Linear equations and graphs - applications paper

Name: _____ Date: _____

16 questions | 53 marks | 60 minutes

Use linear relationships, coordinate geometry and model checks in connected practical situations.

No calculator needed.

1. A group pays 12 dollars to reserve a lane and 6 dollars for each player. The bill is 84 dollars. How many players are there? [2 marks]

2. A tank contains 20 L after 1 minute and 68 L after 5 minutes. Assume a constant filling rate. Find the rate. [2 marks]

3. A map grid is measured in kilometres. A shelter is at $(3, 1)$ and a gate is at $(9, 9)$. [4 marks]

(a) Find the midpoint of the direct route. [2 marks]

(b) Find the length of the direct route. [2 marks]

4. A phone battery is modelled by $B = 90 - 7t$ percent after t hours, for $0 \le t \le 10$. When does the model give 55%? [3 marks]

5. Two hire plans charge $A = 18 + 3h$ and $B = 6 + 5h$ dollars for a whole number of hours h, with $1 \le h \le 8$. [5 marks]

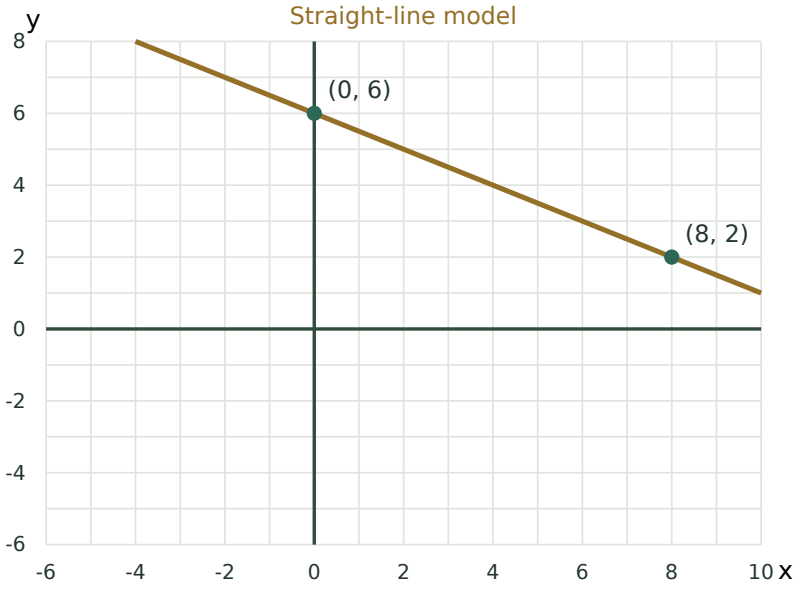
(a) Find the hire length at which the two plans cost the same. [3 marks]

(b) Which plan is cheaper for 4 hours and for 8 hours? [2 marks]

6. A cable follows $2x + y = 8$. A second cable is perpendicular to it. Find the second cable's gradient. [2 marks]

7. A straight fence passes through $(-2, 1)$ and $(2, 5)$. A marker is proposed at $(5, 8)$. Is the marker on the fence? Justify. [3 marks]

8. The displayed straight-line model relates x and y. [5 marks]



(a) Find its gradient and equation using the labelled points. [3 marks]

(b) Use the equation to find when $y = 3$. [2 marks]

9. A path passes through $(4, -3)$ and is perpendicular to the vertical boundary $x = -1$. Write the path's equation. [2 marks]

10. The midpoint of a bridge is $M(1, 2)$. One end is $A(-3, 5)$. Find the other end B. [3 marks]

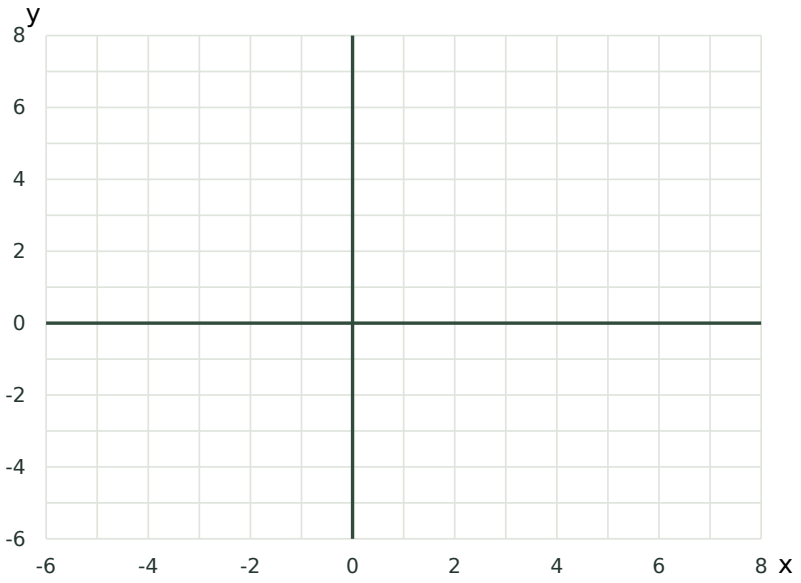
11. A plant is 12 cm high at day 2 and 30 cm high at day 8. Find the average gradient of height against time, including units. [2 marks]

12. A club recorded the costs in the table. Can one constant-rate linear model fit all three entries? Explain. [3 marks]

Recorded club costs

People	2	4	6
Cost (dollars)	18	28	42

13. On the supplied grid, draw $y = 2x - 1$ for $-2 \leq x \leq 3$. Label both axis intercepts. [4 marks]



14. A student says that changing $y = 2x + 1$ to $y = 5x + 1$ shifts the graph straight upwards. Explain why this is wrong. [3 marks]

15. A line of gradient -2 passes through $(3, 4)$. Find where it crosses the horizontal axis. [3 marks]

16. A straight walking track joins $A(0, 0)$ and $B(8, 6)$ on a kilometre grid. A rest point M is halfway along it. A straight service path passes through M at right angles to AB. [7 marks]

(a) Find M and the gradient of AB. [2 marks]

(b) Find an equation for the service path. [3 marks]

(c) How far is M from A along the walking track? [2 marks]