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**International Leadership Charter High School**

Algebra 2  
Holiday Packet

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## Quadratic Word Problems

1. Jason jumped off a cliff into the ocean in Acapulco while vacationing with some friends. His height as a function of time could be modeled by the function  $h(t) = -16t^2 + 16t + 480$ , where  $t$  is the time in seconds and  $h$  is the height in feet.
  - a. How long did it take for Jason to reach his maximum height?
  - b. What was the highest point that Jason reached?
  - c. Jason hit the water after how many seconds?
  
2. If a toy rocket is launched vertically upward from ground level with an initial velocity of 128 feet per second, then its height  $h$  after  $t$  seconds is given by the equations  $h(t) = -16t^2 + 128t$  (if air resistance is neglected).
  - a. How long will it take for the rocket to return to the ground?
  - b. After how many seconds will the rocket be 112 feet above the ground?
  - c. How long will it take the rocket to hit its maximum height?
  - d. What is the maximum height?

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3. A rocket is launched from atop a 101 foot cliff with an initial velocity of 116 ft/s.

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a. Substitute the values into the vertical motion formula  $h(t) = -16t^2 + vt + h_0$ . Let  $h(t) = 0$

b. How long will the rocket take to hit the ground after it is launched? Round to the nearest tenth of a second.

4. You and a friend are hiking in the mountains. You want to climb to a ledge that is 20 ft above you. The height of the grappling hook you throw is given by the function  $h(t) = -16t^2 + 32t + 5$ . What is the maximum height of the grappling hook? Can you throw it high enough to reach the ledge?

5. You are trying to dunk a basketball. You need to jump 2.5 ft in the air to dunk the ball. The height that your feet are above the ground is given by the function  $h(t) = -16t^2 + 12t$ . What is the maximum height your feet will be above the ground? Will you be able to dunk the basketball?

6. A diver is standing on a platform 24 ft above the pool. He jumps from the platform with an initial upward velocity of 8 ft/s. Use the formula  $h(t) = -16t^2 + vt + s$ , where  $h$  is his height above the water,  $t$  is the time,  $v$  is his starting upward velocity and  $s$  is his starting height. How long will it take for him to hit the water?

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7. A ball is thrown upward from a height of 15 ft with an initial upward velocity of 5 ft/s. Use the formula  $h(t) = -16t^2 + vt + s$  to find how long it will take for the ball to hit the ground.
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8. One of the games at a carnival involves trying to ring a bell with a ball by hitting a lever that propels the ball into the air. The height of the ball is modeled by the equations  $h(t) = -16t^2 + 39t$ . If the bell is 25 ft above the ground, will it be hit by the ball.
9. A ship drops anchor in a harbor. The anchor is 49 ft above the surface of the water when it is released. Use the vertical motion formula  $h(t) = -16t^2 + vt + s$  to answer the following questions.
- What is the value of  $s$ , the starting height?
  - What is the value of  $h$  when the anchor hits the water?
  - The starting velocity is zero. After how many seconds will the anchor hit the water?
10. An amateur rocketry club is holding a competition. There is cloud cover at 1000 ft. If a rocket is launched with a velocity of 315 ft/s, use the function  $h(t) = -16t^2 + vt + h_0$  to determine how long the rocket is out of sight.

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11. A trebuchet launches a projectile on a parabolic arc from a height of 47 ft at a velocity of 40 ft/s. Using the function  $h(t) = -16t^2 + vt + h_0$ , determine when the projectile will first reach a height of 60 ft and how many seconds later it will again be at 60 feet.

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12. During World War I, mortars were fired from trenches 3 feet down. The mortars had a velocity of 150 ft/s. Determine how long it will take for the mortar shell to strike its target

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**Assessment:**

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- Assess students' understanding through the exit ticket responses.
- Informal assessment through participation in class discussions.

This lesson plan aims to provide students with a clear understanding of leaders and role models, their qualities, and their impact on society. It encourages students to reflect on their own experiences and identify those who have inspired them.