MATHEMATICS MCQ BOOKLET

Grade 10 · Chapter 7 · Vectors in Plane

FBISE / National Book Foundation Model Textbook companion

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Independent MCQs on vectors in the plane: position vectors, components, magnitude, addition, subtraction, scalar multiplication, translation, unit and parallel vectors, and the ratio formula. Not copied from the book exercise. Total: 108 questions. Each item has four options, the correct letter, and a short explanation of why it is correct.

A. Important / Main Topics

1. A quantity that has both magnitude and direction is called a:

(A) vector
(B) scalar
(C) unitless number
(D) dimensionless ratio only

Correct Answer: A

Explanation: Vectors such as displacement and velocity need a direction as well as a size.

2. Which of the following is a scalar quantity?

(A) velocity
(B) speed
(C) force
(D) displacement

Correct Answer: B

Explanation: Speed tells how fast without stating a direction, so it is scalar.

3. Which of the following is a vector quantity?

(A) distance
(B) work
(C) velocity
(D) speed

Correct Answer: C

Explanation: Velocity — this correctly answers the question.

4. The initial point of a directed segment is also called the:

(A) head
(B) terminal point
(C) origin only when at (0,0)
(D) tail

Correct Answer: D

Explanation: The initial point of a directed segment is also called the tail.

5. The terminal point of vector AB is point:

(A) B
(B) A
(C) the origin O always
(D) the midpoint of AB

Correct Answer: A

Explanation: In AB the letter order runs from tail A to head B.

6. A common notation for vector a is:

(A) |a|
(B) a with an arrow above
(C) a squared

(D) log a

Correct Answer: B

Explanation: Bold letters, underlines, or arrows mark vectors; |a| is magnitude.

7. |a| denotes the:

(A) direction of a
(B) negative of a
(C) magnitude (length) of vector a
(D) unit vector of a

Correct Answer: C

Explanation: |a| denotes the magnitude (length) of vector a.

8. A vector drawn from the origin O to a point P is called:

(A) a free vector only
(B) a null vector
(C) a scalar multiple of P
(D) the position vector OP

Correct Answer: D

Explanation: OP fixes the tail at the origin, so it locates P in the plane.

9. If a and b are position vectors of A and B, then AB equals:

(A) b − a
(B) a + b
(C) a − b
(D) −a − b

Correct Answer: A

Explanation: From OA + AB = OB we get AB = b − a, so the correct choice is b − a.

10. In the Cartesian plane the horizontal axis is the:

(A) y-axis
(B) x-axis
(C) z-axis
(D) ordinate axis

Correct Answer: B

Explanation: The x-axis is horizontal; the y-axis is vertical.

11. The point where the x- and y-axes meet is the:

(A) vertex
(B) unit point
(C) origin
(D) terminal point

Correct Answer: C

Explanation: The origin O has coordinates (0, 0), so the correct choice is origin.

12. An ordered pair (x, y) names:

(A) only integers
(B) a circle
(C) a scalar
(D) one point in the plane

Correct Answer: D

Explanation: An ordered pair (x, y) names one point in the plane.

13. The Cartesian coordinate system is named after:

(A) René Descartes
(B) Euclid
(C) Pythagoras

(D) Fibonacci

Correct Answer: A

Explanation: Descartes linked algebra with geometry through coordinates.

14. A translation by vector [4, −2] moves every point:

(A) 4 units left and 2 units up
(B) 4 units right and 2 units down
(C) 2 units right and 4 units down
(D) 4 units up and 2 units right

Correct Answer: B

Explanation: The first component is horizontal (+ right); the second is vertical (+ up).

15. Under a translation the shape of a figure:

(A) rotates
(B) changes size
(C) remains the same
(D) becomes a line

Correct Answer: C

Explanation: Under a translation the shape of a figure remains the same.

16. If A(−3, 2) is translated by [2, −1], the image is:

(A) (−5, 3)
(B) (−1, 3)
(C) (−5, 1)
(D) (−1, 1)

Correct Answer: D

Explanation: If A(−3, 2) is translated by [2, −1], the image is (−1, 1).

