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CHAPTER

# Equations and Inequalities

## Lesson 8.1 Solving Algebraic Equations

**Evaluate each expression for the given value of the variable.**

**1.** $x + 4$ when $x = 3$

**2.** $y - 6$ when $y = 10$

**3.** $3x + 4$ when $x = 5$

**4.** $5y - 6$ when $y = 4$

**5.** $\frac{5y}{4}$ when $y = 8$

**6.** $\frac{4k}{3} + 5$ when $k = 6$

**Solve each equation using the substitution method.**

*Example*

$x + 6 = 10$

If $x = 2$, $x + 6 =$ 2 $+ 6$

$=$ 8 $\neq$ 10

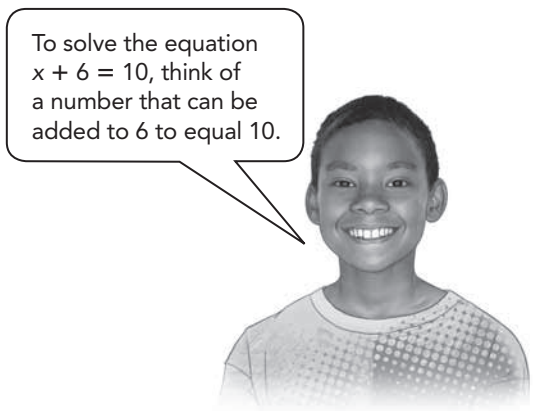
If $x = 3$, $x + 6 =$ 3 $+ 6$

$=$ 9 $\neq$ 10

If $x = 4$, $x + 6 =$ 4 $+ 6$

$=$ 10 $=$ 10

$x =$ 4 is the solution of the equation $x + 6 = 10$.



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**7.** $x + 8 = 15$

If $x = 5$, $x + 8 =$ _____ $+ 8$

$=$ _____ ☐ 15

If $x = 6$, $x + 8 =$ _____ $+ 8$

$=$ _____ ☐ 15

If $x =$ _____, $x + 8 =$ _____ $+ 8$

$=$ _____ ☐ 15

$x =$ _____ is the solution of the equation $x + 8 = 15$.

**8.** $m - 7 = 12$

If $m = 17$, $m - 7 =$ _____ $- 7$

$=$ _____ $- 7$ ☐ 12

If $m = 18$, $m - 7 =$ _____ $- 7$

$=$ _____ $- 7$ ☐ 12

If $m =$ _____, $m - 7 =$ _____ $- 7$

$=$ _____ $- 7$ ☐ 12

$m =$ _____ is the solution of the equation $m - 7 = 12$.

**9.** $a + 3 = 11$

**10.** $g - 4 = 5$

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**11.** $b + 7 = 12$

**12.** $h + 10 = 18$

**13.** $k - 9 = 7$

**14.** $p - 15 = 3$

**Solve each equation using the substitution method.**

*Example*

$4p = 16$

If $p = 2$, $4p = 4 \cdot$ 2

$=$ 8 ≠ 16

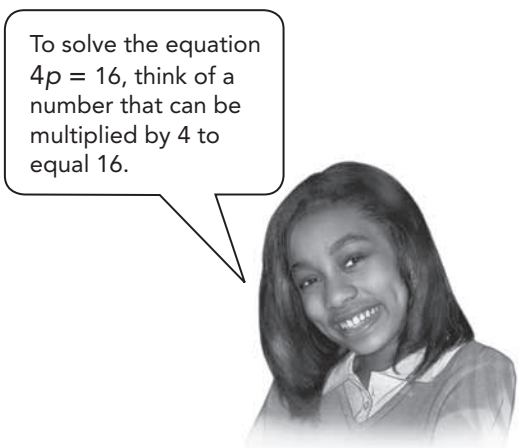
If $p = 3$, $4p = 4 \cdot$ 3

$=$ 12 ≠ 16

If $p = 4$, $4p = 4 \cdot$ 4

$=$ 16 = 16

$p =$ 4 is the solution of the equation $4p = 16$.



