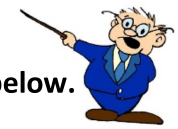
8 Algebra CC

Unit 14 Practice ANSWER KEY



Let's Review – Use your notes from Monday and Tuesday to help you solve the equations below.

Solve -2x² + 24x – 46 = 0 by completing the square.

$$\frac{-2x^2}{-2}+\frac{24x}{-2}-\frac{46}{-2}=\frac{0}{-2}$$

$$x^2-12x+23=0$$

$$x^2-12x+\_\_\_\_=-23+\_\_\_\_$$

$$\left(\frac{-12}{2}\right)^2$$

$$x^2-12x+36=-23+36$$

$$(x-6)^2=13$$

$$\sqrt{(x-6)^2}=\sqrt{13}$$

$$x-6=\pm\sqrt{13}$$

$$x=6\pm\sqrt{13}$$

$$\boxed{\{6+\sqrt{13},6-\sqrt{13}\}}$$

Solve –x² + 5 = 2x using the quadratic formula.

$$-x^2+5=2x$$

$$-x^2-2x+5=0$$

$a=-1$

$b=-2$

$c=5$

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

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

$$x=\frac{2\pm\sqrt{24}}{-2}$$

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

$$x=\frac{2\pm 2\sqrt{6}}{-2}$$

$$x=-1\pm\sqrt{6}$$

$$\boxed{\{-1+\sqrt{6},-1-\sqrt{6}\}}$$

All irrational solutions must be expressed in simplest radical form.

1. 2x² + 18x = -16

$$2x^2+18x+16=0$$

$$2(x^2+9x+8)=0$$

$$2(x+8)(x+1)=0$$

$x+8=0$	$x+1=0$
$x=-8$	$x=-1$

$$\boxed{\{-8, -1\}}$$

2. 3x² + 5 = 152

$$3x^2=147$$

$$\frac{3x^2}{3}=\frac{147}{3}$$

$$x^2=49$$

$$\sqrt{x^2}=\sqrt{49}$$

$$x=\pm 7$$

$$\boxed{\{-7, 7\}}$$

3. 4x² + 4x – 9 = 0

$a=4$

$b=4$

$c=-9$

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

$$x=\frac{-4\pm\sqrt{(4)^2-4(4)(-9)}}{2(4)}$$

$$x=\frac{-4\pm\sqrt{160}}{8}$$

$$x=\frac{-4\pm\sqrt{16}\sqrt{10}}{8}$$

$$x=\frac{-4\pm 4\sqrt{10}}{8}$$

$$\boxed{x=\frac{-1\pm\sqrt{10}}{2}}$$

4. **$10x^2 + 2x = 0$**

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

$$2x=0 \quad | \quad 5x+1=0$$

$$x=0 \quad | \quad 5x=-1$$

$$x=-\frac{1}{5}$$

$\boxed{\{0, -1/5\}}$

5. **$x^2 - 10x + 15 = 8$**

$$x^2-10x+\_\_\_\_\_=-7+\_\_\_\_\_ \qquad \left(\frac{-10}{2}\right)^2$$

$$x^2-10x+25=-7+25$$

$$x^2-10x+25=18$$

$$(x-5)^2=18$$

$$\sqrt{(x-5)^2}=\sqrt{18}$$

$$x-5=\pm\sqrt{9}\sqrt{2}$$

$$x=5\pm3\sqrt{2}$$

$\boxed{\{5+3\sqrt{2}, 5-3\sqrt{2}\}}$

6. **$6x^2 = 300$**

$$\frac{6x^2}{6}=\frac{300}{6}$$

$$x^2=50$$

$$\sqrt{x^2}=\sqrt{50}$$

$$x=\pm\sqrt{25}\sqrt{2}$$

$$x=\pm5\sqrt{2}$$

$\boxed{\{5\sqrt{2}, -5\sqrt{2}\}}$

7. **Meredith is deciding which method to use to solve $5x^2 - 7x - 6 = 0$. Jeremy says that she should complete the square and Greg says she should use the quadratic formula. Who do agree with? <u>Explain your reasoning and justify your response</u>.**

I would use the quadratic formula. If I used the method of completing the square, you would have to divide each term by 5 and get a number of fractions that would be more complex to work with.

$$5x^2-7x-6=0$$

$a=5$

$b=-7$

$c=-6$

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

$$x=\frac{7\pm\sqrt{(-7)^2-4(5)(-6)}}{2(5)}$$

$$x=\frac{7\pm\sqrt{169}}{10}$$

$$x=\frac{7\pm13}{10}$$

$$x=\frac{7+13}{10} \qquad x=\frac{7-13}{10}$$

$$x=2 \qquad x=-\frac{3}{5}$$

$\boxed{\{2, -3/5\}}$

8. **A student was given the equation $x^2 + 6x - 13 = 0$ to solve by completing the square.**

The first step that was written was $x^2 + 6x = 13$

The next step in the student's process was $x^2 + 6x + \mathbf{c} = 13 + \mathbf{c}$.

State the value of c that creates a perfect square trinomial. Explain how the value of c is determined.

