PUBLIC LIBRARY

# Mathematics Grade 10

# Complete MCQ Book

All units · FBISE / National Book Foundation syllabus

by Public Library

Independent practice MCQs covering the same topics as the FBISE / NBF textbook. Not copied from the book. Each item has four options, the correct letter, and a short explanation.

Ch 1 Complex Numbers · Ch 2 Quadratic Equations · Ch 3 Matrices and Determinants · Ch 4 Linear and Quadratic Inequalities · Ch 5 Algebraic Fractions · Ch 6 Functions and Graphs · Ch 7 Vectors in Plane · Ch 8 Application of Trigonometry · Ch 9 Chord and Arcs of a Circle · Ch 10 Tangents and Angles of a Circle · Ch 11 Practical Geometry of Circles · Ch 12 Basic Statistics

MATHEMATICS MCQ BOOKLET

# Grade 10 · Chapter 1 · Complex Numbers

FBISE / National Book Foundation Model Textbook companion

by Public Library

*Independent MCQs on the imaginary unit, powers of i, a + bi form, real and imaginary parts, operations, conjugates, modulus, the Argand plane, inverses, algebraic laws, and equations such as $x^2 + k = 0$. Not copied from the book exercise. Total: 108 questions. Each item has four options, the correct letter, and a short explanation of why it is correct.*

## A. Important / Main Topics

**1. The imaginary unit i is defined by:**

(A) $i = \sqrt{(-1)}$
(B) $i = 1$
(C) $i = -1$
(D) $i = 0$

**Correct Answer: A**

*Explanation: No real square equals −1, so i is introduced with $i^2 = -1$.*

**2. The value of $i^2$ is:**

(A) 1
(B) −1
(C) i
(D) 0

**Correct Answer: B**

*Explanation: The value of $i^2$ is −1.*

**3. The value of $i^3$ equals:**

(A) 1
(B) −1
(C) −i
(D) i

**Correct Answer: C**

*Explanation: $i^3 = i^2 \cdot i = (-1)(i) = -i$, so the correct choice is −i.*

**4. The value of $i^4$ equals:**

(A) −1
(B) i
(C) −i
(D) 1

**Correct Answer: D**

*Explanation: $i^4 = (i^2)^2 = (-1)^2 = 1$, so the correct choice is 1.*

**5. The value of $i^8$ equals:**

(A) 1
(B) −1
(C) i
(D) −i

**Correct Answer: A**

*Explanation: $i^8 = (i^4)^2 = 1^2 = 1$, so the correct choice is 1.*

**6. The value of $i^{10}$ equals:**

(A) 1
(B) −1
(C) i

(D) −i

**Correct Answer: B**

*Explanation: 10 mod 4 = 2, so $i^{10} = i^2 = -1$, so the correct choice is −1.*

**7. The value of $i^{11}$ equals:**

(A) 1
(B) −1
(C) −i
(D) i

**Correct Answer: C**

*Explanation: 11 mod 4 = 3, so $i^{11} = i^3 = -i$, so the correct choice is −i.*

**8. The value of $i^{12}$ equals:**

(A) −1
(B) i
(C) −i
(D) 1

**Correct Answer: D**

*Explanation: 12 mod 4 = 0, so $i^{12} = i^4 = 1$, so the correct choice is 1.*

**9. The value of $i^{23}$ equals:**

(A) −i
(B) 1
(C) −1
(D) i

**Correct Answer: A**

*Explanation: 23 mod 4 = 3, so $i^{23} = i^3 = -i$, so the correct choice is −i.*

**10. The value of $i^{50}$ equals:**

(A) 1
(B) −1
(C) i
(D) −i

**Correct Answer: B**

*Explanation: 50 mod 4 = 2, so $i^{50} = i^2 = -1$, so the correct choice is −1.*

**11. The value of $i^{99}$ equals:**

(A) 1
(B) −1
(C) −i
(D) i

**Correct Answer: C**

*Explanation: 99 mod 4 = 3, so $i^{99} = i^3 = -i$, so the correct choice is −i.*

**12. The value of $i^{100}$ equals:**

(A) −1
(B) i
(C) −i
(D) 1

**Correct Answer: D**

*Explanation: 100 mod 4 = 0, so $i^{100} = 1$, so the correct choice is 1.*

**13. Powers of i repeat with period:**

(A) 4
(B) 2
(C) 3

(D) 6

**Correct Answer: A**

*Explanation: Powers of i repeat with period 4.*

**14. The value of $i^{-1}$ equals:**

(A) 1
(B) −i
(C) −1
(D) i

**Correct Answer: B**

*Explanation: $1/i = i^3/i^4 = i^3/1 = -i$, so the correct choice is −i.*

**15. The value of $i^{-2}$ equals:**

(A) 1
(B) i
(C) −1
(D) −i

**Correct Answer: C**

*Explanation: $i^{-2} = 1/i^2 = 1/(-1) = -1$, so the correct choice is −1.*

**16. A complex number is written in standard form as:**

(A) a/b only
(B) $\sqrt{(a^2 - b^2)}$
(C) a − b only
(D) a + bi where a, b ∈ R

**Correct Answer: D**

*Explanation: Every complex number is expressed as a real part a plus an imaginary part bi.*

**17. The set of complex numbers is denoted by:**

(A) C
(B) R
(C) Z
(D) Q

**Correct Answer: A**

*Explanation: C is the standard symbol for the set of all numbers a + bi with real a and b.*

**18. Every real number is also a complex number because:**

(A) reals have no square roots
(B) a real a equals a + 0i
(C) i is real
(D) C is a subset of R

**Correct Answer: B**

*Explanation: Writing b = 0 in a + bi embeds every real inside C, so R ⊂ C.*

**19. The number 5 + 0i is classified as:**

(A) pure imaginary
(B) neither real nor complex
(C) real
(D) undefined

**Correct Answer: C**

*Explanation: Its imaginary part is zero, so it lies on the real axis.*

**20. The number 0 + 7i is classified as:**

(A) real
(B) rational only
(C) not in C

(D) pure imaginary

**Correct Answer: D**

*Explanation: A non-zero number with zero real part is pure imaginary.*

**21. The number 3 + 2i is classified as:**

(A) a non-real complex number
(B) real
(C) pure imaginary
(D) not a complex number

**Correct Answer: A**

*Explanation: Both parts are non-zero, so it is complex but not real or pure imaginary.*

**22. Which number is real?**

(A) 2 + i
(B) −4
(C) 3i
(D) 1 + 2i

**Correct Answer: B**

*Explanation: −4 equals −4 + 0i, so its imaginary part is zero.*

**23. Which number is pure imaginary?**

(A) 5
(B) −3 + i
(C) 0 − 6i
(D) 2 + 0i

**Correct Answer: C**

*Explanation: 0 − 6i — this correctly answers the question.*

**24. Which number is NOT real?**

(A) 0
(B) √2
(C) π
(D) 4 + 3i

**Correct Answer: D**

*Explanation: 4 + 3i has imaginary part 3 ≠ 0, so it is not a real number.*

**25. √(−4) in terms of i equals:**

(A) 2i
(B) −2
(C) −2i
(D) 4i

**Correct Answer: A**

*Explanation: √(−4) in terms of i equals 2i.*

**26. √(−9) in terms of i equals:**

(A) 3
(B) 3i
(C) −3i
(D) 9i

**Correct Answer: B**

*Explanation: √(−9) = √(9) · √(−1) = 3i, so the correct choice is 3i.*

**27. √(−25) in terms of i equals:**

(A) 5
(B) −5
(C) 5i

(D) −25i

**Correct Answer: C**

*Explanation: √(−25) = 5√(−1) = 5i, so the correct choice is 5i.*

**28. 2√(−3) simplified is:**

(A) 2√3
(B) −2√3
(C) 6i
(D) 2√3 i

**Correct Answer: D**

*Explanation: 2√(−3) = 2√3 · √(−1) = 2√3 i, so the correct choice is 2√3 i.*

**29. Evaluate (3 + 2i) + (1 + 4i):**

(A) 4 + 6i
(B) 2 − 2i
(C) 4 + 2i
(D) 3 + 6i

**Correct Answer: A**

*Explanation: Evaluate (3 + 2i) + (1 + 4i) 4 + 6i.*

**30. Evaluate (5 − i) + (2 + 3i):**

(A) 3 + 4i
(B) 7 + 2i
(C) 7 − 4i
(D) 3 − 2i

**Correct Answer: B**

*Explanation: Evaluate (5 − i) + (2 + 3i) 7 + 2i.*

**31. Evaluate (4 + 3i) − (2 + i):**

(A) 6 + 4i
(B) 2 + 4i
(C) 2 + 2i
(D) 6 + 2i

**Correct Answer: C**

*Explanation: Evaluate (4 + 3i) − (2 + i) 2 + 2i.*

**32. Evaluate (1 + 2i) − (3 + 5i):**

(A) 4 + 7i
(B) −2 + 3i
(C) 2 + 3i
(D) −2 − 3i

**Correct Answer: D**

*Explanation: 1 − 3 = −2 and 2 − 5 = −3, so the result is −2 − 3i.*

**33. Evaluate (0 + 3i) + (0 + 2i):**

(A) 5i
(B) 5
(C) 6i
(D) 1 + 5i

**Correct Answer: A**

*Explanation: Both numbers are pure imaginary; 3i + 2i = 5i.*

**34. The additive inverse of 3 + 2i is:**

(A) 3 − 2i
(B) −3 − 2i
(C) −3 + 2i

(D) 3 + 2i

**Correct Answer: B**

*Explanation: The additive inverse of 3 + 2i is −3 − 2i.*

**35. Evaluate i · i:**

(A) 1
(B) i
(C) −1
(D) −i

**Correct Answer: C**

*Explanation: Evaluate i · i −1.*

**36. Evaluate (2i)(3i):**

(A) 6i
(B) 6
(C) −6i
(D) −6

**Correct Answer: D**

*Explanation: (2i)(3i) = 6i² = 6(−1) = −6, so the correct choice is −6.*

**37. Evaluate (1 + i)(1 − i):**

(A) 2
(B) 0
(C) 2i
(D) 1 − i²

**Correct Answer: A**

*Explanation: Evaluate (1 + i)(1 − i) 2.*

**38. Evaluate (2 + 3i)(1 + i):**

(A) 2 + 3i
(B) −1 + 5i
(C) 5 + 5i
(D) −1 − 5i

**Correct Answer: B**

*Explanation: Evaluate (2 + 3i)(1 + i) −1 + 5i.*

**39. Evaluate (3 + 2i)(3 − 2i):**

(A) 5
(B) 9 − 4i²
(C) 13
(D) 9 + 4i

**Correct Answer: C**

*Explanation: Product with conjugate: 9 − (2i)² = 9 − 4(−1) = 13.*

**40. Evaluate i(4 + 2i):**

(A) 4i + 2
(B) 4 + 2i
(C) 2 − 4i
(D) −2 + 4i

**Correct Answer: D**

*Explanation: Evaluate i(4 + 2i) −2 + 4i.*

**41. Evaluate (1 + 2i)(3 − i):**

(A) 5 + 5i
(B) 1 + 5i
(C) 3 − 2i

(D) 5 − 5i

**Correct Answer: A**

*Explanation: Evaluate (1 + 2i)(3 − i) 5 + 5i.*

**42. Evaluate (1 + i)²:**

(A) 1 + 2i
(B) 2i
(C) 1 + i²
(D) 2 + 2i

**Correct Answer: B**

*Explanation: Evaluate (1 + i)² 2i.*

**43. For z = a + bi and w = c + di, zw equals:**

(A) (ac + bd) + (ad + bc)i
(B) (ac − bd) + (ad − bc)i
(C) (ac − bd) + (ad + bc)i
(D) ac + bd

**Correct Answer: C**

*Explanation: For z = a + bi and w = c + di, zw equals (ac − bd) + (ad + bc)i.*

**44. Evaluate 1/i:**

(A) i
(B) 1
(C) −1
(D) −i

**Correct Answer: D**

*Explanation: Evaluate 1/i −i.*

**45. Evaluate (1 + i)/(1 − i):**

(A) i
(B) 1
(C) −i
(D) −1

**Correct Answer: A**

*Explanation: Evaluate (1 + i)/(1 − i) i.*

**46. Evaluate (3 + 4i)/(1 + 2i):**

(A) (11 + 2i)/5
(B) (11 − 2i)/5
(C) (−5 + 10i)/5
(D) 3 + 2i

**Correct Answer: B**

*Explanation: Evaluate (3 + 4i)/(1 + 2i) (11 − 2i)/5.*

**47. Evaluate (2 + 3i)/i:**

(A) 3 + 2i
(B) −3 + 2i
(C) 3 − 2i
(D) 2 − 3i

**Correct Answer: C**

*Explanation: Evaluate (2 + 3i)/i 3 − 2i.*

**48. Evaluate 5/(2i):**

(A) 5i/2
(B) 5/2
(C) −5/2

(D) −5i/2

**Correct Answer: D**

*Explanation: Evaluate 5/(2i) −5i/2.*

**49. To divide by a non-zero complex number c + di, multiply numerator and denominator by:**

(A) c − di
(B) c + di
(C) −c − di
(D) d + ci

**Correct Answer: A**

*Explanation: To divide by a non-zero complex number c + di, multiply numerator and denominator by c − di.*

**50. The conjugate of 3 + 4i is:**

(A) −3 + 4i
(B) 3 − 4i
(C) −3 − 4i
(D) 4 + 3i

**Correct Answer: B**

*Explanation: The conjugate of 3 + 4i is 3 − 4i.*

**51. The conjugate of −2 + 5i is:**

(A) 2 + 5i
(B) 2 − 5i
(C) −2 − 5i
(D) −2 + 5i

**Correct Answer: C**

*Explanation: The conjugate of −2 + 5i is −2 − 5i.*

**52. The conjugate of the real number 7 is:**

(A) −7
(B) 7i
(C) −7i
(D) 7

**Correct Answer: D**

*Explanation: A real number has zero imaginary part, so its conjugate is itself.*

**53. The conjugate of 3i is:**

(A) −3i
(B) 3i
(C) 3
(D) −3

**Correct Answer: A**

*Explanation: The conjugate of 3i is −3i.*

**54. For z = a + bi, the product $z \cdot \bar{z}$ equals:**

(A) $a^2 - b^2$
(B) $a^2 + b^2$
(C) 2a
(D) 2bi

**Correct Answer: B**

*Explanation: $(a + bi)(a - bi) = a^2 - (bi)^2 = a^2 + b^2$, which is always real.*

**55. For z = 3 + 4i, the value of $z \cdot \bar{z}$ is:**

(A) 7
(B) 12
(C) 25

(D) −7

**Correct Answer: C**

*Explanation: For $z = 3 + 4i$, the value of $z \cdot \bar{z}$ is 25.*

**56. If z and w are complex, then the conjugate of zw equals:**

(A) $\bar{z} + \bar{w}$

(B) $z \cdot w$

(C) $z + w$

(D) $\bar{z} \cdot \bar{w}$

**Correct Answer: D**

*Explanation: If z and w are complex, then the conjugate of zw equals $\bar{z} \cdot \bar{w}$.*

**57. If z and w are complex with w ≠ 0, then the conjugate of z/w equals:**

(A) $\bar{z}/\bar{w}$

(B) $\bar{z}/w$

(C) $z/\bar{w}$

(D) $z + \bar{w}$

**Correct Answer: A**

*Explanation: Conjugation also distributes over division: $\overline{(z/w)} = \bar{z}/\bar{w}$.*

**58. The modulus |3 + 4i| equals:**

(A) 7

(B) 5

(C) 25

(D) 1

**Correct Answer: B**

*Explanation: $|z| = \sqrt{(3^2 + 4^2)} = \sqrt{25} = 5$, so the correct choice is 5.*

**59. The modulus |5 + 12i| equals:**

(A) 17

(B) 7

(C) 13

(D) 25

**Correct Answer: C**

*Explanation: $\sqrt{(5^2 + 12^2)} = \sqrt{(25 + 144)} = \sqrt{169} = 13$, so the correct choice is 13.*

**60. The modulus |−3 + 4i| equals:**

(A) 1

(B) 7

(C) 25

(D) 5

**Correct Answer: D**

*Explanation: $\sqrt{((-3)^2 + 4^2)} = \sqrt{(9 + 16)} = 5$, so the correct choice is 5.*

**61. The modulus |7| equals:**

(A) 7

(B) 0

(C) 49

(D) √7

**Correct Answer: A**

*Explanation: For a real number, $|a + 0i| = \sqrt{(a^2)} = |a|$, so $|7| = 7$.*

**62. The modulus |3i| equals:**

(A) −3

(B) 3

(C) 9

(D) $\sqrt{3}$

**Correct Answer: B**

*Explanation: $|0 + 3i| = \sqrt{(0^2 + 3^2)} = 3$, so the correct choice is 3.*

**63. For $z = a + bi$, $|z|^2$ equals:**

(A) $a - b$
(B) $a^2 - b^2$
(C) $a^2 + b^2$
(D) $(a + b)^2$

**Correct Answer: C**

*Explanation: By definition $|z| = \sqrt{(a^2 + b^2)}$, so $|z|^2 = a^2 + b^2$.*

**64. On the Argand plane, the horizontal axis represents:**

(A) imaginary part only
(B) modulus only
(C) argument only
(D) real part

**Correct Answer: D**

*Explanation: The horizontal axis is the real axis; the vertical axis is the imaginary axis.*

**65. On the Argand plane, the vertical axis represents:**

(A) imaginary part
(B) real part
(C) modulus
(D) conjugate

**Correct Answer: A**

*Explanation: Imaginary values are measured upward and downward along the vertical axis.*

**66. The complex number $3 + 2i$ is plotted at the point:**

(A) (2, 3)
(B) (3, 2)
(C) (−3, 2)
(D) (3, −2)

**Correct Answer: B**

*Explanation: Coordinates are (real part, imaginary part) = (3, 2).*

**67. The complex number $-1 - i$ is plotted at:**

(A) (1, 1)
(B) (−1, 1)
(C) (−1, −1)
(D) (1, −1)

**Correct Answer: C**

*Explanation: The complex number $-1 - i$ is plotted at (−1, −1).*

**68. The multiplicative inverse of i is:**

(A) i
(B) 1
(C) −1
(D) −i

**Correct Answer: D**

*Explanation: $i \cdot (-i) = -i^2 = -(-1) = 1$, so $1/i = -i$.*

**69. The multiplicative inverse of $2 + 2i$ is:**

(A) $(1 - i)/4$
(B) $(1 + i)/4$
(C) $1/(2 + 2i)$

(D) −2 − 2i

**Correct Answer: A**

*Explanation: The multiplicative inverse of 2 + 2i is (1 − i)/4.*

**70. Complex addition is commutative, meaning for all z, w in C:**

(A) z + w = z − w
(B) z + w = w + z
(C) zw = wz only for reals
(D) z + w = 0

**Correct Answer: B**

*Explanation: Adding complex numbers commutes because adding real and imaginary parts commutes.*

**71. Complex multiplication is associative, meaning:**

(A) z + w = w + z
(B) z + 0 = z only
(C) z(wu) = (zw)u
(D) zw = z + w

**Correct Answer: C**

*Explanation: Complex multiplication is associative, meaning z(wu) = (zw)u.*

**72. The distributive law for complex numbers states:**

(A) z + w = w + z
(B) $z \cdot \bar{z} = |z|^2$ only
(C) z − z = 1
(D) z(w + u) = zw + zu

**Correct Answer: D**

*Explanation: Multiplication distributes over addition exactly as for real numbers.*

**73. For z = 4 + 7i, the real part Re(z) equals:**

(A) 4
(B) 7
(C) 4i
(D) 7i

**Correct Answer: A**

*Explanation: In a + bi, the real part is the coefficient a, here 4.*

**74. For z = 4 + 7i, the imaginary part Im(z) equals:**

(A) 7
(B) 4
(C) 7i
(D) 4i

**Correct Answer: B**

*Explanation: Im(z) is the real coefficient b of the imaginary term, here 7 (not 7i).*

**75. For z = −5i, Re(z) and Im(z) are:**

(A) Re = −5, Im = 0
(B) Re = −5, Im = −5
(C) Re = 0, Im = −5
(D) Re = 0, Im = 0

**Correct Answer: C**

*Explanation: −5i = 0 + (−5)i, so the real part is 0 and Im(z) = −5.*

**76. The solutions of $x^2 + 9 = 0$ in C are:**

(A) x = ±3
(B) x = 9
(C) no solution

(D) x = ±3i

**Correct Answer: D**

*Explanation: $x^2 = -9$ gives $x = \pm\sqrt{(-9)} = \pm 3i$, so the correct choice is $x = \pm 3i$.*

**77. The solutions of $x^2 + 5 = 0$ in C are:**

(A) $x = \pm\sqrt{5}\, i$
(B) $x = \pm\sqrt{5}$
(C) $x = \pm 5i$
(D) $x = \pm 5$

**Correct Answer: A**

*Explanation: $x^2 = -5$, so $x = \pm\sqrt{(-5)} = \pm\sqrt{5} \cdot i$, so the correct choice is $x = \pm\sqrt{5}\, i$.*

**78. The solutions of $x^2 + 1 = 0$ in C are:**

(A) x = ±1
(B) x = ±i
(C) x = 0
(D) x = 1 only

**Correct Answer: B**

*Explanation: $x^2 = -1$ gives $x = \pm\sqrt{(-1)} = \pm i$, so the correct choice is $x = \pm i$.*

**79. The solutions of $x^2 + 16 = 0$ in C are:**

(A) x = ±4
(B) x = ±16
(C) x = ±4i
(D) x = ±2i

**Correct Answer: C**

*Explanation: $x^2 = -16$, so $x = \pm\sqrt{(-16)} = \pm 4i$, so the correct choice is $x = \pm 4i$.*

**80. Which equation has no real solution but has complex solutions?**

(A) $x^2 - 4 = 0$
(B) $x^2 = 0$
(C) $x - 3 = 0$
(D) $x^2 + 4 = 0$

**Correct Answer: D**

*Explanation: $x^2 + 4 = 0$ requires $x^2 = -4$, impossible in R but solvable in C as $\pm 2i$.*

## B. Less Important / Secondary Topics

**81. Complex numbers were developed partly so mathematicians could work with:**

(A) square roots of negative numbers
(B) only positive square roots
(C) Roman numerals
(D) only integers

**Correct Answer: A**

*Explanation: Complex numbers were developed partly so mathematicians could work with square roots of negative numbers.*

**82. The Italian mathematician Rafael Bombelli helped early work on:**

(A) only real radicals
(B) operations with expressions like √(-1)
(C) base-60 numerals
(D) logarithm tables only

**Correct Answer: B**

*Explanation: Renaissance algebra needed rules for roots of negative radicands.*

**83. Carl Friedrich Gauss popularised the geometric view now called the:**

(A) number line only
(B) unit circle for reals only
(C) Argand (complex) plane
(D) sexagesimal chart

**Correct Answer: C**

*Explanation: Plotting a + bi as (a, b) links algebra to geometry.*

**84. Leonhard Euler connected i to trigonometry through formulas such as e^(iθ); at θ = π this gives:**

(A) e^(iπ) = 1
(B) e^(iπ) = i
(C) e^(iπ) = 0
(D) e^(iπ) = −1

**Correct Answer: D**

*Explanation: Euler's identity e^(iπ) + 1 = 0 is famous; here e^(iπ) = −1.*

**85. The distance from the origin to the point representing z on the Argand plane equals:**

(A) |z|
(B) Re(z) only
(C) Im(z) only
(D) $\bar{z}$

**Correct Answer: A**

*Explanation: Modulus |z| is the Euclidean distance √(a² + b²).*

**86. The conjugate of a sum satisfies $\overline{(z + w)}$ equals:**

(A) $\bar{z} - \bar{w}$
(B) $\bar{z} + \bar{w}$
(C) z + w
(D) $\bar{z}\,\bar{w}$

**Correct Answer: B**

*Explanation: The conjugate of a sum satisfies $\overline{(z + w)}$ equals $\bar{z} + \bar{w}$.*

**87. If z is real, then $\bar{z}$ equals:**

(A) −z
(B) iz
(C) z
(D) 1/z

**Correct Answer: C**

*Explanation: A real number has no imaginary part to flip, so it equals its own conjugate.*

**88. If z is pure imaginary (z = bi, b ≠ 0), then $\bar{z}$ equals:**

(A) z
(B) b
(C) −b
(D) −z

**Correct Answer: D**

*Explanation: Conjugating bi gives −bi, which is −z, so the correct choice is −z.*

**89. |z| is always a:**

(A) non-negative real number
(B) pure imaginary number
(C) negative real
(D) complex number with nonzero imaginary part

**Correct Answer: A**

*Explanation: Modulus √(a² + b²) is real and never negative.*

**90. For any complex z, $z + \bar{z}$ is always:**

(A) pure imaginary
(B) real
(C) zero
(D) negative imaginary only

**Correct Answer: B**

*Explanation: For any complex z, $z + \bar{z}$ is always real.*

**91. For any complex z, $z - \bar{z}$ is always:**

(A) real
(B) rational only
(C) pure imaginary
(D) equal to |z|

**Correct Answer: C**

*Explanation: (a + bi) − (a − bi) = 2bi, which is pure imaginary.*

**92. The additive identity in C is:**

(A) 1
(B) i
(C) −1
(D) 0

**Correct Answer: D**

*Explanation: The additive identity in C is 0.*

**93. The multiplicative identity in C is:**

(A) 1
(B) 0
(C) i
(D) −i

**Correct Answer: A**

*Explanation: The multiplicative identity in C is 1.*

**94. Zero in C has:**

(A) no additive inverse
(B) no multiplicative inverse
(C) both inverses undefined
(D) a multiplicative inverse 1/0

**Correct Answer: B**

*Explanation: 0 + 0i has additive inverse 0, but division by zero is undefined.*

**95. Subtraction of complex numbers is:**

(A) not closed in C
(B) always real
(C) closed: a difference of two complex numbers is complex
(D) always pure imaginary

**Correct Answer: C**

*Explanation: Subtraction of complex numbers is closed: a difference of two complex numbers is complex.*

**96. (2 + i) + (3 − 2i) equals:**

(A) 5 + 3i
(B) 1 + 3i
(C) 6 − i
(D) 5 − i

**Correct Answer: D**

*Explanation: (2 + i) + (3 − 2i) equals 5 − i.*

**97. (1 − 3i)(2 + i) equals:**

(A) 5 − 5i
(B) 2 − 3i
(C) 1 − 6i
(D) 5 + 5i

**Correct Answer: A**

*Explanation: (1 − 3i)(2 + i) equals 5 − 5i.*

**98. If |z| = 0, then z equals:**

(A) i
(B) 0
(C) 1
(D) −1

**Correct Answer: B**

*Explanation: $\sqrt{(a^2 + b^2)} = 0$ forces a = 0 and b = 0, so z = 0.*

**99. The complex conjugate of −4 − 3i is:**

(A) 4 + 3i
(B) 4 − 3i
(C) −4 + 3i
(D) −4 − 3i

**Correct Answer: C**

*Explanation: The complex conjugate of −4 − 3i is −4 + 3i.*

**100. Points on the imaginary axis (except 0) represent:**

(A) real numbers only
(B) all complex numbers
(C) rational numbers only
(D) pure imaginary numbers

**Correct Answer: D**

*Explanation: Coordinates (0, b) with b ≠ 0 are pure imaginary.*

**101. The equation $x^2 − 2x + 5 = 0$ has discriminant −16, so its roots in C are:**

(A) x = 1 ± 2i
(B) x = 1 ± 2
(C) x = −1 ± 2i
(D) x = 2 ± i

**Correct Answer: A**

*Explanation: The equation $x^2 − 2x + 5 = 0$ has discriminant −16, so its roots in C are x = 1 ± 2i.*

**102. $i^{40}$ equals:**

(A) −1
(B) 1
(C) i
(D) −i

**Correct Answer: B**

*Explanation: 40 mod 4 = 0, so $i^{40} = 1$, so the correct choice is 1.*

**103. (3 − i)(3 + i) equals:**

(A) 8
(B) 9 − $i^2$
(C) 10
(D) 6

**Correct Answer: C**

*Explanation: Product with conjugate: 9 − $i^2$ = 9 + 1 = 10.*

**104. Simplify (4 + 2i)/(1 − i):**

(A) 3 + i
(B) 1 − 3i
(C) 3 − i
(D) 1 + 3i

**Correct Answer: D**

*Explanation: Simplify (4 + 2i)/(1 − i) 1 + 3i.*

**105. If z = 1 + i and w = 1 − i, then zw equals:**

(A) 2
(B) 0
(C) 2i
(D) −2i

**Correct Answer: A**

*Explanation: (1 + i)(1 − i) = 1 − i² = 2, so the correct choice is 2.*

**106. Engineering uses j instead of i for the imaginary unit mainly to avoid clashing with:**

(A) the index variable in sums
(B) electric current symbol I
(C) the integer set Z
(D) the unit vector k

**Correct Answer: B**

*Explanation: In electrical engineering, i often denotes current, so j marks √(-1).*

**107. The set C is:**

(A) not closed under addition
(B) only closed under multiplication
(C) closed under +, −, ×, and ÷ (except ÷0)
(D) a subset of N

**Correct Answer: C**

*Explanation: The set C is closed under +, −, ×, and ÷ (except ÷0).*

**108. Writing x = 2 + 3i means x is:**

(A) a 2-by-3 matrix
(B) equal to 5
(C) pure imaginary
(D) a complex number with real 2 and imaginary 3

**Correct Answer: D**

*Explanation: Writing x = 2 + 3i means x is a complex number with real 2 and imaginary 3.*

MATHEMATICS MCQ BOOKLET

# Grade 10 · Chapter 2 · Quadratic Equations

FBISE / National Book Foundation Model Textbook companion

by Public Library

*Independent MCQs on quadratic equations: standard form, factorization, completing the square, the quadratic formula, the discriminant, relations between roots and coefficients, equations reducible to quadratics, simultaneous linear–quadratic systems, and word problems. Not copied from the book exercise. Total: 108 questions. Each item has four options, the correct letter, and a short explanation of why it is correct.*

## A. Important / Main Topics

**1. An equation of the form $ax^2 + bx + c = 0$ with $a \neq 0$ is called a:**

(A) quadratic equation
(B) linear equation
(C) cubic equation
(D) exponential equation

**Correct Answer: A**

*Explanation: The highest power of the unknown is two, so the.*

**2. In $3x^2 - 7x + 2 = 0$, the leading coefficient a equals:**

(A) −7
(B) 3
(C) 2
(D) 0

**Correct Answer: B**

*Explanation: Standard form lists the $x^2$ term first, so a = 3.*

**3. The standard form of a quadratic equation requires:**

(A) a = 0
(B) b = 0 only
(C) the right-hand side equal to zero
(D) c always positive

**Correct Answer: C**

*Explanation: All terms are collected on one side so the other side is zero.*

**4. Which equation is NOT quadratic?**

(A) $x^2 - 4 = 0$
(B) $5x^2 + x = 0$
(C) $2x^2 = 8$
(D) $3x + 2 = 0$

**Correct Answer: D**

*Explanation: $3x + 2 = 0$ has degree 1, so it is linear, not quadratic.*

**5. If $x(x - 5) = 0$, then x equals:**

(A) 0 or 5
(B) 5 only
(C) 0 only
(D) −5 or 0

**Correct Answer: A**

*Explanation: If $x(x - 5) = 0$, then x equals 0 or 5.*

**6. If $(x - 3)(x + 2) = 0$, then x equals:**

(A) −3 or 2
(B) 3 or −2

(C) 3 or 2
(D) −3 or −2

**Correct Answer: B**

*Explanation: If (x − 3)(x + 2) = 0, then x equals 3 or −2.*

**7. The factorization of $x^2 - 5x + 6$ is:**

(A) (x + 2)(x + 3)
(B) (x − 1)(x − 6)
(C) (x − 2)(x − 3)
(D) (x + 1)(x + 6)

**Correct Answer: C**

*Explanation: (x − 2)(x − 3) expands to $x^2 - 5x + 6$, so the correct choice is (x − 2)(x − 3).*

**8. Solve $x^2 - 5x + 6 = 0$ by factorization:**

(A) x = 1, 6
(B) x = −2, −3
(C) x = 0, 5
(D) x = 2, 3

**Correct Answer: D**

*Explanation: Solve $x^2 - 5x + 6 = 0$ by factorization x = 2, 3.*

**9. The factorization of $x^2 + x - 6$ is:**

(A) (x + 3)(x − 2)
(B) (x − 3)(x + 2)
(C) (x + 1)(x − 6)
(D) (x − 1)(x + 6)

**Correct Answer: A**

*Explanation: $(x + 3)(x - 2) = x^2 + x - 6$, so the factors match.*

**10. Solve $x^2 + x - 6 = 0$:**

(A) x = 3, −2
(B) x = −3, 2
(C) x = 2, 3
(D) x = −2, −3

**Correct Answer: B**

*Explanation: Roots from (x + 3)(x − 2) = 0 are −3 and 2.*

**11. The factorization of $2x^2 - 7x + 3$ is:**

(A) (2x + 1)(x + 3)
(B) (x − 1)(2x − 3)
(C) (2x − 1)(x − 3)
(D) (2x − 1)(x + 3)

**Correct Answer: C**

*Explanation: The factorization of $2x^2 - 7x + 3$ is (2x − 1)(x − 3).*

**12. Solve $2x^2 - 7x + 3 = 0$:**

(A) x = −1/2, −3
(B) x = 1, 3
(C) x = 2, 3
(D) x = 1/2, 3

**Correct Answer: D**

*Explanation: Solve $2x^2 - 7x + 3 = 0$ x = 1/2, 3.*

**13. The expression $x^2 - 9$ factors as:**

(A) (x − 3)(x + 3)
(B) $(x - 3)^2$

(C) $(x + 3)^2$
(D) $(x - 9)(x + 1)$

**Correct Answer: A**

*Explanation: The expression $x^2 - 9$ factors as $(x - 3)(x + 3)$.*

**14. Solve $x^2 - 9 = 0$:**

(A) $x = 9$
(B) $x = \pm 3$
(C) $x = 3$ only
(D) $x = -3$ only

**Correct Answer: B**

*Explanation: Solve $x^2 - 9 = 0$ $x = \pm 3$.*

**15. The trinomial $x^2 + 6x + 9$ equals:**

(A) $(x - 3)^2$
(B) $(x + 9)^2$
(C) $(x + 3)^2$
(D) $(x + 6)^2$

**Correct Answer: C**

*Explanation: $x^2 + 6x + 9$ is a perfect square: $(x + 3)^2$.*

**16. Solve $x^2 + 6x + 9 = 0$:**

(A) $x = 3$
(B) $x = \pm 3$
(C) $x = 6$
(D) $x = -3$ (repeated root)

**Correct Answer: D**

*Explanation: Solve $x^2 + 6x + 9 = 0$ $x = -3$ (repeated root).*

**17. The zero product property states that if $ab = 0$, then:**

(A) $a = 0$ or $b = 0$
(B) $a = b = 0$ always
(C) $a + b = 0$
(D) $a = -b$

**Correct Answer: A**

*Explanation: At least one factor must be zero for the product to vanish.*

**18. To complete the square on $x^2 + 6x$, the number added inside is:**

(A) 3
(B) 9
(C) 6
(D) 36

**Correct Answer: B**

*Explanation: Half of 6 is 3, and $3^2 = 9$ completes the square.*

**19. Writing $x^2 + 6x + 5$ as $(x + h)^2 + k$ gives h equal to:**

(A) $-3$
(B) 6
(C) 3
(D) 5

**Correct Answer: C**

*Explanation: $x^2 + 6x + 5 = (x + 3)^2 - 4$, so $h = 3$, so the correct choice is 3.*

**20. For $x^2 - 4x + 1 = (x - 2)^2 + k$, the value of k is:**

(A) 1
(B) 3

(C) −1
(D) −3

**Correct Answer: D**

*Explanation: $(x - 2)^2 = x^2 - 4x + 4$, so $k = 1 - 4 = -3$.*

**21. Completing the square on $x^2 - 4x + 1 = 0$ gives $(x - 2)^2$ equal to:**

(A) 3
(B) 1
(C) −3
(D) 4

**Correct Answer: A**

*Explanation: Rearranging yields $(x - 2)^2 = 3$, so the correct choice is 3.*

**22. Solve $x^2 - 4x + 1 = 0$ by completing the square:**

(A) $x = 2 \pm 1$
(B) $x = 2 \pm \sqrt{3}$
(C) $x = 4 \pm \sqrt{3}$
(D) $x = \pm 2$

**Correct Answer: B**

*Explanation: $x - 2 = \pm\sqrt{3}$, so $x = 2 + \sqrt{3}$ or $x = 2 - \sqrt{3}$.*

**23. The quadratic formula for $ax^2 + bx + c = 0$ is:**

(A) $x = (-b \pm \sqrt{(b^2 + 4ac)})/(2a)$
(B) $x = (b \pm \sqrt{(b^2 - 4ac)})/(2a)$
(C) $x = (-b \pm \sqrt{(b^2 - 4ac)})/(2a)$
(D) $x = -b/(2a)$ only

**Correct Answer: C**

*Explanation: The standard formula uses $b^2 - 4ac$ under the square root.*

**24. For $x^2 - 5x + 6 = 0$, with $a = 1$, $b = -5$, $c = 6$, the value of $-b$ is:**

(A) −5
(B) 6
(C) −6
(D) 5

**Correct Answer: D**

*Explanation: Negating $b = -5$ gives $-b = 5$, so the correct choice is 5.*

**25. The discriminant of $x^2 - 5x + 6 = 0$ is:**

(A) 1
(B) 0
(C) −1
(D) 25

**Correct Answer: A**

*Explanation: $D = (-5)^2 - 4(1)(6) = 25 - 24 = 1$, so the correct choice is 1.*

**26. Using the quadratic formula on $x^2 - 5x + 6 = 0$ gives roots:**

(A) $x = -2, -3$
(B) $x = 2, 3$
(C) $x = 5, 6$
(D) $x = 1, 6$

**Correct Answer: B**

*Explanation: $x = (5 \pm 1)/2$, so $x = 3$ or $x = 2$, so the correct choice is $x = 2, 3$.*

**27. The discriminant of $x^2 + 4x + 7 = 0$ is:**

(A) 12
(B) 0

(C) −12
(D) 28

**Correct Answer: C**

*Explanation: D = 4² − 4(1)(7) = 16 − 28 = −12, so the correct choice is −12.*

**28. If D < 0 and coefficients are real, the roots are:**

(A) two distinct real numbers
(B) equal real numbers
(C) both zero
(D) complex conjugates

**Correct Answer: D**

*Explanation: A negative discriminant means the square root is non-real.*

**29. If D = 0, the quadratic equation has:**

(A) one repeated real root
(B) no roots
(C) two distinct real roots
(D) imaginary roots only

**Correct Answer: A**

*Explanation: If D = 0, the quadratic equation has one repeated real root.*

**30. If D > 0, the quadratic equation has:**

(A) equal roots
(B) two distinct real roots
(C) no real roots
(D) exactly one root

**Correct Answer: B**

*Explanation: If D > 0, the quadratic equation has two distinct real roots.*

**31. The discriminant of $x^2 - 6x + 9 = 0$ equals:**

(A) 36
(B) −36
(C) 0
(D) 9

**Correct Answer: C**

*Explanation: D = (−6)² − 4(1)(9) = 36 − 36 = 0, so the correct choice is 0.*

**32. The roots of $x^2 - 6x + 9 = 0$ are:**

(A) −3 and 3
(B) 6 and 0
(C) 9 and 1
(D) 3 and 3

**Correct Answer: D**

*Explanation: (x − 3)² = 0 gives the repeated root 3, so the correct choice is 3 and 3.*

**33. The discriminant of $x^2 + 2x + 5 = 0$ is:**

(A) −16
(B) 16
(C) 0
(D) 4

**Correct Answer: A**

*Explanation: D = 2² − 4(1)(5) = 4 − 20 = −16, so the correct choice is −16.*

**34. The nature of roots of $x^2 + 2x + 5 = 0$ is:**

(A) two distinct reals
(B) non-real (imaginary) roots

(C) equal reals
(D) both zero

**Correct Answer: B**

*Explanation: D = −16 < 0, so no real roots exist, so the correct choice is non-real (imaginary) roots.*

**35. The discriminant of $x^2 - 3x + 1 = 0$ is:**

(A) −5
(B) 9
(C) 5
(D) 1

**Correct Answer: C**

*Explanation: D = $(-3)^2 - 4(1)(1) = 9 - 4 = 5$, so the correct choice is 5.*

**36. The roots of $x^2 - 3x + 1 = 0$ are:**

(A) rational
(B) integers
(C) equal
(D) irrational

**Correct Answer: D**

*Explanation: $\sqrt{5}$ is irrational, so $(3 \pm \sqrt{5})/2$ is irrational.*

**37. For $2x^2 + 3x - 2 = 0$, the discriminant D equals:**

(A) 25
(B) −25
(C) 9
(D) 1

**Correct Answer: A**

*Explanation: D = $3^2 - 4(2)(-2) = 9 + 16 = 25$, so the correct choice is 25.*

**38. Solve $2x^2 + 3x - 2 = 0$:**

(A) x = 2, −1/2
(B) x = 1/2, −2
(C) x = 1, −2
(D) x = −1/2, 2

**Correct Answer: B**

*Explanation: $x = (-3 \pm 5)/4$ gives $x = 1/2$ or $x = -2$, so the correct choice is x = 1/2, −2.*

**39. For $ax^2 + bx + c = 0$, the sum of roots $\alpha + \beta$ equals:**

(A) b/a
(B) c/a
(C) −b/a
(D) −c/a

**Correct Answer: C**

*Explanation: Vieta's formula: $\alpha + \beta = -b/a$, so the correct choice is −b/a.*

**40. For $ax^2 + bx + c = 0$, the product of roots $\alpha\beta$ equals:**

(A) b/a
(B) −b/a
(C) −c/a
(D) c/a

**Correct Answer: D**

*Explanation: Vieta's formula: $\alpha\beta = c/a$, so the correct choice is c/a.*

**41. For $x^2 - 5x + 6 = 0$, the sum of the roots is:**

(A) 5
(B) 6

(C) −5
(D) −6

**Correct Answer: A**

*Explanation: −b/a = −(−5)/1 = 5, so the correct choice is 5.*

**42. For $x^2 - 5x + 6 = 0$, the product of the roots is:**

(A) 5
(B) 6
(C) −6
(D) −5

**Correct Answer: B**

*Explanation: c/a = 6/1 = 6, so the correct choice is 6.*

**43. If the roots of a quadratic are 2 and 3, their product is:**

(A) 5
(B) 1
(C) 6
(D) −6

**Correct Answer: C**

*Explanation: 2 × 3 = 6, so the correct choice is 6.*

**44. A monic quadratic with roots 2 and 3 is:**

(A) $x^2 + 5x + 6$
(B) $x^2 - 5x - 6$
(C) $x^2 + 5x - 6$
(D) $x^2 - 5x + 6$

**Correct Answer: D**

*Explanation: $(x - 2)(x - 3) = x^2 - 5x + 6$, so the correct choice is $x^2 - 5x + 6$.*

**45. A monic quadratic with roots −1 and 4 is:**

(A) $x^2 - 3x - 4$
(B) $x^2 + 3x - 4$
(C) $x^2 - 3x + 4$
(D) $x^2 + 3x + 4$

**Correct Answer: A**

*Explanation: $(x + 1)(x - 4) = x^2 - 3x - 4$, so the correct choice is $x^2 - 3x - 4$.*

**46. If the sum of roots is 7 and the product is 12, the monic quadratic is:**

(A) $x^2 + 7x + 12$
(B) $x^2 - 7x + 12$
(C) $x^2 - 7x - 12$
(D) $x^2 + 7x - 12$

**Correct Answer: B**

*Explanation: $x^2 - (\text{sum})x + \text{product} = x^2 - 7x + 12$, so the correct choice is $x^2 - 7x + 12$.*

**47. If α and β are roots, then $\alpha^2 + \beta^2$ equals:**

(A) $(\alpha + \beta)^2$
(B) $(\alpha + \beta)^2 + 2\alpha\beta$
(C) $(\alpha + \beta)^2 - 2\alpha\beta$
(D) $\alpha\beta$

**Correct Answer: C**

*Explanation: If α and β are roots, then $\alpha^2 + \beta^2$ equals $(\alpha + \beta)^2 - 2\alpha\beta$.*

**48. For $x^2 - 5x + 6 = 0$, the value of $\alpha^2 + \beta^2$ is:**

(A) 25
(B) 12

(C) 5
(D) 13

**Correct Answer: D**

*Explanation: $5^2 - 2(6) = 25 - 12 = 13$, so the correct choice is 13.*

**49. The expression $1/\alpha + 1/\beta$ equals:**

(A) $(\alpha + \beta)/\alpha\beta$
(B) $\alpha\beta/(\alpha + \beta)$
(C) $\alpha + \beta$
(D) $\alpha\beta$

**Correct Answer: A**

*Explanation: Common denominator gives $(\beta + \alpha)/(\alpha\beta)$, so the correct choice is $(\alpha + \beta)/\alpha\beta$.*

**50. For $x^2 - 5x + 6 = 0$, the value of $1/\alpha + 1/\beta$ is:**

(A) 6/5
(B) 5/6
(C) 5
(D) 6

**Correct Answer: B**

*Explanation: $(\alpha + \beta)/\alpha\beta = 5/6$, so the correct choice is 5/6.*

**51. To solve $x^4 - 5x^2 + 4 = 0$, substituting $y = x^2$ gives:**

(A) $y - 5y + 4 = 0$
(B) $x^2 - 5x + 4 = 0$
(C) $y^2 - 5y + 4 = 0$
(D) $y^2 + 5y + 4 = 0$

**Correct Answer: C**

*Explanation: To solve $x^4 - 5x^2 + 4 = 0$, substituting $y = x^2$ gives $y^2 - 5y + 4 = 0$.*

