PUBLIC LIBRARY

Mathematics Grade 9

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 Real Numbers · Ch 2 Logarithms · Ch 3 Sets and Relations · Ch 4 Factorization and Algebraic Manipulation · Ch 5 Linear Equations and Inequalities · Ch 6 Trigonometry and Bearing · Ch 7 Coordinate Geometry · Ch 8 Geometry of Straight Lines · Ch 9 Geometry and Polygons · Ch 10 Practical Geometry · Ch 11 Basic Statistics

MATHEMATICS MCQ BOOKLET

Grade 9 · Chapter 1 · Real Numbers

FBISE / National Book Foundation Model Textbook companion

by Public Library

Independent MCQs on the history of numbers, rationals and irrationals, the number line, properties of reals, radicals, and laws of exponents. 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 number is an abstract idea used for counting or measuring, while a numeral is the:

(A) written symbol that represents that idea
(B) price of the object counted
(C) always a fraction only
(D) same as a geometric point

Correct Answer: A

Explanation: The idea is the number; the written mark such as 7 or VII is the numeral.

2. The earliest counting numbers used by shepherds and traders are called:

(A) complex numbers
(B) natural numbers
(C) imaginary units
(D) transcendental constants only

Correct Answer: B

Explanation: Natural numbers began as counting numbers for discrete objects.

3. Babylonians used a sexagesimal system, meaning their place-value base was:

(A) 2
(B) 10
(C) 60
(D) 12

Correct Answer: C

Explanation: Babylonians used a sexagesimal system, meaning their place-value base was 60.

4. Babylonians indicated nothingness in a place by a:

(A) digit 0 like Hindu-Arabic
(B) letter M
(C) negative sign
(D) space between digits, which could be ambiguous

Correct Answer: D

Explanation: A blank gap stood for an empty place, so readings were sometimes unclear.

5. Roman numerals used seven symbols and, like the Babylonian system, originally lacked a:

(A) symbol for nothingness (zero)
(B) symbol for five
(C) symbol for ten
(D) symbol for one thousand

Correct Answer: A

Explanation: Roman numerals used seven symbols and, like the Babylonian system, originally lacked a symbol for nothingness (zero).

6. The modern digits 0 through 9 are called the:

(A) Attic numerals
(B) Hindu-Arabic digits

(C) Mayan bar-and-dot only
(D) cuneiform wedges

Correct Answer: B

Explanation: Today's decimal digits come from the Hindu-Arabic tradition.

7. Brahmagupta is credited with writing a symbol for nothingness in about:

(A) 30 000 BC
(B) 500 BC
(C) 628 AD
(D) 1202 AD

Correct Answer: C

Explanation: His 7th-century work treated zero as a genuine numeral, not just a gap.

8. Al-Khwarizmi called the digit zero sifr; through Italian usage this became the word:

(A) infinity
(B) ratio
(C) mantissa
(D) zero

Correct Answer: D

Explanation: Sifr → zefero → zero is the European path of the name.

9. Fibonacci's 1202 book helped Europe adopt the 0–9 system mainly for:

(A) practical arithmetic such as accounts and currency
(B) poetry metre
(C) naming constellations
(D) drawing maps only

Correct Answer: A

Explanation: Merchants needed a place-value system for profit, loss, and conversion.

10. The word rational in rational number comes from:

(A) radius of a circle
(B) ratio, because such numbers are quotients a/b
(C) a Roman emperor
(D) the word radical

Correct Answer: B

Explanation: A rational is a ratio of integers with a non-zero denominator.

11. Hippasus linked √2 to the hypotenuse of a right isosceles triangle of side 1, showing √2 is:

(A) an integer
(B) a terminating decimal 1.4 exactly
(C) irrational, not writable as a/b in lowest terms
(D) equal to 22/7

Correct Answer: C

Explanation: No integers a and b give a/b = √2, so the length is irrational.

12. The set of real numbers R is the union:

(A) N □ {0} only
(B) Z □ P only
(C) imaginary numbers □ zero
(D) Q □ Q'

Correct Answer: D

Explanation: Every real is rational or irrational; those two classes together make R.

13. Q ∩ Q' equals:

(A) the empty set
(B) R

(C) N
(D) {0}

Correct Answer: A

Explanation: No number is both a ratio of integers and not a ratio of integers.

14. Because Q □ Q' = R and Q ∩ Q' is empty, Q and Q' are called:

(A) equal sets
(B) exhaustive (and disjoint) subsets of R
(C) complex conjugates
(D) open intervals only

Correct Answer: B

Explanation: They partition the reals: nothing is left out and nothing sits in both.

15. Which number is rational?

(A) √11
(B) √23
(C) 9/11
(D) −√7

Correct Answer: C

Explanation: 9/11 is an integer over a non-zero integer, so it lies in Q.

16. Which number is irrational?

(A) −5
(B) 0
(C) 7
(D) √11

Correct Answer: D

Explanation: 11 is not a perfect square, so √11 cannot be written as a/b.

17. Every integer belongs to:

(A) Q, because n = n/1
(B) Q' only
(C) only N
(D) only the empty set

Correct Answer: A

Explanation: Writing n as n/1 shows every integer is rational.

18. Whole numbers W are:

(A) {…, −2, −1}
(B) {0, 1, 2, 3, …}
(C) {1, 2, 3, …} excluding 0
(D) all irrationals

Correct Answer: B

Explanation: Whole numbers W are {0, 1, 2, 3, …}.

19. Natural numbers N, in this course's classification chart, are:

(A) {0, 1, 2, …}
(B) all negatives
(C) {1, 2, 3, …}
(D) Q'

Correct Answer: C

Explanation: Here N begins at 1; 0 is a whole number but not natural.

20. On a number line the origin is the point corresponding to:

(A) 1
(B) −1

(C) √2
(D) 0

Correct Answer: D

Explanation: Zero is the reference point from which positive and negative directions are measured.

21. Positive integers lie to the:

(A) right of 0
(B) left of 0
(C) same point as −1
(D) origin only

Correct Answer: A

Explanation: Positive integers lie to the right of 0.

22. The distance between consecutive integers on the standard real line is called the:

(A) mantissa
(B) unit length
(C) index of a radical
(D) characteristic

Correct Answer: B

Explanation: That spacing is the unit used to locate other reals.

23. 7/8 as a decimal is 0.875, which is a:

(A) non-terminating non-recurring decimal
(B) purely imaginary value
(C) terminating decimal
(D) Roman numeral

Correct Answer: C

Explanation: The division ends after three digits, so the decimal terminates.

24. 1/3 as a decimal is 0.333…, which is a:

(A) terminating decimal
(B) non-recurring irrational expansion
(C) finite binary only
(D) non-terminating recurring decimal

Correct Answer: D

Explanation: 1/3 as a decimal is 0.333…, which is a non-terminating recurring decimal.

25. √2 ≈ 1.414213… is:

(A) non-terminating and non-recurring
(B) terminating
(C) recurring with period 2
(D) exactly 7/5

Correct Answer: A

Explanation: Irrationals have infinite decimals that never settle into a repeating block.

26. A fraction in lowest terms has a terminating decimal if and only if the denominator's prime factors are among:

(A) 3 and 7 only
(B) 2 and/or 5 only
(C) 11 only
(D) all primes

Correct Answer: B

Explanation: After cancelling, only factors 2 and 5 can be cleared by powers of 10.

27. Which expansion is terminating?

(A) 2/3

(B) 5/6
(C) 3/8
(D) 1/7

Correct Answer: C

Explanation: 3/8 = 0.375 because 8 = 2³, so only the prime 2 appears in the denominator.

28. Which expansion is recurring but not terminating?

(A) 1/4
(B) 1/5
(C) 1/2
(D) 5/6

Correct Answer: D

Explanation: 5/6 — this correctly answers the question.

29. For real a, b the closure law for addition says:

(A) a + b is always in R
(B) a + b may leave R
(C) a + b is always irrational
(D) a + b = 0 always

Correct Answer: A

Explanation: The sum of two reals is again a real number.

30. The commutative law for multiplication is:

(A) a(bc) = (ab)c
(B) ab = ba
(C) a + 0 = a
(D) a(1/a) = 1

Correct Answer: B

Explanation: The commutative law for multiplication is ab = ba.

31. The associative law for addition is:

(A) a + b = b + a
(B) a(b + c) = ab + ac
(C) a + (b + c) = (a + b) + c
(D) a + (−a) = 0

Correct Answer: C

Explanation: Grouping of three addends can be changed without changing the sum.

32. The additive identity for real numbers is:

(A) 1
(B) −1
(C) a
(D) 0

Correct Answer: D

Explanation: The additive identity for real numbers is 0.

33. The multiplicative identity for real numbers is:

(A) 1
(B) 0
(C) −a
(D) 1/a

Correct Answer: A

Explanation: The multiplicative identity for real numbers is 1.

34. The additive inverse of a is:

(A) 1/a

(B) −a
(C) a²
(D) 0 only when a = 1

Correct Answer: B

Explanation: a + (−a) = 0, so −a cancels a under addition.

35. The multiplicative inverse of a (a ≠ 0) is:

(A) −a
(B) a + 1
(C) 1/a
(D) 0

Correct Answer: C

Explanation: a · (1/a) = 1, so 1/a is the reciprocal.

36. Which real has no multiplicative inverse in R?

(A) 1
(B) −1
(C) 2
(D) 0

Correct Answer: D

Explanation: Division by zero is undefined, so 0 has no reciprocal in the reals.

37. Which number is equal to its own additive inverse?

(A) 0
(B) 1
(C) −1
(D) 2

Correct Answer: A

Explanation: 0 — this correctly answers the question.

38. The distributive law of multiplication over addition is:

(A) a + (b + c) = (a + b) + c
(B) a(b + c) = ab + ac
(C) ab = ba
(D) a + 0 = a

Correct Answer: B

Explanation: The distributive law of multiplication over addition is a(b + c) = ab + ac.

39. Evaluate 24(1/6 + 1/8) using the distributive law:

(A) 5
(B) 6
(C) 7
(D) 8

Correct Answer: C

Explanation: 24 · (1/6) + 24 · (1/8) = 4 + 3 = 7, so the correct choice is 7.

40. The same distributive idea over subtraction is:

(A) a(b − c) = ab + ac
(B) a(b − c) = a − bc
(C) a(b − c) = b − ac
(D) a(b − c) = ab − ac

Correct Answer: D

Explanation: Multiplication still distributes, and the minus sign is kept on the second product.

41. Trichotomy for real a and b says that exactly one of the following 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: Trichotomy for real a and b says that exactly one of the following holds a < b, a = b, or a > b.

42. The symbols < and > were introduced by Thomas Harriot around:

(A) 628 AD
(B) 1630
(C) 1202
(D) 1525

Correct Answer: B

Explanation: Those inequality signs date from about 1630 in Harriot's work.

43. The reflexive property of equality is:

(A) if a = b then b = a
(B) if a = b and b = c then a = c
(C) a = a
(D) if a = b then a + c = b + c

Correct Answer: C

Explanation: Every real is equal to itself, so the correct choice is a = a.

44. The symmetric property of equality is:

(A) a = a
(B) if a = b then ac = bc
(C) a < b or a > b only
(D) if a = b then b = a

Correct Answer: D

Explanation: Equality can be read in either direction.

45. The transitive property of equality is:

(A) if a = b and b = c then a = c
(B) a = a
(C) a + 0 = a
(D) ab = ba

Correct Answer: A

Explanation: The transitive property of equality is if a = b and b = c then a = c.

46. If a = b then a + c = b + c is the:

(A) multiplicative property of equality
(B) additive property of equality
(C) trichotomy law
(D) inverse law

Correct Answer: B

Explanation: If a = b then a + c = b + c is the additive property of equality.

47. If a = b and c ≠ 0, then ac = bc is the:

(A) cancellation for addition
(B) associative law
(C) multiplicative property of equality
(D) identity law

Correct Answer: C

Explanation: If a = b and c ≠ 0, then ac = bc is the multiplicative property of equality.

48. If a + c = b + c, then a = b is cancellation with respect to:

(A) multiplication only

(B) radicals only
(C) exponents only
(D) addition

Correct Answer: D

Explanation: The same addend can be removed from both sides.

49. If $a < b$ and $c > 0$, then:

(A) $ac < bc$
(B) $ac > bc$
(C) $ac = bc$ always
(D) the inequality cannot be multiplied

Correct Answer: A

Explanation: If $a < b$ and $c > 0$, then $ac < bc$.

50. If $a < b$ and $c < 0$, then:

(A) $ac < bc$
(B) $ac > bc$
(C) $ac = a + c$
(D) signs stay the same always

Correct Answer: B

Explanation: If $a < b$ and $c < 0$, then $ac > bc$.

51. 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: C

Explanation: If $2 < 5$, then $1/2$ compared with $1/5$ is $1/2 > 1/5$.

52. Graphing $x \leq 3$ on a number line uses a:

(A) hollow circle at 3 and a ray to the left
(B) filled circle at 3 and a ray to the right
(C) hollow circles at -3 and 3 only
(D) filled circle at 3 and a ray to the left

Correct Answer: D

Explanation: Filled means 3 is included; leftward covers all smaller reals.

53. Graphing $-2 < x < 4$ uses:

(A) hollow circles at -2 and 4 with the open segment between
(B) filled circles at -2 and 4
(C) only a filled circle at 0
(D) arrows covering all reals

Correct Answer: A

Explanation: Graphing $-2 < x < 4$ uses hollow circles at -2 and 4 with the open segment between.

54. A square root of 36 is a number m with $m^2 = 36$. Two such reals are:

(A) 6 and 0
(B) 6 and -6
(C) 18 and 2
(D) 36 and 1

Correct Answer: B

Explanation: Both 6^2 and $(-6)^2$ equal 36; they are additive inverses.

55. The principal square root $\sqrt{49}$ is:

(A) -7

(B) ±7 written together as one value
(C) 7
(D) 1/7

Correct Answer: C

Explanation: The principal square root √49 is 7.

56. In √[5]{40}, the index is 5 and the radicand is:

(A) 5
(B) √
(C) 8
(D) 40

Correct Answer: D

Explanation: The index sits in the crook of the radical; the radicand is the expression underneath.

57. If the index is omitted on a radical, it is understood to be:

(A) 2
(B) 3
(C) 0
(D) 10

Correct Answer: A

Explanation: √b means the principal square root, index 2.

58. There is no real number x with $x^2 = -9$ because:

(A) −9 is not an integer
(B) squares of reals are never negative
(C) 9 is prime
(D) radicals cannot have index 2

Correct Answer: B

Explanation: Any real square is ≥ 0, so √(−9) is not real.

59. If $a^n = b$ with n > 1, then a = b^{1/n} equals:

(A) b^n
(B) n^b
(C) √[n]{b}
(D) 1/b

Correct Answer: C

Explanation: The exponential form b^{1/n} is the same as the radical √[n]{b}.

60. The product rule for like-index radicals is:

(A) √[n]{a} · √[m]{b} = √[n]{ab} even if n ≠ m
(B) √[n]{a} + √[n]{b} = √[n]{a+b}
(C) √[n]{a} · √[n]{b} = √[n]{a+b}
(D) √[n]{a} · √[n]{b} = √[n]{ab}

Correct Answer: D

Explanation: Multiply radicands only when the indices match.

61. √3 · √12 equals:

(A) √36 = 6
(B) √15
(C) 15
(D) 9

Correct Answer: A

Explanation: √3 · √12 equals √36 = 6.

62. □8 · □27 equals:

(A) □35

(B) 6
(C) 216
(D) 3

Correct Answer: B

Explanation: □(8·27) = □216 = 6, since 6³ = 216, so the correct choice is 6.

63. The quotient rule √[n]{a}/√[n]{b} equals:

(A) √[n]{a − b}
(B) n√(a/b)
(C) √[n]{a/b}
(D) √[n]{ab}

Correct Answer: C

Explanation: Divide radicands when the indices are the same.

64. □3 · √2 cannot be combined by the product rule because:

(A) 3 and 2 are primes
(B) both are irrational
(C) 2 is even
(D) the indices 3 and 2 are different

Correct Answer: D

Explanation: The product rule needs a common index, so the correct choice is the indices 3 and 2 are different.

65. √[12]{9^6} reduces because 6 and 12 share a factor; it equals:

(A) 3
(B) 9
(C) 81
(D) 6

Correct Answer: A

Explanation: 9^{6/12} = 9^{1/2} = 3, so the correct choice is 3.

66. Write √[15]{t^{10}} with a smaller index (t > 0):

(A) √[5]{t}
(B) √[3]{t²}
(C) t^{15}
(D) √[10]{t}

Correct Answer: B

Explanation: t^{10/15} = t^{2/3} = √[3]{t²}, so the correct choice is √[3]{t²}.

67. In 5⁴, the base is 5 and the exponent 4 means:

(A) 5 + 4
(B) 4⁵
(C) 5 used as a factor four times
(D) 5/4

Correct Answer: C

Explanation: In 5⁴, the base is 5 and the exponent 4 means 5 used as a factor four times.

68. b^{1/n} is defined as:

(A) n^b
(B) b − n
(C) 1/(nb)
(D) √[n]{b}

Correct Answer: D

Explanation: A unit-fraction exponent is an nth root.

69. 27^{2/3} equals:

(A) 9

(B) 18
(C) 6
(D) 3

Correct Answer: A

Explanation: First □27 = 3, then 3² = 9, so the correct choice is 9.

70. 32^{3/5} equals:

(A) 6
(B) 8
(C) 4
(D) 2

Correct Answer: B

Explanation: Fifth root of 32 is 2, then 2³ = 8, so the correct choice is 8.

71. 125^{2/3} equals:

(A) 5
(B) 15
(C) 25
(D) 50

Correct Answer: C

Explanation: □125 = 5 and 5² = 25, so the correct choice is 25.

72. 9^{−3/2} equals:

(A) 27
(B) −27
(C) 3
(D) 1/27

Correct Answer: D

Explanation: 9^{3/2} = (√9)³ = 27, so the negative exponent gives the reciprocal 1/27.

73. (4/9)^{−1/2} equals:

(A) 3/2
(B) 2/3
(C) −3/2
(D) 8/27

Correct Answer: A

Explanation: (4/9)^{−1/2} equals 3/2.

74. The product rule of exponents is:

(A) a^m · a^n = a^{mn}
(B) a^m · a^n = a^{m+n}
(C) a^m · a^n = a^{m−n}
(D) a^m · a^n = (a + a)^{m+n}

Correct Answer: B

Explanation: Same base: add the exponents, so the correct choice is a^m · a^n = a^{m+n}.

75. The quotient rule of exponents is:

(A) a^m / a^n = a^{m+n}
(B) a^m / a^n = a^{mn}
(C) a^m / a^n = a^{m−n}
(D) a^m / a^n = n − m

Correct Answer: C

Explanation: Same base: subtract the exponents, so the correct choice is a^m / a^n = a^{m−n}.

76. (a^m)^n equals:

(A) a^{m+n}

(B) a^{m−n}
(C) na^m
(D) a^{mn}

Correct Answer: D

Explanation: (a^m)^n equals a^{mn}.

77. (ab)^n equals:

(A) a^n b^n
(B) a^n + b^n
(C) ab^n
(D) n(ab)

Correct Answer: A

Explanation: A power distributes over a product, so the correct choice is a^n b^n.

78. (a/b)^{−n} equals:

(A) (a/b)^n
(B) (b/a)^n
(C) a^n / b^{−n}
(D) −(a/b)^n

Correct Answer: B

Explanation: A negative exponent inverts the fraction, then the positive power is applied.

79. $(3^2)^3$ equals:

(A) 3^5
(B) 18
(C) 729
(D) 9^3 only, which is not 729

Correct Answer: C

Explanation: $(3^2)^3 = 3^6 = 729$, so the correct choice is 729.

80. $\sqrt{5} \cdot \sqrt{20}$ equals:

(A) 5
(B) 25
(C) $\sqrt{15}$
(D) 10

Correct Answer: D

Explanation: $\sqrt{5} \cdot \sqrt{20}$ equals 10.

B. Less Important / Secondary Topics

81. Tally marks carved tens of thousands of years ago were an early way to:

(A) record counts before place-value numerals
(B) write fractions a/b
(C) define logarithms
(D) mark complex numbers

Correct Answer: A

Explanation: Tally marks carved tens of thousands of years ago were an early way to record counts before place-value numerals.

82. Sumerians in the Fertile Crescent (present-day Iraq) were among the first to:

(A) invent calculus
(B) use written symbols for numerals on clay
(C) define Dedekind cuts
(D) ban zero

Correct Answer: B

Explanation: Sumerians in the Fertile Crescent (present-day Iraq) were among the first to use written symbols for numerals on clay.

83. Mayan numerals used dots and bars and a shell-like placeholder in a system of base:

(A) 10
(B) 12
(C) 20
(D) 60

Correct Answer: C

Explanation: Mayan numerals used dots and bars and a shell-like placeholder in a system of base 20.

84. Egyptian hieroglyphs used a lotus-flower symbol for:

(A) 10
(B) 100
(C) 1 000 000
(D) 1000

Correct Answer: D

Explanation: Powers of ten each had a picture; the lotus stood for one thousand.

85. Richard Dedekind is associated with a precise definition of:

(A) real numbers
(B) natural numbers only
(C) Roman numerals
(D) tally bones

Correct Answer: A

Explanation: Richard Dedekind is associated with a precise definition of real numbers.

86. Non-integer rationals include numbers such as:

(A) −2, 0, 7
(B) 9/13 and −13/25
(C) √2 and π
(D) only primes

Correct Answer: B

Explanation: They are ratios that are not whole integers.

87. Integers Z split into negative integers and:

(A) only primes
(B) only irrationals
(C) whole numbers W
(D) only unit fractions

Correct Answer: C

Explanation: W = {0, 1, 2, …} sits inside Z together with the negatives.

88. The coordinate of a point on the number line is:

(A) always an integer
(B) the index of a radical
(C) always positive
(D) the real number associated with that point

Correct Answer: D

Explanation: Each point is labelled by exactly one real.

89. −π ≈ −3.14159… lies between:

(A) −3 and −4
(B) −2 and −3
(C) 3 and 4
(D) 0 and −1

Correct Answer: A

Explanation: $-\pi \approx -3.14159\ldots$ lies between -3 and -4.

90. Natural numbers are typically used in daily life for:

(A) exact circle area with π
(B) counting discrete objects
(C) signed temperatures below zero
(D) wave mechanics only

Correct Answer: B

Explanation: Stock-taking and head-counts are natural-number jobs.

91. Integers are the natural tool for recording:

(A) only probabilities between 0 and 1
(B) only repeating decimals
(C) temperature, gain/loss, or rise/fall
(D) only cube roots

Correct Answer: C

Explanation: Signed whole amounts capture direction as well as size.

92. Engineers meet irrationals such as π when they compute:

(A) only bank interest
(B) only counting sheep
(C) only ISBN codes
(D) circumferences and areas of circles

Correct Answer: D

Explanation: Circle formulae introduce π, which is irrational.

93. Rene Descartes popularised modern exponential notation but often wrote xx instead of:

(A) x^2
(B) x^3
(C) $\sqrt{x}$
(D) x^0

Correct Answer: A

Explanation: He used a repeated letter for the square.

94. The radical sign itself was first used around:

(A) 628 AD
(B) 1525 AD
(C) 1202
(D) 1630

Correct Answer: B

Explanation: The radical sign itself was first used around 1525 AD.

95. Imaginary numbers are introduced so that one can discuss:

(A) only whole-number exponents
(B) terminating decimals
(C) square roots of negative numbers
(D) Roman numerals

Correct Answer: C

Explanation: Imaginary numbers are introduced so that one can discuss square roots of negative numbers.

96. In $3 \cdot 3 \cdot 3 \cdot 3 = 3^4$ the factored form is the left product and the exponential form is:

(A) 3 + 4
(B) 4^3
(C) 12
(D) 3^4

Correct Answer: D

Explanation: In $3 \cdot 3 \cdot 3 \cdot 3 = 3^4$ the factored form is the left product and the exponential form is 3^4.

97. An exponent of 2 is read as a square; an exponent of 3 is read as a:

(A) cube
(B) root
(C) mantissa
(D) characteristic

Correct Answer: A

Explanation: Those two nicknames are standard, so the correct choice is cube.

98. When the exponent is a natural number, the base may be:

(A) only positive integers
(B) any real number
(C) only 10
(D) never negative

Correct Answer: B

Explanation: Repeated multiplication is defined for every real base.

99. $\sqrt{(2a)} \cdot \sqrt{(8a)}$ for $a > 0$ equals:

(A) $\sqrt{10}$ a
(B) $2a^2$
(C) $\sqrt{(16a^2)} = 4a$
(D) 16a

Correct Answer: C

Explanation: $\sqrt{(16a^2)} = 4a$ when a is positive, so the correct choice is $\sqrt{(16a^2)} = 4a$.

100. 4^{5/2} equals:

(A) 8
(B) 16
(C) 64
(D) 32

Correct Answer: D

Explanation: $\sqrt{4} = 2$ and $2^5 = 32$, so the correct choice is 32.

101. 25^{3/2} equals:

(A) 125
(B) 15
(C) 75
(D) 625

Correct Answer: A

Explanation: $\sqrt{25} = 5$ and $5^3 = 125$, so the correct choice is 125.

102. $2^5 \cdot 2^{-2}$ equals:

(A) 2^7 = 128
(B) $2^3 = 8$
(C) 2^{10}
(D) 1/4

Correct Answer: B

Explanation: Add exponents: $5 + (-2) = 3$, so 8, so the correct choice is $2^3 = 8$.

103. 5^0 equals:

(A) 0
(B) 5
(C) 1
(D) undefined

Correct Answer: C

Explanation: Any non-zero real to the power 0 is 1, so the correct choice is 1.

104. (−8)^{1/3} equals:

(A) 2
(B) 8
(C) not a real number
(D) −2

Correct Answer: D

Explanation: The real cube root of −8 is −2 because $(-2)^3 = -8$.

105. 22/7 is:

(A) rational, hence not equal to π
(B) equal to π
(C) irrational
(D) not a real number

Correct Answer: A

Explanation: 22/7 is a ratio of integers; π is irrational, so they differ.

106. 0.272727… (27 repeating) is:

(A) irrational
(B) rational, equal to 27/99 = 3/11
(C) not a real
(D) a terminating decimal 0.27

Correct Answer: B

Explanation: 0.272727… (27 repeating) is rational, equal to 27/99 = 3/11.

107. Commutative property fails for:

(A) addition of reals
(B) multiplication of reals
(C) subtraction of reals
(D) addition and multiplication both

Correct Answer: C

Explanation: a − b is not generally b − a, so the correct choice is subtraction of reals.

108. If a · b = a and a ≠ 0, then b equals:

(A) 0
(B) a
(C) 1/a
(D) 1

Correct Answer: D

Explanation: Factor a(b − 1) = 0 with a ≠ 0 forces b = 1, the multiplicative identity.

MATHEMATICS MCQ BOOKLET

Grade 9 · Chapter 2 · Logarithms

FBISE / National Book Foundation Model Textbook companion

by Public Library

Independent MCQs on scientific notation, logarithms, characteristic and mantissa, antilogarithms, common versus natural logs, and log 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. A number c is in scientific notation when it is written as d × 10^n with n an integer and:

(A) 1 ≤ d < 10
(B) 0 < d < 1
(C) d ≥ 10
(D) d = 10 always

Correct Answer: A

Explanation: The leading factor must have exactly one non-zero digit to the left of the decimal.

2. 0.00072 in scientific notation is:

(A) 7.2 × 10^{−3}
(B) 7.2 × 10^{−4}
(C) 72 × 10^{−5}
(D) 0.72 × 10^{−3}

Correct Answer: B

Explanation: Move the decimal four places right: 7.2, so the power is −4.

3. 720 000 in scientific notation is:

(A) 7.2 × 10^4
(B) 72 × 10^4
(C) 7.2 × 10^5
(D) 7.2 × 10^6

Correct Answer: C

Explanation: 720 000 in scientific notation is 7.2 × 10^5.

4. 4.08 already has one digit left of the decimal, so in scientific notation it is:

(A) 4.08 × 10^1
(B) 40.8 × 10^{−1}
(C) 0.408 × 10^1
(D) 4.08 × 10^0

Correct Answer: D

Explanation: Any d with 1 ≤ d < 10 is written as d × 10^0.

5. 0.00302 in scientific notation is:

(A) 3.02 × 10^{−3}
(B) 3.02 × 10^{−2}
(C) 3.02 × 10^{−4}
(D) 30.2 × 10^{−4}

Correct Answer: A

Explanation: 0.00302 in scientific notation is 3.02 × 10^{−3}.

6. 5.1 × 10^{−4} in standard (ordinary) notation is:

(A) 0.0051
(B) 0.00051
(C) 51 000

(D) 0.051

Correct Answer: B

Explanation: 5.1 × 10^{−4} in standard (ordinary) notation is 0.00051.

7. 3.7 × 10^5 in standard notation is:

(A) 3700
(B) 37 000
(C) 370 000
(D) 3 700 000

Correct Answer: C

Explanation: 3.7 × 10^5 in standard notation is 370 000.

8. If the original number is greater than 10, the exponent n in scientific notation is:

(A) zero
(B) negative
(C) always 1
(D) positive

Correct Answer: D

Explanation: The decimal must move left, which is recorded as a positive power of 10.

9. If the original number is smaller than 1, the exponent n is:

(A) negative
(B) positive
(C) always 0
(D) always 10

Correct Answer: A

Explanation: The decimal must move right, recorded as a negative power of 10.

10. (2.0 × 10^3) × (4.0 × 10^2) in scientific notation is:

(A) 8.0 × 10^6
(B) 8.0 × 10^5
(C) 6.0 × 10^5
(D) 8.0 × 10^1

Correct Answer: B

Explanation: 2 × 4 = 8 and 10^{3+2} = 10^5, so the correct choice is 8.0 × 10^5.

11. (9.0 × 10^6) / (3.0 × 10^2) equals:

(A) 3.0 × 10^3
(B) 6.0 × 10^4
(C) 3.0 × 10^4
(D) 3.0 × 10^8

Correct Answer: C

Explanation: 9/3 = 3 and 10^{6−2} = 10^4, so the correct choice is 3.0 × 10^4.

12. Light travelling 1.5 × 10^8 km at 3.0 × 10^5 km/s takes:

(A) 50 s
(B) 5 s
(C) 5000 s
(D) 500 s

Correct Answer: D

Explanation: Light travelling 1.5 × 10^8 km at 3.0 × 10^5 km/s takes 500 s.

13. If b^y = x with b > 0, b ≠ 1 and x > 0, then y equals:

(A) log_b x
(B) log_x b
(C) x^b

(D) b/x

Correct Answer: A

Explanation: The logarithm is defined as the exponent that produces x from base b.

14. 2^5 = 32 is equivalent to:

(A) log_2 5 = 32
(B) log_2 32 = 5
(C) log_32 2 = 5
(D) log_5 32 = 2

Correct Answer: B

Explanation: 2^5 = 32 is equivalent to log_2 32 = 5.

15. log_3 81 = 4 because:

(A) 3 + 81 = 4
(B) 81/3 = 4
(C) 3^4 = 81
(D) 4^3 = 81

Correct Answer: C

Explanation: Three to the fourth power is 81, so the log base 3 of 81 is 4.

16. log_2 (1/16) equals:

(A) 4
(B) 1/4
(C) 16
(D) −4

Correct Answer: D

Explanation: 2^{−4} = 1/16, so the logarithm is −4, so the correct choice is −4.

17. log_5 625 equals:

(A) 4
(B) 3
(C) 5
(D) 25

Correct Answer: A

Explanation: 5^4 = 625, so the correct choice is 4.

18. log_8 2 equals:

(A) 3
(B) 1/3
(C) 4
(D) −3

Correct Answer: B

Explanation: 8^{1/3} = 2, so the log is 1/3, so the correct choice is 1/3.

19. log_9 27 equals:

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

Correct Answer: C

Explanation: 9^{3/2} = (3^2)^{3/2} = 3^3 = 27, so the correct choice is 3/2.

20. log_25 5 equals:

(A) 2
(B) 5
(C) 25

(D) 1/2

Correct Answer: D

Explanation: 25^{1/2} = 5, so the correct choice is 1/2.

21. log_b 1 equals:

(A) 0
(B) 1
(C) b
(D) undefined always

Correct Answer: A

Explanation: Any allowed base to the power 0 is 1, so the correct choice is 0.

22. log_b b equals:

(A) 0
(B) 1
(C) b
(D) −1

Correct Answer: B

Explanation: b^1 = b, so the log of the base is 1, so the correct choice is 1.

23. log_a (a^x) equals:

(A) a
(B) 1
(C) x
(D) 0

Correct Answer: C

Explanation: The log undoes the exponential with the same base.

24. log_1 8 is:

(A) 8
(B) 0
(C) 1
(D) undefined

Correct Answer: D

Explanation: Base 1 is forbidden: 1 to any power stays 1, never 8.

25. log_5 (−1) is:

(A) undefined in the reals
(B) −1
(C) 0
(D) 1

Correct Answer: A

Explanation: A positive base never yields a negative, so the log of a negative is not real.

26. log_2 0 is:

(A) 0
(B) undefined
(C) 1
(D) −∞ written as 0 in tables

Correct Answer: B

Explanation: No real exponent of 2 produces 0, so the correct choice is undefined.

27. If log_2 x = 5, then x equals:

(A) 10
(B) 25
(C) 32

(D) 64

Correct Answer: C

Explanation: x = 2^5 = 32, so the correct choice is 32.

28. If log_64 x = −2/3, then x equals:

(A) 16
(B) 8
(C) 1/8
(D) 1/16

Correct Answer: D

Explanation: If log_64 x = −2/3, then x equals 1/16.

29. If log_b (1/32) = −5, then b equals:

(A) 2
(B) 5
(C) 32
(D) 1/2

Correct Answer: A

Explanation: b^{−5} = 2^{−5} forces b = 2, so the correct choice is 2.

30. If log_27 3 = y, then y equals:

(A) 3
(B) 1/3
(C) 9
(D) −3

Correct Answer: B

Explanation: 27^y = 3 □ (3^3)^y = 3^1 □ 3y = 1, so the correct choice is 1/3.

31. If log_b (y^3 + 1) = log_b 28 and logs are defined, then y equals:

(A) 9
(B) 27
(C) 3
(D) 28

Correct Answer: C

Explanation: One-to-one: y^3 + 1 = 28 so y^3 = 27 and y = 3.

32. Common logarithms (Briggs) use base:

(A) e
(B) 2
(C) 1
(D) 10

Correct Answer: D

Explanation: log x with no base written means log_10 x.

33. Natural (Naperian) logarithms use base e, which is:

(A) an irrational near 2.71828
(B) exactly 22/7
(C) exactly 10
(D) exactly 2

Correct Answer: A

Explanation: e is transcendental; school value is about 2.71828.

34. ln x is another way to write:

(A) log_10 x
(B) log_e x
(C) log_2 x

(D) antilog x

Correct Answer: B

Explanation: ln x is another way to write log_e x.

35. A logarithm equals characteristic plus mantissa, where the characteristic is the:

(A) fractional part
(B) always positive decimal
(C) integral part
(D) table difference only

Correct Answer: C

Explanation: The characteristic is the integer piece; the mantissa is the decimal piece.

36. The characteristic of log(4.37 × 10^3) is:

(A) 4
(B) 0.437
(C) −3
(D) 3

Correct Answer: D

Explanation: In scientific form d × 10^n the characteristic is n.

37. The characteristic of log(6.02 × 10^{−4}) is:

(A) −4, written bar 4
(B) 4
(C) 6
(D) 0

Correct Answer: A

Explanation: The power of 10 is −4, recorded as a barred 4 so the mantissa can stay positive.

38. For a whole number, the number of digits equals:

(A) the characteristic
(B) characteristic + 1
(C) the mantissa
(D) 10^n

Correct Answer: B

Explanation: A 4-digit integer such as 1009 has characteristic 3.

39. The mantissa of a common log is always:

(A) negative
(B) an integer ≥ 1
(C) a number m with 0 ≤ m < 1
(D) greater than 10

Correct Answer: C

Explanation: The mantissa of a common log is always a number m with 0 ≤ m < 1.

40. log 0.012 written as characteristic plus mantissa uses characteristic:

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

Correct Answer: D

Explanation: 0.012 = 1.2 × 10^{−2}, so the characteristic is −2.

41. One must not rewrite bar 2.0899 as −2.0899 because that would make the:

(A) mantissa negative as well
(B) characteristic positive
(C) base equal to e

(D) antilog undefined

Correct Answer: A

Explanation: One must not rewrite bar 2.0899 as −2.0899 because that would make the mantissa negative as well.

42. If 1 < x < 10, then log_10 x lies in:

(A) (1, 10)
(B) (0, 1)
(C) (−1, 0)
(D) [10, ∞)

Correct Answer: B

Explanation: log 1 = 0 and log 10 = 1, so numbers in between have logs between 0 and 1.

43. log 10 equals:

(A) 0
(B) 10
(C) 1
(D) e

Correct Answer: C

Explanation: 10^1 = 10, so the correct choice is 1.

44. log 0.001 equals:

(A) 3
(B) 1/3
(C) 0.001
(D) −3

Correct Answer: D

Explanation: 10^{−3} = 0.001, so the correct choice is −3.

45. If log x = y, then x is called the:

(A) antilog of y
(B) mantissa of y
(C) characteristic of y only
(D) base of y

Correct Answer: A

Explanation: If log x = y, then x is called the antilog of y.

46. When reading an antilog table one uses the:

(A) characteristic only
(B) mantissa, then places the decimal with the characteristic
(C) base e always
(D) Richter magnitude

Correct Answer: B

Explanation: Digits come from the mantissa; the characteristic only locates the decimal point.

47. antilog 2 equals:

(A) 2
(B) 20
(C) 100
(D) 0.01

Correct Answer: C

Explanation: 10^2 = 100, so the correct choice is 100.

48. antilog 0 equals:

(A) 0
(B) 10
(C) undefined

(D) 1

Correct Answer: D

Explanation: 10^0 = 1, so the correct choice is 1.

49. antilog(bar 1.0000) equals:

(A) 0.1
(B) 10
(C) 1
(D) −10

Correct Answer: A

Explanation: Characteristic −1 with mantissa 0 is 10^{−1} = 0.1.