Take the coefficient of the middle term, divide it by 2 and square that result, $\boxed{c = 9}$

$$\left(\frac{6}{2}\right)^2=9$$

9. **Sally and Jane have ages that are consecutive <u>even</u> integers. The product of their ages is 168. Write an equation that could be used to find Sally's age, s, <u>if she is the oldest</u>. Solve your equation and state the age of Sally.**

s = Sally's age → $\boxed{\textbf{14 years old}}$
$s - 2$ = Jane's age

$$s(s-2) = 168$$
$$s^2 - 2s = 168$$
$$s^2 - 2s - 168 = 0$$
$$(s-14)(s+12) = 0$$

$$\begin{array}{r|l} s - 14 = 0 & s + 12 = 0 \\ s = 14 & s = -12 \end{array}$$

Reject –
age cannot
be negative

10. **The dimensions of a rectangular garden are 5 meters by 12 meters. In order to create a bigger rectangular garden, each dimension was increased by the same amount. <u>The new garden's area is double that of the original garden</u>. Find the dimensions of the new garden. *Draw a diagram to help you*.**

x = number of meters added to each dimension

A = length • width

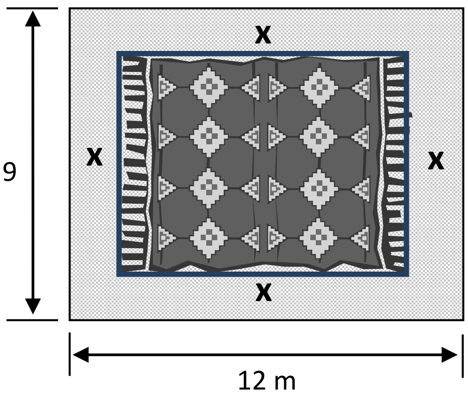
Area of original garden = 60m² (5 • 12)
Area of new garden = 120m² (60 • 2)

$$(12+x)(5+x) = 120$$
$$60 + 12x + 5x + x^2 = 120$$
$$x^2 + 17x - 60 = 0$$
$$(x+20)(x-3) = 0$$

$$\begin{array}{r|l} x + 20 = 0 & x - 3 = 0 \\ x = -20 & x = 3 \end{array}$$

12 + 3 = 15m
5 + 3 = 8m
The dimensions of the new garden are 15 meters by 8 meters.

11. **A decorator places a rug in a 9 meter by 12 meter room. A uniform strip of flooring around the rug remains uncovered. Write and solve an equation to determine the width, *x meters*, of the strip of flooring if <u>the area of the rug is half the area of the room.</u> Find the length and width of the rug.**



> ***Helpful Hint:*** *The key to solving this problem is setting up an equation that represents the <u>area of the rug</u>. First, represent the length and width of the rug algebraically.*

$12 - x - x \rightarrow 12 - 2x$ = length of the rug = **9 meters**

$9 - x - x \rightarrow 9 - 2x$ = width of the rug = **6 meters**

A = length • width

Area of room = 108m² (9 • 12)
Area of rug = 54m² (108 • ½)

$$(12-2x)(9-2x) = 54$$
$$108 - 24x - 18x + 4x^2 = 54$$
$$108 - 42x + 4x^2 = 54$$
$$4x^2 - 42x + 54 = 0$$
$$\frac{4x^2}{2} - \frac{42x}{2} + \frac{54}{2} = 0$$
$$2x^2 - 21x + 27 = 0$$

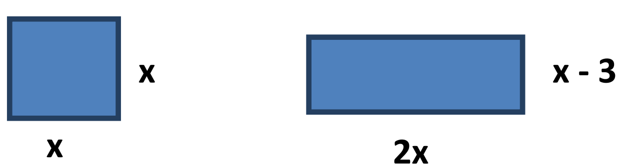
$$a = 2, b = -21, c = 27$$
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$
$$x = \frac{21 \pm \sqrt{(-21)^2 - 4(1)(27)}}{2(2)}$$
$$x = \frac{21 \pm \sqrt{225}}{4}$$
$$x = \frac{21 \pm 15}{4}$$
$$x = \frac{21+15}{4} \qquad x = \frac{21-15}{4}$$
$$x = 9 \qquad x = 1.5$$

width of the rug = $9 - 2x$

$x = 9$	$x = 1.5$
$9 - 2x$	$9 - 2x$
$9 - 2(9)$	$9 - 2(1.5)$
$9 - 18$	$9 - 3$
-9	$\boxed{\text{6 meters}}$
reject	
negative	12 – 2x
measurement	12 – 2(1.5)
	12 – 3
	$\boxed{\text{9 meters}}$

12. **New Clarendon Park is undergoing renovations to its gardens. One garden that was originally a square is being adjusted so that <u>one side is doubled in length</u>, while the <u>other side is decreased by three meters</u>.**

Part A: Represent the dimensions of the two gardens algebraically. Use the diagrams below to help you. Let x = the side length of the original square garden.



Part B: Represent the area of the original *square* garden in terms of x.

A = length • width
A = $x \bullet x$
A = x^2

Part C: Represent the area of the *rectangular* garden in terms of x.

A = length • width
$A = 2x(x - 3)$
$A = 2x^2 - 6x$

Part D: The new rectangular garden will have an area that is 25% more than the original square garden. Write an equation that can be used to determine the length of a side of the original square garden, x. Solve your equation and state the side length.
See the helpful hint box below to help you make sense of a 25% increase.

new garden = 1.25 • original garden

$$2x^2 - 6x = 1.25x^2$$
$$0.75x^2 - 6x = 0$$
$$x(0.75x - 6) = 0$$

$x = 0$	$0.75x - 6 = 0$
	$0.75x = 6$
	$x = 8$
reject - measure of zero	

$\boxed{\textbf{Side of original garden is 8 meters}}$

Helpful Hint: Think about what percent a new amount represents after it has been increased by 25%.

Example:
Original Amount: **10**
25% Increase: .25(10) = **2.5**
New Amount: 10 + 2.5 = **12.5**

10.0 ← 100%
+ 2.5 ← 25%
12.5 ← 125%

New Amount = 125% of the Original Amount
New Amount = 1.25(10)
New Amount = **12.5**

If **p** is increased by 25% then **1.25p** represents the new amount after a 25% increase.