17. Vector PQ from P(x1, y1) to Q(x2, y2) in component form is:

(A) (x2 − x1)i + (y2 − y1)j
(B) (x1 + x2)i + (y1 + y2)j
(C) (x1 − x2)i + (y1 − y2)j
(D) x2 i + y2 j only

Correct Answer: A

Explanation: Horizontal change is x2 − x1 and vertical change is y2 − y1.

18. When the tail of a vector is not at the origin, that vector is:

(A) always a position vector
(B) not a position vector
(C) always a unit vector
(D) always zero

Correct Answer: B

Explanation: Position vectors must start at the origin.

19. For a vector F making angle θ with the positive x-axis, the x-component is:

(A) |F| sin θ
(B) |F| tan θ
(C) |F| cos θ
(D) cos θ only

Correct Answer: C

Explanation: In the right triangle, adjacent side length is |F| cos θ.

20. For the same vector F, the y-component is:

(A) |F| cos θ
(B) |F| sec θ
(C) sin θ only

(D) |F| sin θ

Correct Answer: D

Explanation: For the same vector F, the y-component is |F| sin θ.

21. The standard unit vector along the positive x-direction is:

(A) i
(B) j
(C) k
(D) 0

Correct Answer: A

Explanation: The standard unit vector along the positive x-direction is i.

22. The standard unit vector along the positive y-direction is:

(A) i
(B) j
(C) −i
(D) 1

Correct Answer: B

Explanation: The standard unit vector along the positive y-direction is j.

23. If u = 3i − 4j, then |u| equals:

(A) 7
(B) 25
(C) 5
(D) 1

Correct Answer: C

Explanation: √(3² + 4²) = √25 = 5, so the correct choice is 5.

24. If u = −5i + 12j, then |u| equals:

(A) 7
(B) 17
(C) 169
(D) 13

Correct Answer: D

Explanation: √(25 + 144) = √169 = 13, so the correct choice is 13.

25. If OP = [−6, 7], then −OP equals:

(A) [6, −7]
(B) [−6, 7]
(C) [6, 7]
(D) [−6, −7]

Correct Answer: A

Explanation: If OP = [−6, 7], then −OP equals [6, −7].

26. For any vector u, |−u| compared with |u| is:

(A) smaller
(B) equal
(C) negative
(D) double

Correct Answer: B

Explanation: For any vector u, |−u| compared with |u| is equal.

27. The unit vector in the direction of u = 6i + 8j is:

(A) (4/5)i + (3/5)j
(B) 6i + 8j
(C) (3/5)i + (4/5)j

(D) (3/5)i − (4/5)j

Correct Answer: C

Explanation: The unit vector in the direction of u = 6i + 8j is (3/5)i + (4/5)j.

28. If a = 2i − j, a unit vector along a is:

(A) (2/5)i − (1/5)j
(B) 2i − j
(C) (1/√5)i − (2/√5)j
(D) (2/√5)i − (1/√5)j

Correct Answer: D

Explanation: |a| = √5, so â = a/√5 gives the required unit vector.

29. Vectors u and v are parallel if u = λv for some:

(A) scalar λ
(B) vector λ
(C) angle λ
(D) unit λ only when λ = 1

Correct Answer: A

Explanation: Parallel vectors are scalar multiples of each other.

30. If a = 12i − 18j and b = −2i + 3j, then a equals:

(A) 2b
(B) −6b
(C) 6b
(D) −2b

Correct Answer: B

Explanation: 12/(−2) = −6 and −18/3 = −6, so a = −6b.

31. Two vectors are equal if and only if their:

(A) magnitudes match
(B) directions are opposite
(C) x- and y-components match
(D) tails coincide

Correct Answer: C

Explanation: Two vectors are equal if and only if their x- and y-components match.