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**15.** $6p = 30$

If $p = 3$, $6p = 6 \cdot$ _____

= _____ ☐ 30

If $p = 4$, $6p = 6 \cdot$ _____

= _____ ☐ 30

If $p =$ _____, $6p = 6 \cdot$ _____

= _____ ☐ 30

$p =$ _____ is the solution of the equation $6p = 30$.

**16.** $\frac{1}{4}w = 3$

If $w = 10$, $\frac{1}{4}w = \frac{1}{4} \cdot$ _____

= _____ ☐ 3

If $w = 11$, $\frac{1}{4}w = \frac{1}{4} \cdot$ _____

= _____ ☐ 3

If $w =$ _____, $\frac{1}{4}w = \frac{1}{4} \cdot$ _____

= _____ ☐ 3

$w =$ _____ is the solution of the equation $\frac{1}{4}w = 3$·

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**17.** $3g = 21$

**18.** $8z = 56$

**19.** $\frac{1}{2}b = 9$

**20.** $\frac{1}{3}k = 10$

**Solve each equation using the concept of balancing.**

*Example*

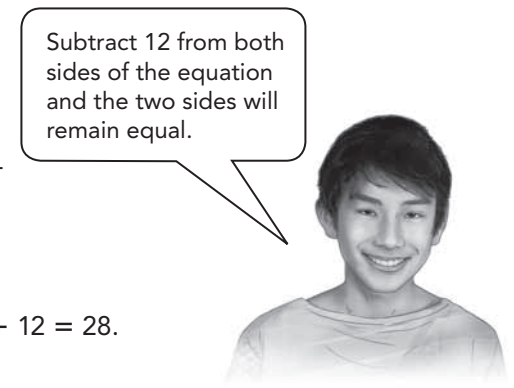
$x + 12 = 28$

$x + 12 = 28$

$x + 12$ (−) 12 $= 28$ (−) 12

$x =$ 16

$x =$ 16 is the solution of the equation $x + 12 = 28$.




**21.** $a + 9 = 24$

$a + 9 = 24$

$a + 9 -$ _____ $= 24 -$ _____

$a =$ _____

$a =$ _____ is the solution of the equation $a + 9 = 24$.

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**22.** $c + 14 = 31$

$c + 14 = 31$

$c + 14$ ◯ _____ $= 31$ ◯ _____

$c =$ _____

$c =$ _____ is the solution of the equation $c + 14 = 31$.

**23.** $w + 15 = 32$

**24.** $g + 16 = 37$

**25.** $75 = p + 29$

**26.** $83 = s + 46$

**Solve each equation using the concept of balancing.**

*Example*

$w - 9 = 17$

$w - 9 = 17$

$w - 9$ (+) 9 $= 17$ (+) 9

$w = 26$

$w =$ 26 is the solution of the equation $w - 9 = 17$.

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**27.** $w - 8 = 25$

$w - 8 = 25$

$w - 8 +$ _____ $= 25 +$ _____

$w =$ _____

$w =$ _____ is the solution of the equation $w - 8 = 25$.

**28.** $k - 13 = 8$

$k - 13 = 8$

$k - 13$ ◯ _____ $= 8$ ◯ _____

$k =$ _____

$k =$ _____ is the solution of the equation $k - 13 = 8$.

**29.** $b - 13 = 21$

**30.** $37 = d - 18$

**31.** $m - 15 = 9$

**32.** $11 = y - 29$

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**Solve each equation using the concept of balancing.**

*Example*

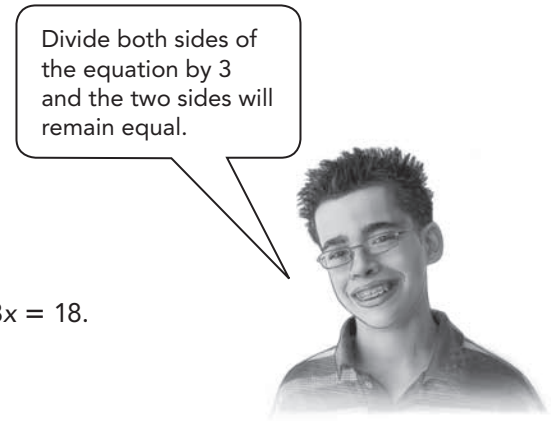
$3x = 18$

$3x = 18$

$3x \div 3 = 18 \div 3$

$x = 6$

$x = 6$ is the solution of the equation $3x = 18$.




