

*Solutions Manual*

# *Algebra 1*

*An Incremental Development*

THIRD EDITION

SAXON

*Solutions Manual for*

# *Algebra 1*

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*An Incremental Development*

*Third Edition*

**John H. Saxon, Jr.**

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SAXON PUBLISHERS, INC.

***Algebra 1: An Incremental Development***  
***Third Edition***  
**Solutions Manual**

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## *Preface*

This manual contains solutions to every problem in the third edition of John Saxon's *Algebra 1* textbook. The solutions are designed to be representative of students' work, but please keep in mind that many problems will have more than one correct solution. We have attempted to stay as close as possible to the methods and procedures outlined in the textbook. Early solutions of problems of a particular type contain every step. Later solutions omit simpler steps. The final answers are set in boldface for ease of grading.

The following Saxon employees were instrumental in the development of this solutions manual, and we gratefully acknowledge their contributions: Edward Burr, Adriana Maxwell, Paul Kerr, and Erin McCain for working the solutions and proofreading the various revisions; Serena Freeberg and Letha Steinbron for typesetting the manual; Travis Southern for creating the graphics; and Emerson Mounger for producing the cover art.

We also thank teacher-consultant James Sellers for providing us with the initial draft of the solutions on which this manual is based.

## Problem Set 1

- $\frac{1}{5} + \frac{2}{5} = \frac{3}{5}$
- $\frac{3}{8} - \frac{2}{8} = \frac{1}{8}$
- $\frac{4}{3} - \frac{1}{3} + \frac{2}{3} = \frac{3}{3} + \frac{2}{3} = \frac{5}{3} = 1\frac{2}{3}$
- $\frac{1}{3} + \frac{1}{5} = \frac{5}{15} + \frac{3}{15} = \frac{8}{15}$
- $\frac{3}{8} - \frac{1}{5} = \frac{15}{40} - \frac{8}{40} = \frac{7}{40}$
- $\frac{2}{3} - \frac{1}{8} = \frac{16}{24} - \frac{3}{24} = \frac{13}{24}$
- $\frac{1}{13} + \frac{1}{5} = \frac{5}{65} + \frac{13}{65} = \frac{18}{65}$
- $\frac{14}{15} - \frac{2}{3} = \frac{14}{15} - \frac{10}{15} = \frac{4}{15}$
- $\frac{5}{9} + \frac{2}{5} = \frac{25}{45} + \frac{18}{45} = \frac{43}{45}$
- $\frac{14}{17} - \frac{6}{34} = \frac{28}{34} - \frac{6}{34} = \frac{22}{34} = \frac{11}{17}$
- $\frac{5}{13} + \frac{1}{26} = \frac{10}{26} + \frac{1}{26} = \frac{11}{26}$
- $\frac{4}{7} - \frac{2}{5} = \frac{20}{35} - \frac{14}{35} = \frac{6}{35}$
- $\frac{4}{7} + \frac{1}{8} + \frac{1}{2} = \frac{32}{56} + \frac{7}{56} + \frac{28}{56} = \frac{67}{56} = 1\frac{11}{56}$
- $\frac{3}{5} + \frac{1}{8} + \frac{1}{8} = \frac{24}{40} + \frac{5}{40} + \frac{5}{40} = \frac{34}{40} = \frac{17}{20}$
- $\frac{5}{11} - \frac{1}{6} + \frac{2}{3} = \frac{30}{66} - \frac{11}{66} + \frac{44}{66} = \frac{63}{66} = \frac{21}{22}$
- $2\frac{1}{2} + 3\frac{1}{5} = 2\frac{5}{10} + 3\frac{2}{10} = 5\frac{7}{10}$
- $7\frac{3}{8} + 6\frac{1}{3} = 7\frac{9}{24} + 6\frac{8}{24} = 13\frac{17}{24}$
- $1\frac{1}{8} + 7\frac{2}{5} = 1\frac{5}{40} + 7\frac{16}{40} = 8\frac{21}{40}$
- $15\frac{1}{3} - 7\frac{4}{5} = 15\frac{5}{15} - 7\frac{12}{15} = 14\frac{20}{15} - 7\frac{12}{15} = 7\frac{8}{15}$
- $42\frac{3}{8} - 21\frac{3}{4} = 42\frac{3}{8} - 21\frac{6}{8} = 41\frac{11}{8} - 21\frac{6}{8} = 20\frac{5}{8}$
- $22\frac{2}{5} - 13\frac{7}{15} = 22\frac{6}{15} - 13\frac{7}{15} = 21\frac{21}{15} - 13\frac{7}{15} = 8\frac{14}{15}$
- $42\frac{1}{11} - 18\frac{2}{3} = 42\frac{3}{33} - 18\frac{22}{33} = 41\frac{36}{33} - 18\frac{22}{33} = 23\frac{14}{33}$
- $78\frac{2}{5} - 14\frac{7}{10} = 78\frac{4}{10} - 14\frac{7}{10} = 77\frac{14}{10} - 14\frac{7}{10} = 63\frac{7}{10}$
- $43\frac{1}{13} - 6\frac{5}{8} = 43\frac{8}{104} - 6\frac{65}{104} = 42\frac{112}{104} - 6\frac{65}{104} = 36\frac{47}{104}$
- $21\frac{1}{5} - 15\frac{7}{13} = 21\frac{13}{65} - 15\frac{35}{65} = 20\frac{78}{65} - 15\frac{35}{65} = 5\frac{43}{65}$
- $21\frac{2}{19} - 7\frac{7}{10} = 21\frac{20}{190} - 7\frac{133}{190} = 20\frac{210}{190} - 7\frac{133}{190} = 13\frac{77}{190}$
- $43\frac{3}{17} - 21\frac{9}{10} = 43\frac{30}{170} - 21\frac{153}{170} = 42\frac{200}{170} - 21\frac{153}{170} = 21\frac{47}{170}$
- $7\frac{1}{8} + 5\frac{2}{7} = 7\frac{7}{56} + 5\frac{16}{56} = 12\frac{23}{56}$  units
- $42\frac{1}{7} - 24\frac{2}{11} = 42\frac{11}{77} - 24\frac{14}{77} = 41\frac{88}{77} - 24\frac{14}{77} = 17\frac{74}{77}$  units
- $12\frac{11}{16} - 3\frac{5}{8} = 12\frac{11}{16} - 3\frac{10}{16} = 9\frac{1}{16}$  units

