

Quadratic Functions and Graphs: math practice, Grade 9 – download the PDF

21 problems graded by difficulty (★ easy, ★★ medium, ★★★ hard). Try first, without looking at the solutions!

1 Reading a , b , and c

★ ★ ★

Write each function in standard form if needed, then give a , b , and c .

a. $y = 3x^2 - 5x + 2$

b. $y = -x^2 + 4$

c. $y = 0.5x^2 + x - 7$

d. $y = 6 - 2x - x^2$

2 Up or down, and the y -intercept

★ ★ ★

For each function, say whether the parabola opens up or down and give the y -intercept.

a. $y = 2x^2 - 9$

b. $y = -0.5x^2 + 3x + 1$

c. $y = -4x^2 + x$

d. $y = x^2 + 8x + 3$

3 A first vertex



Find the axis of symmetry and the vertex of $y = x^2 - 4x + 1$. Is the vertex a maximum or a minimum?

4 Completing a table



Complete the table for $y = x^2 - 2x - 3$, then give the vertex and the axis of symmetry.

x	-2	-1	0	1	2	3	4
y	?	?	?	?	?	?	?

5 Reading vertex form



Give the vertex of each parabola and say whether it opens up or down.

a. $y = (x - 4)^2 + 2$

b. $y = -3(x + 1)^2 - 5$

c. $y = \frac{1}{2}(x - 6)^2$

d. $y = (x + 7)^2 + 9$

6 Describing transformations



Describe how each graph is related to the graph of $y = x^2$.

a. $y = x^2 - 5$

b. $y = (x + 3)^2$

c. $y = -x^2$

d. $y = 2x^2$

e. $y = (x - 1)^2 + 4$

7 Zeros from factored form



Find the zeros of each function.

a. $y = (x - 2)(x + 6)$

b. $y = x(x - 9)$

c. $y = (2x - 5)(x + 1)$

8 Graphing from the vertex



Graph $y = x^2 + 2x - 8$. Find the axis of symmetry, the vertex, the y -intercept and its mirror point, and the x -intercepts.

9 Standard form from vertex form



Write $y = 2(x - 3)^2 - 5$ in standard form $ax^2 + bx + c$.

10 Equation from a vertex and a point



A parabola has its vertex at $(-2, 5)$ and passes through $(0, 1)$. Write its equation in vertex form.

11 Solving by factoring



Solve $x^2 - 3x - 28 = 0$ by factoring, and check both answers.

12 True or false?



Decide whether each statement is true or false and justify your answer.

- a. The zeros of $y = 3x^2 - 12$ are 2 and -2 .
- b. The graph of $y = x^2 + 4$ has two x -intercepts.
- c. The axis of symmetry of $y = x^2 - 10x + 3$ is $x = 5$.

13 Maximum and minimum values



Find the maximum or minimum value of each function and the x -value where it occurs.

- a. $y = x^2 - 8x + 19$
- b. $y = -2x^2 + 12x - 5$

14 The dog run



A rectangular dog run is built with 60 feet of fencing used on all four sides. Let w be the width in feet.

- a. Write the length in terms of w and then the area $A(w)$.
- b. What width gives the largest area, and what is that area?

15 Using the quadratic formula



Solve $2x^2 - 5x - 3 = 0$ with the quadratic formula. Compute the discriminant first.

16 A thrown ball



A ball is thrown upward from a roof. Its height in feet after t seconds is

$h(t) = -16t^2 + 32t + 6$. Use a calculator for decimals.

- How high is the roof?
- Find the maximum height and when it happens. Convert it to meters (1 ft = 0.3048 m).
- When does the ball hit the ground? Round to the nearest hundredth.

17 Smoothie revenue



A snack stand finds that at a price of p dollars it sells $90 - 5p$ smoothies per day.

- Write the daily revenue $R(p)$ as a quadratic function in standard form.
- Which price gives the greatest revenue, and what is it?
- Explain why the revenue is 0 at $p = 18$.

18 Equation from the zeros



A parabola has zeros -1 and 5 , and it passes through the point $(2, -18)$.

- Write its equation in factored form $y = a(x + 1)(x - 5)$ and find a .
- Write it in standard form.
- What is the vertex?

19 A full description

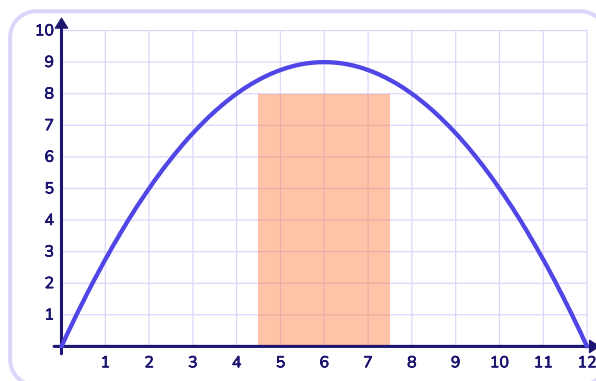
★★★

For $y = -\frac{1}{2}(x + 4)^2 + 6$, give the vertex, the axis of symmetry, the transformations of $y = x^2$, the y -intercept and its mirror point, and the range.

20 A parabolic arch

★★★

A tunnel arch over a road 12 meters wide has the shape $y = -0.25x^2 + 3x$, where x and y are in meters and the road runs from $x = 0$ to $x = 12$.



- How tall is the arch at its highest point?
- A truck 3 meters wide and 8 meters tall drives down the middle of the road. Does it fit?

21 Counting solutions with k

★★★

Consider $x^2 - 6x + k = 0$.

- For which value of k is there exactly one solution?
- How many solutions are there when $k = 5$? When $k = 12$?



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