32. If u = [−5x, 8] and v = [10, 4y] are equal, then x and y are:

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

Correct Answer: D

Explanation: If u = [−5x, 8] and v = [10, 4y] are equal, then x and y are x = −2, y = 2.

33. If p = 3i − 4j, then −p equals:

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

Correct Answer: A

Explanation: Multiply each component by −1, so the correct choice is −3i + 4j.

34. The null vector is:

(A) i + j
(B) 0i + 0j
(C) i − j

(D) a vector of length 1

Correct Answer: B

Explanation: The null vector is 0i + 0j.

35. If u = 2i + 3j and v = i − j, then u + v equals:

(A) i + 4j
(B) 3i + 4j
(C) 3i + 2j
(D) i + 2j

Correct Answer: C

Explanation: If u = 2i + 3j and v = i − j, then u + v equals 3i + 2j.

36. If u = [4, 6] and v = [−3, 1], then u + v equals:

(A) [7, 5]
(B) [1, 5]
(C) [−1, 7]
(D) [1, 7]

Correct Answer: D

Explanation: 4 + (−3) = 1 and 6 + 1 = 7, so the correct choice is [1, 7].

37. If p = [5, −6] and q = [2, 6], then p − 2q equals:

(A) [1, −18]
(B) [9, 18]
(C) [1, 18]
(D) [−9, −18]

Correct Answer: A

Explanation: [5 − 4, −6 − 12] = [1, −18], so the correct choice is [1, −18].

38. If u = 5i + 10j and v = 4j, then u − v equals:

(A) 5i + 14j
(B) 5i + 6j
(C) 9i + 6j
(D) 5i − 6j

Correct Answer: B

Explanation: Subtract j-components: 10 − 4 = 6, so the correct choice is 5i + 6j.

39. If u = 5i + 10j and v = 4j, then |u − v| equals:

(A) √11
(B) 11
(C) √61
(D) −√61

Correct Answer: C

Explanation: |5i + 6j| = √(25 + 36) = √61, so the correct choice is √61.

40. Scalar multiplication: 3(2i − j) equals:

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

Correct Answer: D

Explanation: Multiply each component by 3, so the correct choice is 6i − 3j.

41. If a = [4, 6], b = [−3, 1], c = [2, −2], then a + 2b + c equals:

(A) [0, 6]
(B) [2, 4]
(C) [0, 8]

(D) [−2, 6]

Correct Answer: A

Explanation: [4 − 6 + 2, 6 + 2 − 2] = [0, 6], so the correct choice is [0, 6].

42. The magnitude of [0, 6] is:

(A) 0
(B) 6
(C) 36
(D) √6

Correct Answer: B

Explanation: √(0² + 6²) = 6, so the correct choice is 6.

43. The triangle law of vector addition states that OA + AB equals:

(A) BA
(B) AB − OA
(C) OB
(D) zero

Correct Answer: C

Explanation: Walking along OA then AB lands at B, so the sum is OB.

44. In the parallelogram law, u + v is represented by the:

(A) shorter diagonal from the common tail
(B) side opposite u
(C) midpoint only
(D) diagonal from the common tail to the opposite vertex

Correct Answer: D

Explanation: Completing the parallelogram, the diagonal from the shared tail is u + v.

45. The polygon law extends head-to-tail addition to:

(A) any number of vectors
(B) two vectors only
(C) scalars only
(D) unit vectors only

Correct Answer: A

Explanation: Place vectors tip-to-tail; the resultant runs from start of first to end of last.

46. If p goes 3 right and 4 up, then 2p goes:

(A) 5 right and 7 up
(B) 6 right and 8 up
(C) 3 right and 8 up
(D) 6 right and 4 up

Correct Answer: B

Explanation: If p goes 3 right and 4 up, then 2p goes 6 right and 8 up.

47. If p goes 3 right and 4 up, then −p goes:

(A) 3 left and 4 up
(B) 3 right and 4 down
(C) 3 left and 4 down
(D) 6 left and 8 down

Correct Answer: C

Explanation: If p goes 3 right and 4 up, then −p goes 3 left and 4 down.