50. The product law of logarithms is:

(A) log(mn) = log m · log n
(B) log(mn) = log m + log n
(C) log(mn) = log m − log n
(D) log(m + n) = log m + log n

Correct Answer: B

Explanation: A product inside a log becomes a sum of logs (when defined).

51. The quotient law of logarithms is:

(A) log(m/n) = log m / log n
(B) log(m/n) = log(m − n)
(C) log(m/n) = log m − log n
(D) log(m/n) = n log m

Correct Answer: C

Explanation: The quotient law of logarithms is log(m/n) = log m − log n.

52. The power law of logarithms is:

(A) log(m^n) = (log m)^n
(B) log(m^n) = log m + n
(C) log(m^n) = m log n
(D) log(m^n) = n log m

Correct Answer: D

Explanation: An exponent on the argument comes out as a coefficient.

53. log 8 + log 2 (same base) equals:

(A) log 16
(B) log 10
(C) log 6
(D) log 4

Correct Answer: A

Explanation: 8 × 2 = 16, so the sum is log 16, so the correct choice is log 16.

54. log 72 − log 8 equals:

(A) log 64
(B) log 9
(C) log 80
(D) log 576

Correct Answer: B

Explanation: 72/8 = 9, so the correct choice is log 9.

55. 2 log 5 equals:

(A) log 7
(B) log 10
(C) log 25

(D) log 32

Correct Answer: C

Explanation: 2 log 5 = log(5²) = log 25, so the correct choice is log 25.

56. 3 log 2 + log 5 equals:

(A) log 30
(B) log 15
(C) log 8
(D) log 40

Correct Answer: D

Explanation: log(2³ · 5) = log 40, so the correct choice is log 40.

57. log(50 − 5) compared with log 50 − log 5 is:

(A) not equal in general
(B) always equal
(C) equal only if logs are natural
(D) equal only base 2

Correct Answer: A

Explanation: The log of a difference is not the difference of logs.

58. Change of base: log_b m equals:

(A) log_a m · log_a b
(B) log_a m / log_a b
(C) log_a (m/b)
(D) m / b

Correct Answer: B

Explanation: Divide logs that share a convenient base a (often 10 or e).

59. log_2 8 by change of base to 10 is:

(A) log 2 / log 8
(B) 8/2
(C) log 8 / log 2 which equals 3
(D) log(8 − 2)

Correct Answer: C

Explanation: log 8 / log 2 = 0.9030/0.3010 = 3, so the correct choice is log 8 / log 2 which equals 3.

60. The identity log_b a · log_a b equals:

(A) 0
(B) ab
(C) a + b
(D) 1

Correct Answer: D

Explanation: Each factor is the reciprocal of the other.

61. log_c a equals:

(A) 1 / log_a c
(B) log_a c
(C) log_a 1
(D) c/a

Correct Answer: A

Explanation: This is the reciprocal form of change of base.

62. The cyclic product log_b a · log_c b · log_a c equals:

(A) 0
(B) 1
(C) abc

(D) a + b + c

Correct Answer: B

Explanation: The cyclic product log_b a · log_c b · log_a c equals 1.

63. Using log 2 ≈ 0.3010 and log 3 ≈ 0.4771, log 6 equals:

(A) 0.1761
(B) 0.9030
(C) 0.7781
(D) 1.4771

Correct Answer: C

Explanation: Using log 2 ≈ 0.3010 and log 3 ≈ 0.4771, log 6 equals 0.7781.

64. Using log 2 ≈ 0.3010, log 3 ≈ 0.4771, log 5 ≈ 0.6990, log 30 equals:

(A) 1.1761
(B) 0.8451
(C) 2.0000
(D) 1.4771

Correct Answer: D

Explanation: 30 = 2·3·5, so 0.3010 + 0.4771 + 0.6990 = 1.4771.

65. Using log 2 ≈ 0.3010, log 8 equals:

(A) 0.9030
(B) 0.6020
(C) 2.4080
(D) 0.3010

Correct Answer: A

Explanation: 8 = 2^3 so 3 × 0.3010 = 0.9030, so the correct choice is 0.9030.

66. Using log 2 ≈ 0.3010 and log 3 ≈ 0.4771, log 12 equals:

(A) 0.7781
(B) 1.0791
(C) 0.1761
(D) 1.5561

Correct Answer: B

Explanation: 12 = 4·3 = 2^2·3 so 0.6020 + 0.4771 = 1.0791.

67. Using log 3 ≈ 0.4771 and log 5 ≈ 0.6990, log 15 equals:

(A) 0.2219
(B) 0.6990
(C) 1.1761
(D) 3.3161

Correct Answer: C

Explanation: 15 = 3·5 so 0.4771 + 0.6990 = 1.1761, so the correct choice is 1.1761.

68. log(1/2) using log 2 ≈ 0.3010 equals:

(A) 0.3010
(B) 2.3010
(C) 1.3010
(D) −0.3010

Correct Answer: D

Explanation: log(1/2) = − log 2 = −0.3010, so the correct choice is −0.3010.

69. The Richter magnitude is M = log(I / I_0), so it is a:

(A) common-log scale in intensity
(B) linear scale in I
(C) natural-log of time only

(D) base-2 count of aftershocks

Correct Answer: A

Explanation: Each step in M is a power-of-ten change in I.

70. If two earthquakes differ by 1.0 on the Richter scale, the intensity ratio is about:

(A) 2
(B) 10
(C) 100
(D) 0.1

Correct Answer: B

Explanation: antilog(1) = 10, so one magnitude step is a tenfold intensity jump.

71. If two earthquakes differ by 2.0 on the Richter scale, the intensity ratio is about:

(A) 2
(B) 20
(C) 100
(D) 4

Correct Answer: C

Explanation: 10^2 = 100, so the correct choice is 100.

72. If log(I_2 / I_1) = 0.6, then I_2 / I_1 is about:

(A) 0.6
(B) 6
(C) 60
(D) 4

Correct Answer: D

Explanation: If log(I_2 / I_1) = 0.6, then I_2 / I_1 is about 4.

73. Laws of logs turn a product into:

(A) a sum of logs
(B) a quotient of logs
(C) an exponent of logs
(D) a difference of bases

Correct Answer: A

Explanation: That is why lengthy multiplications become additions.

74. Laws of logs turn a quotient into:

(A) a product of logs
(B) a difference of logs
(C) a sum of bases
(D) an antilog of 0

Correct Answer: B

Explanation: Laws of logs turn a quotient into a difference of logs.

75. Laws of logs turn a power or root into:

(A) an impossible operation
(B) addition of the base
(C) multiplication of a coefficient times a log
(D) a change of mantissa only

Correct Answer: C

Explanation: Laws of logs turn a power or root into multiplication of a coefficient times a log.

76. log_√10 (100) equals:

(A) 1
(B) 2
(C) 10

(D) 4

Correct Answer: D

Explanation: √10 = 10^{1/2} and 100 = 10^2, so the log is 2 / (1/2) = 4.

77. log_√10 (100²) equals:

(A) 8
(B) 4
(C) 2
(D) 1

Correct Answer: A

Explanation: log_√10 (100²) equals 8.

78. 5 log 2 − 2 log 5 equals:

(A) (log 2)^5 / (log 5)^2
(B) log(2^5 / 5^2)
(C) (5/2) log(2/5)
(D) log 2 − log 5

Correct Answer: B

Explanation: 5 log 2 − 2 log 5 equals log(2^5 / 5^2).

79. If log_√x 25 = 4 with x > 0, x ≠ 1, then x equals:

(A) 25
(B) 625
(C) 5
(D) undefined

Correct Answer: C

Explanation: (√x)^4 = 25 □ (x^{1/2})^4 = x² = 25 □ x = 5 (x = −5 is not allowed as a log base).

80. Which of log 1, log 0, log(−2), log_{−2} 2 is defined as a real common log?

(A) log 0
(B) log(−2)
(C) log_{−2} 2
(D) log 1

Correct Answer: D

Explanation: log 1 = 0; zero, negatives, and negative bases are not allowed in the real common log.

B. Less Important / Secondary Topics

81. Al-Khwarizmi's name is historically linked to the word:

(A) logarithm
(B) geometry
(C) mantissa
(D) Richter

Correct Answer: A

Explanation: Al-Khwarizmi's name is historically linked to the word logarithm.

82. John Napier in the late 1500s extended earlier work by starting:

(A) Hindu-Arabic digits
(B) log tables
(C) Roman numerals
(D) set theory

Correct Answer: B

Explanation: John Napier in the late 1500s extended earlier work by starting log tables.

83. Henry Briggs is associated with:

(A) base-e logs only

(B) the empty set
(C) common (base-10) logarithms
(D) Mayan zero

Correct Answer: C

Explanation: Henry Briggs is associated with common (base-10) logarithms.

84. In an integer, the decimal point is understood to sit:

(A) before the first digit
(B) in the middle always
(C) nowhere
(D) to the right of the last digit

Correct Answer: D

Explanation: 543 means 543.0 when counting places for scientific notation.

85. 6.25 in scientific notation is:

(A) 6.25 × 10^0
(B) 6.25 × 10^1
(C) 0.625 × 10^2
(D) 62.5 × 10^{−1}

Correct Answer: A

Explanation: The coefficient already satisfies $1 \le d < 10$, so the power is 0.

86. Exponential models (and thus logs) appear when scientists estimate:

(A) only Roman dates
(B) ages of fossils or half-lives of radioisotopes
(C) only tally marks
(D) only set unions

Correct Answer: B

Explanation: Growth and decay invert as logarithms, so the correct choice is ages of fossils or half-lives of radioisotopes.

87. ln 1 equals:

(A) 1
(B) e
(C) 0
(D) undefined

Correct Answer: C

Explanation: e^0 = 1, so the natural log of 1 is 0, so the correct choice is 0.

88. ln e equals:

(A) 0
(B) e
(C) 10
(D) 1

Correct Answer: D

Explanation: e^1 = e, so the correct choice is 1.

89. ln(e^3) equals:

(A) 3
(B) e^3
(C) ln 3
(D) 1/3

Correct Answer: A

Explanation: The natural log undoes the exponential, so the correct choice is 3.

90. If log x_1 = log x_2 (same base, arguments positive), then:

(A) $x_1 + x_2 = 0$
(B) $x_1 = x_2$
(C) $x_1 = 1/x_2$
(D) $x_1 = 10$

Correct Answer: B

Explanation: Logs with a fixed base are one-to-one on $(0, \infty)$.

91. log 100 equals:

(A) 1
(B) 10
(C) 2
(D) 0

Correct Answer: C

Explanation: $10^2 = 100$, so the correct choice is 2.

92. A 3-digit whole number has characteristic:

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

Correct Answer: D

Explanation: Digits = characteristic + 1, so $3 = n + 1$ gives $n = 2$.

93. The characteristic of log 0.00327 is:

(A) bar 3
(B) 3
(C) bar 2
(D) 0.327

Correct Answer: A

Explanation: $0.00327 = 3.27 \times 10^{-3}$, so the correct choice is bar 3.

94. Slide rules historically performed hard arithmetic by using:

(A) set Venn diagrams
(B) logarithmic scales
(C) Roman numerals only
(D) tally bones

Correct Answer: B

Explanation: Slide rules historically performed hard arithmetic by using logarithmic scales.

95. Do not confuse $\log_a m / \log_a n$ with:

(A) change of base toward $\log_n m$
(B) the power law
(C) the quotient law $\log(m/n)$
(D) antilog

Correct Answer: C

Explanation: A ratio of logs is change of base; the quotient law has one log of a fraction.

96. $\log_b (M + N)$ equals:

(A) $\log_b M + \log_b N$ always
(B) $\log_b (MN)$
(C) $N \log_b M$
(D) not in general equal to $\log_b M + \log_b N$

Correct Answer: D

Explanation: $\log_b (M + N)$ equals not in general equal to $\log_b M + \log_b N$.

97. $\log_7 7^{-3} + \log_2 4^3$ equals:

(A) 3
(B) 0
(C) 6
(D) 9

Correct Answer: A

Explanation: log_7 7^{−3} = −3 and log_2 (4^3) = 3 · log_2 4 = 3 · 2 = 6, so −3 + 6 = 3.

98. log_2 4 − log_3 1 equals:

(A) 0
(B) 2
(C) 1
(D) 4

Correct Answer: B

Explanation: log_2 4 = 2 and log_3 1 = 0, so the difference is 2.

99. log_3 9 − log_b 1 equals:

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

Correct Answer: C

Explanation: log_3 9 = 2 and any log of 1 is 0, so the correct choice is 2.

100. If log_2 x − log_2 (16^{1/4}) = 3, then x equals:

(A) 4
(B) 8
(C) 32
(D) 16

Correct Answer: D

Explanation: 16^{1/4} = 2, so log_2 (x/2) = 3 □ x/2 = 8 □ x = 16.

101. If log_2 (x² − 1) = log_2 3, then a valid real solution is:

(A) x = 2
(B) x = 0
(C) x = 1
(D) x = −1

Correct Answer: A

Explanation: x² − 1 = 3 □ x² = 4 □ x = ±2; both give positive arguments. 2 is listed.

102. The base of a natural logarithm is:

(A) rational
(B) irrational
(C) an integer 10
(D) always 2

Correct Answer: B

Explanation: e is irrational (in fact transcendental).

103. log_√3 (√3) equals:

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

Correct Answer: C

Explanation: Log of the base is 1, so the correct choice is 1.

104. log_√7 343 equals:

(A) 2
(B) 3
(C) 7
(D) 6

Correct Answer: D

Explanation: 343 = 7^3 = (√7)^6, so the log is 6, so the correct choice is 6.

105. (4.0 × 10^{−2}) × (2.0 × 10^5) in scientific notation is:

(A) 8.0 × 10^3
(B) 8.0 × 10^2
(C) 6.0 × 10^3
(D) 8.0 × 10^{−10}

Correct Answer: A

Explanation: 8.0 × 10^{−2+5} = 8.0 × 10^3, so the correct choice is 8.0 × 10^3.

106. 9.067 × 10^{−5} in standard notation is:

(A) 0.0009067
(B) 0.00009067
(C) 90 670
(D) 0.009067

Correct Answer: B

Explanation: Five places left from 9.067, so the correct choice is 0.00009067.

107. log_8 (log_x x − log_b b^{−7}), when defined, equals:

(A) 8
(B) −6
(C) 1
(D) 0

Correct Answer: C

Explanation: log_x x = 1 and log_b b^{−7} = −7, so the inside is 1 − (−7) = 8, and log_8 8 = 1.

108. A logarithm is essentially an:

(A) angle
(B) area
(C) ordered pair
(D) exponent

Correct Answer: D

Explanation: y = log_b x means b^y = x, so y is the exponent.

MATHEMATICS MCQ BOOKLET

Grade 9 · Chapter 3 · Sets and Relations

FBISE / National Book Foundation Model Textbook companion

by Public Library

Independent MCQs on sets, Venn diagrams, operations on two and three sets, laws of union and intersection, Cartesian products, and binary relations. 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 set is a well-defined collection of:

(A) distinct objects
(B) possibly repeated objects with no rule
(C) only numbers greater than 10
(D) ordered pairs only

Correct Answer: A

Explanation: Well-defined membership and no repetition are part of the definition.

2. “Tall students in a class” fails to be a set mainly because it is not:

(A) written in roster form
(B) well-defined: tall has no sharp test
(C) a subset of N
(D) disjoint from Q

Correct Answer: B

Explanation: “Tall students in a class” fails to be a set mainly because it is not well-defined: tall has no sharp test.

3. “Stones with mass less than 1 kg” is well-defined because:

(A) stones are pretty
(B) all stones weigh 1 kg
(C) a measuring test decides in or out
(D) mass is irrational

Correct Answer: C

Explanation: “Stones with mass less than 1 kg” is well-defined because a measuring test decides in or out.

4. In roster form, repeating an element is not allowed, so the natural numbers among 2, 3, 3, 4, −9 are:

(A) {2, 3, 3, 4, −9}
(B) {−9, 2, 3, 4}
(C) {3}
(D) {2, 3, 4}

Correct Answer: D

Explanation: −9 is not natural here, and 3 is listed once.

5. The set of even primes is:

(A) {2}
(B) empty
(C) {2, 4}
(D) all even numbers

Correct Answer: A

Explanation: 2 is the unique even prime, so the correct choice is {2}.

6. The set of natural numbers less than 1 is:

(A) {0}
(B) the empty set
(C) {1}

(D) {1, 2, …}

Correct Answer: B

Explanation: N starts at 1 in this course, so nothing in N is smaller than 1.

7. Set-builder form writes a set by a:

(A) picture of mangoes only
(B) Venn shading only
(C) defining rule for a variable x
(D) Cartesian graph only

Correct Answer: C

Explanation: One names a typical element and the condition it must satisfy.

8. The vertical bar in {x | x □ Z} is read as:

(A) divides
(B) union
(C) absolute value
(D) such that

Correct Answer: D

Explanation: It introduces the membership rule, so the correct choice is such that.

9. N = {1, 2, 3, …} denotes:

(A) natural numbers
(B) whole numbers
(C) integers
(D) rationals

Correct Answer: A

Explanation: N = {1, 2, 3, …} denotes natural numbers.

10. W = {0, 1, 2, 3, …} denotes:

(A) natural numbers excluding 0
(B) whole numbers
(C) integers
(D) primes

Correct Answer: B

Explanation: W = {0, 1, 2, 3, …} denotes whole numbers.

11. Z = {0, ±1, ±2, …} denotes:

(A) naturals
(B) wholes only
(C) integers
(D) rationals only

Correct Answer: C

Explanation: Z = {0, ±1, ±2, …} denotes integers.

12. Q is the set of rationals p/q with p, q integers and:

(A) q = 0
(B) p = 0 always
(C) p > q
(D) q ≠ 0

Correct Answer: D

Explanation: Division by zero is excluded, so the correct choice is q ≠ 0.

13. R in set-builder form is {x | x □ Q or x □ Q'}, which means reals are:

(A) rationals or irrationals
(B) only integers
(C) only primes

(D) only wholes

Correct Answer: A

Explanation: R in set-builder form is {x | x □ Q or x □ Q'}, which means reals are rationals or irrationals.

14. The real numbers cannot be listed in a complete roster because:

(A) R is empty
(B) R is infinite in a way that a finite or simple list cannot exhaust it
(C) R has only 10 elements
(D) roster form is illegal

Correct Answer: B

Explanation: Descriptive or set-builder language is used instead of a full.

15. A □ B is the set of elements that belong to:

(A) both A and B only
(B) neither A nor B
(C) A or B or both
(D) A but not B

Correct Answer: C

Explanation: Union collects everything that appears in at least one of the sets.

16. A ∩ B is the set of elements that belong to:

(A) A or B
(B) A but not B
(C) the universal set only
(D) both A and B

Correct Answer: D

Explanation: A ∩ B is the set of elements that belong to both A and B.

17. If P = {2, 4, 6, 8} and Q = {6, 8, 10}, then P □ Q equals:

(A) {2, 4, 6, 8, 10}
(B) {6, 8}
(C) {2, 4, 10}
(D) {10}

Correct Answer: A

Explanation: List each distinct element from either set once.

18. If P = {2, 4, 6, 8} and Q = {6, 8, 10}, then P ∩ Q equals:

(A) {2, 4}
(B) {6, 8}
(C) {10}
(D) empty

Correct Answer: B

Explanation: Only 6 and 8 sit in both, so the correct choice is {6, 8}.

19. A − B is:

(A) {x | x □ A and x □ B}
(B) {x | x □ B and x □ A}
(C) {x | x □ A and x □ B}
(D) A □ B

Correct Answer: C

Explanation: Difference keeps members of A that are not in B.

20. If A = {2, 4, 6, 8} and B = {4, 8, 10}, then A − B equals:

(A) {4, 8}
(B) {10}
(C) {2, 4, 6, 8, 10}

(D) {2, 6}

Correct Answer: D

Explanation: If A = {2, 4, 6, 8} and B = {4, 8, 10}, then A − B equals {2, 6}.

21. In general A − B compared with B − A is:

(A) not necessarily equal
(B) always equal
(C) always empty
(D) always the universal set

Correct Answer: A

Explanation: Set difference is not commutative, so the correct choice is not necessarily equal.

22. If U is the universal set and A □ U, then A' (or A^c) equals:

(A) A
(B) U − A
(C) A □ U
(D) A ∩ A

Correct Answer: B

Explanation: The complement is everything in U that is not in A.

23. A ∩ A' equals:

(A) U
(B) A
(C) the empty set
(D) A'

Correct Answer: C

Explanation: Nothing can lie both in A and outside A.

24. A □ A' equals:

(A) empty
(B) A
(C) A − A'
(D) U

Correct Answer: D

Explanation: Every member of U is either in A or in the complement.

25. Two sets are disjoint when:

(A) A ∩ B is empty
(B) A □ B = U
(C) A □ B
(D) A = B

Correct Answer: A

Explanation: Disjoint means no shared element, so the correct choice is A ∩ B is empty.

26. Two sets are overlapping when their intersection is non-empty and:

(A) each is a subset of the other
(B) neither is a subset of the other
(C) their union is empty
(D) they are equal

Correct Answer: B

Explanation: Two sets are overlapping when their intersection is non-empty and neither is a subset of the other.

27. A is a subset of B when:

(A) some element of A misses B
(B) A ∩ B is empty
(C) every element of A is in B

(D) A = U

Correct Answer: C

Explanation: Membership in A forces membership in B, so the correct choice is every element of A is in B.

28. In a Venn diagram the universal set is drawn as a:

(A) circle only
(B) single point
(C) arrow
(D) rectangle

Correct Answer: D

Explanation: Sets inside U are usually circles or ovals.

29. If A = {1, 2, 3}, B = {3, 4, 5}, C = {5, 6}, then B ∩ C equals:

(A) {5}
(B) {3}
(C) {3, 5}
(D) empty

Correct Answer: A

Explanation: The only shared member of B and C is 5, so the correct choice is {5}.

30. With A = {1, 2, 3}, B = {3, 4, 5}, C = {5, 6}, A □ (B ∩ C) equals:

(A) {1, 2, 3}
(B) {1, 2, 3, 5}
(C) {5}
(D) {1, 2, 3, 4, 5, 6}

Correct Answer: B

Explanation: B ∩ C = {5}, then union with A adds 5 to {1, 2, 3}.

31. With A = {1, 2, 3}, B = {3, 4, 5}, C = {5, 6}, A ∩ (B □ C) equals:

(A) {1, 2, 3}
(B) {5}
(C) {3}
(D) empty

Correct Answer: C

Explanation: B □ C = {3, 4, 5, 6}; the overlap with A is {3}.

32. The associative law of union is:

(A) A □ B = B ∩ A
(B) A ∩ A' = U
(C) (A □ B)' = A' □ B'
(D) (A □ B) □ C = A □ (B □ C)

Correct Answer: D

Explanation: Grouping of unions can be changed without changing the result.

33. The associative law of intersection is:

(A) (A ∩ B) ∩ C = A ∩ (B ∩ C)
(B) A □ (B ∩ C) = (A □ B) ∩ C always without extra sets
(C) A − B = B − A
(D) A × B = B × A

Correct Answer: A

Explanation: The associative law of intersection is (A ∩ B) ∩ C = A ∩ (B ∩ C).

34. The distributive law of union over intersection is:

(A) A □ (B ∩ C) = (A ∩ B) □ C
(B) A □ (B ∩ C) = (A □ B) ∩ (A □ C)
(C) A ∩ (B □ C) = A □ B □ C

(D) A □ (B ∩ C) = A ∩ B ∩ C

Correct Answer: B

Explanation: Union distributes across a pair the way multiplication distributes across a sum, with roles as in the formula.

35. The distributive law of intersection over union is:

(A) A ∩ (B □ C) = A □ B □ C
(B) A □ (B ∩ C) = A ∩ B
(C) A ∩ (B □ C) = (A ∩ B) □ (A ∩ C)
(D) A ∩ (B □ C) = (A □ B) ∩ C

Correct Answer: C

Explanation: Intersection distributes over union, so the correct choice is A ∩ (B □ C) = (A ∩ B) □ (A ∩ C).

36. A □ A equals:

(A) empty
(B) U
(C) A'
(D) A

Correct Answer: D

Explanation: Union with itself does not add new members (idempotent law).

37. A ∩ A equals:

(A) A
(B) U
(C) empty
(D) A'

Correct Answer: A

Explanation: The common members of A with A are just A.

38. (A')' equals:

(A) empty
(B) A
(C) U
(D) A'

Correct Answer: B

Explanation: (A')' equals A.

39. n(A □ B) equals:

(A) n(A) + n(B)
(B) n(A) − n(B)
(C) n(A) + n(B) − n(A ∩ B)
(D) n(A) · n(B)

Correct Answer: C

Explanation: n(A □ B) equals n(A) + n(B) − n(A ∩ B).

40. If n(A) = 24, n(B) = 18 and n(A □ B) = 31, then n(A ∩ B) equals:

(A) 13
(B) 7
(C) 55
(D) 11

Correct Answer: D

Explanation: 24 + 18 − 31 = 11, so the correct choice is 11.

41. If n(A − B) = 23, n(A ∩ B) = 2 and n(A □ B) = 44, then n(B − A) equals:

(A) 19
(B) 21

(C) 23
(D) 25

Correct Answer: A

Explanation: n(A □ B) = n(A − B) + n(A ∩ B) + n(B − A), so 44 = 23 + 2 + n(B − A) and n(B − A) = 19.

42. 50 houses: 25 have lawns, 32 have porches, 15 have both. How many have neither?

(A) 7
(B) 8
(C) 10
(D) 15

Correct Answer: B

Explanation: Union = 25 + 32 − 15 = 42, so neither = 50 − 42 = 8.

43. Every student plays at least one game. 350 play badminton, 280 table tennis, 150 both. The total is:

(A) 630
(B) 150
(C) 480
(D) 70

Correct Answer: C

Explanation: 350 + 280 − 150 = 480, so the correct choice is 480.

44. 70 people; 48 like tea, 40 like coffee; everyone likes at least one. How many like both?

(A) 22
(B) 8
(C) 88
(D) 18

Correct Answer: D

Explanation: Both = 48 + 40 − 70 = 18, so the correct choice is 18.

45. 80 students; 50 study English, 45 study Maths, 20 study both. How many study neither?

(A) 5
(B) 15
(C) 25
(D) 0

Correct Answer: A

Explanation: Union = 50 + 45 − 20 = 75, so neither = 80 − 75 = 5.

46. An ordered pair (a, b) equals (c, d) if and only if:

(A) a = d and b = c
(B) a = c and b = d
(C) a + b = c + d
(D) ab = cd

Correct Answer: B

Explanation: Both coordinates must match, in order, so the correct choice is a = c and b = d.

47. (2, 5) compared with (5, 2) is:

(A) the same pair
(B) undefined
(C) different because order matters
(D) equal after union

Correct Answer: C

Explanation: First and second places are distinguished.

48. If (x + 1, 3) = (4, y − 1), then (x, y) equals:

(A) (4, 3)
(B) (5, 2)

(C) (3, 2)
(D) (3, 4)

Correct Answer: D

Explanation: If (x + 1, 3) = (4, y − 1), then (x, y) equals (3, 4).

49. If (2a, 2b + 3) = (−10, −b), then a equals:

(A) −5
(B) 5
(C) −10
(D) 2

Correct Answer: A

Explanation: If (2a, 2b + 3) = (−10, −b), then a equals −5.

50. A × B = {(x, y) | x □ A and y □ B}. If A = {1, 2} and B = {a, b}, then n(A × B) equals:

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

Correct Answer: B

Explanation: n(A × B) = n(A) · n(B) = 2 · 2 = 4, so the correct choice is 4.

51. A × B is empty if:

(A) A = B
(B) A □ B
(C) either A or B is empty
(D) n(A) = n(B)

Correct Answer: C

Explanation: There is no pair if there is no first or no second coordinate available.

52. In general A × B equals B × A:

(A) always
(B) never
(C) only when both are empty or one is a singleton always
(D) if and only if A = B (for non-empty sets of this type)

Correct Answer: D

Explanation: Swapping coordinates changes the pairs unless the two sets are the same.

53. n(A × B) compared with n(B × A) is:

(A) equal, even if the sets of pairs differ
(B) always different
(C) n(A) + n(B)
(D) always 0

Correct Answer: A

Explanation: n(A × B) compared with n(B × A) is equal, even if the sets of pairs differ.

54. The number of subsets of A × B, hence the number of binary relations from A to B, is:

(A) n(A) + n(B)
(B) 2^{n(A)·n(B)}
(C) n(A) · n(B)
(D) 2^{n(A)+n(B)}

Correct Answer: B

Explanation: Each subset of the Cartesian product is a relation.

55. If n(A) = 3 and n(B) = 2, the number of relations from A to B is:

(A) 6
(B) 32

(C) 64
(D) 8

Correct Answer: C

Explanation: 2^{3·2} = 2^6 = 64, so the correct choice is 64.

56. If n(A) = 4, the number of relations on A (subsets of A × A) is:

(A) 16
(B) 2^8 = 256
(C) 8
(D) 2^{16}

Correct Answer: D

Explanation: n(A × A) = 16, so 2^{16} relations, so the correct choice is 2^{16}.

57. A binary relation from A to B is:

(A) any subset of A × B
(B) any subset of A □ B
(C) always A × B itself only
(D) a number n(A)

Correct Answer: A

Explanation: That is the definition used in the unit.

58. The empty subset of A × B is called a:

(A) universal relation
(B) void relation
(C) onto function always
(D) disjoint union

Correct Answer: B

Explanation: A relation with no ordered pairs is void.

59. The domain of a relation is the set of all:

(A) second components of its pairs
(B) unions of A and B
(C) first components of its pairs
(D) complements

Correct Answer: C

Explanation: The domain of a relation is the set of all first components of its pairs.

60. The range of a relation is the set of all:

(A) first components
(B) elements of U
(C) indices
(D) second components of its pairs

Correct Answer: D

Explanation: Range collects the right entries, so the correct choice is second components of its pairs.

61. If R = {(2, 1), (4, 3), (2, 5)}, then Dom R equals:

(A) {2, 4}
(B) {2, 4, 2}
(C) {1, 3, 5}
(D) {2}

Correct Answer: A

Explanation: The distinct first elements are 2 and 4.

62. If R = {(2, 1), (4, 3), (2, 5)}, then Range R equals:

(A) {2, 4}
(B) {1, 3, 5}

(C) {2}
(D) empty

Correct Answer: B

Explanation: The distinct second elements are 1, 3 and 5.

63. If R = {(0, 0), (2, 4), (3, 9)}, then R^{−1} equals:

(A) {(0, 0), (2, 4), (3, 9)}
(B) {(2, 0), (3, 2)}
(C) {(0, 0), (4, 2), (9, 3)}
(D) {(9, 4, 0)}

Correct Answer: C

Explanation: Inverse swaps each ordered pair, so the correct choice is {(0, 0), (4, 2), (9, 3)}.

64. Dom(R^{−1}) equals:

(A) Dom R
(B) A □ B
(C) empty always
(D) Range R

Correct Answer: D

Explanation: The first entries of the inverse are the old second entries.

65. Range(R^{−1}) equals:

(A) Dom R
(B) Range R
(C) U
(D) R itself

Correct Answer: A

Explanation: The second entries of the inverse are the old first entries.

66. A = {1, 2, 3}, B = {0, 1, 3}, R = {(a, b) | a > b}. Then R equals:

(A) {(1, 1), (3, 3)}
(B) {(1, 0), (2, 0), (2, 1), (3, 0), (3, 1)}
(C) {(1, 3), (2, 3)}
(D) A × B

Correct Answer: B

Explanation: Keep pairs from A × B whose first coordinate is strictly larger.

67. For that same R, the range does not include 3 from B because:

(A) 3 is not in B
(B) 3 is irrational
(C) no a in A is greater than 3
(D) R is void

Correct Answer: C

Explanation: The largest a is 3, which is not greater than 3.

68. If T = {0, ±1, ±2} and R_1 = {(x, y) | x + y = 0}, then (2, −2) is:

(A) not in R_1
(B) in the complement of T × T only
(C) a triple
(D) in R_1

Correct Answer: D

Explanation: 2 + (−2) = 0, so the pair satisfies the rule.

69. E = {2, 4, 6}, F = {0, 1, 2}, R_2 = {(x, y) | x + y = 6}. Then R_2 equals:

(A) {(4, 2), (6, 0)}
(B) {(2, 4)}

(C) {(2, 2), (4, 1)}
(D) E × F

Correct Answer: A

Explanation: 4 + 2 = 6 and 6 + 0 = 6; 2 + 4 is impossible because 4 □ F.

70. Relations may be shown by tables of pairs, arrow diagrams, and:

(A) only Roman numerals
(B) graphs of the ordered pairs
(C) only characteristic bars
(D) only radicals

Correct Answer: B

Explanation: Relations may be shown by tables of pairs, arrow diagrams, and graphs of the ordered pairs.

71. If A □ B then A − B equals:

(A) A
(B) B
(C) the empty set
(D) B − A

Correct Answer: C

Explanation: Every member of A already lies in B, so nothing remains.

72. If A − B = B − A = empty, then:

(A) A is disjoint from B
(B) A □ B is empty
(C) A' = B
(D) A = B

Correct Answer: D

Explanation: Each set has no leftover elements, so they contain exactly the same members.

73. If A □ B = A and A ∩ B = B, then:

(A) B □ A
(B) A □ B
(C) A ∩ B is empty
(D) A = empty

Correct Answer: A

Explanation: Union equal to A means B contributes nothing new, so B □ A; inter.

74. n(A) = p implies n(A × A) equals:

(A) p
(B) p²
(C) 2p
(D) 2^p

Correct Answer: B

Explanation: n(A) = p implies n(A × A) equals p².

75. If n(B) = t, the number of binary relations on B is:

(A) t
(B) t²
(C) 2^{t²}
(D) 2^t

Correct Answer: C

Explanation: There are t² pairs in B × B and 2^{t²} subsets.

76. Mathematics is described as a study of patterns, structures, and:

(A) only cooking recipes
(B) only Roman history

(C) only book prices
(D) their relationships

Correct Answer: D

Explanation: Mathematics is described as a study of patterns, structures, and their relationships.

77. The next square after 1, 4, 9, 16 in the pattern of k^2 is:

(A) 25
(B) 20
(C) 32
(D) 18

Correct Answer: A

Explanation: The next square after 1, 4, 9, 16 in the pattern of k^2 is 25.

78. If X = {a, b, c, d, e}, Y = {a, c, e}, Z = {g, h}, then (X ∩ Y) ∩ Z equals:

(A) {a, c, e}
(B) empty
(C) {g, h}
(D) {a}

Correct Answer: B

Explanation: X ∩ Y = {a, c, e} shares nothing with Z.

79. If X = {a, b, c, d, e}, Y = {a, c, e}, Z = {g, h}, then (X □ Y) □ Z has how many elements?

(A) 5
(B) 8
(C) 7
(D) 2

Correct Answer: C

Explanation: 7 — this correctly answers the question.

80. n(A) = 60, n(B) = 48, n(A ∩ B) = 20, n(U) = 90. Then n(A □ B) equals:

(A) 108
(B) 28
(C) 90
(D) 88

Correct Answer: D

Explanation: 60 + 48 − 20 = 88, so the correct choice is 88.

B. Less Important / Secondary Topics

81. A collection of lighter stones is a poor set example because lighter is:

(A) not an objective cut-off
(B) a precise SI unit
(C) always 1 kg
(D) a prime number

Correct Answer: A

Explanation: A collection of lighter stones is a poor set example because lighter is not an objective cut-off.

82. Letters of the word set in roster form are:

(A) {s, e, t, t}
(B) {s, e, t}
(C) {set}
(D) empty

Correct Answer: B

Explanation: Three distinct letters; repetition is dropped.

83. Even integers E include:

(A) only positives 2, 4, 6, …
(B) only odds
(C) 0 and both positive and negative even integers
(D) only primes

Correct Answer: C

Explanation: The chapter lists 0, ±2, ±4, …, so the correct choice is 0 and both positive and negative even integers.

84. Odd integers O start their usual list at:

(A) 0
(B) 2, 3, 5
(C) 1/2
(D) ±1, ±3, ±5, …

Correct Answer: D

Explanation: Odd means not divisible by 2, so the correct choice is ±1, ±3, ±5, ….

85. Primes P begin:

(A) {2, 3, 5, 7, 11, …}
(B) {1, 2, 3, 5, …}
(C) {0, 1, 2}
(D) {4, 6, 8}

Correct Answer: A

Explanation: 1 is not prime; 2 is the first prime, so the correct choice is {2, 3, 5, 7, 11, …}.

86. Common elements of A and B are written how many times in A ∩ B?

(A) twice
(B) once
(C) n(A) times
(D) never

Correct Answer: B

Explanation: A set lists each member once, so the correct choice is once.

87. If A = {1, 2, 3} and B = {4, 5}, they are:

(A) overlapping
(B) equal
(C) disjoint
(D) complements of each other always

Correct Answer: C

Explanation: If A = {1, 2, 3} and B = {4, 5}, they are disjoint.

88. If A = {2, 3, 5, 7, 9} and B = {0, 3, 5, 8}, they are overlapping because:

(A) A □ B
(B) A ∩ B is empty
(C) A = B
(D) A ∩ B = {3, 5} ≠ empty and neither set contains the other

Correct Answer: D

Explanation: If A = {2, 3, 5, 7, 9} and B = {0, 3, 5, 8}, they are overlapping because A ∩ B = {3, 5} ≠ empty and neither set contains the other.

89. Brackets in A □ (B ∩ C) mean one should first compute:

(A) B ∩ C
(B) A □ B
(C) A ∩ C
(D) the complement of A

Correct Answer: A

Explanation: Parentheses set the inner operation, so the correct choice is B ∩ C.

90. Idempotent flavour: A □ A' □ A equals:

(A) A
(B) U
(C) A'
(D) empty

Correct Answer: B

Explanation: A □ A' is already U, and U □ A = U, so the correct choice is U.

91. In a school of 10 teachers, 5 teach Maths, 3 teach Biology, all 10 teach English, and Maths/Biology are disjoint inside English. Only English is taught by:

(A) 8 teachers
(B) 5 teachers
(C) 2 teachers
(D) 10 teachers

Correct Answer: C

Explanation: In a school of 10 teachers, 5 teach Maths, 3 teach Biology, all 10 teach English, and Maths/Biology are disjoint inside English. Only English is taught by 2 teachers.

