ExamPath

CLASS 9 MATHEMATICS · FBISE · UNIT 8 · SECTIONS B AND C PRACTICE

Unit 8: Geometry of Straight Lines: 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 · Two-point form

Find the equation of the line through (2, −1) and (4, 5). Write it in the form ax + by + c = 0.

B2 · 3 marks · Gradient and inclination

Find the angle that the line through (1, 2) and (4, 5) makes with the positive x-axis.

B3 · 3 marks · Intercept form

Write 3x + 4y = 12 in intercept form and state its x- and y-intercepts.

B4 · 3 marks · Intercept form

Find the equation of the line with x-intercept 2 and y-intercept −3. Write it in standard form.

B5 · 3 marks · Perpendicular lines

Show that the lines $2x - 3y + 5 = 0$ and $3x + 2y - 7 = 0$ are perpendicular.

B6 · 3 marks · Parallel lines

Find k if the lines $y = (k - 1)x + 4$ and $y = 3x - 2$ are parallel.

Section C style: long questions (6 marks each)

C1 · 6 marks · Parallel and perpendicular lines

A line L has equation $4x - 2y + 1 = 0$.

(a) Find the equation of the line through $(3, -2)$ parallel to L. (3 marks)

(b) Find the equation of the line through $(3, -2)$ perpendicular to L. (3 marks)

C2 · 6 marks · Lines in a triangle

A triangle has vertices A(0, 0), B(6, 0) and C(2, 4).

(a) Find the gradients of AB, BC and AC. (2 marks)

(b) Find the equation of the altitude from A to BC. (2 marks)

(c) Find the equation of the median from C. (2 marks)

C3 · 6 marks · Straight lines in real life

A taxi charges a fixed Rs 100 plus Rs 50 per kilometre.

(a) Write an equation for the fare C (in rupees) for d kilometres. (2 marks)

(b) State the gradient and the y-intercept, and explain what each means. (2 marks)

(c) Find the fare for 12 km, and the distance for a fare of Rs 850. (2 marks)

Model answers

B1.

1. Gradient $m = (5 - (-1))/(4 - 2) = 6/2 = 3$.
2. Point-slope form: $y - (-1) = 3(x - 2)$, so $y + 1 = 3x - 6$ and $y = 3x - 7$.
3. Standard form: $3x - y - 7 = 0$. Check with (4, 5): $12 - 5 - 7 = 0$ ✓

Answer: $3x - y - 7 = 0$

Watch out: Check the final equation with both given points.

B2.

1. $m = (5 - 2)/(4 - 1) = 3/3 = 1$.
2. $m = \tan \alpha$, so $\tan \alpha = 1$.
3. $\alpha = 45°$.

Answer: $45°$

Watch out: The angle of inclination α satisfies $\tan \alpha = m$.

B3.

1. Divide every term by 12: $3x/12 + 4y/12 = 1$
2. $x/4 + y/3 = 1$
3. So the x-intercept is 4 and the y-intercept is 3.

Answer: $x/4 + y/3 = 1$; intercepts 4 and 3

Watch out: Intercept form is $x/a + y/b = 1$, with 1 on the right-hand side.

B4.

1. $x/2 + y/(-3) = 1$
2. Multiply by -6: $-3x + 2y = -6$
3. Multiply by -1: $3x - 2y = 6$, so $3x - 2y - 6 = 0$.
4. Check: (2, 0) gives $6 = 6$ ✓ and (0, −3) gives $6 = 6$ ✓

Answer: $3x - 2y - 6 = 0$

Watch out: The y-intercept is negative, so the denominator under y is −3.

B5.

1. For $ax + by + c = 0$ the gradient is $-a/b$.
2. First line: $m_1 = -2/(-3) = 2/3$. Second line: $m_2 = -3/2$.
3. $m_1 \times m_2 = 2/3 \times (-3/2) = -1$, so the lines are perpendicular.

Answer: $m_1 m_2 = -1$, so they are perpendicular

Watch out: Perpendicular gradients are negative reciprocals of each other.

B6.

1. Parallel lines have equal gradients.
2. $k - 1 = 3$
3. $k = 4$

Answer: $k = 4$

Watch out: The y-intercepts (4 and −2) are different, so with equal gradients the lines are parallel and not the same line.

C1.

1. Gradient of L: $-4/(-2) = 2$.
2. (a) Parallel line: $m = 2$. $y - (-2) = 2(x - 3)$, so $y + 2 = 2x - 6$ and $y = 2x - 8$, or $2x - y - 8 = 0$.
3. (b) Perpendicular line: $m = -1/2$. $y + 2 = -\frac{1}{2}(x - 3)$.
4. Multiply by 2: $2y + 4 = -x + 3$, so $x + 2y + 1 = 0$.
5. Check (3, −2): $3 - 4 + 1 = 0$ ✓

Answer: (a) $2x - y - 8 = 0$ (b) $x + 2y + 1 = 0$

Watch out: Find the gradient of the given line first by writing it as $y = 2x + \frac{1}{2}$.

C2.

1. (a) $m_{AB} = 0$; $m_{BC} = (4 - 0)/(2 - 6) = -1$; $m_{AC} = 4/2 = 2$.
2. (b) The altitude from A is perpendicular to BC, so its gradient is 1. It passes through A(0, 0): $y = x$.
3. (c) The median from C goes to the midpoint of AB, which is (3, 0). Gradient $= (4 - 0)/(2 - 3) = -4$.
4. $y - 0 = -4(x - 3)$, so $y = -4x + 12$. Check C(2, 4): $-8 + 12 = 4$ ✓

Answer: (a) 0, −1, 2 (b) $y = x$ (c) $y = -4x + 12$

Watch out: An altitude is perpendicular to the opposite side; a median goes to its midpoint. Do not mix them up.

C3.

1. (a) $C = 50d + 100$.
2. (b) Gradient 50: the fare rises by Rs 50 for each extra kilometre. Intercept 100: the fixed charge before any distance.
3. (c) $d = 12$: $C = 600 + 100 =$ Rs 700.
4. $C = 850$: $50d = 750$, so $d = 15$ km.

Answer: (a) $C = 50d + 100$ (c) Rs 700; 15 km

Watch out: In $y = mx + c$, the gradient is the rate and the intercept is the starting value.

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