LESSON MAKER PRO

Parabola Connections

Read graphs, write equations, and model community activities.

HIGH SCHOOL · MT.CORE.ALG.QUAD.2

MT.CORE.ALG.QUAD.2 "Represent quadratic functions using tables, graphs, equations, and verbal situations, while using technology strategically. This standard should incorporate cultural context relating to Montana Indigenous Peoples and local communities."

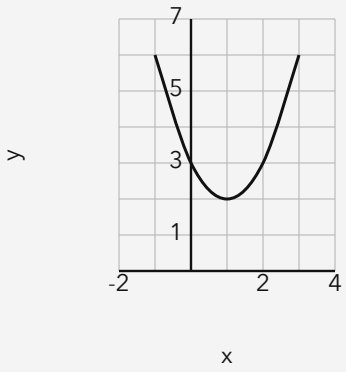
NAME _____ DATE _____

FROM GRAPH TO EQUATION

The turning point of a parabola is its vertex, (h, k). To write an equation, start with $y = a(x - h)^2 + k$, then use another point to find a.

WORKED EXAMPLE

Write an equation for the graphed parabola.



1. The vertex is (1, 2), so $y = a(x - 1)^2 + 2$.
2. Use (0, 3): $3 = a(0 - 1)^2 + 2$.
3. Solve: $a = 1$.

Answer: $y = (x - 1)^2 + 2$

PRACTICE 4 problems

1 For x = -2, -1, 0, 1, 2, the y-values are 9, 3, 1, 3, 9. Write an equation.

ANSWER _____

2 For $y = -3(x - 2)^2 + 7$, find the y-values at x = 1, 2, 3, in order.

ANSWER _____

3 A parabola has vertex (-1, 4) and passes through (0, 2). Write its equation in vertex form.

ANSWER _____

4 For $y = 3(x + 2)^2 - 5$, give the vertex and say whether the parabola opens up or down.

ANSWER _____

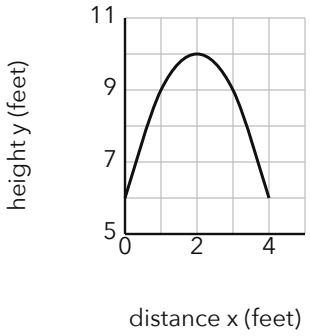
APPLY IT Show your work

1 Student artists at a youth market in Poplar, on the Fort Peck Reservation, model their sticker profit as $P(x) = -3(x - 4)^2 + 48$ dollars for x batches. Find the profit for 2 batches and the number of batches that gives the greatest profit.

WORK SPACE

ANSWER _____

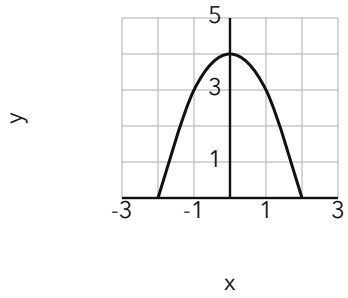
2 At a youth basketball game in Browning, on the Blackfeet Reservation, the graph shows a ball's height against horizontal distance. Write an equation using x and y.



ANSWER _____

CHALLENGE One step up

Write an equation for the graph. Then find both x-values when y = -5 and explain how symmetry helps.



WORK SPACE AND ANSWER

ANSWER KEY

Parabola Connections

HIGH SCHOOL · MT.CORE.ALG.QUAD.2

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	For x = -2, -1, 0, 1, 2, the y-values are 9, 3, 1, 3, 9. Write an equation.	**$y = 2x^2 + 1$**
2	For $y = -3(x - 2)^2 + 7$, find the y-values at x = 1, 2, 3, in order.	**4, 7, 4**
3	A parabola has vertex (-1, 4) and passes through (0, 2). Write its equation in vertex form.	**$y = -2(x + 1)^2 + 4$**
4	For $y = 3(x + 2)^2 - 5$, give the vertex and say whether the parabola opens up or down.	**Vertex: (-2, -5). Opens up.**

PART 2 · APPLY IT

1. **$36 for 2 batches; 4 batches gives the greatest profit.** $P(2) = -3(2 - 4)^2 + 48 = 36$. The vertex gives the maximum at x = 4.
2. **$y = -(x - 2)^2 + 10$** The vertex is (2, 10). Substituting (1, 9) into vertex form gives a = -1.

CHALLENGE

$y = -x^2 + 4$; x = -3 and x = 3. The values are equally far from the axis of symmetry, x = 0.

Accept equivalent equations. In the challenge, students may find one x-value algebraically and use symmetry to find the other.