

NAME: _____

P.I. A2.A.25: Solve quadratic equations, using the quadratic formula

1. A rock is thrown from the top of a tall building. The distance, in feet, between the rock and the ground t seconds after it is thrown is given by $d = -16t^2 - 2t + 763$. How long after the rock is thrown is it 430 feet from the ground?

[A] $\frac{37}{8}$ sec [B] $\frac{11}{2}$ sec
[C] $\frac{45}{8}$ sec [D] $\frac{9}{2}$ sec

2. Use the vertical motion formula $h = -16t^2 + vt + s$ to find the number of seconds it takes for a rocket launched with a starting velocity of 96 ft/s to reach an altitude of 45 ft. Round answers to the nearest tenth.

3. The motion of a ball scooped by a field hockey player can be modeled by $h = -16t^2 + 40t$, where t is the time in seconds and h is the height of the ball. Will the ball ever reach 22 feet? If so, how many seconds will it take?

4. The function $P = 0.0089t^2 + 1.1149t + 78.4491$ models the United States population in millions since 1900. Use the function P to predict the year in which the population exceeds 1 billion.

5. For which value of x is $f(x) = -10$ if $f(x) = -4x^2 + 3x$?

[A] -1 [B] 4 [C] 3 [D] -2 [E] 2

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6. This table shows the height in feet of some of the tallest buildings in the United States.

Building	City	Height (in ft)
Sears Tower	Chicago	1454
World Trade Center	New York City	1377
Empire State Building	New York City	1250
AMOCO	Chicago	1136
John Hancock Center	Chicago	1127
Chrysler	New York City	1046
First Interstate World Center	Los Angeles	1017

The length of time it would take an object to fall from the top of one of these structures is $h(t) = -16t^2 + H$, where H is the height in feet of the structure, t is the number of seconds and $h(t)$ is the height after t seconds.

Find the time it would take an object to fall to the ground from the top of the John Hancock Center. Round your answer to the nearest hundredth of a second.

7. Compare the quantity in Column A with the quantity in Column B.
Solve each by using the quadratic formula. Determine the greater solution of each.

Column A

Column B

$$2x^2 + x - 21 = 0 \quad 3x^2 - 19x - 14 = 0$$

[A] The quantity in Column A is greater.

[B] The quantity in Column B is greater.

[C] The two quantities are equal.

[D] The relationship cannot be determined on the basis of the information supplied.

- [1] D
- [2] after 0.5 s and after 5.5 s
- [3] yes; about 0.8 seconds and about 1.7 seconds
- [4] 2165
- [5] E
- [6] 8.39 seconds
- [7] B