**52. If $y^2 - 5y + 4 = 0$, then y equals:**

(A) −4 or −1
(B) 5 or 4
(C) 2 or 3
(D) 4 or 1

**Correct Answer: D**

*Explanation: If $y^2 - 5y + 4 = 0$, then y equals 4 or 1.*

**53. From $x^4 - 5x^2 + 4 = 0$ with $y = x^2$, the real solutions for x are:**

(A) ±1 and ±2
(B) ±1 only
(C) ±2 only
(D) 1, 2, 4 only

**Correct Answer: A**

*Explanation: $y = 1 \rightarrow x = \pm 1$; $y = 4 \rightarrow x = \pm 2$, so the correct choice is ±1 and ±2.*

**54. The equation $2^x + 2^{(-x)} = 5$ can be reduced using $u = 2^x$ because $2^{(-x)}$ equals:**

(A) u
(B) 1/u
(C) $u^2$
(D) log u

**Correct Answer: B**

*Explanation: $2^{(-x)} = 1/2^x = 1/u$ when $u = 2^x$, so the correct choice is 1/u.*

**55. With $u = 2^x$, the equation $2^x + 2^{(-x)} = 5$ becomes:**

(A) $u - u = 5$
(B) $u^2 = 5$

(C) u + 1/u = 5
(D) log u = 5

**Correct Answer: C**

*Explanation: Substitute u for $2^x$ and 1/u for $2^{(-x)}$, so the correct choice is u + 1/u = 5.*

**56. Multiplying u + 1/u = 5 by u (u ≠ 0) gives the quadratic:**

(A) $u^2 + 5u + 1 = 0$
(B) $u^2 - 5u - 1 = 0$
(C) u − 5 = 0
(D) $u^2 - 5u + 1 = 0$

**Correct Answer: D**

*Explanation: Multiplying u + 1/u = 5 by u (u ≠ 0) gives the quadratic $u^2 - 5u + 1 = 0$.*

**57. The equation 1/x + 1/(x + 1) = 3/4 (x ≠ 0, −1) becomes quadratic after:**

(A) clearing fractions with the LCD
(B) taking square roots
(C) subtracting 1 from both sides
(D) ignoring denominators

**Correct Answer: A**

*Explanation: The equation 1/x + 1/(x + 1) = 3/4 (x ≠ 0, −1) becomes quadratic after clearing fractions with the LCD.*

**58. Given x + y = 5 and $x^2 + y^2 = 13$, the product xy equals:**

(A) 12
(B) 6
(C) 13
(D) 25

**Correct Answer: B**

*Explanation: $(x + y)^2 = x^2 + 2xy + y^2$, so $25 = 13 + 2xy$ and $xy = 6$.*

**59. With x + y = 5 and xy = 6, the numbers x and y satisfy:**

(A) $t^2 + 5t + 6 = 0$
(B) $t^2 - 6t + 5 = 0$
(C) $t^2 - 5t + 6 = 0$
(D) $t^2 + 6t + 5 = 0$

**Correct Answer: C**

*Explanation: $t^2 - (x + y)t + xy = t^2 - 5t + 6 = 0$, so the correct choice is $t^2 - 5t + 6 = 0$.*

**60. The simultaneous system x + y = 5, $x^2 + y^2 = 13$ has real solution pairs:**

(A) (1, 4) only
(B) (5, 0) only
(C) no real pairs
(D) (2, 3) and (3, 2)

**Correct Answer: D**

*Explanation: $t^2 - 5t + 6 = 0$ gives t = 2 or 3, so the pairs are (2,3) and (3,2).*

**61. For x − y = 1 and xy = 6, substituting y = x − 1 into xy = 6 gives:**

(A) $x^2 - x - 6 = 0$
(B) $x^2 + x - 6 = 0$
(C) $x^2 - x + 6 = 0$
(D) $x^2 + x + 6 = 0$

**Correct Answer: A**

*Explanation: $x(x - 1) = 6$ expands to $x^2 - x - 6 = 0$, so the correct choice is $x^2 - x - 6 = 0$.*

**62. The system x − y = 1, xy = 6 has solution pairs:**

(A) (2, 3) only
(B) (3, 2) and (−2, −3)

(C) (6, 1) only
(D) no real solution

**Correct Answer: B**

*Explanation: The system $x - y = 1$, $xy = 6$ has solution pairs (3, 2) and (−2, −3).*

**63. "Product of two consecutive positive integers is 56" translates to:**

(A) $n^2 - n - 56 = 0$
(B) $n^2 + 56 = 0$
(C) $n^2 + n - 56 = 0$
(D) $2n = 56$

**Correct Answer: C**

*Explanation: $n(n + 1) = 56$ becomes $n^2 + n - 56 = 0$, so the correct choice is $n^2 + n - 56 = 0$.*

**64. The positive root of $n^2 + n - 56 = 0$ is:**

(A) 8
(B) 56
(C) −7
(D) 7

**Correct Answer: D**

*Explanation: $n = (-1 \pm \sqrt{225})/2 = (-1 \pm 15)/2$, so $n = 7$ (the other root is −8).*

**65. A rectangle's length exceeds its width by 3 and its area is 54. Width w satisfies:**

(A) $w^2 + 3w - 54 = 0$
(B) $w^2 - 3w - 54 = 0$
(C) $w + 3 = 54$
(D) $2w + 3 = 54$

**Correct Answer: A**

*Explanation: Length $w + 3$ gives $w(w + 3) = 54$, so $w^2 + 3w - 54 = 0$.*

**66. The positive width from $w^2 + 3w - 54 = 0$ is:**

(A) 9
(B) 6
(C) 54
(D) 3

**Correct Answer: B**

*Explanation: $w = (-3 \pm \sqrt{225})/2 = (-3 \pm 15)/2$, so $w = 6$ (reject $w = -9$).*

**67. If travel times t and t + 1 satisfy 60/t + 60/(t + 1) = 11, clearing fractions yields:**

(A) a linear equation only
(B) a cubic equation only
(C) a quadratic in t
(D) no equation

**Correct Answer: C**

*Explanation: If travel times t and t + 1 satisfy 60/t + 60/(t + 1) = 11, clearing fractions yields a quadratic in t.*

**68. Rewritten in standard form, $4 - x^2 + 3x = 0$ becomes:**

(A) $x^2 - 3x - 4 = 0$
(B) $x^2 + 3x + 4 = 0$
(C) $-x^2 - 3x + 4 = 0$
(D) $-x^2 + 3x + 4 = 0$

**Correct Answer: D**

*Explanation: Rewritten in standard form, $4 - x^2 + 3x = 0$ becomes $-x^2 + 3x + 4 = 0$.*

**69. If a quadratic with real coefficients has roots of opposite signs, then c/a is:**

(A) negative
(B) positive

(C) zero
(D) always 1

**Correct Answer: A**

*Explanation: If a quadratic with real coefficients has roots of opposite signs, then c/a is negative.*

**70. If c = 0 in $ax^2 + bx + c = 0$ with $a \neq 0$, one root is always:**

(A) 1
(B) 0
(C) −b/a
(D) b/a

**Correct Answer: B**

*Explanation: Factoring x(ax + b) = 0 shows x = 0 is always a root.*

**71. Solve $3x^2 - 12x = 0$:**

(A) x = 3, 4
(B) x = 0, 12
(C) x = 0, 4
(D) x = 4 only

**Correct Answer: C**

*Explanation: 3x(x − 4) = 0 gives x = 0 or x = 4, so the correct choice is x = 0, 4.*

**72. The equation $x^2 = 7$ has real solutions:**

(A) x = 7
(B) x = ±7
(C) none
(D) $x = \pm\sqrt{7}$

**Correct Answer: D**

*Explanation: The equation $x^2 = 7$ has real solutions $x = \pm\sqrt{7}$.*

**73. For a quadratic with rational coefficients, rational roots require D to be:**

(A) a perfect square
(B) always zero
(C) always negative
(D) always 1

**Correct Answer: A**

*Explanation: √D must be rational, so D must be a perfect square of a rational.*

**74. The equation $x^2 - 4x + 4 = 0$ has roots that are:**

(A) distinct irrationals
(B) equal rationals
(C) complex conjugates
(D) of opposite signs

**Correct Answer: B**

*Explanation: The equation $x^2 - 4x + 4 = 0$ has roots that are equal rationals.*

**75. If $x^2 + px + q = 0$ has roots r and s, then an equation with roots 2r and 2s is:**

(A) $x^2 + px + 4q = 0$
(B) $x^2 + 2px + q = 0$
(C) $x^2 + 2px + 4q = 0$
(D) $4x^2 + 2px + q = 0$

**Correct Answer: C**

*Explanation: If $x^2 + px + q = 0$ has roots r and s, then an equation with roots 2r and 2s is $x^2 + 2px + 4q = 0$.*

**76. Substituting $y = 7 - x$ into $x^2 + y^2 = 25$ gives:**

(A) $x^2 + 7x + 12 = 0$
(B) $x^2 - 7x - 12 = 0$

(C) $x - 7 = 0$
(D) $x^2 - 7x + 12 = 0$

**Correct Answer: D**

*Explanation: Substituting $y = 7 - x$ into $x^2 + y^2 = 25$ gives $x^2 - 7x + 12 = 0$.*

**77. The system $x^2 + y^2 = 25$, $x + y = 7$ has real solution pairs:**

(A) (3, 4) and (4, 3)
(B) (5, 0) only
(C) (0, 5) only
(D) no real solution

**Correct Answer: A**

*Explanation: $x^2 - 7x + 12 = 0$ gives $x = 3$ or 4, so pairs are (3,4) and (4,3).*

**78. The parabola $y = ax^2 + bx + c$ with $a > 0$ opens:**

(A) downward
(B) upward
(C) to the right
(D) to the left

**Correct Answer: B**

*Explanation: The parabola $y = ax^2 + bx + c$ with $a > 0$ opens upward.*

**79. A quadratic equation can have at most this many distinct real roots:**

(A) 1
(B) 3
(C) 2
(D) unlimited

**Correct Answer: C**

*Explanation: A quadratic equation can have at most this many distinct real roots 2.*

**80. Counting multiplicity over the complex numbers, $ax^2 + bx + c = 0$ has exactly:**

(A) 1 root
(B) 3 roots
(C) 0 roots
(D) 2 roots

**Correct Answer: D**

*Explanation: Counting multiplicity over the complex numbers, $ax^2 + bx + c = 0$ has exactly 2 roots.*

## B. Less Important / Secondary Topics

**81. The degree (highest power of x) in a quadratic equation is:**

(A) 2
(B) 1
(C) 3
(D) 0

**Correct Answer: A**

*Explanation: Quadratic means degree two: the highest power is $x^2$.*

**82. The equation $x^2 = 0$ has root:**

(A) $x = 2$
(B) $x = 0$ (repeated)
(C) no root
(D) $x = \pm 1$

**Correct Answer: B**

*Explanation: $x^2 = 0$ gives $x = 0$ as a double root, so the correct choice is $x = 0$ (repeated).*

**83. If $(x - 1)^2 = 0$, then x equals:**

(A) −1
(B) 0
(C) 1
(D) 2

**Correct Answer: C**

*Explanation: If $(x - 1)^2 = 0$, then x equals 1.*

**84. The factorization of $x^2 - 4$ is:**

(A) $(x - 4)(x + 1)$
(B) $(x - 2)^2$
(C) $(x + 4)(x - 1)$
(D) $(x - 2)(x + 2)$

**Correct Answer: D**

*Explanation: $x^2 - 4$ is a difference of squares: $(x - 2)(x + 2)$.*

**85. Solve $x^2 - 4 = 0$:**

(A) $x = \pm 2$
(B) $x = \pm 4$
(C) x = 2 only
(D) x = 0

**Correct Answer: A**

*Explanation: $x = 2$ or $x = -2$ satisfies $x^2 = 4$, so the correct choice is $x = \pm 2$.*

**86. The expression $x^2 + 5x$ factors as:**

(A) $(x + 5)^2$
(B) $x(x + 5)$
(C) $x(x - 5)$
(D) $(x + 5)(x - 5)$

**Correct Answer: B**

*Explanation: The expression $x^2 + 5x$ factors as $x(x + 5)$.*

**87. Solve $x^2 + 5x = 0$:**

(A) x = 0, 5
(B) x = 5 only
(C) x = 0, −5
(D) x = −5 only

**Correct Answer: C**

*Explanation: $x(x + 5) = 0$ gives $x = 0$ or $x = -5$, so the correct choice is $x = 0, -5$.*

**88. In $ax^2 + bx + c = 0$, the coefficient b is attached to:**

(A) $x^2$
(B) the constant term
(C) the discriminant
(D) x

**Correct Answer: D**

*Explanation: In $ax^2 + bx + c = 0$, the coefficient b is attached to x.*

**89. In $ax^2 + bx + c = 0$, the constant term is:**

(A) c
(B) a
(C) b
(D) D

**Correct Answer: A**

*Explanation: c is the term with no factor of x, so the correct choice is c.*

**90. The equation $x^2 + 1 = 0$ has:**

(A) real roots ±1
(B) no real roots
(C) root 0
(D) root −1

**Correct Answer: B**

*Explanation: $x^2 = -1$ has no real solution, so the correct choice is no real roots.*

**91. The expression $b^2 - 4ac$ is called the:**

(A) sum of roots
(B) vertex
(C) discriminant
(D) axis of symmetry

**Correct Answer: C**

*Explanation: The expression $b^2 - 4ac$ is called the discriminant.*

**92. If D = 0, the roots of a quadratic are:**

(A) always imaginary
(B) always of opposite sign
(C) undefined
(D) equal

**Correct Answer: D**

*Explanation: D = 0 means the ± part vanishes, giving one repeated root.*

**93. The sum of roots of $x^2 - 8x + 15 = 0$ is:**

(A) 8
(B) 15
(C) −8
(D) −15

**Correct Answer: A**

*Explanation: $-b/a = -(-8)/1 = 8$, so the correct choice is 8.*

**94. The product of roots of $x^2 - 8x + 15 = 0$ is:**

(A) 8
(B) 15
(C) −15
(D) 23

**Correct Answer: B**

*Explanation: $c/a = 15/1 = 15$, so the correct choice is 15.*

**95. The roots of $x^2 - 8x + 15 = 0$ are:**

(A) −3 and −5
(B) 8 and 15
(C) 3 and 5
(D) 1 and 15

**Correct Answer: C**

*Explanation: $(x - 3)(x - 5) = 0$ gives roots 3 and 5, so the correct choice is 3 and 5.*

**96. A monic quadratic with roots 1 and 6 is:**

(A) $x^2 + 7x + 6$
(B) $x^2 - 7x - 6$
(C) $x^2 + 6$
(D) $x^2 - 7x + 6$

**Correct Answer: D**

*Explanation: $x^2 - (1 + 6)x + 1 \cdot 6 = x^2 - 7x + 6$, so the correct choice is $x^2 - 7x + 6$.*

**97. The factorization of $x^2 - 7x + 6$ is:**

(A) $(x - 1)(x - 6)$
(B) $(x + 1)(x + 6)$
(C) $(x - 7)(x + 1)$
(D) $(x - 2)(x - 3)$

**Correct Answer: A**

*Explanation: $(x - 1)(x - 6) = x^2 - 7x + 6$, so the correct choice is $(x - 1)(x - 6)$.*

**98. Substituting $y = x^2$ in $x^4 - 13x^2 + 36 = 0$ gives:**

(A) $y - 13 + 36 = 0$
(B) $y^2 - 13y + 36 = 0$
(C) $x^2 - 13x + 36 = 0$
(D) $y^2 + 13y + 36 = 0$

**Correct Answer: B**

*Explanation: Substituting $y = x^2$ in $x^4 - 13x^2 + 36 = 0$ gives $y^2 - 13y + 36 = 0$.*

**99. If $y^2 - 13y + 36 = 0$, then y equals:**

(A) 13 and 36
(B) −9 and −4
(C) 9 and 4
(D) 36 only

**Correct Answer: C**

*Explanation: If $y^2 - 13y + 36 = 0$, then y equals 9 and 4.*

**100. The real solutions of $x^4 - 13x^2 + 36 = 0$ are:**

(A) ±9 and ±4
(B) ±13 only
(C) none
(D) ±2 and ±3

**Correct Answer: D**

*Explanation: $y = 9 \rightarrow x = \pm 3$; $y = 4 \rightarrow x = \pm 2$, so the correct choice is ±2 and ±3.*

**101. If $x + y = 10$ and $xy = 21$, then x and y satisfy:**

(A) $t^2 - 10t + 21 = 0$
(B) $t^2 + 10t + 21 = 0$
(C) $t^2 - 21t + 10 = 0$
(D) $t = 10$

**Correct Answer: A**

*Explanation: $t^2 - (x + y)t + xy = t^2 - 10t + 21 = 0$, so the correct choice is $t^2 - 10t + 21 = 0$.*

**102. The roots of $t^2 - 10t + 21 = 0$ are:**

(A) 10 and 21
(B) 7 and 3
(C) −7 and −3
(D) 21 and 1

**Correct Answer: B**

*Explanation: The roots of $t^2 - 10t + 21 = 0$ are 7 and 3.*

**103. To write $x^2 + 8x + c$ as $(x + 4)^2$, the value of c must be:**

(A) 8
(B) 4
(C) 16
(D) 64

**Correct Answer: C**

*Explanation: $(x + 4)^2 = x^2 + 8x + 16$, so $c = 16$, so the correct choice is 16.*

**104. If $(x + 4)^2 - 9 = 0$, then x equals:**

(A) 1 and 7
(B) 4 and −4
(C) 3 only
(D) −1 and −7

**Correct Answer: D**

*Explanation: $x + 4 = \pm 3$ gives $x = -1$ or $x = -7$, so the correct choice is −1 and −7.*

**105. For $2x^2 - 8x + 6 = 0$ with a = 2, b = −8, c = 6, the discriminant D equals:**

(A) 16
(B) −16
(C) 0
(D) 64

**Correct Answer: A**

*Explanation: $D = (-8)^2 - 4(2)(6) = 64 - 48 = 16$, so the correct choice is 16.*

**106. Dividing $2x^2 - 8x + 6 = 0$ by 2 gives $x^2 - 4x + 3 = 0$ with roots:**

(A) 2 and 3
(B) 1 and 3
(C) −1 and −3
(D) 4 and 6

**Correct Answer: B**

*Explanation: $(x - 1)(x - 3) = 0$ gives roots 1 and 3, so the correct choice is 1 and 3.*

**107. "A number plus its square equals 20" gives the equation:**

(A) $n^2 - n - 20 = 0$
(B) $n + 20 = 0$
(C) $n^2 + n - 20 = 0$
(D) $n^2 = 20$ only

**Correct Answer: C**

*Explanation: "A number plus its square equals 20" gives the equation $n^2 + n - 20 = 0$.*

**108. The positive value of n satisfying $n^2 + n - 20 = 0$ is:**

(A) 5
(B) 20
(C) −4
(D) 4

**Correct Answer: D**

*Explanation: $n = (-1 \pm \sqrt{81})/2 = (-1 \pm 9)/2$, so n = 4 (the other root is −5).*

MATHEMATICS MCQ BOOKLET

# Grade 10 · Chapter 3 · Matrices and Determinants

FBISE / National Book Foundation Model Textbook companion

by Public Library

*Independent MCQs on matrix definition and types, matrix addition and scalar multiplication, matrix multiplication and its properties, determinants, adjoint and inverse, and solving 2 × 2 linear systems by inversion and Cramer's rule. Not copied from the book exercise. Total: 108 questions. Each item has four options, the correct letter, and a short explanation of why it is correct.*

## A. Important / Main Topics

**1. A matrix is a rectangular arrangement of numbers written in:**

(A) rows and columns
(B) one row only
(C) alphabetical order only
(D) a single column with no rows

**Correct Answer: A**

*Explanation: Entries are placed in horizontal rows and vertical columns.*

**2. The order (or dimension) of a matrix with m rows and n columns is written:**

(A) n × m
(B) m × n
(C) m + n
(D) mn as a single integer only

**Correct Answer: B**

*Explanation: Order is always rows first, then columns: m × n.*

**3. In the symbol a_ij, the subscripts i and j refer respectively to:**

(A) column and row
(B) determinant and inverse
(C) row and column
(D) scalar and identity

**Correct Answer: C**

*Explanation: The first index is the row number; the second is the column number.*

**4. A matrix of order 4 × 3 has how many elements in total?**

(A) 7
(B) 9
(C) 64
(D) 12

**Correct Answer: D**

*Explanation: 12 — this correctly answers the question.*

**5. Which matrix is square?**

(A) 3 × 3
(B) 2 × 3
(C) 1 × 4
(D) 5 × 1

**Correct Answer: A**

*Explanation: 3 × 3 — this correctly answers the question.*

**6. A matrix with 2 rows and 5 columns is best described as:**

(A) square
(B) rectangular

(C) scalar
(D) identity

**Correct Answer: B**

*Explanation: When rows ≠ columns the matrix is rectangular (non-square).*

**7. The null (zero) matrix O has the property that:**

(A) every entry is 1
(B) diagonal entries are 0 only
(C) every entry is 0
(D) it has no order

**Correct Answer: C**

*Explanation: The null (zero) matrix O has the property that every entry is 0.*

**8. In a diagonal matrix, the only non-zero entries (if any) lie on:**

(A) the anti-diagonal only
(B) every off-diagonal position
(C) the first row only
(D) the main diagonal from top-left to bottom-right

**Correct Answer: D**

*Explanation: Off-diagonal entries are zero; the main diagonal may hold non-zero values.*

**9. A scalar matrix is a diagonal matrix whose diagonal entries are:**

(A) all equal to the same number k
(B) all different
(C) always zero
(D) always ±1 only

**Correct Answer: A**

*Explanation: Every diagonal element equals the same scalar k; off-diagonals are 0.*

**10. The 2 × 2 identity matrix I□ equals:**

(A) [[0, 1], [1, 0]]
(B) [[1, 0], [0, 1]]
(C) [[1, 1], [1, 1]]
(D) [[0, 0], [0, 0]]

**Correct Answer: B**

*Explanation: Ones on the main diagonal and zeros elsewhere define I□.*

**11. For any matrix A of compatible order, A + O equals:**

(A) O
(B) I
(C) A
(D) −A

**Correct Answer: C**

*Explanation: For any matrix A of compatible order, A + O equals A.*

**12. For any square matrix A, A · I equals:**

(A) O
(B) I only when A is diagonal
(C) $A^2$ always
(D) A

**Correct Answer: D**

*Explanation: For any square matrix A, A · I equals A.*

**13. Two matrices can be added only when they have:**

(A) the same order (same number of rows and columns)
(B) the same number of rows only

(C) equal determinants
(D) reciprocal entries

**Correct Answer: A**

*Explanation: Corresponding entries are added only when both matrices share the same order.*

**14. If A = [[1, 2], [3, 4]] and B = [[5, 6], [7, 8]], then A + B equals:**

(A) [[4, 4], [4, 4]]
(B) [[6, 8], [10, 12]]
(C) [[5, 12], [21, 32]]
(D) [[6, 7], [10, 12]]

**Correct Answer: B**

*Explanation: If A = [[1, 2], [3, 4]] and B = [[5, 6], [7, 8]], then A + B equals [[6, 8], [10, 12]].*

**15. If A = [[9, −1], [4, 2]] and B = [[3, 5], [−4, 6]], then A − B equals:**

(A) [[12, 4], [0, 8]]
(B) [[6, 6], [8, 4]]
(C) [[6, −6], [8, −4]]
(D) [[12, −6], [8, −4]]

**Correct Answer: C**

*Explanation: If A = [[9, −1], [4, 2]] and B = [[3, 5], [−4, 6]], then A − B equals [[6, −6], [8, −4]].*

**16. If A = [[2, −3], [0, 5]], then −A equals:**

(A) [[2, 3], [0, 5]]
(B) [[−2, −3], [0, −5]]
(C) [[0, 0], [0, 0]]
(D) [[−2, 3], [0, −5]]

**Correct Answer: D**

*Explanation: Negating a matrix negates every entry, so the correct choice is [[−2, 3], [0, −5]].*

**17. If k = 3 and A = [[1, 4], [2, −1]], then kA equals:**

(A) [[3, 12], [6, −3]]
(B) [[4, 7], [5, 2]]
(C) [[3, 4], [2, −1]]
(D) [[1, 12], [6, −3]]

**Correct Answer: A**

*Explanation: If k = 3 and A = [[1, 4], [2, −1]], then kA equals [[3, 12], [6, −3]].*

**18. If A = [[−2, 0], [1, −4]] and k = −1, then kA equals:**

(A) [[−2, 0], [1, −4]]
(B) [[2, 0], [−1, 4]]
(C) [[2, 0], [1, 4]]
(D) [[−2, 0], [−1, 4]]

**Correct Answer: B**

*Explanation: If A = [[−2, 0], [1, −4]] and k = −1, then kA equals [[2, 0], [−1, 4]].*

**19. Matrix multiplication AB is defined when:**

(A) A and B have the same order
(B) A is square and B is square
(C) the number of columns of A equals the number of rows of B
(D) A and B are both 1 × 1

**Correct Answer: C**

*Explanation: The inner dimensions must match: (m×n)(n×p) → (m×p).*

**20. For A = [[1, 2]] (1×2) and B = [[3], [4]] (2×1), the product AB is a:**

(A) 2 × 2 matrix
(B) 2 × 1 matrix

(C) undefined product
(D) 1 × 1 matrix

**Correct Answer: D**

*Explanation: (1×2)(2×1) yields a single number arranged as 1×1: 1·3 + 2·4 = 11.*

**21. If A = [[1, 2], [3, 4]] and B = [[5, 6], [7, 8]], then the (1,1) entry of AB is:**

(A) 19
(B) 11
(C) 23
(D) 31

**Correct Answer: A**

*Explanation: Row 1 of A dotted with column 1 of B: 1·5 + 2·7 = 19.*

**22. If A = [[1, 2], [3, 4]] and B = [[5, 6], [7, 8]], then AB equals:**

(A) [[23, 34], [31, 46]]
(B) [[19, 22], [43, 50]]
(C) [[6, 8], [10, 12]]
(D) [[5, 12], [21, 32]]

**Correct Answer: B**

*Explanation: If A = [[1, 2], [3, 4]] and B = [[5, 6], [7, 8]], then AB equals [[19, 22], [43, 50]].*

**23. If A = [[1, 2], [3, 4]] and B = [[5, 6], [7, 8]], then BA equals:**

(A) [[19, 22], [43, 50]]
(B) [[6, 8], [10, 12]]
(C) [[23, 34], [31, 46]]
(D) [[11, 16], [13, 18]]

**Correct Answer: C**

*Explanation: Order matters: BA = [[23,34],[31,46]], which differs from AB.*

**24. For A = [[2, 0], [0, 3]] and B = [[1, 4], [5, 6]], the product AB equals:**

(A) [[2, 12], [0, 18]]
(B) [[1, 4], [15, 18]]
(C) [[2, 8], [5, 18]]
(D) [[2, 8], [15, 18]]

**Correct Answer: D**

*Explanation: Left diagonal scaling: rows of B are scaled by 2 and 3 respectively.*

**25. Matrix multiplication is generally:**

(A) non-commutative: AB need not equal BA
(B) commutative: AB = BA always
(C) defined only for 1 × 1 matrices
(D) the same as entry-wise multiplication

**Correct Answer: A**

*Explanation: Even when both products exist, AB and BA can differ.*

**26. Matrix multiplication is associative, meaning:**

(A) AB = BA
(B) A(BC) = (AB)C
(C) A + B = B + A
(D) k(AB) = kA · kB always as matrices

**Correct Answer: B**

*Explanation: Parentheses can be regrouped: A(BC) = (AB)C when the chain is compatible.*

**27. The distributive law for matrices states that:**

(A) AB = BA
(B) (AB)C = A(BC) only for diagonal A

(C) A(B + C) = AB + AC
(D) A + B = AB

**Correct Answer: C**

*Explanation: A multiplies each term inside the sum on the right when orders match.*

**28. If A is 2 × 3 and B is 3 × 4, then AB has order:**

(A) 3 × 3
(B) 4 × 2
(C) 2 × 3
(D) 2 × 4

**Correct Answer: D**

*Explanation: (2×3)(3×4) → 2 rows and 4 columns, so the correct choice is 2 × 4.*

**29. If A is 2 × 2 and B is 2 × 2, then BA has order:**

(A) 2 × 2
(B) 2 × 4
(C) 4 × 2
(D) undefined

**Correct Answer: A**

*Explanation: (2×2)(2×2) remains 2 × 2, so the correct choice is 2 × 2.*

**30. For A = [[0, 1], [1, 0]] and B = [[1, 2], [3, 4]], compute AB:**

(A) [[1, 2], [3, 4]]
(B) [[3, 4], [1, 2]]
(C) [[2, 1], [4, 3]]
(D) [[1, 3], [2, 4]]

**Correct Answer: B**

*Explanation: Swapping rows of B gives [[3,4],[1,2]], so the correct choice is [[3, 4], [1, 2]].*

**31. For A = [[1, 0], [0, 2]] and B = [[3, 1], [2, 4]], compute AB:**

(A) [[3, 2], [4, 8]]
(B) [[3, 1], [2, 8]]
(C) [[3, 1], [4, 8]]
(D) [[5, 5], [4, 8]]

**Correct Answer: C**

*Explanation: For A = [[1, 0], [0, 2]] and B = [[3, 1], [2, 4]], compute AB [[3, 1], [4, 8]].*

**32. The determinant of a 2 × 2 matrix [[a, b], [c, d]] is:**

(A) a + d − b − c
(B) ac − bd
(C) a/d − b/c
(D) ad − bc

**Correct Answer: D**

*Explanation: The determinant of a 2 × 2 matrix [[a, b], [c, d]] is ad − bc.*

**33. If A = [[3, 1], [2, 4]], then |A| equals:**

(A) 10
(B) 14
(C) 12
(D) 2

**Correct Answer: A**

*Explanation: 3·4 − 1·2 = 12 − 2 = 10, so the correct choice is 10.*

**34. If A = [[5, −2], [3, 1]], then |A| equals:**

(A) 7
(B) 11

(C) −1
(D) 13

**Correct Answer: B**

*Explanation: 5·1 − (−2)·3 = 5 + 6 = 11, so the correct choice is 11.*

**35. If A = [[2, 4], [1, 2]], then |A| equals:**

(A) 4
(B) 8
(C) 0
(D) −4

**Correct Answer: C**

*Explanation: 2·2 − 4·1 = 4 − 4 = 0, so A is singular.*

**36. If A = [[−1, 3], [2, 5]], then |A| equals:**

(A) 11
(B) 7
(C) −7
(D) −11

**Correct Answer: D**

*Explanation: (−1)·5 − 3·2 = −5 − 6 = −11, so the correct choice is −11.*

**37. If A = [[1, 2], [3, 4]], then |A| equals:**

(A) −2
(B) 2
(C) 10
(D) −10

**Correct Answer: A**

*Explanation: 1·4 − 2·3 = 4 − 6 = −2, so the correct choice is −2.*

**38. If A = [[6, 0], [0, 6]], then |A| equals:**

(A) 12
(B) 36
(C) 0
(D) 6

**Correct Answer: B**

*Explanation: If A = [[6, 0], [0, 6]], then |A| equals 36.*

**39. A square matrix A is singular when:**

(A) |A| ≠ 0
(B) A = I
(C) |A| = 0
(D) A is diagonal

**Correct Answer: C**

*Explanation: Singular means the determinant is zero, so A has no inverse.*

**40. A square matrix A is non-singular when:**

(A) |A| = 0
(B) all entries are zero
(C) A is not square
(D) |A| ≠ 0

**Correct Answer: D**

*Explanation: A square matrix A is non-singular when |A| ≠ 0.*

**41. The adjoint (adjugate) of [[a, b], [c, d]] is:**

(A) [[d, −b], [−c, a]]
(B) [[a, c], [b, d]]

(C) [[d, b], [c, a]]
(D) [[a, d], [c, b]]

**Correct Answer: A**

*Explanation: The adjoint (adjugate) of [[a, b], [c, d]] is [[d, −b], [−c, a]].*

**42. If A = [[2, 3], [1, 4]], then adj(A) equals:**

(A) [[4, 3], [1, 2]]
(B) [[4, −3], [−1, 2]]
(C) [[2, 1], [3, 4]]
(D) [[4, −1], [−3, 2]]

**Correct Answer: B**

*Explanation: If A = [[2, 3], [1, 4]], then adj(A) equals [[4, −3], [−1, 2]].*

**43. If A = [[2, 3], [1, 4]] with |A| = 5, then A□¹ equals:**

(A) [[4, −3], [−1, 2]]
(B) [[2/5, 3/5], [1/5, 4/5]]
(C) [[4/5, −3/5], [−1/5, 2/5]]
(D) [[4/5, −1/5], [−3/5, 2/5]]

**Correct Answer: C**

*Explanation: If A = [[2, 3], [1, 4]] with |A| = 5, then A□¹ equals [[4/5, −3/5], [−1/5, 2/5]].*

**44. If A = [[1, 2], [3, 4]], then A□¹ equals:**

(A) [[4, −2], [−3, 1]]
(B) [[2, −1], [−1.5, 0.5]]
(C) does not exist because |A| = 0
(D) [[−2, 1], [1.5, −0.5]]

**Correct Answer: D**

*Explanation: If A = [[1, 2], [3, 4]], then A□¹ equals [[−2, 1], [1.5, −0.5]].*

**45. If A is invertible, then A · A□¹ equals:**

(A) I
(B) O
(C) A
(D) A²

**Correct Answer: A**

*Explanation: If A is invertible, then A · A□¹ equals I.*

**46. If |A| = 0, then A□¹:**

(A) equals O
(B) does not exist
(C) equals I
(D) equals adj(A) without scaling

**Correct Answer: B**

*Explanation: Zero determinant means the matrix is singular and has no inverse.*

**47. For the system 2x + 3y = 7, x + 4y = 6, the coefficient matrix is:**

(A) [[2, 7], [1, 6]]
(B) [[7, 3], [6, 4]]
(C) [[2, 3], [1, 4]]
(D) [[2, 3], [4, 1]]

**Correct Answer: C**

*Explanation: For the system 2x + 3y = 7, x + 4y = 6, the coefficient matrix is [[2, 3], [1, 4]].*

**48. For 2x + 3y = 7, x + 4y = 6, Cramer's rule gives x equal to:**

(A) 1
(B) 3

(C) 5
(D) 2

**Correct Answer: D**

*Explanation: For 2x + 3y = 7, x + 4y = 6, Cramer's rule gives x equal to 2.*

**49. For 2x + 3y = 7, x + 4y = 6, Cramer's rule gives y equal to:**

(A) 1
(B) 0
(C) 2
(D) 3

**Correct Answer: A**

*Explanation: For 2x + 3y = 7, x + 4y = 6, Cramer's rule gives y equal to 1.*

**50. Using A□¹ for [[2,3],[1,4]] to solve 2x+3y=7, x+4y=6, the solution vector is:**

(A) [[1], [2]]
(B) [[2], [1]]
(C) [[3], [0]]
(D) [[2], [2]]

**Correct Answer: B**

*Explanation: X = A□¹B with B = [[7],[6]] yields x = 2 and y = 1.*

**51. For 5x + 2y = 9, 3x + 4y = 11, |A| = det[[5,2],[3,4]] equals:**

(A) 20
(B) 11
(C) 14
(D) 8

**Correct Answer: C**

*Explanation: 5·4 − 2·3 = 20 − 6 = 14, so the correct choice is 14.*

**52. For 5x + 2y = 9, 3x + 4y = 11, Cramer's rule gives x equal to:**

(A) 2
(B) 3
(C) 4
(D) 1

**Correct Answer: D**

*Explanation: For 5x + 2y = 9, 3x + 4y = 11, Cramer's rule gives x equal to 1.*

**53. For 5x + 2y = 9, 3x + 4y = 11, Cramer's rule gives y equal to:**

(A) 2
(B) 1
(C) 3
(D) 4

**Correct Answer: A**

*Explanation: For 5x + 2y = 9, 3x + 4y = 11, Cramer's rule gives y equal to 2.*

**54. For x + 2y = 5, 3x + 4y = 11, Cramer's rule gives x equal to:**

(A) 2
(B) 1
(C) 3
(D) 4

**Correct Answer: B**

*Explanation: For x + 2y = 5, 3x + 4y = 11, Cramer's rule gives x equal to 1.*

**55. For x + 2y = 5, 3x + 4y = 11, Cramer's rule gives y equal to:**

(A) 1
(B) 3

(C) 2
(D) 4

**Correct Answer: C**

*Explanation: For x + 2y = 5, 3x + 4y = 11, Cramer's rule gives y equal to 2.*

**56. If A = [[2, 3], [1, 4]] and B = [[1, 2], [3, 4]], then |A|·|B| equals:**

(A) 10
(B) −5
(C) 5
(D) −10

**Correct Answer: D**

*Explanation: |A| = 5 and |B| = −2, so the product is −10.*

**57. If A = [[2, 3], [1, 4]] and B = [[1, 2], [3, 4]], then |AB| equals:**

(A) −10
(B) 10
(C) −5
(D) 5

**Correct Answer: A**

*Explanation: If A = [[2, 3], [1, 4]] and B = [[1, 2], [3, 4]], then |AB| equals −10.*

**58. For invertible 2 × 2 matrices A and B, the property |AB| = |A|·|B| is called:**

(A) the commutative law
(B) the multiplicative property of determinants
(C) the zero-product rule
(D) the distributive law

**Correct Answer: B**

*Explanation: Determinants multiply when the matrices multiply: |AB| = |A||B|.*

**59. If A = [[3, 1], [2, 5]] and B = [[1, 0], [2, 3]], then |AB| equals:**

(A) 13
(B) 26
(C) 39
(D) 9

**Correct Answer: C**

*Explanation: |A| = 13, |B| = 3, so |AB| = 39 without expanding fully.*

**60. If A = [[4, 0], [0, 5]], then |A| equals:**

(A) 9
(B) 0
(C) 1
(D) 20

**Correct Answer: D**

*Explanation: Determinant of a diagonal matrix is the product 4·5 = 20.*

**61. If A = [[1, 3], [2, 6]], then |A| equals:**

(A) 0
(B) 6
(C) 12
(D) −6

**Correct Answer: A**

*Explanation: 1·6 − 3·2 = 6 − 6 = 0; rows are proportional, so A is singular.*

**62. If A = [[7, −1], [2, 3]], then |A| equals:**

(A) 19
(B) 23

(C) 21
(D) 17

**Correct Answer: B**

*Explanation: 7·3 − (−1)·2 = 21 + 2 = 23, so the correct choice is 23.*

**63. If A = [[2, 1], [0, 3]], B = [[1, 2], [3, 1]], then AB equals:**

(A) [[2, 4], [9, 3]]
(B) [[5, 3], [9, 3]]
(C) [[5, 5], [9, 3]]
(D) [[2, 1], [3, 3]]

**Correct Answer: C**

*Explanation: If A = [[2, 1], [0, 3]], B = [[1, 2], [3, 1]], then AB equals [[5, 5], [9, 3]].*

**64. If A = [[1, 0], [2, 1]], B = [[3, 4], [0, 5]], then AB equals:**

(A) [[3, 20], [6, 5]]
(B) [[3, 4], [2, 5]]
(C) [[3, 9], [6, 13]]
(D) [[3, 4], [6, 13]]

**Correct Answer: D**

*Explanation: [[3,4],[6,8+5]] = [[3,4],[6,13]], so the correct choice is [[3, 4], [6, 13]].*

**65. If A = [[−1, 2], [3, −4]], then |A| equals:**

(A) −2
(B) 2
(C) 10
(D) −10

**Correct Answer: A**

*Explanation: (−1)(−4) − 2·3 = 4 − 6 = −2, so the correct choice is −2.*

**66. If A = [[−1, 2], [3, −4]] with |A| = −2, then A□¹ equals:**

(A) [[−2, −1], [−1.5, −0.5]]
(B) [[2, 1], [1.5, 0.5]]
(C) [[−4, −2], [−3, −1]]
(D) [[4, 2], [3, 1]]

**Correct Answer: B**

*Explanation: If A = [[−1, 2], [3, −4]] with |A| = −2, then A□¹ equals [[2, 1], [1.5, 0.5]].*

**67. For 2x + y = 5, x − y = 1, Cramer's rule gives x equal to:**

(A) 1
(B) 3
(C) 2
(D) 4

**Correct Answer: C**

*Explanation: For 2x + y = 5, x − y = 1, Cramer's rule gives x equal to 2.*

**68. If |A| = 4 for an invertible 2 × 2 matrix A, then |A□¹| equals:**

(A) 4
(B) −4
(C) 2
(D) 1/4

**Correct Answer: D**

*Explanation: If |A| = 4 for an invertible 2 × 2 matrix A, then |A□¹| equals 1/4.*

**69. If k = 2 and A is 2 × 2 with |A| = 5, then |2A| equals:**

(A) 20
(B) 10

(C) 4
(D) 25

**Correct Answer: A**

*Explanation: For order 2, $|kA| = k^2|A| = 4 \cdot 5 = 20$, so the correct choice is 20.*

**70. If A = [[0, 1], [1, 0]], then |A| equals:**

(A) 1
(B) −1
(C) 0
(D) 2

**Correct Answer: B**

*Explanation: $0 \cdot 0 - 1 \cdot 1 = -1$, so the correct choice is −1.*

**71. Matrix addition is commutative, so for compatible A and B:**

(A) AB = BA
(B) A − B = B − A
(C) A + B = B + A
(D) A + B = AB

**Correct Answer: C**

*Explanation: Entry-wise addition can be done in either order.*

**72. If A and B are both 2 × 3, then A − B is defined and has order:**

(A) 3 × 2
(B) 2 × 2
(C) 3 × 3
(D) 2 × 3

**Correct Answer: D**

*Explanation: Subtraction requires the same order, which is preserved.*

**73. If A is 2 × 3 and B is 3 × 2, then A + B is:**

(A) not defined
(B) 2 × 2
(C) 3 × 3
(D) defined with order 2 × 3

**Correct Answer: A**

*Explanation: If A is 2 × 3 and B is 3 × 2, then A + B is not defined.*

**74. If A = [[1, 2], [3, 4]] and C = [[1, 2], [3, 4]], then A − C equals:**

(A) I
(B) O
(C) 2A
(D) $A^2$

**Correct Answer: B**

*Explanation: If A = [[1, 2], [3, 4]] and C = [[1, 2], [3, 4]], then A − C equals O.*

**75. If A = [[2, 0], [0, 2]], then A represents:**

(A) the identity matrix
(B) a zero matrix
(C) the scalar matrix 2I
(D) a singular matrix only

**Correct Answer: C**

*Explanation: Equal diagonal entries 2 with zeros off-diagonal give 2I.*

**76. If A = [[3, 0], [0, −1]], then |A| equals:**

(A) 2
(B) 3

(C) −2
(D) −3

**Correct Answer: D**

*Explanation: If A = [[3, 0], [0, −1]], then |A| equals −3.*

**77. If A = [[3, 0], [0, −1]], then A□¹ equals:**

(A) [[1/3, 0], [0, −1]]
(B) [[1/3, 0], [0, 1]]
(C) [[3, 0], [0, −1]]
(D) [[1/3, 0], [0, −1/3]]

**Correct Answer: A**

*Explanation: If A = [[3, 0], [0, −1]], then A□¹ equals [[1/3, 0], [0, −1]].*

**78. If A = [[1, 2], [3, 4]] and B = [[2, 0], [0, 2]], then AB equals:**

(A) [[1, 2], [3, 4]]
(B) [[2, 4], [6, 8]]
(C) [[3, 2], [7, 4]]
(D) [[2, 0], [0, 8]]

**Correct Answer: B**

*Explanation: If A = [[1, 2], [3, 4]] and B = [[2, 0], [0, 2]], then AB equals [[2, 4], [6, 8]].*

**79. If A = [[4, 2], [3, 1]] and B = [[1, 2], [3, 4]], then |AB| equals:**

(A) −4
(B) −2
(C) 4
(D) 2

**Correct Answer: C**

*Explanation: |A| = −2 and |B| = −2, so |AB| = 4; direct check on AB = [[10,16],[6,10]] gives 100 − 96 = 4.*

**80. If A = [[4, 2], [3, 1]], then |A| equals:**

(A) 2
(B) 10
(C) −10
(D) −2

**Correct Answer: D**

*Explanation: 4·1 − 2·3 = 4 − 6 = −2, so the correct choice is −2.*

## B. Less Important / Secondary Topics

**81. A row matrix has:**

(A) only one row
(B) only one column
(C) equal rows and columns
(D) zero entries only

**Correct Answer: A**

*Explanation: A row matrix has only one row.*

**82. A column matrix has:**

(A) only one row
(B) only one column
(C) order 2 × 2 always
(D) no order

**Correct Answer: B**

*Explanation: A column matrix has only one column.*

**83. The element a□□ sits in:**

(A) row 2, column 1
(B) row 1, column 1
(C) row 1, column 2
(D) row 2, column 2

**Correct Answer: C**

*Explanation: The element a□□ sits in row 1, column 2.*

**84. A 5 × 1 matrix is an example of a:**

(A) row matrix
(B) square matrix
(C) scalar matrix
(D) column matrix

**Correct Answer: D**

*Explanation: One column and five rows define a column matrix.*

**85. The zero matrix used as an additive identity has the same order as:**

(A) the matrix being added to it
(B) only square matrices
(C) always 1 × 1
(D) the identity matrix only

**Correct Answer: A**

*Explanation: O must match the order of A in A + O, so the correct choice is the matrix being added to it.*

**86. In [[5, 0, 0], [0, −2, 0], [0, 0, 7]], non-zero entries appear only on:**

(A) every position
(B) the main diagonal
(C) the first column only
(D) anti-diagonal only

**Correct Answer: B**

*Explanation: That layout is diagonal: all off-diagonal entries are zero.*

**87. The scalar matrix with k = −3 in order 2 is:**

(A) [[0, −3], [−3, 0]]
(B) [[−3, −3], [−3, −3]]
(C) [[−3, 0], [0, −3]]
(D) [[0, 0], [0, 0]]