92. In a three-sport survey the region outside all three circles counts people who play:

(A) all three
(B) exactly two
(C) only cricket
(D) none of the three games

Correct Answer: D

Explanation: Outside the union is the complement of C □ H □ F.

93. n(only A) for two sets equals:

(A) n(A) − n(A ∩ B)
(B) n(A)
(C) n(A □ B)
(D) n(B)

Correct Answer: A

Explanation: Remove the shared part from A, so the correct choice is n(A) − n(A ∩ B).

94. The first element of (a, b) is a and the second is:

(A) also a
(B) b
(C) a + b
(D) A × B

Correct Answer: B

Explanation: That is the ordered-pair convention, so the correct choice is b.

95. Each element of A × B is called an:

(A) index
(B) mantissa
(C) ordered pair
(D) radicand

Correct Answer: C

Explanation: Pairs (x, y) with x from A and y from B.

96. The number of possible subsets of A × B is 2 to the power:

(A) n(A) + n(B)
(B) n(A) − n(B)
(C) 2
(D) n(A × B)

Correct Answer: D

Explanation: A finite set with k elements has 2^k subsets.

97. Arrow diagrams for P × Q draw an arrow from every member of P to:

(A) every member of Q
(B) one member of Q only
(C) P itself only
(D) the empty set

Correct Answer: A

Explanation: The full product pairs each first coordinate with all second coordinates.

98. A × (B □ C) equals:

(A) (A □ B) × C
(B) (A × B) □ (A × C)
(C) A □ B □ C
(D) empty always

Correct Answer: B

Explanation: A × (B □ C) equals (A × B) □ (A × C).

99. A × (B ∩ C) equals:

(A) A ∩ B ∩ C
(B) (A ∩ B) × C
(C) (A × B) ∩ (A × C)
(D) B × C

Correct Answer: C

Explanation: The same distributive pattern holds for inter.

100. If (a + 1, 4) = (2, b − 3), then b equals:

(A) 1
(B) 4
(C) 5
(D) 7

Correct Answer: D

Explanation: a + 1 = 2 so a = 1, and 4 = b − 3 so b = 7.

101. A relation on a single set A is a subset of:

(A) A × A
(B) A □ A
(C) A'
(D) N

Correct Answer: A

Explanation: Pairs are taken from A with itself, so the correct choice is A × A.

102. For R = {(a, b) | a, b □ Z and a + b = 0}, Dom R compared with Range R is:

(A) a proper subset
(B) equal (both all of Z)
(C) empty
(D) only N

Correct Answer: B

Explanation: Every integer x pairs with −x, and every integer appears as a second component too.

103. Tabular form of {(a, b) | a, b □ N and a · b = 6} includes:

(A) only (1, 6)
(B) (0, 6)
(C) (1, 6), (2, 3), (3, 2), (6, 1)
(D) (−1, −6)

Correct Answer: C

Explanation: Tabular form of {(a, b) | a, b □ N and a · b = 6} includes (1, 6), (2, 3), (3, 2), (6, 1).

104. A relation can be written in set-builder form by stating:

(A) only n(A)
(B) only the universal set
(C) only the mantissa
(D) the condition on (x, y)

Correct Answer: D

Explanation: The rule picks which pairs from A × B belong to R.

105. Graphs of a relation plot each ordered pair as a:

(A) point in the plane
(B) Venn circle
(C) radical sign
(D) log table row

Correct Answer: A

Explanation: The unit shows Cartesian-product points on axes.

106. If n(A) = 34, n(B) = 52, n(A □ B) = 60, then n(A ∩ B) equals:

(A) 86
(B) 26
(C) 18
(D) 8

Correct Answer: B

Explanation: 34 + 52 − 60 = 26, so the correct choice is 26.

107. De Morgan style from the playground: (A □ B)' equals:

(A) A' □ B'
(B) A ∩ B
(C) A' ∩ B'
(D) A □ B

Correct Answer: C

Explanation: The complement of a union is the inter.

108. Cataloguing products in a mall with overlapping categories is a real-world use of:

(A) only logarithms
(B) only scientific notation
(C) only cube roots
(D) Venn diagrams and set operations

Correct Answer: D

Explanation: The unit lists classification problems as applications of three-set Venn diagrams.

MATHEMATICS MCQ BOOKLET

Grade 9 · Chapter 4 · Factorization and Algebraic Manipulation

FBISE / National Book Foundation Model Textbook companion

by Public Library

Independent MCQs on factorization identities, HCF and LCM of algebraic expressions, algebraic fractions, and square roots. 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. Factorization of an algebraic expression means writing it as a:

(A) product of its factors
(B) sum of unrelated constants only
(C) ratio of two decimals only
(D) list of unrelated words

Correct Answer: A

Explanation: A polynomial is factorized when it is expressed as a product of polynomial factors.

2. The identity used to take out a common monomial factor is:

(A) $a^2 - b^2 = (a + b)(a - b)$ only
(B) $ka + kb + kc = k(a + b + c)$
(C) $a^3 + b^3$ only
(D) $\sin^2\theta + \cos^2\theta = 1$

Correct Answer: B

Explanation: Each term shares the factor k, so k factors out of the whole sum.

3. 6p + 9q + 3r factorizes as:

(A) 3p(2 + 3q + r)
(B) 6(p + q + r)
(C) 3(2p + 3q + r)
(D) 9(p + q + r)

Correct Answer: C

Explanation: The numerical HCF is 3, and 6p + 9q + 3r = 3(2p + 3q + r).

4. Grouping ac + ad + bc + bd yields:

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

Correct Answer: D

Explanation: Grouping ac + ad + bc + bd yields (a + b)(c + d).

5. xy + 4x + 3y + 12 factorizes as:

(A) (x + 3)(y + 4)
(B) (x + 3)(y + 12)
(C) (x + 4)(y + 3)
(D) (xy + 4)(3 + 12)

Correct Answer: A

Explanation: xy + 4x + 3y + 12 factorizes as (x + 3)(y + 4).

6. $a^2 + 2ab + b^2$ is identical to:

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

(D) (a + b)(a − b)

Correct Answer: B

Explanation: The perfect-square identity is $(a + b)^2 = a^2 + 2ab + b^2$.

7. $m^2 - 10m + 25$ equals:

(A) (m − 5)(m + 5)
(B) $(m + 5)^2$
(C) $(m - 5)^2$
(D) $m^2 - 25$

Correct Answer: C

Explanation: $m^2 - 10m + 25$ equals $(m - 5)^2$.

8. The difference of squares identity is:

(A) $a^2 + b^2 = (a + b)^2$
(B) $a^3 - b^3 = (a - b)^2$
(C) $2ab = (a + b)^2$
(D) $a^2 - b^2 = (a - b)(a + b)$

Correct Answer: D

Explanation: The difference of squares identity is $a^2 - b^2 = (a - b)(a + b)$.

9. $t^2 - 49$ factorizes as:

(A) (t − 7)(t + 7)
(B) $(t - 7)^2$
(C) $(t + 7)^2$
(D) t(t − 49)

Correct Answer: A

Explanation: $49 = 7^2$, so $t^2 - 49 = (t - 7)(t + 7)$.

10. $a^2 + 2ab + b^2 - c^2$ factorizes as:

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

Correct Answer: B

Explanation: It is the difference of squares $(a + b)^2 - c^2$.

11. $a^2 - 2ab + b^2 - c^2$ factorizes as:

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

Correct Answer: C

Explanation: It is $(a - b)^2 - c^2 = (a - b + c)(a - b - c)$.

12. $x^2 - 8x + 16 - 9y^2$ equals:

(A) (x − 4 − 3y) only as a single factor
(B) $(x + 4)^2 - 9y$
(C) (x − 4y)(x + 4y)
(D) (x − 4 − 3y)(x − 4 + 3y)

Correct Answer: D

Explanation: $(x - 4)^2 - (3y)^2$ is a difference of squares.

13. To factor $a^4 + a^2b^2 + b^4$ one first adds and subtracts:

(A) a^2b^2
(B) $2a^4$
(C) $4b^4$

(D) ab

Correct Answer: A

Explanation: To factor $a^4 + a^2b^2 + b^4$ one first adds and subtracts a^2b^2.

14. $a^4 + a^2b^2 + b^4$ factorizes as:

(A) $(a^2 + b^2)^2$
(B) $(a^2 + ab + b^2)(a^2 - ab + b^2)$
(C) $(a^2 + b^2)(a^2 - b^2)$
(D) $(a + b)^4$

Correct Answer: B

Explanation: $a^4 + a^2b^2 + b^4$ factorizes as $(a^2 + ab + b^2)(a^2 - ab + b^2)$.

15. $x^4 + x^2 + 1$ factorizes as:

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

Correct Answer: C

Explanation: $x^4 + x^2 + 1$ factorizes as $(x^2 - x + 1)(x^2 + x + 1)$.

16. The identity $a^4 + 4b^4$ equals:

(A) $(a^2 + 2b^2)^2$
(B) $(a^2 + 4b^2)(a^2 - 4b^2)$
(C) $(a + 2b)^4$
(D) $(a^2 + 2ab + 2b^2)(a^2 - 2ab + 2b^2)$

Correct Answer: D

Explanation: The identity $a^4 + 4b^4$ equals $(a^2 + 2ab + 2b^2)(a^2 - 2ab + 2b^2)$.

17. $x^4 + 4y^4$ factorizes as:

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

Correct Answer: A

Explanation: This is $a^4 + 4b^4$ with $a = x$ and $b = y$.

18. For the trinomial $x^2 + px + q$ one splits the middle term using two numbers whose:

(A) quotient is p and difference is q
(B) product is q and sum is p
(C) product is p and sum is q
(D) sum is always 0

Correct Answer: B

Explanation: If those numbers are r and s, then $x^2 + (r + s)x + rs = (x + r)(x + s)$.

19. $n^2 + 8n + 15$ factorizes as:

(A) $(n + 15)(n + 1)$
(B) $(n - 3)(n - 5)$
(C) $(n + 3)(n + 5)$
(D) $(n + 8)(n + 15)$

Correct Answer: C

Explanation: $n^2 + 8n + 15$ factorizes as $(n + 3)(n + 5)$.

20. $w^2 - 11w + 24$ factorizes as:

(A) $(w - 24)(w - 1)$
(B) $(w + 3)(w + 8)$
(C) $(w - 11)(w + 24)$

(D) $(w - 3)(w - 8)$

Correct Answer: D

Explanation: Both factors are negative: $(-3)(-8) = 24$ and $-3 + (-8) = -11$.

21. $k^2 + 2k - 15$ factorizes as:

(A) $(k + 5)(k - 3)$
(B) $(k + 15)(k - 1)$
(C) $(k - 5)(k + 3)$
(D) $(k + 2)(k - 15)$

Correct Answer: A

Explanation: $k^2 + 2k - 15$ factorizes as $(k + 5)(k - 3)$.

22. $u^2 - 2u - 24$ factorizes as:

(A) $(u - 24)(u + 1)$
(B) $(u - 6)(u + 4)$
(C) $(u + 6)(u - 4)$
(D) $(u - 2)(u - 12)$

Correct Answer: B

Explanation: $u^2 - 2u - 24$ factorizes as $(u - 6)(u + 4)$.

23. For $ax^2 + bx + c$ one lists factor pairs of:

(A) $a + c$ only
(B) b^2 only
(C) the product ac, then splits bx
(D) $a - c$ only

Correct Answer: C

Explanation: The split pair must multiply to ac and add to b.

24. $2x^2 + 7x + 3$ factorizes as:

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

Correct Answer: D

Explanation: $2x^2 + 7x + 3$ factorizes as $(2x + 1)(x + 3)$.

25. $3x^2 + 11x - 4$ factorizes as:

(A) $(3x - 1)(x + 4)$
(B) $(3x + 1)(x - 4)$
(C) $(3x + 4)(x - 1)$
(D) $(x + 11)(3x - 4)$

Correct Answer: A

Explanation: $3x^2 + 11x - 4$ factorizes as $(3x - 1)(x + 4)$.

26. $6x^2 - x - 2$ factorizes as:

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

Correct Answer: B

Explanation: $6x^2 - x - 2$ factorizes as $(3x - 2)(2x + 1)$.

27. To factor $(ax^2 + bx + c)(ax^2 + bx + d) + k$ a useful substitution is:

(A) let $y = ax^2$ only
(B) let $y = c + d$
(C) let $y = ax^2 + bx$

(D) let y = k

Correct Answer: C

Explanation: To factor $(ax^2 + bx + c)(ax^2 + bx + d) + k$ a useful substitution is let $y = ax^2 + bx$.

28. $(y^2 + y - 2)(y^2 + y + 4) + 5$ is first rewritten by setting:

(A) $z = y^2$ only
(B) $z = -2 + 4$
(C) $z = 5y$
(D) $z = y^2 + y$

Correct Answer: D

Explanation: Both quadratics share $y^2 + y$, so that common piece is the substitution.

29. For $(x + a)(x + b)(x + c)(x + d) + k$ one pairs binomials so that:

(A) the sums of the paired constants are equal
(B) the products of constants are 0
(C) all four constants are equal
(D) k is ignored

Correct Answer: A

Explanation: Equal constant-sums give two quadratics with the same $x^2 + Sx$ middle part.

30. $(x + 1)(x + 6)(x + 2)(x + 5)$ is paired as $(x + 1)(x + 6)$ with $(x + 2)(x + 5)$ because:

(A) $1 \times 6 = 2 + 5$
(B) $1 + 6 = 2 + 5 = 7$
(C) $1 + 2 = 6 + 5$
(D) the pairing is random

Correct Answer: B

Explanation: Equal sums 7 and 7 produce a common $x^2 + 7x$ for substitution.

31. For $(x + a)(x + b)(x + c)(x + d) + kx^2$ one pairs binomials so that:

(A) the sums of constants are 0
(B) k equals x
(C) the products of the paired constants are equal
(D) all constants are 1

Correct Answer: C

Explanation: For $(x + a)(x + b)(x + c)(x + d) + kx^2$ one pairs binomials so that the products of the paired constants are equal.

32. $(x + 1)(x + 8)(x + 2)(x + 4)$ is a product-pairing because:

(A) $1 + 8 = 2 + 4$
(B) $1 \times 2 = 8 \times 4$
(C) $8 - 4 = 1 \times 2$
(D) $1 \times 8 = 2 \times 4 = 8$

Correct Answer: D

Explanation: The constant products 8 and 8 match, which is the Type-III (c) pairing rule.

33. $a^3 + 3a^2b + 3ab^2 + b^3$ is identical to:

(A) $(a + b)^3$
(B) $(a - b)^3$
(C) $a^3 + b^3$
(D) $(a + b)(a^2 + b^2)$

Correct Answer: A

Explanation: $a^3 + 3a^2b + 3ab^2 + b^3$ is identical to $(a + b)^3$.

34. $a^3 - 3a^2b + 3ab^2 - b^3$ is identical to:

(A) $(a + b)^3$
(B) $(a - b)^3$

(C) $a^3 - b^3$ only as two factors
(D) $(a - b)(a + b)$

Correct Answer: B

Explanation: $a^3 - 3a^2b + 3ab^2 - b^3$ is identical to $(a - b)^3$.

35. $8x^3 + 12x^2 + 6x + 1$ factorizes as:

(A) $(2x - 1)^3$
(B) $(8x + 1)^3$
(C) $(2x + 1)^3$
(D) $(2x + 1)(4x^2 + 1)$

Correct Answer: C

Explanation: $8x^3 + 12x^2 + 6x + 1$ factorizes as $(2x + 1)^3$.

36. $27p^3 - 27p^2 + 9p - 1$ factorizes as:

(A) $(3p + 1)^3$
(B) $(9p - 1)^3$
(C) $(3p - 1)(9p^2 + 1)$
(D) $(3p - 1)^3$

Correct Answer: D

Explanation: $27p^3 - 27p^2 + 9p - 1$ factorizes as $(3p - 1)^3$.

37. The sum-of-cubes identity is:

(A) $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$
(B) $a^3 + b^3 = (a + b)^3$
(C) $a^3 + b^3 = (a - b)(a^2 + ab + b^2)$
(D) $a^3 + b^3 = a^3b^3$

Correct Answer: A

Explanation: The linear factor is $a + b$ and the quadratic is $a^2 - ab + b^2$.

38. The difference-of-cubes identity is:

(A) $a^3 - b^3 = (a - b)^3$
(B) $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$
(C) $a^3 - b^3 = (a + b)(a^2 - ab + b^2)$
(D) $a^3 - b^3 = (a - b)^2$

Correct Answer: B

Explanation: The linear factor is $a - b$ and the quadratic is $a^2 + ab + b^2$.

39. $x^3 + 27$ factorizes as:

(A) $(x + 3)^3$
(B) $(x - 3)(x^2 + 3x + 9)$
(C) $(x + 3)(x^2 - 3x + 9)$
(D) $(x + 27)(x^2 + 1)$

Correct Answer: C

Explanation: $27 = 3^3$, so $x^3 + 27 = (x + 3)(x^2 - 3x + 9)$.

40. $8 - 27y^3$ factorizes as:

(A) $(2 - 3y)^3$
(B) $(2 + 3y)(4 - 6y + 9y^2)$
(C) $(8 - 3y)(1 + 9y^2)$
(D) $(2 - 3y)(4 + 6y + 9y^2)$

Correct Answer: D

Explanation: $8 - 27y^3$ factorizes as $(2 - 3y)(4 + 6y + 9y^2)$.

41. $x^3 - 64$ factorizes as:

(A) $(x - 4)(x^2 + 4x + 16)$
(B) $(x - 4)^3$

(C) $(x + 4)(x^2 - 4x + 16)$
(D) $(x - 8)(x^2 + 8)$

Correct Answer: A

Explanation: $64 = 4^3$, so $x^3 - 64 = (x - 4)(x^2 + 4x + 16)$.

42. $x^6 - y^6$ is most efficiently started as:

(A) $(x - y)^6$
(B) a difference of squares $(x^3)^2 - (y^3)^2$
(C) a sum of cubes only
(D) $(x^6)(y^6)$

Correct Answer: B

Explanation: $x^6 - y^6$ is most efficiently started as a difference of squares $(x^3)^2 - (y^3)^2$.

43. The HCF of two or more polynomials is the:

(A) lowest degree polynomial they divide
(B) product of the polynomials
(C) highest-degree polynomial that divides each of them exactly
(D) sum of their degrees

Correct Answer: C

Explanation: HCF takes every common factor to the least power that appears in all of them.

44. The LCM of two or more polynomials is the:

(A) highest-degree common factor
(B) difference of the polynomials
(C) HCF cubed
(D) lowest-degree polynomial exactly divisible by each given polynomial

Correct Answer: D

Explanation: LCM takes every factor to the highest power that appears in any of them.

45. For monomial HCF one takes the HCF of coefficients and, for each common variable, the:

(A) lowest power that appears in all monomials
(B) highest power
(C) sum of the powers
(D) product of the powers

Correct Answer: A

Explanation: For monomial HCF one takes the HCF of coefficients and, for each common variable, the lowest power that appears in all monomials.

46. HCF of $12a^2b$ and $18ab^3$ is:

(A) $36a^2b^3$
(B) $6ab$
(C) $2a^2b^3$
(D) $12ab$

Correct Answer: B

Explanation: HCF of 12 and 18 is 6; lowest powers are a^1 and b^1, so $6ab$.

47. LCM of $12a^2b$ and $18ab^3$ is:

(A) $6ab$
(B) $12a^2b$
(C) $36a^2b^3$
(D) $18ab^3$

Correct Answer: C

Explanation: LCM of 12 and 18 is 36; highest powers are a^2 and b^3, so $36a^2b^3$.

48. HCF of $8x^3y$ and $12xy^4$ is:

(A) $24x^3y^4$

(B) 8xy
(C) $12x^3y$
(D) 4xy

Correct Answer: D

Explanation: HCF of 8 and 12 is 4; lowest powers are x^1 and y^1, so 4xy.

49. LCM of $8x^3y$ and $12xy^4$ is:

(A) $24x^3y^4$
(B) 4xy
(C) $8x^3y$
(D) $12xy^4$

Correct Answer: A

Explanation: LCM of 8 and 12 is 24; highest powers are x^3 and y^4, so $24x^3y^4$.

50. In factored polynomials, HCF uses each common factor to the:

(A) highest power
(B) least power that is common
(C) sum of the powers
(D) power 0

Correct Answer: B

Explanation: In factored polynomials, HCF uses each common factor to the least power that is common.

51. In factored polynomials, LCM uses each factor to the:

(A) least common power
(B) difference of powers
(C) highest power that appears in any of them
(D) power 1 always

Correct Answer: C

Explanation: LCM must be a multiple of every given polynomial.

52. HCF of $2x(x - 1)$ and $4x(x - 1)^2$ is:

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

Correct Answer: D

Explanation: HCF of $2x(x - 1)$ and $4x(x - 1)^2$ is $2x(x - 1)$.

53. LCM of $2x(x - 1)$ and $4x(x - 1)^2$ is:

(A) $4x(x - 1)^2$
(B) $2x(x - 1)$
(C) $8x^2(x - 1)^3$
(D) $x - 1$

Correct Answer: A

Explanation: LCM of $2x(x - 1)$ and $4x(x - 1)^2$ is $4x(x - 1)^2$.

54. If two polynomials have no common factor other than a constant 1, their HCF is:

(A) their product
(B) 1 (up to a constant unit)
(C) 0
(D) their LCM

Correct Answer: B

Explanation: If two polynomials have no common factor other than a constant 1, their HCF is 1 (up to a constant unit).

55. If two polynomials are coprime, their LCM is:

(A) 1
(B) their difference
(C) their product (up to a constant)
(D) 0

Correct Answer: C

Explanation: If two polynomials are coprime, their LCM is their product (up to a constant).

56. For two polynomials P and Q the relation between HCF and LCM is:

(A) HCF + LCM = P + Q
(B) HCF − LCM = P − Q
(C) LCM = HCF always
(D) HCF × LCM = P × Q

Correct Answer: D

Explanation: For two polynomials P and Q the relation between HCF and LCM is HCF × LCM = P × Q.

57. If P × Q and the HCF of P and Q are known, then LCM equals:

(A) (P × Q) / HCF
(B) P + Q − HCF
(C) HCF / (P × Q)
(D) P − Q

Correct Answer: A

Explanation: If P × Q and the HCF of P and Q are known, then LCM equals (P × Q) / HCF.

58. If the product of two polynomials is $(x - 2)^2(x + 3)$ and their HCF is $(x - 2)$, their LCM is:

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

Correct Answer: B

Explanation: If the product of two polynomials is $(x - 2)^2(x + 3)$ and their HCF is $(x - 2)$, their LCM is $(x - 2)(x + 3)$.

59. Division method for HCF is used mainly when:

(A) the expressions are already monomials
(B) the LCM is 1
(C) factorization of the polynomials is difficult
(D) no variables appear

Correct Answer: C

Explanation: Division method for HCF is used mainly when factorization of the polynomials is difficult.

60. Algebraic fractions with the same denominator are called:

(A) unlike fractions
(B) improper radicals
(C) quadrantal angles
(D) like fractions

Correct Answer: D

Explanation: Like fractions share a denominator, so numerators add or subtract directly.

61. Algebraic fractions with different denominators are called:

(A) unlike fractions
(B) like fractions
(C) integers
(D) perfect cubes

Correct Answer: A

Explanation: Unlike fractions need an LCM of denominators before they can be added.

62. To divide one algebraic fraction by another, multiply the first by the:

(A) square of the second
(B) reciprocal of the second
(C) HCF of the second
(D) degree of the second

Correct Answer: B

Explanation: To divide one algebraic fraction by another, multiply the first by the reciprocal of the second.

63. The product of a non-zero algebraic fraction and its reciprocal is:

(A) 0
(B) the HCF
(C) 1
(D) the LCM

Correct Answer: C

Explanation: The product of a non-zero algebraic fraction and its reciprocal is 1.

64. $(x^2 - 9)/(x + 3)$ simplifies, for $x \neq -3$, to:

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

Correct Answer: D

Explanation: $x^2 - 9 = (x - 3)(x + 3)$, so the $(x + 3)$ cancels.

65. $(4x^2 - 1)/(2x - 1)$ simplifies, for $2x \neq 1$, to:

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

Correct Answer: A

Explanation: $(4x^2 - 1)/(2x - 1)$ simplifies, for $2x \neq 1$, to $2x + 1$.

66. $(2a/3) \times (9/(4a))$ simplifies, for $a \neq 0$, to:

(A) $6a/12$
(B) $3/2$
(C) $8a^2/27$
(D) $2/3$

Correct Answer: B

Explanation: $(2a/3) \times (9/(4a))$ simplifies, for $a \neq 0$, to $3/2$.

67. $(6x^2/y) \div (2x/y)$ simplifies, for $x \neq 0$ and $y \neq 0$, to:

(A) $3x/y^2$
(B) $12x^3/y^2$
(C) $3x$
(D) $y/(3x)$

Correct Answer: C

Explanation: $(6x^2/y) \div (2x/y)$ simplifies, for $x \neq 0$ and $y \neq 0$, to $3x$.

68. $3/(x - 1) + 2/(x - 1)$ equals:

(A) $5 / 2(x - 1)$
(B) $6/(x - 1)^2$
(C) 1
(D) $5/(x - 1)$

Correct Answer: D

Explanation: $3/(x - 1) + 2/(x - 1)$ equals $5/(x - 1)$.

69. $7/(t + 2) - 3/(t + 2)$ equals:

(A) 4/(t + 2)
(B) 4 / 2(t + 2)
(C) 10/(t + 2)
(D) −4/(t + 2)

Correct Answer: A

Explanation: 7/(t + 2) − 3/(t + 2) equals 4/(t + 2).

70. 1/x + 1/y, with xy ≠ 0, equals:

(A) 1/(x + y)
(B) (x + y)/(xy)
(C) xy/(x + y)
(D) 2/(xy)

Correct Answer: B

Explanation: LCM of denominators is xy, so (y + x)/(xy).

71. Reduce $10x^2y / 15xy^2$, for xy ≠ 0, to:

(A) 2x / 3y
(B) 2xy / 3
(C) 10x / 15y
(D) 3y / 2x

Correct Answer: C

Explanation: Cancel 5xy: 10/15 = 2/3 and one x and one y remain as 2x / 3y.

72. A square root of a perfect-square algebraic expression is written with:

(A) only the positive sign
(B) only zero
(C) only the HCF
(D) a ± sign in general

Correct Answer: D

Explanation: If $A^2 = B$ then $A = \pm B$ when working over the reals in this chapter.

73. $\sqrt{(16x^4y^6)}$ equals:

(A) $\pm 4x^2y^3$
(B) $4x^2y^3$ only, never negative
(C) $8x^2y^3$
(D) $\pm 16xy$

Correct Answer: A

Explanation: $\sqrt{(16x^4y^6)}$ equals $\pm 4x^2y^3$.

74. $\sqrt{(x^2 + 6x + 9)}$ equals:

(A) x + 3 only
(B) ±(x + 3)
(C) x − 3
(D) ±(x + 9)

Correct Answer: B

Explanation: $\sqrt{(x^2 + 6x + 9)}$ equals ±(x + 3).

75. $\sqrt{(4x^2 − 12xy + 9y^2)}$ equals:

(A) 2x + 3y
(B) ±(2x + 3y)
(C) ±(2x − 3y)
(D) 4x − 9y

Correct Answer: C

Explanation: $\sqrt{(4x^2 − 12xy + 9y^2)}$ equals ±(2x − 3y).

76. $\sqrt{((5a − 2b)^4)}$ equals:

(A) ±(5a − 2b)
(B) (5a − 2b)⁴
(C) 25a² − 4b²
(D) ±(5a − 2b)²

Correct Answer: D

Explanation: √((5a − 2b)⁴) equals ±(5a − 2b)².

77. In the division method for a square root, the first term of the root is the square root of the:

(A) leading (highest-degree) term
(B) constant term only
(C) middle term only
(D) HCF of coefficients

Correct Answer: A

Explanation: Arrange descending powers, then take √ of the first term as the start of the root.

78. After placing the first root term R, the next divisor begins by:

(A) halving R
(B) doubling the current root
(C) cubing R
(D) erasing R

Correct Answer: B

Explanation: The process mirrors numerical long division for square roots: double the root so far.

79. HCF of (x − 3)(x + 1) and (x − 3)(x + 5) is:

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

Correct Answer: C

Explanation: The only common linear factor is x − 3.

80. LCM of (x − 3)(x + 1) and (x − 3)(x + 5) is:

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

Correct Answer: D

Explanation: LCM of (x − 3)(x + 1) and (x − 3)(x + 5) is (x − 3)(x + 1)(x + 5).

B. Less Important / Secondary Topics

81. Multiplying factors back together is the inverse process of:

(A) factorization
(B) differentiation
(C) taking bearings
(D) converting radians

Correct Answer: A

Explanation: Multiplying factors back together is the inverse process of factorization.

82. 15x²y = (5x)(3xy) illustrates that 5x and 3xy are:

(A) roots of a quadratic
(B) factors of 15x²y
(C) HCF and LCM
(D) unlike fractions

Correct Answer: B

Explanation: $15x^2y = (5x)(3xy)$ illustrates that $5x$ and $3xy$ are factors of $15x^2y$.

83. When the last term of $x^2 + px + q$ is positive and the middle term is negative, the split numbers are usually:

(A) both positive
(B) one zero
(C) both negative
(D) complex

Correct Answer: C

Explanation: When the last term of $x^2 + px + q$ is positive and the middle term is negative, the split numbers are usually both negative.

84. When the last term of $x^2 + px + q$ is negative, the split numbers have:

(A) the same sign
(B) equal absolute values always
(C) product 0
(D) opposite signs

Correct Answer: D

Explanation: A negative product means one positive factor and one negative factor.

85. $x^8 + x^4 + 1$ can be treated like $a^4 + a^2 + 1$ by setting:

(A) $a = x^2$
(B) $a = x$
(C) $a = x^8$
(D) $a = 1/x$

Correct Answer: A

Explanation: Then $a^4 + a^2 + 1 = (a^2 - a + 1)(a^2 + a + 1)$ with $a = x^2$.

86. A polynomial that divides another polynomial exactly is called a:

(A) remainder
(B) factor
(C) bearing
(D) radian

Correct Answer: B

Explanation: That is the algebraic meaning of factor used for HCF.

87. If both given polynomials are multiplied by the same non-zero constant k, the HCF:

(A) is always multiplied by k^2
(B) becomes 0
(C) picks up the factor k only if k is common in the intended coefficient convention
(D) becomes the LCM

Correct Answer: C

Explanation: If both given polynomials are multiplied by the same non-zero constant k, the HCF picks up the factor k only if k is common in the intended coefficient convention.

88. HCF of $7x^2$ and $5y^2$, with distinct variables, is:

(A) $35x^2y^2$
(B) $7x^2$
(C) $5y^2$
(D) 1

Correct Answer: D

Explanation: No common variable and coefficients 7 and 5 are coprime, so HCF is 1.

89. The reciprocal of $(x + 2)/(x - 5)$, for $x \neq 5$ and $x \neq -2$, is:

(A) $(x - 5)/(x + 2)$
(B) $(x + 2)/(x - 5)$

(C) −(x + 2)/(x − 5)
(D) 1

Correct Answer: A

Explanation: The reciprocal of (x + 2)/(x − 5), for x ≠ 5 and x ≠ −2, is (x − 5)/(x + 2).

90. Adding unlike algebraic fractions requires the:

(A) HCF of numerators only
(B) LCM of the denominators
(C) square roots of denominators
(D) degree of the numerators

Correct Answer: B

Explanation: As with arithmetic fractions, a common denominator is the LCM.

91. $(r^2 - s^2)/r \div (r - s)/s$, for $r \neq s$ and $rs \neq 0$, simplifies to:

(A) s/r
(B) r/s
(C) s(r + s)/r
(D) (r − s)/s

Correct Answer: C

Explanation: $(r^2 - s^2)/r \div (r - s)/s$, for $r \neq s$ and $rs \neq 0$, simplifies to $s(r + s)/r$.

92. A quick check after factorization is to:

(A) delete the middle term
(B) replace x by 0 only
(C) take HCF of the factors
(D) expand the factors and recover the original polynomial

Correct Answer: D

Explanation: Multiplication is the inverse check.

93. $x^2 + 4xy + 4y^2 - z^2$ is the difference of squares:

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

Correct Answer: A

Explanation: $x^2 + 4xy + 4y^2 - z^2$ is the difference of squares $(x + 2y)^2 - z^2$.

94. The expression $(2x + 3)^3$ expands with middle terms:

(A) $12x^2 + 6x$ only
(B) $3(2x)^2(3) + 3(2x)(3)^2$
(C) only $8x^3 + 27$
(D) 6x + 9

Correct Answer: B

Explanation: $(a + b)^3$ needs the two cross terms $3a^2b$ and $3ab^2$ with $a = 2x$ and $b = 3$.

95. For square roots by factorization one first writes the expression as:

(A) a sum of unlike fractions
(B) a cubic only
(C) a product of squared factors when possible
(D) an LCM

Correct Answer: C

Explanation: For square roots by factorization one first writes the expression as a product of squared factors when possible.

96. If HCF(P, Q) = d, then d divides:

(A) only P

(B) only Q
(C) neither
(D) both P and Q

Correct Answer: D

Explanation: That is the definition of a common factor, and HCF is the greatest such.

97. LCM must be a multiple of each given polynomial, so each original polynomial:

(A) is larger than the LCM in degree always
(B) divides the LCM
(C) equals the HCF
(D) has degree 0

Correct Answer: A

Explanation: "Exactly divisible by each" means each given polynomial divides the LCM.

98. Canceling a common factor in a fraction is valid only where that factor is:

(A) zero
(B) non-zero
(C) equal to the LCM
(D) negative

Correct Answer: B

Explanation: Division by zero is excluded, so state the cancelled factor ≠ 0.

99. HCF of $2(x^2 - 4)$ and $(x - 2)(x + 2)$ is commonly taken as:

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

Correct Answer: C

Explanation: The common polynomial factor is $x^2 - 4$; the extra 2 is not shared.

100. $(a + b + c)(a + b - c)$ is the factorization of:

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

Correct Answer: D

Explanation: It is the difference of squares $(a + b)^2 - c^2$.

101. The missing factor in $x^2 - 5x - 14 = (x - 7)(\ )$ is:

(A) $x + 2$
(B) $x - 2$
(C) $x + 7$
(D) $x - 14$

Correct Answer: A

Explanation: The missing factor in $x^2 - 5x - 14 = (x - 7)(\ )$ is $x + 2$.

102. $x^6 + y^6$ can be viewed as a sum of cubes of:

(A) x and y
(B) x^2 and y^2
(C) x^3 and y^3
(D) x^6 and 1

Correct Answer: B

Explanation: $x^6 + y^6$ can be viewed as a sum of cubes of x^2 and y^2.

103. When finding LCM of monomials, repeated factors are written as:

(A) sums

(B) square roots
(C) powers
(D) bearings

Correct Answer: C

Explanation: The highest remaining power of each prime/variable factor is kept.

104. 1/x − 1/y, for xy ≠ 0, equals:

(A) 1/(x − y)
(B) (x − y)/(xy)
(C) 0
(D) (y − x)/(xy)

Correct Answer: D

Explanation: 1/x − 1/y, for xy ≠ 0, equals (y − x)/(xy).

105. $\sqrt{(36x^6y^{16})}$ equals:

(A) $\pm 6x^3y^8$
(B) $6x^6y^{16}$
(C) $\pm 36x^3y^8$
(D) 6xy

Correct Answer: A

Explanation: $\sqrt{36} = 6$, half of each even exponent: x^3 and y^8, with a ± sign.

106. If product of HCF and LCM of two polynomials is $(x^3 - y^3)(x + y)$, then the product of the polynomials is:

(A) $x^4 - y^4$ only as a guess
(B) $(x^3 - y^3)(x + y)$
(C) x − y
(D) 1

Correct Answer: B

Explanation: If product of HCF and LCM of two polynomials is $(x^3 - y^3)(x + y)$, then the product of the polynomials is $(x^3 - y^3)(x + y)$.

107. A substitution variable used in Type-III factorization should be a letter:

(A) already used as a given variable
(B) always equal to k
(C) not already present in the expression
(D) always θ

Correct Answer: C

Explanation: A substitution variable used in Type-III factorization should be a letter not already present in the expression.

108. $(x - 1/x)^3$ expands to a form that matches Type-IV with a = x and b =:

(A) x
(B) −x
(C) 3x
(D) 1/x

Correct Answer: D

Explanation: $(a - b)^3$ with $b = 1/x$ produces $x^3 - 3x + 3/x - 1/x^3$ after simplification.

MATHEMATICS MCQ BOOKLET

Grade 9 · Chapter 5 · Linear Equations and Inequalities

FBISE / National Book Foundation Model Textbook companion

by Public Library

Independent MCQs on linear equations, radical equations, absolute value, and linear inequalities. 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 linear equation in one variable can be written in the standard form:

(A) $ax + b = 0$ with $a \neq 0$
(B) $ax^2 + b = 0$ with $a \neq 0$
(C) $ax + b > 0$
(D) $xy = 1$

Correct Answer: A

Explanation: Degree one in a single unknown is the defining shape $ax + b = 0$.

2. The exponent of the variable in a linear equation is:

(A) 2
(B) 1
(C) 0
(D) −1

Correct Answer: B

Explanation: If the highest power of the unknown is 1, the.

3. Which equation is linear in one variable?

(A) $2x^2 + 3 = 0$
(B) $xy + 1 = 0$
(C) $4x - 7 = 0$
(D) $x + y = 5$

Correct Answer: C

Explanation: $4x - 7 = 0$ — this correctly answers the question.

4. $x^2 = 9$ is not linear because:

(A) it has no solution
(B) 9 is even
(C) it uses an equal sign
(D) the exponent of x is 2

Correct Answer: D

Explanation: $x^2 = 9$ is not linear because the exponent of x is 2.

5. $xy = 12$ is not linear because it involves a:

(A) product of two variables
(B) sum of constants
(C) negative sign
(D) fraction

Correct Answer: A

Explanation: The product xy has total degree 2, which matches the chapter rule being tested.

6. A linear equation in one variable, written in standard form, has:

(A) no solution
(B) exactly one solution
(C) exactly two solutions
(D) infinitely many solutions always

Correct Answer: B

Explanation: Isolating x gives a single replacement that makes ax + b = 0 true.

