

Quadratic Graphs

KS3 Maths · Follows the national curriculum

Name _____ Class _____ Date _____

1. Worked example

Complete the table for $y = x^2 - 3$ for $x = -2, -1, 0, 1, 2$.

Step 1 · Substitute each x : $x = -2$: $y = (-2)^2 - 3 = 4 - 3$

$$y = 1$$

Step 2 · $x = -1$: $(-1)^2 - 3 = 1 - 3$

$$y = -2$$

Step 3 · $x = 0$: $0 - 3$

$$y = -3$$

Step 4 · $x = 1$: $1 - 3$

$$y = -2$$

Step 5 · $x = 2$: $4 - 3$

$$y = 1$$

Answer: y values: 1, -2, -3, -2, 1

Check: Symmetry check: $x = -1$ and $x = 1$ give the same y ✓

2. Now try one with the steps

From the graph of $y = x^2 - 4$, find the roots (where it crosses the x -axis).

Step 1 · Set $y = 0$ and solve $x^2 - 4 = 0$

Step 2 · Square root both sides

Answer:

3. Practice

Show your working. The marks tell you how much is expected.

1. What shape does the graph $y = x^2$ produce? [1]

2. Calculate y when $x = -3$ for $y = x^2 + 2$. [1]

3. Complete the table for $y = x^2 - 5$ at $x = -2, -1, 0, 1, 2$. [2]

4. For $y = x^2 - 9$, find the roots (values of x where $y = 0$). [2]

5. How does the graph of $y = -2x^2$ differ from $y = x^2$? [2]

6. $y = x^2 - 6x + 5$ crosses the x -axis at $x = 1$ and $x = 5$. Find its turning point. [3]

7. Calculate y when $x = 4$ for $y = x^2 - 3x$. [1]

8. Is the graph of $y = 3 - x^2$ U-shaped or n-shaped? [1]

9. Complete the table for $y = x^2 + 2x$ at $x = -3, -2, -1, 0, 1$. [2]

10. Where does the graph of $y = x^2 + 2x - 8$ cross the y -axis? [1]

11. Find the roots of $y = x^2 - 16$. [2]

12. A parabola crosses the x -axis at $x = 1$ and $x = 7$. What is the equation of its line of symmetry? [2]

13. A ball's height in metres after t seconds is $h = 20t - 5t^2$. Find its height after 3 seconds. [2]

14. Using $h = 20t - 5t^2$, after how many seconds does the ball land ($h = 0$, $t > 0$)? [3]

15. $y = x^2 - 6x + 8$ has roots $x = 2$ and $x = 4$. Find the coordinates of its turning point. [3]

16. Use the graph of $y = x^2$ to estimate the solutions of $x^2 = 30$, to 1 decimal place. [2]

4. Before you hand it in

$(-3)^2 = -9$

$(-3)^2 = (-3) \times (-3) = 9$. Always square before applying the negative: $-(3^2) = -9$, but $(-3)^2 = +9$.

Plotting a V-shape instead of a smooth curve

Quadratic graphs are smooth curves (parabolas). Plot enough points (at least 5–7) and join them with a smooth, sweeping curve — not a zigzag.

Thinking the roots of $y = x^2 - 4$ are $x = \pm\sqrt{4} = \pm 2$ but writing only one root

$x^2 = 4$ gives $x = +2$ AND $x = -2$. Both are roots. A parabola that crosses the x-axis always crosses it at two points (or touches at one — a repeated root).