LESSON MAKER PRO

Curves in Action

Build parabola models from real situations.

HIGH SCHOOL · PC.CS.1.1

PC.CS.1.1 "Model real-world situations which involve conic sections."

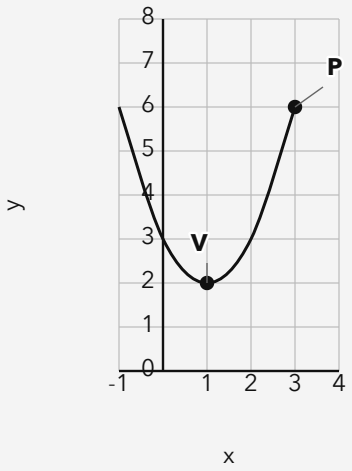
NAME _____ DATE _____

MODEL A PARABOLA

A parabola with vertex (h,k) has the model $y = a(x - h)^2 + k$. Substitute another point to find a. A positive value of a makes the curve open up; a negative value makes it open down.

WORKED EXAMPLE

The curve shown has vertex V and passes through P. Write its equation.



1. The vertex gives $y = a(x - 1)^2 + 2$.
2. Use P: $6 = a(3 - 1)^2 + 2$.
3. Solve: $4 = 4a$, so $a = 1$.

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

PRACTICE 4 problems

1 Write a model for a ramp with vertex (0,5) that passes through (2,13).

ANSWER _____

2 Write a model for a water arc with vertex (-2,4) that passes through (0,0).

ANSWER _____

3 Write a model for a dish cross section with vertex (4,0) that passes through (6,2).

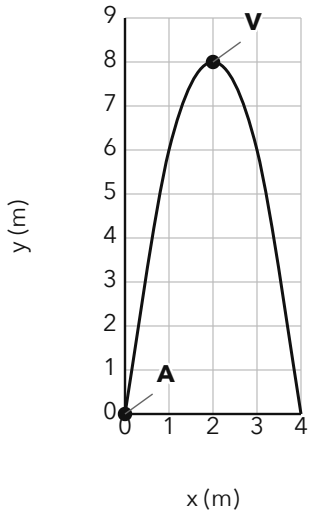
ANSWER _____

4 Write a model for a ball's path with vertex (3,9) that passes through (5,5).

ANSWER _____

APPLY IT Show your work

1 A game designer plots a character's jump. Use the graph to model height y in meters at horizontal distance x in meters.



ANSWER _____

2 A concert spotlight's reflector has its lowest point at (0,0). Its edge is 6 cm high at x = 3 cm. Model its height y in cm at horizontal position x in cm.

WORK SPACE

ANSWER _____

CHALLENGE One step up

A stage arch is 12 ft high at its center, x = 0. It meets the floor at x = -6 and x = 6. Model its height y in feet, then find how far from the center the arch is 9 ft high.

WORK SPACE AND ANSWER

Curves in Action

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Write a model for a ramp with vertex (0,5) that passes through (2,13).	**$y = 2x^2 + 5$**
2	Write a model for a water arc with vertex (-2,4) that passes through (0,0).	**$y = -(x + 2)^2 + 4$**
3	Write a model for a dish cross section with vertex (4,0) that passes through (6,2).	**$y = 1/2(x - 4)^2$**
4	Write a model for a ball's path with vertex (3,9) that passes through (5,5).	**$y = -(x - 3)^2 + 9$**

PART 2 · APPLY IT

1. **$y = -2(x - 2)^2 + 8$** Use vertex (2,8) in vertex form. Substitute (0,0) to get 0 = 4a + 8, so a = -2.
2. **$y = 2/3x^2$** The vertex gives $y = ax^2$. Substitute (3,6): 6 = 9a, so a = 2/3.

CHALLENGE

$y = 12 - 1/3x^2$; the arch is 9 ft high at x = -3 and x = 3, each 3 ft from the center.

Accept equivalent expanded equations. In the challenge, accept 3 ft if the student identifies it as the distance from the center.