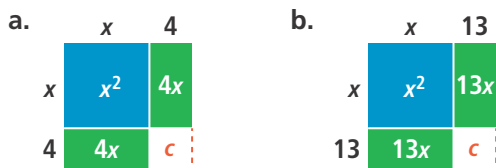## UNDERSTAND

15. Use Structure What value of c completes the square for each area model below? Represent the area model as a perfect-square trinomial and as a binomial squared.

a.

	x	4
x	x^2	$4x$
4	$4x$	c

b.

	x	13
x	x^2	$13x$
13	$13x$	c

16. Construct Arguments To solve the equation $x^2 - 7x - 9 = 0$, would you use graphing, factoring, or completing the square if you want exact solutions? Explain.

17. Error Analysis Describe and correct the error a student made in writing the quadratic function $y = 2x^2 + 12x + 1$ in vertex form.

$y = 2x^2 + 12x + 1$
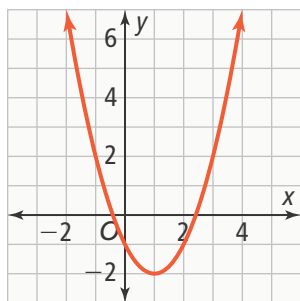$y = 2(x^2 + 6x) + 1$
$y + 9 = 2(x^2 + 6x + 9) + 1$
$y + 9 = 2(x + 3)^2 + 1$
$y = 2(x + 3)^2 - 8$ ✗

18. Reason Find the solution to the equation $x^2 + 4x = -12$. Explain your reasoning.

19. Mathematical Connections Use the graph of $f(x) = x^2 - 2x - 1$ to estimate the solutions of $f(x) = 5$. Then find the exact solutions.

PRACTICE

Find the value of c that makes each expression a perfect-square trinomial. Write each expression as a binomial squared. SEE EXAMPLE 1

20. $x^2 + 16x + c$ **21.** $x^2 + 22x + c$

22. $p^2 - 30p + c$ **23.** $k^2 - 5k + c$

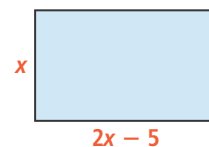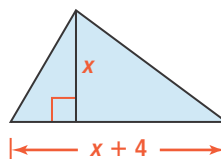**24.** $g^2 + 17g + c$ **25.** $q^2 - 48q + c$

Solve each equation by completing the square. SEE EXAMPLES 2 AND 3

26. $x^2 + 6x = 144$ **27.** $x^2 - 4x = 30$

28. $m^2 + 16m = -59$ **29.** $x^2 - 2x - 35 = 0$

30. $5n^2 - 3n - 15 = 0$ **31.** $4w^2 + 12w - 44 = 0$

32. $3r^2 + 18r = 21$ **33.** $2v^2 - 10v - 20 = 8$

Find the value of x. If necessary, round to the nearest hundredth. SEE EXAMPLE 3

34. Area of triangle = 8   **35.** Area of rectangle = 50
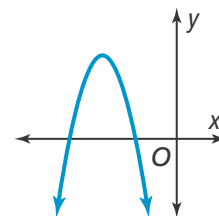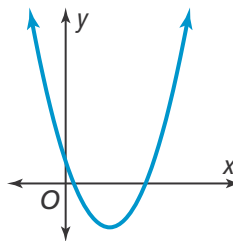

Write each function in vertex form, and identify the vertex. SEE EXAMPLES 4 AND 5

36. $y = x^2 + 4x - 3$ **37.** $y = x^2 + 12x + 27$

38. $y = x^2 - 6x + 12$ **39.** $y = x^2 - 14x - 1$

40. $y = 3x^2 - 6x - 2$ **41.** $y = 2x^2 - 20x + 35$

42. $y = -x^2 - 8x - 7$ **43.** $y = -4x^2 + 16x + 5$

Write each function in vertex form. Tell whether each graph could represent the function.

**44.** $y = x^2 + 6x + 3$ **45.** $f(x) = -x^2 - 10x - 21$

APPLY

46. Model With Mathematics You are designing a square banner for a school assembly. You want the banner to be gold with vertical purple bars as shown. You have enough material to make the area of the rectangular gold section 36 ft². What are the dimensions of the banner?

1ft ⊢ ⊣ 1ft

GO PANTHERS

47. Reason The profile of a satellite dish is shaped like a parabola. The bottom of the dish can be modeled by the function shown, where x and $f(x)$ are measured in meters. Use the vertex form of the quadratic function to determine the vertex or the lowest point of the dish. How wide is the dish at 18 m off of the ground? Explain.

$f(x) = x^2 - 4x + 18$
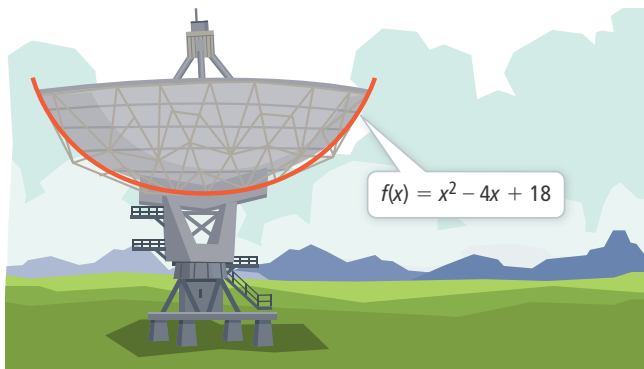
48. Higher Order Thinking The kicker on a football team uses the function, $h = -16t^2 + v_0 t + h_0$, to model the height of a football being kicked into the air.

a. Show that for any values of v_0 and h_0, the maximum height of the object is $\frac{(v_0)^2}{64} + h_0$.

b. The kicker performs an experiment. He thinks if he can double the initial upward velocity of the football kicked from the ground, the maximum height will also double. Is the kicker correct? If not, how does the maximum height change? Explain.

ASSESSMENT PRACTICE

49. A rectangle is 8 cm longer than it is wide. Its area is 250 cm². The width of the rectangle is about _____. The rectangle's perimeter is about _____.

50. SAT/ACT The expressions $f(x) = x^2 + 12x + c$ and $g(x) = x^2 - 20x + d$ are perfect-square trinomials. What is the value of $f(0) - g(0)$?

Ⓐ −256

Ⓑ −64

Ⓒ 0

Ⓓ 32

51. Performance Task An electronics manufacturer designs a smartphone with an aspect ratio (the ratio of the screen's height h to its width w) of 16 : 9.

0.6 in.

10:15AM
Thursday

h

0.2 in.

W
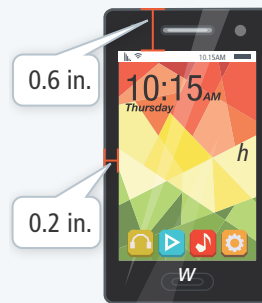
Part A Write the width in terms of h. What is the area of the phone, including the border, in terms of h?

Part B The total area of the screen and border is about 21.48 in.². What is the value of h?

Part C What are the height and width of the screen? What is the total height and width of the phone including the border?