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 Answers to Unit 3
 

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## SECTION 1

Pages 85-88

**Example 2**

$$\begin{array}{r|l}
 5 - 4x = 8x + 2 & \\
 \hline
 5 - 4\left(\frac{1}{4}\right) & 8\left(\frac{1}{4}\right) + 2 \\
 5 - 1 & 2 + 2 \\
 4 & 4
 \end{array}$$

Yes,  $\frac{1}{4}$  is a solution.**Example 6**

$$\begin{aligned}
 \frac{1}{2} &= x - \frac{2}{3} \\
 \frac{1}{2} + \frac{2}{3} &= x - \frac{2}{3} + \frac{2}{3} \\
 \frac{7}{6} &= x
 \end{aligned}$$

The solution is  $\frac{7}{6}$ .**Example 10**

$$\begin{aligned}
 4x - 8x &= 16 \\
 -4x &= 16 \\
 \left(-\frac{1}{4}\right)(-4x) &= \left(-\frac{1}{4}\right)(16) \\
 x &= -4
 \end{aligned}$$

The solution is  $-4$ .**Example 4**

$$\begin{array}{r|l}
 10x - x^2 = 3x - 10 & \\
 \hline
 10(5) - (5)^2 & 3(5) - 10 \\
 50 - 25 & 15 - 10 \\
 25 & 5
 \end{array}$$

No, 5 is not a solution.

**Example 8**

$$\begin{aligned}
 -\frac{2}{5}x &= 6 \\
 \left(-\frac{5}{2}\right)\left(-\frac{2}{5}x\right) &= \left(-\frac{5}{2}\right)(6) \\
 x &= -15
 \end{aligned}$$

The solution is  $-15$ .

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1. Yes    3. No    5. No    7. Yes    9. Yes    11. Yes    13. No    15. No    17. Yes    19. No    21. Yes  
 23. No    25. No    27. Yes    29. Yes    31.  $x = 2$     33.  $b = 15$     35.  $a = 6$     37.  $m = -6$     39.  $n = 3$   
 41.  $b = 0$     43.  $a = -2$     45.  $z = -7$     47.  $m = -7$     49.  $x = -12$     51.  $b = 2$     53.  $x = 6$   
 55.  $x = -5$     57.  $m = 15$     59.  $w = 9$     61.  $b = 14$     63.  $a = 19$     65.  $c = -1$     67.  $x = 1$   
 69.  $a = -\frac{2}{3}$     71.  $b = -\frac{1}{2}$     73.  $n = \frac{4}{15}$     75.  $c = \frac{5}{12}$     77.  $w = 1.869$     79.  $t = 0.884$     81.  $x = 7.251$   
 83.  $y = 7$     85.  $a = -7$     87.  $m = -4$     89.  $n = 5$     91.  $t = 9$     93.  $x = -8$     95.  $x = 0$     97.  $x = -7$   
 99.  $y = 8$     101.  $t = -7$     103.  $x = 12$     105.  $b = -18$     107.  $x = 15$     109.  $m = -20$     111.  $x = -12$   
 113.  $x = 15$     115.  $x = 25$     117.  $x = \frac{8}{3}$     119.  $y = \frac{1}{3}$     121.  $m = \frac{15}{7}$     123.  $n = 4$     125.  $y = 3$   
 127.  $x = 4.745$     129.  $a = 2.06$     131.  $x = -2.13$

## SECTION 2

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**Example 2**

$$\begin{aligned}5x + 7 &= 10 \\5x + 7 + (-7) &= 10 + (-7) \\5x &= 3 \\ \frac{1}{5} \cdot 5x &= \frac{1}{5} \cdot 3 \\x &= \frac{3}{5}\end{aligned}$$

The solution is  $\frac{3}{5}$ .**Example 6**

$$\begin{aligned}x - 5 + 4x &= 25 \\5x - 5 &= 25 \\5x - 5 + 5 &= 25 + 5 \\5x &= 30 \\ \frac{1}{5} \cdot 5x &= \frac{1}{5} \cdot 30 \\x &= 6\end{aligned}$$

The solution is 6.

**Example 4**

$$\begin{aligned}2 &= 11 + 3x \\2 + (-11) &= 11 + (-11) + 3x \\-9 &= 3x \\ \frac{1}{3}(-9) &= \frac{1}{3}(3x) \\-3 &= x\end{aligned}$$

The solution is  $-3$ .**Example 8****Strategy** To find the depth, replace  $P$  with the given value and solve for  $D$ .**Solution**

$$\begin{aligned}P &= 15 + \frac{1}{2}D \\45 &= 15 + \frac{1}{2}D \\45 + (-15) &= 15 + (-15) + \frac{1}{2}D \\30 &= \frac{1}{2}D \\2(30) &= 2 \cdot \frac{1}{2}D \\60 &= D\end{aligned}$$

The depth is 60 ft.