**33.** $7x = 42$

$7x = 42$

$7x \div$ _____ $= 42 \div$ _____

$x =$ _____

$x =$ _____ is the solution of the equation $7x = 42$.

**34.** $5p = 30$

$5p = 30$

$5p \bigcirc$ _____ $= 30 \bigcirc$ _____

$p =$ _____

$p =$ _____ is the solution of the equation $5p = 30$.

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**35.** $7m = 49$

**36.** $9w = 108$

**37.** $6n = 48$

**38.** $11e = 77$

**Solve each equation using the concept of balancing.**

*Example*

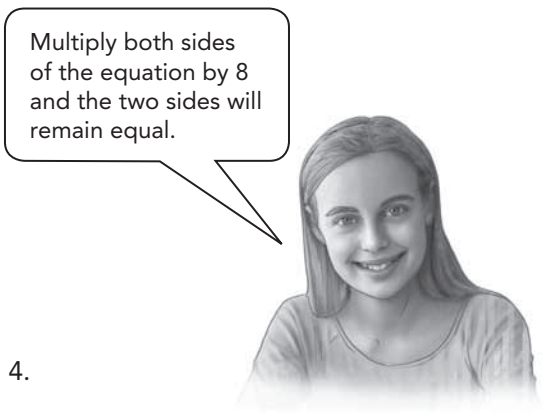
$\frac{x}{8} = 4$

$\frac{x}{8} = 4$

$\frac{x}{8} \cdot \underline{8} = 4 \cdot \underline{8}$

$x = \underline{32}$

$x = \underline{32}$ is the solution of the equation $\frac{x}{8} = 4$.



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**39.** $\frac{w}{9} = 6$

$\frac{w}{9} = 6$

$\frac{w}{9} \cdot$ _____ $= 6 \cdot$ _____

$w =$ _____

$w =$ _____ is the solution of the equation $\frac{w}{9} = 6$.

**40.** $\frac{y}{4} = 9$

$\frac{y}{4} = 9$

$\frac{y}{4}$ ◯ _____ $= 9$ ◯ _____

$y =$ _____

$y =$ _____ is the solution of the equation $\frac{y}{4} = 9$.

**41.** $\frac{m}{9} = 3$

**42.** $\frac{h}{7} = 10$

**43.** $5 = \frac{b}{8}$

**44.** $7 = \frac{s}{9}$

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**Solve each equation using the concept of balancing. Write your answer in simplest form.**

*Example*

$x + \frac{1}{6} = \frac{5}{6}$

$x + \frac{1}{6} = \frac{5}{6}$

$x + \frac{1}{6} - \frac{1}{6} = \frac{5}{6} - \frac{1}{6}$

$x = \frac{4}{6}$

$= \frac{2}{3}$

Subtract $\frac{1}{6}$ from both sides of the equation and the two sides will remain equal. Then simplify.

$x = \frac{2}{3}$ is the solution of the equation $x + \frac{1}{6} = \frac{5}{6}$.

**45.** $x + \frac{3}{8} = \frac{7}{8}$

$x + \frac{3}{8} = \frac{7}{8}$

$x + \frac{3}{8} - \_\_\_\_\_ = \frac{7}{8} - \_\_\_\_\_$

$x = \_\_\_\_\_$

$= \_\_\_\_\_$

$x = \_\_\_\_\_$ is the solution of the equation $x + \frac{3}{8} = \frac{7}{8}$.

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**46.** $e + \frac{2}{10} = \frac{7}{10}$

$e + \frac{2}{10} = \frac{7}{10}$

$e + \frac{2}{10}$ ◯ _____ $= \frac{7}{10}$ ◯ _____

$e =$ _____

$e =$ _____

$e =$ _____ is the solution of the equation $e + \frac{2}{10} = \frac{7}{10}$.