**Correct Answer: C**

*Explanation: The scalar matrix with k = −3 in order 2 is [[−3, 0], [0, −3]].*

**88. Adding matrices of different orders such as 2 × 2 and 2 × 3 is:**

(A) always zero
(B) commutative only
(C) the same as multiplication
(D) not defined

**Correct Answer: D**

*Explanation: Adding matrices of different orders such as 2 × 2 and 2 × 3 is not defined.*

**89. If A = [[1, 0], [2, 3]] and k = 0, then kA equals:**

(A) O
(B) A
(C) I
(D) undefined

**Correct Answer: A**

*Explanation: If A = [[1, 0], [2, 3]] and k = 0, then kA equals O.*

**90. If A = [[2, 1]] and B = [[3], [4]], then AB equals the 1 × 1 matrix:**

(A) [[10]]
(B) [[11]]
(C) [[7]]
(D) [[5]]

**Correct Answer: B**

*Explanation: Row·column product: 2·3 + 1·4 = 11, so the correct choice is [[11]].*

**91. If A = [[1, 0], [0, 0]] and B = [[0, 1], [0, 0]], then AB equals:**

(A) [[0, 0], [0, 0]]
(B) [[1, 1], [0, 0]]
(C) [[0, 1], [0, 0]]
(D) [[0, 0], [1, 0]]

**Correct Answer: C**

*Explanation: Only the first row of A is non-zero, reproducing row 1 of B.*

**92. For compatible matrices, (AB)C and A(BC) are:**

(A) always different
(B) defined only for diagonal A
(C) equal to A + B + C
(D) equal when both sides are defined

**Correct Answer: D**

*Explanation: For compatible matrices, (AB)C and A(BC) are equal when both sides are defined.*

**93. If A = [[1, 2], [3, 4]], then A · O equals:**

(A) O
(B) A
(C) I
(D) undefined

**Correct Answer: A**

*Explanation: If A = [[1, 2], [3, 4]], then A · O equals O.*

**94. The determinant |I□| equals:**

(A) 0
(B) 1
(C) 2
(D) −1

**Correct Answer: B**

*Explanation: Identity has determinant 1, so the correct choice is 1.*

**95. If rows of a 2 × 2 matrix are proportional, then |A| is:**

(A) always 1
(B) always negative
(C) zero
(D) undefined

**Correct Answer: C**

*Explanation: If rows of a 2 × 2 matrix are proportional, then |A| is zero.*

**96. If A = [[8, 0], [0, 3]], then A□¹ equals:**

(A) [[8, 0], [0, 3]]
(B) [[0, 1/8], [1/3, 0]]
(C) does not exist
(D) [[1/8, 0], [0, 1/3]]

**Correct Answer: D**

*Explanation: Invert each diagonal entry when the matrix is diagonal and non-singular.*

**97. Cramer's rule applies directly to a 2 × 2 linear system when:**

(A) $|A| \neq 0$
(B) $|A| = 0$
(C) all coefficients are zero
(D) there is only one variable

**Correct Answer: A**

*Explanation: Cramer's rule applies directly to a 2 × 2 linear system when $|A| \neq 0$.*

**98. For 3x + y = 7, x − y = 1, Cramer's rule gives x equal to:**

(A) 1
(B) 2
(C) 3
(D) 4

**Correct Answer: B**

*Explanation: $|A| = -4$; $|A_x| = -8$; $x = 2$, so the correct choice is 2.*

**99. For 3x + y = 7, x − y = 1, Cramer's rule gives y equal to:**

(A) 0
(B) 2
(C) 1
(D) 3

**Correct Answer: C**

*Explanation: $|A_y| = -4$; $y = 1$, so the correct choice is 1.*

**100. If $|A| = -3$ and $|B| = 4$, then $|AB|$ equals:**

(A) 12
(B) −7
(C) 7
(D) −12

**Correct Answer: D**

*Explanation: Determinants multiply: $(-3)(4) = -12$, so the correct choice is −12.*

**101. If A = [[1, 1], [1, 1]], then |A| equals:**

(A) 0
(B) 2
(C) 1
(D) −1

**Correct Answer: A**

*Explanation: If A = [[1, 1], [1, 1]], then |A| equals 0.*

**102. If A = [[2, 0], [1, 3]] and B = [[1, 4], [0, 2]], then the (2,1) entry of AB is:**

(A) 2
(B) 1
(C) 3
(D) 4

**Correct Answer: B**

*Explanation: If A = [[2, 0], [1, 3]] and B = [[1, 4], [0, 2]], then the (2,1) entry of AB is 1.*

**103. If A = [[0, 2], [0, 1]] and B = [[3, 1], [0, 4]], then AB equals:**

(A) [[3, 1], [0, 4]]
(B) [[0, 2], [0, 1]]
(C) [[0, 8], [0, 4]]
(D) [[6, 2], [0, 4]]

**Correct Answer: C**

*Explanation: First column of A is zero, so only the second column of B contributes.*

**104. If A = [[1, −1], [2, 3]] and B = [[4, 0], [1, 5]], then A + B equals:**

(A) [[5, 1], [3, 8]]
(B) [[4, −1], [2, 8]]
(C) [[5, −1], [2, 3]]
(D) [[5, −1], [3, 8]]

**Correct Answer: D**

*Explanation: If A = [[1, −1], [2, 3]] and B = [[4, 0], [1, 5]], then A + B equals [[5, −1], [3, 8]].*

**105. If k = −2 and A = [[1, −3], [0, 4]], then kA equals:**

(A) [[−2, 6], [0, −8]]
(B) [[−2, −6], [0, −8]]
(C) [[2, 6], [0, 8]]
(D) [[−1, −3], [0, 4]]

**Correct Answer: A**

*Explanation: Multiply each entry by −2, so the correct choice is [[−2, 6], [0, −8]].*

**106. If A is invertible, A□¹A equals:**

(A) O
(B) I
(C) A
(D) |A|

**Correct Answer: B**

*Explanation: The inverse on the left also yields the identity.*

**107. A 1 × 1 matrix [[7]] has determinant:**

(A) 0
(B) 1
(C) 7
(D) 49

**Correct Answer: C**

*Explanation: The single entry is the determinant, so the correct choice is 7.*

**108. If A = [[2, 1], [4, 3]] and B = [[1, 0], [2, 1]], then det(B) equals:**

(A) 0
(B) −1
(C) 2
(D) 1

**Correct Answer: D**

*Explanation: 1·1 − 0·2 = 1, so the correct choice is 1.*

MATHEMATICS MCQ BOOKLET

# Grade 10 · Chapter 4 · Linear and Quadratic Inequalities

FBISE / National Book Foundation Model Textbook companion

by Public Library

*Independent MCQs on linear and quadratic inequalities in one variable, graphing in the plane, systems of inequalities, and absolute value. Not copied from the book exercise. Total: 108 questions. Each item has four options, the correct letter, and a short explanation of why it is correct.*

## A. Important / Main Topics

**1. The trichotomy property for real numbers a and b states that exactly one of these holds:**

(A) $a < b$, $a = b$, or $a > b$
(B) $a + b = 0$ always
(C) $ab = 1$ always
(D) a and b are both irrational

**Correct Answer: A**

*Explanation: The trichotomy property for real numbers a and b states that exactly one of these holds $a < b$, $a = b$, or $a > b$.*

**2. If $a > b$, then adding the same real c to both sides gives:**

(A) $a + c < b + c$
(B) $a + c > b + c$
(C) $a + c = b - c$
(D) $ac > bc$ always

**Correct Answer: B**

*Explanation: If $a > b$, then adding the same real c to both sides gives $a + c > b + c$.*

**3. If $a < b$ and $c > 0$, then ac compared with bc is:**

(A) $ac > bc$
(B) $ac = bc$
(C) $ac < bc$
(D) the sign cannot be determined

**Correct Answer: C**

*Explanation: If $a < b$ and $c > 0$, then ac compared with bc is $ac < bc$.*

**4. If $a < b$ and $c < 0$, then ac compared with bc is:**

(A) $ac < bc$
(B) $ac = bc$
(C) $ac = a + c$
(D) $ac > bc$

**Correct Answer: D**

*Explanation: If $a < b$ and $c < 0$, then ac compared with bc is $ac > bc$.*

**5. Solve $9x + 6 < 8x - 2$:**

(A) $x < -8$
(B) $x > -8$
(C) $x < 8$
(D) $x > 8$

**Correct Answer: A**

*Explanation: Subtract 8x and 6 from both sides to get $x < -8$.*

**6. Solve $6x - 7 \geq 2x + 17$:**

(A) $x \leq 6$
(B) $x \geq 6$

(C) x > 6 only
(D) x < 6

**Correct Answer: B**

*Explanation: 4x ≥ 24, so x ≥ 6, so the correct choice is x ≥ 6.*

**7. Solve 16.2x − 6 ≥ 15x − 9:**

(A) x ≤ −2.5
(B) x ≥ 2.5
(C) x ≥ −2.5
(D) x ≤ 2.5

**Correct Answer: C**

*Explanation: 1.2x ≥ −3, so x ≥ −2.5, so the correct choice is x ≥ −2.5.*

**8. Solve 17 − 3x ≥ 56:**

(A) x ≥ −13
(B) x ≥ 13
(C) x ≤ 13
(D) x ≤ −13

**Correct Answer: D**

*Explanation: Solve 17 − 3x ≥ 56 x ≤ −13.*

**9. Solve −4(2x − 3) < 28:**

(A) x > −5
(B) x > 5 after distributing −8x − 12
(C) x < −5
(D) x < 5

**Correct Answer: A**

*Explanation: −8x + 12 < 28 gives −8x < 16, so x > −2; the common error forgets that −4(−3) = +12.*

**10. On a number line, x < 3 uses:**

(A) a filled circle at 3 and a ray to the right
(B) an open circle at 3 and a ray to the left
(C) a filled circle at 3 and a ray to the left
(D) open circles at −3 and 3

**Correct Answer: B**

*Explanation: Strict inequality excludes 3, so the endpoint is open and the ray points left.*

**11. On a number line, x ≥ −2 uses:**

(A) an open circle at −2
(B) a filled circle at −2 with a ray to the left
(C) a filled circle at −2 with a ray to the right
(D) no endpoint mark

**Correct Answer: C**

*Explanation: On a number line, x ≥ −2 uses a filled circle at −2 with a ray to the right.*

**12. Solve 5x − 12 ≤ 3x − 4:**

(A) x ≥ 4
(B) x ≤ −4
(C) x ≥ −4
(D) x ≤ 4

**Correct Answer: D**

*Explanation: 2x ≤ 8, so x ≤ 4, so the correct choice is x ≤ 4.*

**13. Solve 1 − 8x ≤ −4(2x − 1):**

(A) all real x
(B) x ≤ 0 only

(C) x ≥ 0 only
(D) no solution

**Correct Answer: A**

*Explanation: Both sides simplify to 1 − 8x ≤ −8x + 4, which reduces to 1 ≤ 4, true for every x.*

**14. Solve (−2/3)x − 2 < (1/3)x + 8:**

(A) x < −10
(B) x > −10
(C) x > 10
(D) x < 10

**Correct Answer: B**

*Explanation: Solve (−2/3)x − 2 < (1/3)x + 8 x > −10.*

**15. Solve 8 − (4/5)x > −14 + 2x:**

(A) x > 55/7
(B) x < 5
(C) x < 55/7
(D) x > 5

**Correct Answer: C**

*Explanation: Multiply by 5: 40 − 4x > −70 + 10x → 22 > 2.8x, so x < 55/7.*

**16. Four more than three times x is less than 40 translates to:**

(A) 3(x + 4) < 40
(B) 4x + 3 < 40
(C) 3x − 4 < 40
(D) 3x + 4 < 40

**Correct Answer: D**

*Explanation: The phrase means 3x + 4 < 40, whose solution is x < 12.*

**17. Twice the sum of x and 8 is less than or equal to −2 translates to:**

(A) 2(x + 8) ≤ −2
(B) 2x + 8 ≤ −2
(C) $(2x + 8)^2 \leq -2$
(D) 2x + 16 ≤ −2 only if x = 8

**Correct Answer: A**

*Explanation: 2(x + 8) ≤ −2 simplifies to x + 8 ≤ −1, so x ≤ −9.*

**18. A bag weighs 26.5 lb and the limit is 60 lb. The added weight w satisfies:**

(A) 26.5 + w ≥ 60
(B) 26.5 + w ≤ 60, so w ≤ 33.5
(C) w ≤ 26.5
(D) w ≥ 60

**Correct Answer: B**

*Explanation: Total weight must not exceed 60, so w ≤ 33.5 pounds may be added.*

**19. For a rectangle with height 9 ft and width (x + 2) ft, area > 81 gives:**

(A) 9x > 81, so x > 9
(B) x + 2 > 81
(C) 9(x + 2) > 81, so x > 7
(D) x > 81

**Correct Answer: C**

*Explanation: 9(x + 2) > 81 → x + 2 > 9 → x > 7, so the correct choice is 9(x + 2) > 81, so x > 7.*

**20. For a triangle with base (x + 1) cm and height 8 cm, area ≤ 44 gives:**

(A) 8(x + 1) ≤ 44, so x ≤ 4.5
(B) x + 1 ≤ 44

(C) $x \le 44$
(D) $4(x + 1) \le 44$, so $x \le 10$

**Correct Answer: D**

*Explanation: For a triangle with base $(x + 1)$ cm and height 8 cm, area $\le 44$ gives $4(x + 1) \le 44$, so $x \le 10$.*

**21. Solve $(x + 1)(x - 3) > 0$:**

(A) $x < -1$ or $x > 3$
(B) $-1 < x < 3$
(C) $x < -1$ or $0 < x < 3$
(D) $x > -1$ and $x < 3$

**Correct Answer: A**

*Explanation: The product is positive when both factors share sign: $x < -1$ or $x > 3$.*

**22. Solve $(x - 9)(x + 1) < 0$:**

(A) $x < -1$ or $x > 9$
(B) $-1 < x < 9$
(C) $x < 1$ or $x > 9$
(D) $-9 < x < 1$

**Correct Answer: B**

*Explanation: Solve $(x - 9)(x + 1) < 0$ $-1 < x < 9$.*

**23. Solve $x^2 - x - 90 > 0$:**

(A) $-9 < x < 10$
(B) $x < 10$ only
(C) $x < -9$ or $x > 10$
(D) $x > -9$ only

**Correct Answer: C**

*Explanation: $x^2 - x - 90 = (x - 10)(x + 9)$; the parabola opens upward, so it is positive outside the roots.*

**24. Solve $x^2 + 4x - 21 < 0$:**

(A) $x < -7$ or $x > 3$
(B) $-3 < x < 7$
(C) $x < 3$ only
(D) $-7 < x < 3$

**Correct Answer: D**

*Explanation: Solve $x^2 + 4x - 21 < 0$ $-7 < x < 3$.*

**25. Solve $x^2 + 8x + 16 \ge 0$:**

(A) all real $x$
(B) $x \ge -4$ only
(C) $x \le -4$ only
(D) no solution

**Correct Answer: A**

*Explanation: $x^2 + 8x + 16 = (x + 4)^2 \ge 0$ for every real $x$.*

**26. Solve $9x^2 - 6x + 1 \le 0$:**

(A) $x \le 1/3$
(B) $x = 1/3$ only
(C) $x \ge 1/3$
(D) all real $x$

**Correct Answer: B**

*Explanation: $9x^2 - 6x + 1 = (3x - 1)^2 \le 0$ forces $3x - 1 = 0$, so $x = 1/3$.*

**27. For $(x - 6)(x + 2) > 0$ the solution set is:**

(A) $\{x \mid -2 < x < 6\}$
(B) $\{x \mid x \le -2$ or $x \ge 6\}$

(C) {x | x < −2 or x > 6}
(D) {x | x > −2}

**Correct Answer: C**

*Explanation: Test intervals show the product is positive before −2 and after 6.*

**28. For $x^2 + 6x - 27 \leq 0$ the solution set is:**

(A) {x | x ≤ −9 or x ≥ 3}
(B) {x | −3 ≤ x ≤ 9}
(C) {x | x < 3}
(D) {x | −9 ≤ x ≤ 3}

**Correct Answer: D**

*Explanation: (x + 9)(x − 3) ≤ 0 on the closed interval from −9 to 3.*

**29. The solution of x < 3 for x □ N (natural numbers) is:**

(A) {1, 2}
(B) {0, 1, 2}
(C) {1, 2, 3}
(D) {1}

**Correct Answer: A**

*Explanation: Natural numbers here start at 1, so only 1 and 2 are less than 3.*

**30. Solve x/(−2) < 3 − x:**

(A) x > 6
(B) x < 6
(C) x < 2
(D) x > 2

**Correct Answer: B**

*Explanation: Solve x/(−2) < 3 − x x < 6.*

**31. Solve −5x ≥ −80:**

(A) x ≥ 16
(B) x < 16
(C) x ≤ 16
(D) x > 16

**Correct Answer: C**

*Explanation: Solve −5x ≥ −80 x ≤ 16.*

**32. Which ordered pair satisfies 4x − y ≥ 3?**

(A) (0, 0)
(B) (0, −2)
(C) (−1, 2)
(D) (1, 1)

**Correct Answer: D**

*Explanation: (1, 1) — this correctly answers the question.*

**33. Which ordered pair satisfies x − 3y ≤ 6?**

(A) (0, 0)
(B) (6, −1)
(C) (10, 3)
(D) (6, −1) only if reversed

**Correct Answer: A**

*Explanation: (0, 0) gives 0 ≤ 6; (6, −1) gives 9 ≤ 6, which is false.*

**34. Which ordered pair is NOT a solution of x − 3y ≤ 6?**

(A) (0, 0)
(B) (6, −1)

(C) (10, 3)
(D) (−1, 2)

**Correct Answer: B**

*Explanation: 6 − 3(−1) = 9, which is not ≤ 6, so the correct choice is (6, −1).*

**35. For graphing a linear inequality, the usual test point is:**

(A) (1, 1) always
(B) (−1, −1) always
(C) (0, 0)
(D) the y-intercept only

**Correct Answer: C**

*Explanation: If (0, 0) is not on the boundary line, it is the standard convenient test point.*

**36. For y > 5x − 4 the boundary line is drawn:**

(A) solid because > includes equality
(B) as a vertical line
(C) only in quadrant IV
(D) dashed because > excludes equality

**Correct Answer: D**

*Explanation: Strict inequality uses a dashed boundary line.*

**37. For x + 2y ≤ 0 the boundary line is drawn:**

(A) solid
(B) dashed
(C) horizontal only
(D) vertical only

**Correct Answer: A**

*Explanation: ≤ includes points on the line, so the boundary is solid.*

**38. For y ≥ −2 the boundary is:**

(A) a vertical dashed line
(B) a horizontal solid line at y = −2
(C) a dashed line through the origin
(D) the x-axis

**Correct Answer: B**

*Explanation: y = −2 is horizontal; ≥ requires a solid line.*

**39. Testing (0, 0) in y > 5x − 4 gives:**

(A) 0 > −4, false
(B) 0 = −4
(C) 0 > −4, true, so shade the half-plane containing (0, 0)
(D) undefined

**Correct Answer: C**

*Explanation: Since 0 > −4 is true, shade the region that contains the origin.*

**40. Testing (1, 0) in x + 2y ≤ 0 gives:**

(A) 1 ≤ 0, true
(B) 0 ≤ 0 only
(C) undefined
(D) 1 ≤ 0, false, so shade the opposite half-plane

**Correct Answer: D**

*Explanation: 1 + 0 = 1 is not ≤ 0, so shade away from (1, 0).*

**41. A linear inequality in two variables has solutions that are:**

(A) ordered pairs (x, y)
(B) single numbers only

(C) always integers
(D) always positive reals

**Correct Answer: A**

*Explanation: Each solution is an ordered pair making the inequality true.*

**42. The feasible region for a system of inequalities is:**

(A) the union of only one inequality
(B) the intersection of all individual solution regions
(C) always empty
(D) only boundary lines

**Correct Answer: B**

*Explanation: Points must satisfy every inequality simultaneously.*

**43. Which ordered pair satisfies both $2x - y \leq 5$ and $x + 2y > 2$?**

(A) (1, −1)
(B) (2, 0)
(C) (3, 2)
(D) (4, 1)

**Correct Answer: C**

*Explanation: (3, 2) — this correctly answers the question.*

**44. Point (7, −2) satisfies:**

(A) $2x + y < 10$
(B) $x - y < -4$
(C) $-x - y > -3$
(D) $x + 10y < 1$

**Correct Answer: D**

*Explanation: Point (7, −2) satisfies $x + 10y < 1$.*

**45. The absolute value |x| measures:**

(A) the distance of x from 0 on the number line
(B) the square of x only
(C) x divided by 0
(D) the reciprocal of x

**Correct Answer: A**

*Explanation: Absolute value counts units from the origin, always giving a non-negative result.*

**46. For $x \geq 0$, |x| equals:**

(A) −x
(B) x
(C) 1/x
(D) $x^2$

**Correct Answer: B**

*Explanation: For $x \geq 0$, $|x|$ equals $x$.*

**47. For $x < 0$, |x| equals:**

(A) x
(B) 0
(C) −x
(D) 1/x

**Correct Answer: C**

*Explanation: The absolute value of a negative number is its opposite.*

**48. |7| equals:**

(A) −7
(B) 0

(C) ±7 as one value
(D) 7

**Correct Answer: D**

*Explanation: Seven units from zero gives 7, so the correct choice is 7.*

**49. |−11| equals:**

(A) 11
(B) −11
(C) 0
(D) −1/11

**Correct Answer: A**

*Explanation: The distance from −11 to 0 is 11, so the correct choice is 11.*

**50. The absolute value of any real number is:**

(A) always negative
(B) always positive or zero
(C) always irrational
(D) undefined at 0

**Correct Answer: B**

*Explanation: $|x| \geq 0$ for every real x, so the correct choice is always positive or zero.*

**51. Solve $8|x - 3| = 88$:**

(A) x = 11 or x = −5
(B) x = 3 only
(C) x = 14 or x = −8
(D) no solution

**Correct Answer: C**

*Explanation: $|x - 3| = 11$ gives $x - 3 = \pm 11$, so x = 14 or −8.*

**52. Solve $|2x + 9| = 30$:**

(A) x = 30 or x = −30
(B) x = 9/2 only
(C) no solution
(D) x = 21/2 or x = −39/2

**Correct Answer: D**

*Explanation: Solve $|2x + 9| = 30$ x = 21/2 or x = −39/2.*

**53. The equation $|x - 3| = -26$ has:**

(A) no real solution
(B) x = 29
(C) x = −23
(D) infinitely many solutions

**Correct Answer: A**

*Explanation: The equation $|x - 3| = -26$ has no real solution.*

**54. Solve $|9x - 1| \leq 10$:**

(A) $x \leq -1$ or $x \geq 11/9$
(B) $-1 \leq x \leq 11/9$
(C) $-10 \leq x \leq 10$
(D) x = 1 only

**Correct Answer: B**

*Explanation: Solve $|9x - 1| \leq 10$ $-1 \leq x \leq 11/9$.*

**55. Solve $|2x - 7| < 1$:**

(A) x < 3 or x > 4
(B) −3 < x < 4

(C) 3 < x < 4
(D) x = 7/2 only

**Correct Answer: C**

*Explanation: Solve |2x − 7| < 1 3 < x < 4.*

**56. Solve 5|½x + 3| > 5:**

(A) x < −4 or x > −8
(B) −8 < x < −4
(C) all real x
(D) x > −4 or x < −8

**Correct Answer: D**

*Explanation: Solve 5|½x + 3| > 5 x > −4 or x < −8.*

**57. If |x − 638| ≤ 100, then x satisfies:**

(A) 538 ≤ x ≤ 738
(B) 638 ≤ x ≤ 738
(C) 538 ≤ x ≤ 638
(D) x ≤ 538 or x ≥ 738

**Correct Answer: A**

*Explanation: If |x − 638| ≤ 100, then x satisfies 538 ≤ x ≤ 738.*

**58. An essay of 500 words with deviation at most 30 satisfies:**

(A) 500 ≤ words ≤ 530
(B) 470 ≤ words ≤ 530
(C) 470 ≤ words ≤ 500
(D) words = 500 only

**Correct Answer: B**

*Explanation: |words − 500| ≤ 30 gives the interval from 470 to 530.*

**59. The equation |3x − 6| + 7 = 4 has:**

(A) x = 1 only
(B) x = −1 only
(C) no solution because |3x − 6| = −3
(D) two solutions

**Correct Answer: C**

*Explanation: Rearranging gives |3x − 6| = −3, impossible for absolute value.*

**60. Graphing y > 2x uses:**

(A) a solid line and shading below
(B) only the origin
(C) a vertical line
(D) a dashed line y = 2x and shading above it

**Correct Answer: D**

*Explanation: Strict > means dashed boundary; test (0,0): 0 > 0 is false, so shade where y > 2x.*

**61. Graphing y ≤ −5 uses:**

(A) a horizontal solid line at y = −5 with shading below
(B) a dashed horizontal line above
(C) a vertical line at x = −5
(D) shading only at the origin

**Correct Answer: A**

*Explanation: ≤ includes the line y = −5, shown solid, with the region below.*

**62. Graphing x ≤ 6 uses:**

(A) a horizontal line at y = 6
(B) a vertical solid line at x = 6 with shading to the left

(C) a dashed vertical line to the right
(D) only points with y ≤ 6

**Correct Answer: B**

*Explanation: x ≤ 6 is a vertical boundary at x = 6 with the left half-plane.*

**63. For the system 3x + 4y ≥ 12 and 5x + 6y ≤ 30, the solution is:**

(A) only the line 3x + 4y = 12
(B) all points with x ≥ 0 only
(C) the overlap of two half-planes
(D) the empty set always

**Correct Answer: C**

*Explanation: Both inequalities must hold, so take their inter.*

**64. For 8x + 5y ≤ 40 with x ≥ 0, the region lies:**

(A) only on the y-axis
(B) entirely above the line
(C) only where y < 0
(D) in the first quadrant below the line 8x + 5y = 40

**Correct Answer: D**

*Explanation: x ≥ 0 restricts to the right half-plane; 8x + 5y ≤ 40 adds the region on or below that line.*

**65. Solve (2/3)x − 4 ≥ 1:**

(A) both A and C describe the same answer
(B) x ≥ 15/2
(C) x ≤ 15/2
(D) x ≥ 7.5

**Correct Answer: A**

*Explanation: (2/3)x ≥ 5 → x ≥ 15/2 = 7.5, so the correct choice is both A and C describe the same answer.*

**66. Solve 1 − 3x ≤ −14 + 2x:**

(A) x ≤ 3
(B) x ≥ 3
(C) x ≥ −3
(D) x ≤ −3

**Correct Answer: B**

*Explanation: 1 + 14 ≤ 5x → 15 ≤ 5x → x ≥ 3, so the correct choice is x ≥ 3.*

**67. Solve 7(x − 1) > −8 + 7x:**

(A) no solution
(B) x > 1 only
(C) all real x
(D) x < 1 only

**Correct Answer: C**

*Explanation: 7x − 7 > 7x − 8 reduces to −7 > −8, which is true for every real x.*

**68. Solve −3(2x − 1) ≥ 1 − 8x:**

(A) x ≤ −1
(B) x ≥ 1
(C) all real x
(D) x ≥ −1

**Correct Answer: D**

*Explanation: −6x + 3 ≥ 1 − 8x → 2x ≥ −2 → x ≥ −1, so the correct choice is x ≥ −1.*

**69. If 2 < 5, then 1/2 compared with 1/5 is:**

(A) 1/2 > 1/5
(B) 1/2 < 1/5

(C) 1/2 = 1/5
(D) undefined

**Correct Answer: A**

*Explanation: If 2 < 5, then 1/2 compared with 1/5 is 1/2 > 1/5.*

**70. A hollow circle on a number-line graph means:**

(A) the endpoint is included
(B) the endpoint is not included
(C) x = 0
(D) no solution exists

**Correct Answer: B**

*Explanation: Open circle marks strict inequality at that boundary value.*

**71. A filled circle on a number-line graph means:**

(A) the endpoint is excluded
(B) x is irrational
(C) the endpoint is included
(D) the solution is empty

**Correct Answer: C**

*Explanation: Closed circle shows ≤ or ≥ at that value.*

**72. For ax + by < c the boundary line ax + by = c is drawn:**

(A) solid
(B) as a number line only
(C) with arrows on both ends only
(D) dashed

**Correct Answer: D**

*Explanation: < excludes boundary points, so the line is dashed.*

**73. For ax + by ≥ c the boundary line is:**

(A) solid
(B) dashed
(C) vertical always
(D) absent

**Correct Answer: A**

*Explanation: ≥ includes points on the line, shown with a solid boundary.*

**74. The solution of $2x^2 + 3x + 1 \leq 0$ is:**

(A) $x \leq -1$ or $x \geq -1/2$
(B) $-1 \leq x \leq -1/2$
(C) all real x
(D) no real solution

**Correct Answer: B**

*Explanation: The solution of $2x^2 + 3x + 1 \leq 0$ is $-1 \leq x \leq -1/2$.*

**75. Checking −2, −1, 0, 1, 2 in $2x^2 + 3x + 1 \leq 0$ shows solutions are:**

(A) all five values
(B) none of them
(C) −1 and −1/2 only; integers −1 works, others fail
(D) only 0 and 1

**Correct Answer: C**

*Explanation: Only x = −1 gives 0 ≤ 0 among the listed integers; −1/2 is not listed.*

**76. If a < b and both are negative, then 1/a compared with 1/b (for a, b ≠ 0) follows:**

(A) 1/a < 1/b
(B) 1/a = 1/b

(C) reciprocals cannot be compared
(D) reciprocal reversal: 1/a > 1/b

**Correct Answer: D**

*Explanation: If a < b and both are negative, then 1/a compared with 1/b (for a, b ≠ 0) follows reciprocal reversal: 1/a > 1/b.*

**77. The inequality 26.5 + w ≤ 60 models:**

(A) maximum added weight before exceeding a limit
(B) minimum weight only
(C) equality of two bags
(D) quadratic weight

**Correct Answer: A**

*Explanation: Total weight must stay at or below 60 pounds.*

**78. When graphing (x − 3)(x + 9) ≤ 0, included endpoints are:**

(A) x = −3 and x = 9
(B) x = −9 and x = 3
(C) no endpoints
(D) x = 0 only

**Correct Answer: B**

*Explanation: When graphing (x − 3)(x + 9) ≤ 0, included endpoints are x = −9 and x = 3.*

**79. Shading above a horizontal line y = k corresponds to:**

(A) x > k
(B) y < k always
(C) y > k or y ≥ k depending on the symbol
(D) x < k always

**Correct Answer: C**

*Explanation: Shading above a horizontal line y = k corresponds to y > k or y ≥ k depending on the symbol.*

**80. For y < 3x the test point (0, 0) gives:**

(A) 0 < 0, true
(B) undefined
(C) always true
(D) 0 < 0, false, so shade the region not containing (0, 0)

**Correct Answer: D**

*Explanation: Since 0 < 0 fails, shade the side away from the origin for this strict inequality.*

## B. Less Important / Secondary Topics

**81. Thomas Harriot introduced the symbols < and > around:**

(A) 1630
(B) 628 AD
(C) 1202
(D) 1525

**Correct Answer: A**

*Explanation: Harriot's inequality notation dates from about 1630.*

**82. René Descartes popularised using letters for unknowns in:**

(A) 628 AD
(B) 1637
(C) 820 AD
(D) 1202

**Correct Answer: B**

*Explanation: René Descartes popularised using letters for unknowns in 1637.*

**83. Al-Khwarizmi's book on algebra was written in:**

(A) 1637
(B) 628 AD
(C) 820 AD
(D) 1202

**Correct Answer: C**

*Explanation: Al-Khwarizmi's book on algebra was written in 820 AD.*

**84. A linear inequality in one variable has solutions that are:**

(A) ordered pairs in the plane
(B) matrices only
(C) complex numbers only
(D) intervals on the number line

**Correct Answer: D**

*Explanation: A linear inequality in one variable has solutions that are intervals on the number line.*

**85. A quadratic inequality is often solved by:**

(A) finding zeros and testing intervals
(B) adding 1 to both sides only
(C) squaring both sides always
(D) ignoring the sign chart

**Correct Answer: A**

*Explanation: Critical points from factoring split the line into test intervals.*

**86. The word trichotomy means:**

(A) two equal parts
(B) exactly three possibilities
(C) no solution
(D) four quadrants

**Correct Answer: B**

*Explanation: The word trichotomy means exactly three possibilities.*

**87. STEAM connections in inequalities include:**

(A) only ancient history
(B) only geometry proofs
(C) budget limits and measurement tolerances
(D) Roman numerals

**Correct Answer: C**

*Explanation: Real constraints such as weight limits appear in applied problems.*

**88. When a test point lies on the boundary line, one should:**

(A) shade both half-planes
(B) declare no solution
(C) use only x = 1
(D) choose a different test point

**Correct Answer: D**

*Explanation: Points on the boundary are excluded for strict inequalities and need another test.*

**89. Absolute deviation at most d from m means:**

(A) $|x - m| \le d$
(B) $|x| = d$ only
(C) $x - m > d$
(D) $x + m \le d$

**Correct Answer: A**

*Explanation: Absolute value bounds the distance from the mean.*

**90. A basketball inflated to 8 psi with small tolerance uses:**

(A) only quadratic formula
(B) absolute value to bound acceptable pressure
(C) only complex numbers
(D) no inequality

**Correct Answer: B**

*Explanation: A basketball inflated to 8 psi with small tolerance uses absolute value to bound acceptable pressure.*

**91. Feasible region shading for y > mx + c lies:**

(A) below the solid line always
(B) only at the origin
(C) above the dashed line y = mx + c
(D) on the y-axis only

**Correct Answer: C**

*Explanation: Greater y means points above the boundary for a sloped line.*

**92. For y < mx + c the boundary is:**

(A) solid
(B) vertical
(C) absent
(D) dashed

**Correct Answer: D**

*Explanation: Strict < excludes the boundary, so the line is dashed.*

**93. The intersection of inequality solution sets gives:**

(A) points satisfying every condition
(B) only one inequality
(C) the union always
(D) no region

**Correct Answer: A**

*Explanation: The intersection of inequality solution sets gives points satisfying every condition.*

**94. An open interval on the number line uses:**

(A) brackets on both ends always
(B) parentheses in interval notation
(C) only braces
(D) only absolute value

**Correct Answer: B**

*Explanation: An open interval on the number line uses parentheses in interval notation.*

**95. A closed interval [a, b] includes:**

(A) neither endpoint
(B) only a
(C) both endpoints a and b
(D) only b

**Correct Answer: C**

*Explanation: A closed interval [a, b] includes both endpoints a and b.*

**96. If multiplying an inequality by zero, the result is:**

(A) x = 0 always
(B) x > 0
(C) undefined always
(D) 0 = 0, giving no information about x

**Correct Answer: D**

*Explanation: If multiplying an inequality by zero, the result is 0 = 0, giving no information about x.*

**97. The graph of |x| on the number line from −6 to 6 shows:**

(A) distance 6 from 0 at both 6 and −6
(B) distance 0 at 6
(C) only positive labels
(D) no symmetry

**Correct Answer: A**

*Explanation: Both 6 and −6 are six units from the origin.*

**98. Piecewise definition of |x| uses:**

(A) x for all x
(B) x for x ≥ 0 and −x for x < 0
(C) −x for all x
(D) 1/x for x ≠ 0

**Correct Answer: B**

*Explanation: That split matches distance from zero, so the correct choice is x for x ≥ 0 and −x for x < 0.*

**99. A stopping-distance model $d(x) = 0.05x^2 + 0.2x \le 35$ involves:**

(A) only linear equations
(B) absolute value only
(C) a quadratic inequality in speed x
(D) no inequality

**Correct Answer: C**

*Explanation: Speed must keep the quadratic expression at most 35.*

**100. A garden with perimeter at most 68 ft and area at least 240 ft² leads to:**

(A) only one linear equation
(B) no variables
(C) only absolute value
(D) a system of inequalities in length and width

**Correct Answer: D**

*Explanation: Perimeter and area constraints combine as inequalities.*

**101. Graphing y ≥ −5 shades:**

(A) the half-plane on and above y = −5
(B) only the line y = −5
(C) below y = −5
(D) the vertical line x = −5

**Correct Answer: A**

*Explanation: Graphing y ≥ −5 shades the half-plane on and above y = −5.*

**102. Graphing y < 3x uses:**

(A) a solid horizontal line
(B) a dashed line through the origin with slope 3
(C) a circle
(D) only quadrant II

**Correct Answer: B**

*Explanation: y = 3x is the dashed boundary for strict inequality.*

**103. For x ≤ 6 on the coordinate plane the region is:**

(A) above y = 6
(B) below the x-axis only
(C) to the left of the vertical line x = 6
(D) only at x = 0

**Correct Answer: C**

*Explanation: For x ≤ 6 on the coordinate plane the region is to the left of the vertical line x = 6.*

**104. The system $y - x \geq 1$ and $y - 4 \leq 4$ simplifies to:**

(A) $y \leq x + 1$ only
(B) $x \geq 8$
(C) no variables
(D) $y \geq x + 1$ and $y \leq 8$

**Correct Answer: D**

*Explanation: The system $y - x \geq 1$ and $y - 4 \leq 4$ simplifies to $y \geq x + 1$ and $y \leq 8$.*

**105. Writing inequalities for a shaded rectangle uses:**

(A) bounds on x and y separately
(B) only one variable
(C) absolute value only
(D) no inequalities

**Correct Answer: A**

*Explanation: Writing inequalities for a shaded rectangle uses bounds on x and y separately.*

**106. A triangle feasible region from three vertices requires:**

(A) exactly one equation
(B) three or more linear inequalities
(C) no graph
(D) only quadratic terms

**Correct Answer: B**

*Explanation: A triangle feasible region from three vertices requires three or more linear inequalities.*

**107. Harriot's work on inequalities belongs to:**

(A) Babylonian base 60
(B) Mayan base 20
(C) 17th-century algebra
(D) Roman numerals

**Correct Answer: C**

*Explanation: His notation is part of early modern symbolic algebra.*

**108. When checking a rational inequality solution, one must also:**

(A) ignore denominators
(B) square every term
(C) use only integers
(D) verify domain restrictions if fractions appear

**Correct Answer: D**

*Explanation: Excluded values can affect whether a candidate satisfies the original statement.*

MATHEMATICS MCQ BOOKLET

# Grade 10 · Chapter 5 · Algebraic Fractions

FBISE / National Book Foundation Model Textbook companion

by Public Library

*Independent MCQs on rational expressions, factorization, simplifying fractions, operations on algebraic fractions, and rational equations. Not copied from the book exercise. Total: 108 questions. Each item has four options, the correct letter, and a short explanation of why it is correct.*

## A. Important / Main Topics

**1. An algebraic expression connects variables and constants using:**

(A) arithmetic operations +, −, ×, ÷
(B) only addition
(C) only equality signs
(D) Roman numerals only

**Correct Answer: A**

*Explanation: Algebraic expressions combine symbols with the four basic operations.*

**2. A polynomial has exponents that are:**

(A) any real numbers including fractions
(B) non-negative integers on every variable
(C) always negative
(D) always irrational

**Correct Answer: B**

*Explanation: A polynomial has exponents that are non-negative integers on every variable.*

**3. Which is a polynomial?**

(A) x□³ + 1
(B) √y + 1/y
(C) x² + 3x − 1
(D) 2y^(1/2)

**Correct Answer: C**

*Explanation: X² + 3x − 1 — this correctly answers the question.*

**4. Which is NOT a polynomial?**

(A) x² − 4
(B) 3x + 5
(C) −7
(D) 1/x

**Correct Answer: D**

*Explanation: 1/x = x□¹ has a negative exponent, so it is not a polynomial.*

**5. A rational expression has the form:**

(A) P(x)/Q(x) with Q(x) ≠ 0
(B) √P(x) only
(C) P(x) + Q(x) always
(D) P(x) = 0 only

**Correct Answer: A**

*Explanation: A rational expression is a ratio of polynomials with non-zero denominator.*

**6. Which is a rational expression?**

(A) √(x + 1)
(B) (2x − 1)/(x² + 3)
(C) x^(1/2) + 1

(D) √[3]{y⁴}

**Correct Answer: B**

*Explanation: (2x − 1)/(x² + 3) is a quotient of polynomials.*

**7. The constant 5 regarded as a rational expression equals:**

(A) 5/0
(B) 1/5 only
(C) 5/1
(D) 0/5 undefined always

**Correct Answer: C**

*Explanation: Every integer n can be written as n/1, a rational expression.*

**8. To reduce (x² + x)/(x³ + x) one first:**

(A) add exponents only
(B) multiply top and bottom by x always
(C) ignore the domain
(D) factor numerator and denominator, then cancel common factors

**Correct Answer: D**

*Explanation: To reduce (x² + x)/(x³ + x) one first factor numerator and denominator, then cancel common factors.*

**9. (x² + x)/(x³ + x) in lowest terms is:**

(A) (x + 1)/(x² + 1)
(B) (x + 1)/x
(C) x/(x + 1)
(D) 1/(x + 1)

**Correct Answer: A**

*Explanation: Cancel the common factor x from numerator and denominator.*

**10. The degree of $6x^2yz + 12xy^6z^6 + 9z^4$ is:**

(A) 4
(B) 13
(C) 6
(D) 2

**Correct Answer: B**

*Explanation: The degree of $6x^2yz + 12xy^6z^6 + 9z^4$ is 13.*

**11. A monomial has:**

(A) exactly two terms
(B) at least three terms
(C) exactly one term
(D) no variables

**Correct Answer: C**

*Explanation: Mono means one; a monomial is a single-term polynomial.*

**12. A binomial has:**

(A) exactly one term
(B) exactly three terms
(C) no constants
(D) exactly two terms

**Correct Answer: D**

*Explanation: Bi means two terms, such as x + 3, so the correct choice is exactly two terms.*

**13. A trinomial has:**

(A) exactly three terms
(B) exactly two terms
(C) exactly one term

(D) degree 3 only

**Correct Answer: A**

*Explanation: Tri means three terms, such as $x^2 + 2x + 1$.*

**14. Factor $x^2 - 49$:**

(A) $(x - 7)^2$
(B) $(x - 7)(x + 7)$
(C) $(x + 7)^2$
(D) $x(x - 49)$

**Correct Answer: B**

*Explanation: Factor $x^2 - 49$ $(x - 7)(x + 7)$.*

**15. Factor $x^2 - x - 20$:**

(A) $(x - 4)(x + 5)$
(B) $(x - 20)(x + 1)$
(C) $(x - 5)(x + 4)$
(D) $(x - 2)(x + 10)$

**Correct Answer: C**

*Explanation: Factor $x^2 - x - 20$ $(x - 5)(x + 4)$.*

**16. Factor $2x^2 + 7x + 3$:**

(A) $(2x + 3)(x + 1)$
(B) $(x + 7)(2x + 3)$
(C) $(2x - 1)(x - 3)$
(D) $(2x + 1)(x + 3)$

**Correct Answer: D**

*Explanation: Factor $2x^2 + 7x + 3$ $(2x + 1)(x + 3)$.*

**17. Factor $x^3 - y^3$:**

(A) $(x - y)(x^2 + xy + y^2)$
(B) $(x - y)^3$
(C) $(x + y)(x^2 - xy + y^2)$
(D) $(x - y)(x + y)$

**Correct Answer: A**

*Explanation: Factor $x^3 - y^3$ $(x - y)(x^2 + xy + y^2)$.*

**18. Factor $2x^2 - 11x - 21$:**

(A) $(2x - 3)(x + 7)$
(B) $(2x + 3)(x - 7)$
(C) $(x - 7)(x + 3)$
(D) $(2x + 7)(x - 3)$

**Correct Answer: B**

*Explanation: Factor $2x^2 - 11x - 21$ $(2x + 3)(x - 7)$.*

**19. Factor $x^2 - 49$ in the denominator $x^2 - 49$:**

(A) $(x - 7)^2$
(B) $x - 49$
(C) $(x - 7)(x + 7)$
(D) cannot be factored

**Correct Answer: C**

*Explanation: It is a difference of squares, so the correct choice is $(x - 7)(x + 7)$.*

**20. Simplify $(x^2 - 9)/(x^2 + 2x) \cdot x/(x + 3)$:**

(A) $(x + 3)/(x - 2)$
(B) $x - 3$
(C) 1

(D) (x − 3)/(x + 2)

**Correct Answer: D**

*Explanation: Simplify (x² − 9)/(x² + 2x) · x/(x + 3) (x − 3)/(x + 2).*

**21. Simplify (x² − x − 20) · 3/(x³ + 4x²):**

(A) 3(x − 5)/x²
(B) 3(x + 4)/x
(C) 3(x − 5)(x + 4)/x²
(D) 3/x

**Correct Answer: A**

*Explanation: Simplify (x² − x − 20) · 3/(x³ + 4x²) 3(x − 5)/x².*

**22. Multiply a/b by c/d gives:**

(A) ad/bc
(B) ac/bd
(C) (a + c)/(b + d)
(D) ab/cd

**Correct Answer: B**

*Explanation: Multiply a/b by c/d gives ac/bd.*

**23. Divide a/b by c/d equals:**

(A) ac/bd
(B) bc/ad
(C) ad/bc
(D) (a − c)/(b − d)

**Correct Answer: C**

*Explanation: Divide a/b by c/d equals ad/bc.*

**24. (2x² − 11x − 21)/(x² − 49) ÷ (2x + 3)/(x + 7) simplifies to:**

(A) (x − 7)/(x + 7)
(B) (2x + 3)/(x − 7)
(C) x + 7
(D) 1

**Correct Answer: D**

*Explanation: (2x² − 11x − 21)/(x² − 49) ÷ (2x + 3)/(x + 7) simplifies to 1.*

**25. Add x/2 and x/5:**

(A) 7x/10
(B) x/7
(C) 3x/10
(D) x/10

**Correct Answer: A**

*Explanation: Add x/2 and x/5 7x/10.*

**26. Add (x − 2)/2 and (x + 10)/9:**

(A) (2x + 8)/11
(B) (11x + 16)/18
(C) (x + 8)/18
(D) 11x/18

**Correct Answer: B**

*Explanation: Add (x − 2)/2 and (x + 10)/9 (11x + 16)/18.*

**27. Add 3x/(x + 5) and 10/(5x + 25):**

(A) 3x/(x + 5) only
(B) 13x/(x + 5)
(C) (3x² + 17x + 10)/[5(x + 5)²]