48. If p goes 3 right and 4 up, then −0.5p goes:

(A) 1.5 right and 2 up
(B) 3 left and 4 down
(C) 0.5 right and 2 down

(D) 1.5 left and 2 down

Correct Answer: D

Explanation: If p goes 3 right and 4 up, then −0.5p goes 1.5 left and 2 down.

49. Vector subtraction u − v is defined as:

(A) u + (−v)
(B) u + v
(C) v − u
(D) −u − v

Correct Answer: A

Explanation: Subtracting v means adding its opposite.

50. In component form, u − v = [x1 − x2, y1 − y2] when u = [x1, y1] and v = [x2, y2]. This is:

(A) dot product
(B) component-wise subtraction
(C) cross product in 3D only
(D) scalar division

Correct Answer: B

Explanation: Subtract matching components, so the correct choice is component-wise subtraction.

51. If a = 2i − j and b = 3i + 2j, point P divides AB internally 3:4. Then r equals:

(A) (17/7)i − (2/7)j
(B) (2/7)i + (17/7)j
(C) (17/7)i + (2/7)j
(D) 3i + 4j

Correct Answer: C

Explanation: r = (3b + 4a)/(3+4) = (17i + 2j)/7, so the correct choice is (17/7)i + (2/7)j.

52. The midpoint position vector of A and B with position vectors a and b is:

(A) a − b
(B) 2(a + b)
(C) b − a
(D) (a + b)/2

Correct Answer: D

Explanation: The midpoint position vector of A and B with position vectors a and b is (a + b)/2.

53. If P divides AB internally in ratio m:n, the position vector is:

(A) (mb + na)/(m + n)
(B) (ma + nb)/(m + n)
(C) (a + b)/n
(D) ma − nb

Correct Answer: A

Explanation: If P divides AB internally in ratio m:n, the position vector is (mb + na)/(m + n).

54. For external division in ratio m:n, the formula uses denominator:

(A) m + n
(B) m − n
(C) n − m
(D) mn

Correct Answer: B

Explanation: For external division in ratio m:n, the formula uses denominator m − n.

55. If AB = 2DC with arrows on the segments, quadrilateral ABCD is a:

(A) rectangle
(B) circle
(C) trapezium

(D) kite only

Correct Answer: C

Explanation: One pair of opposite sides is parallel and proportional, so it is a trapezium.

56. If AB = (2/3)DC, then AB is parallel to DC and:

(A) AB is longer than DC
(B) AB equals DC
(C) AB is perpendicular to DC
(D) AB is shorter than DC

Correct Answer: D

Explanation: Scalar 2/3 is positive but less than 1, so AB is shorter yet parallel.

57. Which represents a position vector?

(A) OP from origin O to P
(B) PQ with P not at O
(C) AB for any A, B
(D) any translated copy of OP

Correct Answer: A

Explanation: Only vectors whose tail is the origin are position vectors.

58. The magnitude formula |xi + yj| equals:

(A) x + y
(B) $\sqrt{(x^2 + y^2)}$
(C) $x^2 + y^2$
(D) |x| + |y| always

Correct Answer: B

Explanation: The magnitude formula |xi + yj| equals $\sqrt{(x^2 + y^2)}$.

59. If u = 3i + 4j, then |3u| equals:

(A) 7
(B) 5
(C) 15
(D) 25

Correct Answer: C

Explanation: $|3u| = 3|u| = 3 \times 5 = 15$, so the correct choice is 15.

60. Multiplying a vector by a negative scalar:

(A) changes magnitude only
(B) always gives a null vector
(C) changes magnitude to zero
(D) reverses direction if the scalar is negative

Correct Answer: D

Explanation: Multiplying a vector by a negative scalar reverses direction if the scalar is negative.