## Practice 2

- a.  $x = 180 - 55 - 55 = 70$
- b. Since angles opposite sides of equal length have equal measure,  $x = 40$ .  
 $y = 180 - 40 - 40$   
 $y = 100$
- c. Since angles opposite sides of equal length have equal measure,  $x$  and  $y$  are equivalent.  
 $180 - 112 = 68$   
 $68 \div 2 = 34$   
 $x = 34; y = 34$

## Problem Set 2

- Right angles
- Straight angle
- An acute angle is an angle that is smaller than a right angle.
- An obtuse angle is an angle that is larger than a right angle, but smaller than a straight angle.
- (a)  $90^\circ$   
 (b)  $180^\circ$   
 (c)  $360^\circ$
- Equilateral polygons
- Equiangular polygons
- Regular polygons
- (a) A right triangle is a triangle that contains one right angle.  
 (b) An acute triangle is a triangle that contains three acute angles.  
 (c) An obtuse triangle is a triangle that contains one obtuse angle.  
 (d) An equiangular triangle is a triangle that contains three angles of equal measure.
- (a) An isosceles triangle is a triangle that has at least two sides of equal length.  
 (b) An equilateral triangle is a triangle that contains three sides of equal length.  
 (c) A scalene triangle is a triangle that contains three sides of unequal length.

