4-3 Practice

Form G

Modeling With Quadratic Functions

Find an equation in standard form of the parabola passing through the points.

1. (1, −1), (2, −5), (3, −7)
$y = x^2 - 7x + 5$

2. (1, −4), (2, −3), (3, −4)
$y = -x^2 + 4x - 7$

3. (2, −8), (3, −8), (6, 4)
$y = x^2 - 5x - 2$

4. (−1, −12), (2, −6), (4, −12)
$y = -x^2 + 3x - 8$

5. (−1, −12), (0, −6), (3, 0)
$y = -x^2 + 5x - 6$

6. (−2, −4), (1, −1), (3, 11)
$y = x^2 + 2x - 4$

7. (−1, −6), (0, 0), (2, 6)
$y = -x^2 + 5x$

8. (−3, 2), (1, −6), (4, 9)
$y = x^2 - 7$

9.

x	*f*(*x*)
−1	7
1	5
3	11

$y = x^2 - x + 5$

10.

x	*f*(*x*)
−2	−7
0	1
2	1

$y = -x^2 + 2x + 1$

11.

x	*f*(*x*)
−1	−6
1	4
2	12

$y = x^2 + 5x - 2$

12.

x	*f*(*x*)
−2	−1
2	−1
3	9

$y = 2x^2 - 9$

13. The table shows the number *n* of tickets to a school play sold *t* days after the tickets went on sale, for several days.

a. Find a quadratic model for the data. $n = -2t^2 + 24t + 10$

b. Use the model to find the number of tickets sold on day 7. 80

c. When was the greatest number of tickets sold? day 6

Day, *t*	Number of Tickets Sold, *n*
1	32
3	64
4	74

14. The table gives the number of pairs of skis sold in a sporting goods store for several months last year.

a. Find a quadratic model for the data, using January as month 1, February as month 2, and so on. $s = 2t^2 - 28t + 108$

b. Use the model to predict the number of pairs of skis sold in November. 42

c. In what month were the fewest skis sold? July

Month, *t*	Number of Pairs of Skis Sold, *s*
Jan	82
Mar	42
May	18

4-3 Practice (continued) — Form G

Modeling With Quadratic Functions

Determine whether a quadratic model exists for each set of values. If so, write the model.

15. $f(-1) = -7,\ f(1) = 1,\ f(3) = 1$

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

16. $f(-1) = 13,\ f(0) = 6,\ f(2) = -8$

no

17. $f(2) = 2,\ f(-4) = -1,\ f(-2) = 0$

no

18. $f(2) = 6,\ f(0) = -4,\ f(-2) = -6$

$y = x^2 + 3x - 4$

19. a. Complete the table. It shows the sum of the counting numbers from 1 through n.

Number, *n*	1	2	3	4	5
Sum, *s*	1	3	6	10	15

b. Write a quadratic model for the data. $s = \frac{1}{2}n^2 + \frac{1}{2}n$

c. Predict the sum of the first 50 counting numbers. 1275

20. On a suspension bridge, the roadway is hung from cables hanging between support towers. The cable of one bridge is in the shape of the parabola $y = 0.1x^2 - 7x + 150$, where y is the height in feet of the cable above the roadway at the distance x feet from a support tower.

a. What is the closest the cable comes to the roadway? 27.5 ft

b. How far from the support tower does this occur? 35 ft

21. The owner of a small motel has an unusual idea to increase revenue. The motel has 20 rooms. He advertises that each night will cost a base rate of \$48 plus \$8 times the number of empty rooms that night. For example, if all rooms are occupied, he will have a total income of $20 \times \$48 = \$960$. But, if three rooms are empty, then his total income will be $(20 - 3) \times (\$48 + \$8 \cdot 3) = 17 \times \$72 = \$1224$.

a. Write a linear expression to show how many rooms are occupied if n rooms are empty. $20 - n$

b. Write a linear expression to show the price paid in dollars per room if n rooms are empty. $48 + 8n$

c. Multiply the expressions from parts (a) and (b) to obtain a quadratic model for the data. Write the result in standard form. $y = -8n^2 + 112n + 960$

d. What will the owner's total income be if 10 rooms are empty? \$1280

e. What is the number of empty rooms that results in the maximum income for the owner? 7