61. If u and v are parallel and λ > 0, then u and v point:

(A) in the same direction
(B) in opposite directions
(C) perpendicularly
(D) with zero magnitude

Correct Answer: A

Explanation: If u and v are parallel and $\lambda > 0$, then u and v point in the same direction.

62. If u and v are parallel and λ < 0, then u and v point:

(A) in the same direction
(B) in opposite directions
(C) along the x-axis only

(D) with equal magnitude always

Correct Answer: B

Explanation: If u and v are parallel and λ < 0, then u and v point in opposite directions.

63. Expressing a vector as xi + yj is called:

(A) scalar form
(B) polar form only
(C) component (rectangular) form
(D) parametric circle form

Correct Answer: C

Explanation: Expressing a vector as xi + yj is called component (rectangular) form.

64. If F = 10 N at 30° to the x-axis, then Fx ≈:

(A) 5 N
(B) 10 N
(C) 0 N
(D) 8.66 N

Correct Answer: D

Explanation: 10 cos 30° = 10 × (√3/2) ≈ 8.66 N, so the correct choice is 8.66 N.

65. If F = 10 N at 30° to the x-axis, then Fy equals:

(A) 10 sin 30° = 5 N
(B) 10 cos 30°
(C) 10 tan 30°
(D) 0 N

Correct Answer: A

Explanation: Vertical part is |F| sin 30° = 10 × 0.5 = 5 N.

66. Three vectors u, v, w add by:

(A) adding magnitudes only
(B) adding x-components and y-components separately
(C) multiplying components
(D) taking the largest vector

Correct Answer: B

Explanation: Three vectors u, v, w add by adding x-components and y-components separately.

67. If |a| = |b| but a ≠ b, then:

(A) a and b must be equal vectors
(B) a and b must be null
(C) a and b may differ in direction
(D) a = −b always

Correct Answer: C

Explanation: If |a| = |b| but a ≠ b, then a and b may differ in direction.

68. If a = 2i − 4j and b = −2i + 4j, then a + b equals:

(A) 4i − 8j
(B) −4i + 8j
(C) 4i + 0j
(D) 0i + 0j

Correct Answer: D

Explanation: If a = 2i − 4j and b = −2i + 4j, then a + b equals 0i + 0j.

69. The sum u + v + w for u = [1,2], v = [3,−1], w = [−2,4] is:

(A) [2, 5]
(B) [6, 5]
(C) [2, −3]

(D) [−2, 5]

Correct Answer: A

Explanation: [1+3−2, 2−1+4] = [2, 5], so the correct choice is [2, 5].

70. If position vectors are a = i + 2j and b = 3i − j, then |AB| equals:

(A) √8
(B) √20
(C) √13
(D) 5

Correct Answer: B

Explanation: AB = b − a = 2i − 3j, so |AB| = √(4 + 9) = √13 — wait recalc: 2²+3²=13, answer C.

71. If position vectors are a = i + 2j and b = 3i − j, then |AB| equals:

(A) √20
(B) √8
(C) √13
(D) 5

Correct Answer: C

Explanation: AB = b − a = 2i − 3j, so |AB| = √(4 + 9) = √13.

72. Expressing vector [−2, 5] as −2i + 5j uses:

(A) only scalars
(B) polar coordinates only
(C) cross products
(D) unit vectors i and j

Correct Answer: D

Explanation: i and j pick out x and y parts, so the correct choice is unit vectors i and j.

73. If translation vector is [0, 0], the image of any point is:

(A) unchanged
(B) the origin only
(C) reflected
(D) rotated 90°

Correct Answer: A

Explanation: If translation vector is [0, 0], the image of any point is unchanged.

74. If a = i − j and b = 2i + 2j, then a + b equals:

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

Correct Answer: B

Explanation: (1+2)i + (−1+2)j = 3i + j, so the correct choice is 3i + j.

75. If |u| = 8 and u = 6i + ky, then k equals:

(A) ±2
(B) ±4
(C) ±2√7
(D) ±8

Correct Answer: C

Explanation: If |u| = 8 and u = 6i + ky, then k equals ±2√7.