## Pages 95–97

1.  $x = 3$     3.  $a = 6$     5.  $x = -1$     7.  $x = -3$     9.  $d = 2$     11.  $c = -2$     13.  $w = 2$     15.  $t = 2$   
 17.  $a = 5$     19.  $b = -3$     21.  $x = 6$     23.  $x = 2$     25.  $x = 3$     27.  $a = 1$     29.  $b = 6$     31.  $m = -7$   
 33.  $y = 0$     35.  $c = 2$     37.  $x = \frac{6}{7}$     39.  $a = \frac{2}{3}$     41.  $x = \frac{13}{9}$     43.  $n = -1$     45.  $x = \frac{3}{4}$     47.  $x = \frac{4}{9}$   
 49.  $x = \frac{1}{3}$     51.  $w = -\frac{1}{2}$     53.  $b = -\frac{3}{4}$     55.  $x = -\frac{1}{7}$     57.  $a = \frac{1}{3}$     59.  $x = -\frac{1}{6}$     61.  $a = 1$   
 63.  $x = 1$     65.  $x = 0$     67.  $x = \frac{13}{10}$     69.  $a = \frac{2}{5}$     71.  $x = -\frac{4}{3}$     73.  $x = -\frac{3}{2}$     75.  $m = 18$   
 77.  $n = 8$     79.  $b = -16$     81.  $y = 25$     83.  $c = 21$     85.  $w = 15$     87.  $x = -16$     89.  $x = -21$   
 91.  $x = \frac{15}{2}$     93.  $y = -\frac{18}{5}$     95.  $y = 2$     97.  $z = 3$     99.  $b = 1$     101.  $m = -2$     103.  $y = -0.74$   
 105.  $x = 0.15$

## Page 98

1. The time is 2 s.    3. The length is 30 ft.    5. The height is 5 in.    7. The magnification is 11.    9. The height is 7 ft.

## SECTION 3

Pages 99–102

**Example 2**

$$\begin{aligned}
 5x + 4 &= 6 + 10x \\
 5x + (-10x) + 4 &= 6 + 10x + (-10x) \\
 -5x + 4 &= 6 \\
 -5x + 4 + (-4) &= 6 + (-4) \\
 -5x &= 2 \\
 \left(-\frac{1}{5}\right)(-5x) &= -\frac{1}{5} \cdot 2 \\
 x &= -\frac{2}{5}
 \end{aligned}$$

The solution is  $-\frac{2}{5}$ .**Example 6**

$$\begin{aligned}
 5x - 4(3 - 2x) &= 2(3x - 2) + 6 \\
 5x - 12 + 8x &= 6x - 4 + 6 \\
 13x - 12 &= 6x + 2 \\
 13x + (-6x) - 12 &= 6x + (-6x) + 2 \\
 7x - 12 &= 2 \\
 7x - 12 + 12 &= 2 + 12 \\
 7x &= 14 \\
 \frac{1}{7} \cdot 7x &= \frac{1}{7} \cdot 14 \\
 x &= 2
 \end{aligned}$$

The solution is 2.

**Example 4**

$$\begin{aligned}
 5x - 10 - 3x &= 6 - 4x \\
 2x - 10 &= 6 - 4x \\
 2x + 4x - 10 &= 6 - 4x + 4x \\
 6x - 10 &= 6 \\
 6x - 10 + 10 &= 6 + 10 \\
 6x &= 16 \\
 \frac{1}{6} \cdot 6x &= \frac{1}{6} \cdot 16 \\
 x &= \frac{8}{3}
 \end{aligned}$$

The solution is  $\frac{8}{3}$ .**Example 8**

$$\begin{aligned}
 -2[3x - 5(2x - 3)] &= 3x - 8 \\
 -2[3x - 10x + 15] &= 3x - 8 \\
 -2[-7x + 15] &= 3x - 8 \\
 14x - 30 &= 3x - 8 \\
 14x + (-3x) - 30 &= 3x + (-3x) - 8 \\
 11x - 30 &= -8 \\
 11x - 30 + 30 &= -8 + 30 \\
 11x &= 22 \\
 \frac{1}{11} \cdot 11x &= \frac{1}{11} \cdot 22 \\
 x &= 2
 \end{aligned}$$

The solution is 2.

**Example 10**

**Strategy** To find the location of the fulcrum when the system balances, replace the variables  $F_1$ ,  $F_2$ , and  $d$  in the lever system equation by the given values and solve for  $x$ .