11.  $x = 180 - 80 - 50 = 50$

12.  $y = 180 - 100 - 40 = 40$

13.  $\frac{1}{3} + \frac{4}{9} = \frac{3}{9} + \frac{4}{9} = \frac{7}{9}$

14.  $\frac{3}{5} + \frac{2}{7} = \frac{21}{35} + \frac{10}{35} = \frac{31}{35}$

15.  $\frac{3}{4} - \frac{5}{12} = \frac{9}{12} - \frac{5}{12} = \frac{4}{12} = \frac{1}{3}$

16.  $\frac{2}{3} + \frac{1}{15} = \frac{10}{15} + \frac{1}{15} = \frac{11}{15}$

17.  $\frac{9}{14} - \frac{1}{2} + \frac{3}{7} = \frac{9}{14} - \frac{7}{14} + \frac{6}{14}$   
 $= \frac{2}{14} + \frac{6}{14} = \frac{8}{14} = \frac{4}{7}$

18.  $5\frac{1}{3} + 1\frac{1}{6} = 5\frac{2}{6} + 1\frac{1}{6} = 6\frac{3}{6} = 6\frac{1}{2}$

19.  $3\frac{1}{8} + 4\frac{1}{2} = 3\frac{1}{8} + 4\frac{4}{8} = 7\frac{5}{8}$

20.  $5\frac{2}{5} + 7\frac{7}{10} = 5\frac{4}{10} + 7\frac{7}{10} = 12\frac{11}{10} = 13\frac{1}{10}$

21.  $9\frac{1}{3} + 3\frac{3}{5} = 9\frac{5}{15} + 3\frac{9}{15} = 12\frac{14}{15}$

22.  $9\frac{3}{5} + 5\frac{2}{3} = 9\frac{9}{15} + 5\frac{10}{15} = 14\frac{19}{15} = 15\frac{4}{15}$

23.  $23\frac{7}{10} - 14\frac{2}{5} = 23\frac{7}{10} - 14\frac{4}{10} = 9\frac{3}{10}$

24.  $22\frac{2}{5} - 14\frac{4}{15} = 22\frac{6}{15} - 14\frac{4}{15} = 8\frac{2}{15}$

25.  $8\frac{2}{5} - 5\frac{1}{3} = 8\frac{6}{15} - 5\frac{5}{15} = 3\frac{1}{15}$

26.  $4\frac{2}{3} - 1\frac{5}{6} = 4\frac{4}{6} - 1\frac{5}{6} = 3\frac{10}{6} - 1\frac{5}{6} = 2\frac{5}{6}$

27.  $14\frac{1}{2} - 12\frac{2}{3} = 14\frac{3}{6} - 12\frac{4}{6} = 13\frac{9}{6} - 12\frac{4}{6}$   
 $= 1\frac{5}{6}$

28.  $2\frac{1}{3} + 5\frac{2}{9} = 2\frac{2}{9} + 5\frac{2}{9} = 7\frac{5}{9}$  cm

$$29. 16\frac{3}{4} - 9\frac{7}{8} = 16\frac{6}{8} - 9\frac{7}{8} = 15\frac{14}{8} - 9\frac{7}{8} \\ = 6\frac{7}{8} \text{ m}$$

$$30. 10\frac{1}{5} - 4\frac{2}{3} = 10\frac{3}{15} - 4\frac{10}{15} = 9\frac{18}{15} - 4\frac{10}{15} \\ = 5\frac{8}{15} \text{ units}$$

### Practice 3

a.  $P = (10 + 5 + 10 + 5) \text{ cm} = 30 \text{ cm}$

b.  $l = 12 \text{ m} + 4 = 3 \text{ m}$

c.  $P = (5 + 2 + 2 + 6 + 2 + 4 + 5 + 12) \text{ km} \\ = 38 \text{ km}$

d.  $C = 2\pi r = 2\pi(5 \text{ in.}) = 10\pi \text{ in.} = 31.4 \text{ in.}$

e.  $P = \left(6 + 6 + 6 + \frac{2\pi(3)}{2}\right) \text{ ft} \\ = (18 + 3\pi) \text{ ft} = 27.42 \text{ ft}$

### Problem Set 3

1.  $180^\circ$

2. (a) Each angle measures  $60^\circ$ .

(b) Each angle measures  $60^\circ$ .