**47.** $k + \frac{4}{9} = \frac{7}{9}$

**48.** $\frac{11}{12} = p + \frac{2}{12}$

**Solve each equation using the concept of balancing. Write your answer in simplest form.**

*Example*

$x - \frac{2}{9} = \frac{1}{9}$

$x - \frac{2}{9} = \frac{1}{9}$

$x - \frac{2}{9} + \frac{2}{9} = \frac{1}{9} + \frac{2}{9}$

$x = \frac{3}{9}$

$= \frac{1}{3}$

Add $\frac{2}{9}$ to both sides of the equation and the two sides will remain equal. Then simplify.

$x = \frac{1}{3}$ is the solution of the equation $x - \frac{2}{9} = \frac{1}{9}$.

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**49.** $g - \frac{1}{6} = \frac{1}{6}$

$g - \frac{1}{6} = \frac{1}{6}$

$g - \frac{1}{6} + \_\_\_\_\_ = \frac{1}{6} + \_\_\_\_\_$

$g = \_\_\_\_\_$

$= \_\_\_\_\_$

$g = \_\_\_\_\_$ is the solution of the equation $g - \frac{1}{6} = \frac{1}{6}$.

**50.** $d - \frac{7}{15} = \frac{2}{15}$

$d - \frac{7}{15} = \frac{2}{15}$

$d - \frac{7}{15} \bigcirc \_\_\_\_\_ = \frac{2}{15} \bigcirc \_\_\_\_\_$

$d = \_\_\_\_\_$

$= \_\_\_\_\_$

$d = \_\_\_\_\_$ is the solution of the equation $d - \frac{7}{15} = \frac{2}{15}$.

**51.** $w - \frac{1}{8} = \frac{5}{8}$

**52.** $\frac{7}{10} = n - \frac{1}{10}$

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**Solve each equation using the concept of balancing. Write your answer in simplest form.**

*Example*

$5x = \frac{2}{5}$

$5x = \frac{2}{5}$

$5x \div \underline{5} = \frac{2}{5} \div \underline{5}$

$x = \frac{2}{5} \cdot \underline{\frac{1}{5}}$

$= \underline{\frac{2}{25}}$

$x = \underline{\frac{2}{25}}$ is the solution of the equation $5x = \frac{2}{5}$.


**53.** $7x = \frac{4}{7}$

$7x = \frac{4}{7}$

$7x \div \_\_\_\_\_ = \frac{4}{7} \div \_\_\_\_\_$

$x = \frac{4}{7} \cdot \_\_\_\_\_$

$= \_\_\_\_\_$

$x = \_\_\_\_\_$ is the solution of the equation $7x = \frac{4}{7}$.

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**54.** $9m = \frac{5}{6}$

$9m = \frac{5}{6}$

$9m$ ◯ _____ $= \frac{5}{6}$ ◯ _____

$m = \frac{5}{6}$ ◯ _____

$=$ _____

$m =$ _____ is the solution of the equation $9m = \frac{5}{6}$.

**55.** $3b = \frac{2}{7}$

**56.** $4s = \frac{8}{9}$

**57.** $\frac{3}{4} = 9y$

**58.** $\frac{4}{5} = 6x$

**59.** $8v = \frac{6}{7}$

**60.** $\frac{10}{11} = 5w$

# Answers

## Chapter 8

### Lesson 8.1

**1.** 7 **2.** 4

**3.** 19 **4.** 14

**5.** 10 **6.** 13

**7.** If $x = 5$, $x + 8 = \underline{5} + 8$

$= \underline{13}$ (≠) $\underline{15}$

If $x = 6$, $x + 8 = \underline{6} + 8$

$= \underline{14}$ (≠) $\underline{15}$

If $x = \underline{7}$, $x + 8 = \underline{7} + 8$

$= \underline{15}$ (=) $\underline{15}$

$x = \underline{7}$ is the solution of the equation $x + 8 = 15$.

