IB MATHS AA HL · UNIT 2

Equations of straight lines: exam practice

10 questions · 42 marks · worked solutions and markschemes

Name _____ Date _____ Score / 42

- Answer every question before you look at the solutions. They start after the last question, with the marks for each line: M for method, A for accuracy, R for reasoning.
- Online, with more practice: ibmathrevision.com/hlaa/equations-of-straight-lines-exam-practice

1. **3 marks · Paper 1 style · no calculator**

Find the x- and y-intercepts of the line $5x + 2y = 20$, and its gradient.

Find the intercepts and gradient. **[3]**

2. **3 marks · Paper 1 style · no calculator**

The points $(1, -2)$, $(4, 7)$ and $(k, 19)$ lie on the same straight line.

Find k. **[3]**

3. **4 marks · Paper 1 style · no calculator**

The lines $(k+1)x + 2y = 5$ and $3x + (k-4)y = 1$ are parallel.

Find the possible values of k. **[4]**

4. **4 marks · Paper 1 style · no calculator**

$P(1, 3)$ and $Q(7, -1)$ are two points.

Find the equation of the perpendicular bisector of PQ, in the form $ax + by = c$ with $a, b, c \in \mathbb{Z}$. **[4]**

5. **3 marks · Paper 1 style · no calculator**

The points $A(2, 1)$, $B(6, 3)$ and $C(c, 7)$ form a triangle with a right angle at B.

Find c. **[3]**

6. **4 marks · Paper 1 style · no calculator**

The line L passes through $A(-2, 7)$ and $B(4, -5)$.

(a) Find the gradient of L. **[2]**

(b) Find the equation of L in the form $ax + by + d = 0$. **[2]**

7. **5 marks · Paper 2 style · calculator**

A taxi charges a fixed fee plus a cost per kilometre. A 6 km trip costs $\$13.40$ and a 15 km trip costs $\$27.80$.

(a) Find the cost per kilometre and the fixed fee. **[3]**

(b) Find the length of a trip that costs $\$45.40$. **[2]**

8. **5 marks · Paper 1 style · no calculator**

The line $y = mx + 2$ passes through the point $(3, -7)$.

(a) Find m. **[2]**

(b) Find the area of the triangle formed by the line and the coordinate axes. **[3]**

9. **5 marks · Paper 2 style · calculator**

The line L passes through $(0, 5)$ and is parallel to $2x + 5y = 1$.

(a) Find the equation of L. **[2]**

(b) Find the distance between the points where L meets the axes. **[3]**

10. **6 marks · Paper 1 style · no calculator**

The line L_1 has equation $3x - 4y = 12$. The line L_2 is perpendicular to L_1 and passes through $(6, -1)$.

(a) Find the equation of L_2 in the form $y = mx + c$. **[3]**

(b) Find the coordinates of the point where L_1 and L_2 meet. **[3]**

Answers and worked solutions

Question 1 — 3 marks

Answer: $(4, 0)$, $(0, 10)$, gradient $-\frac{5}{2}$

x—intercept 4 **A1**

y—intercept 10 **A1**

gradient $-\frac{5}{2}$ **A1**

Question 2 — 3 marks

Answer: 8

gradient $= 3$ **A1**

$\frac{19-7}{k-4} = 3$ **M1**

$k = 8$ **A1**

Question 3 — 4 marks

Answer: $k = 5$, $k = -2$

$-\frac{k+1}{2} = -\frac{3}{k-4}$ **M1**

$(k+1)(k-4) = 6$ **A1**

$k^2 - 3k - 10 = 0$ **A1**

$k = 5$, $k = -2$ **A1**

Question 4 — 4 marks

Answer: $3x - 2y = 10$

midpoint $(4, 1)$ **A1**

gradient $PQ = -\frac{2}{3}$, so

perpendicular gradient $\frac{3}{2}$ **A1**

$y - 1 = \frac{3}{2}(x - 4)$ **M1**

$3x - 2y = 10$ **A1**

Question 5 — 3 marks

Answer: 4

gradient $AB = \frac{1}{2}$ **A1**

$\frac{7-3}{c-6} = -2$ **M1**

$c = 4$ **A1**

Question 6 — 4 marks

Answer: (a) -2; (b) $2x + y - 3 = 0$

(a)

$\frac{-5-7}{4-(-2)}$ **M1**

-2 **A1**

(b)

$y - 7 = -2(x + 2)$ **M1**

$2x + y - 3 = 0$ **A1**

Question 7 — 5 marks

Answer: (a) $\$1.60$ per km, $\$3.80$ fixed; (b) 26

(a)

$\frac{27.80 - 13.40}{15 - 6}$ **M1**

$\$1.60$ per km **A1**

fixed fee $\$3.80$ **A1**

(b)

$3.80 + 1.60d = 45.40$ **M1**

26 km **A1**

Question 8 — 5 marks

Answer: (a) -3; (b) $\frac{2}{3}$

(a)

$-7 = 3m + 2$ **M1**

$m = -3$ **A1**

(b)

x—intercept $\frac{2}{3}$ **A1**

$\frac{1}{2} \times \frac{2}{3} \times 2$ **M1**

$\frac{2}{3}$ **A1**

Question 9 — 5 marks

Answer: (a) $y = -\frac{2}{5}x + 5$; (b) 13.5

(a)

gradient $-\frac{2}{5}$ **A1**

$y = -\frac{2}{5}x + 5$ **A1**

(b)

$(12.5, 0)$ and $(0, 5)$ **A1**

$\sqrt{12.5^2 + 5^2}$ **M1**

13.5 **A1**

Question 10 — 6 marks

Answer: (a) $y = -\frac{4}{3}x + 7$; (b) $\left(\frac{24}{5}, \frac{3}{5}\right)$

(a)

gradient of $L_1 = \frac{3}{4}$ **A1**

gradient of $L_2 = -\frac{4}{3}$ **A1**

$y = -\frac{4}{3}x + 7$ **A1**

(b)

$3x - 4\left(-\frac{4}{3}x + 7\right) = 12$ **M1**

$x = \frac{24}{5}$ **A1**

$\left(\frac{24}{5}, \frac{3}{5}\right)$ **A1**

Every solution is also on ibmathrevision.com/hlaa/equations-of-straight-lines-exam-practice
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