3. The angles opposite the sides of equal length have equal measures.

4. The sides opposite the angles of equal measure have equal lengths.

5. Parallelogram

6. Trapezoid

7.  $P = (12 + 8 + 12 + 8) \text{ in.} = 40 \text{ in.}$

8.  $l = 16 \text{ ft} + 4 = 4 \text{ ft}$

9.  $C = 2\pi r = 2\pi(6 \text{ cm}) = 12\pi \text{ cm} = 37.68 \text{ cm}$

10.  $C = \pi D = \pi(8 \text{ m}) = 8\pi \text{ m} = 25.12 \text{ m}$

11.  $P = (20 + 8 + 10 + 17 + 10 + 25) \text{ in.} \\ = 90 \text{ in.}$

12.  $P = (5 + 15 + 10 + 10 + 15 + 25) \text{ in.} \\ = 80 \text{ in.}$

13.  $P = \left(4 + 4 + 4 + \frac{2\pi(2)}{2}\right) \text{ in.} \\ = (12 + 2\pi) \text{ in.} = 18.28 \text{ in.}$

14.  $P = \left(10 + 6 + 10 + \frac{2\pi(3)}{2}\right) \text{ in.} \\ = (26 + 3\pi) \text{ in.} = 35.42 \text{ in.}$

15.  $x = 180 - 60 - 60 = 60$

16.  $y = 180 - 110 - 35 = 35$

17.  $\frac{1}{2} + \frac{5}{18} = \frac{9}{18} + \frac{5}{18} = \frac{14}{18} = \frac{7}{9}$

18.  $\frac{11}{12} - \frac{3}{4} = \frac{11}{12} - \frac{9}{12} = \frac{2}{12} = \frac{1}{6}$

19.  $\frac{8}{15} + \frac{2}{3} - \frac{1}{5} = \frac{8}{15} + \frac{10}{15} - \frac{3}{15} = \frac{15}{15} = 1$

20.  $5\frac{2}{3} + 1\frac{7}{12} = 5\frac{8}{12} + 1\frac{7}{12} = 6\frac{15}{12} = 7\frac{3}{12} \\ = 7\frac{1}{4}$

21.  $7\frac{5}{6} + 4\frac{1}{18} = 7\frac{15}{18} + 4\frac{1}{18} = 11\frac{16}{18} = 11\frac{8}{9}$

22.  $6\frac{3}{5} + 14\frac{9}{10} = 6\frac{6}{10} + 14\frac{9}{10} = 20\frac{15}{10} \\ = 21\frac{5}{10} = 21\frac{1}{2}$

23.  $4\frac{7}{8} + 3\frac{3}{16} = 4\frac{14}{16} + 3\frac{3}{16} = 7\frac{17}{16} = 8\frac{1}{16}$

24.  $5\frac{1}{8} + 8\frac{3}{7} = 5\frac{7}{56} + 8\frac{24}{56} = 13\frac{31}{56}$

25.  $4\frac{3}{5} - 3\frac{4}{15} = 4\frac{9}{15} - 3\frac{4}{15} = 1\frac{5}{15} = 1\frac{1}{3}$

26.  $15\frac{2}{3} - 4\frac{5}{11} = 15\frac{22}{33} - 4\frac{15}{33} = 11\frac{7}{33}$

27.  $7\frac{5}{6} - 6\frac{11}{12} = 7\frac{10}{12} - 6\frac{11}{12} = 6\frac{22}{12} - 6\frac{11}{12} \\ = \frac{11}{12}$

## Problem Set 4

$$28. 33\frac{5}{8} - 7\frac{11}{16} = 33\frac{10}{16} - 7\frac{11}{16} = 32\frac{26}{16} - 7\frac{11}{16} \\ = 25\frac{15}{16}$$

$$29. 14\frac{1}{3} + 12\frac{2}{5} = 14\frac{5}{15} + 12\frac{6}{15} = 26\frac{11}{15} \text{ ft}$$

$$30. 7\frac{2}{3} - 4\frac{1}{2} = 7\frac{4}{6} - 4\frac{3}{6} = 3\frac{1}{6} \text{ yd}$$