**8.** If $m = 17$, $m - 7 = \underline{17} - 7$

$= \underline{10}$ (≠) $\underline{12}$

If $m = 18$, $m - 7 = \underline{18} - 7$

$= \underline{11}$ (≠) $\underline{12}$

If $m = \underline{19}$, $m - 7 = \underline{19} - 7$

$= \underline{12}$ (=) $\underline{12}$

$m = \underline{19}$ is the solution of the equation $m - 7 = 12$.

**9.** $a = 7$ **10.** $g = 9$

**11.** $b = 5$ **12.** $h = 8$

**13.** $k = 16$ **14.** $p = 18$

**15.** If $p = 3$, $6p = 6 \cdot \underline{3}$

$= \underline{18}$ (≠) $\underline{30}$

If $p = 4$, $6p = \underline{6} \cdot 4$

$= \underline{24}$ (≠) $\underline{30}$

If $p = \underline{5}$, $6p = 6 \cdot \underline{5}$

$= \underline{30}$ (=) $\underline{30}$

$p = \underline{5}$ is the solution of the equation $6p = 30$.

**16.** If $w = 10$, $\frac{1}{4}w = \frac{1}{4} \cdot \underline{10}$

$= \frac{10}{4}$ or $2\frac{1}{2}$ (≠) $\underline{3}$

If $w = 11$, $\frac{1}{4}w = \frac{1}{4} \cdot \underline{11}$

$= \frac{11}{4}$ or $2\frac{3}{4}$ (≠) $\underline{3}$

If $w = \underline{12}$, $\frac{1}{4}w = \frac{1}{4} \cdot \underline{12}$

$= \frac{12}{4}$ or $\underline{3}$ (=) $\underline{3}$

$w = \underline{12}$ is the solution of the equation $\frac{1}{4}w = 3$.

**17.** $g = 7$ **18.** $z = 7$

**19.** $b = 18$ **20.** $k = 30$

**21.** $a + 9 = 24$

$a + 9 - \underline{9} = 24 - \underline{9}$

$a = \underline{15}$

$a = \underline{15}$ is the solution of the equation $a + 9 = 24$.

**22.** $c + 14 = 31$

$c + 14$ (−) $\underline{14} = 31$ (−) $\underline{14}$

$c = 17$

$c = \underline{17}$ is the solution of the equation $c + 14 = 31$.

**23.** $w = 17$ **24.** $g = 21$

**25.** $p = 46$ **26.** $s = 37$

**27.** $w - 8 = 25$

$w - 8 + \underline{8} = 25 + \underline{8}$

$w = \underline{33}$

$w = \underline{33}$ is the solution of the equation $w - 8 = 25$.

**28.** $k - 13 = 8$

$k - 13$ (+) $\underline{13} = 8$ (+) $\underline{13}$

$k = \underline{21}$

$k = \underline{21}$ is the solution of the equation $k - 13 = 8$.

**29.** $b = 34$ **30.** $d = 55$

**31.** $m = 24$ **32.** $y = 40$

**33.** $7x = 42$

$7x \div \underline{7} = 42 \div \underline{7}$

$x = \underline{6}$

$x = \underline{6}$ is the solution of the equation $7x = 42$.

**34.** $5p = 30$

$5p$ (÷) $\underline{5} = 30$ (÷) $\underline{5}$

$p = \underline{6}$

$p = \underline{6}$ is the solution of the equation $5p = 30$.

**35.** $m = 7$ **36.** $w = 12$

**37.** $n = 8$ **38.** $e = 7$

**39.** $\frac{w}{9} = 6$

$\frac{w}{9} \cdot \underline{9} = 6 \cdot \underline{9}$

$w = \underline{54}$

$w = \underline{54}$ is the solution of the equation $\frac{w}{9} = 6$.

**40.** $\frac{y}{4} = 9$

$\frac{y}{4}$ (·) $\underline{4} = 9$ (·) $\underline{4}$

$y = \underline{36}$

$y = \underline{36}$ is the solution of the equation $\frac{y}{4} = 9$.