**Solution**

$$\begin{aligned}
 F_1 \cdot x &= F_2 \cdot (d - x) \\
 45x &= 80(25 - x) \\
 45x &= 2000 - 80x \\
 45x + 80x &= 2000 - 80x + 80x \\
 125x &= 2000 \\
 \frac{1}{125} \cdot 125x &= \frac{1}{125} \cdot 2000 \\
 x &= 16
 \end{aligned}$$

The fulcrum is 16 ft from the 45-pound force.

## Pages 103–105

1.  $x = 2$     3.  $m = 3$     5.  $x = 3$     7.  $y = -1$     9.  $x = -1$     11.  $x = 2$     13.  $x = -2$     15.  $b = -3$   
 17.  $x = -8$     19.  $y = 0$     21.  $x = -1$     23.  $x = -3$     25.  $x = -1$     27.  $m = 4$     29.  $x = -2$   
 31.  $n = 3$     33.  $x = -6$     35.  $a = -2$     37.  $b = \frac{2}{3}$     39.  $x = \frac{5}{6}$     41.  $n = -\frac{2}{3}$     43.  $y = 3.5$     45.  $x = 2.45$   
 47.  $y = 1$     49.  $x = 4$     51.  $m = -1$     53.  $b = 1$     55.  $x = -1$     57.  $y = 2$     59.  $x = -4$     61.  $n = -6$   
 63.  $x = \frac{5}{6}$     65.  $a = -\frac{7}{10}$     67.  $x = \frac{1}{4}$     69.  $x = 5$     71.  $x = \frac{20}{3}$     73.  $x = 2$     75.  $y = 2.5$

## Page 106

1. The fulcrum is 12 ft from the 26-pound force.    3. A 400-pound force must be applied to the other end.    5. The break-even point is 200 power saws.    7. The break-even point is 40 popcorn poppers.    9. To break even, 250 cassettes must be sold.

## SECTION 4

## Pages 107–110

**Example 2**The unknown number:  $n$ 

four less than one third of a number	equals	five minus two thirds of the number
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$$\frac{1}{3}x - 4 = 5 - \frac{2}{3}x$$

$$\frac{1}{3}x + \frac{2}{3}x - 4 = 5 - \frac{2}{3}x + \frac{2}{3}x$$

$$x - 4 = 5$$

$$x - 4 + 4 = 5 + 4$$

$$x = 9$$

The number is 9.

**Example 4**The unknown number:  $n$ 

two times the difference between a number and eight	is equal to	the sum of six times the number and eight
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$$2(n - 8) = 6n + 8$$

$$2n - 16 = 6n + 8$$

$$2n + (-6n) - 16 = 6n + (-6n) + 8$$

$$-4n - 16 = 8$$

$$-4n - 16 + 16 = 8 + 16$$

$$-4n = 24$$

$$-\frac{1}{4}(-4n) = -\frac{1}{4}(24)$$

$$n = -6$$

The number is  $-6$ .**Example 6**The smaller number:  $n$ The larger number:  $12 - n$ 

the total of three times the smaller and six	amounts to	seven less than the product of four and the larger
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$$3n + 6 = 4(12 - n) - 7$$

$$3n + 6 = 48 - 4n - 7$$

$$3n + 6 = 41 - 4n$$

$$3n + 4n + 6 = 41 - 4n + 4n$$

$$7n + 6 = 41$$

$$7n + 6 + (-6) = 41 + (-6)$$

$$7n = 35$$

$$\frac{1}{7} \cdot 7n = \frac{1}{7} \cdot 35$$

$$n = 5$$

$$12 - n = 12 - 5 = 7$$

The smaller number is 5.

The larger number is 7.

**Example 8**

**Strategy** To find the number of carbon atoms in a butane molecule, write and solve an equation using  $c$  to represent the number of carbon atoms in a butane molecule.

**Solution**

8	is	twice the number of carbon atoms in a butane molecule
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$$8 = 2c$$

$$\frac{1}{2} \cdot 8 = \frac{1}{2} \cdot 2c$$

$$4 = c$$

There are 4 carbon atoms in a butane molecule.

**Example 12**

**Strategy** To find the length of the wire which produces an A note, write and solve an equation using  $A$  to represent the length of the wire.

**Solution**

10	is	6 in. less than $\frac{1}{2}$ the length of the wire
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$$10 = \frac{1}{2}A - 6$$

$$10 + 6 = \frac{1}{2}A - 6 + 6$$

$$16 = \frac{1}{2}A$$

$$2 \cdot 16 = 2 \cdot \frac{1}{2}A$$

$$32 = A$$

The length of the wire which produces an A note is 32 in.

