

$$X = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

KEY

WS - Quadratic Formula

Date

Period

Solve each equation with the quadratic formula.

1) $4x^2 - 6 = -12x$

$$4x^2 + 12x - 6 = 0$$

$$2 \left(\begin{matrix} 2x^2 & + & 6x & - & 3 \end{matrix} \right) = 0$$

a b c

$$X = \frac{-6 \pm \sqrt{(6)^2 - 4(2)(-3)}}{2(2)}$$

$$X = \frac{-3 \pm \sqrt{60}}{4}$$

$$\sqrt{60} = 2\sqrt{15}$$



$$X = \frac{-3 \pm 2\sqrt{15}}{4}$$

$$X = \frac{-3 \pm \sqrt{15}}{2}$$

or

$$X = \frac{-3 \pm \sqrt{15}}{2}$$

3) $m^2 = -11 + 10m$

$$m^2 + 10m - 11 = 0$$

$$X = \frac{-10 \pm \sqrt{(10)^2 - 4(1)(-11)}}{2(1)}$$

$$X = -5 \pm \frac{12}{2}$$

$$X = \frac{-10 \pm \sqrt{100 + 44}}{2}$$

$$X = -5 \pm 6$$

$$X = 1 \text{ and } -11$$

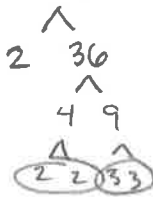
5) $m^2 = -8m + 2$

$$m^2 + 8m - 2 = 0$$

a b c

$$X = \frac{-8 \pm \sqrt{(8)^2 - 4(1)(-2)}}{2(1)}$$

$$\sqrt{72} = 6\sqrt{2}$$



$$X = -4 \pm \frac{6\sqrt{2}}{2}$$

$$X = -4 \pm 3\sqrt{2}$$

7) $8r^2 + 1 = -8r$

$$8r^2 - 8r + 1 = 0$$

a b c

$$X = \frac{8 \pm \sqrt{(-8)^2 - 4(8)(1)}}{2(8)}$$

$$X = \frac{8 \pm \sqrt{32}}{16}$$

$$\sqrt{32} = 4\sqrt{2}$$



$$X = \frac{8 \pm 4\sqrt{2}}{16} = \frac{1 \pm \sqrt{2}}{2} \text{ or } \frac{-2 \pm \sqrt{2}}{4}$$