(D) 1

**Correct Answer: C**

*Explanation: Add 3x/(x + 5) and 10/(5x + 25) $(3x^2 + 17x + 10)/[5(x + 5)^2]$.*

**28. Subtract 7 from (23 − x)/5:**

(A) (x − 12)/5
(B) (16 − x)/5
(C) (x − 35)/5
(D) (23 − x − 35)/5 = (−x − 12)/5

**Correct Answer: D**

*Explanation: 7 = 35/5, so (23 − x − 35)/5 = (−x − 12)/5.*

**29. Simplify x/2 + x/3 − x/4 + x/5:**

(A) 47x/60
(B) 77x/60
(C) 13x/60
(D) x/60

**Correct Answer: A**

*Explanation: Simplify x/2 + x/3 − x/4 + x/5 47x/60.*

**30. Simplify 2/(x + 1) + x/(x − 1) − (x + 2)/(x − 1):**

(A) $2x/(x^2 - 1)$
(B) 2/(x + 1) − 2/(x − 1)
(C) 0
(D) $4/(x^2 - 1)$

**Correct Answer: B**

*Explanation: Simplify 2/(x + 1) + x/(x − 1) − (x + 2)/(x − 1) 2/(x + 1) − 2/(x − 1).*

**31. Simplify $(x^2 - 25)/5 - x/4 \div 3x/20$:**

(A) (x − 5)/5
(B) x/3
(C) $(x^2 - 25)/5 - 5/3$
(D) 1

**Correct Answer: C**

*Explanation: $x/4 \div 3x/20 = (x/4)(20/3x) = 5/3$, so the correct choice is $(x^2 - 25)/5 - 5/3$.*

**32. Divide $x^4 - 10x^2 + 9$ by $x^2 - 2x - 3$:**

(A) $x^2 - 2x + 3$
(B) $x^2 + 3$
(C) $x^2 - 3$
(D) $x^2 + 2x - 3$

**Correct Answer: D**

*Explanation: Divide $x^4 - 10x^2 + 9$ by $x^2 - 2x - 3$ $x^2 + 2x - 3$.*

**33. Divide $x^3 - 3x^2y + 3xy^2 - y^3$ by x − y:**

(A) $x^2 - 2xy + y^2$
(B) $x^2 + 2xy + y^2$
(C) $(x - y)^2$
(D) $x^2 - y^2$

**Correct Answer: A**

*Explanation: The dividend is $(x - y)^3$, so quotient is $(x - y)^2 = x^2 - 2xy + y^2$.*

**34. Simplify $(4x^2 - 16)/(5x) \div (2x + 4)/15$:**

(A) 12/x
(B) 6(x − 2)/x
(C) 4(x − 2)/x

(D) 6/x

**Correct Answer: B**

*Explanation: Simplify (4x² − 16)/(5x) ÷ (2x + 4)/15 6(x − 2)/x.*

**35. Simplify (x² + 5x)/(x − 3) ÷ (x² − 25)/(x − 3):**

(A) (x + 5)/(x − 3)
(B) x/(x + 5)
(C) x/(x − 5)
(D) 1

**Correct Answer: C**

*Explanation: Simplify (x² + 5x)/(x − 3) ÷ (x² − 25)/(x − 3) x/(x − 5).*

**36. For a rational expression, values making the denominator zero are:**

(A) always solutions
(B) ignored in all steps
(C) added to the numerator
(D) excluded from the domain

**Correct Answer: D**

*Explanation: Division by zero is undefined, so those x-values are excluded.*

**37. Solve 12/(x² − 16) − 24/(x − 4) = 3:**

(A) x = −2 after checking domain
(B) x = 4
(C) x = 0
(D) no solution

**Correct Answer: A**

*Explanation: Solve 12/(x² − 16) − 24/(x − 4) = 3 x = −2 after checking domain.*

**38. Solve y/(2y − 6) − 3/(y² − 6y + 9) = (y − 2)/(3y − 9):**

(A) y = 3 always
(B) requires y ≠ 3 and clearing denominators
(C) y = 0 only
(D) all real y

**Correct Answer: B**

*Explanation: Denominators factor with (y − 3); y = 3 must be excluded before solving.*

**39. When checking a rational-equation solution one must verify:**

(A) only the numerator
(B) x = 0 always
(C) no denominator becomes zero
(D) only positive x

**Correct Answer: C**

*Explanation: Extraneous values can appear if they zero a denominator.*

**40. Simplify x/(x + 2) − (5x + 3)/(x − 2) + 1/2:**

(A) x only
(B) cancel all terms to 0
(C) cannot be simplified
(D) combine over LCD (x + 2)(x − 2)

**Correct Answer: D**

*Explanation: Simplify x/(x + 2) − (5x + 3)/(x − 2) + 1/2 combine over LCD (x + 2)(x − 2).*

**41. Simplify [x/(x² − y²)] · [(x² + 2xy + y²)/(x + y)] ÷ 3x/(x − y):**

(A) 1/[3(x + y)] after cancellation
(B) x − y
(C) 3x

(D) x + y

**Correct Answer: A**

*Explanation: Simplify [x/(x² − y²)] · [(x² + 2xy + y²)/(x + y)] ÷ 3x/(x − y) 1/[3(x + y)] after cancellation.*

**42. The set 7, 24, 25 forms a right triangle because:**

(A) 7 + 24 = 25
(B) $7^2 + 24^2 = 25^2$
(C) $7^2 = 24^2 + 25^2$
(D) 25 − 24 = 1 only

**Correct Answer: B**

*Explanation: The set 7, 24, 25 forms a right triangle because $7^2 + 24^2 = 25^2$.*

**43. The set 3, 4, 5 forms a right triangle because:**

(A) 3 + 4 = 6
(B) $5^2 = 3 + 4$
(C) $3^2 + 4^2 = 5^2$
(D) 3·4 = 5

**Correct Answer: C**

*Explanation: 9 + 16 = 25 shows a right triangle, so the correct choice is $3^2 + 4^2 = 5^2$.*

**44. The set 12, 35, 36 does NOT form a right triangle because:**

(A) 12 + 35 = 36
(B) 36 is prime
(C) 35 is even
(D) $12^2 + 35^2 \neq 36^2$

**Correct Answer: D**

*Explanation: 144 + 1225 = 1369 ≠ 1296, so the correct choice is $12^2 + 35^2 \neq 36^2$.*

**45. If a = 3, b = 4, c = 1, then √(2ab + 4ac) + √(9b) + 2abc/3 equals:**

(A) 20
(B) 11
(C) 44/3
(D) 38/3

**Correct Answer: A**

*Explanation: √36 + √36 + 8 = 6 + 6 + 8 = 20, so the correct choice is 20.*

**46. René Descartes introduced letters for unknowns in about:**

(A) 820 AD
(B) 1637
(C) 1202
(D) 628 AD

**Correct Answer: B**

*Explanation: René Descartes introduced letters for unknowns in about 1637.*

**47. Al-Khwarizmi is called the Father of Algebra for his work in:**

(A) 1637
(B) 1525
(C) 820 AD
(D) 628 AD

**Correct Answer: C**

*Explanation: His Hisab al-Jabr wal-Muqabala dates from about 820 AD.*

**48. Overtime pay at Rs. 60 per hour for t hours is modeled by:**

(A) 60 + t
(B) t/60
(C) 60/t

(D) 60t

**Correct Answer: D**

*Explanation: Overtime pay at Rs. 60 per hour for t hours is modeled by 60t.*

**49. A rational expression in lowest terms has:**

(A) no common factor between numerator and denominator except 1
(B) equal numerator and denominator
(C) degree zero always
(D) no variables

**Correct Answer: A**

*Explanation: Fully cancelled common factors define lowest terms.*

**50. Factor $x^2 + 5x + 6$:**

(A) $(x + 1)(x + 6)$
(B) $(x + 2)(x + 3)$
(C) $(x - 2)(x - 3)$
(D) $(x + 5)(x + 1)$

**Correct Answer: B**

*Explanation: 2 and 3 multiply to 6 and add to 5, so the correct choice is $(x + 2)(x + 3)$.*

**51. Factor $x^2 - 7x + 12$:**

(A) $(x + 3)(x + 4)$
(B) $(x - 2)(x - 6)$
(C) $(x - 3)(x - 4)$
(D) $(x - 1)(x - 12)$

**Correct Answer: C**

*Explanation: $-3$ and $-4$ multiply to 12 and add to $-7$, so the correct choice is $(x - 3)(x - 4)$.*

**52. Simplify $(x^2 - 4)/(x - 2)$:**

(A) $x - 2$
(B) $x + 2$ for all x including 2
(C) 1
(D) $x + 2$ for $x \neq 2$

**Correct Answer: D**

*Explanation: $(x - 2)(x + 2)/(x - 2) = x + 2$ with $x \neq 2$.*

**53. Simplify $(x^3 - 8)/(x - 2)$:**

(A) $x^2 + 2x + 4$ for $x \neq 2$
(B) $x^2 - 2x + 4$
(C) $x + 2$
(D) $x^2 + 4$

**Correct Answer: A**

*Explanation: Difference of cubes gives $x^2 + 2x + 4$, so the correct choice is $x^2 + 2x + 4$ for $x \neq 2$.*

**54. Add $4/(x + 1)$ and $2/(x - 1)$:**

(A) $6/(x^2 - 1)$
(B) $(6x - 2)/[(x + 1)(x - 1)]$
(C) $2/(x + 1)$
(D) $4x/(x^2 - 1)$

**Correct Answer: B**

*Explanation: Add $4/(x + 1)$ and $2/(x - 1)$ $(6x - 2)/[(x + 1)(x - 1)]$.*

**55. Complex rational expressions are simplified using:**

(A) only addition
(B) only squaring
(C) BODMAS and fraction rules

(D) Roman numerals

**Correct Answer: C**

*Explanation: Order of operations applies as in arithmetic.*

**56. The expression $(2x + 4)/(x^2 + 5x + 6)$ factors as:**

(A) $2/(x + 2)$

(B) $x + 2$

(C) $2x/(x + 3)$

(D) $2/(x + 3)$ after cancelling $x + 2$

**Correct Answer: D**

*Explanation: The expression $(2x + 4)/(x^2 + 5x + 6)$ factors as $2/(x + 3)$ after cancelling $x + 2$.*

**57. Subtract the sum of $2x^3 - 3x + 4$ and $-3x^2 + 2x - 7$ from $4x^3 - 3x^2 + x - 6$ involves:**

(A) combining like polynomials first

(B) only multiplication

(C) only division

(D) no grouping

**Correct Answer: A**

*Explanation: Add the subtrahend polynomials, then subtract from the minuend.*

**58. Divide the product $(x - 2)(x + 3)(2x - 7)$ by a quadratic denominator requires:**

(A) adding exponents only

(B) expanding or factoring both parts

(C) ignoring $(x - 2)$

(D) squaring each factor

**Correct Answer: B**

*Explanation: Divide the product $(x - 2)(x + 3)(2x - 7)$ by a quadratic denominator requires expanding or factoring both parts.*

**59. If $P(x)/Q(x)$ is rational and $Q(a) = 0$, then $x = a$ is:**

(A) always a solution

(B) always in the range

(C) not in the domain

(D) the y-intercept

**Correct Answer: C**

*Explanation: Denominator zero excludes that input value.*

**60. The expression $3/(4x^2)$ is rational because:**

(A) it contains a square root

(B) x has fractional exponent in numerator

(C) it equals 0

(D) it is a constant over a polynomial

**Correct Answer: D**

*Explanation: $4x^2$ is a polynomial and 3 is a constant numerator.*

**61. Simplify $(m + 3)/(24m) - (m + 1)/(24m)$:**

(A) $1/(12m)$

(B) $2/(24m)$

(C) $1/(24m)$

(D) $m/12$

**Correct Answer: A**

*Explanation: Simplify $(m + 3)/(24m) - (m + 1)/(24m)$ $1/(12m)$.*

**62. For $(1 - p^2)/(1 + q) \cdot (1 - q^2)/(p + p^2)$, cancellation uses:**

(A) adding numerators

(B) factor $1 - p^2 = (1 - p)(1 + p)$ and $1 - q^2 = (1 - q)(1 + q)$

(C) p = q
(D) no factoring

**Correct Answer: B**

*Explanation: For $(1 - p^2)/(1 + q) \cdot (1 - q^2)/(p + p^2)$, cancellation uses factor $1 - p^2 = (1 - p)(1 + p)$ and $1 - q^2 = (1 - q)(1 + q)$.*

**63. Rational equations are solved by:**

(A) squaring every term always
(B) ignoring denominators
(C) multiplying through by the LCD and checking restrictions
(D) graphing only

**Correct Answer: C**

*Explanation: Clear fractions with the least common denominator, then solve and verify.*

**64. An irrational expression may contain:**

(A) only integer powers
(B) only constants
(C) only one term always
(D) variable under a radical or fractional exponent not allowed in polynomials

**Correct Answer: D**

*Explanation: An irrational expression may contain variable under a radical or fractional exponent not allowed in polynomials.*

**65. The numerator and denominator of a rational expression may both be multiplied by the same non-zero expression to:**

(A) obtain an equivalent fraction
(B) change the value always
(C) make the denominator zero
(D) remove variables

**Correct Answer: A**

*Explanation: The numerator and denominator of a rational expression may both be multiplied by the same non-zero expression to obtain an equivalent fraction.*

**66. When dividing polynomials, the result is:**

(A) always 1
(B) quotient (and possibly remainder)
(C) always 0
(D) always the product

**Correct Answer: B**

*Explanation: When dividing polynomials, the result is quotient (and possibly remainder).*

**67. Factor 6p + 9q + 3r:**

(A) 3p(2 + 3q + r)
(B) 6(p + q + r)
(C) 3(2p + 3q + r)
(D) 9(p + q + r)

**Correct Answer: C**

*Explanation: HCF 3 factors out of all three terms, so the correct choice is 3(2p + 3q + r).*

**68. Group ac + ad + bc + bd as:**

(A) (a + c)(b + d)
(B) (a − b)(c − d)
(C) ac·bd
(D) (a + b)(c + d)

**Correct Answer: D**

*Explanation: a(c + d) + b(c + d) = (a + b)(c + d), so the correct choice is (a + b)(c + d).*

**69. Group xy + 4x + 3y + 12 as:**

(A) (x + 3)(y + 4)
(B) (x + 4)(y + 3)
(C) (x + 3)(y + 12)
(D) (xy + 4)(3 + 12)

**Correct Answer: A**

*Explanation: x(y + 4) + 3(y + 4) = (x + 3)(y + 4), so the correct choice is (x + 3)(y + 4).*

**70. The identity $a^2 - b^2$ equals:**

(A) $(a + b)^2$
(B) $(a - b)(a + b)$
(C) $(a - b)^2$
(D) $a^2 + b^2$

**Correct Answer: B**

*Explanation: Difference of squares factors as (a − b)(a + b).*

**71. The identity $(a + b)^2$ equals:**

(A) $a^2 - 2ab + b^2$
(B) $a^2 - b^2$
(C) $a^2 + 2ab + b^2$
(D) $a^2 + b^2$

**Correct Answer: C**

*Explanation: Perfect square trinomial expansion, so the correct choice is $a^2 + 2ab + b^2$.*

**72. The identity $(a - b)^2$ equals:**

(A) $a^2 + 2ab + b^2$
(B) $a^2 - b^2$
(C) a − b
(D) $a^2 - 2ab + b^2$

**Correct Answer: D**

*Explanation: The identity $(a - b)^2$ equals $a^2 - 2ab + b^2$.*

**73. Factor $m^2 - 10m + 25$:**

(A) $(m - 5)^2$
(B) $(m + 5)^2$
(C) $(m - 5)(m + 5)$
(D) $m^2 - 25$

**Correct Answer: A**

*Explanation: Factor $m^2 - 10m + 25$ $(m - 5)^2$.*

**74. Factor $t^2 - 49$:**

(A) $(t - 7)^2$
(B) $(t - 7)(t + 7)$
(C) $(t + 7)^2$
(D) t(t − 49)

**Correct Answer: B**

*Explanation: $49 = 7^2$, so difference of squares applies.*

**75. For $ax^2 + bx + c$, split bx using numbers whose product is ac and sum is b when:**

(A) a = 0
(B) c = 0 always
(C) $a \neq 1$ requires the ac method
(D) b = 0 only

**Correct Answer: C**

*Explanation: When leading coefficient is not 1, factor pairs of ac split the middle term.*

**76. Factor $n^2 + 8n + 15$:**

(A) (n + 15)(n + 1)
(B) (n − 3)(n − 5)
(C) (n + 8)(n + 15)
(D) (n + 3)(n + 5)

**Correct Answer: D**

*Explanation: 3 and 5 multiply to 15 and add to 8, so the correct choice is (n + 3)(n + 5).*

**77. Factor $w^2 - 11w + 24$:**

(A) (w − 3)(w − 8)
(B) (w − 24)(w − 1)
(C) (w + 3)(w + 8)
(D) (w − 11)(w + 24)

**Correct Answer: A**

*Explanation: Factor $w^2 - 11w + 24$ (w − 3)(w − 8).*

**78. Factor $k^2 + 2k - 15$:**

(A) (k + 15)(k − 1)
(B) (k + 5)(k − 3)
(C) (k − 5)(k + 3)
(D) (k + 2)(k − 15)

**Correct Answer: B**

*Explanation: 5 and −3 multiply to −15 and add to 2, so the correct choice is (k + 5)(k − 3).*

**79. Factor $u^2 - 2u - 24$:**

(A) (u − 24)(u + 1)
(B) (u + 6)(u − 4)
(C) (u − 6)(u + 4)
(D) (u − 2)(u − 12)

**Correct Answer: C**

*Explanation: −6 and 4 multiply to −24 and add to −2, so the correct choice is (u − 6)(u + 4).*

**80. Factor $2x^2 + 7x + 3$ using ac = 6 split:**

(A) (2x + 3)(x + 1)
(B) (x + 7)(2x + 3)
(C) (2x − 1)(x − 3)
(D) (2x + 1)(x + 3)

**Correct Answer: D**

*Explanation: Factor $2x^2 + 7x + 3$ using ac = 6 split (2x + 1)(x + 3).*

## B. Less Important / Secondary Topics

**81. Muhammad ibn Musa al-Khwarizmi wrote on algebra in Arabic as:**

(A) Hisab al-Jabr wal-Muqabala
(B) Principia Mathematica
(C) Elements
(D) Liber Abaci only

**Correct Answer: A**

*Explanation: That title gives us the word algebra from al-jabr.*

**82. X-rays were named for unknown radiation, linking to the letter:**

(A) y for output
(B) x for unknown
(C) z for complex

(D) a for constant

**Correct Answer: B**

*Explanation: Scientists called them unknown rays, echoing algebraic x.*

**83. A polynomial with respect to variables can be classified by:**

(A) color only
(B) page number
(C) terms, degree, coefficients, and variables
(D) only constants

**Correct Answer: C**

*Explanation: A polynomial with respect to variables can be classified by terms, degree, coefficients, and variables.*

**84. The expression $z - \sqrt{2}t$ is algebraic but:**

(A) always rational
(B) always an integer
(C) degree zero
(D) not a polynomial because of the radical in $\sqrt{2}t$ if t is variable

**Correct Answer: D**

*Explanation: The expression $z - \sqrt{2}t$ is algebraic but not a polynomial because of the radical in $\sqrt{2}t$ if t is variable.*

**85. Whole numbers as coefficients like 1/2, −π, 22/7 are:**

(A) real coefficients allowed in polynomials
(B) not allowed ever
(C) only in denominators
(D) only irrational

**Correct Answer: A**

*Explanation: Coefficients may be any real numbers; exponents on variables must be whole.*

**86. Memory Plus: rational expressions have variable exponents that are:**

(A) always fractions
(B) integers in numerator and denominator polynomials
(C) always negative only
(D) always irrational

**Correct Answer: B**

*Explanation: Memory Plus: rational expressions have variable exponents that are integers in numerator and denominator polynomials.*

**87. Reduction step 1 is:**

(A) add numerators
(B) multiply by zero
(C) factor completely
(D) remove variables

**Correct Answer: C**

*Explanation: Reduction step 1 is factor completely.*

**88. Reduction step 2 is:**

(A) add denominators
(B) take square roots
(C) set x = 0
(D) divide by common factors

**Correct Answer: D**

*Explanation: Reduction step 2 is divide by common factors.*

**89. Reduction step 3 is:**

(A) rewrite the simplified fraction
(B) graph on number line

(C) ignore restrictions
(D) multiply by LCD only

**Correct Answer: A**

*Explanation: Reduction step 3 is rewrite the simplified fraction.*

**90. When subtracting rational expressions, rewrite as:**

(A) multiplication only
(B) addition of the opposite
(C) division always
(D) absolute value

**Correct Answer: B**

*Explanation: When subtracting rational expressions, rewrite as addition of the opposite.*

**91. Nested fractions like 1 − x/(1 + x/(1 − x)) require:**

(A) only addition
(B) ignoring inner fractions
(C) working from inner denominators outward
(D) squaring first

**Correct Answer: C**

*Explanation: Complex fractions simplify stepwise from the innermost layer.*

**92. Checking denominators after solving prevents:**

(A) factoring
(B) adding fractions
(C) finding LCD
(D) extraneous roots

**Correct Answer: D**

*Explanation: Values that zero a denominator must be rejected.*

**93. Right-triangle sets are tested using:**

(A) $a^2 + b^2 = c^2$ with c the hypotenuse
(B) a + b = c always
(C) $a^2 = b^2$
(D) a/b = c

**Correct Answer: A**

*Explanation: Pythagoras links legs and hypotenuse, so the correct choice is $a^2 + b^2 = c^2$ with c the hypotenuse.*

**94. The set 1.6, 6.3, 6.5 is a right triangle because:**

(A) 1.6 + 6.3 = 6.5
(B) $1.6^2 + 6.3^2 = 6.5^2$
(C) 6.5 is largest only
(D) 6.3 is prime

**Correct Answer: B**

*Explanation: $2.56 + 39.69 = 42.25 = 6.5^2$, so the correct choice is $1.6^2 + 6.3^2 = 6.5^2$.*

**95. Algebra is described as an extension of:**

(A) geometry only
(B) calculus
(C) arithmetic
(D) statistics only

**Correct Answer: C**

*Explanation: Algebra is described as an extension of arithmetic.*

**96. Grouping symbols in expressions include:**

(A) only commas
(B) only absolute value

(C) only radicals
(D) parentheses, brackets, and braces

**Correct Answer: D**

*Explanation: Grouping symbols in expressions include parentheses, brackets, and braces.*

**97. A zero polynomial is:**

(A) Q(x) = 0, not allowed as denominator
(B) any constant
(C) x + 1
(D) always numerator only

**Correct Answer: A**

*Explanation: Division by the zero polynomial is undefined.*

**98. Irrational expressions include:**

(A) 3x + 1
(B) $\sqrt{(b^2 - 4ac)}$ with variable under root
(C) 5/7
(D) $x^2$

**Correct Answer: B**

*Explanation: Irrational expressions include $\sqrt{(b^2 - 4ac)}$ with variable under root.*

**99. Historical note: Fibonacci helped spread Hindu-Arabic numerals for:**

(A) poetry only
(B) astronomy only
(C) practical trade and accounts
(D) tally marks

**Correct Answer: C**

*Explanation: Merchants needed efficient calculation, so the correct choice is practical trade and accounts.*

**100. When multiplying two rational expressions, factor:**

(A) after adding only
(B) never
(C) only constants
(D) before multiplying to ease cancellation

**Correct Answer: D**

*Explanation: Factoring first exposes terms that cancel across multiply.*

**101. Division of fractions uses:**

(A) multiply by reciprocal
(B) add denominators
(C) subtract numerators
(D) cross-add only

**Correct Answer: A**

*Explanation: $a/b \div c/d = a/b \cdot d/c$, so the correct choice is multiply by reciprocal.*

**102. Polynomial degree of 3x + 5 is:**

(A) 3
(B) 1
(C) 5
(D) 0

**Correct Answer: B**

*Explanation: Highest power of x is 1, so the correct choice is 1.*

**103. Polynomial degree of 7 is:**

(A) 1
(B) 7

(C) 0
(D) undefined

**Correct Answer: C**

*Explanation: A non-zero constant has degree 0, so the correct choice is 0.*

**104. The expression 0 is a polynomial of:**

(A) degree 1
(B) degree −1
(C) not a polynomial
(D) degree not defined or treated as 0 constant

**Correct Answer: D**

*Explanation: Zero polynomial is special; constants have degree 0.*

**105. Rational expressions appear in rates such as:**

(A) distance/time with variable time
(B) only geometry
(C) only Roman numerals
(D) only tally marks

**Correct Answer: A**

*Explanation: Quotients like d/t are rational when t is variable.*

**106. Simplifying (x + 1)/(x + 1) for x ≠ −1 gives:**

(A) x + 1
(B) 1
(C) 0
(D) x

**Correct Answer: B**

*Explanation: Equal non-zero factors cancel to 1, so the correct choice is 1.*

**107. Adding fractions x/a + y/b needs:**

(A) adding numerators only without LCD
(B) multiplying x and y
(C) common denominator ab or LCD
(D) no denominator

**Correct Answer: C**

*Explanation: Adding fractions x/a + y/b needs common denominator ab or LCD.*

**108. Long division of polynomials is analogous to:**

(A) adding exponents
(B) graphing lines
(C) absolute value
(D) long division of integers

**Correct Answer: D**

*Explanation: Long division of polynomials is analogous to long division of integers.*

MATHEMATICS MCQ BOOKLET

# Grade 10 · Chapter 6 · Functions and Graphs

FBISE / National Book Foundation Model Textbook companion

by Public Library

*Independent MCQs on functions, domain and range, types of mappings, inverses and composites, and graphs of common functions. Not copied from the book exercise. Total: 108 questions. Each item has four options, the correct letter, and a short explanation of why it is correct.*

## A. Important / Main Topics

**1. A function maps each input to:**

(A) exactly one output
(B) many outputs always
(C) no output
(D) only the input itself

**Correct Answer: A**

*Explanation: A function maps each input to exactly one output.*

**2. The set of allowed inputs of a function is its:**

(A) range
(B) domain
(C) origin
(D) gradient

**Correct Answer: B**

*Explanation: The set of allowed inputs of a function is its domain.*

**3. The set of outputs produced by a function is its:**

(A) domain
(B) x-intercept
(C) range
(D) asymptote

**Correct Answer: C**

*Explanation: The set of outputs produced by a function is its range.*

**4. If f(x) = x² − ½x + 3, then f(2) equals:**

(A) 5
(B) 4½
(C) 7
(D) 6

**Correct Answer: D**

*Explanation: 4 − 1 + 3 = 6, so the correct choice is 6.*

**5. If f(x) = x² − ½x + 3, then f(−1) equals:**

(A) 3½
(B) 2½
(C) 4
(D) 5

**Correct Answer: A**

*Explanation: 1 + ½ + 3 = 3.5, so the correct choice is 3½.*

**6. If f(x) = x² − ½x + 3, then f(2/3) equals:**

(A) 3
(B) 28/9
(C) 2⅔

(D) 3⅓

**Correct Answer: B**

*Explanation: If f(x) = x² − ½x + 3, then f(2/3) equals 28/9.*

**7. If f(x) = x² − ½x + 3, then f(t + 1) equals:**

(A) t² + 3 only
(B) t + 4
(C) (t + 1)² − ½(t + 1) + 3
(D) 2t + 3

**Correct Answer: C**

*Explanation: Replace x by t + 1 throughout the rule, so the correct choice is (t + 1)² − ½(t + 1) + 3.*

**8. For V(t) = 9500 − 860t, V(5) equals:**

(A) 9500 dollars
(B) 4300 dollars
(C) 860 dollars
(D) 5200 dollars

**Correct Answer: D**

*Explanation: For V(t) = 9500 − 860t, V(5) equals 5200 dollars.*

**9. If V(t) = 9500 − 860t and V(t) = 6920, then t equals:**

(A) 3 years
(B) 5 years
(C) 8 years
(D) 10 years

**Correct Answer: A**

*Explanation: 860t = 2580, so t = 3, so the correct choice is 3 years.*

**10. A relation is a function only if:**

(A) every pair is repeated
(B) each first component maps to exactly one second component
(C) domain equals range always
(D) outputs repeat freely

**Correct Answer: B**

*Explanation: A relation is a function only if each first component maps to exactly one second component.*

**11. From A = {2, 4, 6, 8} to B = {1, 3, 5}, R = {(2,3), (6,5), (8,3), (4,1)} is a function because:**

(A) 6 maps twice
(B) 8 is missing
(C) each element of A appears once as a first coordinate
(D) B has three elements

**Correct Answer: C**

*Explanation: From A = {2, 4, 6, 8} to B = {1, 3, 5}, R = {(2,3), (6,5), (8,3), (4,1)} is a function because each element of A appears once as a first coordinate.*

**12. R = {(2,3), (6,1), (8,3), (6,5)} is NOT a function because:**

(A) 2 maps to 3
(B) 8 maps to 3
(C) 4 is absent
(D) 6 is paired with both 1 and 5

**Correct Answer: D**

*Explanation: R = {(2,3), (6,1), (8,3), (6,5)} is NOT a function because 6 is paired with both 1 and 5.*

**13. A function f: A → B is one-to-one (injective) when:**

(A) different inputs give different outputs
(B) every b in B is hit

(C) f(x) = x always
(D) domain is empty

**Correct Answer: A**

*Explanation: A function f: A → B is one-to-one (injective) when different inputs give different outputs.*

**14. A function is onto (surjective) when:**

(A) no output repeats
(B) every element of the codomain is an output
(C) domain has one point
(D) range is empty

**Correct Answer: B**

*Explanation: A function is onto (surjective) when every element of the codomain is an output.*

**15. A bijective function is:**

(A) neither injective nor surjective
(B) constant only
(C) both injective and surjective
(D) always quadratic

**Correct Answer: C**

*Explanation: Bijection means one-to-one correspondence.*

**16. The identity function is:**

(A) f(x) = 1
(B) f(x) = 0
(C) f(x) = −x
(D) f(x) = x

**Correct Answer: D**

*Explanation: Output equals input for every allowed x.*

**17. The graph of f(x) = x passes through:**

(A) (0, 0) with slope 1
(B) (1, 0) only
(C) (0, 1) only
(D) no origin

**Correct Answer: A**

*Explanation: The graph of f(x) = x passes through (0, 0) with slope 1.*

**18. The absolute value function f(x) = |x| has range:**

(A) all real y
(B) y ≥ 0
(C) y ≤ 0 only
(D) y = x only

**Correct Answer: B**

*Explanation: Distance from zero is never negative, so the correct choice is y ≥ 0.*

**19. For x ≥ 0, |x| equals:**

(A) −x
(B) 1/x
(C) x
(D) $x^2$

**Correct Answer: C**

*Explanation: Non-negative inputs stay unchanged, so the correct choice is x.*

**20. For x < 0, |x| equals:**

(A) x
(B) 0

(C) 1/x
(D) −x

**Correct Answer: D**

*Explanation: For x < 0, |x| equals −x.*

**21. The graph of y = |x| is:**

(A) V-shaped with vertex at (0, 0)
(B) a straight line through origin only in QI
(C) a parabola opening down
(D) a hyperbola

**Correct Answer: A**

*Explanation: The graph of y = |x| is V-shaped with vertex at (0, 0).*

**22. If P(x) = |2x − 100| and 120 units are sold, profit equals:**

(A) 100 rupees
(B) 140 rupees
(C) 240 rupees
(D) 20 rupees

**Correct Answer: B**

*Explanation: |240 − 100| = 140, so the correct choice is 140 rupees.*

**23. A constant function has the form:**

(A) f(x) = x
(B) f(x) = 1/x
(C) f(x) = c for every x
(D) f(x) = $x^2$

**Correct Answer: C**

*Explanation: Output stays fixed regardless of input, so the correct choice is f(x) = c for every x.*

**24. The graph of a constant function y = c is:**

(A) a vertical line
(B) a parabola
(C) a V-shape
(D) a horizontal line

**Correct Answer: D**

*Explanation: All points share the same y-value c, so the correct choice is a horizontal line.*

**25. A linear function has the form:**

(A) f(x) = mx + c
(B) f(x) = $x^2$
(C) f(x) = 1/x
(D) f(x) = |x|

**Correct Answer: A**

*Explanation: Degree-one polynomial graphs as a straight line.*

**26. The gradient (slope) of y = 2x − 1 is:**

(A) −1
(B) 2
(C) 1
(D) −2

**Correct Answer: B**

*Explanation: Coefficient of x in y = mx + c is the slope.*

**27. The y-intercept of y = 2x − 1 is:**

(A) 2
(B) 0

(C) −1
(D) 1

**Correct Answer: C**

*Explanation: Set x = 0 to get y = −1, so the correct choice is −1.*

**28. If f(x) = 2x − 1, then f⁻¹(x) equals:**

(A) (1 − x)/2
(B) 2x + 1
(C) x/2 − 1
(D) (1 + x)/2

**Correct Answer: D**

*Explanation: Solve y = 2x − 1 for x: x = (y + 1)/2, so the correct choice is (1 + x)/2.*

**29. If f(x) = ½x, then f²(x) = f(f(x)) equals:**

(A) ¼x
(B) ½x²
(C) x/4
(D) 2x

**Correct Answer: A**

*Explanation: f(f(x)) = ½(½x) = ¼x, so the correct choice is ¼x.*

**30. Composite notation fg(x) means:**

(A) f(x) + g(x)
(B) f(g(x))
(C) f(x)g(x) only
(D) g(f(x)) always

**Correct Answer: B**

*Explanation: Apply g first, then f to the result, so the correct choice is f(g(x)).*

**31. If f(x) = x + 1 and g(x) = x², then f(g(2)) equals:**

(A) 4
(B) 6
(C) 5
(D) 9

**Correct Answer: C**

*Explanation: g(2) = 4, then f(4) = 5, so the correct choice is 5.*

**32. If f(x) = x + 1 and g(x) = x², then g(f(2)) equals:**

(A) 5
(B) 4
(C) 6
(D) 9

**Correct Answer: D**

*Explanation: f(2) = 3, then g(3) = 9, so the correct choice is 9.*

**33. The square root function f(x) = √x requires:**

(A) x ≥ 0
(B) x > 0 only if zero excluded
(C) all real x
(D) x ≤ 0

**Correct Answer: A**

*Explanation: Principal square root is defined for non-negative x.*

**34. The domain of f(x) = √x is:**

(A) x > 0 only
(B) x ≥ 0

(C) all reals
(D) x ≤ 0

**Correct Answer: B**

*Explanation: Non-negative reals form the domain, so the correct choice is x ≥ 0.*

**35. The range of f(x) = √x is:**

(A) all reals
(B) y ≤ 0
(C) y ≥ 0
(D) y = x

**Correct Answer: C**

*Explanation: Principal root outputs are non-negative.*

**36. The reciprocal function f(x) = 1/x is undefined at:**

(A) x = 1
(B) x = −1
(C) x = 2
(D) x = 0

**Correct Answer: D**

*Explanation: Division by zero is undefined, so the correct choice is x = 0.*

**37. The graph of y = 1/x has asymptotes:**

(A) x = 0 and y = 0
(B) x = 1 and y = 1
(C) no asymptotes
(D) only y = x

**Correct Answer: A**

*Explanation: The graph of y = 1/x has asymptotes x = 0 and y = 0.*

**38. For y = 1/x, as x increases the value:**

(A) increases without bound always
(B) decreases toward 0
(C) stays constant
(D) equals x

**Correct Answer: B**

*Explanation: For y = 1/x, as x increases the value decreases toward 0.*

**39. The reciprocal of zero is:**

(A) 0
(B) 1
(C) undefined
(D) ∞ as a real number

**Correct Answer: C**

*Explanation: The reciprocal of zero is undefined.*

**40. Which is an exponential function?**

(A) $x^2$ only
(B) √x only
(C) 1/x only
(D) 2^x

**Correct Answer: D**

*Explanation: Variable in the exponent defines an exponential function.*

**41. Functions (1/3)^x, e^x, and 2^x are all:**

(A) exponential
(B) linear

(C) constant
(D) identity

**Correct Answer: A**

*Explanation: Each has the variable in the exponent, so the correct choice is exponential.*

**42. If y = x/(x − 2), the function is undefined when:**

(A) x = 0
(B) x = 2
(C) x = −2
(D) x = 1

**Correct Answer: B**

*Explanation: Denominator x − 2 equals zero at x = 2, so the correct choice is x = 2.*

**43. If f(x) = 2/3 $x^2$ − 5, then f(−3) equals:**

(A) −1
(B) 0
(C) 1
(D) 3

**Correct Answer: C**

*Explanation: 2/3 × 9 − 5 = 6 − 5 = 1, so the correct choice is 1.*

**44. The domain of g = {(1, 0), (2, 2), (3, 4)} is:**

(A) {0, 2, 4}
(B) {0, 1, 2, 3, 4}
(C) {2, 3}
(D) {1, 2, 3}

**Correct Answer: D**

*Explanation: The domain of g = {(1, 0), (2, 2), (3, 4)} is {1, 2, 3}.*

**45. The range of g = {(1, 0), (2, 2), (3, 4)} is:**

(A) {0, 2, 4}
(B) {1, 2, 3}
(C) {0, 1, 2, 3, 4}
(D) {1, 4}

**Correct Answer: A**

*Explanation: Range is the set of second coordinates, so the correct choice is {0, 2, 4}.*

**46. If |X| = 3 and |Y| = 2, the number of binary relations from Y to X is:**

(A) $2^9$
(B) $2^6$
(C) 6
(D) 9

**Correct Answer: B**

*Explanation: If |X| = 3 and |Y| = 2, the number of binary relations from Y to X is $2^6$.*

**47. The x-intercept of every point on the y-axis is:**

(A) 1
(B) undefined always
(C) 0
(D) −1

**Correct Answer: C**

*Explanation: The x-intercept of every point on the y-axis is 0.*

**48. The graph of y = 2$x^2$ − 1 cuts the y-axis at:**

(A) (0, 1)
(B) (−1, 0)

(C) (1, 0)
(D) (0, −1)

**Correct Answer: D**

*Explanation: Substitute x = 0 to get y = −1, so the correct choice is (0, −1).*

**49. A quadratic $y = ax^2 + bx + c$ opens upward when:**

(A) a > 0
(B) a < 0
(C) b > 0
(D) c > 0

**Correct Answer: A**

*Explanation: A quadratic $y = ax^2 + bx + c$ opens upward when a > 0.*

**50. The graph of $y = -x^2 - 4x$ opens:**

(A) upward
(B) downward
(C) horizontally
(D) is a line

**Correct Answer: B**

*Explanation: The graph of $y = -x^2 - 4x$ opens downward.*

**51. For $y = ax^2 + bx + c$ through (−1, 0), (1, 0), and (0, 10):**

(A) a = 1 always
(B) b = 10
(C) c = 10 and a + b + c = 0 gives a = −10, b = 0, c = 10
(D) c = 0

**Correct Answer: C**

*Explanation: For $y = ax^2 + bx + c$ through (−1, 0), (1, 0), and (0, 10) c = 10 and a + b + c = 0 gives a = −10, b = 0, c = 10.*

**52. If $f(x) = x^2 - x - 6$ and f(x) = f(3), then x equals:**

(A) 3 only
(B) −2 only
(C) 0
(D) 3 or −2

**Correct Answer: D**

*Explanation: If $f(x) = x^2 - x - 6$ and f(x) = f(3), then x equals 3 or −2.*

**53. The inverse of f(x) = 3x/(2x − 1) is found by:**

(A) swapping x and y and solving for y
(B) adding 1 only
(C) squaring both sides
(D) differentiating

**Correct Answer: A**

*Explanation: The inverse of f(x) = 3x/(2x − 1) is found by swapping x and y and solving for y.*

**54. For f(x) = 3x/(2x − 1), f□¹(x) is undefined when:**

(A) x = 2/3
(B) x = 3/2
(C) x = 0
(D) x = 1

**Correct Answer: B**

*Explanation: For f(x) = 3x/(2x − 1), f□¹(x) is undefined when x = 3/2.*

**55. If f(x) = 3x/(2x − 1), then f□¹(−1) equals:**

(A) −1

(B) 1
(C) 1/5
(D) 5

**Correct Answer: C**

*Explanation: If f(x) = 3x/(2x − 1), then f□¹(−1) equals 1/5.*

**56. To solve f(x) = x − 2 and g(x) = x² − 4x + 2 graphically, find:**

(A) y-intercept only
(B) asymptotes only
(C) domain only
(D) intersection points of the two graphs

**Correct Answer: D**

*Explanation: To solve f(x) = x − 2 and g(x) = x² − 4x + 2 graphically, find intersection points of the two graphs.*

**57. Solving x − 2 = x² − 4x + 2 gives intersections at:**

(A) x = 1 and x = 4
(B) x = 0 only
(C) x = −1 only
(D) no real x

**Correct Answer: A**

*Explanation: x² − 5x + 4 = 0 → (x − 1)(x − 4) = 0, so the correct choice is x = 1 and x = 4.*

**58. The gradient of a curve at a point is shown by:**

(A) the y-intercept
(B) the slope of the tangent line there
(C) the x-intercept only
(D) area under graph

**Correct Answer: B**

*Explanation: The gradient of a curve at a point is shown by the slope of the tangent line there.*

**59. A system of one linear and one quadratic equation can be solved by:**

(A) adding exponents
(B) ignoring the linear part
(C) graphing both and reading intersections
(D) only factoring

**Correct Answer: C**

*Explanation: A system of one linear and one quadratic equation can be solved by graphing both and reading intersections.*

**60. For f(n) = 120(0.9)^n mg, the medicine decays:**

(A) linearly by 120
(B) not at all
(C) by absolute value only
(D) exponentially by 10% each hour

**Correct Answer: D**

*Explanation: For f(n) = 120(0.9)^n mg, the medicine decays exponentially by 10% each hour.*

**61. If A(t) = |2 cos(t)| and t = 5 seconds, amplitude is:**

(A) |2 cos(5)|
(B) 2 only
(C) 0 always
(D) 5

**Correct Answer: A**

*Explanation: If A(t) = |2 cos(t)| and t = 5 seconds, amplitude is |2 cos(5)|.*

**62. The graph of y = x^n for even positive integer n is:**

(A) only in QI
(B) symmetric about the y-axis
(C) a straight line
(D) undefined at 0 always

**Correct Answer: B**

*Explanation: The graph of y = x^n for even positive integer n is symmetric about the y-axis.*

**63. The graph of y = x^n for odd positive integer n passes through:**

(A) only (1, 1)
(B) no origin
(C) (0, 0) with symmetry about the origin
(D) vertical asymptote at 0

**Correct Answer: C**

*Explanation: Odd powers are origin-symmetric, so the correct choice is (0, 0) with symmetry about the origin.*

**64. An into function may leave some codomain elements:**

(A) all mapped
(B) doubly mapped
(C) as inputs
(D) unmapped

**Correct Answer: D**

*Explanation: Into means range may be smaller than codomain.*

**65. An onto function satisfies:**

(A) range = codomain
(B) range empty
(C) domain empty
(D) f(x) = c only

**Correct Answer: A**

*Explanation: Every codomain element is hit at least once.*

**66. Mapping diagram h with 0→a, 2→b, 4→c is:**

(A) not a function
(B) one-to-one
(C) constant
(D) undefined

**Correct Answer: B**

*Explanation: Mapping diagram h with 0→a, 2→b, 4→c is one-to-one.*

**67. Mapping g with 0→5, 2→7, 4→7 is a function but:**

(A) not a function
(B) bijective
(C) not one-to-one because 2 and 4 share output 7
(D) without range

**Correct Answer: C**

*Explanation: Two inputs share the same output, so it is not injective.*

**68. If X = prime factors of 6 and Y = {0, 1, 2}, f: X → Y with (x, y) such that x − y = 1:**

(A) always bijective
(B) always constant
(C) has no domain
(D) check pairs (2,1) and (3,2) for injectivity/bijectivity

**Correct Answer: D**

*Explanation: X = {2, 3}; valid pairs are (2,1) and (3,2), giving a bijection between two-element sets.*

**69. Celsius C = 5/9(F − 32) solved for F gives:**

(A) F = 9C/5 + 32
(B) F = C + 32
(C) F = 5C/9
(D) F = 32C

**Correct Answer: A**

*Explanation: Celsius C = 5/9(F − 32) solved for F gives F = 9C/5 + 32.*

**70. 25°C converts to Fahrenheit using F = 9C/5 + 32 as:**

(A) 45°F
(B) 77°F
(C) 57°F
(D) 25°F

**Correct Answer: B**

*Explanation: 9×25/5 + 32 = 45 + 32 = 77, so the correct choice is 77°F.*

**71. Independent quantity in a calculator input means:**

(A) the displayed result
(B) the battery level
(C) the chosen input value
(D) the key color

**Correct Answer: C**

*Explanation: Input is controlled independently before processing.*

**72. Dependent quantity in function language means:**

(A) input chosen freely always
(B) constant only
(C) domain element only
(D) output determined by input

**Correct Answer: D**

*Explanation: Dependent quantity in function language means output determined by input.*

**73. The modulus function is another name for:**

(A) absolute value function
(B) identity function
(C) reciprocal function
(D) constant function

**Correct Answer: A**

*Explanation: The modulus function is another name for absolute value function.*

**74. A graph that never touches an asymptote:**

(A) y = x through origin
(B) y = 1/x approaching axes
(C) y = 3 horizontal
(D) y = |x| at vertex

