b. What will be the maximum value of the pool?

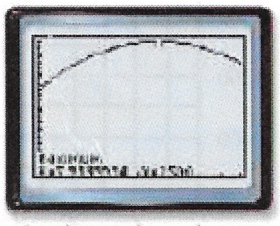
Find the maximum value of the quadratic function $P(x)$ by evaluating $P(6)$.

$P(x) = -25x^2 + 300x + 1600$	Total pool function
$P(6) = -25(6)^2 + 300(6) + 1600$	$x = 6$
$= -900 + 1800 + 1600$ or 2500	Simplify

Thus, the maximum prize pool is $2500 after 6 price increases.

CHECK Graph the function on a graphing calculator and use the **CALC:maximum** function to confirm the solution.

Select a left bound of 0 and a right bound of 10. The calculator will display the coordinates of the maximum at the bottom of the screen.



[0, 10] scl: 1 by [0, 2500] scl: 100

The domain is $\{x \mid x \geq 0\}$ because there can be no negative increases in price. The range is $\{y \mid 0 \leq y \leq 2500\}$ because the prize pool cannot have a negative monetary value.

Problem #1

ECONOMICS A souvenir shop sells about 200 coffee mugs each month for $6 each. The shop owner estimates that for each $0.50 increase in the price, he will sell about 10 fewer coffee mugs per month.

a) How much should the owner charge for each mug in order to maximize the monthly income from their sales? $8

b) What is the maximum monthly income the owner can expect to make from the mugs?

$1200

$1280

Problem #2: Maximum and Minimum

BUSINESS A store rents 1400 videos per week at $2.25 per video. The owner estimates that they will rent 100 fewer videos for each $0.25 increase in price. What price will maximize the income of the store?

Max. when increase 2.5 times

Max price is $2.88

Problem #3

CCSS MODELING A financial analyst determined that the cost, in thousands of dollars, of producing bicycle frames is $C = 0.000025f^2 - 0.04f + 40$, where f is the number of frames produced.

a. Find the number of frames that minimizes cost.

b. What is the total cost for that number of frames?

a. 800

b. $24000

Problem #4

FINANCIAL LITERACY A babysitting club sits for 50 different families. They would like to increase their current rate of \$9.50 per hour. After surveying the families, the club finds that the number of families will decrease by about 2 for each \$0.50 increase in the hourly rate.

a. Write a quadratic function that models this situation.

b. State the domain and range of this function as it applies to the situation.

c. What hourly rate will maximize the club's income? Is this reasonable?

d. What is the maximum income the club can expect to make?

a. $y = -x^2 + 6x + 475$

b. b. $D = \{x | 0 \leq x \leq 25\}$, $R = \{y | 0 \leq y \leq 484\}$

c. \$11 because the function has a maximum at x=3, it is in the domain. Therefore, \$0.50 increases is reasonable.

d. \$484

Problem #5

ACTIVITIES Last year, 300 people attended the Franklin High School Drama Club's winter play. The ticket price was \$8. The advisor estimates that 20 fewer people would attend for each \$1 increase in ticket price.

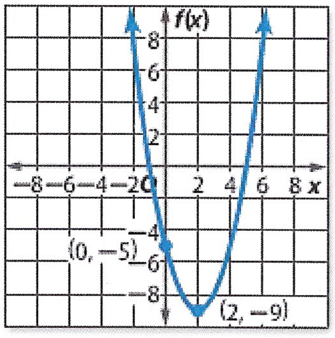
a. What ticket price would give the greatest income for the Drama Club?

b. If the Drama Club raised its tickets to this price, how much income should it expect to bring in?

a. \$11.50

b. \$2645

Problem #6: Determine the function represented by each graph



$f(x) = x^2 - 4x - 5$

~~Problem #7:~~

Suppose a different tournament that Eddie organizes has 120 players and the entry fee is \$40. Each time he increases the fee by \$5, he loses 10 players. Determine what the entry fee should be to maximize the value of the pool.

~~Problem #8~~

BASEBALL Lolita throws a baseball into the air and the height h of the ball in feet at a given time t in seconds after she releases the ball is given by the function $h(t) = -16t^2 + 30t + 5$.

a. State the domain and range for this situation.

b. Find the maximum height the ball will reach.

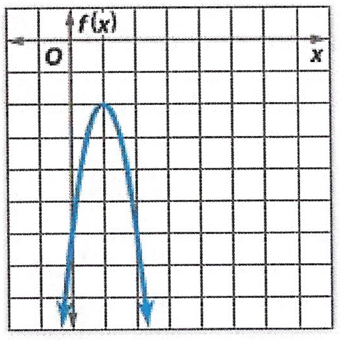
$D = \{t \mid 0 < t < 2.09\}$,
$R = \{h(t) \mid 0 \leq h(t) \leq 19.0625\}$

a. 19.0625 ft

Higher Order Thinking

Problem #1

CCSS CRITIQUE Trent thinks that the function $f(x)$ graphed below, and the function $g(x)$ described next to it have the same maximum. Madison thinks that $g(x)$ has a greater maximum. Is either of them correct? Explain your reasoning.



$g(x)$ is a quadratic function with roots of 4 and 2 and a y-intercept of -8.

Madison is correct. f(x) has a maximum at -2 and g(x) has a maximum at 1

Problem #2

REASONING Determine whether the following statement is *sometimes*, *always*, or *never* true. Explain your reasoning.

In a quadratic function, if two x-coordinates are equidistant from the axis of symmetry, then they will have the same y-coordinate.

Always; the coordinates of a quadratic function are symmetrical, so x-coordinates equidistant from the vertex will have the same y-coordinate.