2) $4p^2 - 140 = 8p$

$$4p^2 - 8p - 140 = 0$$

$$4 \left(\begin{matrix} p^2 & - & 2p & - & 35 \end{matrix} \right) = 0$$

a b c

$$X = \frac{2 \pm \sqrt{(-2)^2 - 4(1)(-35)}}{2(1)}$$

$$X = 1 \pm \frac{\sqrt{144}}{2}$$

$$X = 1 \pm \frac{12}{2}$$

$$X = 1 \pm 6$$

$$X = 7 \text{ and } -5$$

$$X = \frac{2 \pm \sqrt{4 + 140}}{2}$$

4) $2p^2 - 2 = 10p$

$$2p^2 - 10p - 2 = 0$$

$$2(p^2 - 5p - 1) = 0$$

$$X = \frac{5 \pm \sqrt{(-5)^2 - 4(1)(-1)}}{2(1)}$$

$$X = \frac{5 \pm \sqrt{29}}{2}$$

OR

$$X = \frac{5 \pm \sqrt{29}}{2}$$

$$X = \frac{5 \pm \sqrt{25 + 4}}{2}$$

6) $10x^2 + 10x = -2$

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

$$2(5x^2 + 5x + 1) = 0$$

a b c

$$X = \frac{-5 \pm \sqrt{(5)^2 - 4(5)(1)}}{2(5)}$$

$$X = \frac{-1}{2} \pm \frac{\sqrt{5}}{10}$$

$$X = \frac{-5 \pm \sqrt{25 - 20}}{10}$$

8) $3b^2 + 10b = 9$

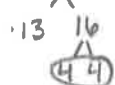
$$3b^2 + 10b - 9 = 0$$

a b c

$$X = \frac{-10 \pm \sqrt{(10)^2 - 4(3)(-9)}}{2(3)}$$

$$X = \frac{-5}{3} \pm \frac{\sqrt{208}}{6}$$

$$\sqrt{208} = 4\sqrt{13}$$



$$X = \frac{-10 \pm \sqrt{100 + 108}}{6}$$

$$X = \frac{-5}{3} \pm \frac{4\sqrt{13}}{6}$$

$$X = \frac{-5}{3} \pm \frac{2\sqrt{13}}{3}$$

$$9) n^2 - 22 = -8n$$

$$n^2 + 8n - 22 = 0$$

a b c

$$\sqrt{152} = 2\sqrt{38}$$

4 38

(2) (2) (2) (19)

$$X = \frac{-8 \pm \sqrt{(8)^2 - 4(1)(-22)}}{2(1)}$$

$$X = \frac{-8 \pm 2\sqrt{38}}{2}$$

$$X = \frac{-8 \pm \sqrt{152}}{2}$$

$$X = -4 \pm \sqrt{38}$$

$$10) m^2 = -9 - 7m$$

$$m^2 + 7m + 9 = 0$$

a b c

$$X = \frac{-7 \pm \sqrt{(7)^2 - 4(1)(9)}}{2(1)}$$

$$X = \frac{-7 \pm \sqrt{49 - 36}}{2}$$

$$X = \frac{-7 \pm \sqrt{13}}{2}$$

Round your answers to the nearest tenth.

11) A ball is thrown upward from a height of 15 ft. with an initial upward velocity of 5 ft/s. Use the formula $h(t) = -16t^2 + 5t + 15$ to find how long it will take for the ball to hit the ground.

12) A ball is shot from a cannon into the air with an upward velocity of 40 ft/sec. The equation that gives the height (h) of the ball at any time (t) is: $h(t) = -16t^2 + 40t + 1.5$. How long did it take for the ball to reach the ground?

$$-16t^2 + 5t + 15 = 0$$

a b c

$$X = \frac{-5 \pm \sqrt{(5)^2 - 4(-16)(15)}}{2(-16)}$$

$$X = \frac{-5 \pm \sqrt{25 + 960}}{-32}$$

$$X = \frac{-5 \pm \sqrt{985}}{-32}$$

$$X = -.825$$

$$X = 1.14 \text{ secs}$$

$$-16t^2 + 40t + 1.5 = 0$$

$$X = \frac{-40 \pm \sqrt{(40)^2 - 4(-16)(1.5)}}{2(-16)}$$

$$X = \frac{-40 \pm \sqrt{1696}}{-32}$$

$$X = -0.037$$

$$X = 2.54 \text{ sec.}$$

13) Fay throw a basketball from the basketball hoop. The quadratic equation that models the path of the ball is $p(t) = -16t^2 + 20t + 6$. If the is 10 feet high, how long is the ball in the air before the ball goes through the hoop?

14) Suppose a ball is thrown directly upward from an initial height of 200 feet with an initial velocity of 96 feet per second. After how many seconds will the ball reach a height of 300 feet? Use the formula $h(t) = -16t^2 + 96t + 200$.

$$-16t^2 + 20t + 6 = 10$$

$$-16t^2 + 20t - 4 = 0$$

$$-4(4t^2 - 5t + 1) = 0$$

a b c

$$X = \frac{5 \pm \sqrt{(-5)^2 - 4(4)(1)}}{2(4)}$$

$$X = \frac{5 \pm \sqrt{9}}{8}$$

$$X = 1 \text{ sec.}$$

or

$$X = .25 \text{ sec}$$

$$-16t^2 + 96t + 200 = 300$$

$$-16t^2 + 96t - 100 = 0$$

$$-4(4t^2 - 24t + 25) = 0$$

$$X = \frac{24 \pm \sqrt{(-24)^2 - 4(4)(25)}}{2(4)}$$

$$X = \frac{24 \pm \sqrt{176}}{8}$$

$$X = 4.658 \text{ sec}$$

$$X = 1.34 \text{ sec}$$