## Practice 4

$$a. 4\frac{1}{2} \times 2\frac{4}{5} = \frac{9}{2} \times \frac{14}{5} = \frac{63}{5} = 12\frac{3}{5}$$

$$b. 3\frac{1}{4} \div 1\frac{3}{8} = \frac{13}{4} \div \frac{11}{8} = \frac{13}{4} \times \frac{8}{11} = \frac{26}{11} \\ = 2\frac{4}{11}$$

$$c. \begin{array}{r} 47.123 \\ 8.416 \\ + 705.4 \\ \hline 760.939 \end{array}$$

$$d. \begin{array}{r} 800.62 \\ - 75.88 \\ \hline 724.74 \end{array}$$

$$e. \begin{array}{r} 47.05 \\ \times 6.42 \\ \hline 9410 \\ 18820 \\ 28230 \\ \hline 302.0610 \end{array}$$

$$f. \begin{array}{r} 100.7 \\ 4 \overline{)402.8} \\ \underline{4} \phantom{0} \\ 28 \\ \underline{28} \\ 0 \end{array}$$

$$g. 75 \text{ ft} \times \frac{12 \text{ in.}}{1 \text{ ft}} \times \frac{2.54 \text{ cm}}{1 \text{ in.}} = 75(12)(2.54) \text{ cm} \\ = 2286 \text{ cm}$$

$$h. 450 \text{ in.} \times \frac{1 \text{ ft}}{12 \text{ in.}} \times \frac{1 \text{ mi}}{5280 \text{ ft}} = \frac{450}{(12)(5280)} \text{ mi} \\ = 0.0071 \text{ mi}$$

## Problem Set 4

1. A number is an idea. A numeral is a symbol used to express the idea of a number.

2. (a) Decimal system

(b) The Hindus of India

(c) 0, 1, 2, 3, 4, 5, 6, 7, 8, 9

3. (a) 1, 2, 3, 4, 5, ...

(b) 1, 2, 3, 4, 5, ...

4. A positive real number is any number that can be used to describe a physical distance greater than zero.

5. (a) A rectangle is a parallelogram with four right angles.

(b) A rhombus is an equilateral parallelogram.

(c) A square is a rhombus with four right angles.

(d) Yes

$$6. 20 \text{ in.} \times \frac{2.54 \text{ cm}}{1 \text{ in.}} = 20(2.54) \text{ cm} = 50.8 \text{ cm}$$

$$7. 25 \text{ ft} \times \frac{12 \text{ in.}}{1 \text{ ft}} \times \frac{2.54 \text{ cm}}{1 \text{ in.}} = 25(12)(2.54) \text{ cm} \\ = 762 \text{ cm}$$

$$8. P = (16 + 9 + 16 + 9) \text{ cm} = 50 \text{ cm}$$

$$9. l = 24 \text{ m} + 4 = 6 \text{ m}$$

$$10. C = 2\pi r = 2\pi(8 \text{ in.}) = 16\pi \text{ in.} = 50.24 \text{ in.}$$

$$11. C = \pi D = \pi(10 \text{ ft}) = 10\pi \text{ ft} = 31.4 \text{ ft}$$

$$12. P = (15 + 4 + 6 + 8 + 9 + 12) \text{ cm} = 54 \text{ cm}$$

$$13. P = (25 + 30 + 12 + 22 + 13 + 8) \text{ cm} \\ = 110 \text{ cm}$$

$$14. P = \left( 8 + 8 + 8 + \frac{2\pi(4)}{2} \right) \text{ cm} \\ = (24 + 4\pi) \text{ cm} = 36.56 \text{ cm}$$

$$15. P = \left( 7 + 10 + 7 + \frac{2\pi(5)}{2} \right) \text{ cm} \\ = (24 + 5\pi) \text{ cm} = 39.7 \text{ cm}$$

$$16. x = 180 - 70 - 55 = 55$$



$$17. \frac{17}{24} - \frac{1}{4} - \frac{1}{8} = \frac{17}{24} - \frac{6}{24} - \frac{3}{24}$$

