Name Solutions

A∞Ω
MATH@TD
MCR3U

11U3 - Zeros of Quadratics Practice Quiz

Multiple Choice
Identify the choice that best completes the statement or answers the question.

A

1. Which of the following are roots of the equation $x^2 - 3x - 28 = 0$?
   a. $x = -4, 7$ c. $x = -7, 4$
   b. $x = -28, 0$ d. $x = -24, 4$

B

2. Which of the following are approximate roots of the equation $2x^2 - 13x + 8 = 0$?
   a. $x \doteq 0.4, 0.67$ c. $x \doteq 1.38, 11.63$
   b. $x \doteq 0.69, 5.81$ d. $x \doteq -13.13, 3.25$

B

3. A model rocket is launched off the top of a table. The height of the rocket is given by the function $h(t) = -4.9t^2 + 92t + 1.2$, where $h(t)$ is the height in metres and t is the time in seconds. How long will it take for the rocket to reach the ground?
   a. 0.13 s c. 18.79 s
   b. 18.76 s d. 0.13 s and 18.79 s

B

4. Which of the following are roots of the equation $-3x^2 + 6x + 105 = 0$?
   a. $x = -7, 5$ c. $x = -5, 3, 7$
   b. $x = -5, 7$ d. $x = -5, -3, 7$

D

5. Barbara hit a softball with a bat. The height of the ball is given by the function $h(t) = -4.9t^2 + 30t + 0.8$, where $h(t)$ is the height in metres and t is the time in seconds. How long will it take for the ball to reach the ground?
   a. 0.8 s c. 0.03 s
   b. 3.06 s d. 6.15 s

Provide clear solutions to the following problems:

6. Determine the roots of the equation $-2x^2 + 4x + 96 = 0$ by factoring.

7. Use the quadratic formula to determine each of the roots of $-7x^2 - 23x = -10$ to two decimal places.

8. Heidi owns a business that sells photographs. The profit function for her business can be modelled by the equation $P(x) = -0.5x^2 + 5x - 7$, where x is the quantity sold, in thousands, and $P(x)$ is the profit in thousands of dollars. How many photos must Heidi sell in order for her business to break even?

9. Stephanie owns a business that sells greeting cards. The profit function for her business can be modelled by the equation $P(x) = -0.5x^2 + 8x - 9.3$, where x is the quantity sold, in thousands, and $P(x)$ is the profit in thousands of dollars. How many cards must Stephanie sell in order for her business to break even?

6. $-2x^2 + 4x + 96 = 0$ by factoring. ⇒ get "a" positive

÷ -2 everywhere

$\Rightarrow x^2 - 2x - 48 = 0$

x	+
-48	-2

$-8, +6$

$\Rightarrow (x-8)(x+6) = 0$

$\Rightarrow \boxed{x = +8, -6}$

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7. $-7x^2 - 23x \overset{+10}{=} -10 \overset{+10}{}$ (need "stuff = 0")

$\Rightarrow -7x^2 - 23x + 10 = 0$

$a = -7 \quad b = -23 \quad c = +10$

(normally I would next divide both sides by "-1" to make "a" positive - but since we are using the quadratic formula - no need)

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

$$= \frac{23 \pm \sqrt{(-23)^2 - 4(-7)(10)}}{2(-7)}$$

$$= \frac{23 \pm \sqrt{809}}{-14}$$

$\therefore x = \frac{23 + \sqrt{809}}{-14}$ or $x = \frac{23 - \sqrt{809}}{-14}$

$\doteq -3.67$ or $\doteq 0.39$

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8) $P(x) = -0.5x^2 + 5x - 7$

Break even ⇒ profit equals zero

(x in thousands)

$\Rightarrow -0.5x^2 + 5x - 7 = 0$ quadratic formula

$a = -0.5 \quad b = \quad c =$

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

$$= \frac{-5 \pm \sqrt{5^2 - 4(0.5)(-7)}}{2(-0.5)}$$

$$= \frac{-5 \pm \sqrt{11}}{-1}$$

$\therefore x = \frac{-5 + \sqrt{11}}{-1}$ or $\frac{-5 - \sqrt{11}}{-1}$

$\doteq 1.68$ (1680) or $\doteq 8.32$ (8320)

makes more sense.

$\therefore$ Heidi must sell either 1680 or 8320 things to break even

9. Stephanie owns a business that sells greeting cards. The profit function for her business can be modelled by the equation $P(x) = -0.5x^2 + 8x - 9.3$, where x is the quantity sold, in thousands, and $P(x)$ is the profit in thousands of dollars. How many cards must Stephanie sell in order for her business to break even?

$P(x) = 0$

Break even $\Rightarrow$ profit equals zero
(x in thousands)

$\Rightarrow -0.5x^2 + 8x - 9.3 = 0$ quadratic formula

$a = -0.5 \quad b = 8 \quad c = -9.3$

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

$$= \frac{-8 \pm \sqrt{8^2 - 4(-0.5)(-9.3)}}{2(-0.5)}$$

$$= \frac{-8 \pm \sqrt{45.4}}{-1}$$

$\Rightarrow x \doteq 1.25$ OR $x \doteq 14.7$

($\doteq$ 1250 cards or 14,700 cards)

$\Rightarrow$ to break even Stephanie must sell either

1250 cards OR 14,700 cards

↳ makes more sense.