6.5 Modeling using projectiles and inequalities

1. A bolt falls off an airplane at an altitude of 500m. How long will it take the bolt to reach the ground?

2. How far will an object fall in 5 seconds if it is thrown downward at an initial velocity of 30m/sec from a height of 400 m?

3. A coin is tossed upward with an initial velocity of 30 ft/sec from an altitude of 8 feet. What is the maximum height of the coin?

4. A water balloon is dropped from a height of 26 feet. How long before it lands on someone who is 6 feet tall?

5. A bottle of water is thrown upward with an initial velocity of 32 ft/sec from a cliff that is 1920 feet high. For what time does the height exceed 1920 feet?

6. A company determines that its total profit function can be modeled by $P(x) = -2x^2 + 480x - 16000$. Find all the value of x for which the company starts making a profit.

7. A rocket is launched with an initial velocity of 24 m/sec from a platform that is 3 meters high. The rocket will burst into flames unless it stays below 25 meters. Find the interval of time before the rocket bursts into flames.

8. An object is launched at a velocity of 19.6 meters per second from a 58.8-meter-tall platform. When does the object strike the ground?

9. An object is launched directly upward with a velocity of 64 feet per second from a platform 80 feet high.
    a) What will be the object's maximum height?

10. An object is launched from ground level directly upward with a velocity of 39.2 m/s. For how long is the object at or above a height of 34.3 meters?

    b) When will the object reach the maximum height?

11. J is 4 times the square of the difference of K and 4. Write a function to represent the relationship between J and K.

12. Students use $F = G\frac{m_1 m_2}{r^2}$ to calculate the force of an object that has fallen where G is the force of gravity. The students want to find the value of the constant G. What is the best way for the students to rewrite this equation to help them get their calculation?

13. A quadratic equation is shown.

$$x^2 + 12x + 10 = 0$$

Complete the square to rewrite this equation in the form $(x - p)^2 = q$. (Hint: find the vertex)

14. Given

$ax^2 + bx + c = 0$ with
$b = 3 \; and \; c = 2$.
The solutions to the equation are
$\frac{-3 \pm i\sqrt{31}}{10}$
What is the value of a?

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15. Simplify $\sqrt{-25}$

16. Simplify $\sqrt{-50}$

17. Evaluate $4(2 + 3i) - 6i$

18. Factor $2x^2 - 12x + 10$

19. What are the solutions to the equation

$$x^2 + 6x + 14 = 4 \; ?$$

20. What are the solutions of the equation?
$$9 = 3(x - 5)^2$$