**41.** $m = 27$ **42.** $h = 70$

**43.** $b = 40$ **44.** $s = 63$

**45.** $x + \frac{3}{8} = \frac{7}{8}$

$x + \frac{3}{8} - \underline{\frac{3}{8}} = \frac{7}{8} - \underline{\frac{3}{8}}$

$x = \underline{\frac{4}{8}}$

$= \underline{\frac{1}{2}}$

$x = \underline{\frac{1}{2}}$ is the solution of the equation $x + \frac{3}{8} = \frac{7}{8}$.

**46.** $e + \frac{2}{10} = \frac{7}{10}$

$e + \frac{2}{10} \ominus \underline{\frac{2}{10}} = \frac{7}{10} \ominus \underline{\frac{2}{10}}$

$e = \underline{\frac{5}{10}}$

$= \underline{\frac{1}{2}}$

$e = \underline{\frac{1}{2}}$ is the solution of the equation $e + \frac{2}{10} = \frac{7}{10}$.

**47.** $k = \frac{1}{3}$ **48.** $p = \frac{3}{4}$

**49.** $g - \frac{1}{6} = \frac{1}{6}$

$g - \frac{1}{6} + \underline{\frac{1}{6}} = \frac{1}{6} + \underline{\frac{1}{6}}$

$g = \underline{\frac{2}{6}}$

$= \underline{\frac{1}{3}}$

$g = \underline{\frac{1}{3}}$ is the solution of the equation $g - \frac{1}{6} = \frac{1}{6}$.

**50.** $d - \frac{7}{15} = \frac{2}{15}$

$d - \frac{7}{15} \oplus \underline{\frac{7}{15}} = \frac{2}{15} \oplus \underline{\frac{7}{15}}$

$d = \underline{\frac{9}{15}}$

$= \underline{\frac{3}{5}}$

$d = \underline{\frac{3}{5}}$ is the solution of the equation $d - \frac{7}{15} = \frac{2}{15}$.

**51.** $w = \underline{\frac{3}{4}}$ **52.** $n = \underline{\frac{4}{5}}$

**53.** $7x = \frac{4}{7}$

$7x \div \underline{7} = \frac{4}{7} \div \underline{7}$

$x = \frac{4}{7} \cdot \underline{\frac{1}{7}}$

$= \underline{\frac{4}{49}}$

$x = \underline{\frac{4}{49}}$ is the solution of the equation $7x = \frac{4}{7}$.

**54.** $9m = \frac{5}{6}$

$9m \oslash \underline{9} = \frac{5}{6} \oslash \underline{9}$

$m = \frac{5}{6} \odot \underline{\frac{1}{9}}$

$= \underline{\frac{5}{54}}$

$m = \underline{\frac{5}{54}}$ is the solution of the equation $9m = \frac{5}{6}$.

**55.** $b = \frac{2}{21}$ **56.** $s = \frac{2}{9}$

**57.** $y = \frac{1}{12}$ **58.** $x = \frac{2}{15}$

**59.** $y = \frac{3}{28}$ **60.** $w = \frac{2}{11}$

## Lesson 8.2

**1.** $6 + u$ **2.** $9 - w$

**3.** $\frac{z}{8}$ **4.** $10s$

**5. a)** $x - 10$

**b)** $y = x - 10$

**c)** Independent: $x$
Dependent: $y$

**6. a)** $g + 6$

**b)** $h = g + 6$

**c)** Independent: $g$
Dependent: $h$

**7. a)** $(t + 35)$ dollars

**b)** $u = t + 35$

**c)** Independent: $t$
Dependent: $u$

**8. a)** $g - 8$

**b)** $v = g - 8$

**c)** Independent: $g$
Dependent: $v$

**9. a)** $4 \cdot d = 4d$

**b)** $g = 4d$

**c)** Independent: $d$
Dependent: $g$

**10. a)** $m \div 10 = \frac{m}{10}$

**b)** $w = \frac{m}{10}$

**c)** Independent: $m$
Dependent: $w$

**11. a)** $3n$ years

**b)** $s = 3n$

**c)** Independent: $n$
Dependent: $s$

**12. a)** $b \div 5 = \frac{b}{5}$ dollars

**b)** $k = \frac{b}{5}$

**c)** Independent: $b$
Dependent: $k$