ExamPath

CLASS 9 MATHEMATICS · FBISE · UNIT 7 · SECTIONS B AND C PRACTICE

Unit 7: Coordinate Geometry: short and long questions

Write your working in the boxes. Model answers are on the last pages. These are practice questions written by ExamPath, not official FBISE questions or marking schemes.

Section B style: short questions (3 marks each)

B1 · 3 marks · Collinear points

Use the distance formula to show that A(1, 1), B(4, 5) and C(7, 9) are collinear.

B2 · 3 marks · Midpoint

M(3, −2) is the midpoint of PQ, where P is (−1, 4). Find the coordinates of Q.

B3 · 3 marks · Types of triangle

Show that the triangle with vertices O(0, 0), A(6, 0) and B(3, 3√3) is equilateral.

B4 · 3 marks · Distance formula

The distance between (2, k) and (5, 1) is 5 units. Find the possible values of k.

B5 · 3 marks · Types of triangle

Show that A(1, 2), B(4, 6) and C(8, 3) are the vertices of a right-angled isosceles triangle.

B6 · 3 marks · Distance formula

Find the point on the x-axis that is equidistant from A(2, 3) and B(6, 1).

Section C style: long questions (6 marks each)

C1 · 6 marks · Quadrilaterals on the plane

The points are A(1, 1), B(5, 2), C(6, 6) and D(2, 5).

(a) Show that all four sides of ABCD are equal. (3 marks)

(b) Find the lengths of the diagonals AC and BD, and state whether ABCD is a square. (2 marks)

(c) Show that the diagonals have the same midpoint. (1 mark)

C2 · 6 marks · Distance and midpoint

A triangle has vertices A(−2, 1), B(4, 1) and C(1, 5).

(a) Show that the triangle is isosceles. (2 marks)

(b) Find its perimeter. (1 mark)

(c) Find the midpoint M of AB, the length CM, and the area of the triangle. (3 marks)

C3 · 6 marks · Coordinate geometry in real life

On a map, a school is at S(2, 3) and a park is at P(10, 9). Each unit is 1 km.

(a) Find the straight-line distance from the school to the park. (2 marks)

(b) A shop is exactly halfway between them. Find its coordinates. (2 marks)

(c) Sara cycles from the school to the park at 12 km/h. How many minutes does it take? (2 marks)

Model answers

B1.

1. AB = $\sqrt{(3^2 + 4^2)} = 5$
2. BC = $\sqrt{(3^2 + 4^2)} = 5$
3. AC = $\sqrt{(6^2 + 8^2)} = 10$
4. AB + BC = 5 + 5 = 10 = AC, so B lies on AC and the points are collinear.

Answer: AB + BC = AC, so A, B and C are collinear

Watch out: If three points form a triangle, the two shorter distances add up to more than the longest; equality means a straight line.

B2.

1. Let Q = (x, y). Then $(-1 + x)/2 = 3$ and $(4 + y)/2 = -2$.
2. $-1 + x = 6$, so $x = 7$. $4 + y = -4$, so $y = -8$.
3. Check: $((-1 + 7)/2, (4 - 8)/2) = (3, -2)$ ✓

Answer: Q(7, –8)

Watch out: A quick method: Q = (2 × 3 – (–1), 2 × (–2) – 4).

B3.

1. OA = 6
2. AB = $\sqrt{((3 - 6)^2 + (3\sqrt{3})^2)} = \sqrt{(9 + 27)} = \sqrt{36} = 6$
3. OB = $\sqrt{(3^2 + (3\sqrt{3})^2)} = \sqrt{(9 + 27)} = 6$
4. All three sides are 6, so the triangle is equilateral.

Answer: OA = AB = OB = 6

Watch out: $(3\sqrt{3})^2 = 9 \times 3 = 27$.

B4.

1. $(5 - 2)^2 + (1 - k)^2 = 5^2$
2. $9 + (1 - k)^2 = 25$, so $(1 - k)^2 = 16$
3. $1 - k = 4$ or $1 - k = -4$, so $k = -3$ or $k = 5$.

Answer: k = –3 or k = 5

Watch out: Square both sides to remove the root, and keep both square roots of 16.

B5.

1. $AB^2 = 3^2 + 4^2 = 25$
2. $BC^2 = 4^2 + (-3)^2 = 25$
3. $AC^2 = 7^2 + 1^2 = 50$
4. AB = BC, so it is isosceles, and $AB^2 + BC^2 = 50 = AC^2$, so the right angle is at B.

Answer: Right-angled at B and isosceles (AB = BC = 5)

Watch out: Comparing squared lengths avoids square roots.

B6.

1. A point on the x-axis is P(x, 0). Set $PA^2 = PB^2$.
2. $(x - 2)^2 + 9 = (x - 6)^2 + 1$
3. $x^2 - 4x + 13 = x^2 - 12x + 37$, so $8x = 24$ and $x = 3$.

Answer: P(3, 0)

Watch out: Any point on the x-axis has y-coordinate 0.

C1.

1. (a) $AB^2 = 4^2 + 1^2 = 17$, $BC^2 = 1^2 + 4^2 = 17$, $CD^2 = 4^2 + 1^2 = 17$, $DA^2 = 1^2 + 4^2 = 17$. All sides are $\sqrt{17}$.
2. (b) $AC = \sqrt{(5^2 + 5^2)} = \sqrt{50} = 5\sqrt{2}$ and $BD = \sqrt{(3^2 + 3^2)} = \sqrt{18} = 3\sqrt{2}$.
3. The diagonals are not equal, so ABCD is a rhombus but not a square.
4. (c) Midpoint of AC = (3.5, 3.5) and midpoint of BD = (3.5, 3.5), so the diagonals bisect each other.

Answer: (a) all sides $\sqrt{17}$ (b) $\sqrt{50}$ and $\sqrt{18}$; a rhombus, not a square (c) both (3.5, 3.5)

Watch out: Equal sides alone do not make a square; the diagonals must also be equal.

C2.

1. (a) $AC = \sqrt{(3^2 + 4^2)} = 5$ and $BC = \sqrt{(3^2 + 4^2)} = 5$, so AC = BC and the triangle is isosceles.
2. (b) AB = 6, so the perimeter is 5 + 5 + 6 = 16.
3. (c) M = ((−2 + 4)/2, (1 + 1)/2) = (1, 1). CM = 5 − 1 = 4 (M is directly below C).
4. In an isosceles triangle the median CM is also the height, so area = ½ × 6 × 4 = 12 square units.

Answer: (b) 16 (c) M(1, 1), CM = 4, area = 12 square units

Watch out: AB is horizontal (both y = 1), so its length is simply 4 − (−2) = 6.

C3.

1. (a) $SP = \sqrt{((10 - 2)^2 + (9 - 3)^2)} = \sqrt{(64 + 36)} = 10$ km.
2. (b) Midpoint = ((2 + 10)/2, (3 + 9)/2) = (6, 6).
3. (c) Time = distance ÷ speed = 10 ÷ 12 = 5/6 hour = 50 minutes.

Answer: (a) 10 km (b) (6, 6) (c) 50 minutes

Watch out: Change hours to minutes by multiplying by 60: 5/6 × 60 = 50.

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