

Solve each of the following using the skills you have learned about in this unit.

1. Nina dives into a pool from a platform 3.75 feet above the water. Her height above the water in feet x seconds into the jump is given by the expression $-5(x - 0.5)^2 + 5$. How long will it take Nina to hit the water?

2. Quinn is making necklaces. She has 192 orange beads and 306 brown beads. She wants to make all of the necklaces the same with no beads left over.

3. Kareem wants to put up a small corner shelf in his room. The shelf is in the shape of a right triangle. One leg of the triangle is 2 inches shorter than the other. The longest side of the shelf is 10 inches long. Kareem needs to find the area of the shelf so that he knows if he has enough paint to cover the top of the shelf. The area of a triangle is $A = \frac{1}{2}bh$.
 - a. Let the length of the long leg of the triangle equal x . How can the length of the short leg be expressed in terms of x ?

 - b. How can the Pythagorean Theorem help us to relate the lengths of all three sides of the triangular shelf?

 - c. How can your equation be simplified and set equal to 0?

 - d. How can the quadratic expression be factored?

 - e. Do both of your answers make sense as side lengths?

 - f. What are the lengths of the two legs of the triangle?

 - h. What is the area of the shelf?

4. The income in dollars for a school talent show can be expressed by $100p - 5p^2$, where p is the ticket price. What ticket price(s) will result in an income of \$0?
5. A rectangular carpet has an area of $x^2 + 6x - 16$ square feet. Find the width of the carpet if the length is $x + 8$ feet.
6. The altitude of a triangle is 3 inches longer than its base. The area of the triangle is 20 square inches. Find the length of the base of the triangle.
7. The height of a baseball in feet x seconds after it is thrown is given by $-16x^2 + 32x + 5$. When will the ball be at a height of 7 feet?
- How can you represent the situation with an equation?
 - Can you combine the two constants?
 - How can you solve the equation? Show your steps.
 - Do both of your answers make sense?
 - When will the ball be at a height of 7 feet?
8. A pet owner throws a tennis ball for his dog to chase. The tennis ball's height in feet x seconds after it is thrown is given by $-16x^2 + 32x + 4$. When will the ball hit the ground?

9. The fuel economy in miles per gallon of a certain vehicle is given by $-0.01x^2 + 1.2x - 5.8$, where x is the car's speed in miles per hour. For what speed(s) does the car have a fuel economy of 22 miles per gallon?
10. The height of a softball in meters x seconds after it has been thrown is given by: $-4.9x^2 + 9x + 1.2$. When does the ball hit the ground?
11. A company sells about $20x - x^2$ units each month, where x is the price of one unit. For what price(s) does the company sell 100 units?
12. As part of a science experiment, Carson designs and creates a cushioned egg carrier. He puts an egg inside it, and then drops it from a window to see whether his design can safely cushion the egg and keep it from breaking. The egg's height in feet x seconds after being dropped is given by $27 - 16x^2$. After how many seconds will the egg hit the ground?
13. A small company manufactures two types of computer games. One puzzle game takes 0.6 hour for assembly and one racing game takes 0.3 hour for assembly. The company has at most 240 labor hours available for game assembly.

Solve the following inequalities.

14. $(x + 3)(x - 2) < 0$

15. $(3x + 4)(2x - 1) \geq 0$

16. $x^2 - 25 \geq 0$

17. $x^2 + x - 12 < 0$

18. $x^2 + 12 \geq -7x$

19. $x^2 + 20x - 3 \leq 0$

20. $4x^2 + 4 < x$

21. Milo dives into a pool from a platform. His height above the water in feet x seconds into the dive is given by the expression $-5x^2 + 5x + 3$. When is Milo more than 4 feet above the water?

22) A school is planning to host a dance with all profits going to charity. The amount of profit is found by subtracting the total costs from the total income. The income from ticket sales can be expressed as $200x - 10x^2$, where x is the cost of a ticket. The costs of putting on the dance can be expressed as $500 + 20x$. What are all the ticket prices that will result in a profit of \$200 or more?

a. How can profit be expressed in terms of income, I , and costs, C ?

b. How can profit be expressed in terms of the cost of a ticket, x ?

c. How can your expression for profit in terms of ticket cost be used to write an inequality that represents the situation?

d. How can you solve your inequality for x ? Show your steps.

e. Do your answers make sense?

f. What are all the ticket prices that will result in a profit of \$200 or more?