**Correct Answer: B**

*Explanation: A graph that never touches an asymptote y = 1/x approaching axes.*

**75. Sketching $y = x^2$ requires plotting:**

(A) only one point
(B) a hyperbola
(C) a parabola through (0, 0) if c = 0
(D) parallel lines

**Correct Answer: C**

*Explanation: Basic quadratic graphs are parabolas, so the correct choice is a parabola through (0, 0) if c = 0.*

**76. For y = mx + c, larger m makes the line:**

(A) horizontal
(B) vertical always
(C) lower on y-axis only
(D) steeper

**Correct Answer: D**

*Explanation: For y = mx + c, larger m makes the line steeper.*

**77. Function notation f(x) replaces:**

(A) the variable x in the rule with a specific input
(B) the equals sign
(C) the domain
(D) the range only

**Correct Answer: A**

*Explanation: f(2) means substitute 2 for x in the defining expression.*

**78. If a relation repeats a first coordinate with different second coordinates, it:**

(A) is always bijective
(B) fails the function test
(C) is always linear
(D) has empty domain

**Correct Answer: B**

*Explanation: One input cannot produce two outputs, so the correct choice is fails the function test.*

**79. The vertex of y = |x| is at:**

(A) (1, 1)
(B) (0, 1)
(C) (0, 0)
(D) (−1, 0)

**Correct Answer: C**

*Explanation: The V meets at the origin, so the correct choice is (0, 0).*

**80. For $y = x^3$, f(−2) equals:**

(A) 8
(B) −6
(C) 6
(D) −8

**Correct Answer: D**

*Explanation: $(-2)^3 = -8$, so the correct choice is −8.*

## B. Less Important / Secondary Topics

**81. René Descartes linked algebra and geometry using coordinates in:**

(A) 1637
(B) 820 AD
(C) 1202
(D) 628 AD

**Correct Answer: A**

*Explanation: René Descartes linked algebra and geometry using coordinates in 1637.*

**82. A calculator machine analogy compares a function to:**

(A) only storage
(B) input → process → output
(C) only printing
(D) random guessing

**Correct Answer: B**

*Explanation: A calculator machine analogy compares a function to input → process → output.*

**83. Cash register totals illustrate:**

(A) only constants
(B) only inverse functions
(C) dependent outputs from item-price inputs
(D) no process

**Correct Answer: C**

*Explanation: Cash register totals illustrate dependent outputs from item-price inputs.*

**84. Venn diagrams help classify functions as:**

(A) only linear
(B) only quadratic
(C) only exponential
(D) into, onto, and one-to-one

**Correct Answer: D**

*Explanation: Arrow diagrams show how sets map, so the correct choice is into, onto, and one-to-one.*

**85. A photocopier value model V(t) = 9500 − 860t is:**

(A) linear depreciation
(B) exponential growth
(C) quadratic only
(D) constant

**Correct Answer: A**

*Explanation: A photocopier value model V(t) = 9500 − 860t is linear depreciation.*

**86. Sound amplitude A(t) = |2 cos(t)| uses:**

(A) only linear terms
(B) absolute value of a trigonometric expression
(C) only reciprocals
(D) only identity

**Correct Answer: B**

*Explanation: Sound amplitude A(t) = |2 cos(t)| uses absolute value of a trigonometric expression.*

**87. Medicine decay f(n) = 120(0.9)^n is modeled by:**

(A) adding 0.9 each hour
(B) linear subtraction only
(C) repeated multiplication by 0.9
(D) absolute value only

**Correct Answer: C**

*Explanation: Medicine decay f(n) = 120(0.9)^n is modeled by repeated multiplication by 0.9.*

**88. Feasible graph reading for intersections uses:**

(A) only y-axis
(B) only largest x
(C) only origin
(D) common coordinates on both curves

**Correct Answer: D**

*Explanation: Feasible graph reading for intersections uses common coordinates on both curves.*

**89. The identity graph y = x has slope:**

(A) 1
(B) 0
(C) −1
(D) undefined

**Correct Answer: A**

*Explanation: Rise over run is 1 for equal steps in x and y.*

**90. A constant graph y = 4 has slope:**

(A) 4
(B) 0
(C) 1
(D) undefined vertical

**Correct Answer: B**

*Explanation: Horizontal lines have zero slope, so the correct choice is 0.*

**91. An exponential graph rises faster than a linear one for large x when base:**

(A) < 0 only
(B) = 0
(C) > 1
(D) = 1 only

**Correct Answer: C**

*Explanation: An exponential graph rises faster than a linear one for large x when base > 1.*

**92. Square root graph y = √x stays in:**

(A) second quadrant only
(B) third quadrant
(C) fourth only
(D) first quadrant including origin

**Correct Answer: D**

*Explanation: Square root graph y = √x stays in first quadrant including origin.*

**93. Reciprocal graph branches lie in:**

(A) quadrants I and III for y = 1/x
(B) only quadrant IV
(C) only on axes
(D) only at origin

**Correct Answer: A**

*Explanation: Same-sign x and y give positive 1/x, so the correct choice is quadrants I and III for y = 1/x.*

**94. Even power graphs $y = x^2$, $x^4$ share:**

(A) origin symmetry only
(B) y-axis symmetry
(C) horizontal asymptotes
(D) no symmetry

**Correct Answer: B**

*Explanation: Replacing x by −x gives the same y for even exponents.*

**95. Odd power graphs y = x, $x^3$ share:**

(A) y-axis symmetry only
(B) horizontal lines
(C) origin symmetry
(D) no defined domain

**Correct Answer: C**

*Explanation: f(−x) = −f(x) for odd powers, so the correct choice is origin symmetry.*

**96. Gradient through a tangent estimates:**

(A) total area
(B) y-intercept only
(C) domain size
(D) instantaneous rate of change

**Correct Answer: D**

*Explanation: Tangent slope measures local steepness, so the correct choice is instantaneous rate of change.*

**97. Binary relations differ from functions because relations:**

(A) may assign multiple outputs to one input
(B) always have empty range
(C) never use pairs
(D) always bijective

**Correct Answer: A**

*Explanation: Binary relations differ from functions because relations may assign multiple outputs to one input.*

**98. If f is bijective, its inverse exists and:**

(A) doubles outputs
(B) undoes the mapping
(C) removes domain
(D) always equals $x^2$

**Correct Answer: B**

*Explanation: If f is bijective, its inverse exists and undoes the mapping.*

**99. Composite order f(g(x)) means:**

(A) apply f first always
(B) add f and g
(C) apply g first, then f
(D) multiply domains

**Correct Answer: C**

*Explanation: Inner function g is evaluated before outer f.*

**100. Real-life function examples include:**

(A) only ancient numerals
(B) only Roman dates
(C) only prime lists
(D) cost from items sold and depreciation over time

**Correct Answer: D**

*Explanation: Real-life function examples include cost from items sold and depreciation over time.*

**101. The range of a quadratic may be found from:**

(A) vertex y-value when $a \neq 0$
(B) x-intercept only
(C) domain only
(D) always all reals for any quadratic

**Correct Answer: A**

*Explanation: The range of a quadratic may be found from vertex y-value when $a \neq 0$.*

**102. A linear function f(x) = mx + c crosses the y-axis at:**

(A) (c, 0)
(B) (0, c)
(C) (0, m)
(D) (m, 0)

**Correct Answer: B**

*Explanation: Set x = 0 to read the intercept c, so the correct choice is (0, c).*

**103. Horizontal line test relates to:**

(A) only constants
(B) only reciprocals
(C) one-to-one functions
(D) only square roots

**Correct Answer: C**

*Explanation: If every horizontal line hits at most once, the function is injective.*

**104. Vertical line test on a graph checks:**

(A) only slope
(B) only intercepts
(C) only symmetry
(D) whether the graph represents a function

**Correct Answer: D**

*Explanation: A vertical line must not hit the graph more than once.*

**105. The reciprocal of a large number is:**

(A) small
(B) large
(C) zero
(D) always 1

**Correct Answer: A**

*Explanation: The reciprocal of a large number is small.*

**106. The reciprocal of a small positive number is:**

(A) small
(B) large
(C) zero
(D) negative always

**Correct Answer: B**

*Explanation: The reciprocal of a small positive number is large.*

**107. Function types injective, surjective, bijective come from:**

(A) only graph color
(B) page number
(C) how inputs map to outputs
(D) coefficient sign only

**Correct Answer: C**

*Explanation: Mapping properties define these standard classifications.*

**108. Graphical solution of linear and quadratic systems gives:**

(A) only slope
(B) only asymptotes
(C) only domain
(D) intersection coordinates

**Correct Answer: D**

*Explanation: Graphical solution of linear and quadratic systems gives intersection coordinates.*

MATHEMATICS MCQ BOOKLET

# Grade 10 · Chapter 7 · Vectors in Plane

FBISE / National Book Foundation Model Textbook companion

by Public Library

*Independent MCQs on vectors in the plane: position vectors, components, magnitude, addition, subtraction, scalar multiplication, translation, unit and parallel vectors, and the ratio formula. Not copied from the book exercise. Total: 108 questions. Each item has four options, the correct letter, and a short explanation of why it is correct.*

## A. Important / Main Topics

**1. A quantity that has both magnitude and direction is called a:**

(A) vector
(B) scalar
(C) unitless number
(D) dimensionless ratio only

**Correct Answer: A**

*Explanation: Vectors such as displacement and velocity need a direction as well as a size.*

**2. Which of the following is a scalar quantity?**

(A) velocity
(B) speed
(C) force
(D) displacement

**Correct Answer: B**

*Explanation: Speed tells how fast without stating a direction, so it is scalar.*

**3. Which of the following is a vector quantity?**

(A) distance
(B) work
(C) velocity
(D) speed

**Correct Answer: C**

*Explanation: Velocity — this correctly answers the question.*

**4. The initial point of a directed segment is also called the:**

(A) head
(B) terminal point
(C) origin only when at (0,0)
(D) tail

**Correct Answer: D**

*Explanation: The initial point of a directed segment is also called the tail.*

**5. The terminal point of vector AB is point:**

(A) B
(B) A
(C) the origin O always
(D) the midpoint of AB

**Correct Answer: A**

*Explanation: In AB the letter order runs from tail A to head B.*

**6. A common notation for vector a is:**

(A) |a|
(B) a with an arrow above
(C) a squared

(D) log a

**Correct Answer: B**

*Explanation: Bold letters, underlines, or arrows mark vectors; |a| is magnitude.*

**7. |a| denotes the:**

(A) direction of a
(B) negative of a
(C) magnitude (length) of vector a
(D) unit vector of a

**Correct Answer: C**

*Explanation: |a| denotes the magnitude (length) of vector a.*

**8. A vector drawn from the origin O to a point P is called:**

(A) a free vector only
(B) a null vector
(C) a scalar multiple of P
(D) the position vector OP

**Correct Answer: D**

*Explanation: OP fixes the tail at the origin, so it locates P in the plane.*

**9. If a and b are position vectors of A and B, then AB equals:**

(A) b − a
(B) a + b
(C) a − b
(D) −a − b

**Correct Answer: A**

*Explanation: From OA + AB = OB we get AB = b − a, so the correct choice is b − a.*

**10. In the Cartesian plane the horizontal axis is the:**

(A) y-axis
(B) x-axis
(C) z-axis
(D) ordinate axis

**Correct Answer: B**

*Explanation: The x-axis is horizontal; the y-axis is vertical.*

**11. The point where the x- and y-axes meet is the:**

(A) vertex
(B) unit point
(C) origin
(D) terminal point

**Correct Answer: C**

*Explanation: The origin O has coordinates (0, 0), so the correct choice is origin.*

**12. An ordered pair (x, y) names:**

(A) only integers
(B) a circle
(C) a scalar
(D) one point in the plane

**Correct Answer: D**

*Explanation: An ordered pair (x, y) names one point in the plane.*

**13. The Cartesian coordinate system is named after:**

(A) René Descartes
(B) Euclid
(C) Pythagoras

(D) Fibonacci

**Correct Answer: A**

*Explanation: Descartes linked algebra with geometry through coordinates.*

**14. A translation by vector [4, −2] moves every point:**

(A) 4 units left and 2 units up
(B) 4 units right and 2 units down
(C) 2 units right and 4 units down
(D) 4 units up and 2 units right

**Correct Answer: B**

*Explanation: The first component is horizontal (+ right); the second is vertical (+ up).*

**15. Under a translation the shape of a figure:**

(A) rotates
(B) changes size
(C) remains the same
(D) becomes a line

**Correct Answer: C**

*Explanation: Under a translation the shape of a figure remains the same.*

**16. If A(−3, 2) is translated by [2, −1], the image is:**

(A) (−5, 3)
(B) (−1, 3)
(C) (−5, 1)
(D) (−1, 1)

**Correct Answer: D**

*Explanation: If A(−3, 2) is translated by [2, −1], the image is (−1, 1).*

**17. Vector PQ from P(x1, y1) to Q(x2, y2) in component form is:**

(A) (x2 − x1)i + (y2 − y1)j
(B) (x1 + x2)i + (y1 + y2)j
(C) (x1 − x2)i + (y1 − y2)j
(D) x2 i + y2 j only

**Correct Answer: A**

*Explanation: Horizontal change is x2 − x1 and vertical change is y2 − y1.*

**18. When the tail of a vector is not at the origin, that vector is:**

(A) always a position vector
(B) not a position vector
(C) always a unit vector
(D) always zero

**Correct Answer: B**

*Explanation: Position vectors must start at the origin.*

**19. For a vector F making angle θ with the positive x-axis, the x-component is:**

(A) |F| sin θ
(B) |F| tan θ
(C) |F| cos θ
(D) cos θ only

**Correct Answer: C**

*Explanation: In the right triangle, adjacent side length is |F| cos θ.*

**20. For the same vector F, the y-component is:**

(A) |F| cos θ
(B) |F| sec θ
(C) sin θ only

(D) |F| sin θ

**Correct Answer: D**

*Explanation: For the same vector F, the y-component is |F| sin θ.*

**21. The standard unit vector along the positive x-direction is:**

(A) i
(B) j
(C) k
(D) 0

**Correct Answer: A**

*Explanation: The standard unit vector along the positive x-direction is i.*

**22. The standard unit vector along the positive y-direction is:**

(A) i
(B) j
(C) −i
(D) 1

**Correct Answer: B**

*Explanation: The standard unit vector along the positive y-direction is j.*

**23. If u = 3i − 4j, then |u| equals:**

(A) 7
(B) 25
(C) 5
(D) 1

**Correct Answer: C**

*Explanation: √(3² + 4²) = √25 = 5, so the correct choice is 5.*

**24. If u = −5i + 12j, then |u| equals:**

(A) 7
(B) 17
(C) 169
(D) 13

**Correct Answer: D**

*Explanation: √(25 + 144) = √169 = 13, so the correct choice is 13.*

**25. If OP = [−6, 7], then −OP equals:**

(A) [6, −7]
(B) [−6, 7]
(C) [6, 7]
(D) [−6, −7]

**Correct Answer: A**

*Explanation: If OP = [−6, 7], then −OP equals [6, −7].*

**26. For any vector u, |−u| compared with |u| is:**

(A) smaller
(B) equal
(C) negative
(D) double

**Correct Answer: B**

*Explanation: For any vector u, |−u| compared with |u| is equal.*

**27. The unit vector in the direction of u = 6i + 8j is:**

(A) (4/5)i + (3/5)j
(B) 6i + 8j
(C) (3/5)i + (4/5)j

(D) (3/5)i − (4/5)j

**Correct Answer: C**

*Explanation: The unit vector in the direction of u = 6i + 8j is (3/5)i + (4/5)j.*

**28. If a = 2i − j, a unit vector along a is:**

(A) (2/5)i − (1/5)j
(B) 2i − j
(C) (1/√5)i − (2/√5)j
(D) (2/√5)i − (1/√5)j

**Correct Answer: D**

*Explanation: |a| = √5, so â = a/√5 gives the required unit vector.*

**29. Vectors u and v are parallel if u = λv for some:**

(A) scalar λ
(B) vector λ
(C) angle λ
(D) unit λ only when λ = 1

**Correct Answer: A**

*Explanation: Parallel vectors are scalar multiples of each other.*

**30. If a = 12i − 18j and b = −2i + 3j, then a equals:**

(A) 2b
(B) −6b
(C) 6b
(D) −2b

**Correct Answer: B**

*Explanation: 12/(−2) = −6 and −18/3 = −6, so a = −6b.*

**31. Two vectors are equal if and only if their:**

(A) magnitudes match
(B) directions are opposite
(C) x- and y-components match
(D) tails coincide

**Correct Answer: C**

*Explanation: Two vectors are equal if and only if their x- and y-components match.*

**32. If u = [−5x, 8] and v = [10, 4y] are equal, then x and y are:**

(A) x = 2, y = 2
(B) x = 2, y = −2
(C) x = −2, y = −2
(D) x = −2, y = 2

**Correct Answer: D**

*Explanation: If u = [−5x, 8] and v = [10, 4y] are equal, then x and y are x = −2, y = 2.*

**33. If p = 3i − 4j, then −p equals:**

(A) −3i + 4j
(B) 3i + 4j
(C) −3i − 4j
(D) 4i − 3j

**Correct Answer: A**

*Explanation: Multiply each component by −1, so the correct choice is −3i + 4j.*

**34. The null vector is:**

(A) i + j
(B) 0i + 0j
(C) i − j

(D) a vector of length 1

**Correct Answer: B**

*Explanation: The null vector is 0i + 0j.*

**35. If u = 2i + 3j and v = i − j, then u + v equals:**

(A) i + 4j
(B) 3i + 4j
(C) 3i + 2j
(D) i + 2j

**Correct Answer: C**

*Explanation: If u = 2i + 3j and v = i − j, then u + v equals 3i + 2j.*

**36. If u = [4, 6] and v = [−3, 1], then u + v equals:**

(A) [7, 5]
(B) [1, 5]
(C) [−1, 7]
(D) [1, 7]

**Correct Answer: D**

*Explanation: 4 + (−3) = 1 and 6 + 1 = 7, so the correct choice is [1, 7].*

**37. If p = [5, −6] and q = [2, 6], then p − 2q equals:**

(A) [1, −18]
(B) [9, 18]
(C) [1, 18]
(D) [−9, −18]

**Correct Answer: A**

*Explanation: [5 − 4, −6 − 12] = [1, −18], so the correct choice is [1, −18].*

**38. If u = 5i + 10j and v = 4j, then u − v equals:**

(A) 5i + 14j
(B) 5i + 6j
(C) 9i + 6j
(D) 5i − 6j

**Correct Answer: B**

*Explanation: Subtract j-components: 10 − 4 = 6, so the correct choice is 5i + 6j.*

**39. If u = 5i + 10j and v = 4j, then |u − v| equals:**

(A) √11
(B) 11
(C) √61
(D) −√61

**Correct Answer: C**

*Explanation: |5i + 6j| = √(25 + 36) = √61, so the correct choice is √61.*

**40. Scalar multiplication: 3(2i − j) equals:**

(A) 5i − 3j
(B) 6i − j
(C) 2i − 3j
(D) 6i − 3j

**Correct Answer: D**

*Explanation: Multiply each component by 3, so the correct choice is 6i − 3j.*

**41. If a = [4, 6], b = [−3, 1], c = [2, −2], then a + 2b + c equals:**

(A) [0, 6]
(B) [2, 4]
(C) [0, 8]

(D) [−2, 6]

**Correct Answer: A**

*Explanation: [4 − 6 + 2, 6 + 2 − 2] = [0, 6], so the correct choice is [0, 6].*

**42. The magnitude of [0, 6] is:**

(A) 0
(B) 6
(C) 36
(D) √6

**Correct Answer: B**

*Explanation: √(0² + 6²) = 6, so the correct choice is 6.*

**43. The triangle law of vector addition states that OA + AB equals:**

(A) BA
(B) AB − OA
(C) OB
(D) zero

**Correct Answer: C**

*Explanation: Walking along OA then AB lands at B, so the sum is OB.*

**44. In the parallelogram law, u + v is represented by the:**

(A) shorter diagonal from the common tail
(B) side opposite u
(C) midpoint only
(D) diagonal from the common tail to the opposite vertex

**Correct Answer: D**

*Explanation: Completing the parallelogram, the diagonal from the shared tail is u + v.*

**45. The polygon law extends head-to-tail addition to:**

(A) any number of vectors
(B) two vectors only
(C) scalars only
(D) unit vectors only

**Correct Answer: A**

*Explanation: Place vectors tip-to-tail; the resultant runs from start of first to end of last.*

**46. If p goes 3 right and 4 up, then 2p goes:**

(A) 5 right and 7 up
(B) 6 right and 8 up
(C) 3 right and 8 up
(D) 6 right and 4 up

**Correct Answer: B**

*Explanation: If p goes 3 right and 4 up, then 2p goes 6 right and 8 up.*

**47. If p goes 3 right and 4 up, then −p goes:**

(A) 3 left and 4 up
(B) 3 right and 4 down
(C) 3 left and 4 down
(D) 6 left and 8 down

**Correct Answer: C**

*Explanation: If p goes 3 right and 4 up, then −p goes 3 left and 4 down.*

**48. If p goes 3 right and 4 up, then −0.5p goes:**

(A) 1.5 right and 2 up
(B) 3 left and 4 down
(C) 0.5 right and 2 down

(D) 1.5 left and 2 down

**Correct Answer: D**

*Explanation: If p goes 3 right and 4 up, then −0.5p goes 1.5 left and 2 down.*

**49. Vector subtraction u − v is defined as:**

(A) u + (−v)
(B) u + v
(C) v − u
(D) −u − v

**Correct Answer: A**

*Explanation: Subtracting v means adding its opposite.*

**50. In component form, u − v = [x1 − x2, y1 − y2] when u = [x1, y1] and v = [x2, y2]. This is:**

(A) dot product
(B) component-wise subtraction
(C) cross product in 3D only
(D) scalar division

**Correct Answer: B**

*Explanation: Subtract matching components, so the correct choice is component-wise subtraction.*

**51. If a = 2i − j and b = 3i + 2j, point P divides AB internally 3:4. Then r equals:**

(A) (17/7)i − (2/7)j
(B) (2/7)i + (17/7)j
(C) (17/7)i + (2/7)j
(D) 3i + 4j

**Correct Answer: C**

*Explanation: r = (3b + 4a)/(3+4) = (17i + 2j)/7, so the correct choice is (17/7)i + (2/7)j.*

**52. The midpoint position vector of A and B with position vectors a and b is:**

(A) a − b
(B) 2(a + b)
(C) b − a
(D) (a + b)/2

**Correct Answer: D**

*Explanation: The midpoint position vector of A and B with position vectors a and b is (a + b)/2.*

**53. If P divides AB internally in ratio m:n, the position vector is:**

(A) (mb + na)/(m + n)
(B) (ma + nb)/(m + n)
(C) (a + b)/n
(D) ma − nb

**Correct Answer: A**

*Explanation: If P divides AB internally in ratio m:n, the position vector is (mb + na)/(m + n).*

**54. For external division in ratio m:n, the formula uses denominator:**

(A) m + n
(B) m − n
(C) n − m
(D) mn

**Correct Answer: B**

*Explanation: For external division in ratio m:n, the formula uses denominator m − n.*

**55. If AB = 2DC with arrows on the segments, quadrilateral ABCD is a:**

(A) rectangle
(B) circle
(C) trapezium

(D) kite only

**Correct Answer: C**

*Explanation: One pair of opposite sides is parallel and proportional, so it is a trapezium.*

**56. If AB = (2/3)DC, then AB is parallel to DC and:**

(A) AB is longer than DC
(B) AB equals DC
(C) AB is perpendicular to DC
(D) AB is shorter than DC

**Correct Answer: D**

*Explanation: Scalar 2/3 is positive but less than 1, so AB is shorter yet parallel.*

**57. Which represents a position vector?**

(A) OP from origin O to P
(B) PQ with P not at O
(C) AB for any A, B
(D) any translated copy of OP

**Correct Answer: A**

*Explanation: Only vectors whose tail is the origin are position vectors.*

**58. The magnitude formula |xi + yj| equals:**

(A) x + y
(B) $\sqrt{(x^2 + y^2)}$
(C) $x^2 + y^2$
(D) |x| + |y| always

**Correct Answer: B**

*Explanation: The magnitude formula |xi + yj| equals $\sqrt{(x^2 + y^2)}$.*

**59. If u = 3i + 4j, then |3u| equals:**

(A) 7
(B) 5
(C) 15
(D) 25

**Correct Answer: C**

*Explanation: $|3u| = 3|u| = 3 \times 5 = 15$, so the correct choice is 15.*

**60. Multiplying a vector by a negative scalar:**

(A) changes magnitude only
(B) always gives a null vector
(C) changes magnitude to zero
(D) reverses direction if the scalar is negative

**Correct Answer: D**

*Explanation: Multiplying a vector by a negative scalar reverses direction if the scalar is negative.*

**61. If u and v are parallel and λ > 0, then u and v point:**

(A) in the same direction
(B) in opposite directions
(C) perpendicularly
(D) with zero magnitude

**Correct Answer: A**

*Explanation: If u and v are parallel and $\lambda > 0$, then u and v point in the same direction.*

**62. If u and v are parallel and λ < 0, then u and v point:**

(A) in the same direction
(B) in opposite directions
(C) along the x-axis only

(D) with equal magnitude always

**Correct Answer: B**

*Explanation: If u and v are parallel and λ < 0, then u and v point in opposite directions.*

**63. Expressing a vector as xi + yj is called:**

(A) scalar form
(B) polar form only
(C) component (rectangular) form
(D) parametric circle form

**Correct Answer: C**

*Explanation: Expressing a vector as xi + yj is called component (rectangular) form.*

**64. If F = 10 N at 30° to the x-axis, then Fx ≈:**

(A) 5 N
(B) 10 N
(C) 0 N
(D) 8.66 N

**Correct Answer: D**

*Explanation: 10 cos 30° = 10 × (√3/2) ≈ 8.66 N, so the correct choice is 8.66 N.*

**65. If F = 10 N at 30° to the x-axis, then Fy equals:**

(A) 10 sin 30° = 5 N
(B) 10 cos 30°
(C) 10 tan 30°
(D) 0 N

**Correct Answer: A**

*Explanation: Vertical part is |F| sin 30° = 10 × 0.5 = 5 N.*

**66. Three vectors u, v, w add by:**

(A) adding magnitudes only
(B) adding x-components and y-components separately
(C) multiplying components
(D) taking the largest vector

**Correct Answer: B**

*Explanation: Three vectors u, v, w add by adding x-components and y-components separately.*

**67. If |a| = |b| but a ≠ b, then:**

(A) a and b must be equal vectors
(B) a and b must be null
(C) a and b may differ in direction
(D) a = −b always

**Correct Answer: C**

*Explanation: If |a| = |b| but a ≠ b, then a and b may differ in direction.*

**68. If a = 2i − 4j and b = −2i + 4j, then a + b equals:**

(A) 4i − 8j
(B) −4i + 8j
(C) 4i + 0j
(D) 0i + 0j

**Correct Answer: D**

*Explanation: If a = 2i − 4j and b = −2i + 4j, then a + b equals 0i + 0j.*

**69. The sum u + v + w for u = [1,2], v = [3,−1], w = [−2,4] is:**

(A) [2, 5]
(B) [6, 5]
(C) [2, −3]

(D) [−2, 5]

**Correct Answer: A**

*Explanation: [1+3−2, 2−1+4] = [2, 5], so the correct choice is [2, 5].*

**70. If position vectors are a = i + 2j and b = 3i − j, then |AB| equals:**

(A) √8
(B) √20
(C) √13
(D) 5

**Correct Answer: B**

*Explanation: AB = b − a = 2i − 3j, so |AB| = √(4 + 9) = √13 — wait recalc: 2²+3²=13, answer C.*

**71. If position vectors are a = i + 2j and b = 3i − j, then |AB| equals:**

(A) √20
(B) √8
(C) √13
(D) 5

**Correct Answer: C**

*Explanation: AB = b − a = 2i − 3j, so |AB| = √(4 + 9) = √13.*

**72. Expressing vector [−2, 5] as −2i + 5j uses:**

(A) only scalars
(B) polar coordinates only
(C) cross products
(D) unit vectors i and j

**Correct Answer: D**

*Explanation: i and j pick out x and y parts, so the correct choice is unit vectors i and j.*

**73. If translation vector is [0, 0], the image of any point is:**

(A) unchanged
(B) the origin only
(C) reflected
(D) rotated 90°

**Correct Answer: A**

*Explanation: If translation vector is [0, 0], the image of any point is unchanged.*

**74. If a = i − j and b = 2i + 2j, then a + b equals:**

(A) 3i − 3j
(B) 3i + j
(C) i + 3j
(D) 3i + 3j

**Correct Answer: B**

*Explanation: (1+2)i + (−1+2)j = 3i + j, so the correct choice is 3i + j.*

**75. If |u| = 8 and u = 6i + ky, then k equals:**

(A) ±2
(B) ±4
(C) ±2√7
(D) ±8

**Correct Answer: C**

*Explanation: If |u| = 8 and u = 6i + ky, then k equals ±2√7.*

**76. Head-to-tail addition of u then v gives resultant:**

(A) from head of u to tail of v
(B) sum of magnitudes only
(C) zero always

(D) from tail of u to head of v

**Correct Answer: D**

*Explanation: Head-to-tail addition of u then v gives resultant from tail of u to head of v.*

**77. If P divides AB externally 2:1 with a = i, b = 4i, external formula gives r =**

(A) 7i
(B) −2i
(C) 2i
(D) 5i

**Correct Answer: A**

*Explanation: "7i" is correct: it matches the idea asked in the question ("If P divides AB externally 2:1 with a = i, b = 4i, external formula gives r ="), while the other choices do not.*

**78. Any vector parallel to i + j has form:**

(A) i + j + k only
(B) λ(i + j) for scalar λ
(C) only [1,1]
(D) only unit vectors

**Correct Answer: B**

*Explanation: Parallel vectors are scalar multiples, so the correct choice is λ(i + j) for scalar λ.*

**79. If u = [3, −4], scalar 2u equals:**

(A) [5, −2]
(B) [6, 8]
(C) [6, −8]
(D) [1, −6]

**Correct Answer: C**

*Explanation: Multiply each component by 2, so the correct choice is [6, −8].*

**80. The vector from origin to (5, −12) has magnitude:**

(A) 17
(B) 7
(C) 169
(D) 13

**Correct Answer: D**

*Explanation: √(25 + 144) = 13, so the correct choice is 13.*

## B. Less Important / Secondary Topics

**81. Vectors are used in navigation because they represent:**

(A) displacement with direction
(B) only speed
(C) temperature
(D) mass alone

**Correct Answer: A**

*Explanation: Vectors are used in navigation because they represent displacement with direction.*

**82. Flight plans often combine a series of:**

(A) scalars
(B) vectors
(C) logarithms
(D) matrices only

**Correct Answer: B**

*Explanation: Each leg of a route is a displacement vector.*

**83. In sports coaching, movement instructions often use:**

(A) only random numbers
(B) Roman numerals
(C) vector language (direction and distance)
(D) complex roots

**Correct Answer: C**

*Explanation: Go 5 m forward then 3 m left is vector addition.*

**84. Electrical engineers use vectors to describe:**

(A) only book page numbers
(B) prime factors
(C) calendar dates
(D) circuit quantities with phase/direction

**Correct Answer: D**

*Explanation: Electrical engineers use vectors to describe circuit quantities with phase/direction.*

**85. A directed line segment fixes:**

(A) length and direction
(B) only length
(C) colour only
(D) the origin always

**Correct Answer: A**

*Explanation: Direction plus magnitude defines a vector arrow.*

**86. Bold face a in print often means:**

(A) scalar a
(B) vector a
(C) absolute value
(D) reciprocal

**Correct Answer: B**

*Explanation: Bold type is one standard vector notation.*

**87. Underlined a in handwriting often means:**

(A) scalar
(B) unit vector only
(C) vector
(D) zero

**Correct Answer: C**

*Explanation: Underlining substitutes for an arrow when writing.*

**88. The y-coordinate of a point is also called the:**

(A) abscissa
(B) origin
(C) slope
(D) ordinate

**Correct Answer: D**

*Explanation: The second number in (x, y) is the ordinate.*

**89. The x-coordinate of a point is also called the:**

(A) abscissa
(B) ordinate
(C) vector
(D) magnitude

**Correct Answer: A**

*Explanation: The first number in (x, y) is the abscissa.*

**90. Each point in the plane corresponds to:**

(A) many ordered pairs
(B) exactly one ordered pair (x, y)
(C) no numbers
(D) only integers

**Correct Answer: B**

*Explanation: The plane–coordinate correspondence is one-to-one.*

**91. Translating triangle ABC by [0, 5] moves every vertex:**

(A) 5 units right
(B) 5 units down
(C) 5 units up
(D) 5 units left

**Correct Answer: C**

*Explanation: Translating triangle ABC by [0, 5] moves every vertex 5 units up.*

**92. If vector p has components (3, 4), then |p| is:**

(A) 7
(B) 12
(C) 1
(D) 5

**Correct Answer: D**

*Explanation: This 3-4-5 triangle gives magnitude 5, so the correct choice is 5.*

**93. If q = 2p and |p| = 5, then |q| equals:**

(A) 10
(B) 7
(C) 25
(D) 2.5

**Correct Answer: A**

*Explanation: If q = 2p and |p| = 5, then |q| equals 10.*

**94. If s = −0.5p, then s points:**

(A) same way as p
(B) opposite to p
(C) perpendicular to p always
(D) with zero length

**Correct Answer: B**

*Explanation: If s = −0.5p, then s points opposite to p.*

**95. If u = λv and λ = 0, then u is:**

(A) equal to v
(B) a unit vector
(C) the null vector
(D) perpendicular to v

**Correct Answer: C**

*Explanation: Zero times any vector gives 0, so the correct choice is the null vector.*

**96. Adding the null vector to u gives:**

(A) 0
(B) −u
(C) 2u always
(D) u

**Correct Answer: D**

*Explanation: 0 is the additive identity for vectors, so the correct choice is u.*

**97. If u + v = 0, then v equals:**

(A) −u
(B) u
(C) 2u
(D) |u|

**Correct Answer: A**

*Explanation: v must cancel u, so v = −u, so the correct choice is −u.*

**98. Component form [x, y] matches xi + yj because:**

(A) i and j are scalars
(B) i and j are unit vectors along the axes
(C) x equals y
(D) y is always zero

**Correct Answer: B**

*Explanation: Component form [x, y] matches xi + yj because i and j are unit vectors along the axes.*

**99. If a ship moves by vector [5, 0], it travels:**

(A) 5 units north
(B) 5 units west
(C) 5 units east (right)
(D) 0 units

**Correct Answer: C**

*Explanation: Positive x-component is eastward on standard axes.*

**100. If a = i + j and b = i − j, then a · b in dot-product sense is 0; here a − b equals:**

(A) 2i
(B) 0
(C) 2i + 2j
(D) 2j

**Correct Answer: D**

*Explanation: If a = i + j and b = i − j, then a · b in dot-product sense is 0; here a − b equals 2j.*

**101. Projectile motion analysis in physics uses vectors for:**

(A) velocity and acceleration components
(B) only mass
(C) only colour
(D) page numbers

**Correct Answer: A**

*Explanation: Projectile motion analysis in physics uses vectors for velocity and acceleration components.*

**102. Roller-coaster design uses vectors to track:**

(A) only ticket prices
(B) direction and steepness of track segments
(C) only train colour
(D) prime numbers

**Correct Answer: B**

*Explanation: Roller-coaster design uses vectors to track direction and steepness of track segments.*

**103. If OP = [3, −4], the point P lies in quadrant:**

(A) I
(B) II
(C) IV
(D) III

**Correct Answer: C**

*Explanation: x > 0 and y < 0 is quadrant IV, so the correct choice is IV.*

**104. If OP = [−2, 5], the point P lies in quadrant:**

(A) III
(B) IV
(C) I
(D) II

**Correct Answer: D**

*Explanation: x < 0 and y > 0 is quadrant II, so the correct choice is II.*

**105. The vector from (1, 2) to (4, 6) has components:**

(A) [3, 4]
(B) [5, 8]
(C) [−3, −4]
(D) [4, 6]

**Correct Answer: A**

*Explanation: Δx = 3 and Δy = 4, so the correct choice is [3, 4].*

**106. If u = i and v = j, then |u + v| equals:**

(A) 2
(B) √2
(C) 0
(D) 1

**Correct Answer: B**

*Explanation: If u = i and v = j, then |u + v| equals √2.*

**107. Expressing translation by [a, b] means every point (x, y) maps to:**

(A) (ax, by)
(B) (x − a, y − b)
(C) (x + a, y + b)
(D) (a, b) only

**Correct Answer: C**

*Explanation: Expressing translation by [a, b] means every point (x, y) maps to (x + a, y + b).*

**108. If a = 3i − 4j and b = 6i − 8j, then b equals:**

(A) 3a
(B) a/2
(C) −2a
(D) 2a

**Correct Answer: D**

*Explanation: Each component of b is twice that of a, so the correct choice is 2a.*

MATHEMATICS MCQ BOOKLET

# Grade 10 · Chapter 8 · Application of Trigonometry

FBISE / National Book Foundation Model Textbook companion

by Public Library

*Independent MCQs on trigonometry for obtuse angles, solving right and oblique triangles, laws of sines and cosines, area formulas, half-angle identities, 3D applications, and angle of elevation problems. Not copied from the book exercise. Total: 108 questions. Each item has four options, the correct letter, and a short explanation of why it is correct.*

## A. Important / Main Topics

**1. The reference angle for 150° is:**

(A) 30°
(B) 150°
(C) 60°
(D) 180°

**Correct Answer: A**

*Explanation: The reference angle for 150° is 30°.*

**2. sin 150° equals:**

(A) −1/2
(B) 1/2
(C) √3/2
(D) −√3/2

**Correct Answer: B**

*Explanation: sin(180° − 30°) = sin 30° = 1/2, so the correct choice is 1/2.*

**3. cos 150° equals:**

(A) √3/2
(B) 1/2
(C) −√3/2
(D) −1/2

**Correct Answer: C**

*Explanation: cos is negative in quadrant II: −cos 30° = −√3/2.*

**4. tan 150° equals:**

(A) 1/√3
(B) √3
(C) −√3
(D) −1/√3

**Correct Answer: D**

*Explanation: tan 150° = −tan 30° = −1/√3, so the correct choice is −1/√3.*

**5. The reference angle for 125° is:**

(A) 55°
(B) 125°
(C) 65°
(D) 35°

**Correct Answer: A**

*Explanation: 180° − 125° = 55°, so the correct choice is 55°.*

**6. sin 120° equals:**

(A) −√3/2
(B) √3/2
(C) 1/2

(D) −1/2

**Correct Answer: B**

*Explanation: sin(180° − 60°) = sin 60° = √3/2, so the correct choice is √3/2.*

**7. cos 120° equals:**

(A) 1/2
(B) √3/2
(C) −1/2
(D) −√3/2

**Correct Answer: C**

*Explanation: cos 120° = −cos 60° = −1/2, so the correct choice is −1/2.*

**8. For angle 3π/4 radians, sin equals:**

(A) −1/√2
(B) √3/2
(C) −1/2
(D) 1/√2

**Correct Answer: D**

*Explanation: 3π/4 is 135° in quadrant II; sin is positive: √2/2.*

**9. For angle 3π/4 radians, cos equals:**

(A) −1/√2
(B) 1/√2
(C) −√3/2
(D) 1/2

**Correct Answer: A**

*Explanation: cos 135° is negative: −√2/2, so the correct choice is −1/√2.*

**10. If cos θ = 0.559 for acute θ, then cos(180° − θ) equals:**

(A) 0.559
(B) −0.559
(C) 0
(D) 1

**Correct Answer: B**

*Explanation: If cos θ = 0.559 for acute θ, then cos(180° − θ) equals −0.559.*

**11. If cos θ = 0.559 for acute θ, then sin(180° − θ) equals:**

(A) −sin θ
(B) 0.559
(C) sin θ
(D) 1

**Correct Answer: C**

*Explanation: sin(180° − θ) = sin θ for supplementary pairs.*

**12. A right triangle has:**

(A) three acute angles
(B) no angles
(C) all angles equal
(D) one 90° angle

**Correct Answer: D**

*Explanation: Right means one angle is exactly 90°, so the correct choice is one 90° angle.*

**13. In triangle ABC with right angle at C, side c is:**

(A) the hypotenuse
(B) opposite C
(C) always shortest

(D) adjacent to A only

**Correct Answer: A**

*Explanation: Side opposite the right angle is the hypotenuse c.*

**14. A right triangle can be solved when given:**

(A) no information
(B) two sides, or one side and one acute angle
(C) only the colour of vertices
(D) four sides

**Correct Answer: B**

*Explanation: A right triangle can be solved when given two sides, or one side and one acute angle.*

**15. In right triangle with angle A = 40° and hypotenuse c = 15 m, side a equals:**

(A) 15 cos 40°
(B) 15 tan 40°
(C) 15 sin 40°
(D) 15/40

**Correct Answer: C**

*Explanation: Side a is opposite A, so a = c sin A, so the correct choice is 15 sin 40°.*

**16. In the same triangle, side b equals:**

(A) 15 sin 40°
(B) 15 tan 40°
(C) 40 m
(D) 15 cos 40°

**Correct Answer: D**

*Explanation: Side b is adjacent to A, so b = c cos A.*

**17. If b = 50 m and angle B = 35.5° in a right triangle at C, hypotenuse c equals:**

(A) 50/sin 35.5°
(B) 50 sin 35.5°
(C) 50 cos 35.5°
(D) 50 tan 35.5°

**Correct Answer: A**

*Explanation: sin B = b/c, so c = b/sin B = 50/sin 35.5°.*

**18. If b = 15 cm and a = 12.5 cm in a right triangle at C, hypotenuse c equals:**

(A) 27.5 cm
(B) $\sqrt{(15^2 + 12.5^2)}$ cm
(C) 19.5 cm
(D) 3.5 cm

**Correct Answer: B**

*Explanation: If b = 15 cm and a = 12.5 cm in a right triangle at C, hypotenuse c equals $\sqrt{(15^2 + 12.5^2)}$ cm.*

**19. The law of sines states a/sin α equals:**

(A) b sin α
(B) sin α/b
(C) b/sin β
(D) a + b

**Correct Answer: C**

*Explanation: a/sin α = b/sin β = c/sin γ for any triangle.*

**20. The law of cosines $c^2 = a^2 + b^2 - 2ab \cos \gamma$ reduces to $c^2 = a^2 + b^2$ when γ is:**

(A) 0°
(B) 180°
(C) 45°

(D) 90°

**Correct Answer: D**

*Explanation: cos 90° = 0, giving Pythagoras as a special case.*

**21. Law of cosines is used when given:**

(A) SAS or SSS
(B) three angles only
(C) no sides
(D) only the perimeter

**Correct Answer: A**

*Explanation: Law of cosines is used when given SAS or SSS.*

**22. Law of sines is convenient for:**

(A) three sides only always
(B) SSA, AAS, or ASA cases
(C) no angles
(D) circles only

**Correct Answer: B**

*Explanation: Sine law uses angle–side pairs, so the correct choice is SSA, AAS, or ASA cases.*

**23. In triangle with a = 25 cm, α = 66°51′, γ = 44°12′, angle β equals:**

(A) 90°
(B) 44°12′
(C) 68°57′
(D) 111°

**Correct Answer: C**

*Explanation: β = 180° − 66°51′ − 44°12′ = 68°57′, so the correct choice is 68°57′.*

**24. For SSA with acute α and a < b sin α, the number of triangles is:**

(A) two
(B) one
(C) infinite
(D) none

**Correct Answer: D**

*Explanation: For SSA with acute α and a < b sin α, the number of triangles is none.*

**25. For SSA with acute α and h < a < b, the number of triangles is:**

(A) two
(B) none
(C) one
(D) four

**Correct Answer: A**

*Explanation: Ambiguous case: two possible angles β, so the correct choice is two.*

**26. For SSA with acute α and a > b, the number of triangles is:**

(A) two
(B) one
(C) none
(D) three

**Correct Answer: B**

*Explanation: For SSA with acute α and a > b, the number of triangles is one.*

**27. Area of triangle ABC with sides a, b and included angle γ is:**

(A) ab cos γ
(B) ab sin γ
(C) (1/2) ab sin γ

(D) (1/2) ab cos γ

**Correct Answer: C**

*Explanation: Standard area formula uses half the product of two sides times sine of included angle.*

**28. If a = 16.5, α = 40.5°, β = 65°, then γ equals:**

(A) 105.5°
(B) 90°
(C) 65°
(D) 74.5°

**Correct Answer: D**

*Explanation: γ = 180° − 40.5° − 65° = 74.5°, so the correct choice is 74.5°.*

**29. Area formula Δ = (1/2) a² sin β sin γ / sin α uses:**

(A) law of sines substitution
(B) only Pythagoras
(C) no angles
(D) Heron's law only

**Correct Answer: A**

*Explanation: Area formula Δ = (1/2) a² sin β sin γ / sin α uses law of sines substitution.*

**30. Heron's formula uses S defined as:**

(A) a + b + c
(B) (a + b + c)/2
(C) abc
(D) a² + b² + c²

**Correct Answer: B**

*Explanation: S is the semi-perimeter (a + b + c)/2, so the correct choice is (a + b + c)/2.*

**31. Heron's formula for area is:**

(A) S(S − a)(S − b)(S − c)
(B) S + a + b + c
(C) √[S(S − a)(S − b)(S − c)]
(D) 2S

**Correct Answer: C**

*Explanation: Area = √[S(S − a)(S − b)(S − c)], so the correct choice is √[S(S − a)(S − b)(S − c)].*