$$= \frac{11}{24} - \frac{3}{24} = \frac{8}{24} = \frac{1}{3}$$

$$18. 8\frac{1}{4} + 5\frac{3}{8} = 8\frac{2}{8} + 5\frac{3}{8} = 13\frac{5}{8}$$

$$19. 8\frac{1}{4} - 5\frac{3}{8} = 8\frac{2}{8} - 5\frac{3}{8} = 7\frac{10}{8} - 5\frac{3}{8} = 2\frac{7}{8}$$

$$20. 95\frac{1}{8} - 4\frac{13}{16} = 95\frac{2}{16} - 4\frac{13}{16} = 94\frac{18}{16} - 4\frac{13}{16}$$

$$= 90\frac{5}{16}$$

$$21. \frac{4}{3} \times \frac{7}{2} \times \frac{9}{5} = \frac{42}{5} = 8\frac{2}{5}$$

$$22. 4\frac{1}{2} \times 6\frac{2}{3} = \frac{9}{2} \times \frac{20}{3} = 30$$

$$23. 4\frac{1}{2} \div 6\frac{2}{3} = \frac{9}{2} \div \frac{20}{3} = \frac{9}{2} \times \frac{3}{20} = \frac{27}{40}$$

$$24. \frac{14\frac{2}{3}}{3\frac{1}{4}} = \frac{44}{3} \div \frac{13}{4} = \frac{44}{3} \times \frac{4}{13} = \frac{176}{39}$$

$$= 4\frac{20}{39}$$

$$25. \begin{array}{r} 6.0018 \\ + 0.03121 \\ \hline 6.03301 \end{array}$$

$$26. \begin{array}{r} 8.0146 \\ - 0.03251 \\ \hline 7.98209 \end{array}$$

$$27. \begin{array}{r} 16.04 \\ \times 3.46 \\ \hline 9624 \\ 6416 \\ 4812 \\ \hline 55.4984 \end{array}$$

$$28. \begin{array}{r} 44 \\ 123 \overline{)5412} \\ \underline{492} \\ 492 \\ \underline{492} \\ 0 \end{array}$$

$$29. 3\frac{1}{2} + 10\frac{3}{8} = 3\frac{4}{8} + 10\frac{3}{8} = 13\frac{7}{8} \text{ m}$$

$$30. 15\frac{2}{3} - 10\frac{1}{6} = 15\frac{4}{6} - 10\frac{1}{6} = 5\frac{3}{6} = 5\frac{1}{2} \text{ km}$$

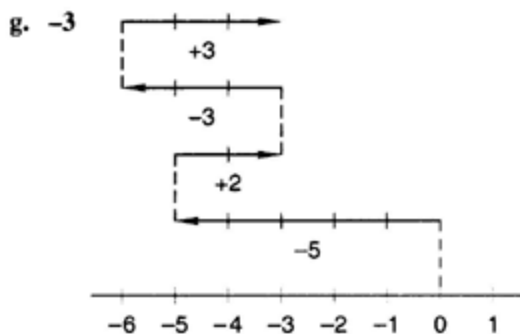
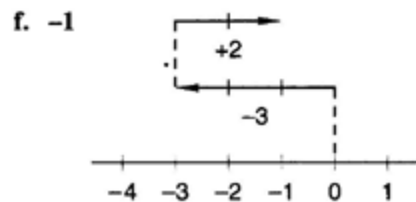
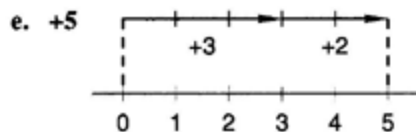
## Practice 5

a.  $|-4| = 4$

b.  $|4.2| = 4.2$

c.  $-|10 - 6| = -|4| = -4$

d.  $-|-14 + 6| = -|-8| = -8$



## Problem Set 5

- (a)  $\{1, 2, 3, 4, 5, \dots\}$   
 (b)  $\{0, 1, 2, 3, 4, 5, \dots\}$   
 (c)  $\{\dots, -3, -2, -1, 0, 1, 2, 3, \dots\}$

## 2. Origin

- (a) A dot on the number line that represents the location of the number  
 (b) The number that the point represents  
 (c) The greater number is further to the right-hand side on the number line.