7. Two equations with the same solution set are called:

(A) quadratic equations
(B) strict inequalities
(C) equivalent equations
(D) extraneous roots

Correct Answer: C

Explanation: Two equations with the same solution set are called equivalent equations.

8. The solution of 5x − 8 = 12 is:

(A) x = 4/5
(B) x = 20
(C) x = −4
(D) x = 4

Correct Answer: D

Explanation: 5x = 20, so x = 4, which matches the chapter rule being tested.

9. The solution of −6x + 18 = 0 is:

(A) x = 3
(B) x = 18
(C) x = −3
(D) x = 0

Correct Answer: A

Explanation: −6x = −18, so x = 3, which matches the chapter rule being tested.

10. The solution of 3(x − 2) = 15 is:

(A) x = 3
(B) x = 7
(C) x = 5
(D) x = 13

Correct Answer: B

Explanation: x − 2 = 5, so x = 7, which matches the chapter rule being tested.

11. The solution of 4x + 9 = 25 is:

(A) x = 25
(B) x = 16
(C) x = 4
(D) x = 9/4

Correct Answer: C

Explanation: 4x = 16, so x = 4, which matches the chapter rule being tested.

12. To clear denominators in an equation with fractions, multiply every term by the:

(A) HCF of the numerators
(B) largest numerator
(C) degree of x
(D) LCM of the denominators

Correct Answer: D

Explanation: To clear denominators in an equation with fractions, multiply every term by the LCM of the denominators.

13. The solution of x/2 + 3 = 7 is:

(A) x = 8
(B) x = 2
(C) x = 10

(D) x = 4

Correct Answer: A

Explanation: x/2 = 4, so x = 8, which matches the chapter rule being tested.

14. The solution of 3x/4 − 1/2 = 1 is:

(A) x = 1
(B) x = 2
(C) x = 4
(D) x = 6

Correct Answer: B

Explanation: Multiply by 4: 3x − 2 = 4, so 3x = 6 and x = 2.

15. The solution of (2x + 1)/3 = (x − 1)/2 is:

(A) x = 1
(B) x = 5
(C) x = −5
(D) x = 0

Correct Answer: C

Explanation: Cross-multiply: 2(2x + 1) = 3(x − 1) gives 4x + 2 = 3x − 3, so x = −5.

16. The solution of (x + 3)/5 = (2x − 1)/3 is:

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

Correct Answer: D

Explanation: 3(x + 3) = 5(2x − 1) gives 3x + 9 = 10x − 5, so 14 = 7x and x = 2.

17. The solution of 0.5x − 0.2 = 1.3 is:

(A) x = 3
(B) x = 1
(C) x = 2.6
(D) x = 0.5

Correct Answer: A

Explanation: 0.5x = 1.5, so x = 3, which matches the chapter rule being tested.

18. The solution of 0.4(x + 5) = 2.4 is:

(A) x = 6
(B) x = 1
(C) x = 2.4
(D) x = 0.4

Correct Answer: B

Explanation: x + 5 = 2.4 / 0.4 = 6, so x = 1, which matches the chapter rule being tested.

19. The solution of 2(3x − 1) = 16 is:

(A) x = 16
(B) x = 8
(C) x = 3
(D) x = 2

Correct Answer: C

Explanation: 3x − 1 = 8, so 3x = 9 and x = 3, which matches the chapter rule being tested.

20. The solution of 7x + 5 = 5x + 17 is:

(A) x = 17
(B) x = 12
(C) x = 2

(D) x = 6

Correct Answer: D

Explanation: 2x = 12, so x = 6, which matches the chapter rule being tested.

21. The solution of x/3 + x/6 = 4 is:

(A) x = 8
(B) x = 4
(C) x = 12
(D) x = 6

Correct Answer: A

Explanation: Common denominator 6: 2x + x = 24, so 3x = 24 and x = 8.

22. The solution of (4x − 3)/5 = 1 is:

(A) x = 1
(B) x = 2
(C) x = 8
(D) x = 5

Correct Answer: B

Explanation: 4x − 3 = 5, so 4x = 8 and x = 2, which matches the chapter rule being tested.

23. The solution of 0.7x + 0.3 = 1.7 is:

(A) x = 1
(B) x = 0.7
(C) x = 2
(D) x = 1.4

Correct Answer: C

Explanation: 0.7x = 1.4, so x = 2, which matches the chapter rule being tested.

24. The solution of 5 − 2x = 11 is:

(A) x = 8
(B) x = 3
(C) x = −8
(D) x = −3

Correct Answer: D

Explanation: −2x = 6, so x = −3, which matches the chapter rule being tested.

25. The solution of 8 − 3x = x + 4 is:

(A) x = 1
(B) x = 4
(C) x = 12
(D) x = −1

Correct Answer: A

Explanation: 8 − 4 = 4x, so 4 = 4x and x = 1, which matches the chapter rule being tested.

26. The solution of 9x = 3 is:

(A) x = 3
(B) x = 1/3
(C) x = 27
(D) x = −3

Correct Answer: B

Explanation: Divide both sides by 9 to get x = 1/3, which matches the chapter rule being tested.

27. The solution of −x = 8 is:

(A) x = 8
(B) x = 0
(C) x = −8

(D) x = 1

Correct Answer: C

Explanation: Multiply both sides by −1, so x = −8, which matches the chapter rule being tested.

28. The solution of 0.3x = 1.2 is:

(A) x = 0.4
(B) x = 1.5
(C) x = 0.9
(D) x = 4

Correct Answer: D

Explanation: x = 1.2 / 0.3 = 4, which matches the chapter rule being tested.

29. Solving a linear equation uses the addition, subtraction, multiplication, and division:

(A) properties of equality
(B) properties of inequality only
(C) trigonometric identities
(D) factor theorems

Correct Answer: A

Explanation: Solving a linear equation uses the addition, subtraction, multiplication, and division properties of equality.

30. After finding a candidate root, a reliable check is to:

(A) ignore the original equation
(B) substitute it back into the original equation
(C) square both sides again
(D) change the sign of the root

Correct Answer: B

Explanation: A true numerical identity confirms that the replacement is a root.

31. An equation in which the unknown appears under a radical sign is called a:

(A) linear inequality
(B) bearing
(C) radical equation
(D) quadrantal angle

Correct Answer: C

Explanation: The variable sits inside a root, so the.

32. The usual first algebraic step for a radical equation is to:

(A) divide by the radical
(B) take HCF of both sides
(C) convert to radians
(D) isolate the radical, then square both sides

Correct Answer: D

Explanation: The usual first algebraic step for a radical equation is to isolate the radical, then square both sides.

33. Squaring both sides of a radical equation can introduce:

(A) an extraneous root that fails the original equation
(B) no extra solutions ever
(C) a bearing
(D) a cubic factor

Correct Answer: A

Explanation: If a = b then $a^2 = b^2$, but equal squares need not come from equal numbers.

34. If an isolated square-root term equals a negative number, the real solution set is:

(A) all real numbers
(B) the empty set

(C) {0}
(D) {1}

Correct Answer: B

Explanation: A principal square root is never negative.

35. If x = y then $x^2 = y^2$; if $x^2 = y^2$, then x and y:

(A) must be equal
(B) must both be zero
(C) may or may not be equal
(D) must both be positive

Correct Answer: C

Explanation: Counter-example: $(-5)^2 = 5^2$ but $-5 \neq 5$, which matches the chapter rule being tested.

36. The solution of $\sqrt{(x - 1)} = 4$ is:

(A) x = 4
(B) x = 15
(C) x = 5
(D) x = 17

Correct Answer: D

Explanation: Square: $x - 1 = 16$, so $x = 17$, and $\sqrt{16} + 0$ checks.

37. The solution of $\sqrt{(2x + 3)} = 5$ is:

(A) x = 11
(B) x = 5
(C) x = 22
(D) x = 1

Correct Answer: A

Explanation: $2x + 3 = 25$, so $2x = 22$ and $x = 11$, which matches the chapter rule being tested.

38. The solution of $\sqrt{x} = 9$ is:

(A) x = 9
(B) x = 81
(C) x = 3
(D) x = 18

Correct Answer: B

Explanation: Square both sides: $x = 81$, and $\sqrt{81} = 9$, which matches the chapter rule being tested.

39. The solution of $\sqrt{(x + 5)} - 2 = 3$ is:

(A) x = 3
(B) x = 4
(C) x = 20
(D) x = 11

Correct Answer: C

Explanation: $\sqrt{(x + 5)} = 5$, so $x + 5 = 25$ and $x = 20$, which matches the chapter rule being tested.

40. The solution of $7 - \sqrt{(3x)} = 1$ is:

(A) x = 6
(B) x = 36
(C) x = 2
(D) x = 12

Correct Answer: D

Explanation: $\sqrt{(3x)} = 6$, so $3x = 36$ and $x = 12$, which matches the chapter rule being tested.

41. The real solution set of $\sqrt{(5x)} = -2$ is:

(A) the empty set
(B) {4/5}

(C) {−2}
(D) {0}

Correct Answer: A

Explanation: The real solution set of √(5x) = −2 is the empty set.

42. The real solution set of 4 + √(2y + 1) = 3 is:

(A) {−1/2}
(B) the empty set
(C) {3}
(D) {0}

Correct Answer: B

Explanation: Isolating gives √(2y + 1) = −1, which is impossible in the reals.

43. The solution of √(3x − 2) = √(x + 4) is:

(A) x = 1
(B) x = 6
(C) x = 3
(D) x = −4

Correct Answer: C

Explanation: 3x − 2 = x + 4, so 2x = 6 and x = 3; both sides equal √7.

44. The solution of √(x − 3) = 2 is:

(A) x = 2
(B) x = 5
(C) x = 1
(D) x = 7

Correct Answer: D

Explanation: x − 3 = 4, so x = 7, which matches the chapter rule being tested.

45. A candidate that appears after squaring but fails the original radical equation is called:

(A) an extraneous root
(B) the HCF
(C) a bearing
(D) a linear factor

Correct Answer: A

Explanation: It is extra algebraic debris created by squaring.

46. The absolute value |x| is the:

(A) opposite of x always
(B) distance of x from 0 on the number line
(C) square of x
(D) reciprocal of x

Correct Answer: B

Explanation: Distance is never negative, so |x| ≥ 0, which matches the chapter rule being tested.

47. By definition, |x| = x when x ≥ 0, and |x| equals:

(A) x when x < 0
(B) 0 when x < 0
(C) −x when x < 0
(D) 1 when x < 0

Correct Answer: C

Explanation: By definition, |x| = x when x ≥ 0, and |x| equals −x when x < 0.

48. If k > 0, the equation |x| = k has:

(A) no solution
(B) one solution only

(C) infinitely many solutions
(D) two solutions, k and −k

Correct Answer: D

Explanation: Two points on the number line lie at distance k from 0.

49. If k = 0, the equation |x| = k has:

(A) exactly one solution, x = 0
(B) two solutions
(C) no solution
(D) all real x

Correct Answer: A

Explanation: Only 0 is at distance 0 from the origin.

50. If k < 0, the equation |x| = k has:

(A) two solutions
(B) no real solution
(C) x = k
(D) x = −k

Correct Answer: B

Explanation: If k < 0, the equation |x| = k has no real solution.

51. The equation |ax + b| = c with a ≠ 0 and c > 0 is equivalent to:

(A) ax + b = c only
(B) ax + b = 0 only
(C) ax + b = c or ax + b = −c
(D) a = c

Correct Answer: C

Explanation: The expression inside can be c or its opposite.

52. The solution set of |x| = 7 is:

(A) {7}
(B) {0}
(C) empty
(D) {−7, 7}

Correct Answer: D

Explanation: Both 7 and −7 have absolute value 7, which matches the chapter rule being tested.

53. The solution set of |x + 4| = 6 is:

(A) {2, −10}
(B) {2}
(C) {−4}
(D) {6, −6}

Correct Answer: A

Explanation: x + 4 = 6 or x + 4 = −6, so x = 2 or x = −10.

54. The solution set of |2x − 3| = 9 is:

(A) {6}
(B) {6, −3}
(C) {3}
(D) {9, −9}

Correct Answer: B

Explanation: 2x − 3 = 9 or 2x − 3 = −9, so x = 6 or x = −3.

55. The solution of |3x + 1| = 0 is:

(A) x = 0
(B) x = 1/3

(C) x = −1/3
(D) no solution

Correct Answer: C

Explanation: Absolute value is 0 only when the inside is 0, so 3x + 1 = 0.

56. The solution set of 4|x| = 20 is:

(A) {5}
(B) {20}
(C) {4}
(D) {−5, 5}

Correct Answer: D

Explanation: |x| = 5, so x = ±5, which matches the chapter rule being tested.

57. The real solution set of |x| + 8 = 3 is:

(A) the empty set
(B) {−5, 5}
(C) {−8}
(D) {3}

Correct Answer: A

Explanation: |x| = −5 is impossible, which matches the chapter rule being tested.

58. The solutions of |x − 2| = |2x + 1| are:

(A) x = 2 only
(B) x = −3 and x = 1/3
(C) x = 0
(D) x = 1

Correct Answer: B

Explanation: The solutions of |x − 2| = |2x + 1| are x = −3 and x = 1/3.

59. The identity |ab| equals:

(A) |a| + |b|
(B) |a| − |b|
(C) |a| · |b|
(D) a + b

Correct Answer: C

Explanation: Absolute value of a product is the product of the absolute values.

60. The identity |a/b| with b ≠ 0 equals:

(A) |a| · |b|
(B) |a| + |b|
(C) a/b without bars
(D) |a| / |b|

Correct Answer: D

Explanation: Absolute value of a quotient is the quotient of the absolute values.

61. |a| + |a| simplifies to:

(A) 2|a|
(B) 0
(C) $|2a^2|$
(D) a

Correct Answer: A

Explanation: |a| + |a| simplifies to 2|a|.

62. A statement that two algebraic expressions are not equal is called an:

(A) identity always
(B) inequality (inequation)

(C) absolute value
(D) arc length

Correct Answer: B

Explanation: The relation uses <, >, ≤, ≥, or ≠ rather than a lone equals sign.

63. A linear inequality in one variable can be written in a form such as:

(A) $ax^2 + b < 0$
(B) $xy < 1$
(C) $ax + b < 0$ with $a \neq 0$
(D) $x^2 = 4$

Correct Answer: C

Explanation: A linear inequality in one variable can be written in a form such as $ax + b < 0$ with $a \neq 0$.

64. An inequality that uses < or > (but not ≤ or ≥) is called:

(A) an equation
(B) an identity
(C) a radical
(D) a strict inequality

Correct Answer: D

Explanation: Strict means the two sides are forbidden to be equal.

65. Trichotomy for real numbers a and b says that exactly one of these holds:

(A) $a < b$ or $a = b$ or $a > b$
(B) $a < b$ only always
(C) $a \leq b$ always
(D) $a + b = 0$

Correct Answer: A

Explanation: Two reals are comparable in exactly one of those three ways.

66. Transitivity of < says that if a < b and b < c, then:

(A) $c < a$
(B) $a < c$
(C) $a = c$
(D) $a + c = b$

Correct Answer: B

Explanation: Transitivity of < says that if $a < b$ and $b < c$, then $a < c$.

67. The additive property of inequalities says that if a < b then:

(A) $a - c > b - c$ always
(B) $ac < bc$ for every c
(C) $a + c < b + c$
(D) $a = b + c$

Correct Answer: C

Explanation: The additive property of inequalities says that if $a < b$ then $a + c < b + c$.

68. If a < b and c > 0, then:

(A) $ac > bc$
(B) $ac = 0$
(C) $a + c > b + c$ always
(D) $ac < bc$

Correct Answer: D

Explanation: If $a < b$ and $c > 0$, then $ac < bc$.

69. If a < b and c < 0, then:

(A) $ac > bc$
(B) $ac < bc$

(C) ac = bc
(D) c must be zero

Correct Answer: A

Explanation: If a < b and c < 0, then ac > bc.

70. When both sides of an inequality are multiplied or divided by a negative number, the inequality symbol:

(A) stays the same
(B) is reversed
(C) becomes an equal sign
(D) is deleted

Correct Answer: B

Explanation: That reversal is the one essential difference from solving.

71. The solution of 8x + 9 < 6x − 7 is:

(A) x < 8
(B) x > −8
(C) x < −8
(D) x = −8

Correct Answer: C

Explanation: 2x < −16, so x < −8, which matches the chapter rule being tested.

72. The solution of −3x > 12 is:

(A) x > −4
(B) x > 4
(C) x < 4
(D) x < −4

Correct Answer: D

Explanation: Divide by −3 and reverse: x < −4, which matches the chapter rule being tested.

73. The solution of 2x − 5 ≥ 7 is:

(A) x ≥ 6
(B) x ≥ 1
(C) x ≤ 6
(D) x = 6 only

Correct Answer: A

Explanation: 2x ≥ 12, so x ≥ 6, which matches the chapter rule being tested.

74. The solution of x/2 + 1 ≤ 4 is:

(A) x ≤ 3
(B) x ≤ 6
(C) x ≥ 6
(D) x = 8

Correct Answer: B

Explanation: x/2 ≤ 3, so x ≤ 6, which matches the chapter rule being tested.

75. A compound inequality joined by “or” has solution set equal to the:

(A) intersection of the two sets
(B) empty set always
(C) union of the two solution sets
(D) HCF of the sets

Correct Answer: C

Explanation: “Or” is true when at least one part is true.

76. A compound inequality joined by “and” has solution set equal to the:

(A) union of the two sets

(B) whole real line always
(C) set {0}
(D) intersection of the two solution sets

Correct Answer: D

Explanation: A compound inequality joined by "and" has solution set equal to the intersection of the two solution sets.

77. The solution of −2 < 3x + 1 < 7 is:

(A) −1 < x < 2
(B) −2 < x < 1
(C) x < −1
(D) x > 2

Correct Answer: A

Explanation: The solution of −2 < 3x + 1 < 7 is −1 < x < 2.

78. The solution set of an inequality is the set of all replacements that make it:

(A) false
(B) true
(C) undefined
(D) quadratic

Correct Answer: B

Explanation: Those replacements are the solutions, which matches the chapter rule being tested.

79. Two inequalities with the same solution set are called:

(A) strict equations
(B) extraneous inequalities
(C) equivalent inequalities
(D) bearings

Correct Answer: C

Explanation: Two inequalities with the same solution set are called equivalent inequalities.

80. The compact form −1 ≤ x ≤ 4 means:

(A) x ≤ −1 or x ≥ 4
(B) x = −1 only
(C) x > 4
(D) x ≥ −1 and x ≤ 4

Correct Answer: D

Explanation: The compact chain is an "and" compound inequality.

B. Less Important / Secondary Topics

81. Equations and formulae are used in this unit as models of:

(A) real-life problems in science, business, and sport
(B) only poetry metre
(C) only compass roses
(D) only cube identities

Correct Answer: A

Explanation: Equations and formulae are used in this unit as models of real-life problems in science, business, and sport.

82. For any two real scores x and y, trichotomy says that exactly one of x < y, x = y, or:

(A) x + y = 0
(B) x > y
(C) xy = 1
(D) $x^2 = y$

Correct Answer: B

Explanation: For any two real scores x and y, trichotomy says that exactly one of x < y, x = y, or x > y.

83. A useful habit while checking a possible root is to treat the substituted equality as:

(A) already proved
(B) always false
(C) still on trial until both sides match
(D) a bearing

Correct Answer: C

Explanation: The check is a verification, not an assumption.

84. Cross-multiplication is valid for an equation of two fractions because it is the same as multiplying both sides by the:

(A) HCF of the numerators
(B) square of x
(C) absolute value
(D) product of the two denominators

Correct Answer: D

Explanation: That product clears both denominators, which matches the chapter rule being tested.

85. |5| and |−5| are equal because both numbers lie:

(A) 5 units from 0
(B) on opposite sides of 10
(C) at the origin
(D) in quadrant II

Correct Answer: A

Explanation: |5| and |−5| are equal because both numbers lie 5 units from 0.

86. The symbols < and > for inequalities were introduced in the 1600s by:

(A) Euclid only
(B) Thomas Harriot
(C) Ansel Adams
(D) a GPS satellite

Correct Answer: B

Explanation: The symbols < and > for inequalities were introduced in the 1600s by Thomas Harriot.

87. If an inequality is solved over the integers rather than the reals, the solution set:

(A) never changes
(B) becomes empty always
(C) contains only the integer members of the real solution
(D) becomes all reals

Correct Answer: C

Explanation: The same inequality is restricted to Z, so non-integers drop out.

88. Two inequalities such as −6 < 5x + 3 and 5x + 3 < 5 can be written compactly as:

(A) −6 < 5x + 3 or 5x + 3 < 5
(B) 5x + 3 = −6
(C) x = 5
(D) −6 < 5x + 3 < 5

Correct Answer: D

Explanation: Two inequalities such as −6 < 5x + 3 and 5x + 3 < 5 can be written compactly as −6 < 5x + 3 < 5.

89. There is no equally short compact chain for a compound inequality joined by:

(A) or
(B) and
(C) ≤
(D) ≥

Correct Answer: A

Explanation: There is no equally short compact chain for a compound inequality joined by or.

90. If 4 < 2x + 1 < 10, then x lies between:

(A) 4 and 10
(B) 1.5 and 4.5
(C) 2 and 5
(D) 0 and 1

Correct Answer: B

Explanation: If 4 < 2x + 1 < 10, then x lies between 1.5 and 4.5.

91. The symbol ≠ is read:

(A) is less than
(B) is a bearing of
(C) is not equal to
(D) is the HCF of

Correct Answer: C

Explanation: It is the inequality that simply denies equality.

92. −5 < 7 is an example of the relation:

(A) greater than
(B) absolute value
(C) parallel
(D) less than

Correct Answer: D

Explanation: The smaller number is written on the left of <.

93. 7 ≤ 7 is true because:

(A) equality is allowed by ≤
(B) 7 < 7
(C) 7 > 7
(D) 7 is negative

Correct Answer: A

Explanation: Less-than-or-equal holds when the two sides are equal.

94. 5 ≥ 1 is true because:

(A) 5 = 1
(B) 5 > 1, which is allowed by ≥
(C) 1 > 5
(D) they are opposites

Correct Answer: B

Explanation: Greater-than-or-equal holds whenever the left side is larger.

95. When clearing 1/2 x + 3 ≥ 1/4 x + 2, a convenient first multiplier is:

(A) 3
(B) 1/4
(C) 4, the LCM of 2 and 4
(D) x

Correct Answer: C

Explanation: When clearing 1/2 x + 3 ≥ 1/4 x + 2, a convenient first multiplier is 4, the LCM of 2 and 4.

96. The solution of 3(−4 + 5y) ≤ −8(1 − 2y) + 6 is:

(A) y ≤ −10
(B) y = 0
(C) y < 3
(D) y ≥ −10

Correct Answer: D

Explanation: Expand: $-12 + 15y \le -8 + 16y + 6$, so $-12 + 15y \le 16y - 2$, hence $-y \le 10$ and $y \ge -10$.

97. A compound inequality is two simple inequalities connected by:

(A) the words and or or
(B) sine or cosine
(C) HCF or LCM
(D) degrees or radians

Correct Answer: A

Explanation: A compound inequality is two simple inequalities connected by the words and or or.

98. A compound "or" statement is true if:

(A) both parts are false
(B) at least one of its inequalities is true
(C) the intersection is empty
(D) x = 0

Correct Answer: B

Explanation: Union needs only one successful side, which matches the chapter rule being tested.

99. A compound "and" statement is true only if:

(A) one part is true
(B) x is negative
(C) both individual inequalities are true
(D) the union is all reals

Correct Answer: C

Explanation: A compound "and" statement is true only if both individual inequalities are true.

100. The empty set is the correct solution when a check shows that every candidate is:

(A) positive
(B) an integer
(C) less than 10
(D) extraneous or impossible

Correct Answer: D

Explanation: The empty set is the correct solution when a check shows that every candidate is extraneous or impossible.

101. Which is the standard form of a linear equation among these?

(A) $ax + b = 0$
(B) $ax + b > 0$
(C) $ax^2 + b = 0$
(D) $ax + b = -c$ written without moving $-c$

Correct Answer: A

Explanation: The unit takes $ax + b = 0$ as the standard linear form.

102. The solution of $3x + 5 = 14$ is:

(A) x = 14
(B) x = 3
(C) x = 19
(D) x = 9

Correct Answer: B

Explanation: $3x = 9$, so $x = 3$, which matches the chapter rule being tested.

103. To solve $-2x = 2/5$ one mainly uses the:

(A) addition property only
(B) trichotomy
(C) division (or multiplication) property of equality

(D) arc-length formula

Correct Answer: C

Explanation: To solve −2x = 2/5 one mainly uses the division (or multiplication) property of equality.

104. The solution set of 5|x| = 25 is:

(A) {25, −25}
(B) {5}
(C) {}
(D) {−5, 5}

Correct Answer: D

Explanation: |x| = 5, so x = ±5, which matches the chapter rule being tested.

105. The solution set of √(3x + 1) = 5 is:

(A) {8}
(B) {5}
(C) {24}
(D) {25}

Correct Answer: A

Explanation: 3x + 1 = 25, so 3x = 24 and x = 8; √25 = 5 checks.

106. Linear equations with rational coefficients are still linear provided the variable appears to power:

(A) 2
(B) 1
(C) 1/2 only
(D) 0

Correct Answer: B

Explanation: Linear equations with rational coefficients are still linear provided the variable appears to power 1.

107. Dividing 2x < −16 by 2 (a positive number) gives:

(A) x > −8
(B) x < 8
(C) x < −8
(D) x > 8

Correct Answer: C

Explanation: Dividing 2x < −16 by 2 (a positive number) gives x < −8.

108. The number that must be subtracted from the right side of 5x = 22 so that x = 4 becomes a root is:

(A) 0
(B) 4
(C) 22
(D) 2

Correct Answer: D

Explanation: If x = 4 then the left side is 20, so subtract 2 from 22 to match.

MATHEMATICS MCQ BOOKLET

Grade 9 · Chapter 6 · Trigonometry and Bearing

FBISE / National Book Foundation Model Textbook companion

by Public Library

Independent MCQs on angle measure, radians, arc and sector, trigonometric ratios, identities, elevation, and bearings. 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 union of two rays with a common endpoint forms an:

(A) angle
(B) arc
(C) sector area
(D) bearing north only

Correct Answer: A

Explanation: The common endpoint is the vertex of the angle.

2. A positive angle is measured in the:

(A) clockwise direction
(B) anti-clockwise direction
(C) downward direction only
(D) east-west line only

Correct Answer: B

Explanation: The standard convention takes anti-clockwise as positive.

3. A negative angle is measured in the:

(A) anti-clockwise direction
(B) radial direction
(C) clockwise direction
(D) along the y-axis only

Correct Answer: C

Explanation: Clockwise rotation is assigned a negative measure.

4. An angle is in standard position if its vertex is at the origin and its initial arm lies along the:

(A) negative y-axis
(B) line y = x
(C) negative x-axis only
(D) positive x-axis

Correct Answer: D

Explanation: An angle is in standard position if its vertex is at the origin and its initial arm lies along the positive x-axis.

5. The sexagesimal system is also called the:

(A) English system of degree measure
(B) circular system
(C) centesimal system
(D) bearing-only system

Correct Answer: A

Explanation: A full turn is 360°, each degree splitting into minutes and seconds.

6. The circular system measures angles in:

(A) degrees only
(B) radians

(C) grades only
(D) three-figure bearings only

Correct Answer: B

Explanation: Radian measure compares arc length with radius.

7. The centesimal (French) system is:

(A) the main system of this unit
(B) the same as radians
(C) beyond the scope of this book
(D) the same as bearings

Correct Answer: C

Explanation: The centesimal (French) system is beyond the scope of this book.

8. One degree equals:

(A) 60 seconds
(B) 3600 minutes
(C) π radians
(D) 60 minutes

Correct Answer: D

Explanation: 1° = 60′, which matches the chapter rule being tested.

9. One minute of arc equals:

(A) 60 seconds
(B) 60 degrees
(C) 3600 degrees
(D) π/180 radians exactly as a minute

Correct Answer: A

Explanation: 1′ = 60″, which matches the chapter rule being tested.

10. One degree equals how many seconds?

(A) 60″
(B) 3600″
(C) 180″
(D) 90″

Correct Answer: B

Explanation: 1° = 60 × 60″ = 3600″, which matches the chapter rule being tested.

11. 30′ equals:

(A) 30″
(B) 3600″
(C) 1800″
(D) 90″

Correct Answer: C

Explanation: 30 × 60″ = 1800″, which matches the chapter rule being tested.

12. 60° equals how many seconds?

(A) 3600″
(B) 360″
(C) 60″
(D) 216000″

Correct Answer: D

Explanation: 60 × 3600″ = 216000″, which matches the chapter rule being tested.

13. 36° written in minutes is:

(A) 2160′
(B) 36′

(C) 360′
(D) 6′

Correct Answer: A

Explanation: 36 × 60′ = 2160′, which matches the chapter rule being tested.

14. 60.5° in D°M′S″ form is:

(A) 60° 50′
(B) 60° 30′
(C) 60° 5′
(D) 61° 0′

Correct Answer: B

Explanation: 0.5 × 60′ = 30′, so 60° 30′, which matches the chapter rule being tested.

15. 45.125° in D°M′S″ form is:

(A) 45° 12′ 5″
(B) 45° 1′ 25″
(C) 45° 7′ 30″
(D) 45° 75′

Correct Answer: C

Explanation: 0.125 × 60′ = 7.5′ and 0.5′ = 30″, which matches the chapter rule being tested.

16. 60° 30′ 30″ in degrees to 4 d.p. is:

(A) 60.3030°
(B) 60.5300°
(C) 61.0000°
(D) 60.5083°

Correct Answer: D

Explanation: 60° 30′ 30″ in degrees to 4 d.p. is 60.5083°.

17. The radian measure of an angle is the ratio of:

(A) arc length to radius
(B) radius to diameter
(C) area to circumference
(D) chord to radius

Correct Answer: A

Explanation: θ (in radians) = l / r, which matches the chapter rule being tested.

18. One radian is the central angle of an arc whose length equals the:

(A) diameter
(B) radius
(C) circumference
(D) area

Correct Answer: B

Explanation: When l = r the ratio l/r is 1, which matches the chapter rule being tested.

19. A complete turn in radians is:

(A) π
(B) π/2
(C) 2π
(D) 360

Correct Answer: C

Explanation: Circumference 2πr divided by r is 2π, which matches the chapter rule being tested.

20. π radians equal:

(A) 90°
(B) 360°

(C) 1°
(D) 180°

Correct Answer: D

Explanation: Half a turn is 180° and also π radians, which matches the chapter rule being tested.

21. To convert radians to degrees, multiply by:

(A) 180/π
(B) π/180
(C) 2π
(D) 60

Correct Answer: A

Explanation: 1 radian = (180/π)°, which matches the chapter rule being tested.

22. To convert degrees to radians, multiply by:

(A) 180/π
(B) π/180
(C) 60
(D) 2π

Correct Answer: B

Explanation: 1° = π/180 radians, which matches the chapter rule being tested.

23. 45° in radians is:

(A) π/2
(B) π/6
(C) π/4
(D) π/3

Correct Answer: C

Explanation: 45 × π/180 = π/4, which matches the chapter rule being tested.

24. 150° in radians is:

(A) 5π/4
(B) 2π/3
(C) π/6
(D) 5π/6

Correct Answer: D

Explanation: 150 × π/180 = 5π/6, which matches the chapter rule being tested.

25. 300° in radians is:

(A) 5π/3
(B) 5π/6
(C) 3π/2
(D) π/3

Correct Answer: A

Explanation: 300 × π/180 = 5π/3, which matches the chapter rule being tested.

26. π/3 radians in degrees is:

(A) 30°
(B) 60°
(C) 90°
(D) 120°

Correct Answer: B

Explanation: (π/3) × (180/π) = 60°, which matches the chapter rule being tested.

27. 3π/4 radians in degrees is:

(A) 75°
(B) 150°

(C) 135°
(D) 240°

Correct Answer: C

Explanation: (3π/4) × (180/π) = 135°, which matches the chapter rule being tested.

28. 1 radian is about:

(A) 30°
(B) 90°
(C) 180°
(D) 57° 17′ 45″

Correct Answer: D

Explanation: 180/π ≈ 57.2958°, which is about 57° 17′ 45″.

29. The length of a circular arc is l = rθ provided θ is in:

(A) radians
(B) degrees without conversion
(C) minutes
(D) grades

Correct Answer: A

Explanation: The defining ratio l/r is the radian measure.

30. If r = 2 cm and θ = π/4, the arc length is:

(A) π cm
(B) π/2 cm
(C) 2π cm
(D) π/4 cm

Correct Answer: B

Explanation: l = 2 × (π/4) = π/2 cm, which matches the chapter rule being tested.

31. If r = 30 cm and θ = 60°, the arc length is:

(A) 30 cm
(B) 60 cm
(C) 10π cm
(D) π/3 cm

Correct Answer: C

Explanation: 60° = π/3 rad, so l = 30 × π/3 = 10π cm.

32. A sector is the region bounded by an arc and:

(A) one tangent
(B) a chord only
(C) a bearing line
(D) the two corresponding radii

Correct Answer: D

Explanation: A sector is the region bounded by an arc and the two corresponding radii.

33. The area of a sector is A = (1/2)r²θ with θ in:

(A) radians
(B) degrees only
(C) minutes
(D) three-figure form

Correct Answer: A

Explanation: Proportionality with the full disk πr² over 2π yields that formula.

34. If r = 5 cm and θ = 120°, the sector area is:

(A) 25π cm²
(B) 25π/3 cm²

(C) 5π cm²
(D) 10 cm²

Correct Answer: B

Explanation: 120° = 2π/3, so A = (1/2)×25×(2π/3) = 25π/3 cm².

35. If arc length l = 4 cm and sector area A = 16 cm², then r equals:

(A) 4 cm
(B) 2 cm
(C) 8 cm
(D) 16 cm

Correct Answer: C

Explanation: A = (1/2) r l because θ = l/r, so 16 = 2r and r = 8 cm.

36. With l = 4 cm and r = 8 cm, the central angle is:

(A) 4 rad
(B) 2 rad
(C) 8 rad
(D) 1/2 rad

Correct Answer: D

Explanation: θ = l/r = 4/8 = 1/2 radian, which matches the chapter rule being tested.

37. A quadrantal angle has terminal ray along an axis, so its measure is a multiple of:

(A) 90°
(B) 45°
(C) 30°
(D) 1 radian only

Correct Answer: A

Explanation: 0°, 90°, 180°, 270°, 360°, … are the quadrantal cases.

38. A unit circle has radius:

(A) π
(B) 1
(C) 2
(D) 0

Correct Answer: B

Explanation: A unit circle has radius 1.

39. On a unit circle, the point at angle θ has coordinates:

(A) (sin θ, cos θ)
(B) (tan θ, 1)
(C) (cos θ, sin θ)
(D) (θ, 1)

Correct Answer: C

Explanation: cos θ is the x-coordinate and sin θ is the y-coordinate.

40. In a right triangle, sin θ equals:

(A) adjacent / hypotenuse
(B) opposite / adjacent
(C) hypotenuse / opposite
(D) opposite / hypotenuse

Correct Answer: D

Explanation: Sine is perpendicular over hypotenuse, which matches the chapter rule being tested.

41. In a right triangle, cos θ equals:

(A) adjacent / hypotenuse
(B) opposite / hypotenuse

(C) opposite / adjacent
(D) hypotenuse / adjacent

Correct Answer: A

Explanation: Cosine is base over hypotenuse, which matches the chapter rule being tested.

42. In a right triangle, tan θ equals:

(A) adjacent / opposite
(B) opposite / adjacent
(C) opposite / hypotenuse
(D) adjacent / hypotenuse

Correct Answer: B

Explanation: Tangent is perpendicular over base, and also sin θ / cos θ.

43. csc θ is the reciprocal of:

(A) cos θ
(B) tan θ
(C) sin θ
(D) sec θ

Correct Answer: C

Explanation: csc θ is the reciprocal of sin θ.

44. sec θ is the reciprocal of:

(A) sin θ
(B) tan θ
(C) cot θ
(D) cos θ

Correct Answer: D

Explanation: sec θ is the reciprocal of cos θ.

45. cot θ is the reciprocal of:

(A) tan θ
(B) sin θ
(C) cos θ
(D) sec θ

Correct Answer: A

Explanation: cot θ = adjacent / opposite = 1/tan θ, which matches the chapter rule being tested.

46. sin 30° equals:

(A) √3/2
(B) 1/2
(C) 1
(D) 0

Correct Answer: B

Explanation: In a 30°–60°–90° unit-circle triangle the opposite side is 1/2.

47. cos 30° equals:

(A) 1/2
(B) 0
(C) √3/2
(D) 1

Correct Answer: C

Explanation: The adjacent side on the unit circle is √3/2.

48. tan 30° equals:

(A) √3
(B) 1

(C) 0
(D) 1/√3

Correct Answer: D

Explanation: tan 30° equals 1/√3.

49. sin 45° equals:

(A) 1/√2
(B) 1/2
(C) √3/2
(D) 0

Correct Answer: A

Explanation: sin 45° equals 1/√2.

50. tan 45° equals:

(A) 0
(B) 1
(C) √3
(D) undefined

Correct Answer: B

Explanation: Opposite equals adjacent, so the ratio is 1.

51. sin 60° equals:

(A) 1/2
(B) 1/√2
(C) √3/2
(D) 0

Correct Answer: C

Explanation: The unit-circle point at 60° is (1/2, √3/2).

52. cos 60° equals:

(A) √3/2
(B) 0
(C) 1
(D) 1/2

Correct Answer: D

Explanation: The x-coordinate at 60° is 1/2, which matches the chapter rule being tested.

53. tan 60° equals:

(A) √3
(B) 1/√3
(C) 1
(D) 0

Correct Answer: A

Explanation: (√3/2) / (1/2) = √3, which matches the chapter rule being tested.

54. sin 0° equals:

(A) 1
(B) 0
(C) −1
(D) undefined

Correct Answer: B

Explanation: The point is (1, 0), so the y-coordinate is 0.

55. cos 0° equals:

(A) 0
(B) −1

(C) 1
(D) undefined

Correct Answer: C

Explanation: The point is (1, 0), which matches the chapter rule being tested.

56. sin 90° equals:

(A) 0
(B) −1
(C) undefined
(D) 1

Correct Answer: D

Explanation: The point is (0, 1), which matches the chapter rule being tested.

