QUADRATIC GRAPHS

BUILDING BLOCKS

NAME _____ CLASS _____ DATE _____

KEY IDEA

x^2 means x × x (x squared).

$3^2 = 3 \times 3 = 9$ (a 3 by 3 square of dots)



A negative number squared is positive:

$(-3)^2 = -3 \times -3 = 9$

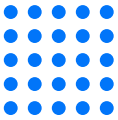
1 Each pattern of dots is a square. Write the square number.



$2^2 =$ ☐



$4^2 =$ ☐



$5^2 =$ ☐

2 Work out each square number.

$1^2 =$ ☐ $6^2 =$ ☐ $7^2 =$ ☐ $10^2 =$ ☐

3 Work out each answer.

Negative × negative = positive.

$(-1)^2 =$ ☐ $(-2)^2 =$ ☐ $(-4)^2 =$ ☐ $(-5)^2 =$ ☐

4 Is each graph straight or curved? Circle your answer.



a) STRAIGHT CURVED



b) STRAIGHT CURVED



c) STRAIGHT CURVED

QUADRATIC GRAPHS

SUPPORT

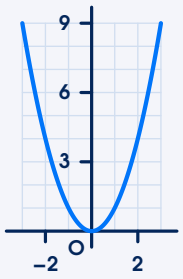
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KEY IDEA

$y = x^2$ is a quadratic graph. It makes a U-shaped curve.

x	−3	−2	−1	0	1	2	3
y	9	4	1	0	1	4	9

Join the points with a smooth curve, not straight lines.



1 Complete the table of values for $y = x^2$

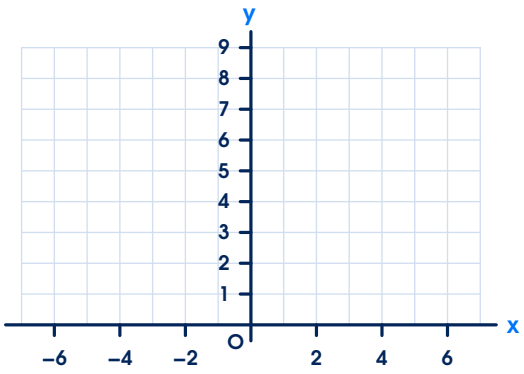
x	−3	−2	−1	0	1	2	3
y	9			0			

$(-2)^2 = -2 \times -2 = 4$

2 Draw the graph of $y = x^2$

Plot the points from your table in question 1. Join them with a smooth U-shaped curve.

Tip: turn the paper so your hand is inside the curve.



3 Complete the table of values for $y = x^2 + 2$

x	−2	−1	0	1	2
y					

Square first, then add 2.

4 Sort the equations. An equation with x^2 in it is quadratic.

$y = x^2$ | $y = 3x + 1$ | $y = x^2 - 5$ | $y = 2x$ | $y = 4 - x$ | $y = 2x^2$

Linear (straight line)

Quadratic (curve)

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CORE

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KEY IDEA

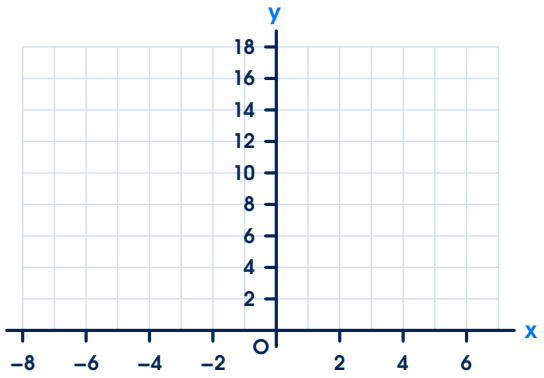
Square before you multiply: $2x^2$ means $2 \times x^2$. Join quadratic points with a smooth curve.

FLUENCY

1 a) Complete the table of values for $y = 2x^2$

x	–3	–2	–1	0	1	2	3
y	☐	☐	☐	☐	☐	☐	☐

b) Draw the graph of $y = 2x^2$ on the grid.



2 a) Complete the table of values for $y = x^2 - 4$

x	–3	–2	–1	0	1	2	3
y	☐	☐	☐	☐	☐	☐	☐

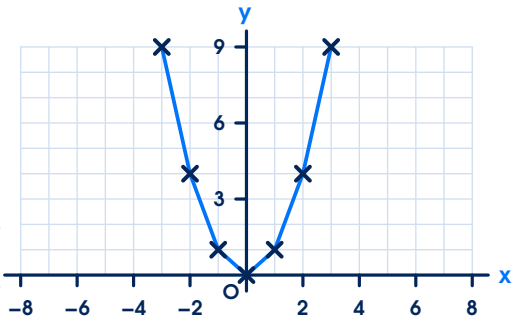
b) Where will the graph cross the x-axis?

