Linear equations and graphs - practice paper 2

16 questions | 47 marks | 55 minutes

Build from equations and coordinate facts to straight-line rules, geometric reasoning and contextual models.

Equivalent correct methods earn the corresponding marks.

1. Solve $5x - 9 = 16$. [2 marks]

Add 9 to get $5x = 25$, then divide by 5.

Answer: $x = 5$

2. Solve $7 - 3(x + 1) = 19$. [3 marks]

Expand: $4 - 3x = 19$.

Thus $-3x = 15$ and $x = -5$.

Answer: $x = -5$

3. What is the gradient of the horizontal line through $(1, -3)$ and $(7, -3)$? [2 marks]

The vertical change is zero and the horizontal change is 6.

Answer: 0

4. The segment from $(1, 2)$ to $(5, k)$ has gradient $\frac{3}{2}$. Find k. [3 marks]

$\frac{k-2}{4} = \frac{3}{2}$.

Multiply by 4: $k - 2 = 6$, giving $k = 8$.

Answer: $k = 8$

5. One endpoint is $(-2, 7)$ and the midpoint is $(3, 1)$. Find the other endpoint. [3 marks]

Double the midpoint: $(6, 2)$.

Subtract the known endpoint: $(6 - (-2), 2 - 7) = (8, -5)$.

Answer: $(8, -5)$

6. Find the exact distance between $(-1, -2)$ and $(4, 3)$. [2 marks]

Both coordinate changes equal 5.

$d = \sqrt{25 + 25} = \sqrt{50}$.

Answer: $\sqrt{50}$ units

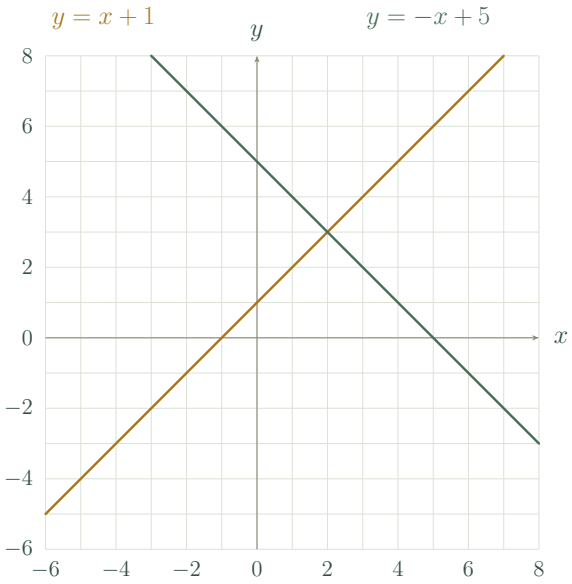
7. Rearrange $2x + 3y = 12$ into $y = mx + c$ form. [2 marks]

Subtract $2x$: $3y = -2x + 12$.

Divide all terms by 3.

Answer: $y = -\frac{2}{3}x + 4$

8. The graph shows two straight lines. [3 marks]



(a) Use the graph to state their intersection. [1 mark]

Read the grid intersection at horizontal coordinate 2 and vertical coordinate 3.

Answer: $(2, 3)$

(b) Check this point in both labelled equations. [2 marks]

For $y = x + 1$, substitute $x = 2$ to get 3.

For $y = -x + 5$, substitute $x = 2$ to get 3.

Answer: Both equations give $y = 3$.

9. Find the equation through $(2, 5)$ and $(6, 7)$. [3 marks]

$m = \frac{7-5}{6-2} = \frac{1}{2}$.

$5 = (\frac{1}{2})(2) + c$ gives $c = 4$.

Answer: $y = \frac{1}{2}x + 4$

10. A line through $(4, -2)$ is perpendicular to $x = 1$. Write its equation. [2 marks]

$x = 1$ is vertical, so the required line is horizontal.

It passes through a point with $y = -2$.

Answer: $y = -2$

11. Find the line perpendicular to $y = 2x + 1$ through $(2, 4)$. [3 marks]

The perpendicular gradient is $-\frac{1}{2}$.

$4 = -(\frac{1}{2})(2) + c$ gives $c = 5$.

Answer: $y = -\frac{1}{2}x + 5$

12. A print shop charges a fixed setup cost and a constant price per poster. [5 marks]

Print costs

Posters n	5	10
Cost C (dollars)	23	38

(a) Use the table to find the cost per poster and setup cost. [3 marks]

The cost increases by 15 dollars for 5 extra posters, so the rate is 3 dollars per poster.

At 5 posters, $23 = 3(5) + c$, so $c = 8$.

Answer: 3 dollars per poster and 8 dollars setup.

(b) Write the rule and find the cost of 12 posters. [2 marks]

Substitute $n = 12$: $C = 36 + 8 = 44$.

Answer: $C = 3n + 8$; 44 dollars.

13. A line has equation $y = mx + 4$ and passes through $(-2, -2)$. Find m. [3 marks]

Substitute the point: $-2 = -2m + 4$.

Then $-6 = -2m$, so $m = 3$.

Answer: $m = 3$

14. Mila claims increasing a line's gradient always increases its output. Give a counterexample using $y = x$ and $y = 3x$. [3 marks]

Choose a negative input.

Substitute it into both rules.

Answer: At $x = -1$, the outputs are -1 and -3; the larger gradient gives the smaller output.

15. A temperature model $T = 28 - 2h$ was fitted using observations from $h = 0$ to $h = 3$. It predicts $T = -12$ at $h = 20$. Explain why this prediction is unreliable. [3 marks]

The observed range stops at $h = 3$.

The equation's constant rate is an assumption, not a guarantee.

Answer: It extrapolates far outside the observed period; the temperature is unlikely to keep falling at a fixed rate for 20 hours.

16. A rectangular court has adjacent corners $A(-3, -1)$, $B(5, -1)$ and $C(5, 5)$. [5 marks]

(a) Find the fourth corner D and the centre of the court. [3 marks]

D uses A's horizontal coordinate and C's vertical coordinate.

Average A and C to get $(\frac{-3+5}{2}, \frac{-1+5}{2}) = (1, 2)$.

Answer: $D = (-3, 5)$; centre $(1, 2)$.

(b) Find the diagonal length AC. [2 marks]

The side lengths are 8 and 6.

$AC = \sqrt{8^2 + 6^2} = 10$.

Answer: 10 units