57. cos 90° equals:

(A) 0
(B) 1
(C) −1
(D) undefined

Correct Answer: A

Explanation: The point is (0, 1), so the x-coordinate is 0.

58. tan 90° is:

(A) 0
(B) undefined
(C) 1
(D) −1

Correct Answer: B

Explanation: Division by cos 90° = 0 is undefined, which matches the chapter rule being tested.

59. sin 180° equals:

(A) 1
(B) −1
(C) 0
(D) undefined

Correct Answer: C

Explanation: The point is (−1, 0), which matches the chapter rule being tested.

60. cos 180° equals:

(A) 0
(B) 1
(C) undefined
(D) −1

Correct Answer: D

Explanation: The x-coordinate on the negative x-axis is −1.

61. sin 270° equals:

(A) −1
(B) 0
(C) 1
(D) undefined

Correct Answer: A

Explanation: The point is (0, −1), which matches the chapter rule being tested.

62. cos 270° equals:

(A) −1
(B) 0

(C) 1
(D) undefined

Correct Answer: B

Explanation: The point is (0, −1), which matches the chapter rule being tested.

63. tan 270° is:

(A) 0
(B) 1
(C) undefined
(D) −1

Correct Answer: C

Explanation: cos 270° = 0, so tangent is undefined, which matches the chapter rule being tested.

64. sin 360° equals:

(A) 1
(B) −1
(C) undefined
(D) 0

Correct Answer: D

Explanation: sin 360° equals 0.

65. In quadrant I, all six trigonometric ratios are:

(A) positive
(B) negative
(C) undefined
(D) zero

Correct Answer: A

Explanation: Both x and y are positive, so every ratio built from them is positive.

66. In quadrant II the positive ratios are:

(A) cos and sec
(B) sin and csc
(C) tan and cot
(D) all six

Correct Answer: B

Explanation: y > 0 and x < 0, so sine and its reciprocal stay positive.

67. In quadrant III the positive ratios are:

(A) sin and csc
(B) cos and sec
(C) tan and cot
(D) all six

Correct Answer: C

Explanation: Both x and y are negative, so their quotient is positive.

68. In quadrant IV the positive ratios are:

(A) sin and csc
(B) tan and cot
(C) all six
(D) cos and sec

Correct Answer: D

Explanation: x > 0 and y < 0, so cosine and secant stay positive.

69. The Pythagorean identity is:

(A) $\sin^2\theta + \cos^2\theta = 1$
(B) $\sin\theta + \cos\theta = 1$

(C) $\sin\theta \cdot \cos\theta = 1$
(D) $\tan\theta + \cot\theta = 1$

Correct Answer: A

Explanation: The Pythagorean identity is $\sin^2\theta + \cos^2\theta = 1$.

70. $1 + \tan^2\theta$ equals:

(A) $\sin^2\theta$
(B) $\sec^2\theta$
(C) $\csc^2\theta$
(D) $\cot^2\theta$

Correct Answer: B

Explanation: $1 + \tan^2\theta$ equals $\sec^2\theta$.

71. $1 + \cot^2\theta$ equals:

(A) $\sec^2\theta$
(B) $\sin^2\theta$
(C) $\csc^2\theta$
(D) $\tan^2\theta$

Correct Answer: C

Explanation: $1 + \cot^2\theta$ equals $\csc^2\theta$.

72. $\tan\theta$ equals:

(A) $\cos\theta / \sin\theta$
(B) $1 / \sin\theta$
(C) $\cos\theta \cdot \sin\theta$
(D) $\sin\theta / \cos\theta$

Correct Answer: D

Explanation: This is the quotient identity, which matches the chapter rule being tested.

73. The line from observer to object is the:

(A) line of sight
(B) normal
(C) bearing north
(D) unit circle

Correct Answer: A

Explanation: Elevation and depression are measured from the horizontal to that line.

74. Angle of elevation is the angle between the horizontal and the line of sight when the object is:

(A) below the horizontal
(B) above the horizontal
(C) on the unit circle
(D) due south

Correct Answer: B

Explanation: The observer looks up, which matches the chapter rule being tested.

75. Angle of depression is the angle between the horizontal and the line of sight when the object is:

(A) above the horizontal
(B) at the zenith
(C) below the horizontal
(D) at 90° elevation

Correct Answer: C

Explanation: The observer looks down, which matches the chapter rule being tested.

76. From a point 15 m from a tree, the angle of elevation of the top is 45°. The height of the tree is:

(A) $15\sqrt{3}$ m
(B) $15/\sqrt{3}$ m

(C) 30 m
(D) 15 m

Correct Answer: D

Explanation: tan 45° = 1 = height/15, so height = 15 m.

77. A 10 m pole casts a 10 m shadow. The sun's angle of elevation is:

(A) 45°
(B) 30°
(C) 60°
(D) 90°

Correct Answer: A

Explanation: tan θ = 10/10 = 1, so θ = 45°, which matches the chapter rule being tested.

78. A three-figure bearing is an angle measured clockwise from:

(A) east
(B) due north
(C) south
(D) the x-axis

Correct Answer: B

Explanation: Navigation bearings start at north and run clockwise, written with three digits.

79. The three-figure bearing of due east is:

(A) 045°
(B) 180°
(C) 090°
(D) 270°

Correct Answer: C

Explanation: A right angle clockwise from north is 090°.

80. The three-figure bearing of north-east is:

(A) 090°
(B) 135°
(C) 315°
(D) 045°

Correct Answer: D

Explanation: NE sits halfway from north to east, which matches the chapter rule being tested.

B. Less Important / Secondary Topics

81. Trigonometry studies relations among sides and angles of a:

(A) triangle
(B) circle only
(C) square only
(D) cube only

Correct Answer: A

Explanation: Trigonometry studies relations among sides and angles of a triangle.

82. Similar triangles have equal angles and therefore equal:

(A) areas always
(B) ratios of corresponding sides
(C) perimeters only
(D) bearings only

Correct Answer: B

Explanation: Trigonometric ratios are constant for a given angle because of similarity.

83. A full circle in the sexagesimal system is:

(A) 100°
(B) 400 grades
(C) 360°
(D) 2 radians

Correct Answer: C

Explanation: A full circle in the sexagesimal system is 360°.

84. A quadrant measures:

(A) 45°
(B) 180°
(C) 360°
(D) 90°

Correct Answer: D

Explanation: A quarter of 360° is 90°, which matches the chapter rule being tested.

85. A half-turn measures:

(A) 180°
(B) 90°
(C) 270°
(D) 45°

Correct Answer: A

Explanation: Half of 360° is 180°, which matches the chapter rule being tested.

86. 1″ in degrees is:

(A) 1/60°
(B) 1/3600°
(C) 1°
(D) 60°

Correct Answer: B

Explanation: 1° = 3600", so 1" = 1/3600 of a degree, which matches the chapter rule being tested.

87. π/4 radians equals:

(A) 90°
(B) 30°
(C) 45°
(D) 60°

Correct Answer: C

Explanation: (π/4) × (180/π) = 45°, which matches the chapter rule being tested.

88. 5π/6 radians equals:

(A) 30°
(B) 120°
(C) 210°
(D) 150°

Correct Answer: D

Explanation: (5π/6) × (180/π) = 150°, which matches the chapter rule being tested.

89. The proportion (arc length)/(2πr) = θ/(2π) recovers:

(A) $l = r\theta$
(B) $A = \pi r^2$
(C) $\sin \theta = y$
(D) bearing 000°

Correct Answer: A

Explanation: Cancel 2π to get $l = r\theta$, which matches the chapter rule being tested.

90. csc 30° equals:

(A) 1/2
(B) 2
(C) √3
(D) 2/√3

Correct Answer: B

Explanation: csc = 1/sin and sin 30° = 1/2, which matches the chapter rule being tested.

91. sec 60° equals:

(A) 1/2
(B) √3
(C) 2
(D) 2/√3

Correct Answer: C

Explanation: sec = 1/cos and cos 60° = 1/2, which matches the chapter rule being tested.

92. cot 30° equals:

(A) 1/√3
(B) 1
(C) 0
(D) √3

Correct Answer: D

Explanation: cot = 1/tan and tan 30° = 1/√3, which matches the chapter rule being tested.

93. cot 90° equals:

(A) 0
(B) undefined
(C) 1
(D) −1

Correct Answer: A

Explanation: cos 90° / sin 90° = 0/1 = 0, which matches the chapter rule being tested.

94. sec 0° equals:

(A) 0
(B) 1
(C) undefined
(D) −1

Correct Answer: B

Explanation: 1/cos 0° = 1/1 = 1, which matches the chapter rule being tested.

95. csc 0° is:

(A) 0
(B) 1
(C) undefined
(D) −1

Correct Answer: C

Explanation: sin 0° = 0, so the reciprocal blows up, which matches the chapter rule being tested.

96. The product sin 30° · cos 30° · cos 90° · sin 90° equals:

(A) 1
(B) √3/4
(C) 1/2
(D) 0

Correct Answer: D

Explanation: The product sin 30° · cos 30° · cos 90° · sin 90° equals 0.

97. $1 - \cos^2\theta$ equals:

(A) $\sin^2\theta$
(B) $\sec^2\theta$
(C) $\tan^2\theta$
(D) 1

Correct Answer: A

Explanation: Rearrange $\sin^2\theta + \cos^2\theta = 1$, which matches the chapter rule being tested.

98. $\csc^2\theta - 1$ equals:

(A) $\sin^2\theta$
(B) $\cot^2\theta$
(C) $\tan^2\theta$
(D) $\sec^2\theta$

Correct Answer: B

Explanation: Rearrange $1 + \cot^2\theta = \csc^2\theta$, which matches the chapter rule being tested.

99. In a right triangle with opposite 6 and hypotenuse 12 to angle A, sin A equals:

(A) 2
(B) $\sqrt{3}/2$
(C) 1/2
(D) 1

Correct Answer: C

Explanation: 6/12 = 1/2, so A = 30° in the standard.

100. If □C = 90° and □A = 30° then □B equals:

(A) 30°
(B) 90°
(C) 45°
(D) 60°

Correct Answer: D

Explanation: Angles of a triangle sum to 180°, which matches the chapter rule being tested.

101. Due south as a three-figure bearing is:

(A) 180°
(B) 090°
(C) 270°
(D) 360°

Correct Answer: A

Explanation: Halfway around the compass clockwise from north.

102. Due west as a three-figure bearing is:

(A) 090°
(B) 270°
(C) 180°
(D) 045°

Correct Answer: B

Explanation: Three quadrants clockwise from north, which matches the chapter rule being tested.

103. North-west as a three-figure bearing is:

(A) 045°
(B) 135°
(C) 315°
(D) 225°

Correct Answer: C

Explanation: NW is 45° west of north, which is 360° − 45° = 315°.

104. South-east as a three-figure bearing is:

(A) 045°
(B) 225°
(C) 315°
(D) 135°

Correct Answer: D

Explanation: SE is 90° + 45° clockwise from north, which matches the chapter rule being tested.

105. If the bearing of B from A is 070°, the bearing of A from B is:

(A) 250°
(B) 070°
(C) 110°
(D) 290°

Correct Answer: A

Explanation: Add 180°: 070° + 180° = 250°, which matches the chapter rule being tested.

106. Exact north is written as the three-figure bearing:

(A) 360° only
(B) 000°
(C) 090°
(D) 180°

Correct Answer: B

Explanation: The reference direction itself is 000°, which matches the chapter rule being tested.

107. A car travels 13 km on a bearing of 090°. The northward component is:

(A) 13 km
(B) 13/√2 km
(C) 0 km
(D) 13√3 km

Correct Answer: C

Explanation: A car travels 13 km on a bearing of 090°. The northward component is 0 km.

108. Sailors and pilots use three-figure bearings mainly for:

(A) factorizing cubics
(B) solving |x| = 2
(C) finding HCF
(D) navigation

Correct Answer: D

Explanation: A clockwise angle from north locates a course or a target.

MATHEMATICS MCQ BOOKLET

Grade 9 · Chapter 7 · Coordinate Geometry

FBISE / National Book Foundation Model Textbook companion

by Public Library

Independent MCQs on the Cartesian plane, distance, collinearity, and the midpoint 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. On a number line, the distance between points with coordinates a and b is:

(A) |b − a|
(B) b − a without absolute value
(C) a + b
(D) ab

Correct Answer: A

Explanation: Absolute value makes the distance non-negative, so the order of subtraction does not matter.

2. Distance on a number line is never:

(A) zero when the points coincide
(B) negative
(C) equal to |a − b|
(D) symmetric in the two points

Correct Answer: B

Explanation: Length is defined with absolute value, so d(A, B) ≥ 0 always.

3. For points A and B on a line, d(A, B) compared with d(B, A) is:

(A) always larger
(B) always smaller
(C) equal
(D) undefined

Correct Answer: C

Explanation: Distance is symmetric: |b − a| = |a − b|.

4. The distance between −5 and 3 on a number line is:

(A) 2
(B) −8
(C) 15
(D) 8

Correct Answer: D

Explanation: The distance between −5 and 3 on a number line is 8.

5. If A is at −8 and B is at −2, then AB equals:

(A) 6
(B) 10
(C) −6
(D) 16

Correct Answer: A

Explanation: If A is at −8 and B is at −2, then AB equals 6.

6. An ordered pair (x, y) names a point in the:

(A) number line only
(B) Cartesian plane
(C) complex plane only
(D) set of integers only

Correct Answer: B

Explanation: The first number is the x-coordinate (abscissa) and the second is the y-coordinate (ordinate).

7. The point (0, 0) is called the:

(A) x-intercept only
(B) quadrant II
(C) origin
(D) unit length

Correct Answer: C

Explanation: The axes meet at the origin, which is the reference for all coordinates.

8. A point with x = 0 and y ≠ 0 lies on the:

(A) x-axis
(B) line y = x
(C) origin only
(D) y-axis

Correct Answer: D

Explanation: A point with x = 0 and y ≠ 0 lies on the y-axis.

9. A point with y = 0 and x ≠ 0 lies on the:

(A) x-axis
(B) y-axis
(C) line x = y
(D) origin only

Correct Answer: A

Explanation: The x-axis consists of points whose ordinate is 0.

10. The point (−3, 5) lies in quadrant:

(A) I
(B) II
(C) III
(D) IV

Correct Answer: B

Explanation: The point (−3, 5) lies in quadrant II.

11. The point (4, −2) lies in quadrant:

(A) I
(B) II
(C) IV
(D) III

Correct Answer: C

Explanation: The point (4, −2) lies in quadrant IV.

12. The point (−1, −6) lies in quadrant:

(A) I
(B) II
(C) IV
(D) III

Correct Answer: D

Explanation: Both coordinates are negative in quadrant III.

13. In general (x, y) equals (y, x) if and only if:

(A) x = y
(B) xy = 1
(C) x = −y
(D) x + y = 0

Correct Answer: A

Explanation: Order matters in an ordered pair, so the pairs coincide only when the two numbers are the same.

14. The distance between P1(x1, y1) and P2(x2, y2) is:

(A) $|x2 - x1| + |y2 - y1|$
(B) $\sqrt{[(x2 - x1)^2 + (y2 - y1)^2]}$
(C) $(x2 - x1) + (y2 - y1)$
(D) $|x2y2 - x1y1|$

Correct Answer: B

Explanation: The formula is Pythagoras on the horizontal and vertical legs of the right triangle they determine.

15. In the distance formula, swapping the two points:

(A) changes the sign of the distance
(B) doubles the distance
(C) leaves the distance unchanged
(D) makes the distance undefined

Correct Answer: C

Explanation: Squaring means $(x2 - x1)^2 = (x1 - x2)^2$, so order of the points does not matter.

16. The distance formula comes from applying Pythagoras in a triangle whose legs are:

(A) the two radii of a circle
(B) the intercepts only
(C) the midpoints only
(D) $|x2 - x1|$ and $|y2 - y1|$

Correct Answer: D

Explanation: Drop a horizontal and a vertical segment to form a right triangle with those legs.

17. Distance between (0, 0) and (6, 8) is:

(A) 10
(B) 14
(C) 48
(D) 7

Correct Answer: A

Explanation: Distance between (0, 0) and (6, 8) is 10.

18. Distance between (−2, 3) and (4, −5) is:

(A) 8
(B) 10
(C) 14
(D) 6

Correct Answer: B

Explanation: $\Delta x = 6$ and $\Delta y = -8$, so $\sqrt{(36 + 64)} = 10$.

19. Distance between (1, −1) and (1, 8) is:

(A) 7
(B) $\sqrt{65}$
(C) 9
(D) 0

Correct Answer: C

Explanation: The x-coordinates match, so the distance is $|8 - (-1)| = 9$.

20. Distance between (−4, 2) and (5, 2) is:

(A) 7
(B) $\sqrt{85}$
(C) 3
(D) 9

Correct Answer: D

Explanation: The y-coordinates match, so the distance is $|5 - (-4)| = 9$.

21. Distance between (0, −5) and (−12, 0) is:

(A) 13
(B) 7
(C) 17
(D) 60

Correct Answer: A

Explanation: Distance between (0, −5) and (−12, 0) is 13.

22. Distance between (2, 7) and (5, 11) is:

(A) 6
(B) 5
(C) 7
(D) 25

Correct Answer: B

Explanation: Distance between (2, 7) and (5, 11) is 5.

23. If A(−1, 2) and B(3, 5), then AB^2 equals:

(A) 7
(B) 5
(C) 25
(D) 16

Correct Answer: C

Explanation: $\Delta x = 4$ and $\Delta y = 3$, so $AB^2 = 16 + 9 = 25$ and $AB = 5$.

24. Points that lie on one straight line are called:

(A) concurrent
(B) conjugate
(C) cyclic
(D) collinear

Correct Answer: D

Explanation: Collinear means they share a single line; otherwise they are non-collinear.

25. Three points A, B, C with B between A and C are collinear when:

(A) AC = AB + BC
(B) AB = BC only
(C) AB · BC = AC
(D) $AB^2 + BC^2 = AC^2$ always

Correct Answer: A

Explanation: On a line the longest segment is the sum of the other two.

26. Vertices of a triangle must be:

(A) collinear
(B) non-collinear
(C) on the x-axis
(D) equidistant from the origin

Correct Answer: B

Explanation: Vertices of a triangle must be non-collinear.

27. A(1, 1), B(3, 5) and C(5, 9) are collinear because:

(A) AB = AC
(B) AB · BC = 1
(C) AC = AB + BC
(D) they form a right angle at B

Correct Answer: C

Explanation: AB = $\sqrt{[(2)^2+(4)^2]} = \sqrt{20} = 2\sqrt{5}$, BC = $2\sqrt{5}$, AC = $4\sqrt{5}$, so AC = AB + BC.

28. P(0, 0), Q(2, 1) and R(3, 4) are non-collinear because:

(A) PQ + QR equals PR
(B) all slopes are equal
(C) they lie on y = x
(D) PQ + QR is not equal to PR

Correct Answer: D

Explanation: PQ = $\sqrt{5}$, QR = $\sqrt{10}$, PR = 5, and $\sqrt{5} + \sqrt{10} \neq 5$, so they form a triangle.

29. A(0, 0), B(3, 0) and C(0, 4) form a right triangle because:

(A) $AB^2 + AC^2 = BC^2$
(B) AB = AC
(C) AB + AC = BC
(D) all sides are equal

Correct Answer: A

Explanation: AB = 3, AC = 4, BC = 5, and 9 + 16 = 25, so the right angle is at A.

30. The triangle with vertices (0, 0), (6, 0) and (0, 8) has hypotenuse:

(A) 6
(B) 10
(C) 8
(D) 14

Correct Answer: B

Explanation: It is a 6-8-10 right triangle, a scaled 3-4-5 triangle.

31. Vertices (0, 0), (4, 0) and (2, $2\sqrt{3}$) form an:

(A) isosceles right triangle
(B) obtuse scalene triangle
(C) equilateral triangle
(D) rectangle

Correct Answer: C

Explanation: Each side is 4, because the height of an equilateral triangle of side 4 is $2\sqrt{3}$.

32. Vertices (0, 0), (6, 0) and (3, 4) form an isosceles triangle because:

(A) all three sides equal 6
(B) it has a right angle at (3, 4)
(C) the base angles are 90°
(D) two sides equal $\sqrt{(9 + 16)} = 5$

Correct Answer: D

Explanation: The two equal sides from (3, 4) to the base ends are each 5, while the base is 6.

33. A scalene triangle has:

(A) three sides of different lengths
(B) all sides equal
(C) two sides equal
(D) a right angle always

Correct Answer: A

Explanation: Scalene means no two sides are equal.

34. Perimeter of triangle (0, 0), (3, 0), (0, 4) is:

(A) 7
(B) 12
(C) 5
(D) 24

Correct Answer: B

Explanation: Perimeter of triangle (0, 0), (3, 0), (0, 4) is 12.

35. If AB = 5, BC = 12 and AC = 13, triangle ABC is:

(A) equilateral
(B) impossible
(C) right-angled
(D) isosceles only

Correct Answer: C

Explanation: $5^2 + 12^2 = 25 + 144 = 169 = 13^2$, so Pythagoras holds.

36. A rectangle on the plane has opposite sides equal and:

(A) diagonals of different lengths
(B) all sides equal always
(C) no right angles
(D) equal diagonals that bisect each other

Correct Answer: D

Explanation: Distance between opposite corners is the same, and the shared midpoint is the centre.

37. Vertices (0, 0), (5, 0), (5, 3), (0, 3) form a rectangle because:

(A) adjacent sides 5 and 3 are perpendicular and opposite sides match
(B) all sides equal 5
(C) diagonals are unequal
(D) one angle is 60°

Correct Answer: A

Explanation: Horizontal and vertical sides meet at right angles, and opposite sides are equal.

38. Diagonals of that rectangle (0, 0), (5, 0), (5, 3), (0, 3) each have length:

(A) 4
(B) $\sqrt{34}$
(C) 8
(D) 15

Correct Answer: B

Explanation: $\sqrt{(5^2 + 3^2)} = \sqrt{34}$ for both AC and BD.

39. A square has equal sides and equal diagonals; (0, 0), (2, 0), (2, 2), (0, 2) has diagonal:

(A) 2
(B) 4
(C) $2\sqrt{2}$
(D) $\sqrt{2}$

Correct Answer: C

Explanation: A square has equal sides and equal diagonals; (0, 0), (2, 0), (2, 2), (0, 2) has diagonal $2\sqrt{2}$.

40. Diagonals of a parallelogram:

(A) are always equal
(B) are always perpendicular
(C) never meet
(D) bisect each other

Correct Answer: D

Explanation: Each diagonal's midpoint is the same point, which is the centre of the parallelogram.

41. For A(0, 0), B(4, 0), C(5, 2), D(1, 2), midpoint of AC is:

(A) (2.5, 1)
(B) (4, 2)
(C) (5, 0)
(D) (1, 2)

Correct Answer: A

Explanation: ((0 + 5)/2, (0 + 2)/2) = (2.5, 1), which is also the midpoint of BD.

42. The mid-point of A(x1, y1) and B(x2, y2) is:

(A) (x1 − x2, y1 − y2)
(B) ((x1 + x2)/2, (y1 + y2)/2)
(C) (x1x2, y1y2)
(D) (|x1 − x2|, |y1 − y2|)

Correct Answer: B

Explanation: Each coordinate of the midpoint is the average of the corresponding end coordinates.

43. Midpoint of (2, 8) and (6, 2) is:

(A) (8, 10)
(B) (4, 6)
(C) (4, 5)
(D) (2, 3)

Correct Answer: C

Explanation: Midpoint of (2, 8) and (6, 2) is (4, 5).

44. Midpoint of (−4, 7) and (2, −1) is:

(A) (−1, 4)
(B) (3, 3)
(C) (−2, 8)
(D) (−1, 3)

Correct Answer: D

Explanation: Midpoint of (−4, 7) and (2, −1) is (−1, 3).

45. Midpoint of (0, −6) and (10, 4) is:

(A) (5, −1)
(B) (10, −2)
(C) (5, 5)
(D) (0, 4)

Correct Answer: A

Explanation: Midpoint of (0, −6) and (10, 4) is (5, −1).

46. If (3, 1) is the midpoint of (a, 5) and (7, b), then a equals:

(A) 10
(B) −1
(C) 4
(D) 3

Correct Answer: B

Explanation: If (3, 1) is the midpoint of (a, 5) and (7, b), then a equals −1.

47. If (3, 1) is the midpoint of (a, 5) and (7, b), then b equals:

(A) 6
(B) 4
(C) −3
(D) 1

Correct Answer: C

Explanation: If (3, 1) is the midpoint of (a, 5) and (7, b), then b equals −3.

48. The centre of a circle with diameter ends (1, 2) and (7, 8) is:

(A) (8, 10)
(B) (6, 6)
(C) (1, 8)
(D) (4, 5)

Correct Answer: D

Explanation: The centre is the midpoint of the diameter: ((1 + 7)/2, (2 + 8)/2) = (4, 5).

49. Radius of the circle with diameter ends (1, 2) and (7, 8) is:

(A) $3\sqrt{2}$
(B) 6
(C) $\sqrt{72}$
(D) 10

Correct Answer: A

Explanation: Half of $\sqrt{[(6)^2 + (6)^2]}$ = half of $6\sqrt{2}$, which is $3\sqrt{2}$.

50. If M is the midpoint of LN, the ratio LN : MN is:

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

Correct Answer: B

Explanation: M halves LN, so the whole segment is twice MN.

51. The segment joining midpoints of two sides of a triangle is:

(A) equal to the third side
(B) twice the third side
(C) half the third side and parallel to it
(D) perpendicular to the third side always

Correct Answer: C

Explanation: That is the mid-segment (midpoint) theorem in the plane.

52. In □XYZ with X(0, 0), Y(8, 0), Z(4, 6), midpoint L of XY is:

(A) (8, 6)
(B) (2, 3)
(C) (4, 6)
(D) (4, 0)

Correct Answer: D

Explanation: In □XYZ with X(0, 0), Y(8, 0), Z(4, 6), midpoint L of XY is (4, 0).

53. In that same triangle, midpoint M of XZ is:

(A) (2, 3)
(B) (4, 6)
(C) (8, 0)
(D) (4, 0)

Correct Answer: A

Explanation: In that same triangle, midpoint M of XZ is (2, 3).

54. Then LM compared with YZ is:

(A) LM = YZ
(B) LM = YZ / 2
(C) LM = 2 YZ
(D) LM = YZ / 4

Correct Answer: B

Explanation: Then LM compared with YZ is LM = YZ / 2.

55. A lamp post equally far from two houses A and B should stand on the:

(A) x-axis always
(B) circle through A only
(C) perpendicular bisector of AB
(D) origin

Correct Answer: C

Explanation: Every point equidistant from A and B lies on the perpendicular bisector of the segment joining them.

56. If P(x, y) is equidistant from (2, 0) and (8, 0), then x equals:

(A) 2
(B) 8
(C) 10
(D) 5

Correct Answer: D

Explanation: The perpendicular bisector of those points on the x-axis is the line x = 5.

57. A point 4 units from both axes in quadrant I is:

(A) (4, 4)
(B) (−4, 4)
(C) (4, −4)
(D) (−4, −4)

Correct Answer: A

Explanation: Equal positive distances from both axes give (4, 4).

58. A point 3 units from both axes in quadrant III is:

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

Correct Answer: B

Explanation: Both coordinates must be negative in quadrant III.

59. Distance from (3, 5) to the x-axis is:

(A) 3
(B) √34
(C) 5
(D) 8

Correct Answer: C

Explanation: Vertical distance to y = 0 is |5| = 5.

60. Distance from (3, 5) to the y-axis is:

(A) 5
(B) √34
(C) 0
(D) 3

Correct Answer: D

Explanation: Horizontal distance to x = 0 is |3| = 3, which is smaller than the distance to the x-axis.

61. Distance from (3, 5) to the origin is:

(A) √34
(B) 8
(C) 4
(D) 15

Correct Answer: A

Explanation: Distance from (3, 5) to the origin is √34.

62. If P is equally far from (0, 0) and (6, 0), then P lies on:

(A) x = 0
(B) x = 3
(C) y = 3
(D) x + y = 6

Correct Answer: B

Explanation: The perpendicular bisector of the segment from (0, 0) to (6, 0) is the vertical line x = 3.

63. Length of a vertical segment from (2, −3) to (2, 9) is:

(A) 6
(B) 11
(C) 12
(D) √13

Correct Answer: C

Explanation: Length of a vertical segment from (2, −3) to (2, 9) is 12.

64. If A(c, 0) and B(0, 0) are 7 units apart, then c is:

(A) 0 only
(B) 49
(C) √7
(D) 7 or −7

Correct Answer: D

Explanation: If A(c, 0) and B(0, 0) are 7 units apart, then c is 7 or −7.

65. For A(k, 6) and O(0, 0) with AO = 10, a possible value of k is:

(A) 8
(B) 4
(C) 6
(D) 10

Correct Answer: A

Explanation: For A(k, 6) and O(0, 0) with AO = 10, a possible value of k is 8.

66. The abscissa of a point on the y-axis is:

(A) 1
(B) 0
(C) equal to its ordinate
(D) undefined

Correct Answer: B

Explanation: Every y-axis point is written (0, y).

67. The ordinate of a point on the x-axis is:

(A) x
(B) 1
(C) 0
(D) undefined

Correct Answer: C

Explanation: Every x-axis point is written (x, 0).

68. If (2, 5) = ((a + 1)/2, b − 1), then a equals:

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

Correct Answer: D

Explanation: If (2, 5) = ((a + 1)/2, b − 1), then a equals 3.

69. If (2, 5) = ((a + 1)/2, b − 1), then b equals:

(A) 6
(B) 5
(C) 4
(D) 1

Correct Answer: A

Explanation: If (2, 5) = ((a + 1)/2, b − 1), then b equals 6.

70. Unit length on a coordinate axis is the distance between:

(A) the origin and (2, 0)
(B) consecutive integers on that axis
(C) (1, 1) and (2, 2) only
(D) any two points

Correct Answer: B

Explanation: Consecutive integer marks are one unit apart by definition of the scale.

71. Collinear points (0, 2), (2, 6) and (3, 8) satisfy:

(A) AB = AC
(B) $AB^2 + BC^2 = AC^2$
(C) the largest distance equals the sum of the other two
(D) they form an equilateral triangle

Correct Answer: C

Explanation: Collinear points (0, 2), (2, 6) and (3, 8) satisfy the largest distance equals the sum of the other two.

72. To prove four points form a rhombus you can show:

(A) only one pair of sides equal
(B) only the diagonals equal
(C) they are collinear
(D) all four sides equal (by distance)

Correct Answer: D

Explanation: A rhombus is a quadrilateral with four equal sides; distance checks that.

73. To prove a parallelogram you can show:

(A) both pairs of opposite sides equal, or diagonals sharing a midpoint
(B) one right angle only
(C) all angles 90°
(D) one pair of sides equal

Correct Answer: A

Explanation: Equal opposite sides, or diagonals that bisect each other, characterise a parallelogram.

74. If A(2, 1), B(6, 1), C(6, 4), D(2, 4), then ABCD is a:

(A) rhombus that is not a rectangle
(B) rectangle
(C) kite with no right angle
(D) scalene triangle

Correct Answer: B

Explanation: Sides 4 and 3 are perpendicular, opposite sides match, so it is a rectangle.

75. The same rectangle ABCD has perimeter:

(A) 12
(B) 24
(C) 14
(D) 7

Correct Answer: C

Explanation: The same rectangle ABCD has perimeter 14.

76. If C is the midpoint of A(−2, 3) and B(8, 7), then C is:

(A) (6, 10)
(B) (5, 4)
(C) (3, 10)
(D) (3, 5)

Correct Answer: D

Explanation: If C is the midpoint of A(−2, 3) and B(8, 7), then C is (3, 5).

77. Two starts (0, 6) and (6, 0) are each 6 from the origin. A point C in quadrant I at equal distance from both starts lies on:

(A) y = x
(B) x = 0
(C) y = 6
(D) x + y = 0

Correct Answer: A

Explanation: The perpendicular bisector of (0, 6) and (6, 0) is y = x, so equal distance means C is on y = x.

78. On y = x, a point at distance 6 from (6, 0) in quadrant I is:

(A) (3, 3)
(B) (6, 6)
(C) (0, 0)
(D) (9, 9)

Correct Answer: B

Explanation: Let C = (t, t). Then (t − 6)² + t² = 36 □ 2t² − 12t = 0 □ t(t − 6) = 0. The first-quadrant solution is t = 6, so C(6, 6).

79. If end-points of a diameter are (0, −2) and (8, 4), the centre is:

(A) (8, 2)
(B) (4, 6)
(C) (4, 1)
(D) (0, 4)

Correct Answer: C

Explanation: If end-points of a diameter are (0, −2) and (8, 4), the centre is (4, 1).

80. Hassan at (4, 0) and Ali at (0, 4) are equally far from C(2, 2) because:

(A) C is the origin
(B) C lies on the x-axis
(C) the distance is 8
(D) C is the midpoint of the segment joining the starts, so HC = AC

Correct Answer: D

Explanation: Midpoint of (4, 0) and (0, 4) is (2, 2), so both distances equal √(4 + 4) = 2√2.

B. Less Important / Secondary Topics

81. Coordinate geometry is often linked historically with René Descartes, who is said to have described a fly's path using:

(A) coordinates on a plane
(B) only Roman numerals
(C) only tally marks
(D) sexagesimal hours alone

Correct Answer: A

Explanation: The Cartesian plane lets a point's position be recorded as an ordered pair.

82. The Cartesian plane is named after:

(A) Euclid only
(B) Descartes
(C) Pythagoras only
(D) Al-Khwarizmi only

Correct Answer: B

Explanation: Descartes' coordinate method is the historical source of the name.

83. Line segment AB is commonly denoted:

(A) only AB without a bar
(B) only d(A, B) as the segment itself
(C) overline AB
(D) angle AB

Correct Answer: C

Explanation: The bar marks the geometric segment; AB or d(A, B) is used for its length.

84. Length of segment AB may be written as AB, d(A, B), or:

(A) only □AB
(B) only the origin
(C) the slope of AB always
(D) m overline AB or |AB|

Correct Answer: D

Explanation: Length of segment AB may be written as AB, d(A, B), or m overline AB or |AB|.

85. (x, y) ≠ (y, x) in general because:

(A) order in an ordered pair matters
(B) addition is not commutative
(C) distance is negative
(D) the origin is undefined

Correct Answer: A

Explanation: Abscissa and ordinate play different roles, so swapping them usually moves the point.

86. On a number line the midpoint of coordinates a and b is:

(A) (a/2, b/2)
(B) (a + b)/2
(C) a − b
(D) ab/2

Correct Answer: B

Explanation: In one dimension the midpoint is simply the average of the two numbers.

87. The number line is also called a real line because:

(A) it shows only integers
(B) it cannot show negatives
(C) every real number corresponds to a point on it
(D) distance on it is always 1

Correct Answer: C

Explanation: Each real number is the coordinate of exactly one point of the line.

88. A coordinate of a point on a number line is:

(A) always positive
(B) always an integer
(C) the distance from 1
(D) the real number attached to that point

Correct Answer: D

Explanation: The origin is 0; positives lie one way and negatives the other.

89. If three points are collinear, they:

(A) do not form a triangle
(B) must form a right triangle
(C) must be on the y-axis
(D) have equal x-coordinates always

Correct Answer: A

Explanation: If three points are collinear, they do not form a triangle.

90. Non-collinear points in a plane can be vertices of a:

(A) single line only
(B) triangle or a non-degenerate polygon
(C) point
(D) ray only

Correct Answer: B

Explanation: Non-collinear points in a plane can be vertices of a triangle or a non-degenerate polygon.

91. The distance formula still works if one point is the origin (0, 0); then OP equals:

(A) x + y
(B) xy
(C) $\sqrt{(x^2 + y^2)}$
(D) |x − y|

Correct Answer: C

Explanation: That is the polar radius of P(x, y).

92. For a horizontal segment, the distance formula reduces to:

(A) |y2 − y1|
(B) $\sqrt{(x^2 + y^2)}$ with both changing
(C) 0 always
(D) |x2 − x1|

Correct Answer: D

Explanation: For a horizontal segment, the distance formula reduces to |x2 − x1|.

93. For a vertical segment, the distance formula reduces to:

(A) |y2 − y1|
(B) |x2 − x1|
(C) x2y2
(D) the midpoint

Correct Answer: A

Explanation: For a vertical segment, the distance formula reduces to |y2 − y1|.

94. All perpendicular bisectors of a given segment pass through:

(A) the origin always
(B) the midpoint of that segment
(C) both axes always
(D) quadrant I only

Correct Answer: B

Explanation: All perpendicular bisectors of a given segment pass through the midpoint of that segment.

95. If four vertices of a kite have diagonals AC and BD that cross at right angles at M, then M is:

(A) always the origin
(B) outside the kite
(C) the intersection (and often midpoint of one diagonal)
(D) a vertex

Correct Answer: C

Explanation: Kite diagonals are perpendicular; one of them is bisected at the crossing.

96. A useful check that (3, 4) is 5 from the origin is:

(A) 3 + 4 = 5
(B) 3 × 4 = 5
(C) 5 − 4 = 3 only as coincidence
(D) $3^2 + 4^2 = 5^2$

Correct Answer: D

Explanation: The 3-4-5 relation is Pythagoras, which is the distance formula at the origin.

97. Plotting Islamabad on a map uses geographic coordinates, which are analogous to:

(A) an ordered pair locating a point on a plane
(B) only integers on a line
(C) a single real number
(D) a slope

Correct Answer: A

Explanation: Latitude and longitude play the same locating role as (x, y).

98. If A, B, C are collinear with B between A and C, then d(A, C) − d(B, C) equals:

(A) d(B, C)
(B) d(A, B)
(C) d(A, C)
(D) 0 always

Correct Answer: B

Explanation: If A, B, C are collinear with B between A and C, then d(A, C) − d(B, C) equals d(A, B).

99. Minimum number of sides of a polygon in the plane is:

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

Correct Answer: C

Explanation: Minimum number of sides of a polygon in the plane is 3.

100. If x < 0 and y > 0, the point (−x, y) lies in quadrant:

(A) II
(B) III
(C) IV
(D) I

Correct Answer: D

Explanation: −x is positive when x is negative, and y is already positive, so the point is in quadrant I.