(,) (,)

REASONING

3 Look at Leo's graph.

Leo drew the graph of $y = x^2$ like this. Explain why he should not join the points with straight lines.



4 Jen made this table of values for $y = x^2$

x	0	1	2	3	4
y	0	1	4	9	16

Jen says, "The y-values for $y = x^2$ should be symmetrical, so this table is wrong." Is Jen right? Explain.

QUADRATIC GRAPHS

GREATER DEPTH

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REASONING

1 Is each statement always, sometimes or never true? Circle your answer.

If it is sometimes true, give an example of when it is true and when it is not.

a) x^2 is greater than x. ALWAYS SOMETIMES NEVER

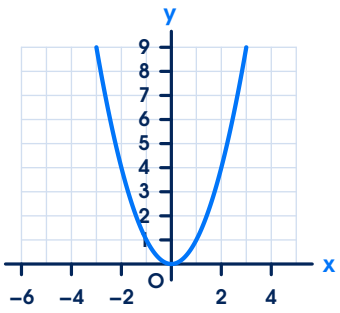
b) The graph of $y = x^2 + 3$ passes through (0, 3). ALWAYS SOMETIMES NEVER

c) The graph of $y = x^2$ has a line of symmetry. ALWAYS SOMETIMES NEVER

d) A quadratic graph crosses the x-axis twice. ALWAYS SOMETIMES NEVER

PROBLEM SOLVING

2 This is the graph of $y = x^2$



a) Estimate y when x = 1.5 ☐

b) Estimate both x-values when y = 5 ☐ ☐

c) Estimate both solutions of $x^2 = 7$ ☐ ☐

3 A quadratic graph passes through (–1, 5), (0, 2) and (2, 14).

$y = x^2 + 2$ $y = 3x^2 + 2$ $y = 2x^2 + 3$

Which equation is it? Show how you know.

★ CHALLENGE FOR ALL

4 Complete both tables. Find the two points where $y = x^2$ and $y = x + 2$ meet.

x	–2	–1	0	1	2	3
$y = x^2$						
$y = x + 2$						

They meet at

(,)

(,)

QUADRATIC GRAPHS

ANSWERS

BUILDING BLOCKS

1 4 · 16 · 25
2 1 · 36 · 49 · 100
3 1 · 4 · 16 · 25
4 a) straight · b) curved · c) straight

SUPPORT

1 9, 4, 1, 0, 1, 4, 9
2 Smooth U-shaped curve through the seven points, lowest point (0, 0)
3 6, 3, 2, 3, 6
4 Linear: $y = 3x + 1$, $y = 2x$, $y = 4 - x$ · Quadratic: $y = x^2$, $y = x^2 - 5$, $y = 2x^2$

CORE

1 a) 18, 8, 2, 0, 2, 8, 18 · b) smooth U-shaped curve through these points
2 a) 5, 0, –3, –4, –3, 0, 5 · b) (–2, 0) and (2, 0)
3 The graph of $y = x^2$ is a smooth curve: points between the plotted ones are not on straight lines (e.g. $x = 1.5$ gives $y = 2.25$, below the straight line from (1, 1) to (2, 4)).
4 No. The table only uses positive x-values, so it is not symmetrical. The graph is symmetrical about $x = 0$; the table would only look symmetrical if it used x-values on both sides of 0.

GREATER DEPTH

1 a) Sometimes: true for $x = 3$, false for $x = 0.5$ · b) Always · c) Always (the y-axis) · d) Sometimes: $y = x^2 - 4$ does, $y = x^2$ touches it once, $y = x^2 + 1$ never does
2 a) about 2.2 to 2.3 · b) about 2.2 and –2.2 · c) about 2.6 and –2.6
3 $y = 3x^2 + 2$: $3 \times 1 + 2 = 5$, $3 \times 0 + 2 = 2$, $3 \times 4 + 2 = 14$
4 $y = x^2$: 4, 1, 0, 1, 4, 9 · $y = x + 2$: 0, 1, 2, 3, 4, 5 · they meet at (–1, 1) and (2, 4)