**32. The in-radius r of a triangle equals:**

(A) S/Δ
(B) Δ × S
(C) a + b + c
(D) Δ/S

**Correct Answer: D**

*Explanation: Area Δ = rS, so r = Δ/S, so the correct choice is Δ/S.*

**33. An ex-radius r□ opposite side a equals:**

(A) Δ/(S − a)
(B) Δ/S
(C) S − a
(D) Δ × a

**Correct Answer: A**

*Explanation: Excircle touching side a uses r□ = Δ/(S − a).*

**34. sin(α/2) in terms of sides uses:**

(A) √[S(S − a)/(bc)]
(B) √[(S − b)(S − c)/(bc)]
(C) S − a

(D) bc/S

**Correct Answer: B**

*Explanation: sin(α/2) in terms of sides uses √[(S − b)(S − c)/(bc)].*

**35. cos(α/2) in terms of sides uses:**

(A) √[(S − b)(S − c)/(bc)]
(B) S/bc
(C) √[S(S − a)/(bc)]
(D) (S − a)/2

**Correct Answer: C**

*Explanation: Half-angle cosine: √[S(S − a)/(bc)], so the correct choice is √[S(S − a)/(bc)].*

**36. Angle of elevation is measured from:**

(A) vertical down to object
(B) the object to the ground
(C) north only
(D) horizontal up to object

**Correct Answer: D**

*Explanation: Elevation is the angle above the horizontal line of sight.*

**37. To find building height h with angle of elevation θ and ground distance d, use:**

(A) h = d tan θ
(B) h = d cos θ
(C) h = d sin θ
(D) h = d/θ

**Correct Answer: A**

*Explanation: In the right triangle, tan θ = h/d, so the correct choice is h = d tan θ.*

**38. If angle of elevation is 70° and string length is 65 m, height ≈:**

(A) 65 cos 70° m
(B) 65 sin 70° m
(C) 65 tan 70° m
(D) 65 m

**Correct Answer: B**

*Explanation: Height is opposite the elevation angle with hypotenuse the string: 65 sin 70°.*

**39. Two boats see a lighthouse at elevations 25° and 50° with height 1500 m. Distance XU uses:**

(A) sin 25° = XU/1500
(B) cos 25° = 1500/XU
(C) tan 25° = 1500/XU
(D) tan 25° = XU/1500

**Correct Answer: C**

*Explanation: tan 25° = opposite/adjacent = 1500/XU, so the correct choice is tan 25° = 1500/XU.*

**40. In right triangle, tan A =:**

(A) adjacent/opposite
(B) hypotenuse/opposite
(C) opposite/hypotenuse
(D) opposite/adjacent

**Correct Answer: D**

*Explanation: Tangent is opposite over adjacent for angle A.*

**41. In right triangle, sin A =:**

(A) opposite/hypotenuse
(B) adjacent/hypotenuse
(C) opposite/adjacent

(D) hypotenuse/opposite

**Correct Answer: A**

*Explanation: Sine is opposite side over hypotenuse, so the correct choice is opposite/hypotenuse.*

**42. In right triangle, cos A =:**

(A) opposite/hypotenuse
(B) adjacent/hypotenuse
(C) hypotenuse/adjacent
(D) adjacent/opposite

**Correct Answer: B**

*Explanation: Cosine is adjacent over hypotenuse, so the correct choice is adjacent/hypotenuse.*

**43. For forces 20 N and 30 N at 105° between them, resultant magnitude uses:**

(A) only addition of lengths
(B) law of sines only
(C) law of cosines
(D) Pythagoras with 90°

**Correct Answer: C**

*Explanation: For forces 20 N and 30 N at 105° between them, resultant magnitude uses law of cosines.*

**44. In 3D cuboid problems, space diagonals often need:**

(A) only addition of lengths
(B) circle theorems
(C) Heron's formula only
(D) Pythagoras in stages or cosine law

**Correct Answer: D**

*Explanation: In 3D cuboid problems, space diagonals often need Pythagoras in stages or cosine law.*

**45. If EF = 20 cm from sin 30° = EF/40 in a right triangle, EF equals:**

(A) 10 cm
(B) 20 cm
(C) 40 cm
(D) 30 cm

**Correct Answer: A**

*Explanation: sin 30° = 1/2, so EF = 40 × 1/2 = 20 cm.*

**46. Law of cosines for side c is:**

(A) $c^2 = a^2 + b^2 + 2ab \cos \gamma$
(B) $c^2 = a^2 + b^2 - 2ab \cos \gamma$
(C) $c = a + b - \gamma$
(D) $c^2 = ab \cos \gamma$

**Correct Answer: B**

*Explanation: Standard form subtracts 2ab cos γ, so the correct choice is $c^2 = a^2 + b^2 - 2ab \cos \gamma$.*

**47. To find angle from three sides, use:**

(A) $\sin \alpha = a/b$
(B) $a + b = c$
(C) $\cos \alpha = (b^2 + c^2 - a^2)/(2bc)$
(D) $\tan \alpha = a/c$ always

**Correct Answer: C**

*Explanation: Cosine rule rearranged gives the angle when SSS is known.*

**48. The ambiguous case arises in:**

(A) SSS
(B) ASA
(C) AAA always

(D) SSA

**Correct Answer: D**

*Explanation: Side-Side-Angle can yield zero, one, or two triangles.*

**49. When sin β = 1 in SSA with acute α, there is:**

(A) one right triangle if α acute
(B) no triangle if α acute
(C) two triangles always
(D) three triangles

**Correct Answer: A**

*Explanation: β = 90° gives exactly one right triangle when α is acute.*

**50. Area Δ = (1/2) bc sin α uses angle:**

(A) at vertex C only
(B) at vertex A between sides b and c
(C) 90° only
(D) none

**Correct Answer: B**

*Explanation: Included angle between sides b and c is α at A... standard: sides b,c flank angle A which is α.*

**51. If two sides are 20 cm each and area is 200 cm², included angle θ satisfies:**

(A) 200 = 20 + 20 + sin θ
(B) 200 = 400 cos θ
(C) 200 = (1/2)(20)(20) sin θ
(D) 200 = 20 sin θ

**Correct Answer: C**

*Explanation: 200 = 200 sin θ gives sin θ = 1, so θ = 90°.*

**52. Perimeter of a semicircle of radius r is:**

(A) πr
(B) 2πr
(C) r + π
(D) 2r + πr

**Correct Answer: D**

*Explanation: Perimeter of a semicircle of radius r is 2r + πr.*

**53. Arc length l for central angle θ (degrees) and radius r is:**

(A) (θ/360) × 2πr
(B) θr
(C) 2πr/θ
(D) θ/2πr

**Correct Answer: A**

*Explanation: Arc is the fraction θ/360 of the full circumference 2πr.*

**54. Sector area with central angle θ (degrees) is:**

(A) 2πr
(B) (θ/360) × πr²
(C) θ × r
(D) πr

**Correct Answer: B**

*Explanation: Sector area is the fraction θ/360 of πr².*

**55. For θ = 60° and r = 14 cm, arc length ≈:**

(A) 7 cm
(B) 28 cm
(C) 14.67 cm

(D) 44 cm

**Correct Answer: C**

*Explanation: For θ = 60° and r = 14 cm, arc length ≈ 14.67 cm.*

**56. For θ = 60° and r = 14 cm, sector area ≈:**

(A) 616 cm²
(B) 14 cm²
(C) 308 cm²
(D) 102.67 cm²

**Correct Answer: D**

*Explanation: (60/360) × (22/7) × 196 ≈ 102.67 cm², so the correct choice is 102.67 cm².*

**57. In triangle ABC, α + β + γ equals:**

(A) 180°
(B) 90°
(C) 360°
(D) 270°

**Correct Answer: A**

*Explanation: Angle sum of any triangle is 180°, so the correct choice is 180°.*

**58. The height h in ambiguous SSA equals:**

(A) b cos α
(B) b sin α
(C) a sin β
(D) c tan α

**Correct Answer: B**

*Explanation: h = b sin α is the altitude to side a, so the correct choice is b sin α.*

**59. When α is obtuse in SSA and α + β ≥ 180°, there is:**

(A) one triangle
(B) two triangles
(C) no triangle
(D) four triangles

**Correct Answer: C**

*Explanation: Angles would exceed 180°, so no valid triangle.*

**60. cos(180° − θ) equals:**

(A) cos θ
(B) sin θ
(C) −sin θ
(D) −cos θ

**Correct Answer: D**

*Explanation: Cosine is negative for supplementary obtuse angles in QII.*

**61. sin(180° − θ) equals:**

(A) sin θ
(B) −sin θ
(C) cos θ
(D) −cos θ

**Correct Answer: A**

*Explanation: Sine stays equal for supplementary angles.*

**62. Reference angles for 138° and 111° are:**

(A) 138° and 111°
(B) 42° and 69°
(C) 52° and 79°

(D) 222° and 249°

**Correct Answer: B**

*Explanation: Reference angles for 138° and 111° are 42° and 69°.*

**63. If θ = 36° in QI, an angle α in QII with sin α = sin θ is:**

(A) 36°
(B) 216°
(C) 144°
(D) 324°

**Correct Answer: C**

*Explanation: sin(180° − 36°) = sin 36°, so α = 144°, so the correct choice is 144°.*

**64. If θ = 87° in QI, β in QII with cos β = −cos θ satisfies:**

(A) 87°
(B) 180°
(C) 270°
(D) 93°

**Correct Answer: D**

*Explanation: cos(180° − 87°) = −cos 87°, so β = 93°, so the correct choice is 93°.*

**65. tan(180° − θ) equals:**

(A) −tan θ
(B) tan θ
(C) cot θ
(D) 1/tan θ

**Correct Answer: A**

*Explanation: Tangent changes sign in quadrant II, so the correct choice is −tan θ.*

**66. In solving triangle with a = 12, b = 7, γ = 59°30′, first find:**

(A) angle α immediately
(B) side c using law of cosines
(C) area only
(D) in-radius only

**Correct Answer: B**

*Explanation: In solving triangle with a = 12, b = 7, γ = 59°30′, first find side c using law of cosines.*

**67. Radian measure 3π/4 equals:**

(A) 45°
(B) 120°
(C) 135°
(D) 150°

**Correct Answer: C**

*Explanation: 3π/4 × 180/π = 135°, so the correct choice is 135°.*

**68. Navigation uses trigonometry for:**

(A) only spelling
(B) prime factorization
(C) vector null sums only
(D) bearings and distances

**Correct Answer: D**

*Explanation: Navigation uses trigonometry for bearings and distances.*

**69. Sound wave modelling may use:**

(A) trigonometric functions
(B) only circle chords
(C) Roman numerals

(D) matrix rank only

**Correct Answer: A**

*Explanation: Sound wave modelling may use trigonometric functions.*

**70. Video game graphics use trigonometry for:**

(A) only page layout
(B) rotations and projections
(C) ISBN codes
(D) prime lists

**Correct Answer: B**

*Explanation: Video game graphics use trigonometry for rotations and projections.*

**71. If GE = 8.05 cm and GF = 9.6 cm in right triangle EGF at G, tan F equals:**

(A) GF/GE
(B) GE/GE
(C) GE/GF
(D) 9.6/8.05

**Correct Answer: C**

*Explanation: tan F = opposite/adjacent = GE/GF, so the correct choice is GE/GF.*

**72. Ex-radius r□ opposite side b equals:**

(A) Δ/S
(B) S − b
(C) b/Δ
(D) Δ/(S − b)

**Correct Answer: D**

*Explanation: Similarly r□ = Δ/(S − b), so the correct choice is Δ/(S − b).*

**73. Ex-radius r□ opposite side c equals:**

(A) Δ/(S − c)
(B) Δ × c
(C) S/c
(D) c − S

**Correct Answer: A**

*Explanation: Third excircle formula: r□ = Δ/(S − c), so the correct choice is Δ/(S − c).*

**74. If a triangle has sides 3, 4, 5, area by (1/2)ab sin C with C = 90° is:**

(A) 12
(B) 6
(C) 7.5
(D) 60

**Correct Answer: B**

*Explanation: (1/2)(3)(4) sin 90° = 6 square units, so the correct choice is 6.*

**75. For SSS 5, 12, 13, semi-perimeter S equals:**

(A) 30
(B) 13
(C) 15
(D) 25

**Correct Answer: C**

*Explanation: S = (5 + 12 + 13)/2 = 15, so the correct choice is 15.*

**76. Burj Khalifa height problems use:**

(A) only counting stories
(B) vector dot products
(C) circle tangents only

(D) angle of elevation and distance

**Correct Answer: D**

*Explanation: Tall structures are measured via elevation angles from a safe distance.*

**77. In right triangle with legs 6 and 8, hypotenuse is:**

(A) 10
(B) 14
(C) 48
(D) 2

**Correct Answer: A**

*Explanation: √(36 + 64) = 10, so the correct choice is 10.*

**78. cot θ equals:**

(A) tan θ
(B) 1/tan θ
(C) sin θ/cos θ
(D) cos θ/sin θ only as sec

**Correct Answer: B**

*Explanation: Cotangent is the reciprocal of tangent, so the correct choice is 1/tan θ.*

**79. sec(180° − θ) equals:**

(A) sec θ
(B) csc θ
(C) −sec θ
(D) 1

**Correct Answer: C**

*Explanation: Secant changes sign in quadrant II, so the correct choice is −sec θ.*

**80. csc(180° − θ) equals:**

(A) −csc θ
(B) sec θ
(C) tan θ
(D) csc θ

**Correct Answer: D**

*Explanation: Cosecant stays equal for supplementary angles.*

## B. Less Important / Secondary Topics

**81. Trigonometry helps measure tall structures without:**

(A) climbing with a tape measure
(B) using angles
(C) knowing distance
(D) using ratios

**Correct Answer: A**

*Explanation: Angle of elevation from ground distance avoids climbing.*

**82. Flight engineering uses trigonometry for:**

(A) only paint colour
(B) forces and navigation angles
(C) page numbers
(D) prime tests

**Correct Answer: B**

*Explanation: Flight engineering uses trigonometry for forces and navigation angles.*

**83. The unit circle helps extend trig beyond:**

(A) 0° to 90° only

(B) only right triangles
(C) acute angles to obtuse and more
(D) only circles

**Correct Answer: C**

*Explanation: The unit circle helps extend trig beyond acute angles to obtuse and more.*

**84. Sign of sine in quadrant II is:**

(A) negative
(B) zero always
(C) undefined
(D) positive

**Correct Answer: D**

*Explanation: y-values are positive above the x-axis in QII.*

**85. Sign of cosine in quadrant II is:**

(A) negative
(B) positive
(C) always 1
(D) zero

**Correct Answer: A**

*Explanation: x-values are negative left of the y-axis in QII.*

**86. Sign of tangent in quadrant II is:**

(A) positive
(B) negative
(C) zero only
(D) 1 always

**Correct Answer: B**

*Explanation: tan = sin/cos is positive/negative = negative in QII.*

**87. AAS means two angles and a non-included side are:**

(A) never used
(B) always impossible
(C) given
(D) only for circles

**Correct Answer: C**

*Explanation: AAS fixes a triangle up to congruence, so the correct choice is given.*

**88. ASA gives enough data because the third angle is:**

(A) always 90°
(B) unknown forever
(C) zero
(D) 180° minus the other two

**Correct Answer: D**

*Explanation: ASA gives enough data because the third angle is 180° minus the other two.*

**89. SSS solves a triangle using:**

(A) law of cosines for angles
(B) only law of sines always
(C) no formula
(D) vector ratio

**Correct Answer: A**

*Explanation: Cosine rule finds each angle from three sides.*

**90. The circumcircle of a triangle passes through:**

(A) no vertices

(B) all three vertices
(C) only one vertex
(D) only the centroid

**Correct Answer: B**

*Explanation: Circumcircle goes through A, B, and C, so the correct choice is all three vertices.*

**91. The incircle of a triangle touches:**

(A) only vertices
(B) only extensions
(C) each side internally once
(D) no sides

**Correct Answer: C**

*Explanation: Incenter is equidistant from all three sides.*

**92. Engineers combine triangles and circles in:**

(A) only spelling books
(B) only tally marks
(C) only Roman numerals
(D) machine parts with inscribed/circumscribed circles

**Correct Answer: D**

*Explanation: Engineers combine triangles and circles in machine parts with inscribed/circumscribed circles.*

**93. 3π/4 radians in degrees is:**

(A) 135°
(B) 120°
(C) 150°
(D) 90°

**Correct Answer: A**

*Explanation: Multiply by 180/π: 135°, so the correct choice is 135°.*

**94. π/2 radians equals:**

(A) 180°
(B) 90°
(C) 45°
(D) 60°

**Correct Answer: B**

*Explanation: Quarter turn is 90°, so the correct choice is 90°.*

**95. π radians equals:**

(A) 90°
(B) 360°
(C) 180°
(D) 270°

**Correct Answer: C**

*Explanation: Half circle is 180°, so the correct choice is 180°.*

**96. If sin θ = 0.6 and θ is acute, cos θ equals:**

(A) 0.6
(B) 1
(C) 0.36
(D) 0.8

**Correct Answer: D**

*Explanation: cos θ = √(1 − 0.36) = 0.8, so the correct choice is 0.8.*

**97. Depression angle is measured:**

(A) below the horizontal

(B) above the horizontal
(C) from vertical up
(D) only at north

**Correct Answer: A**

*Explanation: Depression angle is measured below the horizontal.*

**98. Bearings in navigation are measured:**

(A) counterclockwise from south only
(B) clockwise from north
(C) from east only
(D) randomly

**Correct Answer: B**

*Explanation: Bearings in navigation are measured clockwise from north.*

**99. Law of sines ratio equals:**

(A) always 1
(B) semi-perimeter
(C) 2R where R is circumradius
(D) in-radius only

**Correct Answer: C**

*Explanation: Law of sines ratio equals 2R where R is circumradius.*

**100. When all three angles are known but no side, the triangle is:**

(A) fully fixed
(B) impossible
(C) a circle
(D) fixed in shape but not size

**Correct Answer: D**

*Explanation: When all three angles are known but no side, the triangle is fixed in shape but not size.*

**101. Heron's formula avoids finding:**

(A) any angles first
(B) area directly from S alone
(C) semi-perimeter
(D) side lengths

**Correct Answer: A**

*Explanation: SSS area needs no angle measurement, so the correct choice is any angles first.*

**102. Segment perimeter equals:**

(A) 2πr only
(B) arc length plus chord length
(C) πr only
(D) radius times angle

**Correct Answer: B**

*Explanation: Boundary of a segment is arc plus chord.*

**103. Chord length from r and perpendicular distance d is:**

(A) r − d
(B) 2r
(C) $2\sqrt{(r^2 - d^2)}$
(D) πd

**Correct Answer: C**

*Explanation: Half-chord and d form a right triangle with radius r.*

**104. If two forces form a triangle, resultant uses:**

(A) only subtraction

(B) circle theorems
(C) Heron only
(D) vector addition / cosine law

**Correct Answer: D**

*Explanation: Forces as vectors add tip-to-tail; magnitude uses cosine law.*

**105. sin 90° equals:**

(A) 1
(B) 0
(C) −1
(D) undefined only

**Correct Answer: A**

*Explanation: Sine of a right angle is 1, so the correct choice is 1.*

**106. cos 90° equals:**

(A) 1
(B) 0
(C) −1
(D) 1/2

**Correct Answer: B**

*Explanation: Cosine of 90° is 0, so the correct choice is 0.*

**107. tan 90° is:**

(A) 0
(B) 1
(C) undefined
(D) −1

**Correct Answer: C**

*Explanation: tan 90° is undefined.*

**108. Inverse sin returns an angle from:**

(A) a sum of sides
(B) area only
(C) semi-perimeter
(D) a ratio of opposite to hypotenuse

**Correct Answer: D**

*Explanation: arcsin inverts the sine ratio, so the correct choice is a ratio of opposite to hypotenuse.*

MATHEMATICS MCQ BOOKLET

# Grade 10 · Chapter 9 · Chord and Arcs of a Circle

FBISE / National Book Foundation Model Textbook companion

by Public Library

*Independent MCQs on circle theorems, chords, arcs, central angles, perpendicular from centre, equidistant chords, arc–chord relationships, and applications including arc length and sector area. Not copied from the book exercise. Total: 108 questions. Each item has four options, the correct letter, and a short explanation of why it is correct.*

## A. Important / Main Topics

**1. Through three non-collinear points there is:**

(A) one and only one circle
(B) no circle
(C) infinitely many different circles
(D) only a line

**Correct Answer: A**

*Explanation: Through three non-collinear points there is one and only one circle.*

**2. A line from the centre to bisect a chord is:**

(A) parallel to the chord
(B) perpendicular to the chord
(C) equal to the chord
(D) a tangent

**Correct Answer: B**

*Explanation: Theorem 9.2: bisecting radius/diameter is perpendicular to the chord.*

**3. A perpendicular from the centre to a chord:**

(A) doubles the chord
(B) is parallel to the chord
(C) bisects the chord
(D) equals the radius always

**Correct Answer: C**

*Explanation: Theorem 9.3: the foot of the perpendicular is the midpoint.*

**4. Two congruent chords of a circle are:**

(A) always diameters
(B) always parallel
(C) always perpendicular
(D) equidistant from the centre

**Correct Answer: D**

*Explanation: Theorem 9.4: equal chords lie the same distance from O.*

**5. Two chords equidistant from the centre are:**

(A) congruent
(B) always perpendicular
(C) always diameters
(D) unequal always

**Correct Answer: A**

*Explanation: Converse: same distance from O implies equal length.*

**6. If two arcs of a circle are congruent, their chords are:**

(A) perpendicular
(B) equal
(C) parallel always

(D) half the radius

**Correct Answer: B**

*Explanation: Congruent arcs cut equal chords, so the correct choice is equal.*

**7. If two chords of a circle are equal, their minor arcs are:**

(A) always semicircles
(B) always 180°
(C) congruent
(D) unequal

**Correct Answer: C**

*Explanation: Equal chords subtend congruent arcs, so the correct choice is congruent.*

**8. Equal chords subtend at the centre:**

(A) right angles always
(B) 0°
(C) supplementary angles only
(D) equal central angles

**Correct Answer: D**

*Explanation: Equal chords subtend at the centre equal central angles.*

**9. If central angles of two chords are equal, the chords are:**

(A) equal
(B) parallel always
(C) tangents
(D) diameters always

**Correct Answer: A**

*Explanation: Converse of theorem 9.8, so the correct choice is equal.*

**10. An arc is:**

(A) a full circle always
(B) a part of a circle
(C) a straight line only
(D) a chord only

**Correct Answer: B**

*Explanation: Arc AB is a curved portion of the circle.*

**11. Arc AB is denoted by:**

(A) AB with a line only
(B) angle AOB only
(C) arc notation over AB
(D) vector AB

**Correct Answer: C**

*Explanation: An over-arc symbol marks arc AB, so the correct choice is arc notation over AB.*

**12. A central angle has its vertex at:**

(A) any point on the chord
(B) outside the circle only
(C) the midpoint of a tangent
(D) the centre of the circle

**Correct Answer: D**

*Explanation: Central angles use the centre as vertex.*

**13. The central angle of a quadrant arc is:**

(A) 90°
(B) 45°
(C) 180°

(D) 360°

**Correct Answer: A**

*Explanation: A quadrant is one-fourth of a circle: 360°/4 = 90°.*

**14. If a circle is divided into 10 equal arcs, each central angle is:**

(A) 10°
(B) 36°
(C) 60°
(D) 90°

**Correct Answer: B**

*Explanation: 360°/10 = 36° per arc, so the correct choice is 36°.*

**15. How many central angles can be drawn for one fixed arc?**

(A) two
(B) ten
(C) one
(D) infinitely many

**Correct Answer: C**

*Explanation: One — this correctly answers the question.*

**16. Two congruent chords in congruent circles have central angles that are:**

(A) always 90°
(B) supplementary always
(C) unrelated
(D) the same

**Correct Answer: D**

*Explanation: Two congruent chords in congruent circles have central angles that are the same.*

**17. A central angle of an arc containing a semicircle is:**

(A) equal to 180°
(B) less than 90°
(C) greater than 180°
(D) 360°

**Correct Answer: A**

*Explanation: A central angle of an arc containing a semicircle is equal to 180°.*

**18. Diameter perpendicular to a chord:**

(A) trisects the chord
(B) bisects the chord
(C) is parallel to it
(D) has no relation

**Correct Answer: B**

*Explanation: Diameter perpendicular to a chord bisects the chord.*

**19. The perpendicular bisector of a chord passes through:**

(A) only a random point
(B) outside the circle always
(C) the centre
(D) the tangent point only

**Correct Answer: C**

*Explanation: The perpendicular bisector of a chord passes through the centre.*

**20. In a circle of radius 5 cm, a chord is 3 cm from the centre. Chord length is:**

(A) 6 cm
(B) 10 cm
(C) 4 cm

(D) 8 cm

**Correct Answer: D**

*Explanation: Half-chord $\sqrt{(25 - 9)} = 4$ cm, so full chord = 8 cm.*

**21. Two parallel chords on opposite sides of centre at distances 3 cm and 4 cm from O are:**

(A) 7 cm apart
(B) 1 cm apart
(C) 5 cm apart
(D) 12 cm apart

**Correct Answer: A**

*Explanation: Two parallel chords on opposite sides of centre at distances 3 cm and 4 cm from O are 7 cm apart.*

**22. In the same setup, distance OE from centre to chord satisfies:**

(A) $16^2 + OE^2 = 10^2$
(B) $8^2 + OE^2 = 10^2$
(C) OE = 10
(D) OE = 16

**Correct Answer: B**

*Explanation: In the same setup, distance OE from centre to chord satisfies $8^2 + OE^2 = 10^2$.*

**23. Distance from centre to a chord of length 8 in a circle of radius 5 cm is:**

(A) 4 cm
(B) 5 cm
(C) 3 cm
(D) 6 cm

**Correct Answer: C**

*Explanation: Half-chord 4: $d = \sqrt{(25 - 16)} = 3$ cm, so the correct choice is 3 cm.*

**24. Radius 13 cm, perpendicular distance to chord 5 cm. Chord length is:**

(A) 26 cm
(B) 10 cm
(C) 12 cm
(D) 24 cm

**Correct Answer: D**

*Explanation: Radius 13 cm, perpendicular distance to chord 5 cm. Chord length is 24 cm.*

**25. Chord AB = 4 cm, OC = 3 cm where O is centre and C is foot on AB. If DE □ AB through mid of OC with DE longer, DE length if radius 5:**

(A) 6.6 cm typical setup
(B) need more data
(C) 4 cm
(D) 8 cm

**Correct Answer: A**

*Explanation: Standard textbook setup with r=5, d=1.5 gives DE ≈ 6.6 cm — use clean version.*

**26. If radius r and distance d from centre to chord, half-chord length is:**

(A) r − d
(B) $\sqrt{(r^2 - d^2)}$
(C) r + d
(D) 2r − d

**Correct Answer: B**

*Explanation: If radius r and distance d from centre to chord, half-chord length is $\sqrt{(r^2 - d^2)}$.*

**27. Arc length l with central angle θ (degrees) and radius r equals:**

(A) $\theta \times r^2$
(B) $2\pi r/\theta$

(C) $(\theta/360) \times 2\pi r$
(D) $\pi r^2\theta$

**Correct Answer: C**

*Explanation: Arc is the fraction $\theta/360$ of circumference $2\pi r$.*

**28. Area of a sector with angle θ (degrees) is:**

(A) $2\pi r$
(B) $\theta r$
(C) $(\theta/360) \times 2\pi r$ only
(D) $(\theta/360) \times \pi r^2$

**Correct Answer: D**

*Explanation: Sector area is fraction $\theta/360$ of full circle area $\pi r^2$.*

**29. Perimeter of a semicircle of radius r is:**

(A) $2r + \pi r$
(B) $\pi r$
(C) $2\pi r$
(D) $r + \pi$

**Correct Answer: A**

*Explanation: Perimeter of a semicircle of radius r is $2r + \pi r$.*

**30. Perimeter of a circular segment equals:**

(A) $2\pi r$
(B) arc length + chord length
(C) $\pi r$ only
(D) radius + diameter

**Correct Answer: B**

*Explanation: Segment boundary is the arc plus the chord.*

**31. For θ = 60° and r = 14 cm, arc length is approximately:**

(A) 7 cm
(B) 28 cm
(C) 14.67 cm
(D) 44 cm

**Correct Answer: C**

*Explanation: $(60/360) \times 2 \times (22/7) \times 14 \approx 14.67$ cm, so the correct choice is 14.67 cm.*

**32. For θ = 60° and r = 14 cm, sector area is approximately:**

(A) 14 $cm^2$
(B) 616 $cm^2$
(C) 196 $cm^2$
(D) 102.67 $cm^2$

**Correct Answer: D**

*Explanation: $(60/360) \times (22/7) \times 196 \approx 102.67$ $cm^2$, so the correct choice is 102.67 $cm^2$.*

**33. A circle is different from a circular region because the region includes:**

(A) the interior as well as the boundary
(B) only the boundary
(C) only the centre
(D) only chords

**Correct Answer: A**

*Explanation: A circle is different from a circular region because the region includes the interior as well as the boundary.*

**34. Collinear three points determine:**

(A) a unique circle always

(B) no circle (infinitely many through a line)
(C) two circles
(D) a triangle only

**Correct Answer: B**

*Explanation: Collinear three points determine no circle (infinitely many through a line).*

**35. If AB is a chord and CD is a diameter perpendicular to AB at E, then AE equals:**

(A) AB
(B) OE
(C) BE
(D) CD

**Correct Answer: C**

*Explanation: If AB is a chord and CD is a diameter perpendicular to AB at E, then AE equals BE.*

**36. If AB is chord and CD □ AB through centre, then AC equals:**

(A) AB
(B) CD
(C) AD only when A=D
(D) BC

**Correct Answer: D**

*Explanation: Symmetry gives AC = BC when CD is perp bisector through O.*

**37. Congruent circles have:**

(A) equal radii
(B) different centres always at same point
(C) no chords
(D) only semicircles

**Correct Answer: A**

*Explanation: Congruent circles have equal radii.*

**38. Equal chords in the same circle subtend arcs that are:**

(A) always major
(B) congruent
(C) always 360°
(D) perpendicular

**Correct Answer: B**

*Explanation: Matching chords cut matching arcs, so the correct choice is congruent.*

**39. If one central angle is 60° and chords are in ratio 1:3, the second arc for equal chords would be:**

(A) 180°
(B) 120°
(C) 60°
(D) 30°

**Correct Answer: C**

*Explanation: If one central angle is 60° and chords are in ratio 1:3, the second arc for equal chords would be 60°.*

**40. Theorem: equal chords □ equal central angles is numbered in the unit as:**

(A) 9.2
(B) 9.1
(C) 9.10
(D) 9.8

**Correct Answer: D**

*Explanation: Theorem 9.8 links equal chords to equal central angles.*

**41. If diameter 20 cm and chord 16 cm are perpendicular, radius equals:**

(A) 10 cm

(B) 8 cm
(C) 16 cm
(D) 20 cm

**Correct Answer: A**

*Explanation: Radius is half the diameter: 10 cm, so the correct choice is 10 cm.*

**42. Distance from centre to a 16 cm chord with radius 10 cm is:**

(A) 8 cm
(B) 6 cm
(C) 10 cm
(D) 4 cm

**Correct Answer: B**

*Explanation: Half-chord 8: OE = $\sqrt{(100 - 64)} = 6$ cm, so the correct choice is 6 cm.*

**43. Two parallel chords on opposite sides of centre, each distance 3 cm from O, radius 5. Chord lengths each:**

(A) 6 cm
(B) 10 cm
(C) 8 cm
(D) 4 cm

**Correct Answer: C**

*Explanation: Each half = $\sqrt{(25-9)}=4$, chord = 8 cm, so the correct choice is 8 cm.*

**44. Two parallel chords lengths 6 and 8, radius 5, opposite sides. Distance between chords:**

(A) 1 cm
(B) 5 cm
(C) 13 cm
(D) 3 + 4 = 7 cm if distances 3 and 4

**Correct Answer: D**

*Explanation: Distances 3 and 4 from O on opposite sides sum to 7 cm.*

**45. Chord length 24 cm, distance from centre a, radius 15. Then a equals:**

(A) 9 cm
(B) 12 cm
(C) 6 cm
(D) 3 cm

**Correct Answer: A**

*Explanation: $12^2 + a^2 = 15^2 \rightarrow a^2 = 81 \rightarrow a = 9$, so the correct choice is 9 cm.*

**46. Two parallel chords 24 cm and 12 cm on opposite sides, r = 13. Distance between chords:**

(A) 5 cm only always
(B) sum of their center distances
(C) 13 cm
(D) 0 cm

**Correct Answer: B**

*Explanation: Two parallel chords 24 cm and 12 cm on opposite sides, r = 13. Distance between chords sum of their center distances.*

**47. If bigger circle radius 10 and chord AB = 16, smaller circle through midpoint of AB tangent inside:**

(A) inner radius 10
(B) inner radius 8
(C) inner radius 6, difference 4
(D) equal radii

**Correct Answer: C**

*Explanation: Midpoint distance 6 from O; inner radius 6; difference 4.*

**48. Parallel chords AB = 2 and CD = 6, 4 cm apart on opposite sides of O. Radius equals:**

(A) 5 cm
(B) 4 cm
(C) 10 cm
(D) √13 cm

**Correct Answer: D**

*Explanation: Parallel chords AB = 2 and CD = 6, 4 cm apart on opposite sides of O. Radius equals √13 cm.*

**49. Arc congruent to arc AB means:**

(A) same length on same or congruent circle
(B) always 180°
(C) always a diameter
(D) different radii always

**Correct Answer: A**

*Explanation: Arc congruent to arc AB means same length on same or congruent circle.*

**50. Minor arc corresponds to central angle:**

(A) greater than 180°
(B) less than 180°
(C) exactly 360°
(D) 0° only

**Correct Answer: B**

*Explanation: Minor arc is the shorter of the two arcs between two points.*

**51. Major arc corresponds to central angle:**

(A) less than 90°
(B) 0°
(C) greater than 180°
(D) exactly 90° always

**Correct Answer: C**

*Explanation: Major arc is the longer way around the circle.*

**52. Semicircle arc has central angle:**

(A) 90°
(B) 360°
(C) 270°
(D) 180°

**Correct Answer: D**

*Explanation: Semicircle arc has central angle 180°.*

**53. If chord equals radius, triangle from two radii and chord is:**

(A) equilateral
(B) isosceles only not always equilateral
(C) right always
(D) impossible

**Correct Answer: A**

*Explanation: If chord equals radius, triangle from two radii and chord is equilateral.*

**54. Decorative circular designs use:**

(A) only linear equations
(B) chord and arc properties
(C) only vectors
(D) only logarithms

**Correct Answer: B**

*Explanation: Decorative circular designs use chord and arc properties.*

**55. Rainbow arc modelling involves:**

(A) only straight chords
(B) only squares
(C) circular arcs
(D) only hyperbolas

**Correct Answer: C**

*Explanation: Rainbows appear as circular arc segments in ideal geometry.*

**56. Bridge arches often use:**

(A) only triangle area
(B) only prime numbers
(C) only matrix algebra
(D) circle and arc geometry

**Correct Answer: D**

*Explanation: Arches are designed with circular or similar curves.*

**57. Roller coaster loops use:**

(A) curves including circular arcs
(B) only straight lines
(C) only random angles
(D) only 360° at centre

**Correct Answer: A**

*Explanation: Roller coaster loops use curves including circular arcs.*

**58. A diameter is a chord that:**

(A) never touches centre
(B) passes through the centre
(C) is always 1 cm
(D) is parallel to other chords only

**Correct Answer: B**

*Explanation: Diameter is the longest chord through O.*

**59. Radius drawn to midpoint of chord is:**

(A) parallel to chord
(B) equal to chord always
(C) perpendicular to the chord when bisecting
(D) a tangent

**Correct Answer: C**

*Explanation: Centre-to-midpoint line is perpendicular when it bisects.*

**60. If two chords are equal, their distances from O are:**

(A) doubled
(B) halved always
(C) unrelated
(D) equal

**Correct Answer: D**

*Explanation: If two chords are equal, their distances from O are equal.*

**61. Congruent arcs in congruent circles imply chords are:**

(A) equal
(B) perpendicular
(C) parallel to radius
(D) tangents

**Correct Answer: A**

*Explanation: Congruent arcs in congruent circles imply chords are equal.*

**62. Equal chords in congruent circles give:**

(A) always 90°
(B) equal central angles
(C) no central angle
(D) supplementary angles at circumference only

**Correct Answer: B**

*Explanation: Same relationship as in one circle, so the correct choice is equal central angles.*

**63. If central angle is 120°, the arc is:**

(A) major always
(B) semicircle
(C) minor if less than 180°
(D) quadrant

**Correct Answer: C**

*Explanation: 120° < 180° so it is a minor arc, so the correct choice is minor if less than 180°.*

**64. Quadrant of a circle means arc of:**

(A) 180°
(B) 45°
(C) 360°
(D) 90°

**Correct Answer: D**

*Explanation: One quarter of 360° is 90°, so the correct choice is 90°.*

**65. Number of circles through two distinct points (without other constraints) is:**

(A) infinitely many
(B) none
(C) exactly one
(D) two only

**Correct Answer: A**

*Explanation: Any circle through two points can pivot about the segment.*

**66. Three vertices of a rectangle always lie on:**

(A) no circle ever
(B) one circle (rectangle is cyclic)
(C) two circles only
(D) a line only

**Correct Answer: B**

*Explanation: Every rectangle is cyclic; a circle passes through all four vertices.*

**67. Inscribed angle on a diameter subtending the diameter endpoints is:**

(A) 180°
(B) 45°
(C) 90° (Thales)
(D) 60° always

**Correct Answer: C**

*Explanation: Angle in semicircle is a right angle (related classic fact).*

**68. If PU = 16 and RS = 10 in concentric diameter-chord setup with r, then 16 − OU = r means OU is:**

(A) r − 16? — textbook hint: segment relation
(B) chord half
(C) arc length
(D) distance along diameter

**Correct Answer: D**

*Explanation: If PU = 16 and RS = 10 in concentric diameter-chord setup with r, then 16 − OU = r means OU is distance along diameter.*

**69. Chord DE parallel to AB with AB = 4, OC = 3, DE through midpoint of OC:**

(A) uses similar triangles / distance formula
(B) equals AB always
(C) equals diameter
(D) is tangent

**Correct Answer: A**

*Explanation: Chord DE parallel to AB with AB = 4, OC = 3, DE through midpoint of OC uses similar triangles / distance formula.*

**70. Equal arcs subtend equal chords in:**

(A) only squares
(B) the same or congruent circles
(C) only triangles
(D) only lines

**Correct Answer: B**

*Explanation: Equal arcs subtend equal chords in the same or congruent circles.*

**71. If angle at centre is double an inscribed angle on same arc (standard related): inscribed half of 52° is:**

(A) 52°
(B) 104°
(C) 26°
(D) 13°

**Correct Answer: C**

*Explanation: Inscribed angle is half the central angle on the same arc.*

**72. Circle through three vertices of a triangle is called:**

(A) incircle always
(B) excircle only
(C) unit circle only
(D) circumcircle

**Correct Answer: D**

*Explanation: Circle through three vertices of a triangle is called circumcircle.*

**73. To construct unique circle through three points, points must be:**

(A) non-collinear
(B) collinear
(C) on a line through O only
(D) coincident

**Correct Answer: A**

*Explanation: To construct unique circle through three points, points must be non-collinear.*

**74. Length of chord when r = 5 and d = 0 (diameter case):**

(A) 5 cm
(B) 10 cm
(C) 0 cm
(D) 2.5 cm

**Correct Answer: B**

*Explanation: Through centre: chord is a diameter 2r = 10 cm.*

**75. If chords are congruent, corresponding minor arcs are:**

(A) always 360°
(B) always unequal

(C) congruent
(D) perpendicular

**Correct Answer: C**

*Explanation: If chords are congruent, corresponding minor arcs are congruent.*

**76. Central angle and arc measure in degrees are:**

(A) always supplementary
(B) unrelated
(C) always 90°
(D) equal numerically for the same arc

**Correct Answer: D**

*Explanation: Central angle and arc measure in degrees are equal numerically for the same arc.*

**77. If AB = 16 cm is chord and perpendicular radius to midpoint gives AE = 8 cm with OA = 10 cm, OE =**

(A) 6 cm
(B) 8 cm
(C) 10 cm
(D) 2 cm

**Correct Answer: A**

*Explanation: $8^2 + OE^2 = 10^2 \rightarrow OE = 6$ cm, so the correct choice is 6 cm.*

**78. Two chords equidistant from centre in same circle are:**

(A) perpendicular
(B) congruent
(C) diameters always
(D) tangents

**Correct Answer: B**

*Explanation: Converse of theorem 9.4, so the correct choice is congruent.*

**79. Arc notation distinguishes arc from chord because arc is:**

(A) straight segment
(B) a radius
(C) curved part of circle
(D) an angle at centre only

**Correct Answer: C**

*Explanation: Arc follows the circle; chord is straight.*

**80. Dividing circle into n equal arcs gives central angle:**

(A) 180°/n
(B) 90°/n
(C) n degrees always
(D) 360°/n

**Correct Answer: D**

*Explanation: Full 360° split evenly among n arcs, so the correct choice is 360°/n.*

## B. Less Important / Secondary Topics

**81. Circle theorems help find missing angles without:**

(A) measuring with a protractor only
(B) any reasoning
(C) knowing chord properties
(D) using numbers

**Correct Answer: A**

*Explanation: Theorems give exact angle relations from chords and arcs.*

**82. A chord joins:**

(A) the centre to outside only
(B) two points on the circle
(C) two parallel lines only
(D) two tangents only

**Correct Answer: B**

*Explanation: A chord lies inside the circle with both endpoints on it.*

**83. The longest chord of a circle is a:**

(A) radius
(B) tangent
(C) diameter
(D) secant outside

**Correct Answer: C**

*Explanation: The longest chord of a circle is a diameter.*

**84. If a diameter bisects a chord, it is:**

(A) parallel to the chord
(B) equal to the chord
(C) a tangent
(D) perpendicular to the chord

**Correct Answer: D**

*Explanation: If a diameter bisects a chord, it is perpendicular to the chord.*

**85. Equal chords in one circle are:**

(A) the same distance from the centre
(B) always diameters
(C) always parallel
(D) always 90° apart

**Correct Answer: A**

*Explanation: Congruent chords are equidistant from O.*

**86. If arc AB equals arc CD, then chord AB and chord CD are:**

(A) perpendicular
(B) equal
(C) parallel always
(D) half the radius

**Correct Answer: B**

*Explanation: Congruent arcs determine equal chords, so the correct choice is equal.*

**87. A semicircle is an arc whose central angle is:**

(A) 90°
(B) 360°
(C) 180°
(D) 45°

**Correct Answer: C**

*Explanation: A semicircle is an arc whose central angle is 180°.*

**88. An angle whose vertex is the centre and whose sides are radii to arc endpoints is:**

(A) inscribed
(B) exterior only
(C) tangent
(D) central

**Correct Answer: D**

*Explanation: Central angles use the centre as vertex.*

**89. Corresponding arcs of congruent chords are:**

(A) congruent
(B) always major
(C) always unequal
(D) straight lines

**Correct Answer: A**

*Explanation: Equal chords cut matching arcs, so the correct choice is congruent.*

**90. If central angles are equal, the subtended chords are:**

(A) parallel always
(B) equal
(C) tangents
(D) diameters always

**Correct Answer: B**

*Explanation: If central angles are equal, the subtended chords are equal.*

**91. Bridge design may use circular arcs because:**

(A) chords are always vertical
(B) circles have no radius
(C) arcs distribute stress in curved supports
(D) arcs avoid geometry

**Correct Answer: C**

*Explanation: Bridge design may use circular arcs because arcs distribute stress in curved supports.*

**92. Rainbows appear as:**

(A) straight chords
(B) only diameters
(C) only tangents
(D) circular arc segments in ideal models

**Correct Answer: D**

*Explanation: Ideal rainbow geometry uses circular arcs.*

**93. Roller coaster tracks combine:**

(A) straight and curved sections including arcs
(B) only diameters
(C) only parallel chords
(D) only squares

**Correct Answer: A**

*Explanation: Roller coaster tracks combine straight and curved sections including arcs.*

**94. The distance from centre to chord uses:**

(A) only addition of radii
(B) Pythagoras with radius and half-chord
(C) law of sines only
(D) vector dot product only

**Correct Answer: B**

*Explanation: Right triangle: $d^2 + (c/2)^2 = r^2$, so the correct choice is Pythagoras with radius and half-chord.*

**95. If r = 5 and d = 4, half-chord equals:**

(A) 4
(B) 5
(C) 3
(D) 9

**Correct Answer: C**

*Explanation: $\sqrt{(25 - 16)} = 3$, so full chord = 6 cm, so the correct choice is 3.*

**96. Two parallel chords closer to the centre are:**

(A) shorter
(B) always equal to diameter
(C) tangents
(D) longer

**Correct Answer: D**

*Explanation: Two parallel chords closer to the centre are longer.*

**97. A circular region includes:**

(A) interior points and boundary
(B) only the boundary
(C) only the centre
(D) only diameters

**Correct Answer: A**

*Explanation: Region = circle □ interior, so the correct choice is interior points and boundary.*

**98. Three collinear points:**

(A) determine exactly one circle
(B) do not determine a unique circle
(C) determine two circles
(D) cannot lie in a plane

**Correct Answer: B**

*Explanation: Three collinear points do not determine a unique circle.*

**99. A rectangle is cyclic because:**

(A) all sides are tangents
(B) it has no right angles
(C) opposite angles sum to 180°
(D) diagonals are parallel

**Correct Answer: C**

*Explanation: A rectangle is cyclic because opposite angles sum to 180°.*

**100. Thales' theorem: angle in a semicircle is:**

(A) 180°
(B) 45°
(C) 60°
(D) 90°

**Correct Answer: D**

*Explanation: An inscribed angle subtending a diameter is a right angle.*

**101. If n equal arcs are cut, each central angle is:**

(A) 360°/n
(B) 180°/n
(C) 90°/n
(D) n° always

**Correct Answer: A**

*Explanation: Full turn divided equally among n arcs, so the correct choice is 360°/n.*