101. The point (−4, −(−6)) simplifies to (−4, 6), which is in quadrant:

(A) II
(B) III
(C) I
(D) IV

Correct Answer: A

Explanation: Negative x and positive y is quadrant II.

102. Two ordered pairs (4, 5) and ((t + 2)/2, 5) are equal when t equals:

(A) 4
(B) 6
(C) 8
(D) 2

Correct Answer: B

Explanation: Two ordered pairs (4, 5) and ((t + 2)/2, 5) are equal when t equals 6.

103. Midpoint of (c, −d) and (−d, c) is:

(A) (c − d, c − d)
(B) (c + d, −d + c)
(C) ((c − d)/2, (c − d)/2)
(D) (0, 0) always

Correct Answer: C

Explanation: Midpoint of (c, −d) and (−d, c) is ((c − d)/2, (c − d)/2).

104. If P(1, 4) is midpoint of A(x, 6) and B(−5, y), then (x, y) is:

(A) (−3, 8)
(B) (1, 4)
(C) (−5, 6)
(D) (7, 2)

Correct Answer: D

Explanation: If P(1, 4) is midpoint of A(x, 6) and B(−5, y), then (x, y) is (7, 2).

105. A 5-12-13 right triangle can sit with the right angle at (0, 0) using vertices:

(A) (5, 0), (0, 0), (0, 12)
(B) (5, 12), (0, 0), (13, 0)
(C) (5, 12) only two points
(D) (1, 1), (2, 2), (3, 3)

Correct Answer: A

Explanation: Those two legs are perpendicular axes segments of lengths 5 and 12.

106. Joining the midpoints of all four sides of any quadrilateral produces a:

(A) circle
(B) parallelogram (Varignon)
(C) always a square
(D) always a rhombus only if the original is a kite

Correct Answer: B

Explanation: The Varignon figure of a quadrilateral is always a parallelogram.

107. If A(3, 4), B(−1, 7) and C(x, y) are collinear with B the midpoint of AC, then C is:

(A) (7, 1)
(B) (1, 5.5)
(C) (−5, 10)
(D) (3, 7)

Correct Answer: C

Explanation: If A(3, 4), B(−1, 7) and C(x, y) are collinear with B the midpoint of AC, then C is (−5, 10).

108. Equidistance from two homes to place a lamp is a real-life reading of:

(A) the midpoint or perpendicular bisector in coordinate geometry
(B) factorization
(C) bearing without coordinates
(D) only logarithms

Correct Answer: D

Explanation: Equidistance from two homes to place a lamp is a real-life reading of only logarithms.

MATHEMATICS MCQ BOOKLET

Grade 9 · Chapter 8 · Geometry of Straight Lines

FBISE / National Book Foundation Model Textbook companion

by Public Library

Independent MCQs on slope, intercepts, standard forms of a line, angles, and families of lines. 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 inclination of a straight line is the angle it makes with the positive x-axis, measured:

(A) anticlockwise from the positive x-axis
(B) clockwise from the y-axis
(C) from the origin only
(D) clockwise from the negative x-axis

Correct Answer: A

Explanation: Inclination θ is taken from the positive x-axis in the anticlockwise sense.

2. A line parallel to the x-axis is called:

(A) vertical
(B) horizontal
(C) oblique
(D) normal

Correct Answer: B

Explanation: Horizontal lines have inclination 0° and never meet the x-axis (unless they are the x-axis itself).

3. A line parallel to the y-axis is called:

(A) horizontal
(B) oblique
(C) vertical
(D) a ray

Correct Answer: C

Explanation: A line parallel to the y-axis is called vertical.

4. A line that is neither horizontal nor vertical is called:

(A) normal
(B) axial
(C) null
(D) oblique

Correct Answer: D

Explanation: A line that is neither horizontal nor vertical is called oblique.

5. The inclination of a horizontal line is:

(A) 0°
(B) 90°
(C) 45°
(D) undefined

Correct Answer: A

Explanation: A horizontal line does not rise, so θ = 0°.

6. The inclination of a vertical line is:

(A) 0°
(B) 90°
(C) 180°
(D) 45°

Correct Answer: B

Explanation: A vertical line is perpendicular to the x-axis.

7. Gradient (slope) of a line is the ratio:

(A) run / rise
(B) rise × run
(C) rise / run
(D) run − rise

Correct Answer: C

Explanation: Steepness is vertical change divided by horizontal change, which is also tan θ.

8. If a line has inclination θ, its gradient m is:

(A) sin θ
(B) cos θ
(C) cot θ
(D) tan θ

Correct Answer: D

Explanation: By definition m = tan θ for a non-vertical line.

9. The gradient of a line with inclination 45° is:

(A) 1
(B) √3
(C) 0
(D) undefined

Correct Answer: A

Explanation: The gradient of a line with inclination 45° is 1.

10. The gradient of a line with inclination 60° is:

(A) 1
(B) √3
(C) 1/√3
(D) 0

Correct Answer: B

Explanation: The gradient of a line with inclination 60° is √3.

11. The gradient of a line with inclination 30° is:

(A) √3
(B) 1
(C) 1/√3
(D) 0

Correct Answer: C

Explanation: The gradient of a line with inclination 30° is 1/√3.

12. If m = 1.732 (approximately √3), the inclination is:

(A) 30°
(B) 45°
(C) 90°
(D) 60°

Correct Answer: D

Explanation: tan 60° ≈ 1.732, so θ = tan□¹(1.732) = 60°.

13. Gradient of a horizontal line is:

(A) 0
(B) undefined
(C) 1
(D) ∞

Correct Answer: A

Explanation: tan 0° = 0, so a horizontal line has slope 0.

14. Gradient of a vertical line is:

(A) 0
(B) undefined
(C) 1
(D) −1

Correct Answer: B

Explanation: tan 90° is undefined, so a vertical line has no real slope.

15. If A(x1, y1) and B(x2, y2) lie on a non-vertical line, then m equals:

(A) (x2 − x1)/(y2 − y1)
(B) (y2 + y1)/(x2 + x1)
(C) (y2 − y1)/(x2 − x1)
(D) y2/x2 only

Correct Answer: C

Explanation: The same indices must be used in numerator and denominator.

16. The slope between (1, 2) and (4, 8) is:

(A) 2/3
(B) 3
(C) 6
(D) 2

Correct Answer: D

Explanation: The slope between (1, 2) and (4, 8) is 2.

17. The slope between (0, 5) and (3, −1) is:

(A) −2
(B) 2
(C) −1/2
(D) 6

Correct Answer: A

Explanation: The slope between (0, 5) and (3, −1) is −2.

18. The slope between (−3, 4) and (1, 4) is:

(A) 1
(B) 0
(C) undefined
(D) 4

Correct Answer: B

Explanation: The y-coordinates are equal, so the line is horizontal and m = 0.

19. The slope between (2, −1) and (2, 7) is:

(A) 4
(B) 0
(C) undefined
(D) 8

Correct Answer: C

Explanation: The x-coordinates are equal, so the line is vertical.

20. A line with 0° < θ < 90° has:

(A) negative gradient
(B) zero gradient only
(C) undefined gradient
(D) positive gradient

Correct Answer: D

Explanation: tan θ is positive in the first quadrant, so the line rises from left to right.

21. A line with 90° < θ < 180° has:

(A) negative gradient
(B) positive gradient
(C) zero gradient
(D) gradient 1

Correct Answer: A

Explanation: tan θ is negative in the second quadrant, so the line falls from left to right.

22. Among y = 2x, y = x and y = (1/3)x, the steepest upward line is:

(A) y = x
(B) y = 2x
(C) y = (1/3)x
(D) they are equally steep

Correct Answer: B

Explanation: Larger positive slope means a steeper rise from left to right.

23. If two non-vertical lines are parallel, then:

(A) m1 m2 = −1
(B) m1 + m2 = 0
(C) m1 = m2
(D) m1 m2 = 1

Correct Answer: C

Explanation: Parallel lines make the same angle with the x-axis, so their slopes are equal.

24. If two non-vertical lines are perpendicular, then:

(A) m1 = m2
(B) m1 + m2 = 1
(C) m1 m2 = 0
(D) m1 m2 = −1

Correct Answer: D

Explanation: The product of the slopes is −1, equivalently each is the negative reciprocal of the other.

25. A line parallel to a line of slope 5 has slope:

(A) 5
(B) −1/5
(C) 1/5
(D) −5

Correct Answer: A

Explanation: Equal slopes are the parallel condition.

26. A line perpendicular to a line of slope 5 has slope:

(A) 5
(B) −1/5
(C) 1/5
(D) −5

Correct Answer: B

Explanation: The negative reciprocal of 5 is −1/5.

27. A line perpendicular to a line of slope −2/3 has slope:

(A) −2/3
(B) 2/3
(C) 3/2
(D) −3/2

Correct Answer: C

Explanation: The negative reciprocal of −2/3 is 3/2.

28. Three points A, B, C are collinear if the slopes of AB, BC and AC are:

(A) negative reciprocals
(B) zero
(C) undefined
(D) equal

Correct Answer: D

Explanation: Three points A, B, C are collinear if the slopes of AB, BC and AC are equal.

29. Slope of AB for A(2, 1) and B(6, 9) is 2. Slope of BC for C(8, 13) is:

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

Correct Answer: A

Explanation: (13 − 9)/(8 − 6) = 4/2 = 2, so A, B, C are collinear.

30. If the slope through (3, k) and (5, 11) is 4, then k equals:

(A) 19
(B) 3
(C) 7
(D) 11

Correct Answer: B

Explanation: If the slope through (3, k) and (5, 11) is 4, then k equals 3.

31. Lines through (k, 1), (4, 7) and (0, 2), (3, 8) are parallel when k equals:

(A) 3
(B) 4
(C) 1
(D) 7

Correct Answer: C

Explanation: First slope (7 − 1)/(4 − k) = 6/(4 − k). Second slope (8 − 2)/(3 − 0) = 2. So 6/(4 − k) = 2 □ 4 − k = 3 □ k = 1.

32. The equation of a line parallel to the x-axis at height b is:

(A) x = b
(B) y = bx
(C) x + y = b
(D) y = b

Correct Answer: D

Explanation: Every point on that line has the same y-coordinate b.

33. The equation of the x-axis is:

(A) y = 0
(B) x = 0
(C) y = x
(D) x + y = 0

Correct Answer: A

Explanation: On the x-axis the ordinate is identically 0.

34. The equation of a line parallel to the y-axis at abscissa a is:

(A) y = a
(B) x = a
(C) x = ay

(D) y = ax

Correct Answer: B

Explanation: Every point on that line has the same x-coordinate a.

35. The equation of the y-axis is:

(A) y = 0
(B) x = 1
(C) x = 0
(D) y = x

Correct Answer: C

Explanation: On the y-axis the abscissa is identically 0.

36. The line y = b lies above the x-axis when:

(A) b < 0
(B) b = 0
(C) b ≠ 1
(D) b > 0

Correct Answer: D

Explanation: The line y = b lies above the x-axis when b > 0.

37. The line x = a lies to the left of the y-axis when:

(A) a < 0
(B) a > 0
(C) a = 0
(D) a ≠ 0

Correct Answer: A

Explanation: The line x = a lies to the left of the y-axis when a < 0.

38. If a line meets the x-axis at (a, 0), then a is the:

(A) y-intercept
(B) x-intercept
(C) slope
(D) inclination

Correct Answer: B

Explanation: The x-intercept is the signed distance from the origin to that intercept point.

39. If a line meets the y-axis at (0, b), then b is the:

(A) x-intercept
(B) run
(C) y-intercept
(D) normal

Correct Answer: C

Explanation: That is the definition of the y-intercept.

40. Slope-intercept form of a non-vertical line is:

(A) x/a + y/b = 1
(B) x cos α + y sin α = p
(C) ax + by = 0 only
(D) y = mx + c

Correct Answer: D

Explanation: m is the slope and c is the y-intercept.

41. If c = 0 in y = mx + c, the line:

(A) passes through the origin
(B) is vertical
(C) is horizontal always

(D) has undefined slope

Correct Answer: A

Explanation: y = mx is the pencil of non-vertical lines through (0, 0).

42. Point-slope form of a line through (x1, y1) with slope m is:

(A) y = mx + x1
(B) y − y1 = m(x − x1)
(C) x/x1 + y/y1 = m
(D) y/y1 = m x/x1

Correct Answer: B

Explanation: The slope between a general point (x, y) and the given point is m.

43. Two-point form through (x1, y1) and (x2, y2) may be written:

(A) (y − y1)/(x − x1) = (x2 − x1)/(y2 − y1)
(B) y/x = y1/x1
(C) (y − y1)/(y2 − y1) = (x − x1)/(x2 − x1)
(D) xy = x1 y1

Correct Answer: C

Explanation: That equates the slope from the first point to (x, y) with the slope of the given segment.

44. Intercept form of a line with intercepts a and b is:

(A) y = ax + b
(B) ax + by = 1
(C) x cos a + y sin b = 1
(D) x/a + y/b = 1

Correct Answer: D

Explanation: Intercept form of a line with intercepts a and b is x/a + y/b = 1.

45. Symmetric form of a line through (x1, y1) with inclination α is:

(A) (x − x1)/cos α = (y − y1)/sin α
(B) y = x tan α
(C) x sin α + y cos α = 1
(D) y − y1 = (x − x1)/tan α

Correct Answer: A

Explanation: It comes from tan α = (y − y1)/(x − x1) rewritten with sine and cosine.

46. Normal form of a line is:

(A) y = mx + c
(B) x cos α + y sin α = p
(C) x/a + y/b = 1
(D) y − y1 = m(x − x1)

Correct Answer: B

Explanation: p is the length of the perpendicular from the origin to the line, and α is that perpendicular's inclination.

47. The line with slope 3 and y-intercept −2 has equation:

(A) y = −2x + 3
(B) 3x + y = 2
(C) y = 3x − 2
(D) x = 3y − 2

Correct Answer: C

Explanation: The line with slope 3 and y-intercept −2 has equation y = 3x − 2.

48. The line through (2, −1) with slope 4 has equation:

(A) y + 1 = 4(x + 2)
(B) y − 1 = 4(x − 2)
(C) y = 4x

(D) y + 1 = 4(x − 2)

Correct Answer: D

Explanation: The line through (2, −1) with slope 4 has equation y + 1 = 4(x − 2).

49. The line through (0, 3) and (6, 0) in intercept form is:

(A) x/6 + y/3 = 1
(B) x/3 + y/6 = 1
(C) x/6 + y/6 = 1
(D) x/3 + y/3 = 1

Correct Answer: A

Explanation: The line through (0, 3) and (6, 0) in intercept form is x/6 + y/3 = 1.

50. The line with slope 5 through (0, 0) is:

(A) x = 5
(B) y = 5x
(C) y = x + 5
(D) 5x + y = 0

Correct Answer: B

Explanation: The line with slope 5 through (0, 0) is y = 5x.

51. A linear equation ax + by + c = 0 represents a straight line provided:

(A) a, b, c are all nonzero
(B) c ≠ 0
(C) a and b are not both zero
(D) a = b

Correct Answer: C

Explanation: A linear equation ax + by + c = 0 represents a straight line provided a and b are not both zero.

52. If a = 0 and b ≠ 0 in ax + by + c = 0, the line is:

(A) vertical
(B) through the origin only
(C) undefined
(D) horizontal (parallel to the x-axis)

Correct Answer: D

Explanation: If a = 0 and b ≠ 0 in ax + by + c = 0, the line is horizontal (parallel to the x-axis).

53. If b = 0 and a ≠ 0 in ax + by + c = 0, the line is:

(A) vertical (parallel to the y-axis)
(B) horizontal
(C) y = x
(D) the x-axis

Correct Answer: A

Explanation: If b = 0 and a ≠ 0 in ax + by + c = 0, the line is vertical (parallel to the y-axis).

54. Slope of ax + by + c = 0 (b ≠ 0) is:

(A) a/b
(B) −a/b
(C) −c/b
(D) c/a

Correct Answer: B

Explanation: Rewriting as y = (−a/b)x + (−c/b) shows m = −a/b.

55. Y-intercept of ax + by + c = 0 (b ≠ 0) is:

(A) −a/b
(B) c/a
(C) −c/b

(D) a/c

Correct Answer: C

Explanation: Y-intercept of ax + by + c = 0 (b ≠ 0) is −c/b.

56. Slope of 2x − 4y + 8 = 0 is:

(A) 2
(B) −1/2
(C) 4
(D) 1/2

Correct Answer: D

Explanation: Slope of 2x − 4y + 8 = 0 is 1/2.

57. Y-intercept of 2x − 4y + 8 = 0 is:

(A) 2
(B) −2
(C) 8
(D) 4

Correct Answer: A

Explanation: Y-intercept of 2x − 4y + 8 = 0 is 2.

58. X-intercept of x + 2y = 6 is:

(A) 2
(B) 6
(C) 3
(D) 0

Correct Answer: B

Explanation: X-intercept of x + 2y = 6 is 6.

59. The angle θ from a line of slope m1 to a line of slope m2 satisfies:

(A) tan θ = (m1 + m2)/(1 − m1 m2)
(B) tan θ = m1 m2
(C) tan θ = (m2 − m1)/(1 + m1 m2)
(D) tan θ = m2/m1

Correct Answer: C

Explanation: It is the tangent subtraction formula with tan α = m2 and tan β = m1.

60. If m1 = m2, then tan θ = 0, so the lines are:

(A) perpendicular
(B) vertical
(C) normal to the origin
(D) parallel (or coincident)

Correct Answer: D

Explanation: Zero tangent means θ = 0°, the parallel case.

61. If 1 + m1 m2 = 0, then tan θ is undefined, so the lines are:

(A) perpendicular
(B) parallel
(C) horizontal
(D) the same line

Correct Answer: A

Explanation: tan 90° is undefined, matching m1 m2 = −1.

62. If m1 = 0 and m2 = 1, then θ equals:

(A) 30°
(B) 45°
(C) 60°

(D) 90°

Correct Answer: B

Explanation: tan θ = (1 − 0)/(1 + 0) = 1, so θ = 45°.

63. If m1 = 1 and m2 = −1, the lines:

(A) are parallel
(B) both pass through (1, −1) only
(C) are perpendicular
(D) have slope 0

Correct Answer: C

Explanation: If m1 = 1 and m2 = −1, the lines are perpendicular.

64. Two non-parallel lines a1x + b1y + c1 = 0 and a2x + b2y + c2 = 0 meet at exactly:

(A) no point
(B) two points
(C) infinitely many points
(D) one point

Correct Answer: D

Explanation: Two non-parallel lines a1x + b1y + c1 = 0 and a2x + b2y + c2 = 0 meet at exactly one point.

65. Those two lines are parallel when:

(A) a1 b2 − a2 b1 = 0 but the lines are not coincident
(B) a1/a2 = b1/b2 = c1/c2
(C) a1 = a2 only
(D) c1 = c2

Correct Answer: A

Explanation: The x, y coefficient determinant vanishing means equal slopes (or both vertical).

66. The intersection of x + y = 5 and x − y = 1 is:

(A) (1, 4)
(B) (3, 2)
(C) (5, 0)
(D) (2, 3)

Correct Answer: B

Explanation: The intersection of x + y = 5 and x − y = 1 is (3, 2).

67. The intersection of x + 2y = 4 and 2x − y = 3 is:

(A) (0, 2)
(B) (4, 0)
(C) (2, 1)
(D) (1, 2)

Correct Answer: C

Explanation: 2(x + 2y) = 8 and 2x − y = 3; subtract after aligning x: from first y = (4 − x)/2. Then 2x − (4 − x)/2 = 3 □ 4x − 4 + x = 6 □ 5x = 10 □ x = 2, y = 1.

68. Infinitely many lines can pass through:

(A) two distinct points
(B) no point
(C) three non-collinear points
(D) a single given point

Correct Answer: D

Explanation: A point does not determine a unique line; a second condition is needed.

69. The family of lines through the intersection of L1 = 0 and L2 = 0 is:

(A) L1 + k L2 = 0
(B) L1 L2 = k

(C) $L_1 = k L_2^2$
(D) $k L_1 = 1$

Correct Answer: A

Explanation: Every value of the parameter k (and the original two lines) gives a line through that common point.

70. A line through the intersection of $x + y = 0$ and $x - y = 2$, and through (1, 1), is found by:

(A) ignoring the given point
(B) substituting (1, 1) into $(x + y) + k(x - y - 2) = 0$ to fix k
(C) taking $k = 0$ always
(D) using only slope 1

Correct Answer: B

Explanation: A line through the intersection of $x + y = 0$ and $x - y = 2$, and through (1, 1), is found by substituting (1, 1) into $(x + y) + k(x - y - 2) = 0$ to fix k.

71. The line through (3, 5) parallel to the x-axis is:

(A) $x = 3$
(B) $y = x + 2$
(C) $y = 5$
(D) $x + y = 8$

Correct Answer: C

Explanation: A horizontal line keeps the y-coordinate of the given point.

72. The line through (3, 5) parallel to the y-axis is:

(A) $y = 5$
(B) $y = 3x$
(C) $x = 5$
(D) $x = 3$

Correct Answer: D

Explanation: A vertical line keeps the x-coordinate of the given point.

73. A line through (1, −2) perpendicular to a line of slope 3 has slope:

(A) $-1/3$
(B) 3
(C) $1/3$
(D) -3

Correct Answer: A

Explanation: Perpendicular slope is the negative reciprocal $-1/3$.

74. A line with y-intercept −4 parallel to slope 2 is:

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

Correct Answer: B

Explanation: A line with y-intercept −4 parallel to slope 2 is $y = 2x - 4$.

75. Normal form with $p = 4$ and $\alpha = 0°$ is:

(A) $y = 4$
(B) $x + y = 4$
(C) $x = 4$
(D) $y = x + 4$

Correct Answer: C

Explanation: Normal form with $p = 4$ and $\alpha = 0°$ is $x = 4$.

76. Normal form with $p = 5$ and $\alpha = 90°$ is:

(A) $x = 5$

(B) x + y = 5
(C) y = 5x
(D) y = 5

Correct Answer: D

Explanation: Normal form with p = 5 and α = 90° is y = 5.

77. If a line has x-intercept 4 and y-intercept 4, its slope is:

(A) −1
(B) 1
(C) 4
(D) 0

Correct Answer: A

Explanation: It joins (4, 0) and (0, 4), so m = (4 − 0)/(0 − 4) = −1.

78. Reducing 3x + 6y − 12 = 0 to slope-intercept form gives:

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

Correct Answer: B

Explanation: Reducing 3x + 6y − 12 = 0 to slope-intercept form gives y = −(1/2)x + 2.

79. Interior angles of a triangle whose side slopes are known can be found from:

(A) the distance formula only
(B) m1 + m2 + m3 = 180
(C) tan θ = (m2 − m1)/(1 + m1 m2) at each vertex
(D) intercepts only

Correct Answer: C

Explanation: Each vertex angle is the angle between the two sides meeting there; the third angle is 180° minus the other two.

80. In a real linear model p = 7.5 t + 5 for pollution p at time t hours, the gradient 7.5 means:

(A) pollution at midnight is 7.5
(B) time increases by 7.5
(C) the intercept is 7.5
(D) pollution increases by 7.5 units per hour

Correct Answer: D

Explanation: In a real linear model p = 7.5 t + 5 for pollution p at time t hours, the gradient 7.5 means pollution increases by 7.5 units per hour.

B. Less Important / Secondary Topics

81. Gradient is also called:

(A) slope
(B) intercept
(C) origin
(D) locus

Correct Answer: A

Explanation: The chapter uses the two words interchangeably for m = tan θ.

82. A median of a triangle is the segment joining a vertex to the:

(A) incentre
(B) midpoint of the opposite side
(C) orthocentre only
(D) a vertex of another triangle

Correct Answer: B

Explanation: That is the definition used when slopes of medians are required.

83. Slopes are observed from left to right, so a line falling to the right has:

(A) positive slope
(B) undefined slope
(C) negative slope
(D) slope 1

Correct Answer: C

Explanation: The chapter's key fact is that sign is read left-to-right.

84. tan 0° equals:

(A) 1
(B) undefined
(C) √3
(D) 0

Correct Answer: D

Explanation: That is why a horizontal line has slope 0.

85. The general form ax + by + c = 0 can be reduced to intercept form by:

(A) moving c and dividing so the right-hand side is 1
(B) dividing by a only
(C) setting m = 0
(D) taking tan□¹

Correct Answer: A

Explanation: The general form ax + by + c = 0 can be reduced to intercept form by moving c and dividing so the right-hand side is 1.

86. In normal form the sign of the radical is chosen so that p is:

(A) negative
(B) positive
(C) zero
(D) equal to m

Correct Answer: B

Explanation: p is a length, so the constant on the right is taken positive.

87. Two coincident lines have:

(A) no common point
(B) exactly two common points
(C) infinitely many common points
(D) a unique perpendicular

Correct Answer: C

Explanation: Two coincident lines have infinitely many common points.

88. Solution of two parallel distinct lines:

(A) is the origin
(B) is any point on either line
(C) is (1, 1) always
(D) does not exist

Correct Answer: D

Explanation: Solution of two parallel distinct lines does not exist.

89. Family of lines L1 + k L2 = 0 does not include L2 itself unless:

(A) k → ∞ is regarded as giving L2 (finite k recovers the rest of the pencil)
(B) k = 1 always
(C) k = −1 always
(D) k = m

Correct Answer: A

Explanation: Family of lines L1 + k L2 = 0 does not include L2 itself unless k → ∞ is regarded as giving L2 (finite k recovers the rest of the pencil).

90. If a line is written y = 5x − 3, the form is:

(A) two-point
(B) slope-intercept
(C) normal
(D) symmetric

Correct Answer: B

Explanation: If a line is written y = 5x − 3, the form is slope-intercept.

91. x-intercept of x + y = 7 is:

(A) 0
(B) −7
(C) 7
(D) 1

Correct Answer: C

Explanation: x-intercept of x + y = 7 is 7.

92. A line intersecting the axes at (2, 0) and (0, 5) has y-intercept:

(A) 2
(B) −5
(C) 7
(D) 5

Correct Answer: D

Explanation: The y-intercept is the y-coordinate of (0, 5).

93. The lines 2x − y = 0 and 4x − 2y + 6 = 0:

(A) are parallel and distinct
(B) intersect at one point
(C) are perpendicular
(D) are the same line

Correct Answer: A

Explanation: The lines 2x − y = 0 and 4x − 2y + 6 = 0 are parallel and distinct.

94. Point of intersection of 5x = 0 and 3y = 0 is:

(A) (5, 3)
(B) (0, 0)
(C) (1, 1)
(D) (3, 5)

Correct Answer: B

Explanation: x = 0 and y = 0 together are the origin.

95. A hill with rise 3 m and run 12 m has gradient:

(A) 4
(B) 3
(C) 1/4
(D) 12

Correct Answer: C

Explanation: A hill with rise 3 m and run 12 m has gradient 1/4.

96. Inclination of a line with slope 0 is:

(A) 90°
(B) 45°
(C) 180°

(D) 0°

Correct Answer: D

Explanation: Inclination of a line with slope 0 is 0°.

97. If slope of PQ is −4, slope of a perpendicular line is:

(A) 1/4
(B) −4
(C) 4
(D) −1/4

Correct Answer: A

Explanation: If slope of PQ is −4, slope of a perpendicular line is 1/4.

98. Which line has slope 2/3?

(A) 2x + 3y = 0
(B) 2x − 3y = 6
(C) 3x − 2y = 1
(D) 3x + 2y = 0

Correct Answer: B

Explanation: 2x − 3y = 6 — this correctly answers the question.

99. The line y = b is the x-axis itself when:

(A) b > 0
(B) b < 0
(C) b = 0
(D) b = 1

Correct Answer: C

Explanation: The line y = b is the x-axis itself when b = 0.

100. To find the third interior angle of a triangle after two are known, subtract their sum from:

(A) 90°
(B) 360°
(C) 270°
(D) 180°

Correct Answer: D

Explanation: The angle sum in a triangle is 180°.

101. In y = mx + c, increasing |m| makes the line:

(A) steeper
(B) flatter
(C) always horizontal
(D) always vertical

Correct Answer: A

Explanation: In y = mx + c, increasing |m| makes the line steeper.

102. A vertical line cannot be written in slope-intercept form because:

(A) it has y-intercept 0
(B) its slope is undefined
(C) it passes through the origin
(D) c would be infinite always

Correct Answer: B

Explanation: A vertical line cannot be written in slope-intercept form because its slope is undefined.

103. The intercept form x/a + y/b = 1 cannot describe a line through the origin because:

(A) a would equal b
(B) slope would be 1
(C) a line through the origin has both intercepts 0, so division by a or b fails

(D) normal form is required

Correct Answer: C

Explanation: Through the origin both intercepts vanish, so that standard form is unavailable.

104. If two sides of a right triangle lie along y = 0 and x = 0, the right angle is at:

(A) (1, 1)
(B) (1, 0) only
(C) infinity
(D) (0, 0)

Correct Answer: D

Explanation: The axes are perpendicular at the origin.

105. Family of lines of slope 3 may be written:

(A) y = 3x + k for real k
(B) x = 3
(C) y = 3
(D) xy = 3

Correct Answer: A

Explanation: Equal slopes with a free intercept give a parallel family (plus the same slope through every height).

106. The condition a1/a2 = b1/b2 = c1/c2 means the two linear equations:

(A) are perpendicular
(B) represent the same line
(C) have no solution
(D) are vertical

Correct Answer: B

Explanation: The condition a1/a2 = b1/b2 = c1/c2 means the two linear equations represent the same line.

107. A useful check that y = −x + 4 is perpendicular to y = x − 1 is:

(A) intercepts add to 3
(B) they share intercept 4
(C) product of slopes (−1)(1) = −1
(D) both pass through (0, 0)

Correct Answer: C

Explanation: The slope product test is the quick perpendicular check.

108. When interpreting a linear model, the y-intercept is the value of the dependent variable when:

(A) the slope is 1
(B) time is 12
(C) the gradient is 0
(D) the independent variable is 0

Correct Answer: D

Explanation: That is the meaning of c in y = mx + c.

MATHEMATICS MCQ BOOKLET

Grade 9 · Chapter 9 · Geometry and Polygons

FBISE / National Book Foundation Model Textbook companion

by Public Library

Independent MCQs on proof language, similarity, area and volume ratios, regular polygons, and loci. 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. Demonstrative geometry proves statements using:

(A) logical reasoning from given facts, axioms and earlier theorems
(B) guesswork only
(C) measurement with a ruler only
(D) majority vote

Correct Answer: A

Explanation: A proof is a chain of reasons, not an informal sketch.

2. Inductive reasoning works from:

(A) a general law to a particular case
(B) specific observations toward a general claim
(C) axioms alone with no examples
(D) converse statements only

Correct Answer: B

Explanation: Induction generalises from instances; those general claims still need a proof to be theorems.

3. Deductive reasoning works from:

(A) one example to a universal law
(B) conjecture with no premises
(C) a general result to a particular conclusion
(D) open sentences only

Correct Answer: C

Explanation: Once a general rule is known, deduction applies it to a specific case.

4. A mathematical statement is a meaningful sentence that is:

(A) always true
(B) always an open sentence
(C) never symbolic
(D) either true or false

Correct Answer: D

Explanation: Truth value is required; a sentence that cannot be judged true or false is not a statement.

5. “The product of x and y is 10” with x, y unspecified is:

(A) an open sentence
(B) a true theorem
(C) an axiom
(D) a corollary

Correct Answer: A

Explanation: Without values, it is not yet true or false.

6. A proposition consists of premise, argument, and:

(A) a diagram only
(B) conclusion
(C) a conjecture only

(D) an intercept

Correct Answer: B

Explanation: The conclusion follows if the premises are true and the argument is valid.

7. The two parts of a mathematical statement in geometry are often called:

(A) base and height
(B) radius and apothem
(C) hypothesis and conclusion
(D) locus and path

Correct Answer: C

Explanation: The hypothesis is what is assumed; the conclusion is what must be shown.

8. An axiom is a statement that is:

(A) proved from a theorem
(B) always false
(C) only about polygons
(D) accepted as true without proof

Correct Answer: D

Explanation: Axioms are starting assumptions; later results rest on them.

9. The word axiom comes from Greek axioma, meaning a claim taken as:

(A) true without proof
(B) false until measured
(C) a conjecture only
(D) a converse

Correct Answer: A

Explanation: That is the textbook etymology used in the unit.

10. Axioms about numbers (such as a = a) are also called:

(A) loci
(B) properties
(C) polygons
(D) medians

Correct Answer: B

Explanation: Axioms about numbers (such as a = a) are also called properties.

11. A postulate is an axiom that is specifically about:

(A) arithmetic only
(B) statistics only
(C) geometry
(D) logarithms

Correct Answer: C

Explanation: The unit treats geometric assumptions as postulates.

12. Through two distinct points there passes:

(A) no line
(B) exactly two lines
(C) a unique circle only
(D) exactly one line

Correct Answer: D

Explanation: That uniqueness is a standard incidence postulate.

13. Through a single point there pass:

(A) infinitely many lines
(B) no lines
(C) exactly two lines

(D) exactly one line

Correct Answer: A

Explanation: You may draw as many directions as you like through one point.

14. A conjecture is a statement believed true that:

(A) has already been proved
(B) still needs a proof
(C) is an axiom
(D) is always false

Correct Answer: B

Explanation: Until it is proved, it remains a conjecture, not a theorem.

15. A theorem is a statement that:

(A) cannot be proved
(B) is assumed with no argument
(C) can be proved by logical reasons
(D) is an open sentence

Correct Answer: C

Explanation: The Greek root theorien is linked with contemplating a result that is then established.

16. A corollary is a result that:

(A) contradicts a theorem
(B) is always an axiom
(C) needs no reason
(D) follows quickly from a theorem already proved

Correct Answer: D

Explanation: It is a short extra consequence, not an independent starting point.

17. The converse of a theorem is formed by:

(A) interchanging given and to-prove
(B) negating the conclusion only
(C) erasing the figure
(D) doubling all lengths

Correct Answer: A

Explanation: The converse need not be true even if the original theorem is true.

18. A standard first step in writing a geometric proof is to state the:

(A) corollary
(B) theorem in words (the statement)
(C) volume ratio
(D) exterior angle sum only

Correct Answer: B

Explanation: Then come figure, given, required to prove, construction, and the reasoned proof.

19. Similar figures have:

(A) the same size and different shape
(B) equal areas always
(C) the same shape but not necessarily the same size
(D) no corresponding angles

Correct Answer: C

Explanation: Similarity is about shape; congruence is the special case of the same size as well.

20. The symbol for ‘is similar to’ is:

(A) ≡
(B) □
(C) □

(D) □

Correct Answer: D

Explanation: If figures A and B are similar one writes A □ B.

21. All circles are similar because they:

(A) have the same shape (round) regardless of radius
(B) have equal radii
(C) have equal area
(D) are polygons

Correct Answer: A

Explanation: A circle is determined by radius, but the shape does not change with scale.

22. A rectangle and a non-rectangular parallelogram:

(A) are always similar
(B) need not be similar, because the shapes differ
(C) are always congruent
(D) have equal angles always

Correct Answer: B

Explanation: A rectangle and a non-rectangular parallelogram need not be similar, because the shapes differ.

23. If □ABC □ □DEF, corresponding angles satisfy:

(A) □A = □E only
(B) all angles 90°
(C) □A = □D, □B = □E, □C = □F
(D) □A + □D = 180° only

Correct Answer: C

Explanation: Vertices are named in corresponding order.

24. Corresponding sides of similar triangles are:

(A) equal in length always
(B) perpendicular
(C) parallel always
(D) proportional

Correct Answer: D

Explanation: The scale factor k is the common ratio of matching sides.

25. SAS similarity requires two pairs of proportional sides and:

(A) the included angles congruent
(B) a right angle anywhere
(C) equal perimeters
(D) equal areas

Correct Answer: A

Explanation: The equal angle must sit between the proportional sides.

26. If two pairs of angles of two triangles are equal, the triangles are similar by:

(A) SSS
(B) AA
(C) SAS only
(D) RHS only

Correct Answer: B

Explanation: AA forces the third angles equal as well, so the shapes match.

27. If □ABC □ □DEF with scale factor 2, and DE = 5 cm, then AB equals:

(A) 2.5 cm
(B) 5 cm
(C) 10 cm

(D) 25 cm

Correct Answer: C

Explanation: If □ABC □ □DEF with scale factor 2, and DE = 5 cm, then AB equals 10 cm.

28. If corresponding sides of two similar triangles are in ratio 3 : 5, the ratio of their perimeters is:

(A) 9 : 25
(B) 27 : 125
(C) 6 : 5
(D) 3 : 5

Correct Answer: D

Explanation: Perimeter is a linear quantity, so it scales with k.

29. The ratio of areas of two similar figures is:

(A) k^2
(B) k
(C) k^3
(D) 2k

Correct Answer: A

Explanation: Area involves two length factors, so it scales with the square of the linear scale factor.

30. The ratio of volumes of two similar solids is:

(A) k^2
(B) k^3
(C) k
(D) 3k

Correct Answer: B

Explanation: The ratio of volumes of two similar solids is k^3.

31. If two similar triangles have side ratio 1 : 2, the area ratio is:

(A) 1 : 2
(B) 1 : 8
(C) 1 : 4
(D) 2 : 1

Correct Answer: C

Explanation: If two similar triangles have side ratio 1 : 2, the area ratio is 1 : 4.

32. If two similar solids have length ratio 2 : 3, the volume ratio is:

(A) 4 : 9
(B) 2 : 3
(C) 6 : 9
(D) 8 : 27

Correct Answer: D

Explanation: If two similar solids have length ratio 2 : 3, the volume ratio is 8 : 27.

33. If areas of two similar pentagons are 16 : 25, the side ratio is:

(A) 4 : 5
(B) 16 : 25
(C) 64 : 125
(D) 8 : 10

Correct Answer: A

Explanation: Linear ratio is the square root of the area ratio.

34. Two triangles with the same height have area ratio equal to the ratio of their:

(A) angles
(B) bases
(C) perimeters squared always

(D) volumes

Correct Answer: B

Explanation: Area = (1/2) × base × height, so a common height cancels in the ratio.

35. If a line parallel to one side of a triangle cuts the other two sides, it creates a smaller triangle:

(A) congruent to the original
(B) of equal area
(C) similar to the original
(D) with opposite orientation only

Correct Answer: C

Explanation: Corresponding angles with the parallel line are equal, giving AA similarity.