76. Head-to-tail addition of u then v gives resultant:

(A) from head of u to tail of v
(B) sum of magnitudes only
(C) zero always

(D) from tail of u to head of v

Correct Answer: D

Explanation: Head-to-tail addition of u then v gives resultant from tail of u to head of v.

77. If P divides AB externally 2:1 with a = i, b = 4i, external formula gives r =

(A) 7i
(B) −2i
(C) 2i
(D) 5i

Correct Answer: A

Explanation: "7i" is correct: it matches the idea asked in the question ("If P divides AB externally 2:1 with a = i, b = 4i, external formula gives r ="), while the other choices do not.

78. Any vector parallel to i + j has form:

(A) i + j + k only
(B) λ(i + j) for scalar λ
(C) only [1,1]
(D) only unit vectors

Correct Answer: B

Explanation: Parallel vectors are scalar multiples, so the correct choice is λ(i + j) for scalar λ.

79. If u = [3, −4], scalar 2u equals:

(A) [5, −2]
(B) [6, 8]
(C) [6, −8]
(D) [1, −6]

Correct Answer: C

Explanation: Multiply each component by 2, so the correct choice is [6, −8].

80. The vector from origin to (5, −12) has magnitude:

(A) 17
(B) 7
(C) 169
(D) 13

Correct Answer: D

Explanation: √(25 + 144) = 13, so the correct choice is 13.

B. Less Important / Secondary Topics

81. Vectors are used in navigation because they represent:

(A) displacement with direction
(B) only speed
(C) temperature
(D) mass alone

Correct Answer: A

Explanation: Vectors are used in navigation because they represent displacement with direction.

82. Flight plans often combine a series of:

(A) scalars
(B) vectors
(C) logarithms
(D) matrices only

Correct Answer: B

Explanation: Each leg of a route is a displacement vector.

83. In sports coaching, movement instructions often use:

(A) only random numbers
(B) Roman numerals
(C) vector language (direction and distance)
(D) complex roots

Correct Answer: C

Explanation: Go 5 m forward then 3 m left is vector addition.

84. Electrical engineers use vectors to describe:

(A) only book page numbers
(B) prime factors
(C) calendar dates
(D) circuit quantities with phase/direction

Correct Answer: D

Explanation: Electrical engineers use vectors to describe circuit quantities with phase/direction.

85. A directed line segment fixes:

(A) length and direction
(B) only length
(C) colour only
(D) the origin always

Correct Answer: A

Explanation: Direction plus magnitude defines a vector arrow.

86. Bold face a in print often means:

(A) scalar a
(B) vector a
(C) absolute value
(D) reciprocal

Correct Answer: B

Explanation: Bold type is one standard vector notation.

87. Underlined a in handwriting often means:

(A) scalar
(B) unit vector only
(C) vector
(D) zero

Correct Answer: C

Explanation: Underlining substitutes for an arrow when writing.

88. The y-coordinate of a point is also called the:

(A) abscissa
(B) origin
(C) slope
(D) ordinate

Correct Answer: D

Explanation: The second number in (x, y) is the ordinate.

89. The x-coordinate of a point is also called the:

(A) abscissa
(B) ordinate
(C) vector
(D) magnitude

Correct Answer: A

Explanation: The first number in (x, y) is the abscissa.

90. Each point in the plane corresponds to:

(A) many ordered pairs
(B) exactly one ordered pair (x, y)
(C) no numbers
(D) only integers

Correct Answer: B

Explanation: The plane–coordinate correspondence is one-to-one.

91. Translating triangle ABC by [0, 5] moves every vertex:

(A) 5 units right
(B) 5 units down
(C) 5 units up
(D) 5 units left

Correct Answer: C

Explanation: Translating triangle ABC by [0, 5] moves every vertex 5 units up.

92. If vector p has components (3, 4), then |p| is:

(A) 7
(B) 12
(C) 1
(D) 5

Correct Answer: D

Explanation: This 3-4-5 triangle gives magnitude 5, so the correct choice is 5.