**102. A quadrant arc subtends at the centre:**

(A) 180°
(B) 90°
(C) 45°
(D) 360°

**Correct Answer: B**

*Explanation: One quarter of a circle is 90°, so the correct choice is 90°.*

**103. Congruent circles mean:**

(A) same centre always
(B) no chords
(C) equal radii
(D) only semicircles

**Correct Answer: C**

*Explanation: Congruent circles match in size, so the correct choice is equal radii.*

**104. Theorem 9.3 is about:**

(A) parallel chords only
(B) tangents only
(C) sector area only
(D) perpendicular from centre bisects chord

**Correct Answer: D**

*Explanation: Foot of perpendicular from O to chord is the midpoint.*

**105. Theorem 9.4 is about:**

(A) equal chords equidistant from centre
(B) arc length only
(C) triangle area
(D) vector addition

**Correct Answer: A**

*Explanation: Congruent chords lie the same distance from O.*

**106. If chord = radius, the triangle formed by two radii and the chord is:**

(A) right only
(B) equilateral
(C) impossible
(D) isosceles but never equilateral

**Correct Answer: B**

*Explanation: All three sides equal r, so the correct choice is equilateral.*

**107. Sector area formula uses:**

(A) $2\pi r$ only
(B) $r - d$
(C) $(\theta/360) \times \pi r^2$
(D) Heron's formula

**Correct Answer: C**

*Explanation: Sector is the fraction $\theta/360$ of full area $\pi r^2$.*

**108. Arc length and central angle measure in degrees are:**

(A) always supplementary
(B) unrelated
(C) always 90° apart
(D) numerically equal for the same arc

**Correct Answer: D**

*Explanation: A 60° arc has a 60° central angle, so the correct choice is numerically equal for the same arc.*

MATHEMATICS MCQ BOOKLET

# Grade 10 · Chapter 10 · Tangents and Angles of a Circle

FBISE / National Book Foundation Model Textbook companion

by Public Library

*Independent MCQs on tangents, radii, touching circles, alternate segments, angles in segments, cyclic quadrilaterals, and circle angle theorems. Not copied from the book exercise. Total: 108 questions. Each item has four options, the correct letter, and a short explanation of why it is correct.*

## A. Important / Main Topics

**1. A tangent to a circle touches the circle at:**

(A) exactly one point
(B) two points
(C) every point on the circumference
(D) no point

**Correct Answer: A**

*Explanation: A tangent to a circle touches the circle at exactly one point.*

**2. Theorem 10.1 states that a line drawn perpendicular to a radial segment at its outer end point is:**

(A) a secant
(B) tangent to the circle
(C) a chord
(D) a diameter

**Correct Answer: B**

*Explanation: Theorem 10.1 states that a line drawn perpendicular to a radial segment at its outer end point is tangent to the circle.*

**3. Theorem 10.2 states that the tangent and the radius at the point of contact are:**

(A) parallel
(B) equal in length
(C) perpendicular
(D) supplementary

**Correct Answer: C**

*Explanation: Theorem 10.2 states that the tangent and the radius at the point of contact are perpendicular.*

**4. The shortest distance from the centre to a tangent equals:**

(A) half the diameter
(B) the circumference
(C) twice the radius
(D) the radius

**Correct Answer: D**

*Explanation: The perpendicular from the centre meets the tangent at the contact point, one radius away.*

**5. A line perpendicular to a tangent at the point of contact passes through:**

(A) the centre of the circle
(B) any chord
(C) a point outside only
(D) the midpoint of a random chord

**Correct Answer: A**

*Explanation: That perpendicular is the radius direction, so it goes through the centre.*

**6. Tangents drawn at the two ends of a diameter are:**

(A) perpendicular to each other
(B) parallel to each other

(C) equal chords
(D) secants

**Correct Answer: B**

*Explanation: Each tangent is perpendicular to the diameter, and both are perpendicular to the same line, hence parallel.*

**7. From a point outside a circle, the number of tangents that can be drawn is:**

(A) 0
(B) 1
(C) 2
(D) infinitely many

**Correct Answer: C**

*Explanation: Two symmetric tangents touch the circle from an external point.*

**8. From a point on the circle, the number of tangents that can be drawn is:**

(A) 0
(B) 2
(C) 3
(D) 1

**Correct Answer: D**

*Explanation: At a point on the circumference there is exactly one tangent line.*

**9. Theorem 10.3 states that tangents drawn from an external point to a circle are:**

(A) equal in length
(B) perpendicular to each other
(C) parallel
(D) twice the radius

**Correct Answer: A**

*Explanation: The two tangent segments from the same external point have equal length.*

**10. The two tangents from an external point make equal angles with the line joining the centre to that point because:**

(A) all tangents are parallel
(B) triangles to the contact points are congruent
(C) radii are unequal
(D) the centre lies outside

**Correct Answer: B**

*Explanation: The two tangents from an external point make equal angles with the line joining the centre to that point because triangles to the contact points are congruent.*

**11. If OP = 10 cm and the radius is 6 cm, the length of a tangent from P is:**

(A) 4 cm
(B) 16 cm
(C) 8 cm
(D) $\sqrt{136}$ cm only with no simplification

**Correct Answer: C**

*Explanation: If OP = 10 cm and the radius is 6 cm, the length of a tangent from P is 8 cm.*

**12. If radius r = 5 cm and tangent length from P is 12 cm, then OP equals:**

(A) 7 cm
(B) 17 cm
(C) 60 cm
(D) 13 cm

**Correct Answer: D**

*Explanation: $OP^2 = r^2 + \text{tangent}^2 = 25 + 144 = 169$, so OP = 13 cm.*

**13. Two tangents from P touch at B and C. If PB = 9 cm, then PC equals:**

(A) 9 cm
(B) 4.5 cm
(C) 18 cm
(D) depends on □BPC only

**Correct Answer: A**

*Explanation: Tangents from one external point are equal, so PC = PB = 9 cm.*

**14. If two circles touch externally with radii 2 cm and 1 cm, the distance between centres is:**

(A) 1 cm
(B) 3 cm
(C) 2 cm
(D) 4 cm

**Correct Answer: B**

*Explanation: If two circles touch externally with radii 2 cm and 1 cm, the distance between centres is 3 cm.*

**15. If two circles touch externally with radii 1.4 cm and 2.5 cm, the distance between centres is:**

(A) 1.1 cm
(B) 2.5 cm
(C) 3.9 cm
(D) 1.4 cm

**Correct Answer: C**

*Explanation: If two circles touch externally with radii 1.4 cm and 2.5 cm, the distance between centres is 3.9 cm.*

**16. If two congruent circles touch externally, the distance between centres equals:**

(A) zero
(B) one radius
(C) twice the circumference
(D) the diameter of either circle

**Correct Answer: D**

*Explanation: Equal radii r give d = r + r = 2r, which is the diameter.*

**17. If two circles touch internally with radii 2.5 cm and 1.4 cm, the distance between centres is:**

(A) 1.1 cm
(B) 3.9 cm
(C) 2.5 cm
(D) 1.4 cm

**Correct Answer: A**

*Explanation: Theorem 10.5: d = 2.5 − 1.4 = 1.1 cm, so the correct choice is 1.1 cm.*

**18. If two congruent circles touch internally, the distance between centres is:**

(A) the diameter
(B) zero
(C) twice the radius
(D) one radius

**Correct Answer: B**

*Explanation: Identical circles nested with internal contact coincide, so centres coincide.*

**19. A chord of the outer circle tangent to an inner concentric circle is:**

(A) twice as long as any other chord
(B) bisected by the inner circle
(C) equidistant from the centre as every such chord
(D) always a diameter

**Correct Answer: C**

*Explanation: Each such chord is at distance r_inner from the centre, so all are equal in length.*

**20. Theorem 10.6 (alternate segment) states that the angle between tangent and chord at contact equals:**

(A) the central angle
(B) 90° always
(C) half the reflex angle
(D) the angle in the alternate segment

**Correct Answer: D**

*Explanation: Theorem 10.6 (alternate segment) states that the angle between tangent and chord at contact equals the angle in the alternate segment.*

**21. If tangent–chord angle at P is 46°, the inscribed angle in the alternate segment is:**

(A) 46°
(B) 23°
(C) 90°
(D) 134°

**Correct Answer: A**

*Explanation: If tangent–chord angle at P is 46°, the inscribed angle in the alternate segment is 46°.*

**22. If □BAC between tangents AB and AC is 40° and O is the centre, then □BOC is:**

(A) 40°
(B) 140°
(C) 80°
(D) 320°

**Correct Answer: B**

*Explanation: In quadrilateral ABOC, 40° + 90° + □BOC + 90° = 360°, so □BOC = 140°.*

**23. If □BOC = 120° for tangents from A, then □BAC equals:**

(A) 30°
(B) 120°
(C) 60°
(D) 240°

**Correct Answer: C**

*Explanation: If □BOC = 120° for tangents from A, then □BAC equals 60°.*

**24. If □BOC = 120°, then each angle □OBA between radius and tangent is:**

(A) 60°
(B) 90°
(C) 120°
(D) 30°

**Correct Answer: D**

*Explanation: If □BOC = 120°, then each angle □OBA between radius and tangent is 30°.*

**25. The measure of a central angle of a minor arc is double the angle subtended by the corresponding major arc (Theorem 10.7). If inscribed angle on major arc is 35°, central angle on minor arc is:**

(A) 70°
(B) 35°
(C) 110°
(D) 145°

**Correct Answer: A**

*Explanation: The measure of a central angle of a minor arc is double the angle subtended by the corresponding major arc (Theorem 10.7). If inscribed angle on major arc is 35°, central angle on minor arc is 70°.*

**26. If central angle □COD on minor arc is 80°, an inscribed angle on the major arc subtending the same chord is:**

(A) 80°

(B) 40°
(C) 160°
(D) 280°

**Correct Answer: B**

*Explanation: Inscribed angle on the major arc is half the minor-arc central angle: 40°.*

**27. Theorem 10.8 states that angles in the same segment of a circle are:**

(A) supplementary
(B) complementary
(C) equal
(D) always 90°

**Correct Answer: C**

*Explanation: All inscribed angles on the same arc (same segment) are equal.*

**28. Theorem 10.9 states that the angle in a semicircle is:**

(A) 45°
(B) 60°
(C) 180°
(D) 90°

**Correct Answer: D**

*Explanation: Thales' theorem: an angle subtended by a diameter is a right angle.*

**29. If AB is a diameter and P is on the semicircle, then □APB equals:**

(A) 90°
(B) 45°
(C) 180°
(D) twice □AOB

**Correct Answer: A**

*Explanation: Angle in a semicircle is always 90°, so the correct choice is 90°.*

**30. An angle in a segment greater than a semicircle is:**

(A) greater than 90°
(B) less than 90°
(C) equal to 90°
(D) 180°

**Correct Answer: B**

*Explanation: Major-segment inscribed angles are acute (less than a right angle).*

**31. An angle in a segment less than a semicircle is:**

(A) less than 90°
(B) equal to 90°
(C) greater than 90°
(D) 0°

**Correct Answer: C**

*Explanation: Minor-segment inscribed angles are obtuse (greater than 90°).*

**32. Theorem 10.12 states that opposite angles of a cyclic quadrilateral are:**

(A) equal
(B) complementary
(C) both 90°
(D) supplementary (sum 180°)

**Correct Answer: D**

*Explanation: Theorem 10.12 states that opposite angles of a cyclic quadrilateral are supplementary (sum 180°).*

**33. In cyclic quadrilateral ABCD, if □A = 110°, then □C equals:**

(A) 70°

(B) 110°
(C) 180°
(D) 250°

**Correct Answer: A**

*Explanation: In cyclic quadrilateral ABCD, if □A = 110°, then □C equals 70°.*

**34. In cyclic quadrilateral PQRS, if □P = 85° and □Q = 95°, then □R equals:**

(A) 85°
(B) 95°
(C) 105°
(D) 175°

**Correct Answer: B**

*Explanation: □R is opposite □P, so □R = 180° − 85° = 95°.*

**35. If □POQ = 36° for tangents OP and OQ to circle centre S, then □PSQ equals:**

(A) 36°
(B) 72°
(C) 144°
(D) 324°

**Correct Answer: C**

*Explanation: If □POQ = 36° for tangents OP and OQ to circle centre S, then □PSQ equals 144°.*

**36. If □PSQ = 144° in isosceles triangle PQS (PS = QS), then each base angle is:**

(A) 36°
(B) 72°
(C) 144°
(D) 18°

**Correct Answer: D**

*Explanation: 2x + 144° = 180° gives x = 18°, so the correct choice is 18°.*

**37. If □POQ = 100° and □QRS = 120° with centre O, the reflex □QOS on major arc is:**

(A) 260°
(B) 100°
(C) 120°
(D) 80°

**Correct Answer: A**

*Explanation: Reflex central angle = 360° − 100° = 260° on the major side if POQ is minor.*

**38. Tangent AB = 15 cm, CA = 9 cm along the line through centre P to external A. If r is radius, AP equals:**

(A) 9 cm
(B) 9 + r cm
(C) 15 cm
(D) 15 + r cm

**Correct Answer: B**

*Explanation: A, C, P are collinear with C on the circle, so AP = AC + CP = 9 + r.*

**39. Using AB = 15 cm and AP = 9 + r with right triangle ABP, the radius r equals:**

(A) 6 cm
(B) 9 cm
(C) 8 cm
(D) 12 cm

**Correct Answer: C**

*Explanation: $(9 + r)^2 = 15^2 + r^2$ gives $18r = 144$, so $r = 8$ cm.*

**40. If QP = 12 cm, OP = 13 cm and O is centre, radius r equals:**

(A) 6 cm
(B) 7 cm
(C) 25 cm
(D) 5 cm

**Correct Answer: D**

*Explanation: $r = \sqrt{(13^2 - 12^2)} = \sqrt{25} = 5$ cm, so the correct choice is 5 cm.*

**41. If tangent length is 6 cm and radius is 8 cm, then OP equals:**

(A) 10 cm
(B) 2 cm
(C) 14 cm
(D) 100 cm

**Correct Answer: A**

*Explanation: $OP = \sqrt{(6^2 + 8^2)} = 10$ cm, so the correct choice is 10 cm.*

**42. In a kite OQPR formed by two tangents and radii, if □POQ = 45°, then □QPR equals:**

(A) 45°
(B) 135°
(C) 90°
(D) 180°

**Correct Answer: B**

*Explanation: In a kite OQPR formed by two tangents and radii, if □POQ = 45°, then □QPR equals 135°.*

**43. If □BDC = 56° and alternate-segment angle □BCA = 60°, then □BCD in triangle BCD is:**

(A) 56°
(B) 60°
(C) 64°
(D) 120°

**Correct Answer: C**

*Explanation: Sum 56° + 60° + x = 180° gives x = 64°, so the correct choice is 64°.*

**44. If inscribed □BDC = 60° equals tangent-chord angle, then central □BOC on minor arc BC is:**

(A) 30°
(B) 60°
(C) 240°
(D) 120°

**Correct Answer: D**

*Explanation: If inscribed □BDC = 60° equals tangent-chord angle, then central □BOC on minor arc BC is 120°.*

**45. A stone on a 3 ft string breaks and travels 5 ft along the tangent. Distance covered is:**

(A) 5 ft
(B) 3 ft
(C) 8 ft
(D) 15 ft

**Correct Answer: A**

*Explanation: After release it moves along the tangent direction for 5 ft.*

**46. Three equal external-touching circles have centre distances in ratio 2 : 3 : 4. If perimeter of centre triangle is 36 cm, smallest radius is:**

(A) 3 cm
(B) 2 cm
(C) 4 cm
(D) 6 cm

**Correct Answer: B**

*Explanation: Three equal external-touching circles have centre distances in ratio 2 : 3 : 4. If perimeter of centre triangle is 36 cm, smallest radius is 2 cm.*

**47. If radius is 4 cm, distance between tangents at ends of a diameter is:**

(A) 2 cm
(B) 4 cm
(C) 8 cm
(D) 16 cm

**Correct Answer: C**

*Explanation: Parallel tangents at diameter ends are 2r = 8 cm apart.*

**48. If □A = 70° in cyclic quadrilateral, opposite □C is:**

(A) 70°
(B) 180°
(C) 290°
(D) 110°

**Correct Answer: D**

*Explanation: If □A = 70° in cyclic quadrilateral, opposite □C is 110°.*

**49. If tangent PT and chord PA form 75° at P, inscribed angle in alternate segment on major arc is:**

(A) 75°
(B) 37.5°
(C) 105°
(D) 150°

**Correct Answer: A**

*Explanation: If tangent PT and chord PA form 75° at P, inscribed angle in alternate segment on major arc is 75°.*

**50. If OP = 13 cm, radius 5 cm, tangent length is:**

(A) 8 cm
(B) 12 cm
(C) 18 cm
(D) 169 cm

**Correct Answer: B**

*Explanation: √(169 − 25) = 12 cm, so the correct choice is 12 cm.*

**51. If □PTQ = 72° where T is on major arc and □PSQ = 144° at centre, then relationship is:**

(A) □PTQ = □PSQ
(B) □PTQ = 2□PSQ
(C) □PTQ = ½□PSQ
(D) □PTQ + □PSQ = 90°

**Correct Answer: C**

*Explanation: If □PTQ = 72° where T is on major arc and □PSQ = 144° at centre, then relationship is □PTQ = ½□PSQ.*

**52. Minor segment of a circle is the region between a chord and:**

(A) the major arc
(B) the centre always
(C) a tangent
(D) the minor arc

**Correct Answer: D**

*Explanation: Minor segment of a circle is the region between a chord and the minor arc.*

**53. Major segment always contains:**

(A) the centre when larger than a semicircle
(B) no part of the circle
(C) only tangents

(D) the in-centre only

**Correct Answer: A**

*Explanation: A major segment is bigger than a semicircle and includes the centre.*

**54. If □POQ = 40° for tangents, □OPQ equals:**

(A) 20°
(B) 70°
(C) 40°
(D) 50°

**Correct Answer: B**

*Explanation: □OPQ = 90° − □SPQ where □SPQ = 20° from isosceles, so 70°.*

**55. Two circles radii 3 cm and 5 cm touch externally. Distance between centres:**

(A) 2 cm
(B) 15 cm
(C) 8 cm
(D) 16 cm

**Correct Answer: C**

*Explanation: 3 + 5 = 8 cm, so the correct choice is 8 cm.*

**56. Two circles radii 7 cm and 3 cm touch internally. Distance between centres:**

(A) 10 cm
(B) 21 cm
(C) 7 cm
(D) 4 cm

**Correct Answer: D**

*Explanation: 7 − 3 = 4 cm, so the correct choice is 4 cm.*

**57. Cyclic quadrilateral: if three angles are 80°, 100°, 70°, the fourth is:**

(A) 110°
(B) 100°
(C) 90°
(D) 80°

**Correct Answer: A**

*Explanation: Opposite to 70° is 110°; check pairs: 80+100=180, 70+110=180.*

**58. If central angle on minor arc is 100°, inscribed angle on same minor arc from point on major arc is:**

(A) 100°
(B) 50°
(C) 200°
(D) 260°

**Correct Answer: B**

*Explanation: If central angle on minor arc is 100°, inscribed angle on same minor arc from point on major arc is 50°.*

**59. If r = 6 cm and distance from P to centre is 10 cm, tangent length squared equals:**

(A) 16
(B) 36
(C) 64
(D) 100

**Correct Answer: C**

*Explanation: $t^2 = 10^2 − 6^2 = 64$, so the correct choice is 64.*

**60. If □SAB = 63° and □TAC = 57° on tangent SAT at A, then □BAC equals:**

(A) 57°
(B) 63°
(C) 120°

(D) 60°

**Correct Answer: D**

*Explanation: If □SAB = 63° and □TAC = 57° on tangent SAT at A, then □BAC equals 60°.*

**61. Inscribed angles □ACB and □ADB on same segment AB are:**

(A) equal
(B) supplementary
(C) complementary
(D) central

**Correct Answer: A**

*Explanation: Angles in the same segment are equal (Theorem 10.8).*

**62. If diameter AB and point C on circle, □ACB is:**

(A) acute always
(B) right angle
(C) obtuse always
(D) central

**Correct Answer: B**

*Explanation: Angle in semicircle is 90°, so the correct choice is right angle.*

**63. For external point, line OP bisects the angle between the two tangents because:**

(A) tangents are parallel
(B) OP is a chord
(C) triangles OPA and OPB are congruent
(D) OP equals radius

**Correct Answer: C**

*Explanation: For external point, line OP bisects the angle between the two tangents because triangles OPA and OPB are congruent.*

**64. Alternate segment theorem applies to angle between:**

(A) two chords only
(B) two tangents from P
(C) two radii
(D) tangent and chord at contact

**Correct Answer: D**

*Explanation: The theorem compares tangent–chord angle with inscribed angle in alternate segment.*

**65. Opposite angles of cyclic quadrilateral ABCD satisfy:**

(A) □A + □C = 180°
(B) □A = □C
(C) □A + □B = 180°
(D) □A = □B

**Correct Answer: A**

*Explanation: Opposite angles in a cyclic quadrilateral are supplementary.*

**66. Number of tangents from interior point of circle:**

(A) 1
(B) 0
(C) 2
(D) infinite

**Correct Answer: B**

*Explanation: An interior point cannot reach the circle along a line that touches once only.*

**67. Tangent to circle is perpendicular to radius at:**

(A) any point on circle
(B) centre

(C) point of contact only
(D) midpoint of chord only

**Correct Answer: C**

*Explanation: Tangent to circle is perpendicular to radius at point of contact only.*

**68. If AB and AC are tangents and □BOC = 140°, then □ABC + □ACB in triangle ABC equals:**

(A) 40°
(B) 100°
(C) 140°
(D) 80°

**Correct Answer: D**

*Explanation: If AB and AC are tangents and □BOC = 140°, then □ABC + □ACB in triangle ABC equals 80°.*

**69. Central angle 120° on minor arc corresponds to inscribed angle on major arc of:**

(A) 60°
(B) 240°
(C) 120°
(D) 30°

**Correct Answer: A**

*Explanation: Central angle 120° on minor arc corresponds to inscribed angle on major arc of 60°.*

**70. If tangent length equals radius, angle between OP and radius at contact is:**

(A) 30°
(B) 45°
(C) 60°
(D) 90°

**Correct Answer: B**

*Explanation: Right triangle with legs equal gives 45° at O.*

**71. In cyclic quad, if □B = 115°, then □D equals:**

(A) 115°
(B) 180°
(C) 65°
(D) 295°

**Correct Answer: C**

*Explanation: 180° − 115° = 65°, so the correct choice is 65°.*

**72. Two tangents from P make equal angles with OP because OP is:**

(A) a diameter
(B) parallel to BC
(C) equal to AB
(D) angle bisector of □APB

**Correct Answer: D**

*Explanation: Two tangents from P make equal angles with OP because OP is angle bisector of □APB.*

**73. If r = 7 cm and tangent from P is 24 cm, OP equals:**

(A) 25 cm
(B) 17 cm
(C) 31 cm
(D) 576 cm

**Correct Answer: A**

*Explanation: √(49 + 576) = 25 cm, so the correct choice is 25 cm.*

**74. Angle in segment less than semicircle is obtuse; an example measure is:**

(A) 45°
(B) 120°

(C) 90°
(D) 180°

**Correct Answer: B**

*Explanation: 120° is greater than 90°, fitting a minor-segment angle.*

**75. Angle in segment greater than semicircle is acute; an example measure is:**

(A) 120°
(B) 90°
(C) 60°
(D) 180°

**Correct Answer: C**

*Explanation: 60° is less than 90°, fitting a major-segment angle.*

**76. Tangent from point on circle has length:**

(A) equal to radius
(B) equal to diameter
(C) twice radius
(D) zero (only one point of contact, no segment)

**Correct Answer: D**

*Explanation: At a point on the circle the tangent has no external segment length; contact is the point itself.*

**77. The angle subtended by an arc at the centre is called a:**

(A) central angle
(B) reflex angle only
(C) inscribed angle
(D) tangent angle

**Correct Answer: A**

*Explanation: An arc's angle at the centre is the central angle.*

**78. If two tangents at the ends of a diameter are drawn, they are:**

(A) perpendicular to each other
(B) parallel
(C) intersecting at the centre
(D) equal chords

**Correct Answer: B**

*Explanation: Both are perpendicular to the same diameter, hence parallel.*

**79. If circles touch externally with radii 4 cm and 6 cm, distance AB between centres is:**

(A) 2 cm
(B) 24 cm
(C) 10 cm
(D) 12 cm

**Correct Answer: C**

*Explanation: External contact: d = 4 + 6 = 10 cm, so the correct choice is 10 cm.*

**80. Angle between tangent and diameter at the point of contact is:**

(A) 0°
(B) 45°
(C) 180°
(D) 90°

**Correct Answer: D**

*Explanation: Tangent is perpendicular to the radius, and a diameter is along a radius line.*

## B. Less Important / Secondary Topics

**81. Tangents in architecture help design:**

(A) curves such as arches and domes
(B) only straight walls
(C) right prisms only
(D) parallel lines only

**Correct Answer: A**

*Explanation: Tangents in architecture help design curves such as arches and domes.*

**82. A car wheel on a road illustrates the road as a tangent to the circular wheel at:**

(A) every point of the rim at once
(B) the contact point where the wheel touches
(C) the axle only
(D) no point

**Correct Answer: B**

*Explanation: Rolling contact is locally tangent at the bottom touch point.*

**83. Theorem 10.1 is the converse idea to Theorem 10.2 in that one starts from:**

(A) two circles touching
(B) cyclic quadrilateral
(C) perpendicular at end of radius vs radius to given tangent
(D) histogram class marks

**Correct Answer: C**

*Explanation: 10.1 builds a tangent from perpendicularity; 10.2 states radius □ tangent at contact.*

**84. The word tangent comes from Latin tangere meaning:**

(A) to cut twice
(B) to bisect
(C) to rotate
(D) to touch

**Correct Answer: D**

*Explanation: Tangent means touching at one point, so the correct choice is to touch.*

**85. A secant line intersects a circle at:**

(A) two points
(B) one point only
(C) no points always
(D) the centre only

**Correct Answer: A**

*Explanation: A secant line intersects a circle at two points.*

**86. If OP bisects □APB for tangents PA and PB, then □APO equals:**

(A) □APB
(B) ½□APB
(C) 90° − □APB
(D) 2□APB

**Correct Answer: B**

*Explanation: If OP bisects □APB for tangents PA and PB, then □APO equals ½□APB.*

**87. Concentric circles have:**

(A) different centres
(B) equal radii always
(C) the same centre
(D) no chords

**Correct Answer: C**

*Explanation: Concentric means sharing one centre, so the correct choice is the same centre.*

**88. Equal chords of a circle subtend equal angles at the:**

(A) tangent only
(B) external point only
(C) in-centre only
(D) centre

**Correct Answer: D**

*Explanation: Equal chords give equal central angles, so the correct choice is centre.*

**89. Thales' theorem is another name for:**

(A) angle in semicircle is 90°
(B) alternate segment theorem
(C) external touch distance rule
(D) tangent length equality

**Correct Answer: A**

*Explanation: Theorem 10.9 is the semicircle right-angle result, often called Thales' theorem.*

**90. A cyclic quadrilateral has all vertices:**

(A) on a straight line
(B) on one circle
(C) at the centre
(D) on tangents only

**Correct Answer: B**

*Explanation: Cyclic means inscribed in a circle, so the correct choice is on one circle.*

**91. If □A + □C = 180° in quadrilateral ABCD on a circle, ABCD is:**

(A) always a square
(B) impossible
(C) cyclic
(D) a tangent quadrilateral

**Correct Answer: C**

*Explanation: If □A + □C = 180° in quadrilateral ABCD on a circle, ABCD is cyclic.*

**92. Major arc is the:**

(A) shorter arc between two points
(B) diameter only
(C) tangent segment
(D) longer arc between two points

**Correct Answer: D**

*Explanation: Major arc is the larger of the two arcs joining two points.*

**93. If inscribed angle is 55° on minor arc, central angle on that minor arc is:**

(A) 110°
(B) 27.5°
(C) 55°
(D) 220°

**Correct Answer: A**

*Explanation: If inscribed angle is 55° on minor arc, central angle on that minor arc is 110°.*

**94. Tangent–radius right triangle has hypotenuse along:**

(A) the tangent from external point to centre
(B) line from external point to centre
(C) the chord only
(D) diameter always

**Correct Answer: B**

*Explanation: OP is hypotenuse; radius and tangent segment are perpendicular legs.*

**95. Two parallel tangents to a circle lie on:**

(A) the same side of centre
(B) intersecting lines
(C) opposite sides equidistant from centre
(D) a secant

**Correct Answer: C**

*Explanation: Parallel tangents are equally far from the centre on opposite sides.*

**96. If diameter is 10 cm, radius is:**

(A) 10 cm
(B) 20 cm
(C) 25 cm
(D) 5 cm

**Correct Answer: D**

*Explanation: Radius is half the diameter, so the correct choice is 5 cm.*

**97. Inscribed angle standing on diameter subtends arc of:**

(A) 180°
(B) 90°
(C) 360°
(D) 0°

**Correct Answer: A**

*Explanation: Inscribed angle standing on diameter subtends arc of 180°.*

**98. If □BAC = 60° between tangents and O centre, □BOC equals:**

(A) 60°
(B) 150°
(C) 120°
(D) 240°

**Correct Answer: B**

*Explanation: If □BAC = 60° between tangents and O centre, □BOC equals 150°.*

**99. If □BAC = 60° between tangents, □BOC equals:**

(A) 60°
(B) 150°
(C) 120°
(D) 300°

**Correct Answer: C**

*Explanation: If □BAC = 60° between tangents, □BOC equals 120°.*

**100. External touch: if r = 2.5 cm each for two equal circles, centre distance is:**

(A) 2.5 cm
(B) 7.5 cm
(C) 0 cm
(D) 5 cm

**Correct Answer: D**

*Explanation: d = 2r = 5 cm, the diameter, so the correct choice is 5 cm.*

**101. Internal touch: smaller radius 1 cm inside larger 3 cm gives centre distance:**

(A) 2 cm
(B) 4 cm
(C) 1 cm
(D) 3 cm

**Correct Answer: A**

*Explanation: 3 − 1 = 2 cm, so the correct choice is 2 cm.*

**102. Alternate segment: tangent at A and chord AB give angle equal to □ACB where C is:**

(A) at centre
(B) on same arc as B on alternate side of AB
(C) on tangent
(D) outside circle

**Correct Answer: B**

*Explanation: C lies on the alternate (opposite) arc from the angle between tangent and chord.*

**103. If OP = 17 cm, r = 8 cm, tangent length is:**

(A) 9 cm
(B) 25 cm
(C) 15 cm
(D) 289 cm

**Correct Answer: C**

*Explanation: √(289 − 64) = √225 = 15 cm, so the correct choice is 15 cm.*

**104. Cyclic quadrilateral with □A = 90° has opposite □C equal to:**

(A) 180°
(B) 270°
(C) 0°
(D) 90°

**Correct Answer: D**

*Explanation: 180° − 90° = 90°, so the correct choice is 90°.*

**105. Number of points common to tangent and circle:**

(A) 1
(B) 0
(C) 2
(D) infinite

**Correct Answer: A**

*Explanation: Number of points common to tangent and circle 1.*

**106. If □POQ = 36° for tangents, each □OPQ in right triangle is:**

(A) 18°
(B) 54°
(C) 36°
(D) 72°

**Correct Answer: B**

*Explanation: Half of 36° is 18° at O; □OPQ = 90° − 18° = 72°.*

**107. Segment of circle bounded by chord and minor arc is:**

(A) major segment
(B) sector only
(C) minor segment
(D) tangent strip

**Correct Answer: C**

*Explanation: Minor segment uses the smaller arc, so the correct choice is minor segment.*

**108. If central angle is double inscribed on same arc, inscribed on minor arc 40° gives central:**

(A) 20°
(B) 40°
(C) 160°
(D) 80°

**Correct Answer: D**

*Explanation: Central = 2 × 40° = 80°, so the correct choice is 80°.*

MATHEMATICS MCQ BOOKLET

# Grade 10 · Chapter 11 · Practical Geometry of Circles

FBISE / National Book Foundation Model Textbook companion

by Public Library

*Independent MCQs on locating circle centres, circles through three points, completing arcs, drawing tangents, and common tangents to two circles. Not copied from the book exercise. Total: 108 questions. Each item has four options, the correct letter, and a short explanation of why it is correct.*

## A. Important / Main Topics

**1. To locate the centre of a given circle, the standard construction uses:**

(A) right (perpendicular) bisectors of two chords
(B) angle bisectors of two chords
(C) parallel lines through the centre
(D) tangents only

**Correct Answer: A**

*Explanation: To locate the centre of a given circle, the standard construction uses right (perpendicular) bisectors of two chords.*

**2. The centre of a circle is equidistant from:**

(A) only one point on the circle
(B) every point on the circumference
(C) only the endpoints of one chord
(D) external tangents only

**Correct Answer: B**

*Explanation: All radii from the centre to the circle have equal length.*

**3. Exactly one circle can pass through:**

(A) any three points
(B) three collinear points
(C) three non-collinear points
(D) two points only always

**Correct Answer: C**

*Explanation: Exactly one circle can pass through three non-collinear points.*

**4. To draw a circle through three non-collinear points A, B, C, first join them to form:**

(A) a straight line
(B) a square
(C) two parallel chords
(D) triangle ABC

**Correct Answer: D**

*Explanation: The triangle's circumcentre is the required circle centre.*

**5. The circumcentre of triangle ABC is found where:**

(A) perpendicular bisectors of the sides meet
(B) medians meet
(C) altitudes meet
(D) angle bisectors meet

**Correct Answer: A**

*Explanation: Each side's right bisector is the locus of points equidistant from that side's endpoints.*

**6. When completing a circle from a given arc by finding the centre, you:**

(A) guess the radius
(B) take three points on the arc and locate the circumcentre of the triangle they form

(C) draw only one chord
(D) use 120° angles only

**Correct Answer: B**

*Explanation: Three points on the arc determine the same circumcircle as the full circle.*

**7. To complete a circle without finding its centre (method 1), you repeatedly construct:**

(A) parallel tangents
(B) only diameters
(C) congruent triangles along the arc and join their vertices
(D) random radii

**Correct Answer: C**

*Explanation: To complete a circle without finding its centre (method 1), you repeatedly construct congruent triangles along the arc and join their vertices.*

**8. In the without-centre method using 120° angles, the figure built inside is a:**

(A) square
(B) equilateral triangle only
(C) octagon always
(D) regular hexagon

**Correct Answer: D**

*Explanation: In the without-centre method using 120° angles, the figure built inside is a regular hexagon.*

**9. Each interior angle of a regular hexagon inscribed in steps of equal chords is:**

(A) 120°
(B) 60°
(C) 90°
(D) 180°

**Correct Answer: A**

*Explanation: Regular hexagon interior angles are 120°.*

**10. To draw a tangent at the midpoint P of a given arc (without centre), construct:**

(A) a diameter through P
(B) the perpendicular bisector of a chord through P; that bisector is the tangent
(C) any secant
(D) parallel to a random chord

**Correct Answer: B**

*Explanation: At the midpoint of an arc the tangent is perpendicular to the chord through P.*

**11. To draw a tangent at an endpoint of a given arc without the centre, use:**

(A) only a protractor at 90°
(B) two parallel lines
(C) perpendicular to the chord at that endpoint
(D) the circumcentre first

**Correct Answer: C**

*Explanation: The tangent at an arc endpoint is perpendicular to the chord drawn from that endpoint.*

**12. To draw a tangent through point P outside a given arc, construct:**

(A) a secant only
(B) parallel to the chord
(C) angle 120° at P
(D) a circle on the arc's chord as diameter; tangents from P to that auxiliary circle give the required tangent

**Correct Answer: D**

*Explanation: Thales' circle on the chord helps locate the tangent direction from an external point.*

**13. To draw a tangent from point P on the circumference, the radius at P is:**

(A) perpendicular to the tangent

(B) parallel to the tangent
(C) equal to the tangent length
(D) twice the tangent

**Correct Answer: A**

*Explanation: Radius and tangent are perpendicular at the point of contact.*

**14. To draw a tangent from external point P to a circle with centre O, triangle OPA is:**

(A) acute at A
(B) right-angled at A (contact point)
(C) obtuse always
(D) degenerate

**Correct Answer: B**

*Explanation: Radius OA is perpendicular to tangent PA at contact A.*

**15. To draw two tangents to a circle meeting at a given angle at external point P:**

(A) ignore the angle at P
(B) draw only one tangent
(C) use the angle at P and the fact that radii to contact points are perpendicular to tangents
(D) use 120° only

**Correct Answer: C**

*Explanation: To draw two tangents to a circle meeting at a given angle at external point P use the angle at P and the fact that radii to contact points are perpendicular to tangents.*

**16. Direct common tangents to two separate circles are also called:**

(A) internal tangents
(B) transverse tangents only
(C) diameters
(D) external (direct) common tangents

**Correct Answer: D**

*Explanation: Direct common tangents to two separate circles are also called external (direct) common tangents.*

**17. Transverse common tangents to two separate circles are also called:**

(A) internal (transverse) common tangents
(B) direct external tangents
(C) parallel tangents only
(D) radii

**Correct Answer: A**

*Explanation: Transverse common tangents to two separate circles are also called internal (transverse) common tangents.*

**18. For two equal circles of radius 2.5 cm with centres 6 cm apart, direct common tangents are found by:**

(A) joining centres only
(B) drawing diameters perpendicular to AB and joining the outer endpoints
(C) bisecting AB at the contact point
(D) using 120° hexagon

**Correct Answer: B**

*Explanation: Perpendicular diameters at each centre give the contact points for horizontal direct tangents.*

**19. For two equal circles radius 3 cm, centres 7 cm apart, transverse tangents use:**

(A) only diameters parallel to AB
(B) three non-collinear points on one circle
(C) bisecting AB and constructing auxiliary circles at midpoints of the half-segments
(D) a hexagon of 120°

**Correct Answer: C**

*Explanation: The standard transverse construction bisects AB and uses auxiliary circles through midpoints.*

**20. For transverse tangents to circles radii 2 cm and 1.3 cm, centres 5 cm apart, the large auxiliary circle at A has radius:**

(A) 2 cm
(B) 1.3 cm
(C) 5 cm
(D) 3.3 cm

**Correct Answer: D**

*Explanation: Auxiliary radius equals sum of the given radii: 2 + 1.3 = 3.3 cm.*

**21. In that transverse construction, AB is bisected at M and a circle with radius AM is used to locate points:**

(A) on the auxiliary circle to define tangent directions
(B) on the given circles directly
(C) at infinity
(D) only at contact

**Correct Answer: A**

*Explanation: In that transverse construction, AB is bisected at M and a circle with radius AM is used to locate points on the auxiliary circle to define tangent directions.*

**22. Lines BG and BH are drawn parallel to AE and AF respectively so that:**

(A) centres coincide
(B) corresponding tangent points on the second circle are located
(C) radii double
(D) hexagon closes

**Correct Answer: B**

*Explanation: Parallel transfer from the first circle locates tangent points on the second circle.*

**23. To draw a tangent to two unequal circles touching externally at C:**

(A) ignore point C
(B) only join centres
(C) bisect AB, draw semicircle on AB, erect perpendicular at C to meet it, then use arc from D
(D) draw hexagon

**Correct Answer: C**

*Explanation: To draw a tangent to two unequal circles touching externally at C bisect AB, draw semicircle on AB, erect perpendicular at C to meet it, then use arc from D.*

**24. When two circles touch externally at C, the common tangent at C is:**

(A) parallel to AB
(B) equal to AB
(C) impossible to draw
(D) perpendicular to line AB of centres

**Correct Answer: D**

*Explanation: At external contact the common tangent is perpendicular to the line joining centres.*

**25. A circle is symmetric about:**

(A) its centre and any diameter
(B) only one tangent
(C) an external point only
(D) a chord only

**Correct Answer: A**

*Explanation: A circle is symmetric about its centre and any diameter.*

**26. The perpendicular bisector of a chord passes through:**

(A) a random point on the circle

(B) the centre of the circle
(C) only one endpoint
(D) an external tangent point

**Correct Answer: B**

*Explanation: The centre is equidistant from the chord's endpoints.*

**27. If PQ □ QR with PQ = 4 cm and QR = 3 cm, a circle through P, Q, R has diameter:**

(A) 4 cm
(B) 7 cm
(C) 5 cm
(D) 12 cm

**Correct Answer: C**

*Explanation: Right angle at Q means PR is a diameter; PR = √(16 + 9) = 5 cm.*

**28. The radius of that circle through P, Q, R (legs 4 cm and 3 cm) is:**

(A) 2 cm
(B) 5 cm
(C) 3.5 cm
(D) 2.5 cm

**Correct Answer: D**

*Explanation: Radius is half the hypotenuse: 5/2 = 2.5 cm.*

**29. If AB = BC = 3 cm and □B = 120° in triangle ABC, the circumradius relates to side AC by:**

(A) sine rule with R = AC/(2 sin B)
(B) Pythagoras only
(C) area formula only
(D) tangent length

**Correct Answer: A**

*Explanation: Extended sine rule gives circumradius R = a/(2 sin A) for any triangle.*

**30. An arc-shaped tile has inner radius 7 in and arc length 2 in. One full circle needs about:**

(A) 7 tiles
(B) 22 tiles
(C) 11 tiles
(D) 44 tiles

**Correct Answer: B**

*Explanation: An arc-shaped tile has inner radius 7 in and arc length 2 in. One full circle needs about 22 tiles.*

**31. To find centre of a circular path inscribed in a 50 m square boundary, the radius is:**

(A) 50 m
(B) 12.5 m
(C) 25 m
(D) 100 m

**Correct Answer: C**

*Explanation: Inscribed circle diameter equals side length, so r = 50/2 = 25 m.*

**32. Locating the centre of an inscribed circular path in a rectangular boundary uses:**

(A) only one corner
(B) a single tangent
(C) 120° hexagon
(D) perpendicular bisectors of chords or diagonals of the rectangle

**Correct Answer: D**

*Explanation: Rectangle diagonals meet at the centre of the inscribed circle when the path is centred.*

**33. Completing a circle without centre by equal chords uses interior angle:**

(A) 120° for regular hexagon method

(B) 60° for square
(C) 180° always
(D) 45° only

**Correct Answer: A**

*Explanation: The textbook's second method uses 120° to step around with equal chords.*

**34. Drawing tangent at middle of arc without centre requires bisecting:**

(A) the tangent
(B) a chord through the midpoint of the arc
(C) only the radius
(D) the external angle

**Correct Answer: B**

*Explanation: Drawing tangent at middle of arc without centre requires bisecting a chord through the midpoint of the arc.*

**35. Drawing tangent at end of arc without centre is perpendicular to:**

(A) the tangent at the other end
(B) line of centres
(C) the chord from that endpoint
(D) hexagon side

**Correct Answer: C**

*Explanation: Tangent at arc endpoint is perpendicular to the chord drawn from that point.*

**36. For tangent from P outside arc, auxiliary construction often uses diameter on:**

(A) any random segment
(B) the line of centres only
(C) two parallel tangents
(D) a chord of the arc

**Correct Answer: D**

*Explanation: Semicircle on a chord helps locate the tangent from an external point.*

**37. Two tangents from external P to a circle are equal because:**

(A) right triangles OPA and OPB are congruent
(B) radii differ
(C) P is on the circle
(D) tangents are parallel

**Correct Answer: A**

*Explanation: Two tangents from external P to a circle are equal because right triangles OPA and OPB are congruent.*

**38. When constructing tangents at a given angle θ at P, the angle between the radii to contact points is:**

(A) θ
(B) 180° − θ
(C) 360° − θ
(D) 90° − θ

**Correct Answer: B**

*Explanation: Quadrilateral with two 90° angles at contacts gives central angle 180° − θ.*

**39. Direct tangents to equal circles never:**

(A) touch both circles
(B) lie on the same side of both circles
(C) cross between the centres
(D) use perpendicular diameters

**Correct Answer: C**

*Explanation: Direct tangents to equal circles never cross between the centres.*

**40. Transverse tangents to two separate circles always:**

(A) are parallel to AB
(B) touch only one circle
(C) equal the sum of radii
(D) cross the segment AB between the circles

**Correct Answer: D**

*Explanation: Transverse tangents to two separate circles always cross the segment AB between the circles.*

**41. If two equal circles have radius 2.5 cm and AB = 6 cm, direct tangents use vertical diameters because:**

(A) AB is horizontal in the standard figure and diameters □ AB give tangent points
(B) radii must be parallel
(C) hexagon requires it
(D) centres must coincide

**Correct Answer: A**

*Explanation: If two equal circles have radius 2.5 cm and AB = 6 cm, direct tangents use vertical diameters because AB is horizontal in the standard figure and diameters □ AB give tangent points.*

**42. Auxiliary circle radius r□ + r□ in transverse construction represents:**

(A) difference of radii
(B) sum of radii for the large circle at first centre
(C) distance AB
(D) inscribed hexagon side

**Correct Answer: B**

*Explanation: Auxiliary circle radius r□ + r□ in transverse construction represents sum of radii for the large circle at first centre.*

**43. Tangent to touching circles at C uses semicircle on AB because:**

(A) C is irrelevant
(B) AB equals r□ + r□ always
(C) the right angle in the semicircle locates point D for the tangent arc
(D) hexagon closes

**Correct Answer: C**

*Explanation: Tangent to touching circles at C uses semicircle on AB because the right angle in the semicircle locates point D for the tangent arc.*

**44. Practical geometry of circles applies to:**

(A) only paper folding
(B) statistics only
(C) probability trees only
(D) athletic tracks, Ferris wheels, and machine parts

**Correct Answer: D**

*Explanation: Real designs such as tracks and wheels use circle constructions.*

**45. The wheel invention is cited because circles provide:**

(A) efficient rotation and symmetric motion
(B) only decoration
(C) right angles only
(D) zero friction always

**Correct Answer: A**

*Explanation: Circular wheels roll smoothly because of uniform distance from the axle.*

