Linear equations and graphs - topic test

15 questions | 37 marks | 45 minutes

A progressive topic paper with calculations, explanations and practical applications.

Equivalent correct methods earn the corresponding marks.

1. Solve $3x + 4 = 19$. [2 marks]

Subtract 4.

Divide the resulting $3x = 15$ by 3.

Answer: $x = 5$.

2. Solve $5x - 7 = 8$. [2 marks]

Add 7.

Divide $5x = 15$ by 5.

Answer: $x = 3$.

3. Solve $2(x + 4) = 22$. [2 marks]

Divide by 2.

Subtract 4 from $x + 4 = 11$.

Answer: $x = 7$.

4. Solve $4x + 3 = x + 18$. [2 marks]

Subtract x and 3.

Divide $3x = 15$ by 3.

Answer: $x = 5$.

5. Solve $6x = 5$ exactly. [2 marks]

Divide both sides by 6.

Keep the fraction exact.

Answer: $x = 5/6$.

6. Check x = -3 in $2x + 7 = 1$. [2 marks]

The left side is $-6 + 7 = 1$.

This equals the right side.

Answer: It is a solution.

7. Solve $2x + 1 < 9$. [2 marks]

Subtract 1.

Divide by positive 2; the endpoint is excluded.

Answer: $x < 4$.

8. The table gives three points on a straight line. [3 marks]

Values on a line

x	0	1	2
y	-2	1	4

(a) Find the rule for the line. [2 marks]

The output rises by 3 each step.

The output at x = 0 is -2.

Answer: $y = 3x - 2$.

(b) Find the output at x = 3. [1 mark]

Substitute 3: $3(3) - 2 = 7$.

Answer: y = 7.

9. Give the equation of the vertical line through $(-2, 5)$. [2 marks]

A vertical line fixes x.

Use the given first coordinate.

Answer: $x = -2$.

10. Compare $y = 2x + 1$ and $y = 2x - 4$. [2 marks]

They have equal multipliers.

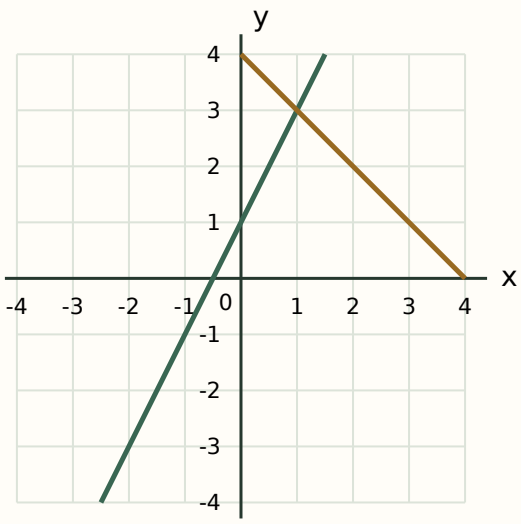
Their constants differ by 5.

Answer: Parallel, with outputs always 5 apart.

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

y = 2x + 1

y = -x + 4



Each grid square represents 1 unit.

(a) Read their intersection as an ordered pair. [1 mark]

Read x = 1 and y = 3 from the crossing.

Answer: $(1, 3)$.

(b) Check that point in both displayed rules. [2 marks]

First rule: $2(1) + 1 = 3$.

Second rule: $-1 + 4 = 3$.

Answer: Both rules give y = 3 when x = 1.

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

Expand: $3x - 6 = 2x + 2$.

Subtract $2x$ and add 6.

Answer: $x = 8$.

13. Hire costs AUD 12 plus AUD 5/hour. With AUD 42, find the greatest whole number of hours. Include an inequality. [3 marks]

Subtract 12 and divide by positive 5.

Use a whole-number domain.

Answer: $12 + 5h \le 42$ gives at most 6 hours.

14. A plant is initially 14 cm tall. In a simplified model, it grows 2 cm each week. [3 marks]

(a) Write a rule for height H after w weeks. [1 mark]

Start at 14 cm and add 2 cm for each week.

Answer: $H = 14 + 2w$.

(b) Find when the model predicts a height of 30 cm. [2 marks]

Solve $30 = 14 + 2w$.

Subtract 14 and divide by 2.

Answer: 8 weeks.

15. Two plans have costs in dollars given by $A = 10 + 2n$ and $B = 4 + 5n$. [4 marks]

(a) Find the value of n where both plans have the same cost, and state that cost. [2 marks]

Set $10 + 2n = 4 + 5n$ to get $6 = 3n$.

Thus n = 2; substitute into either rule.

Answer: n = 2; both cost AUD 14.

(b) Which plan is cheaper at n = 5? Give both costs. [2 marks]

$A = 10 + 2(5) = 20$.

$B = 4 + 5(5) = 29$.

Answer: A costs AUD 20 and B costs AUD 29, so A is cheaper.