4.  $|-8| = 8$

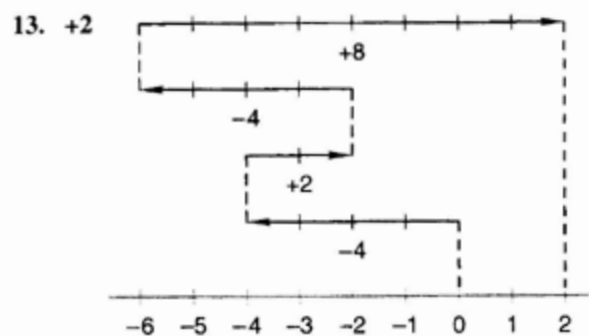
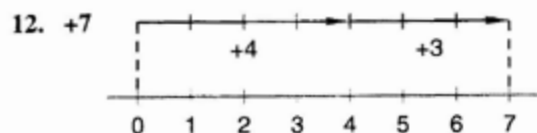
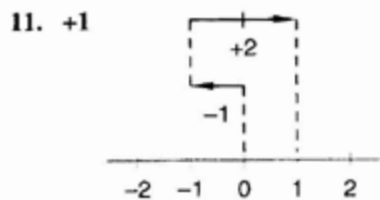
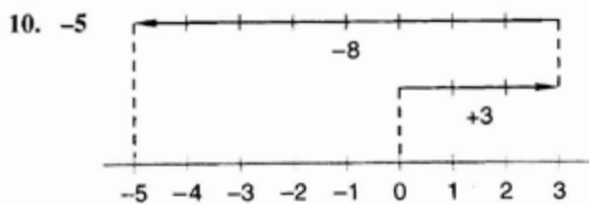
5.  $|+8| = 8$

6.  $|-12| = 12$

7.  $-|15 - 5| = -|10| = -10$

8.  $-|-15 + 5| = -|-10| = -10$

9.  $|12 - 30| = |-18| = 18$



14.  $28 \text{ cm} \times \frac{1 \text{ in.}}{2.54 \text{ cm}} = \frac{28}{2.54} \text{ in.} = 11.02 \text{ in.}$

15.  $42 \text{ cm} \times \frac{1 \text{ in.}}{2.54 \text{ cm}} \times \frac{1 \text{ ft}}{12 \text{ in.}} = \frac{42}{(2.54)(12)} \text{ ft} = 1.38 \text{ ft}$

16.  $P = (22 + 13 + 22 + 13) \text{ in.} = 70 \text{ in.}$

17.  $C = 2\pi r = 2\pi(10 \text{ ft}) = 20\pi \text{ ft} = 62.8 \text{ ft}$

18.  $P = (10 + 18 + 15 + 4 + 5 + 14) \text{ yd} = 66 \text{ yd}$

19.  $P = \left(12 + 12 + 12 + \frac{2\pi(6)}{2}\right) \text{ yd} = (36 + 6\pi) \text{ yd} = 54.84 \text{ yd}$

20.  $y = 180 - 120 - 30 = 30$

21.  $6\frac{2}{3} + 7\frac{4}{9} = 6\frac{6}{9} + 7\frac{4}{9} = 13\frac{10}{9} = 14\frac{1}{9}$

22.  $95\frac{1}{8} - 4\frac{13}{16} = 95\frac{2}{16} - 4\frac{13}{16} = 94\frac{18}{16} - 4\frac{13}{16} = 90\frac{5}{16}$

23.  $4\frac{1}{2} \times 2\frac{2}{3} = \frac{9}{2} \times \frac{8}{3} = 12$

24.  $4\frac{1}{2} + 7\frac{3}{8} = \frac{9}{2} + \frac{59}{8} = \frac{9}{2} \times \frac{8}{59} = \frac{36}{59}$

25.  $\frac{7\frac{1}{8}}{4\frac{2}{5}} = \frac{57}{8} \div \frac{22}{5} = \frac{57}{8} \times \frac{5}{22} = \frac{285}{176} = 1\frac{109}{176}$