**46. To trace a boat swing's circular path, the path is:**

(A) a straight line
(B) an arc or full circle about the swing pivot

(C) a hexagon
(D) two parallel tangents

**Correct Answer: B**

*Explanation: To trace a boat swing's circular path, the path is an arc or full circle about the swing pivot.*

**47. Three points on an arc DEF with DE = 3.5 cm, EF = 4.2 cm, angle 60° locate centre by:**

(A) guessing
(B) only one perpendicular
(C) circumcentre of triangle DEF
(D) 120° stepping

**Correct Answer: C**

*Explanation: Non-collinear arc points determine a triangle whose circumcentre is the arc's centre.*

**48. Right bisector of chord AB is the set of points equidistant from:**

(A) centre and A only
(B) two tangents
(C) external P only
(D) A and B

**Correct Answer: D**

*Explanation: Definition of perpendicular bisector: equal distance from A and B.*

**49. Compass width for circumcircle through A, B, C is set to:**

(A) OA where O is circumcentre (distance from O to any vertex)
(B) AB only
(C) half of BC only
(D) perimeter of triangle

**Correct Answer: A**

*Explanation: Once O is found, radius equals OA = OB = OC.*

**50. If only an arc is given, taking three points on the arc is necessary because:**

(A) two points are always enough
(B) three non-collinear points fix the circle uniquely
(C) one point fixes radius
(D) arc has no centre ever

**Correct Answer: B**

*Explanation: If only an arc is given, taking three points on the arc is necessary because three non-collinear points fix the circle uniquely.*

**51. Method (a) for completing arc uses finding centre; method (b) avoids centre by:**

(A) ignoring the arc
(B) drawing only one radius
(C) stepping congruent triangles or 120° chords around the arc
(D) parallel tangents

**Correct Answer: C**

*Explanation: Without-centre methods march equal geometry around the given arc.*

**52. In octagon stepping method, triangles BCD, CDE, etc. are built to be:**

(A) right angled only
(B) always equilateral
(C) degenerate
(D) congruent to the initial triangle on the arc

**Correct Answer: D**

*Explanation: In octagon stepping method, triangles BCD, CDE, etc. are built to be congruent to the initial triangle on the arc.*

**53. Tangent meeting angle 30° at P implies careful marking of:**

(A) □APC = 30° at P between the two tangents
(B) only one radius
(C) hexagon vertices only
(D) AB distance

**Correct Answer: A**

*Explanation: The given angle at P between tangents controls the entire construction.*

**54. Constructing □APC = 30° and tangent CD at C meeting first tangent at D gives □BDC:**

(A) 60°
(B) 30°
(C) 90°
(D) 180°

**Correct Answer: B**

*Explanation: The exercise result matches the given angle between tangents, 30°.*

**55. For unequal touching circles radii 2.5 cm and 2 cm, common tangent uses bisected AB and:**

(A) parallel diameters only
(B) hexagon
(C) semicircle and perpendicular at contact C
(D) three random chords

**Correct Answer: C**

*Explanation: Standard touching-circle tangent uses bisector, semicircle, and perpendicular at C.*

**56. Intersecting circles tangent construction differs from separate circles because:**

(A) no tangents exist
(B) only hexagons work
(C) centres coincide
(D) circles overlap and construction uses their common region

**Correct Answer: D**

*Explanation: Intersecting circles tangent construction differs from separate circles because circles overlap and construction uses their common region.*

**57. Transverse tangent construction for r = 2 and 1.3 cm uses auxiliary 3.3 cm at centre:**

(A) A of larger circle
(B) B only
(C) midpoint only
(D) contact C

**Correct Answer: A**

*Explanation: Large auxiliary circle is centred at the first given centre A with radius sum.*

**58. Direct tangent to equal circles: join outer diameter points E–D and F–C because those segments:**

(A) pass through centres
(B) touch each circle at right angles and do not cross between centres
(C) are radii
(D) bisect AB

**Correct Answer: B**

*Explanation: Direct tangent to equal circles: join outer diameter points E–D and F–C because those segments touch each circle at right angles and do not cross between centres.*

**59. Without-centre hexagon method: each new chord equals:**

(A) half the arc
(B) diameter always
(C) the first chord AB on the arc
(D) sum of radii

**Correct Answer: C**

*Explanation: Equal chord steps of the same length as the starting chord close the.*

**60. 120° interior angle in stepping method comes from:**

(A) square corners
(B) right triangle only
(C) tangent perpendicularity alone
(D) regular hexagon geometry

**Correct Answer: D**

*Explanation: 120° interior angle in stepping method comes from regular hexagon geometry.*

**61. To locate centre of round object traced on paper:**

(A) mark three points on edge and bisect two chords
(B) use one mark only
(C) draw tangent only
(D) use 120° without points

**Correct Answer: A**

*Explanation: To locate centre of round object traced on paper mark three points on edge and bisect two chords.*

**62. Arc completion by centre method: radius after finding O is:**

(A) always AB chord
(B) OB or OA to any point on arc
(C) half AB only
(D) external tangent length

**Correct Answer: B**

*Explanation: Any point on the arc is distance R from the located centre.*

**63. Practical geometry differs from pure tangent theorems by emphasizing:**

(A) only proofs without diagrams
(B) probability
(C) compass-and-ruler construction steps
(D) ogives

**Correct Answer: C**

*Explanation: Practical geometry differs from pure tangent theorems by emphasizing compass-and-ruler construction steps.*

**64. Given arc only, method (a) finds centre; method (b) uses repeated:**

(A) secants through centre
(B) parallel lines only
(C) ogive points
(D) congruent polygon steps along the arc

**Correct Answer: D**

*Explanation: Given arc only, method (a) finds centre; method (b) uses repeated congruent polygon steps along the arc.*

**65. Two tangents at given angle meeting at P require marking P:**

(A) outside the circle
(B) inside the circle
(C) at the centre
(D) on a diameter only

**Correct Answer: A**

*Explanation: Two tangents from one external point meet at P outside the circle.*

**66. For transverse tangents, final lines EG and FH in the textbook construction are:**

(A) radii
(B) the required common tangents crossing between circles
(C) parallel to AB only

(D) diameters

**Correct Answer: B**

*Explanation: Those joined segments are the transverse tangents touching both circles.*

**67. Touching circles tangent at C: perpendicular CD to AB meets semicircle at D; arc from D with radius CD finds:**

(A) centre O
(B) hexagon vertex
(C) tangent points E and F on the circles
(D) external P

**Correct Answer: C**

*Explanation: Arc from D locates where the common tangent meets each circle.*

**68. Circle through three points fails if points are:**

(A) vertices of acute triangle
(B) on a minor arc
(C) non-collinear
(D) collinear

**Correct Answer: D**

*Explanation: Circle through three points fails if points are collinear.*

**69. Perpendicular bisectors of triangle sides meet at exactly:**

(A) one circumcentre
(B) three points
(C) no point for obtuse triangle off circle
(D) the in-centre always

**Correct Answer: A**

*Explanation: Circumcentre is unique for any non-degenerate triangle.*

**70. Engineer with 50 m square and circular path locates centre at:**

(A) corner of square
(B) intersection of diagonals of square
(C) midpoint of one side only
(D) external tangent point

**Correct Answer: B**

*Explanation: Centre of inscribed circle in rectangle/square is at diagonal inter.*

**71. Inner radius 7 in, arc 2 in per tile: total circumference ≈:**

(A) 14 in
(B) 22 in
(C) 44 in
(D) 7 in

**Correct Answer: C**

*Explanation: $2\pi r \approx 43.98$ in, nearest whole tile count context uses ~22 tiles covering ~44 in - circumference ~44 in.*

**72. Bisecting AB in transverse construction finds midpoint for:**

(A) direct tangent only
(B) in-centre
(C) hexagon side
(D) auxiliary circle that helps locate tangent directions

**Correct Answer: D**

*Explanation: Bisecting AB in transverse construction finds midpoint for auxiliary circle that helps locate tangent directions.*

**73. Parallel lines AE and BG in transverse construction ensure:**

(A) corresponding angles locate tangent point G on second circle

(B) equal radii
(C) centres merge
(D) diameter doubles

**Correct Answer: A**

*Explanation: Parallel transfer aligns the tangent direction from the first to the second circle.*

**74. Practical geometry circle unit pairs with chapter 10 because:**

(A) both ignore tangents
(B) chapter 10 proves tangent facts; chapter 11 constructs them
(C) both are statistics
(D) neither uses compass

**Correct Answer: B**

*Explanation: Practical geometry circle unit pairs with chapter 10 because chapter 10 proves tangent facts; chapter 11 constructs them.*

**75. To draw tangent when P is outside the circle (centre known), compass at O, radius to tangent foot gives:**

(A) secant
(B) hexagon
(C) right triangle with OP as hypotenuse
(D) ogive

**Correct Answer: C**

*Explanation: Known centre: right triangle OPA with OA □ tangent at A.*

**76. Drawing two tangents meeting at 60° at P gives central angle between radii of:**

(A) 60°
(B) 180°
(C) 240°
(D) 120°

**Correct Answer: D**

*Explanation: Drawing two tangents meeting at 60° at P gives central angle between radii of 120°.*

**77. Completing circle from arc without centre: joining C to D, D to E, … eventually:**

(A) closes the full circumference through polygon vertices
(B) forms a straight line only
(C) finds ogive
(D) bisects AB only

**Correct Answer: A**

*Explanation: Stepping around connects vertices that lie on the completed circle.*

**78. When P is on the circle, exactly one tangent exists because:**

(A) radii are parallel
(B) only one line is perpendicular to the radius at P
(C) P is outside
(D) two tangents always

**Correct Answer: B**

*Explanation: One unique line through P is perpendicular to radius OP.*

**79. External point P yields two tangents because:**

(A) circle has two centres
(B) radii differ
(C) two symmetric right triangles OPA and OPB are possible
(D) P is on circle

**Correct Answer: C**

*Explanation: External point P yields two tangents because two symmetric right triangles OPA and OPB are possible.*

**80. Direct common tangent length between contact points on horizontal layout equals:**

(A) sum of radii
(B) difference of radii
(C) zero
(D) distance AB between centres for equal circles

**Correct Answer: D**

*Explanation: Direct common tangent length between contact points on horizontal layout equals distance AB between centres for equal circles.*

## B. Less Important / Secondary Topics

**81. A circle has rotational symmetry of order:**

(A) infinite about its centre
(B) 1
(C) 2
(D) 6 only

**Correct Answer: A**

*Explanation: A circle has rotational symmetry of order infinite about its centre.*

**82. The compass is essential in circle constructions for:**

(A) measuring angles in degrees only
(B) transferring equal lengths (radii, chords)
(C) drawing histograms
(D) calculating mean

**Correct Answer: B**

*Explanation: The compass is essential in circle constructions for transferring equal lengths (radii, chords).*

**83. Non-collinear means:**

(A) on one straight line
(B) forming a right angle only
(C) not all on one line
(D) equilateral only

**Correct Answer: C**

*Explanation: Non-collinear means not all on one line.*

**84. Circumcircle of a triangle passes through:**

(A) midpoints of sides only
(B) only the orthocentre
(C) centre of earth
(D) all three vertices

**Correct Answer: D**

*Explanation: Circumcircle of a triangle passes through all three vertices.*

**85. Inscribed circle in a triangle touches:**

(A) three sides internally
(B) vertices
(C) circumference of circumcircle
(D) only one side

**Correct Answer: A**

*Explanation: Incircle is tangent to each side; this chapter focuses on circum constructions.*

**86. Arc length s on radius r subtends angle θ (radians) with s =:**

(A) r + θ
(B) rθ
(C) r/θ

(D) θ/r

**Correct Answer: B**

*Explanation: Arc length s on radius r subtends angle θ (radians) with s = rθ.*

**87. For tile count, approximate π as 22/7 gives circumference 7 in tile more accurately as:**

(A) 20
(B) 25
(C) 22
(D) 30

**Correct Answer: C**

*Explanation: (22/7)×14 = 44 in; 44/2 = 22 tiles, so the correct choice is 22.*

**88. Bicycle wheels overlapping in the chapter illustration show:**

(A) parallel tangents only
(B) ogives
(C) box plots
(D) intersecting circles in real objects

**Correct Answer: D**

*Explanation: Bicycle wheels overlapping in the chapter illustration show intersecting circles in real objects.*

**89. Right bisector is another name for:**

(A) perpendicular bisector
(B) angle bisector
(C) median
(D) altitude

**Correct Answer: A**

*Explanation: Right bisector means perpendicular bisector in the textbook wording.*

**90. If construction arcs for bisector do not meet, likely error is:**

(A) correct centre found
(B) compass width changed between arcs
(C) three collinear points used properly
(D) tangent drawn

**Correct Answer: B**

*Explanation: If construction arcs for bisector do not meet, likely error is compass width changed between arcs.*

**91. Tangent construction from known centre O and external P starts by:**

(A) bisecting OP blindly
(B) 120° hexagon
(C) finding midpoint of OP and drawing semicircle for right angle
(D) ogive

**Correct Answer: C**

*Explanation: Tangent construction from known centre O and external P starts by finding midpoint of OP and drawing semicircle for right angle.*

**92. Athletic track inner and outer lanes use:**

(A) only straight lines
(B) random segments
(C) Venn diagrams
(D) concentric circular arcs at bends

**Correct Answer: D**

*Explanation: Lane curves are arcs of circles with different radii.*

**93. Mechanical gears often have:**

(A) circular pitch circles for meshing
(B) square teeth only

(C) no circular parts
(D) only tangents without centres

**Correct Answer: A**

*Explanation: Gear pitch surfaces are circular cylinders in cross-.*

**94. Completing arc by centre is generally more accurate when:**

(A) arc is very short noise
(B) arc spans enough to define a stable circumcentre
(C) points are collinear
(D) no compass exists

**Correct Answer: B**

*Explanation: Completing arc by centre is generally more accurate when arc spans enough to define a stable circumcentre.*

**95. Hexagon method suits when:**

(A) only one point on arc
(B) circles touch internally only
(C) centre must never be found and arc allows equal chord stepping
(D) statistics grouped data

**Correct Answer: C**

*Explanation: Hexagon method suits when centre must never be found and arc allows equal chord stepping.*

**96. Transverse tangents exist for two separate circles when:**

(A) one circle is inside without overlap in some cases
(B) circles never have radii
(C) only equal radii forbidden
(D) circles are separate or appropriately nested

**Correct Answer: D**

*Explanation: Transverse tangents exist for two separate circles when circles are separate or appropriately nested.*

**97. Direct tangents exist for:**

(A) two circles that do not overlap internally in the usual external case
(B) nested circles only
(C) collinear points
(D) degenerate line

**Correct Answer: A**

*Explanation: Direct tangents exist for two circles that do not overlap internally in the usual external case.*

**98. Given angle between tangents 90° at P, central angle between radii is:**

(A) 180°
(B) 90°
(C) 270°
(D) 360°

**Correct Answer: B**

*Explanation: 180° − 90° = 90° between radii when tangents are perpendicular at P.*

**99. Practical geometry safety tip: arc stepping without centre may accumulate:**

(A) zero error
(B) exact π
(C) small compass error over many steps
(D) impossible overlap always

**Correct Answer: C**

*Explanation: Repeated constructions can drift slightly if each step is not precise.*

**100. Chapter 11 real-life list includes recreational parks because:**

(A) only straight paths exist

(B) no geometry applies
(C) only probability
(D) paths and flower beds use circular arcs

**Correct Answer: D**

*Explanation: Chapter 11 real-life list includes recreational parks because paths and flower beds use circular arcs.*

**101. To check a constructed tangent, verify angle between radius and line is:**

(A) 90°
(B) 0°
(C) 45°
(D) 180°

**Correct Answer: A**

*Explanation: Tangent–radius test: 90° at contact, so the correct choice is 90°.*

**102. Three chords' perpendicular bisectors concur at:**

(A) random point
(B) circumcentre if triangle non-degenerate
(C) always outside triangle for all triangles
(D) ogive quartile

**Correct Answer: B**

*Explanation: Concurrency at circumcentre is the basis of centre location.*

**103. If AB = 6 cm and both circles radius 2.5 cm for direct tangents, vertical offset of contact from AB line is:**

(A) 6 cm
(B) 0 cm in standard symmetric drawing
(C) 2.5 cm
(D) 11 cm

**Correct Answer: C**

*Explanation: If AB = 6 cm and both circles radius 2.5 cm for direct tangents, vertical offset of contact from AB line is 2.5 cm.*

**104. Semicircle on AB in touching-circle tangent helps because angle in semicircle is:**

(A) 45°
(B) 120°
(C) 180°
(D) 90°

**Correct Answer: D**

*Explanation: Right angle locates the direction needed for perpendicular CD.*

**105. Tracing swing path records:**

(A) circular arc motion about pivot
(B) linear motion only
(C) ogive of marks
(D) scatter plot

**Correct Answer: A**

*Explanation: Swing bob follows a circular arc if rope length is fixed.*

**106. Equal circles transverse case AB = 7 cm, r = 3 cm: midpoint C of AB is:**

(A) 3 cm from A
(B) 3.5 cm from A
(C) 7 cm from A
(D) 1 cm from A

**Correct Answer: B**

*Explanation: Midpoint is 7/2 = 3.5 cm from each centre.*

**107. Construction title 'Practical Geometry' signals focus on:**

(A) proofs only without drawing
(B) calculator statistics only
(C) accurate drawings with instruments
(D) memorizing π digits

**Correct Answer: C**

*Explanation: Construction title 'Practical Geometry' signals focus on accurate drawings with instruments.*

**108. When completing circle from arc, dashed part of final figure shows:**

(A) removed error
(B) tangent only
(C) histogram bar
(D) portion of circumference not originally given

**Correct Answer: D**

*Explanation: Given arc is solid; completed remainder is often shown dashed.*

MATHEMATICS MCQ BOOKLET

# Grade 10 · Chapter 12 · Basic Statistics

FBISE / National Book Foundation Model Textbook companion

by Public Library

*Independent MCQs on cumulative frequency, ogives, quartiles, box plots, scatter correlation, grouped mean/SD/variance, and probability laws. Not copied from the book exercise. Total: 108 questions. Each item has four options, the correct letter, and a short explanation of why it is correct.*

## A. Important / Main Topics

**1. Cumulative frequency of a class is the number of values:**

(A) less than the upper class boundary (running total)
(B) only in that class
(C) equal to the class mark
(D) above the maximum

**Correct Answer: A**

*Explanation: Cumulative frequency counts all observations up to that upper boundary.*

**2. An ogive is another name for:**

(A) frequency polygon of class marks
(B) cumulative frequency polygon or curve
(C) scatter diagram
(D) box plot only

**Correct Answer: B**

*Explanation: An ogive is another name for cumulative frequency polygon or curve.*

**3. To draw a cumulative frequency polygon, the x-axis usually uses:**

(A) lower class limits only
(B) frequencies only
(C) upper class boundaries
(D) probabilities only

**Correct Answer: C**

*Explanation: To draw a cumulative frequency polygon, the x-axis usually uses upper class boundaries.*

**4. On an ogive, Q□ is read by marking on the y-axis:**

(A) n/2
(B) 3n/4
(C) n
(D) n/4

**Correct Answer: D**

*Explanation: First quartile position is n/4 on the cumulative frequency scale.*

**5. On an ogive, the median Q□ is read at cumulative frequency:**

(A) n/2
(B) n/4
(C) 3n/4
(D) n only

**Correct Answer: A**

*Explanation: Median is the middle order position n/2 on the ogive.*

**6. On an ogive, Q□ is read at cumulative frequency:**

(A) n/4
(B) 3n/4
(C) n/2

(D) n

**Correct Answer: B**

*Explanation: On an ogive, Q□ is read at cumulative frequency 3n/4.*

**7. Interquartile range IQR equals:**

(A) Q□ + Q□
(B) Q□ − Q□
(C) Q□ − Q□
(D) max − min only

**Correct Answer: C**

*Explanation: IQR is the spread of the middle 50%: upper quartile minus lower quartile.*

**8. If Q□ = 40, Q□ = 70, Q□ = 90, the percentage scoring above 90 is about:**

(A) 10%
(B) 50%
(C) 75%
(D) 25%

**Correct Answer: D**

*Explanation: If Q□ = 40, Q□ = 70, Q□ = 90, the percentage scoring above 90 is about 25%.*

**9. A decile D□ marks the value below which lie:**

(A) 10% of data
(B) 1% of data
(C) 25% of data
(D) 50% of data

**Correct Answer: A**

*Explanation: First decile cuts off the lowest 10%, so the correct choice is 10% of data.*

**10. D□ as a decile corresponds to:**

(A) first quartile
(B) median (second quartile)
(C) third quartile
(D) maximum

**Correct Answer: B**

*Explanation: Fifth decile (50th percentile) is the median.*

**11. Percentile P□□ means:**

(A) 30% scored below
(B) 70th student only
(C) 70% scored below this value
(D) top 70%

**Correct Answer: C**

*Explanation: Percentile P□□ means 70% scored below this value.*

**12. A box-and-whisker plot shows:**

(A) only mean and mode
(B) only cumulative frequency
(C) only correlation r
(D) five-number summary: min, Q□, median, Q□, max

**Correct Answer: D**

*Explanation: Box plots display min, quartiles, median, and max with whiskers.*

**13. In a box plot, the box spans from:**

(A) Q□ to Q□
(B) min to max
(C) Q□ to Q□

(D) 0 to n

**Correct Answer: A**

*Explanation: In a box plot, the box spans from Q□ to Q□.*

**14. The line inside the box of a box plot is:**

(A) Q□
(B) median Q□
(C) Q□
(D) mean always

**Correct Answer: B**

*Explanation: The median is drawn as a line inside the IQR box.*

**15. Whiskers on a box plot extend toward:**

(A) only Q□ and Q□
(B) mean only
(C) minimum and maximum (non-outlier extremes)
(D) class marks

**Correct Answer: C**

*Explanation: Whiskers on a box plot extend toward minimum and maximum (non-outlier extremes).*

**16. If box plot shows min = 50, Q□ = 160, median = 300, Q□ = 800, max = 1000, IQR equals:**

(A) 150
(B) 750
(C) 950
(D) 640

**Correct Answer: D**

*Explanation: IQR = 800 − 160 = 640, so the correct choice is 640.*

**17. Positive correlation in box-plot comparison means:**

(A) one variable up, the other tends up
(B) one up, the other tends down
(C) no relationship
(D) IQR is zero

**Correct Answer: A**

*Explanation: Positive correlation in box-plot comparison means one variable up, the other tends up.*

**18. Negative correlation means:**

(A) both increase together
(B) one tends to increase when the other decreases
(C) IQR equals range
(D) median equals mean

**Correct Answer: B**

*Explanation: Negative correlation is an inverse tendency between variables.*

**19. A scatter diagram plots:**

(A) cumulative frequency only
(B) class marks only
(C) pairs (x, y) as points
(D) tree branches only

**Correct Answer: C**

*Explanation: Each observation is one point with horizontal x and vertical y.*

**20. A line of best fit on a scatter plot is drawn to:**

(A) pass through every point exactly
(B) show IQR
(C) replace the ogive

(D) approximate the linear trend of the data

**Correct Answer: D**

*Explanation: A line of best fit on a scatter plot is drawn to approximate the linear trend of the data.*

**21. Strong negative linear correlation has r close to:**

(A) −1
(B) +1
(C) 0
(D) n/2

**Correct Answer: A**

*Explanation: Strong negative linear correlation has r close to −1.*

**22. Pearson r is calculated as $\Sigma(x_i-\bar{x})(y_i-\bar{y})$ divided by:**

(A) n only
(B) $\sqrt{[\Sigma(x_i-\bar{x})^2 \times \Sigma(y_i-\bar{y})^2]}$
(C) range of x
(D) IQR

**Correct Answer: B**

*Explanation: Standard Pearson formula uses product of deviation sums in the denominator square root.*

**23. If r ≈ −0.88, as x increases y tends to:**

(A) increase
(B) stay constant
(C) decrease
(D) equal x

**Correct Answer: C**

*Explanation: Strong negative r means y decreases as x increases.*

**24. Range of a data set is:**

(A) $Q_3 - Q_1$
(B) mean − median
(C) variance
(D) largest value − smallest value

**Correct Answer: D**

*Explanation: Range is max minus min, so the correct choice is largest value − smallest value.*

**25. Variance measures:**

(A) spread around the mean (average squared deviation)
(B) central location only
(C) only quartiles
(D) only probability

**Correct Answer: A**

*Explanation: Variance quantifies how far values typically lie from the mean.*

**26. Standard deviation SD is:**

(A) square of variance
(B) positive square root of variance
(C) equal to range always
(D) IQR

**Correct Answer: B**

*Explanation: SD = √variance, in the same units as the data.*

**27. For grouped data, mean $\bar{x}$ uses:**

(A) Σx only
(B) class width only
(C) Σfx / Σf

(D) n/2

**Correct Answer: C**

*Explanation: For grouped data, mean $\bar{x}$ uses $\Sigma fx / \Sigma f$.*

**28. Grouped variance often uses formula with $\Sigma f(x_i - \bar{x})^2$ divided by:**

(A) class width only
(B) range
(C) IQR
(D) Σf (or n)

**Correct Answer: D**

*Explanation: Grouped variance often uses formula with $\Sigma f(x_i - \bar{x})^2$ divided by Σf (or n).*

**29. Coefficient of variation CV equals:**

(A) (SD/mean) × 100%
(B) SD × mean
(C) variance/mean
(D) IQR/median

**Correct Answer: A**

*Explanation: CV compares relative spread: SD as percentage of mean.*

**30. If mean = 68, SD = 14.6, CV equals approximately:**

(A) 14.6%
(B) 21.5%
(C) 68%
(D) 4.7%

**Correct Answer: B**

*Explanation: CV = (14.6/68)×100 ≈ 21.5%, so the correct choice is 21.5%.*

**31. Lower SD with similar mean suggests data are:**

(A) more spread out
(B) always skewed right
(C) more consistent (less spread)
(D) without median

**Correct Answer: C**

*Explanation: Smaller SD means observations cluster closer to the mean.*

**32. Comparing two classes: higher mean but higher SD suggests:**

(A) lower average and more consistent
(B) identical spread
(C) zero range
(D) higher average but more variable performance

**Correct Answer: D**

*Explanation: Better average with larger SD means less consistent results.*

**33. Dispersion refers to:**

(A) how spread out data values are
(B) central tendency only
(C) only probability
(D) only ogive shape

**Correct Answer: A**

*Explanation: Dispersion refers to how spread out data values are.*

**34. Three common measures of dispersion include:**

(A) mean, median, mode
(B) range, variance, standard deviation
(C) Q□, Q□, Q□ only

(D) only deciles

**Correct Answer: B**

*Explanation: Range, variance, and SD are standard dispersion measures.*

**35. Frequency polygon uses class marks on x-axis and:**

(A) cumulative frequency
(B) probability only
(C) class frequency on y-axis
(D) SD on y-axis

**Correct Answer: C**

*Explanation: Frequency polygon uses class marks on x-axis and class frequency on y-axis.*

**36. To close a frequency polygon, extra classes with zero frequency are added:**

(A) only at the top
(B) never
(C) only at median
(D) at both ends of the distribution

**Correct Answer: D**

*Explanation: To close a frequency polygon, extra classes with zero frequency are added at both ends of the distribution.*

**37. Sample space for two fair coins flipped is:**

(A) {HH, HT, TH, TT}
(B) {H, T}
(C) {H, T, HH}
(D) {0, 1}

**Correct Answer: A**

*Explanation: Sample space for two fair coins flipped is {HH, HT, TH, TT}.*

**38. P(both tails) for two fair coins equals:**

(A) 1/2
(B) 1/4
(C) 1/3
(D) 1/8

**Correct Answer: B**

*Explanation: One of four outcomes is TT, so P = 1/4, so the correct choice is 1/4.*

**39. P(Maria H and Haleema T) for two coins in order is:**

(A) 1/2
(B) 1/3
(C) 1/4
(D) 1/8

**Correct Answer: C**

*Explanation: P(Maria H and Haleema T) for two coins in order is 1/4.*

**40. Tree diagram for combined events shows:**

(A) only one branch
(B) only ogive
(C) box plot
(D) branches for successive choices and their probabilities

**Correct Answer: D**

*Explanation: Tree diagram for combined events shows branches for successive choices and their probabilities.*

**41. For independent events A and B, P(A and B) equals:**

(A) P(A) × P(B)
(B) P(A) + P(B)

(C) P(A) − P(B)
(D) 1 − P(A)

**Correct Answer: A**

*Explanation: Multiplication law: independent joint probability is the product.*

**42. For mutually exclusive events A and B, P(A or B) equals:**

(A) P(A) × P(B)
(B) P(A) + P(B)
(C) P(A) − P(B)
(D) 1

**Correct Answer: B**

*Explanation: For mutually exclusive events A and B, P(A or B) equals P(A) + P(B).*

**43. If P(A) = 0.3 and P(B) = 0.4 for independent tests, P(A or B) if not mutually exclusive needs:**

(A) only addition
(B) multiplication only
(C) inclusion–exclusion if overlap exists; if disjoint, 0.7
(D) zero

**Correct Answer: C**

*Explanation: If events can overlap, subtract P(A and B); if disjoint, P = 0.3 + 0.4 = 0.7.*

**44. If tests are independent with P(A+) = 0.3, P(B+) = 0.4, P(both positive) =**

(A) 0.7
(B) 0.1
(C) 1.0
(D) 0.12

**Correct Answer: D**

*Explanation: 0.3 × 0.4 = 0.12 for independent both positive.*

**45. If P(Job A) = 0.5, P(Job B) = 0.4 independent, P(either job) if mutually exclusive offers:**

(A) 0.9
(B) 0.2
(C) 0.1
(D) 0.5

**Correct Answer: A**

*Explanation: Disjoint: 0.5 + 0.4 = 0.9, so the correct choice is 0.9.*

**46. P(Volvo) = 1/2, P(Bedford) = 1/3 independent choice, P(either) if exclusive:**

(A) 1/6
(B) 5/6
(C) 2/3
(D) 1/2

**Correct Answer: B**

*Explanation: 1/2 + 1/3 = 5/6 when only one bus is taken.*

**47. P(Team S) = 12/27, P(Team H) = 13/27 independent wins, P(either) if exclusive:**

(A) 12/13
(B) 1/27
(C) 25/27
(D) 1

**Correct Answer: C**

*Explanation: 12/27 + 13/27 = 25/27, so the correct choice is 25/27.*

**48. P(colour damage) = 0.1, P(bad stitch) = 0.2 same item, P(either) if mutually exclusive:**

(A) 0.02
(B) 0.1

(C) 0.2
(D) 0.3

**Correct Answer: D**

*Explanation: 0.1 + 0.2 = 0.3 for disjoint defects, so the correct choice is 0.3.*

**49. P(A+) = 0.9, P(B+) = 0.7 independent, P(both positive) =**

(A) 0.63
(B) 1.6
(C) 0.2
(D) 0.9

**Correct Answer: A**

*Explanation: 0.9 × 0.7 = 0.63, so the correct choice is 0.63.*

**50. P(pass A) = 0.9, P(pass B) = 0.8 independent, P(pass both) =**

(A) 1.7
(B) 0.72
(C) 0.1
(D) 0.9

**Correct Answer: B**

*Explanation: 0.9 × 0.8 = 0.72, so the correct choice is 0.72.*

**51. Venn diagram with 40 like pizza, 45 like burgers, none both: total 100, P(either) =**

(A) 5/100
(B) 40/100
(C) 85/100
(D) 1

**Correct Answer: C**

*Explanation: Disjoint: (40 + 45)/100 = 85/100, so the correct choice is 85/100.*

**52. Conditional probability P(A|B) equals:**

(A) P(A) × P(B)
(B) P(B) / P(A)
(C) 1 − P(B)
(D) P(A and B) / P(B)

**Correct Answer: D**

*Explanation: Conditional probability P(A|B) equals P(A and B) / P(B).*

**53. Drawing two kings with replacement: P = (1/13)² =**

(A) 1/169
(B) 1/26
(C) 2/13
(D) 4/52

**Correct Answer: A**

*Explanation: "1/169" is correct: it matches the idea asked in the question ("Drawing two kings with replacement: P = (1/13)² ="), while the other choices do not.*

**54. Two kings without replacement: P = (4/52) × (3/51) =**

(A) 1/169
(B) 3/663
(C) 1/221
(D) 12/51

**Correct Answer: B**

*Explanation: "3/663" is correct: it matches the idea asked in the question ("Two kings without replacement: P = (4/52) × (3/51) ="), while the other choices do not.*

**55. Two sixes on two dice: P = (1/6)² =**

(A) 1/12
(B) 1/6
(C) 1/36
(D) 2/36

**Correct Answer: C**

*Explanation: "1/36" is correct: it matches the idea asked in the question ("Two sixes on two dice: P = (1/6)² ="), while the other choices do not.*

**56. 10 contestants equally likely for 1st place: P(one specific winner) =**

(A) 1/5
(B) 9/10
(C) 10
(D) 1/10

**Correct Answer: D**

*Explanation: Equal chance among 10 gives 1/10 each, so the correct choice is 1/10.*

**57. After 1st decided, 9 remain for 2nd; P(specific person 2nd | not 1st) context uses:**

(A) 1/9 among remaining
(B) 1/10 still
(C) 1/100
(D) zero

**Correct Answer: A**

*Explanation: Conditional: one of nine remaining equally likely for second.*

**58. Library Venn: 3 grade-7 only, 2 both, 5 grade-8 only, 40 neither; total books:**

(A) 10
(B) 50
(C) 40
(D) 8

**Correct Answer: B**

*Explanation: 3 + 2 + 5 + 40 = 50 books, so the correct choice is 50.*

**59. P(grade 7 book) with above counts =**

(A) 3/50
(B) 2/50
(C) 5/50
(D) 40/50

**Correct Answer: C**

*Explanation: Grade 7 total = 3 + 2 = 5, so 5/50 = 1/10.*

**60. P(English | grade 7) with 2 English in grade 7 region =**

(A) 2/50
(B) 2/3
(C) 5/50
(D) 2/5

**Correct Answer: D**

*Explanation: Among 5 grade-7 books, 2 are English: 2/5.*

**61. P(grade 7 and English) = (5/50) × (2/5) =**

(A) 1/25
(B) 2/50
(C) 10/50
(D) 2/5

**Correct Answer: A**

*Explanation: Joint: 2/50 = 1/25, so the correct choice is 1/25.*

**62. Mass vs fuel efficiency table: as mass increases, efficiency decreases suggests:**

(A) positive correlation
(B) negative correlation
(C) zero correlation
(D) IQR zero

**Correct Answer: B**

*Explanation: Mass vs fuel efficiency table: as mass increases, efficiency decreases suggests negative correlation.*

**63. Mass IQR = 1700 − 1200 = 500 kg; fuel IQR = 20 − 12 = 8 km/l used to:**

(A) find mean
(B) find probability
(C) compare spread of each variable
(D) draw tree

**Correct Answer: C**

*Explanation: IQR measures middle spread for each variable separately.*

**64. Grouped marks 0–10, 11–20, … cumulative last entry 35 means:**

(A) 35 classes
(B) mean is 35
(C) Q□ is 35 always
(D) 35 students total

**Correct Answer: D**

*Explanation: Grouped marks 0–10, 11–20, … cumulative last entry 35 means 35 students total.*

**65. Upper boundary for class 11–20 with 0.5 adjustment is:**

(A) 20.5
(B) 20
(C) 19.5
(D) 21

**Correct Answer: A**

*Explanation: Upper boundary for class 11–20 with 0.5 adjustment is 20.5.*

**66. Cumulative frequency at 10.5 boundary with f = 2 in class 1–10 gives c.f. =**

(A) 0
(B) 2
(C) 4
(D) 6

**Correct Answer: B**

*Explanation: Running total includes that class: c.f. = 2.*

**67. Ogive used to find median is more helpful than raw table when:**

(A) data are ungrouped only
(B) no frequencies exist
(C) quartiles must be estimated from grouped data
(D) probability is 1

**Correct Answer: C**

*Explanation: Ogive graphically locates quartiles for grouped distributions.*

**68. Scatter correlation r = 0 suggests:**

(A) perfect line
(B) negative relation
(C) IQR = 0
(D) no linear correlation

**Correct Answer: D**

*Explanation: r near 0 means little or no linear association.*

**69. SD of grouped data uses class marks as:**

(A) representative x values in deviation formulas
(B) frequencies
(C) probabilities
(D) boundaries only

**Correct Answer: A**

*Explanation: Each class midpoint stands for its interval in $\Sigma f(x-\bar{x})^2$.*

**70. Variance in same units as data squared means SD is preferred because:**

(A) SD is always larger
(B) SD has same units as original measurements
(C) variance is always 0
(D) SD equals mean

**Correct Answer: B**

*Explanation: Variance in same units as data squared means SD is preferred because SD has same units as original measurements.*

**71. Mutually exclusive events cannot:**

(A) have probabilities
(B) be shown on tree
(C) occur together in one trial
(D) appear in Venn diagram

**Correct Answer: C**

*Explanation: Mutually exclusive events cannot occur together in one trial.*

**72. Independent events: occurrence of one:**

(A) changes probability of other
(B) makes P = 0
(C) forces addition law only
(D) does not change probability of other

**Correct Answer: D**

*Explanation: Independence means P(B|A) = P(B), so the correct choice is does not change probability of other.*

**73. Addition law P(A□B) = P(A) + P(B) − P(A∩B) reduces to P(A)+P(B) when:**

(A) A and B are mutually exclusive
(B) always
(C) events independent
(D) P = 1

**Correct Answer: A**

*Explanation: Addition law P(A□B) = P(A) + P(B) − P(A∩B) reduces to P(A)+P(B) when A and B are mutually exclusive.*

**74. Tree diagram for 3 coin tosses: total outcomes =**

(A) 3
(B) 8
(C) 6
(D) 9

**Correct Answer: B**

*Explanation: $2^3 = 8$ equally likely paths, so the correct choice is 8.*

**75. P(three tails in 3 fair tosses) =**

(A) 1/3
(B) 1/6
(C) 1/8
(D) 3/8

**Correct Answer: C**

*Explanation: One path TTT out of 8: 1/8, so the correct choice is 1/8.*

**76. Sample space diagram for two coins is a:**

(A) 1×2 table of outcomes
(B) ogive
(C) box only
(D) 2×2 table listing combined results

**Correct Answer: D**

*Explanation: Sample space diagram for two coins is a 2×2 table listing combined results.*

**77. Real-life uses of SD include:**

(A) quality control, finance, education comparing spread
(B) only coin tossing
(C) only Venn diagrams
(D) only class boundaries

**Correct Answer: A**

*Explanation: Real-life uses of SD include quality control, finance, education comparing spread.*

**78. P(A|B) for drawing English book given grade 7 uses region:**

(A) whole library
(B) only grade 7 portion of Venn diagram
(C) only neither region
(D) only grade 8

**Correct Answer: B**

*Explanation: Conditioning restricts sample space to the given event B.*

**79. Predicting outside data range (extrapolation) on scatter line is:**

(A) always exact
(B) same as IQR
(C) unreliable compared to interpolation
(D) required for ogive

**Correct Answer: C**

*Explanation: Predicting outside data range (extrapolation) on scatter line is unreliable compared to interpolation.*

**80. Probability of combined events may be found using:**

(A) only mean formula
(B) only ogive
(C) only histogram
(D) sample space, tree, or Venn diagrams as appropriate

**Correct Answer: D**

*Explanation: Chapter 12 lists multiple diagrams for compound probability.*

## B. Less Important / Secondary Topics

**81. Raw (ungrouped) data in statistics means:**

(A) original values before grouping
(B) already in classes
(C) only cumulative totals
(D) only probabilities

**Correct Answer: A**

*Explanation: Raw data is the list before frequency.*

**82. Grouped data organizes values into:**

(A) only quartiles
(B) class intervals with frequencies

(C) only tree branches
(D) only Venn circles

**Correct Answer: B**

*Explanation: Grouped data organizes values into class intervals with frequencies.*

**83. Class mark is the:**

(A) frequency
(B) cumulative total
(C) midpoint of a class interval
(D) probability

**Correct Answer: C**

*Explanation: Class mark is the midpoint of a class interval.*

**84. Haani and Haider Qiraat example with 10 contestants illustrates:**

(A) ogive construction
(B) box plot whiskers
(C) variance formula derivation
(D) equally likely outcomes for ranking

**Correct Answer: D**

*Explanation: Each of 10 has chance 1/10 for first place when equally competent.*

**85. After first place fixed, remaining spots illustrate:**

(A) dependent sequential choices
(B) independent identical trials always
(C) mutually exclusive means
(D) IQR

**Correct Answer: A**

*Explanation: After first place fixed, remaining spots illustrate dependent sequential choices.*

**86. Cumulative frequency curve is also called:**

(A) histogram
(B) ogive
(C) scatter plot
(D) tally chart

**Correct Answer: B**

*Explanation: Ogive is the standard name for the cumulative frequency graph.*

**87. Quartile Q□ divides data so about:**

(A) 50% lie below
(B) 75% lie below
(C) 25% lie below
(D) 100% lie below

**Correct Answer: C**

*Explanation: Quartile Q□ divides data so about 25% lie below.*

**88. Percentile P□□ is the same idea as:**

(A) D□
(B) Q□
(C) median only
(D) D□

**Correct Answer: D**

*Explanation: 90th percentile aligns with ninth decile D□.*

**89. Outliers on box plot may be shown as:**

(A) individual points beyond whiskers
(B) hidden

(C) only median
(D) class marks

**Correct Answer: A**

*Explanation: Points beyond 1.5×IQR are often plotted separately.*

**90. Line of best fit by eye should balance points:**

(A) all above line
(B) above and below the line
(C) only at origin
(D) only at max

**Correct Answer: B**

*Explanation: Line of best fit by eye should balance points above and below the line.*

**91. r between +0.9 and +1 suggests:**

(A) weak positive
(B) negative relation
(C) strong positive linear correlation
(D) no correlation

**Correct Answer: C**

*Explanation: r between +0.9 and +1 suggests strong positive linear correlation.*

**92. Variance units for marks-squared means SD is reported in:**

(A) marks squared
(B) percent only
(C) no units
(D) marks

**Correct Answer: D**

*Explanation: Variance units for marks-squared means SD is reported in marks.*

**93. Σf for grouped data equals:**

(A) total number of observations n
(B) number of classes
(C) mean
(D) SD

**Correct Answer: A**

*Explanation: Sum of frequencies is total sample size.*

**94. Possibility diagram is another name for:**

(A) ogive
(B) sample space table of outcomes
(C) box plot
(D) histogram

**Correct Answer: B**

*Explanation: Possibility diagram is another name for sample space table of outcomes.*

**95. Drawing king then queen without replacement differs from with replacement because:**

(A) probabilities multiply the same
(B) events become certain
(C) second draw probability changes
(D) sample space shrinks to one

**Correct Answer: C**

*Explanation: Removing first card changes counts for the second draw.*

**96. P(at least one head) in two tosses = 1 − P(both tails) =**

(A) 1/4
(B) 1/2

(C) 1
(D) 3/4

**Correct Answer: D**

*Explanation: 1 − 1/4 = 3/4, so the correct choice is 3/4.*

**97. Mutually exclusive pizza and burger lovers in Venn diagram have:**

(A) no overlap in the neither-both case
(B) overlapping region
(C) equal circles always
(D) probability 1

**Correct Answer: A**

*Explanation: Disjoint sets: no student in both when none like both.*

**98. STEAM context for statistics includes interpreting:**

(A) only circle tangents
(B) data displays and probability in real decisions
(C) only compass constructions
(D) only cyclic quadrilaterals

**Correct Answer: B**

*Explanation: STEAM context for statistics includes interpreting data displays and probability in real decisions.*

**99. Histogram differs from bar chart for grouped data because:**

(A) bars always separated
(B) histogram has no area
(C) histogram bars touch (continuous classes)
(D) bar chart uses only ogive

**Correct Answer: C**

*Explanation: Histogram bars adjoin because classes are continuous intervals.*

**100. Median is preferred to mean when:**

(A) no skew
(B) only two values
(C) probability is 1/2
(D) extreme outliers pull the mean

**Correct Answer: D**

*Explanation: Median is preferred to mean when extreme outliers pull the mean.*

**101. D represents lowest:**

(A) 20%
(B) 10%
(C) 50%
(D) 90%

**Correct Answer: A**

*Explanation: D represents lowest 20%.*

**102. P(A and B) for dependent events uses:**

(A) P(A)+P(B) always
(B) P(A) × P(B|A)
(C) 1 − P(A)
(D) only Venn without numbers

**Correct Answer: B**

*Explanation: General multiplication: P(A) × P(B given A).*

**103. Three coin toss tree has branch count at each level:**

(A) 3
(B) 8

(C) 2
(D) 6

**Correct Answer: C**

*Explanation: Three coin toss tree has branch count at each level 2.*

**104. Box-and-whisker correlation compares:**

(A) only means
(B) only class width
(C) only tangent lengths
(D) shapes and positions of two distributions

**Correct Answer: D**

*Explanation: Box-and-whisker correlation compares shapes and positions of two distributions.*

**105. Cumulative frequency at lowest boundary is often:**

(A) 0
(B) n
(C) Q□
(D) mean

**Correct Answer: A**

*Explanation: Before first class no values are included, so c.f. starts at 0.*

**106. Chapter 12 links statistics with probability by:**

(A) ignoring data
(B) using diagrams to count favourable combined outcomes
(C) only geometry
(D) only tangents

**Correct Answer: B**

*Explanation: Chapter 12 links statistics with probability by using diagrams to count favourable combined outcomes.*

**107. Interpreting ogive Q□ = 90 means 75% of students scored:**

(A) above 90
(B) exactly 90
(C) at or below 90
(D) below Q□ only

**Correct Answer: C**

*Explanation: Q□ is the 75th percentile: 75% lie at or below it.*

**108. Fair die P(single 6) = 1/6 because:**

(A) six is largest
(B) dice are dependent
(C) addition law
(D) six outcomes equally likely

**Correct Answer: D**

*Explanation: Fair die P(single 6) = 1/6 because six outcomes equally likely.*