Linear equations and graphs - practice paper 1

16 questions | 45 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 $3x+4=19$. [2 marks]

Subtract 4: $3x=15$.

Divide by 3.

Answer: $x=5$

2. Solve $4(x-2)=2x+6$. [3 marks]

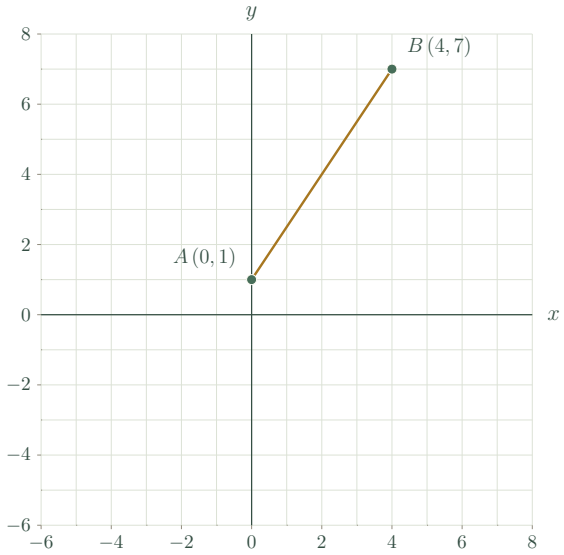
Expand: $4x-8=2x+6$.

Subtract $2x$ and add 8: $2x=14$.

Divide by 2.

Answer: $x=7$

3. The line segment joins $A(0,1)$ and $B(4,7)$. Find its gradient. [2 marks]



The rise is $7-1=6$ and the run is 4.

$m=\frac{6}{4}=\frac{3}{2}$.

Answer: $\frac{3}{2}$

4. Find the midpoint of $(-4, 6)$ and $(8, -2)$. [2 marks]

Average the coordinates: $\frac{-4+8}{2} = 2$ and $\frac{6-2}{2} = 2$.

Answer: $(2, 2)$

5. Find the distance between $(2, 1)$ and $(5, 5)$. [2 marks]

The coordinate changes are 3 and 4.

$d = \sqrt{3^2 + 4^2} = 5$.

Answer: 5 units

6. Consider the straight line $y = -2x + 6$. [4 marks]

(a) State its gradient and its y-intercept. [2 marks]

Read $m = -2$ and $c = 6$.

Answer: Gradient -2; y-intercept $(0, 6)$.

(b) Find its x-intercept. [2 marks]

Set $y = 0$: $-2x + 6 = 0$.

Thus $x = 3$.

Answer: $(3, 0)$

7. Find the equation of the line with gradient 4 passing through $(2, 3)$. [3 marks]

Use $y = 4x + c$.

$3 = 8 + c$, so $c = -5$.

Answer: $y = 4x - 5$

8. Find the equation of the line through $(-1, 5)$ and $(3, -3)$. [3 marks]

$m = \frac{-3-5}{3+1} = -2$.

Using $(-1, 5)$, $5 = 2 + c$, so $c = 3$.

Answer: $y = -2x + 3$

9. Write an equation of a line parallel to $y = 3x - 1$ through $(0, 4)$. [2 marks]

Use the same gradient 3.

The point on the vertical axis gives intercept 4.

Answer: $y = 3x + 4$

10. Find the gradient of a line perpendicular to a line of gradient -3. [2 marks]

The two gradients multiply to -1.

$(-3)(\frac{1}{3}) = -1$.

Answer: $\frac{1}{3}$

11. A canoe hire costs $C = 12 + 5h$ dollars for h hours, for $0 \le h \le 8$. [4 marks]

(a) Explain the meaning of 12 and 5. [2 marks]

The intercept is the cost at zero hours.

The gradient is the hourly increase.

Answer: 12 dollars fixed fee and 5 dollars per hour.

(b) How long was a hire that cost 37 dollars? [2 marks]

$37 = 12 + 5h$ gives $25 = 5h$, so $h = 5$.

This is inside the stated domain.

Answer: 5 hours

12. A container drains according to $V = 96 - 8t$ litres, where t is time in minutes. Find when it becomes empty and state a practical domain for t. [3 marks]

Set $V = 0$: $96 - 8t = 0$, so $t = 12$.

Time starts at 0 and the model stops at empty.

Answer: 12 minutes; $0 \le t \le 12$.

13. Do these values lie on one straight line? Explain using changes. [3 marks]

Recorded values

x	0	1	2
y	2	5	9

From $x = 0$ to 1, y increases by 3.

From $x = 1$ to 2, y increases by 4.

Equal input steps do not have a constant output change.

Answer: No.

14. A student says the gradient of $2y = 6x + 10$ is 6. Correct the mistake. [2 marks]

Divide the entire equation by 2: $y = 3x + 5$.

The coefficient of x is then 3.

Answer: The gradient is 3.

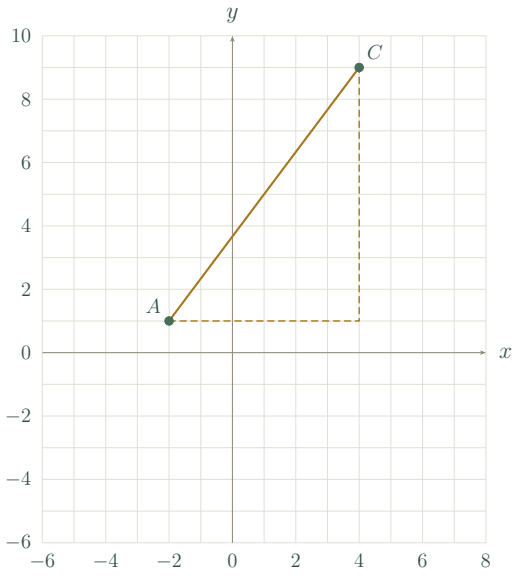
15. The rule $y = -x + 2$ changes to $y = -x - 3$. Describe the change in the graph and justify your answer. [3 marks]

Both gradients equal -1.

At every input, the new output is 5 less.

Answer: The graph moves down 5 units and remains parallel.

16. A walking route joins $A(-2, 1)$, $B(4, 1)$ and $C(4, 9)$. Each coordinate unit represents 50 m. [5 marks]



(a) Find the length of the two-leg route from A to B to C. [2 marks]

$AB = 6$ units and $BC = 8$ units.

The total is $14 \times 50 = 700$ m.

Answer: 700 m

(b) Find the direct distance from A to C and the distance saved. [3 marks]

$AC = \sqrt{6^2 + 8^2} = 10$ units, or 500 m.

$700 - 500 = 200$ m.

Answer: 500 m direct; 200 m saved.