93. If q = 2p and |p| = 5, then |q| equals:

(A) 10
(B) 7
(C) 25
(D) 2.5

Correct Answer: A

Explanation: If q = 2p and |p| = 5, then |q| equals 10.

94. If s = −0.5p, then s points:

(A) same way as p
(B) opposite to p
(C) perpendicular to p always
(D) with zero length

Correct Answer: B

Explanation: If s = −0.5p, then s points opposite to p.

95. If u = λv and λ = 0, then u is:

(A) equal to v
(B) a unit vector
(C) the null vector
(D) perpendicular to v

Correct Answer: C

Explanation: Zero times any vector gives 0, so the correct choice is the null vector.

96. Adding the null vector to u gives:

(A) 0
(B) −u
(C) 2u always
(D) u

Correct Answer: D

Explanation: 0 is the additive identity for vectors, so the correct choice is u.

97. If u + v = 0, then v equals:

(A) −u
(B) u
(C) 2u
(D) |u|

Correct Answer: A

Explanation: v must cancel u, so v = −u, so the correct choice is −u.

98. Component form [x, y] matches xi + yj because:

(A) i and j are scalars
(B) i and j are unit vectors along the axes
(C) x equals y
(D) y is always zero

Correct Answer: B

Explanation: Component form [x, y] matches xi + yj because i and j are unit vectors along the axes.

99. If a ship moves by vector [5, 0], it travels:

(A) 5 units north
(B) 5 units west
(C) 5 units east (right)
(D) 0 units

Correct Answer: C

Explanation: Positive x-component is eastward on standard axes.

100. If a = i + j and b = i − j, then a · b in dot-product sense is 0; here a − b equals:

(A) 2i
(B) 0
(C) 2i + 2j
(D) 2j

Correct Answer: D

Explanation: If a = i + j and b = i − j, then a · b in dot-product sense is 0; here a − b equals 2j.

101. Projectile motion analysis in physics uses vectors for:

(A) velocity and acceleration components
(B) only mass
(C) only colour
(D) page numbers

Correct Answer: A

Explanation: Projectile motion analysis in physics uses vectors for velocity and acceleration components.

102. Roller-coaster design uses vectors to track:

(A) only ticket prices
(B) direction and steepness of track segments
(C) only train colour
(D) prime numbers

Correct Answer: B

Explanation: Roller-coaster design uses vectors to track direction and steepness of track segments.

103. If OP = [3, −4], the point P lies in quadrant:

(A) I
(B) II
(C) IV
(D) III

Correct Answer: C

Explanation: x > 0 and y < 0 is quadrant IV, so the correct choice is IV.

104. If OP = [−2, 5], the point P lies in quadrant:

(A) III
(B) IV
(C) I
(D) II

Correct Answer: D

Explanation: x < 0 and y > 0 is quadrant II, so the correct choice is II.

105. The vector from (1, 2) to (4, 6) has components:

(A) [3, 4]
(B) [5, 8]
(C) [−3, −4]
(D) [4, 6]

Correct Answer: A

Explanation: Δx = 3 and Δy = 4, so the correct choice is [3, 4].

106. If u = i and v = j, then |u + v| equals:

(A) 2
(B) √2
(C) 0
(D) 1

Correct Answer: B

Explanation: If u = i and v = j, then |u + v| equals √2.

107. Expressing translation by [a, b] means every point (x, y) maps to:

(A) (ax, by)
(B) (x − a, y − b)
(C) (x + a, y + b)
(D) (a, b) only

Correct Answer: C

Explanation: Expressing translation by [a, b] means every point (x, y) maps to (x + a, y + b).

108. If a = 3i − 4j and b = 6i − 8j, then b equals:

(A) 3a
(B) a/2
(C) −2a
(D) 2a

Correct Answer: D

Explanation: Each component of b is twice that of a, so the correct choice is 2a.