**Example 10**

**Strategy** To find the Fahrenheit temperature, write and solve an equation using  $F$  to represent the Fahrenheit temperature.

**Solution**

20	is	$\frac{5}{9}$ of the difference between the Fahrenheit temperature and 32
----	----	---

$$20 = \frac{5}{9}(F - 32)$$

$$20 = \frac{5}{9}F - \frac{160}{9}$$

$$20 + \frac{160}{9} = \frac{5}{9}F - \frac{160}{9} + \frac{160}{9}$$

$$\frac{340}{9} = \frac{5}{9}F$$

$$\frac{9}{5} \cdot \frac{340}{9} = \frac{9}{5} \cdot \frac{5}{9}F$$

$$68 = F$$

The Fahrenheit temperature is  $68^\circ$ .

**Example 14**

**Strategy** To find the number of color TV's made each day, write and solve an equation, using  $x$  to represent the number of color TV's and  $140 - x$  to represent the number of black and white TV's.

**Solution**

three times the number of black and white TV's	equals	20 less than the number of color TV's
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$$3(140 - x) = x - 20$$

$$420 - 3x = x - 20$$

$$420 - 3x + (-x) = x + (-x) - 20$$

$$420 - 4x = -20$$

$$420 + (-420) - 4x = -20 + (-420)$$

$$-4x = -440$$

$$-\frac{1}{4}(-4x) = -\frac{1}{4}(-440)$$

$$x = 110$$

There are 110 color TV's made each day.

## Pages 111–112

1.  $x + 12 = 10$ ;  $x = -2$

3.  $\frac{2}{3}x = 6$ ;  $x = 9$

5.  $3(x + 4) = 15$ ;  $x = 1$

7.  $12 - 5x = 7$ ;  $x = 1$

9.  $3x + x = 12$ ;  $x = 3$

11.  $2x + (x + 3) = 15$ ;  $x = 4$

13.  $15 = 4x - 1$ ;  $x = 4$

15.  $3(x + 2) = 15$ ;  $x = 3$

17.  $4x = 2x + 10$ ;  $x = 5$

19.  $x + 4 = 3x - 8$ ;  $x = 6$

21.  $4(3x - 1) = 2x + 6$ ;  $x = 1$

23.  $2(25 - x) = 3x$ ;  $x = 10$ ;  $25 - x = 15$

25.  $3x + 1 = 2(10 - x) - 4$ ;  $x = 3$ ;  $10 - x = 7$

27.  $(16 - x) + 12 = 4x + 3$ ;  $x = 5$ ;  $16 - x = 11$

## Pages 113–114

1.  $52 = x + 23$ . The cost is \$29.    3.  $3600 = \frac{3}{5}x$ . The original value was \$6000.    5.  $36,000 = x + 3x$ . \$9000 was spent for radio advertising and \$27,000 was spent for television advertising.    7.  $2100 = 2x + x$ . During the holiday season, 1400 part-time employees are employed.    9.  $20 = x + x + 2x$ . There are 5 oxygen atoms, 5 carbon atoms, and 10 hydrogen atoms.    11.  $9536 = 48x + 600$ . The monthly payment is \$186.17.    13.  $570 = 3x + 30$ . The pressure is 180 lb/in.<sup>2</sup>    15.  $2000 = 2x - 400$ . The drive shaft speed is 1200 rpm.    17.  $155 = 80 + 25x$ . There were 3 h of labor.    19.  $180 = 90 + 2x + x$ . The second and third angles measure 30° and 60°.    21.  $3(42 - x) = 4x$ . The pieces measure 18 in. and 24 in.    23.  $3x = 2(12 - x) + 1$ . The pieces measure 5 ft and 7 ft.

## REVIEW/TESTS

## Pages 115–116

- 1.1a No    1.1b Yes    1.2  $x = -5$     1.3  $x = -12$     2.1a  $x = -3$     2.1b  $x = 5$     2.2 200 calculators were produced.    3.1a  $x = -5$     3.1b  $x = -\frac{1}{2}$     3.2a  $x = -\frac{1}{3}$     3.2b  $x = \frac{12}{11}$     3.3 The final temperature is 60°C.  
 4.1a  $3x - 15 = 27$ ;  $x = 14$     4.1b  $5x + 6 = 3(x + 12)$ ;  $x = 15$     4.1c 8 and 10    4.2a The time is 7 h.  
 4.2b The pieces measured 6 ft and 12 ft.

## Pages 117–118

- 1.1a b    1.1b d    1.2 d    1.3 d    2.1a b    2.1b a    2.2 b    3.1a d    3.1b b    3.2a d    3.2b b  
 3.3 c    4.1a b    4.1b a    4.1c a    4.2a d    4.2b b