Completing the Square

GCSE Maths · Higher tier · 20 questions · 61 marks

Name _____ Date _____ Score _____ / 61

Start at Level 1 and climb. Stuck? The worked answers show every step.

Level 1 · Warm-up **Level 2 · Build** **Level 3 · Exam-style** **Level 4 · Challenge**

Level 1 · Warm-up

10 marks

Monic quadratics with an even x coefficient.

1 Write $x^2 + 6x$ in the form $(x + a)^2 + b$. [2 marks]

Answer _____

2 Write $x^2 + 10x + 7$ in the form $(x + a)^2 + b$. [2 marks]

Answer _____

3 Write $x^2 - 8x + 3$ in the form $(x + a)^2 + b$. [2 marks]

Answer _____

4 Write $x^2 - 4x - 5$ in the form $(x + a)^2 + b$. [2 marks]

Answer _____

5 $x^2 + 12x + 40 \equiv (x + a)^2 + b$. Find the values of a and b. [2 marks]

Answer _____

Level 2 · Build

13 marks

Odd coefficients, solving equations and turning points.

6 Write $x^2 + 5x + 2$ in the form $(x + a)^2 + b$. [2 marks]

Answer _____

7 Write $x^2 - 3x - 1$ in the form $(x + a)^2 + b$. [2 marks]

Answer _____

8 Solve $x^2 + 6x - 7 = 0$ by completing the square. [3 marks]

Answer _____

9 Solve $x^2 - 4x - 1 = 0$ by completing the square. Give your answers in surd form. [3 marks]

Answer _____

10 By completing the square, find the coordinates of the turning point of $y = x^2 - 6x + 11$. [3 marks]

Answer _____

Level 3 · Exam-style 19 marks
Multi-part questions in real GCSE style.

11 Write $2x^2 + 12x + 5$ in the form $a(x + b)^2 + c$. [3 marks]

Answer _____

12 Solve $x^2 + 8x + 3 = 0$ by completing the square. Give your answers correct to 2 decimal places. [3 marks]

Answer _____

13 (a) Write $x^2 - 10x + 28$ in the form $(x + a)^2 + b$. [2 marks]

Answer _____

(b) Hence explain why $x^2 - 10x + 28 > 0$ for all values of x. [1 mark]

Answer _____

14 (a) The curve $y = x^2 + 4x - 12$. Write $x^2 + 4x - 12$ in the form $(x + a)^2 + b$. [2 marks]

Answer _____

(b) Write down the coordinates of the turning point of the curve. [1 mark]

Answer _____

(c) Use your answer to part (a) to find where the curve crosses the x-axis. [2 marks]

Answer _____

15 (a) Write $3x^2 - 12x + 7$ in the form $a(x + b)^2 + c$. [3 marks]

Answer _____

(b) Hence solve $3x^2 - 12x + 7 = 0$. Give your answers in the form $p \pm \frac{\sqrt{q}}{r}$. [2 marks]

Answer _____

Level 4 · Challenge 19 marks
Grade 8–9: unknown coefficients, proof and maxima.

16 (a) Write $5 - 6x - x^2$ in the form $a - (x + b)^2$. [3 marks]

Answer _____

(b) Hence write down the maximum value of $5 - 6x - x^2$ and the value of x at which it occurs. [2 marks]

Answer _____

17 $x^2 + px + 20 \equiv (x + q)^2 - 5$, where p and q are positive constants. Find the value of p and the value of q. [3 marks]

Answer _____

18 Prove that $4x^2 - 12x + 10$ is positive for all values of x. [3 marks]

Answer _____

19 $f(x) = 2x^2 - 8x + 11$. Find the coordinates of the turning point of $y = f(x)$, state whether it is a maximum or a minimum, and hence write down the range of values that $f(x)$ can take. [4 marks]

Answer _____

20 Solve $2x^2 + 6x - 3 = 0$ by completing the square. Give your answers in the form $\frac{a \pm \sqrt{b}}{c}$. [4 marks]

Answer _____