Algebra and graphs: IGCSE Maths worksheet

8 questions · 30 marks · Algebraic manipulation, Equations and inequalities, Sequences, Graphs of functions

Q	Answer and marking steps		Marks
1	Simplify fully: $5x + 3y - 2x + 7y$		2
	Answer: $3x + 10y$		
	• Collect x terms: $5x - 2x = 3x$	1	
	• Collect y terms: $3y + 7y = 10y$, giving $3x + 10y$	1	
	Algebraic manipulation		
2	(a) Expand and simplify: $3(2x - 1) - 4(x - 5)$		4
	(b) Factorise completely: $6a^2b - 9ab^2$		
	Answer: (a) $2x + 17$ (b) $3ab(2a - 3b)$		
	• (a) Expand brackets: $6x - 3 - 4x + 20$	1	
	• (a) Simplify to $2x + 17$	1	
	• (b) Identify common factor $3ab$	1	
	• (b) Write as $3ab(2a - 3b)$	1	
	Algebraic manipulation		
3	Solve the equation: $4(x + 3) = 2x - 6$		3
	Answer: $x = -9$		
	• Expand brackets: $4x + 12 = 2x - 6$	1	
	• Rearrange: $2x = -18$	1	
	• Solve: $x = -9$	1	
	Equations and inequalities		
4	Priya is solving an inequality for a Science experiment. The temperature, t °C, of a liquid must satisfy: $3t - 5 \leq 16$		4
	(a) Solve the inequality to find the range of values of t.		
	(b) Show the solution on a number line.		
	(c) Write down the largest integer value of t that satisfies the inequality.		
	Answer: (a) $t \leq 7$ (b) see diagram, closed circle at 7 with arrow to the left (c) 7		
	• Add 5 to both sides: $3t \leq 21$	1	
	• Divide by 3: $t \leq 7$	1	
	• Correctly show closed circle at 7 with arrow pointing left	1	
	• State largest integer value as 7	1	
	Equations and inequalities		

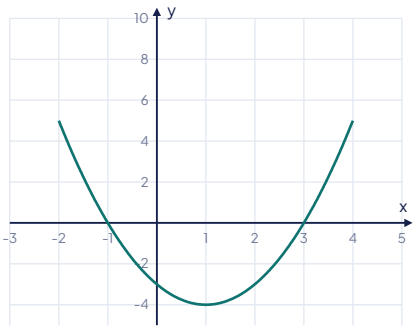
Q	Answer and marking steps	Marks
5	The first five terms of a sequence are: 4, 9, 14, 19, 24 (a) Find the common difference. (b) Write down an expression, in terms of n, for the nth term of the sequence. (c) Use your expression to find the 50th term of the sequence. **Answer:** (a) 5 (b) 5n – 1 (c) 249 • Common difference = 5 — 1 • Form nth term as 5n + c — 1 • Find c = –1, giving 5n – 1 — 1 • Substitute n = 50: 5(50) – 1 = 249 — 1 Sequences	**4**
6	The nth term of a sequence is given by $T(n) = n^2 - 3$. Find the 1st, 2nd and 3rd terms of the sequence, and state whether 94 is a term of this sequence, giving a reason. **Answer:** Terms: –2, 1, 6. 94 is not a term because $n^2 = 97$ has no integer solution for n. • Find T(1) = –2, T(2) = 1, T(3) = 6 — 1 • Set $n^2 - 3 = 94$, giving $n^2 = 97$ — 1 • State 94 is not a term since $\sqrt{97}$ is not a whole number — 1 Sequences	**3**
7	A straight line has equation $y = 2x - 3$. (a) Find the gradient of the line. (b) Find the coordinates of the point where the line crosses the y-axis. (c) Find the coordinates of the point where the line crosses the x-axis. (d) A second line is parallel to $y = 2x - 3$ and passes through the point (0, 5). Write down the equation of this second line. **Answer:** (a) 2 (b) (0, –3) (c) (1.5, 0) (d) $y = 2x + 5$ • State gradient = 2 — 1 • y-intercept at (0, –3) — 1 • Set y = 0: 0 = 2x – 3 — 1 • Solve to get x = 1.5, so (1.5, 0) — 1 • Parallel line through (0,5): $y = 2x + 5$ — 1 Graphs of functions	**5**

Q	Answer and marking steps	Marks
8	The graph shows the curve $y = x^2 - 2x - 3$ for values of x from -2 to 4.	**5**

(a) Use the graph to write down the coordinates of the two points where the curve crosses the x-axis.

(b) Use the graph to write down the coordinates of the minimum point of the curve.

(c) By factorising $y = x^2 - 2x - 3$, confirm your answer to part (a).



Answer: (a) $(-1, 0)$ and $(3, 0)$ (b) $(1, -4)$ (c) $y = (x - 3)(x + 1)$, roots at $x = 3$ and $x = -1$, confirming part (a)

- Read x-axis crossing points as $(-1, 0)$ and $(3, 0)$ — 2
- Read minimum point as $(1, -4)$ — 1
- Factorise correctly as $(x - 3)(x + 1)$ — 1
- State roots $x = 3$, $x = -1$ confirming graph readings — 1

Graphs of functions