36. If AD/AB = 5/8 with DE □ BC in □ABC, then area(□ADE) : area(□ABC) is:

(A) 5 : 8
(B) 125 : 512
(C) 8 : 5
(D) 25 : 64

Correct Answer: D

Explanation: The linear ratio is 5/8, so the area ratio is (5/8)² = 25/64.

37. A polygon is a closed plane figure whose sides are:

(A) straight line segments
(B) arcs of circles
(C) always curved
(D) always infinite rays

Correct Answer: A

Explanation: Greek poly + gon means many angles; sides meet at vertices.

38. The least number of sides a polygon can have is:

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

Correct Answer: B

Explanation: A triangle is the simplest closed polygonal chain.

39. A regular polygon has:

(A) equal sides only
(B) equal angles only
(C) all sides equal and all interior angles equal
(D) at least one right angle

Correct Answer: C

Explanation: It is both equilateral and equiangular.

40. An irregular polygon has:

(A) all sides and angles equal
(B) no vertices
(C) curved sides
(D) at least one side or angle different from the others

Correct Answer: D

Explanation: Failure of regularity in length or angle is enough.

41. A square is a regular polygon; a rectangle that is not a square is:

(A) irregular (angles equal but sides not all equal)
(B) regular
(C) not a polygon

(D) a pentagon

Correct Answer: A

Explanation: A square is a regular polygon; a rectangle that is not a square is irregular (angles equal but sides not all equal).

42. A rhombus that is not a square is:

(A) regular
(B) irregular (sides equal but angles not all equal)
(C) a hexagon
(D) not a quadrilateral

Correct Answer: B

Explanation: Regularity needs equal angles as well as equal sides.

43. A five-sided polygon is a:

(A) hexagon
(B) heptagon
(C) pentagon
(D) octagon

Correct Answer: C

Explanation: A five-sided polygon is a pentagon.

44. A six-sided polygon is a:

(A) pentagon
(B) nonagon
(C) decagon
(D) hexagon

Correct Answer: D

Explanation: A six-sided polygon is a hexagon.

45. An interior angle of a polygon is formed by:

(A) two adjacent sides, inside the shape
(B) a side and the extension of the next side, outside the shape
(C) two diagonals only
(D) a radius and a tangent

Correct Answer: A

Explanation: Interior means inside the closed chain.

46. An exterior angle is formed by a side and:

(A) a diagonal
(B) the extension of an adjacent side
(C) the apothem
(D) a median

Correct Answer: B

Explanation: It sits outside, adjacent to the interior angle at that vertex.

47. An interior angle and the adjacent exterior angle are:

(A) equal
(B) complementary
(C) supplementary (sum 180°)
(D) vertical

Correct Answer: C

Explanation: An interior angle and the adjacent exterior angle are supplementary (sum 180°).

48. The sum of interior angles of an n-gon is:

(A) $n \times 180°$
(B) $(n - 2) \times 360°$

(C) 360°/n
(D) (n − 2) × 180°

Correct Answer: D

Explanation: From one vertex you can draw n − 2 triangles, each contributing 180°.

49. A quadrilateral can be split from one vertex into how many triangles?

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

Correct Answer: A

Explanation: n − 2 = 2 when n = 4, and 2 × 180° = 360°.

50. Sum of interior angles of a pentagon is:

(A) 360°
(B) 540°
(C) 720°
(D) 180°

Correct Answer: B

Explanation: Sum of interior angles of a pentagon is 540°.

51. Sum of interior angles of a hexagon is:

(A) 540°
(B) 900°
(C) 720°
(D) 1080°

Correct Answer: C

Explanation: Sum of interior angles of a hexagon is 720°.

52. Sum of interior angles of a heptagon is:

(A) 720°
(B) 1080°
(C) 1260°
(D) 900°

Correct Answer: D

Explanation: Sum of interior angles of a heptagon is 900°.

53. Sum of interior angles of a decagon is:

(A) 1800°
(B) 1440°
(C) 1620°
(D) 360°

Correct Answer: A

Explanation: Sum of interior angles of a decagon is 1800°.

54. Each interior angle of a regular octagon is:

(A) 120°
(B) 135°
(C) 140°
(D) 150°

Correct Answer: B

Explanation: Each interior angle of a regular octagon is 135°.

55. Each interior angle of a regular nonagon is:

(A) 135°
(B) 150°

(C) 140°
(D) 160°

Correct Answer: C

Explanation: Each interior angle of a regular nonagon is 140°.

56. The sum of exterior angles of any convex polygon is:

(A) 180°
(B) (n − 2) × 180°
(C) n × 90°
(D) 360°

Correct Answer: D

Explanation: The sum of exterior angles of any convex polygon is 360°.

57. Each exterior angle of a regular n-gon is:

(A) 360° / n
(B) (n − 2) × 180° / n
(C) 180° / n
(D) n × 360°

Correct Answer: A

Explanation: Each exterior angle of a regular n-gon is 360° / n.

58. Each exterior angle of a regular pentagon is:

(A) 108°
(B) 72°
(C) 60°
(D) 90°

Correct Answer: B

Explanation: 360°/5 = 72°, and the interior is 108°.

59. Each exterior angle of a regular hexagon is:

(A) 120°
(B) 90°
(C) 60°
(D) 45°

Correct Answer: C

Explanation: Each exterior angle of a regular hexagon is 60°.

60. If each exterior angle of a regular polygon is 45°, then n equals:

(A) 6
(B) 9
(C) 10
(D) 8

Correct Answer: D

Explanation: If each exterior angle of a regular polygon is 45°, then n equals 8.

61. If each exterior angle of a regular polygon is 24°, then n equals:

(A) 15
(B) 12
(C) 18
(D) 24

Correct Answer: A

Explanation: If each exterior angle of a regular polygon is 24°, then n equals 15.

62. A regular polygon with exterior angle 120° is:

(A) a square
(B) an equilateral triangle

(C) a hexagon
(D) a pentagon

Correct Answer: B

Explanation: A regular polygon with exterior angle 120° is an equilateral triangle.

63. If each interior angle of a regular polygon is five times the exterior, then n equals:

(A) 8
(B) 10
(C) 12
(D) 6

Correct Answer: C

Explanation: If each interior angle of a regular polygon is five times the exterior, then n equals 12.

64. If exterior : interior = 1 : 2 in a regular polygon, then n equals:

(A) 4
(B) 8
(C) 3
(D) 6

Correct Answer: D

Explanation: If exterior : interior = 1 : 2 in a regular polygon, then n equals 6.

65. The polygon whose interior-angle sum equals its exterior-angle sum is a:

(A) quadrilateral
(B) pentagon
(C) hexagon
(D) triangle

Correct Answer: A

Explanation: The polygon whose interior-angle sum equals its exterior-angle sum is a quadrilateral.

66. If the interior-angle sum is four times the exterior-angle sum, n equals:

(A) 8
(B) 10
(C) 6
(D) 12

Correct Answer: B

Explanation: If the interior-angle sum is four times the exterior-angle sum, n equals 10.

67. Number of diagonals of an n-gon is:

(A) $n(n - 1)/2$
(B) $n - 2$
(C) $n(n - 3)/2$
(D) $2n$

Correct Answer: C

Explanation: Each vertex joins to $n - 3$ non-adjacent vertices, and each diagonal is counted twice.

68. A pentagon has how many diagonals?

(A) 3
(B) 10
(C) 7
(D) 5

Correct Answer: D

Explanation: 5 — this correctly answers the question.

69. A hexagon has how many diagonals?

(A) 9
(B) 6

(C) 12
(D) 15

Correct Answer: A

Explanation: 9 — this correctly answers the question.

70. A convex polygon with 14 diagonals has n equal to:

(A) 6
(B) 7
(C) 8
(D) 9

Correct Answer: B

Explanation: A convex polygon with 14 diagonals has n equal to 7.

71. If the interior-angle sum is 2880°, then n equals:

(A) 16
(B) 20
(C) 18
(D) 14

Correct Answer: C

Explanation: If the interior-angle sum is 2880°, then n equals 18.

72. The apothem of a regular polygon is the perpendicular from the centre to a side, and is also:

(A) the circumradius always equal to a side
(B) a diagonal
(C) an exterior angle
(D) the radius of the inscribed circle

Correct Answer: D

Explanation: The apothem of a regular polygon is the perpendicular from the centre to a side, and is also the radius of the inscribed circle.

73. Area of a regular polygon with perimeter P and apothem a is:

(A) (1/2) P a
(B) P a
(C) P / a
(D) n a²

Correct Answer: A

Explanation: Area of a regular polygon with perimeter P and apothem a is (1/2) P a.

74. A regular pentagon of side 8 and apothem 7 has area:

(A) 56
(B) 140
(C) 280
(D) 40

Correct Answer: B

Explanation: A regular pentagon of side 8 and apothem 7 has area 140.

75. A locus is the set of points satisfying a given geometric condition; the plural is:

(A) locuses only in Latin
(B) locations only
(C) loci
(D) locii

Correct Answer: C

Explanation: The word is tied to 'location': every point of the locus obeys the rule, and every point that obeys the rule lies on it.

76. In a plane, the locus of points at a fixed distance r from a point O is:

(A) a line
(B) a sphere
(C) two parallel lines
(D) a circle with centre O and radius r

Correct Answer: D

Explanation: In a plane, the locus of points at a fixed distance r from a point O is a circle with centre O and radius r.

77. The locus of points at a fixed distance from a given straight line is:

(A) two lines parallel to the given line, one on each side
(B) one parallel line
(C) a circle
(D) the perpendicular bisector

Correct Answer: A

Explanation: You can stand the same distance on either side of the line.

78. The locus of points equidistant from two given points A and B is:

(A) the circle through A and B
(B) the perpendicular bisector of AB
(C) the line AB itself
(D) two parallels

Correct Answer: B

Explanation: Every point of that bisector is as far from A as from B.

79. The locus of points equidistant from two intersecting lines is:

(A) a circle
(B) one parallel
(C) the pair of angle bisectors of those lines
(D) the intersection point only

Correct Answer: C

Explanation: Distance to a line is measured perpendicularly, and the angle bisector equalises those distances.

80. The locus of points equidistant from two parallel lines is:

(A) a circle
(B) two circles
(C) their common perpendicular only
(D) the parallel line exactly halfway between them

Correct Answer: D

Explanation: The locus of points equidistant from two parallel lines is the parallel line exactly halfway between them.

B. Less Important / Secondary Topics

81. A seven-sided polygon is a:

(A) heptagon
(B) hexagon
(C) octagon
(D) nonagon

Correct Answer: A

Explanation: Hepta- marks seven sides, so the polygon is a heptagon.

82. A nine-sided polygon is a:

(A) octagon
(B) nonagon
(C) decagon
(D) heptagon

Correct Answer: B

Explanation: Nona- marks nine sides, so the polygon is a nonagon.

83. A ten-sided polygon is a:

(A) nonagon
(B) dodecagon
(C) decagon
(D) hexagon

Correct Answer: C

Explanation: Deca- marks ten sides, so the polygon is a decagon.

84. In three-dimensional space, the locus of points at a fixed distance from a point is a:

(A) circle
(B) plane
(C) line
(D) sphere

Correct Answer: D

Explanation: The plane case was a circle; the space analogue is a sphere.

85. Every point on an angle bisector of two intersecting lines is:

(A) equidistant from the two lines
(B) closer to one line
(C) on both lines
(D) at the intersection only

Correct Answer: A

Explanation: That is the characterisation of the bisector as a locus.

86. The word theorem is linked with Greek theorien, meaning to:

(A) measure an apothem
(B) behold or consider
(C) draw a pentagon
(D) count diagonals

Correct Answer: B

Explanation: The word theorem is linked with Greek theorien, meaning to behold or consider.

87. Reflexive property of equality says that for any number a:

(A) a = 0
(B) a = −a
(C) a = a
(D) a + 1 = a

Correct Answer: C

Explanation: Reflexive property of equality says that for any number a a = a.

88. Transitive property: if a = b and b = c, then:

(A) a + c = b
(B) a = −c
(C) a b = c
(D) a = c

Correct Answer: D

Explanation: The same holds for equal angles: □A = □B and □B = □C imply □A = □C.

89. Symmetric property of equality: if a = b then:

(A) b = a
(B) a = −b
(C) a + b = 0
(D) a b = 1

Correct Answer: A

Explanation: Symmetric property of equality: if a = b then b = a.

90. "All right angles are equal to one another" is used as:

(A) a conjecture needing data
(B) a standard geometric axiom/postulate
(C) a volume formula
(D) a locus

Correct Answer: B

Explanation: It is one of the classical starting facts of Euclidean geometry.

91. "The whole is greater than its part" is:

(A) false for lengths
(B) a similarity test
(C) an axiom about magnitudes
(D) an exterior-angle formula

Correct Answer: C

Explanation: It is listed among the basic comparison axioms.

92. A 15-sided polygon is called a:

(A) dodecagon
(B) nonagon
(C) hexadecagon
(D) pentadecagon

Correct Answer: D

Explanation: A 15-sided polygon is called a pentadecagon.

93. As the number of sides of a regular convex polygon grows, each interior angle approaches:

(A) 180°
(B) 90°
(C) 360°
(D) 0°

Correct Answer: A

Explanation: Each interior angle is 180°(1 − 2/n), which increases toward 180° but stays less than 180°.

94. Maximum exterior angle of a regular convex polygon occurs at n = 3 and equals:

(A) 90°
(B) 120°
(C) 60°
(D) 180°

Correct Answer: B

Explanation: 360°/3 = 120° for an equilateral triangle; larger n makes a smaller exterior angle.

95. A regular polygon cannot have exterior angle 50° because:

(A) 50 > 45
(B) 50 is obtuse
(C) 360/50 is not an integer
(D) interior would be 50°

Correct Answer: C

Explanation: n = 360°/E must be an integer at least 3.

96. If an exterior angle of a regular polygon is 12°, the interior-angle sum is:

(A) 168°
(B) 360°
(C) 1800°
(D) 5040°

Correct Answer: D

Explanation: If an exterior angle of a regular polygon is 12°, the interior-angle sum is 5040°.

97. If similar cylinders have base-area ratio 16 : 25, the height ratio is:

(A) 4 : 5
(B) 16 : 25
(C) 64 : 125
(D) 8 : 10

Correct Answer: A

Explanation: Base area scales with k^2, so $k = 4/5$.

98. Those same cylinders have volume ratio:

(A) 16 : 25
(B) 64 : 125
(C) 4 : 5
(D) 8 : 27

Correct Answer: B

Explanation: Those same cylinders have volume ratio 64 : 125.

99. If one similar cone has 8 times the volume of another, the linear scale factor is:

(A) 8
(B) 4
(C) 2
(D) √8

Correct Answer: C

Explanation: If one similar cone has 8 times the volume of another, the linear scale factor is 2.

100. Masses of two similar objects of the same density scale like volume. Masses 8 kg and 27 kg imply height ratio:

(A) 8 : 27
(B) 4 : 9
(C) √8 : √27
(D) 2 : 3

Correct Answer: D

Explanation: Masses of two similar objects of the same density scale like volume. Masses 8 kg and 27 kg imply height ratio 2 : 3.

101. A map shows 10 m as 5 cm. Linear scale is 5 cm : 10 m = 1 : 200. Areas then scale as:

(A) 1 : 40 000
(B) 1 : 200
(C) 1 : 8 000 000
(D) 1 : 100

Correct Answer: A

Explanation: Area scale is the square of the linear scale.

102. If AB = 21 cm and P divides AB in the ratio 3 : 4, then AP equals:

(A) 12 cm
(B) 9 cm
(C) 7 cm
(D) 15 cm

Correct Answer: B

Explanation: If AB = 21 cm and P divides AB in the ratio 3 : 4, then AP equals 9 cm.

103. Which of the following is a polygon?

(A) circle
(B) sphere
(C) quadrilateral

(D) cylinder

Correct Answer: C

Explanation: A quadrilateral is a 4-sided polygonal chain; a circle is not made of line segments.

104. Which of the following is a regular polygon?

(A) rhombus (non-square)
(B) rectangle (non-square)
(C) kite
(D) square

Correct Answer: D

Explanation: Square — this correctly answers the question.

105. Sum of interior angles of a 12-gon is:

(A) 1800°
(B) 2160°
(C) 1980°
(D) 360°

Correct Answer: A

Explanation: Sum of interior angles of a 12-gon is 1800°.

106. Sum of interior angles of an irregular hexagon is still:

(A) 120° each
(B) 720°
(C) 360°
(D) 540°

Correct Answer: B

Explanation: Sum of interior angles of an irregular hexagon is still 720°.

107. A pyramid and a cube:

(A) are similar solids always
(B) always have volume ratio 1 : 8
(C) are not similar in general, because the shapes differ
(D) have the same number of faces

Correct Answer: C

Explanation: A pyramid and a cube are not similar in general, because the shapes differ.

108. Construction in a proof means:

(A) erasing the given figure
(B) changing the hypothesis
(C) measuring with a protractor as the reason
(D) adding extra lines or points that help the argument

Correct Answer: D

Explanation: The extra drawing is justified, then used with axioms and earlier theorems.

MATHEMATICS MCQ BOOKLET

Grade 9 · Chapter 10 · Practical Geometry

FBISE / National Book Foundation Model Textbook companion

by Public Library

Independent MCQs on triangle constructions (SAS, ASA/AAS, SSA ambiguous case) and concurrency of angle bisectors, altitudes, perpendicular bisectors and medians. 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 SAS construction of a triangle uses two sides and the:

(A) included angle between those two sides
(B) angle opposite the longer side only
(C) exterior angle at a remote vertex
(D) sum of the remote interior angles only

Correct Answer: A

Explanation: SAS means the given angle sits between the two given sides, so the third vertex is uniquely located.

2. To construct ΔABC with AB = 3.4 cm, BC = 4.1 cm and included □B = 70°, the first sensible step is to:

(A) draw AC as the base without using AB
(B) draw AB and then construct 70° at B
(C) guess point C without a compass
(D) draw only the altitude from A

Correct Answer: B

Explanation: Lay down one given side, then copy the included angle at the shared vertex before marking the second side.

3. After drawing AB and constructing ray BX so that □ABX equals the given included angle, the next SAS step is to:

(A) bisect AB first
(B) draw the perpendicular bisector of AB
(C) cut off BC on ray BX with a compass set to the given length
(D) construct 180° at A

Correct Answer: C

Explanation: The compass transfers the second given side onto the ray that already carries the included angle.

4. Two sides and the included angle determine:

(A) no triangle, always
(B) always two non-congruent triangles
(C) a unique square
(D) exactly one triangle (up to congruence)

Correct Answer: D

Explanation: SAS is a uniqueness case: the third vertex is the unique inter.

5. ASA construction uses one side and:

(A) two angles (then the third follows from 180°)
(B) two right angles only
(C) three sides
(D) one exterior angle only

Correct Answer: A

Explanation: Two angles fix the third because the interior angles of a triangle sum to 180°, so the base angles at the given side can both be drawn.

6. If □P = 50° and □Q = 65° in ΔPQR, then □R is:

(A) 115°
(B) 65°
(C) 50°
(D) 180°

Correct Answer: B

Explanation: 50° + 65° = 115°, so □R = 180° − 115° = 65°.

7. Given side QR together with □Q and □P (not at R), a correct construction plan is to:

(A) ignore the angle sum
(B) construct only □P on QR
(C) compute □R = 180° − □P − □Q and construct □Q and □R at the ends of QR
(D) draw three arbitrary arcs

Correct Answer: C

Explanation: The given side needs its two adjacent angles; the missing one is recovered from the 180° sum.

8. Two angles and any side (ASA or AAS) determine:

(A) infinitely many dissimilar triangles
(B) always the ambiguous SSA pair
(C) no triangle if the side is the longest
(D) a unique triangle

Correct Answer: D

Explanation: The shape is fixed by AA similarity of angles, and the given side fixes the scale.

9. If two given angles add to 190°, a triangle:

(A) cannot be constructed because the angle sum would exceed 180°
(B) can still be drawn with a 10° third angle
(C) must be right-angled
(D) must be equilateral

Correct Answer: A

Explanation: Interior angles of a triangle total 180°, so 190° already overshoots and no third positive angle remains.

10. The SSA data set is two sides and:

(A) the included angle
(B) an angle opposite one of those sides
(C) all three angles
(D) a right angle at the unused vertex

Correct Answer: B

Explanation: SSA is not SAS: the given angle is opposite one given side, which is why the number of triangles can vary.

11. SSA is called the ambiguous case because:

(A) a compass cannot draw arcs
(B) angles never sum to 180°
(C) zero, one, or two triangles may result
(D) only squares can be drawn

Correct Answer: C

Explanation: The arc from the far endpoint may miss the given ray, touch it once, or cut it twice.

12. In SSA with acute □A, side a opposite A and side b adjacent, the altitude from the far vertex to side b is:

(A) b + a
(B) a / b
(C) 180° − A
(D) b sin A

Correct Answer: D

Explanation: In the right triangle formed by dropping a perpendicular to the adjacent side, the height is b sin A.

13. If □A = 30°, b = 10 cm and a = 4 cm, then b sin A = 5 cm, so compared with a = 4 cm:

(A) no triangle forms because a is shorter than the altitude
(B) two triangles form
(C) exactly one right triangle forms
(D) infinitely many triangles form

Correct Answer: A

Explanation: When a < b sin A the compass arc never meets the given ray, so construction is impossible.

14. If □A = 30°, b = 10 cm and a = 5 cm, then a equals b sin A, so the construction yields:

(A) two obtuse triangles
(B) exactly one right-angled triangle
(C) no triangle
(D) a unique equilateral triangle

Correct Answer: B

Explanation: The arc is tangent to the ray, giving a right angle at the new vertex.

15. If □A = 30°, b = 10 cm and a = 7 cm, then 5 < 7 < 10, so SSA produces:

(A) no triangle
(B) only a square
(C) two distinct triangles
(D) a unique 30°-60°-90° triangle always

Correct Answer: C

Explanation: When b sin A < a < b the arc cuts the ray twice, which is the classic two-triangle ambiguity.

16. If □A = 30°, b = 10 cm and a = 12 cm, then a > b, so SSA produces:

(A) two triangles
(B) no triangle
(C) a circle only
(D) exactly one triangle

Correct Answer: D

Explanation: When the side opposite the given acute angle is at least as long as the other given side, the arc meets the ray once.

17. If the given SSA angle is obtuse and the opposite side is not longer than the adjacent side, typically:

(A) no triangle can be formed
(B) two acute triangles appear
(C) the figure must be equilateral
(D) three triangles appear

Correct Answer: A

Explanation: If the given SSA angle is obtuse and the opposite side is not longer than the adjacent side, typically no triangle can be formed.

18. SSS construction of ΔABC with three given sides uses compass arcs centred at the ends of the base so that they:

(A) never meet
(B) intersect at the third vertex
(C) meet only at a midpoint of the base
(D) form a square

Correct Answer: B

Explanation: Each arc is the locus of points at a given distance from a base endpoint; their inter.

19. Three given sides determine a unique triangle provided they satisfy:

(A) any three positive lengths
(B) exactly one right angle

(C) the triangle inequality (each pair-sum exceeds the third side)
(D) equal altitudes

Correct Answer: C

Explanation: If one side is as long as or longer than the sum of the other two, the arcs miss and no triangle exists.

20. Sides 3 cm, 4 cm and 8 cm:

(A) form a unique right triangle
(B) form two SSA triangles
(C) form an equilateral triangle
(D) cannot form a triangle because 3 + 4 < 8

Correct Answer: D

Explanation: 3 + 4 = 7, which is less than 8, so the triangle inequality fails.

21. A ray that divides a given angle into two equal angles is an:

(A) angle bisector
(B) altitude of a distant side
(C) right bisector of a segment
(D) median to a non-adjacent side

Correct Answer: A

Explanation: A ray that divides a given angle into two equal angles is an angle bisector.

22. To construct an angle bisector with compass and ruler you first draw an arc centred at the vertex that:

(A) misses both arms
(B) cuts both arms, then equal arcs from those points locate a point on the bisector
(C) must use a protractor only
(D) draws the perpendicular bisector of a side

Correct Answer: B

Explanation: Equal radii from the two arm-points give a point equidistant from the arms, which lies on the bisector.

23. The three angle bisectors of a triangle are:

(A) always parallel
(B) concurrent only in right triangles
(C) concurrent at a single point
(D) collinear

Correct Answer: C

Explanation: They meet at one interior point, which is the in-centre.

24. The in-centre of a triangle is the point where the:

(A) medians meet
(B) altitudes meet
(C) right bisectors of the sides meet
(D) angle bisectors meet

Correct Answer: D

Explanation: In-centre is the concurrency point of the angle bisectors and the centre of the incircle.

25. The in-centre always lies:

(A) inside the triangle
(B) outside every triangle
(C) on a side of every obtuse triangle
(D) at a vertex of every right triangle

Correct Answer: A

Explanation: Each angle bisector stays in the interior, so their common point is interior for every triangle.

26. The in-centre is equidistant from the:

(A) three vertices only

(B) three sides (it is the incentre of the incircle)
(C) midpoints of the sides only
(D) orthocentre only

Correct Answer: B

Explanation: Distance to each side equals the in-radius, which is why the incircle touches all three sides.

27. An altitude of a triangle is the perpendicular segment from a vertex to:

(A) the angle bisector at that vertex
(B) the circumcircle only
(C) the line containing the opposite side
(D) the median of another triangle

Correct Answer: C

Explanation: Altitude means orthogonal drop from a vertex to the opposite side's line (possibly extended).

28. The three altitudes of a triangle are concurrent at the:

(A) centroid
(B) in-centre
(C) midpoint of every median
(D) orthocentre

Correct Answer: D

Explanation: Orthocentre is defined as the meeting point of the altitudes.

29. In an acute-angled triangle the orthocentre lies:

(A) inside the triangle
(B) outside the triangle
(C) always at a vertex
(D) at the midpoint of the longest side

Correct Answer: A

Explanation: All altitudes fall inside an acute triangle, so they meet inside.

30. In a right-angled triangle the orthocentre is at:

(A) the midpoint of the hypotenuse
(B) the vertex of the right angle
(C) a point outside the triangle
(D) the in-centre

Correct Answer: B

Explanation: The two legs are themselves altitudes, so they already meet at the right-angled vertex.

31. In an obtuse-angled triangle the orthocentre lies:

(A) inside the triangle
(B) always at the obtuse vertex
(C) outside the triangle
(D) at the centroid

Correct Answer: C

Explanation: Two altitudes must be drawn to extensions of the sides, and they meet outside.

32. In right ΔABC with right angle at B, sides AB and BC are:

(A) medians to the hypotenuse
(B) right bisectors of AC
(C) angle bisectors of □A and □C
(D) altitudes to each other

Correct Answer: D

Explanation: Each leg is perpendicular to the other, so each is the altitude from B to the other leg's line.

33. A line that passes through the midpoint of a segment and is perpendicular to it is a:

(A) perpendicular bisector (right bisector)

(B) median of an unrelated triangle
(C) angle bisector only
(D) altitude from a remote vertex only

Correct Answer: A

Explanation: Right bisector means both 'through the midpoint' and 'at 90°'.

34. Every point on the perpendicular bisector of a segment is:

(A) closer to one endpoint
(B) equidistant from the two endpoints
(C) on the segment itself
(D) outside every circle

Correct Answer: B

Explanation: That equidistance property is why the circumcentre, lying on all three right bisectors, is the centre of the circumcircle.

35. A line segment has:

(A) exactly one bisector in the plane
(B) no midpoint
(C) infinitely many bisectors, but only one perpendicular bisector
(D) exactly three right bisectors

Correct Answer: C

Explanation: Any line through the midpoint bisects the segment; only one of those lines is perpendicular to it.

36. The three perpendicular bisectors of the sides of a triangle are concurrent at the:

(A) in-centre
(B) centroid
(C) orthocentre
(D) circumcentre

Correct Answer: D

Explanation: Circumcentre is the unique point equidistant from all three vertices.

37. In an acute-angled triangle the circumcentre lies:

(A) inside the triangle
(B) outside the triangle
(C) always at a vertex
(D) at the orthocentre of a different triangle only

Correct Answer: A

Explanation: All three right bisectors meet in the interior when every angle is acute.

38. In a right-angled triangle the circumcentre is:

(A) the in-centre
(B) the midpoint of the hypotenuse
(C) the right-angled vertex
(D) outside on the extension of a leg

Correct Answer: B

Explanation: Thales' theorem: the hypotenuse is a diameter of the circumcircle, so the centre is its midpoint.

39. In an obtuse-angled triangle the circumcentre lies:

(A) inside the triangle
(B) at the obtuse vertex
(C) outside the triangle
(D) at the centroid

Correct Answer: C

Explanation: In an obtuse-angled triangle the circumcentre lies outside the triangle.

40. If O is the circumcentre of right ΔLMN with right angle at M, then O is the midpoint of:

(A) leg LM
(B) leg MN
(C) median from M to LN only if it is also an altitude from L
(D) hypotenuse LN

Correct Answer: D

Explanation: The hypotenuse is the unique longest side and the diameter of the circumcircle.

41. A median of a triangle joins a vertex to the:

(A) midpoint of the opposite side
(B) foot of the perpendicular on the opposite side
(C) in-centre
(D) point that trisects an angle

Correct Answer: A

Explanation: Midpoint, not necessarily the perpendicular foot — that would be an altitude.

42. To locate the midpoint of a side with compass and ruler you construct the:

(A) angle bisector at a remote vertex first
(B) perpendicular bisector of that side (the crossing of equal arcs)
(C) incircle
(D) altitude from another vertex only

Correct Answer: B

Explanation: Equal arcs from the two endpoints intersect on the right bisector, which meets the side at its midpoint.

43. The three medians of a triangle are concurrent at the:

(A) orthocentre
(B) circumcentre
(C) centroid
(D) in-centre

Correct Answer: C

Explanation: Centroid is the concurrency point of the medians.

44. The centroid always lies:

(A) outside an obtuse triangle
(B) on a side of a right triangle
(C) at a vertex of an acute triangle
(D) inside every triangle

Correct Answer: D

Explanation: Each median is an interior segment, so their common point is interior.

45. The centroid divides each median in the ratio (vertex : midpoint):

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

Correct Answer: A

Explanation: The longer part is toward the vertex: the medians trisect one another in the 2 : 1 ratio.

46. If a median is 9 cm long, the centroid is:

(A) 4.5 cm from each end
(B) 6 cm from the vertex and 3 cm from the midpoint
(C) 9 cm from the vertex
(D) 3 cm from the vertex and 6 cm from the midpoint

Correct Answer: B

Explanation: 2 : 1 with total 9 cm splits as 6 cm and 3 cm, longer piece from the vertex.

47. If the centroid is 4 cm from the midpoint of a side, the full median length is:

(A) 4 cm
(B) 6 cm
(C) 12 cm
(D) 8 cm

Correct Answer: C

Explanation: The midpoint-to-centroid piece is one-third of the median, so the median is 3 × 4 = 12 cm.

48. The centre of gravity of a uniform triangular lamina lies at the:

(A) in-centre
(B) circumcentre in every triangle
(C) orthocentre of a right triangle only
(D) centroid (intersection of the medians)

Correct Answer: D

Explanation: Mass balances along medians, so the balance point is the centroid.

49. In an equilateral triangle the in-centre, circumcentre, orthocentre and centroid:

(A) coincide at one point
(B) form a square
(C) are collinear but never coincident
(D) lie on three different Euler lines

Correct Answer: A

Explanation: All those special lines coincide in an equilateral triangle, so the four centres are the same point.

50. In an equilateral triangle a median is also:

(A) never an altitude
(B) an altitude, an angle bisector and a right bisector of the base
(C) only a right bisector of a different side
(D) an exterior-angle bisector

Correct Answer: B

Explanation: Base angles are equal and the apex angle is bisected, and the median meets the base at 90° at its midpoint.

51. In any triangle the circumcentre, orthocentre and centroid are:

(A) never collinear
(B) always the same point
(C) collinear (they lie on the Euler line)
(D) always on the incircle

Correct Answer: C

Explanation: Those three centres lie on one straight line, the Euler line; the in-centre is not on it in general.

52. Concurrent lines are lines that:

(A) are parallel
(B) lie in one line themselves
(C) never meet even if extended
(D) meet at a single common point

Correct Answer: D

Explanation: Concurrency is a point-meeting property of three or more lines.

53. Collinear points are points that:

(A) lie on one straight line
(B) form a right angle
(C) are concurrent
(D) are midpoints of altitudes

Correct Answer: A

Explanation: Do not confuse collinear (points on a line) with concurrent (lines through a point).

54. To construct 60° with compass and ruler a standard method is to:

(A) halve a straight angle without an equilateral
(B) draw an equilateral triangle on the ray
(C) copy a 90° angle twice
(D) use only a protractor as the definition of 60°

Correct Answer: B

Explanation: Each angle of an equilateral triangle is 60°, so the construction copies that angle.

55. A 90° angle can be constructed by drawing a:

(A) median
(B) 30° angle twice without justification
(C) perpendicular to a given ray at a point
(D) circle through three collinear points

Correct Answer: C

Explanation: The perpendicular construction with equal arcs is the compass-and-ruler right angle.

56. A 45° angle is obtained by:

(A) trisecting 180° with two arbitrary rays
(B) adding 30° to 60° without tools
(C) copying 15° three times
(D) bisecting a constructed 90° angle

Correct Answer: D

Explanation: A 45° angle is obtained because bisecting a constructed 90° angle yields 45°.

57. When constructing ΔXYZ with XY given and □X, □Y given, the rays from X and Y:

(A) intersect at Z, the third vertex
(B) stay parallel
(C) meet the midpoint of XY only
(D) form the circumcircle immediately

Correct Answer: A

Explanation: ASA: the two rays from the ends of the given side locate Z as their inter.

58. If only two sides and a non-included acute angle are given, you should expect:

(A) SSS uniqueness always
(B) to check whether the arc meets the ray zero, one or two times
(C) exactly the SAS figure
(D) a unique square

Correct Answer: B

Explanation: That is the SSA checklist before claiming a triangle exists.

59. The included angle in SAS is the angle:

(A) opposite the longest side
(B) exterior to the triangle
(C) formed by the two given sides
(D) at the unused vertex

Correct Answer: C

Explanation: 'Included' means the angle is between those sides.

60. AAS is still a unique-triangle case because:

(A) SSA is unique
(B) three sides are given
(C) the triangle must be right-angled
(D) the third angle is determined, reducing the data to ASA

Correct Answer: D

Explanation: AAS is still a unique-triangle case because the third angle is determined, reducing the data to ASA.

61. In SSA, the side opposite the given angle is the side whose compass arc is drawn from the:

(A) other end of the adjacent side, with radius equal to the opposite side
(B) vertex of the given angle only, with radius equal to the adjacent side
(C) midpoint of the base
(D) orthocentre

Correct Answer: A

Explanation: You swing an arc of length a from the far end of side b so it can cut the ray of □A.

62. If an SSA arc cuts the given ray at C and C′, the two triangles share:

(A) no side
(B) the given side between the angle vertex and the far endpoint, plus the given angle
(C) only the opposite side
(D) the orthocentre

Correct Answer: B

Explanation: They share the adjacent side and the given angle; the opposite side reaches two different points on the ray.

63. Angle bisectors of a triangle can be used to locate the centre of the:

(A) circumcircle
(B) nine-point circle only in Grade 9 constructions
(C) incircle
(D) excircle opposite A only

Correct Answer: C

Explanation: The in-centre is the unique centre of the circle tangent to all three sides.

64. Perpendicular bisectors of the sides can be used to locate the centre of the:

(A) incircle
(B) circle tangent to the sides
(C) nine-point circle as a Grade 9 required construction
(D) circumcircle

Correct Answer: D

Explanation: Equidistance from vertices is the circumcircle property.

65. If you need a point inside a triangle that is equally far from all three sides, construct the:

(A) angle bisectors (in-centre)
(B) medians
(C) right bisectors of the sides
(D) altitudes

Correct Answer: A

Explanation: Equal perpendicular distances to the sides means the in-centre.

66. If you need a point equally far from all three vertices, construct the:

(A) angle bisectors
(B) perpendicular bisectors of the sides (circumcentre)
(C) medians only
(D) altitudes only

Correct Answer: B

Explanation: Equidistance from vertices is the circumcentre.

67. The centroid is the intersection of medians; it is not in general the centre of the:

(A) mass of a uniform triangular sheet
(B) triangle’s interior
(C) incircle or the circumcircle
(D) 2 : 1 division of a median

Correct Answer: C

Explanation: The centroid is the intersection of medians; it is not in general the centre of the incircle or the circumcircle.

68. In an isosceles triangle that is not equilateral, the median to the base is also:

(A) never an altitude
(B) a right bisector of a leg
(C) the Euler line of a different triangle
(D) an altitude and an angle bisector of the vertex angle

Correct Answer: D

Explanation: The apex-to-base median of an isosceles triangle is a line of symmetry.

69. To verify concurrency of altitudes in an obtuse triangle you must:

(A) extend sides as needed so the perpendiculars can meet outside
(B) refuse to draw any altitude
(C) use only medians
(D) place the orthocentre at the centroid

Correct Answer: A

Explanation: To verify concurrency of altitudes in an obtuse triangle you must extend sides as needed so the perpendiculars can meet outside.

70. A practical-geometry construction is done with:

(A) freehand curves only
(B) unmarked ruler (straightedge) and compass, as in the unit's constructions
(C) a protractor as the only allowed tool
(D) a set square as the only allowed tool

Correct Answer: B

Explanation: The unit's triangle constructions are compass-and-straightedge procedures (a protractor may check, but the method is classical).

71. When copying a length with a compass, the radius must stay:

(A) changing while you move
(B) equal to 180°
(C) fixed until the arc is drawn
(D) equal to the included angle

Correct Answer: C

Explanation: A compass is a rigid-radius transfer tool; opening it mid-arc spoils the given length.

72. If ΔABC is constructed with AB = AC and □A = 80°, then □B equals:

(A) 80°
(B) 100°
(C) 40°
(D) 50°

Correct Answer: D

Explanation: Base angles of an isosceles triangle are equal: (180° − 80°)/2 = 50°.

73. Constructing a right isosceles triangle given the hypotenuse uses the fact that the right angle is at:

(A) the other vertex, which lies on the circle with the hypotenuse as diameter
(B) an endpoint of the hypotenuse
(C) the centroid
(D) the in-centre only

Correct Answer: A

Explanation: Any right triangle's hypotenuse is a diameter of its circumcircle, so the right-angled vertex is on that circle; isosceles adds the perpendicular bisector.

74. If two triangles are constructed from the same SSA data, they are:

(A) always congruent

(B) generally not congruent; they share some parts but differ in another angle
(C) always similar with ratio 2 : 1
(D) both right-angled

Correct Answer: B

Explanation: The ambiguous pair typically has one acute and one obtuse angle opposite the given side.

75. The phrase ‘measures of two sides and included angle’ names the:

(A) SSA case
(B) AAA case, which never fixes size
(C) SAS case
(D) HL case for every scalene triangle

Correct Answer: C

Explanation: ‘Included’ means the given angle is the one formed by the two given sides, which is SAS not SSA.

76. AAA data (three angles) determines:

(A) a unique triangle including size
(B) no triangle
(C) exactly the SSA pair
(D) shape but not size, so it is not a unique construction of a specific triangle

Correct Answer: D

Explanation: Similar triangles can be scaled; a construction also needs a side length.

77. The foot of an altitude may lie:

(A) on a side or on a side’s extension, depending on the angles
(B) only at a vertex
(C) only at a midpoint
(D) only outside every acute triangle

Correct Answer: A

Explanation: The foot of an altitude may lie on a side or on a side’s extension, depending on the angles.

78. Medians are concurrent; altitudes are concurrent; right bisectors are concurrent; angle bisectors are concurrent. These four points:

(A) always coincide
(B) coincide in an equilateral triangle but are distinct in a general scalene triangle
(C) never coincide
(D) coincide only in a right scalene triangle

Correct Answer: B

Explanation: Equilateral is the coincidence case; a scalene acute triangle has four distinct centres.

79. A student constructs equal arcs from B and C to find A on SSS. The radii must be:

(A) both equal to BC
(B) both half of BC
(C) BA and CA, the other two given sides
(D) the included angle

Correct Answer: C

Explanation: Arc from B has radius AB; arc from C has radius AC.

80. If the given ASA angles at the base are 90° and 90°, the construction:

(A) gives an equilateral triangle
(B) gives a unique acute triangle
(C) gives two SSA triangles
(D) fails because 90° + 90° already uses the full 180°

Correct Answer: D

Explanation: If the given ASA angles at the base are 90° and 90°, the construction fails because 90° + 90° already uses the full 180°.

B. Less Important / Secondary Topics

81. Egyptian pyramids are mentioned in the unit opener to motivate:

(A) practical geometry in large-scale construction
(B) statistics of lambs
(C) logarithms
(D) coordinate slope only

Correct Answer: A

Explanation: Egyptian pyramids are mentioned in the unit opener to motivate practical geometry in large-scale construction.

82. Practical geometry in this unit is mainly about constructing:

(A) circles of arbitrary radius without triangles
(B) triangles and their special lines (bisectors, altitudes, medians)
(C) bar graphs
(D) histograms with unequal classes

Correct Answer: B

Explanation: The SLOs are triangle constructions plus concurrency of the four classical cevians/bisectors.

83. A protractor can measure an angle; constructing the same angle with compass and ruler is a:

(A) graphing skill from statistics
(B) probability experiment
(C) classical geometric construction
(D) mean calculation

Correct Answer: C

Explanation: A protractor can measure an angle; constructing the same angle with compass and ruler is a classical geometric construction.

84. The word 'ray' in a construction step such as drawing ray BD means:

(A) a finite segment only
(B) a circle
(C) a median
(D) a half-line starting at B and passing through D

Correct Answer: D

Explanation: An angle is drawn as two rays; the third vertex is then marked on a ray.

85. 'Join C to A' at the end of a construction means:

(A) draw segment CA to close the triangle
(B) draw the circumcircle
(C) bisect □C
(D) drop an altitude

Correct Answer: A

Explanation: The last given side is the remaining side of the triangle.

86. If a construction says 'with centre B draw an arc of radius 2.8 cm', the compass point is placed:

(A) at A
(B) at B, with opening 2.8 cm
(C) at the orthocentre
(D) at a random interior point

Correct Answer: B

Explanation: In construction language, the centre is the point where the compass pivot is placed.

87. Concurrency of medians can be checked in an obtuse triangle because medians:

(A) escape outside
(B) become altitudes
(C) still meet inside

(D) become right bisectors

Correct Answer: C

Explanation: Concurrency of medians can be checked in an obtuse triangle because medians still meet inside.

88. Concurrency of angle bisectors can be checked in a right triangle because the in-centre is:

(A) at the right vertex
(B) the midpoint of the hypotenuse
(C) outside
(D) still inside, near the right angle but not at a vertex in general

Correct Answer: D

Explanation: Concurrency of angle bisectors can be checked in a right triangle because the in-centre is still inside, near the right angle but not at a vertex in general.

89. A 'right bisector' in this unit is another name for a:

(A) perpendicular bisector
(B) median that is not perpendicular
(C) angle bisector
(D) altitude that does not bisect the opposite side

Correct Answer: A

Explanation: A 'right bisector' in this unit is another name for a perpendicular bisector.

90. An altitude bisects the opposite side if and only if the triangle is:

(A) obtuse
(B) isosceles with that side as base (including equilateral)
(C) scalene acute
(D) right-scalene with that side a leg

Correct Answer: B

Explanation: Only then is the altitude also a median.

91. The Euler line of a scalene triangle contains the centroid and also the:

(A) in-centre in general
(B) midpoint of every side
(C) orthocentre and circumcentre
(D) in-radius

Correct Answer: C

Explanation: In-centre is off the Euler line except in isosceles special cases.

92. On the Euler line the centroid divides the segment from orthocentre to circumcentre in the ratio:

(A) 1 : 1
(B) 3 : 1 toward the in-centre
(C) 1 : 2 toward a vertex
(D) 2 : 1 (closer to the circumcentre)

Correct Answer: D

Explanation: A standard Euler-line fact: HG = 2 GO if H, G, O are orthocentre, centroid, circumcentre.

93. Drawing three medians is enough to locate the centre of gravity; you do not need:

(A) the incircle construction
(B) any midpoint
(C) the triangle itself
(D) segments from vertices

Correct Answer: A

Explanation: Two medians already determine the centroid; the third is a check.

94. If a student confuses orthocentre with circumcentre in a right triangle, the two points are:

(A) the same
(B) the right vertex versus the midpoint of the hypotenuse

(C) both inside
(D) both the in-centre

Correct Answer: B

Explanation: If a student confuses orthocentre with circumcentre in a right triangle, the two points are the right vertex versus the midpoint of the hypotenuse.

95. In a right triangle the centroid lies:

(A) at the right vertex
(B) outside
(C) inside, two-thirds of the way along the median to the hypotenuse's midpoint (which is also the circumcentre)
(D) at the circumcentre

Correct Answer: C

Explanation: The median to the hypotenuse runs from the right vertex to the circumcentre, and G divides it 2 : 1.

96. Construction arcs left on a finished diagram are:

(A) errors that must be erased for the proof to count
(B) frequency densities
(C) class boundaries
(D) the usual record of compass work in practical geometry

Correct Answer: D

Explanation: Visible arcs show that a compass, not a guess, located the point.

97. 'Verify concurrency' in an exercise means you construct the three lines and:

(A) observe that they pass through one point
(B) compute a mean
(C) prove SSA uniqueness
(D) draw a histogram

Correct Answer: A

Explanation: The unit treats concurrency as a construction check, not a coordinate calculation.

98. A scalene triangle has:

(A) all sides equal
(B) all sides of different lengths, so its four classical centres are generally distinct
(C) two equal sides
(D) a right angle always

Correct Answer: B

Explanation: A scalene triangle has all sides of different lengths, so its four classical centres are generally distinct.

99. To construct an angle bisector you do not need:

(A) a compass
(B) the vertex of the angle
(C) the midpoint of the opposite side first
(D) both arms of the angle

Correct Answer: C

Explanation: To construct an angle bisector you do not need the midpoint of the opposite side first.

100. Dropping a perpendicular from a point to a line with compass uses two equal arcs on the line and then:

(A) the in-centre
(B) a median
(C) SSA ambiguity
(D) equal arcs from those two points whose chord is perpendicular to the line

Correct Answer: D

Explanation: That is the standard perpendicular-from-a-point construction, used for altitudes.

101. If AB = 5 cm, □A = 60°, □B = 60°, the triangle is:

(A) equilateral with all sides 5 cm
(B) right-angled
(C) obtuse
(D) impossible

Correct Answer: A

Explanation: If AB = 5 cm, □A = 60°, □B = 60°, the triangle is equilateral with all sides 5 cm.

102. HL (hypotenuse-leg) uniqueness for a right triangle is a special case of:

(A) AAA
(B) congruence that still yields one triangle, unlike generic SSA
(C) the ambiguous acute SSA pair always doubling
(D) median concurrency

Correct Answer: B

Explanation: HL (hypotenuse-leg) uniqueness for a right triangle is a special case of congruence that still yields one triangle, unlike generic SSA.

103. The in-radius is the perpendicular distance from the in-centre to:

(A) a vertex
(B) the circumcentre
(C) a side
(D) the Euler line

Correct Answer: C

Explanation: The incircle is tangent to the sides.

104. The circumradius of a right triangle with hypotenuse 10 cm is:

(A) 10 cm
(B) 20 cm
(C) 2.5 cm
(D) 5 cm

Correct Answer: D

Explanation: The hypotenuse is the diameter, so R = 5 cm.

105. Three lines that meet pairwise at three different points are:

(A) not concurrent; they form a triangle
(B) concurrent
(C) collinear
(D) medians

Correct Answer: A

Explanation: Concurrency requires a single common point for all three.

106. A median is a segment; an angle bisector drawn in constructions is often drawn as a:

(A) circle
(B) ray or line through the vertex
(C) class mark
(D) frequency polygon

Correct Answer: B

Explanation: A median is a segment; an angle bisector drawn in constructions is often drawn as a ray or line through the vertex.

107. If you only construct two altitudes of an acute triangle, the orthocentre is already their:

(A) midpoint
(B) centroid
(C) intersection; the third altitude is a check
(D) circumcentre

Correct Answer: C

Explanation: Any two altitudes determine H; the third must pass through H.

108. The unit's key distinction between SAS and SSA is whether the given angle is:

(A) acute or obtuse only

(B) constructed with a protractor

(C) equal to 60°

(D) included between the two sides, or opposite one of them

Correct Answer: D

Explanation: Location of the angle relative to the sides is the whole difference between unique and ambiguous.

MATHEMATICS MCQ BOOKLET

Grade 9 · Chapter 11 · Basic Statistics

FBISE / National Book Foundation Model Textbook companion

by Public Library

Independent MCQs on grouped frequency tables, histograms (including unequal intervals), frequency polygons, mean, median, mode, weighted mean, and basic probability. 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. Raw (ungrouped) data means values that have:

(A) not yet been arranged into a systematic grouped table
(B) already been placed in class intervals
(C) only class boundaries
(D) only cumulative frequencies

Correct Answer: A

Explanation: Ungrouped data is the original list; grouping organises it into classes with frequencies.

2. Grouped data is a table in which values are distributed into classes and each class shows its:

(A) class mark only
(B) frequency (how many items fall in that class)
(C) probability only
(D) mode only

Correct Answer: B

Explanation: Grouped data is a table in which values are distributed into classes and each class shows its frequency (how many items fall in that class).

3. The smaller number of a class such as 21–30 is the:

(A) upper class limit
(B) class mark
(C) lower class limit
(D) frequency density

Correct Answer: C

Explanation: Lower class limit is the left end of the written interval.

4. The larger number of a class such as 21–30 is the:

(A) lower class limit
(B) adjustment factor
(C) relative frequency of a complementary event
(D) upper class limit

Correct Answer: D

Explanation: Upper class limit is the right end of the written interval.

5. Class boundaries are used so that continuous values sitting between written limits:

(A) can be placed without gaps between adjacent classes
(B) are discarded
(C) become class marks automatically
(D) equal the mode

Correct Answer: A

Explanation: Class boundaries are used so that continuous values sitting between written limits can be placed without gaps between adjacent classes.

6. For classes 1–10 and 11–20 the usual adjustment factor is:

(A) 1

(B) 0.5
(C) 2
(D) 10

Correct Answer: B

Explanation: Half the gap between 10 and 11 is 0.5, subtracted from lower limits and added to upper limits.

7. Class boundaries of 11–20 with adjustment 0.5 are:

(A) 11–20
(B) 11.5–19.5
(C) 10.5–20.5
(D) 10–21

Correct Answer: C

Explanation: The class boundaries are 10.5–20.5 because 11 − 0.5 = 10.5 and 20 + 0.5 = 20.5.

8. The size h of consecutive classes 1–10, 11–20, 21–30 is:

(A) 1
(B) 11
(C) 20
(D) 10

Correct Answer: D

Explanation: h is the difference of consecutive lower limits: 11 − 1 = 10 (also 21 − 11 = 10).

9. The class mark (mid-value) of a class is:

(A) the average of the lower and upper limits (or of the boundaries)
(B) the frequency
(C) the cumulative frequency
(D) always the lower boundary

Correct Answer: A

Explanation: x = (lower + upper)/2, and the same midpoint comes from the boundaries.

10. The class mark of 1–10 is:

(A) 1
(B) 5.5
(C) 10
(D) 4.5

Correct Answer: B

Explanation: The class mark is the midpoint of the limits: (1 + 10)/2 = 5.5.

11. The class mark of continuous class 0–10 is:

(A) 0
(B) 10
(C) 5
(D) 9.5

Correct Answer: C

Explanation: For a continuous class 0–10 the midpoint is (0 + 10)/2 = 5.

12. The difference between class marks of two consecutive equal-width classes equals:

(A) the total frequency n
(B) the mode
(C) the probability
(D) the class interval size h

Correct Answer: D

Explanation: Midpoints are spaced one class width apart.

13. Class boundaries can be recovered from a class mark x and width h as:

(A) x ± h/2

(B) x ± h
(C) x ± 2h
(D) x only

Correct Answer: A

Explanation: The class runs from x − h/2 to x + h/2.

14. Frequency of a grouped class is the:

(A) class mark
(B) number of observations falling in that class
(C) upper boundary
(D) adjustment factor

Correct Answer: B

Explanation: Frequency is a count, not a measurement of the class width.

15. Cumulative frequency of a class is the:

(A) class mark times h
(B) frequency density
(C) sum of that class's frequency and all frequencies before it
(D) relative frequency of a complementary event only

Correct Answer: C

Explanation: Each running total answers 'how many observations are in this class or earlier'.

16. The cumulative frequency of the last class equals:

(A) the first frequency
(B) the class mark
(C) zero always
(D) n, the total number of observations

Correct Answer: D

Explanation: By the last row you have counted everyone, so Σf = n.

17. A usual practical choice for the number of classes is about:

(A) 5 to 15, depending on the size of the data
(B) 1 or 2 only
(C) exactly 100 always
(D) n itself

Correct Answer: A

Explanation: A usual practical choice for the number of classes is about 5 to 15, depending on the size of the data.

18. An approximate class width from largest xl, smallest xs and planned number of classes k is:

(A) xl + xs
(B) (xl − xs)/k
(C) xl × k
(D) xs / k

Correct Answer: B

Explanation: An approximate class width from largest xl, smallest xs and planned number of classes k is (xl − xs)/k.

19. If xl = 86, xs = 26 and 6 classes are planned, h is about:

(A) 8
(B) 60
(C) 10
(D) 6

Correct Answer: C

Explanation: Range 60 divided by 6 is exactly 10.

20. In the tally-bar method, the fifth mark of a group of five is drawn:

(A) as a sixth vertical stroke

(B) as a class boundary
(C) as a class mark
(D) diagonally across four vertical strokes

Correct Answer: D

Explanation: In the tally-bar method, the fifth mark of a group of five is drawn diagonally across four vertical strokes.

21. After tallies are converted to frequencies you should check that Σf equals:

(A) the number of original ungrouped items
(B) the class mark total
(C) the adjustment factor
(D) h

Correct Answer: A

Explanation: A missing or double-counted value shows up as a wrong total.

22. Discrete data in this unit's sense (whole-number values that repeat) typically needs:

(A) wide class intervals and boundaries
(B) class size 1 and no class-boundary column
(C) frequency density on the y-axis always
(D) a histogram of unequal widths always

Correct Answer: B

Explanation: Each distinct value is its own class of width 1.

23. A histogram represents frequencies by:

(A) separated pictograms
(B) a single pie slice
(C) adjacent rectangles whose areas are proportional to class frequencies
(D) a scatter of unconnected points only

Correct Answer: C

Explanation: Bars touch because class boundaries meet; area, not mere height, carries the frequency.

24. On a histogram the bases of the rectangles are marked using:

(A) class marks only
(B) cumulative frequencies on the x-axis
(C) probabilities
(D) class boundaries on the horizontal axis

Correct Answer: D

Explanation: Boundaries give a continuous scale with no gaps between bars.

25. If all class widths are equal, bar heights of a histogram may be taken as:

(A) the class frequencies (or a constant times frequency)
(B) class marks
(C) boundaries
(D) modes

Correct Answer: A

Explanation: Equal width means height □ frequency because area = height × width.

26. If class widths are unequal, bar heights must be:

(A) the raw frequencies still
(B) frequency densities, frequency/width
(C) class marks
(D) cumulative frequencies

Correct Answer: B

Explanation: Area stays proportional to frequency only when height = frequency/width.

27. Frequency density is defined as:

(A) f × h

(B) Σf
(C) frequency divided by the width of the class
(D) the class mark

Correct Answer: C

Explanation: FD = f / h, which is the histogram height for unequal classes.

28. A class 0–20 has frequency 12. Its frequency density is:

(A) 12
(B) 20
(C) 240
(D) 0.6

Correct Answer: D

Explanation: Frequency density is frequency divided by width: 12/20 = 0.6.

29. A class 20–30 has frequency 18. Its frequency density is:

(A) 1.8
(B) 18
(C) 0.18
(D) 30

Correct Answer: A

Explanation: Frequency density is frequency divided by width: 18/10 = 1.8.

30. For unequal-interval histograms, the vertical axis should show:

(A) class marks
(B) frequency densities
(C) only n
(D) probabilities of complementary events

Correct Answer: B

Explanation: For unequal-interval histograms, the vertical axis should show frequency densities.

31. A frequency polygon is a closed figure formed by joining:

(A) upper class limits at height zero only
(B) only class boundaries at height f
(C) points (class mark, frequency) with straight segments, including extra zero-frequency classes at both ends
(D) tally marks

Correct Answer: C

Explanation: A frequency polygon is a closed figure formed by joining points (class mark, frequency) with straight segments, including extra zero-frequency classes at both ends.

32. You can also draw a frequency polygon on a histogram by joining:

(A) lower-left corners of bars
(B) the in-centre to the centroid
(C) cumulative-frequency points only
(D) midpoints of the top edges of the bars, then extending to the x-axis at the extra class marks

Correct Answer: D

Explanation: Those midpoints are exactly the (class mark, frequency) points.

33. If classes are 10–20, 20–30, 30–40, extra classes used to close the polygon are:

(A) 0–10 and 40–50 with frequency 0
(B) 20–30 twice
(C) 10–40 as one class
(D) the modal class twice

Correct Answer: A

Explanation: If classes are 10–20, 20–30, 30–40, extra classes used to close the polygon are 0–10 and 40–50 with frequency 0.

34. A measure of central tendency is a single value that:

(A) is always the range
(B) represents the whole data set as an average / location
(C) must be a class boundary
(D) is always a probability

Correct Answer: B

Explanation: Mean, median and mode are the three location averages in this unit.

35. The arithmetic mean of ungrouped values is:

(A) the middle of the unordered list
(B) the most frequent value
(C) Σx / n
(D) n / Σx

Correct Answer: C

Explanation: Mean is total divided by how many values there are.

36. The mean of 4, 8, 12, 16 is:

(A) 8
(B) 12
(C) 40
(D) 10

Correct Answer: D

Explanation: The four values add to 40, so the arithmetic mean is 40/4 = 10.

37. The mean of 7, 7, 7, 7 is:

(A) 7
(B) 0
(C) 28
(D) 4

Correct Answer: A

Explanation: A constant list has mean equal to that constant.

38. For a frequency table, the mean is:

(A) Σx / Σf without multiplying
(B) Σ(f x) / Σf
(C) the modal class mark always
(D) n × p

Correct Answer: B

Explanation: Each value x is counted f times, so the total is Σ f x.

39. If x = 2, 4, 6 with f = 3, 2, 5, then Σf x equals:

(A) 12
(B) 10
(C) 44
(D) 6

Correct Answer: C

Explanation: 2×3 + 4×2 + 6×5 = 6 + 8 + 30 = 44 and n = 10, so the mean would be 44/10 = 4.4.

40. For grouped data the x in Σ f x is taken as the:

(A) lower limit
(B) frequency density
(C) upper boundary only
(D) class mark of each class

Correct Answer: D

Explanation: The class is represented by its midpoint when computing a mean.

41. Classes 0–10, 10–20, 20–30 have frequencies 4, 6, 10. Class marks are 5, 15, 25, so the mean is:

(A) 18
(B) 20
(C) 360
(D) 15

Correct Answer: A

Explanation: $\Sigma f x = 4\times5 + 6\times15 + 10\times25 = 360$ and $n = 20$, so $360/20 = 18$.

42. If 12 values have mean 15, their sum is:

(A) 15
(B) 180
(C) 12
(D) 1.25

Correct Answer: B

Explanation: By definition of the mean, the sum of the values is n times the mean: $12 \times 15 = 180$.

43. Ten values have mean 22. Nine of them sum to 189. The tenth value is:

(A) 22
(B) 21
(C) 31
(D) 189

Correct Answer: C

Explanation: Total must be 220, so the missing value is $220 - 189 = 31$.

44. The median is the:

(A) most frequent value
(B) $\Sigma x / n$
(C) class width
(D) middle value after the data are arranged in order

Correct Answer: D

Explanation: Order first; then the central position is the median.

45. The symbol used in the unit for the median is:

(A) x-tilde ($\tilde{x}$)
(B) x-bar only
(C) σ
(D) p

Correct Answer: A

Explanation: The unit writes the mean as x-bar and the median as x-tilde, so they are not the same symbol.

46. For an odd number n of ordered values the median is the:

(A) n/2 th value
(B) (n + 1)/2 th value
(C) first value
(D) mean of all n values always

Correct Answer: B

Explanation: For an odd number n of ordered values the median is the (n + 1)/2 th value.

47. Ordered data 2, 5, 9, 11, 18 has median:

(A) 7
(B) 11
(C) 9
(D) 2

Correct Answer: C

Explanation: n = 5, (5 + 1)/2 = 3, and the 3rd value is 9.

48. For even n the median is the mean of the:

(A) first and last values
(B) two modes
(C) class marks only
(D) n/2 th and (n + 2)/2 th ordered values

Correct Answer: D

Explanation: Those two positions are the pair straddling the centre.

49. Ordered data 3, 6, 10, 14 has median:

(A) 8
(B) 6
(C) 10
(D) 4

Correct Answer: A

Explanation: The median is 8 because n = 4, so we average the 2nd and 3rd ordered values: (6 + 10)/2 = 8.

50. For grouped data the median is the n/2 th observation and the formula is:

(A) Σ f x / Σ f
(B) l + (h/f)(n/2 − c)
(C) l + ((fm − f1)/(2 fm − f1 − f2)) h
(D) n × p

Correct Answer: B

Explanation: l is the lower boundary of the median class, f its frequency, c the preceding cumulative frequency.

51. In the grouped-median formula, c must be taken from the:

(A) median class itself
(B) last class
(C) class immediately before the median class
(D) modal class always

Correct Answer: C

Explanation: In the grouped-median formula, c must be taken from the class immediately before the median class.

52. Frequencies 4, 6, 10, 5 on classes 0–10, 10–20, 20–30, 30–40 give n = 25 and n/2 = 12.5. The median class is:

(A) 0–10
(B) 30–40
(C) 10–20
(D) 20–30, because cf values 4, 10, 20, 25 first exceed 12.5 in 20–30

Correct Answer: D

Explanation: The median class is 20–30 because the cumulative frequencies 4, 10, 20, 25 first pass 12.5 there.

53. For that table, l = 20, h = 10, f = 10, c = 10, so the median is:

(A) 22.5
(B) 20
(C) 25
(D) 12.5

Correct Answer: A

Explanation: The median is 22.5 because 20 + (10/10)(12.5 − 10) = 20 + 2.5 = 22.5.

54. The mode is the:

(A) middle ordered value
(B) most frequent value (or values) of the data
(C) Σx / n

(D) class boundary

Correct Answer: B

Explanation: Modal average means 'typical by popularity', not by centre of the list.

55. Unlike mean and median, the mode of a data set:

(A) is always unique
(B) always equals the mean
(C) may be one value, several values, or absent if every value is equally frequent
(D) cannot be a whole number

Correct Answer: C

Explanation: Unimodal, bimodal, trimodal, or no mode are all possible.

56. In 4, 7, 7, 9, 7, 2 the mode is:

(A) 4
(B) 9
(C) there are two modes 4 and 2
(D) 7

Correct Answer: D

Explanation: 7 is the mode because it appears three times while every other value appears once.

57. The data 2, 2, 5, 5, 9 is:

(A) bimodal with modes 2 and 5
(B) unimodal with mode 9
(C) trimodal
(D) without a mode

Correct Answer: A

Explanation: The data are bimodal because 2 and 5 each appear twice, which is more than 9.

58. The data 1, 2, 3, 4 (each once) is treated as having:

(A) mode 1 only
(B) no mode, because every value has the same frequency
(C) mode 4
(D) four means

Correct Answer: B

Explanation: When all frequencies are equal there is no outstanding favourite.

59. The modal class of grouped data is the class with:

(A) smallest frequency
(B) largest class mark
(C) largest frequency
(D) frequency density 0

Correct Answer: C

Explanation: Mode is estimated inside the busiest class.

60. The grouped-data mode formula is:

(A) $l + (h/f)(n/2 - c)$
(B) $\Sigma f x / \Sigma f$
(C) $n \times p$
(D) $l + ((fm - f1)/(2\,fm - f1 - f2)) \times h$

Correct Answer: D

Explanation: fm is the modal frequency; f1 and f2 are the neighbouring frequencies.

61. If the first class is modal then f1 is taken as:

(A) 0
(B) fm
(C) f2

(D) n

Correct Answer: A

Explanation: There is no preceding class, so that neighbour frequency is zero.

62. Frequencies 3, 6, 12, 6, 3 on equal classes 0–10 through 40–50 have modal class 20–30. Then mode equals:

(A) 22
(B) 25
(C) 12
(D) 20

Correct Answer: B

Explanation: The mode is 25 because l = 20, fm = 12, f1 = f2 = 6, h = 10 gives 20 + 6/12 × 10 = 25.

63. An empirical link used when a distribution is moderately skewed is:

(A) mode = mean + median
(B) mean = 3 mode − 2 median
(C) mode = 3 median − 2 mean
(D) median = mean × mode

Correct Answer: C

Explanation: The Pearson-type relation mode ≈ 3 median − 2 mean, rearranged for any one of the three.

64. If mean = 16 and median = 15, the empirical mode is:

(A) 14
(B) 17
(C) 31
(D) 13

Correct Answer: D

Explanation: The empirical rule is mode = 3 median − 2 mean = 3×15 − 2×16 = 13.

65. If mode = 10 and mean = 16, the empirical median is:

(A) 14
(B) 12
(C) 26
(D) 6

Correct Answer: A

Explanation: The empirical median is 14 because (mode + 2 mean)/3 = (10 + 32)/3 = 14.

66. Weighted mean is used when the values are:

(A) all equally important, so weights are ignored
(B) not equally important, so each x is multiplied by a weight w
(C) class marks only
(D) probabilities only

Correct Answer: B

Explanation: Weighted mean is used when the values are not equally important, so each x is multiplied by a weight w.

67. For values 50, 70, 90 with weights 2, 3, 5 the weighted mean is:

(A) 70
(B) 90
(C) 76
(D) 10

Correct Answer: C

Explanation: Σ w x = 100 + 210 + 450 = 760 and Σ w = 10, so 760/10 = 76.

68. Probability of an event is a measure of chance and lies:

(A) always above 1

(B) only at 1/2
(C) in negative numbers for complements
(D) in the closed interval from 0 to 1

Correct Answer: D

Explanation: 0 is impossible, 1 is certain, and everyday events sit strictly between.

69. P(E) = (number of favourable outcomes) / (total number of equally likely outcomes). If a fair die is rolled, P(4) is:

(A) 1/6
(B) 1/4
(C) 4/6
(D) 1

Correct Answer: A

Explanation: P(4) is 1/6 because there is one favourable face out of six equally likely faces.

70. P(even number) on a fair die is:

(A) 1/6
(B) 1/2
(C) 2/3
(D) 0

Correct Answer: B

Explanation: The even faces are 2, 4 and 6, which is 3 out of 6 equally likely outcomes, so 1/2.

71. A single (simple) event consists of:

(A) the whole sample space
(B) two complementary outcomes always
(C) exactly one sample point
(D) an impossible pair

Correct Answer: C

Explanation: Each singleton subset of S is a simple event.

72. Two complementary events E and E′ satisfy:

(A) P(E) + P(E′) = 0
(B) P(E) = P(E′) always
(C) P(E′) = 2 P(E)
(D) P(E) + P(E′) = 1

Correct Answer: D

Explanation: E′ is ‘E does not occur’, so the two chances add to certainty.

73. If P(E) = 3/10 then P(E′) is:

(A) 7/10
(B) 3/7
(C) 10/3
(D) 0

Correct Answer: A

Explanation: Complementary probability is 1 minus P(E), so 1 − 3/10 = 7/10.

74. An event that cannot occur has probability:

(A) 1
(B) 0
(C) 1/2
(D) n

Correct Answer: B

Explanation: Zero favourable outcomes give P = 0; that is an impossible event.

75. An event that is certain to occur has probability:

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

Correct Answer: C

Explanation: Every outcome is favourable, so P = 1.

76. A probability cannot take the value:

(A) 0
(B) 1
(C) 1/2
(D) 1.4

Correct Answer: D

Explanation: 1.4 is greater than 1, which is outside the possible range.

77. Relative frequency (experimental probability) is:

(A) (times the event occurred) / (number of trials)
(B) n × p
(C) Σ f x / Σ f
(D) the class mark

Correct Answer: A

Explanation: It estimates P(E) from data; with many trials it tends to settle near the theoretical value.

78. A spinner is spun 40 times and lands on blue 12 times. Relative frequency of blue is:

(A) 12
(B) 12/40 = 0.3
(C) 40/12
(D) 1/2

Correct Answer: B

Explanation: Relative frequency is successes over trials: 12/40, which equals 0.3.

79. Expected frequency of an event is:

(A) always 0
(B) p / n
(C) n × p, trials times probability
(D) the mode

Correct Answer: C

Explanation: It is how often you predict the event in n independent trials.

80. A fair coin is tossed 80 times. Expected number of heads is:

(A) 80
(B) 20
(C) 1/2
(D) 40

Correct Answer: D

Explanation: Expected frequency is n times p, so 80 × 1/2 = 40 heads. A fair die rolled 240 times is likewise expected to show a six 240 × 1/6 = 40 times.

B. Less Important / Secondary Topics

81. Statistics is described in the unit as the science of collecting and:

(A) analysing numerical data
(B) erasing numerical facts
(C) drawing only triangles
(D) constructing altitudes

Correct Answer: A

Explanation: The subject organises data so that decisions can be based on counts and averages.

82. Online reviews or crowd size at different times of day are everyday uses of:

(A) SSA constructions
(B) data and chance thinking from statistics
(C) in-centres
(D) Euler lines

Correct Answer: B

Explanation: Online reviews or crowd size at different times of day are everyday uses of data and chance thinking from statistics.

83. A genetic 3 : 1 pattern (three matching outcomes out of four equally likely cells) has probability:

(A) 1/4 for the majority trait
(B) 1
(C) 3/4 for the majority trait
(D) 0

Correct Answer: C

Explanation: A genetic 3 : 1 pattern (three matching outcomes out of four equally likely cells) has probability 3/4 for the majority trait.

84. If that 3/4 probability applies to 200 independent offspring, the expected count of the majority trait is:

(A) 50
(B) 200
(C) 3
(D) 150

Correct Answer: D

Explanation: Expected frequency is n times p, so 200 × 3/4 = 150 offspring.

85. Tally sticks in the history note were early tools for:

(A) recording counts
(B) angle bisection
(C) drawing frequency polygons
(D) finding orthocentres

Correct Answer: A

Explanation: Tally sticks in the history note were early tools for recording counts.

86. A broken (kinked) scale at the start of a histogram axis is used when:

(A) n = 0
(B) the first boundary is far from zero and space should be saved
(C) classes are discrete of width 1 always
(D) probability is 1

Correct Answer: B

Explanation: The zigzag warns that the axis does not start at the origin.

87. In a histogram, area of a bar equals (on a density scale):

(A) the class mark
(B) h only
(C) frequency, because height × width = FD × h = f
(D) the median

Correct Answer: C

Explanation: That is why unequal-width bars must use frequency density.

88. 'Direct observation' frequency tables write the actual values in a class instead of:

(A) the total n

(B) class marks
(C) weights
(D) tally marks

Correct Answer: D

Explanation: Both methods must still add to the same frequencies.

89. If 34 of 50 scores are above 20, that reading comes from:

(A) adding frequencies of the classes above 20
(B) the mode formula
(C) P(E′)
(D) an altitude

Correct Answer: A

Explanation: If 34 of 50 scores are above 20, that reading comes from adding frequencies of the classes above 20.

90. The mean is pulled toward extreme values more than the median because it uses:

(A) only the middle pair
(B) every value in the sum
(C) only the modal class
(D) only class boundaries

Correct Answer: B

Explanation: The mean is pulled toward extreme values more than the median because it uses every value in the sum.

91. For a perfectly symmetric unimodal distribution, mean, median and mode are:

(A) as far apart as possible
(B) undefined
(C) equal (and the empirical relation holds as mode = mean)
(D) probabilities

Correct Answer: C

Explanation: 3m − 2m = m, so the formula is consistent with all three coinciding.

92. Weights in a weighted mean play the same algebraic role that frequencies play in:

(A) P(E′)
(B) SSA constructions
(C) class boundaries
(D) the ordinary frequency mean Σ f x / Σ f

Correct Answer: D

Explanation: Replace f by w; the formula is the same shape.

93. Sample space for one fair-coin toss is:

(A) {H, T}
(B) {1, 2, 3, 4, 5, 6}
(C) {0}
(D) {E, E′}

Correct Answer: A

Explanation: Sample space for one fair-coin toss is {H, T}.

94. P(sun rises in the east), treated as certain, is used in the unit as an example of probability:

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

Correct Answer: B

Explanation: P(sun rises in the east), treated as certain, is used in the unit as an example of probability 1.

95. If three names are equally likely to win a toss, each has probability:

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

Correct Answer: C

Explanation: If three names are equally likely, each simple event has probability 1/3.

96. Relative frequency of heads in 150 tosses with 70 heads is:

(A) 70
(B) 150/70
(C) 1/2 exactly as a count
(D) 70/150 ≈ 0.467

Correct Answer: D

Explanation: Empirical estimate 70/150, which is near but not forced to equal 1/2.

97. If 5 students in a class of 30 are absent, p = 1/6. In 12 such classes the expected number absent is:

(A) 60
(B) 5
(C) 30
(D) 12

Correct Answer: A

Explanation: Expected absences are 60 because n = 12 × 30 = 360 students and 360 × 1/6 = 60.

98. A bag holds 5 red and 7 blue marbles. P(red) is:

(A) 5/7
(B) 5/12
(C) 7/12
(D) 1

Correct Answer: B

Explanation: A bag holds 5 red and 7 blue marbles. P(red) is 5/12.

99. For that bag, P(not red) is:

(A) 5/12
(B) 1
(C) 7/12
(D) 0

Correct Answer: C

Explanation: Complement: 1 − 5/12 = 7/12, which is also the blue count over 12.

100. Expected frequency cannot be negative because n and p are:

(A) both negative
(B) always 2
(C) class marks
(D) $n \geq 0$ and $0 \leq p \leq 1$

Correct Answer: D

Explanation: Their product n p is between 0 and n.

101. If you want 90 expected sixes from a fair die, you should roll it about:

(A) 540 times, because 90 = n/6 so n = 540
(B) 90 times
(C) 15 times
(D) 6 times

Correct Answer: A

Explanation: n p = 90 with p = 1/6 gives n = 540.

102. Choosing a letter at random from ‘BOOK’ , P(O) is:

(A) 1/4
(B) 2/4 = 1/2
(C) 3/4
(D) 0

Correct Answer: B

Explanation: The word BOOK has four letters and O appears twice, so P(O) = 2/4 = 1/2.

103. A one-digit whole number from 0 to 9 is chosen. P(the number is 10) is:

(A) 1/10
(B) 1
(C) 0, because 10 is not a one-digit number
(D) 1/2

Correct Answer: C

Explanation: That outcome is impossible in this sample space.

104. P(additive identity of whole numbers) when picking 0–9 is:

(A) 0
(B) 9/10
(C) 1
(D) 1/10, because that identity is 0

Correct Answer: D

Explanation: The additive identity of whole numbers is 0, one outcome among the ten digits 0–9.

105. A frequency table with columns x, f and cf is enough to read off a discrete median as the x whose cf first:

(A) reaches n/2
(B) equals 0
(C) equals the mode
(D) equals h

Correct Answer: A

Explanation: The n/2 th item sits in the first row whose running total is at least n/2.

106. Check-point tasks that count letters or vowels in each word produce:

(A) grouped continuous histograms of heights
(B) discrete frequency distributions
(C) SAS triangles
(D) class boundaries of 0.5 always

Correct Answer: B

Explanation: Letter counts are small whole numbers, so a discrete.

107. If mean = 20 and mode = 14, empirical median is:

(A) 16
(B) 17
(C) 18
(D) 6

Correct Answer: C

Explanation: The empirical median is 18 because (mode + 2 mean)/3 = (14 + 40)/3 = 18.

108. Closing a frequency polygon on the axis is done so that the figure is a:

(A) histogram bar
(B) circle
(C) single ray
(D) many-sided closed polygon

Correct Answer: D

Explanation: A polygon, by the unit's wording, is a closed many-sided.