26. 
$$\begin{array}{r} 23.0106 \\ + 0.1094 \\ \hline 23.1200 \end{array}$$

27. 
$$\begin{array}{r} 48.2 \\ - 13.34 \\ \hline 34.86 \end{array}$$

28. 
$$\begin{array}{r} 8.08 \\ \times 0.120 \\ \hline 000 \\ 1616 \\ 808 \\ \hline 0.96960 \end{array}$$

29. 
$$\begin{array}{r} 4.003 \\ 212 \overline{)848.636} \\ \underline{848} \\ 636 \\ \underline{636} \\ 0 \end{array}$$

30.  $18\frac{2}{5} - 6\frac{1}{15} = 18\frac{6}{15} - 6\frac{1}{15} = 12\frac{5}{15} = 12\frac{1}{3} \text{ mi}$

## Practice 6

a.  $-5 - 2 + 7 - 6 = (-5) + (-2) + (+7) + (-6) = -6$

b.  $-4 - |-2| - 6 + (-5) = (-4) + (-2) + (-6) + (-5) = -17$

c.  $-|-8| - 3 + 5 - 11 = (-8) + (-3) + (+5) + (-11) = -17$

$$\begin{aligned} \text{d. } & -8 + |-6| - |5| - 7 \\ & = (-8) + (+6) + (-5) + (-7) = -14 \end{aligned}$$

### Problem Set 6

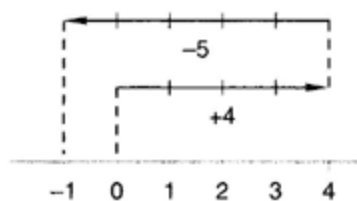
1. Add the absolute values of the numbers and give the result the same sign as that of the numbers.
2. Take the difference of the absolute values of the numbers and give it the sign of the number whose absolute value is greater.
3. Commutative property of addition
4. (a) Sum  
(b) Difference  
(c) Product  
(d) Quotient

$$5. |-5| = 5$$

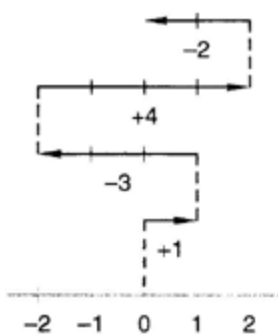
$$6. -|10 - 7| = -|3| = -3$$

$$7. |3 - 6| = |-3| = 3$$

8. -1



9. 0



$$10. 34 \text{ m} \times \frac{100 \text{ cm}}{1 \text{ m}} = 34(100) \text{ cm} = 3400 \text{ cm}$$

$$\begin{aligned} 11. 6 \text{ mi} \times \frac{5280 \text{ ft}}{1 \text{ mi}} \times \frac{12 \text{ in.}}{1 \text{ ft}} &= 6(5280)(12) \text{ in.} \\ &= 380,160 \text{ in.} \end{aligned}$$

$$12. l = 36 \text{ cm} \div 4 = 9 \text{ cm}$$

$$13. C = \pi D = \pi(14 \text{ m}) = 14\pi \text{ m} = 43.96 \text{ m}$$

$$14. (+3) + (-14) = -11$$

$$15. (-3) + (-14) = -17$$

$$\begin{aligned} 16. & (-5) + (4) + (-3) + (+8) \\ & = (-5) + (+4) + (-3) + (+8) = 4 \end{aligned}$$

$$\begin{aligned} 17. & (-3) + (+2) + (-2) + |-2| \\ & = (-3) + (+2) + (-2) + (+2) = -1 \end{aligned}$$

$$\begin{aligned} 18. & -2 + 11 - 4 + 3 - 8 \\ & = (-2) + (+11) + (-4) + (+3) + (-8) = 0 \end{aligned}$$

$$\begin{aligned} 19. & -5 - 11 + 20 - 14 + 5 \\ & = (-5) + (-11) + (+20) + (-14) + (+5) = -5 \end{aligned}$$

$$\begin{aligned} 20. & -4 - 3 + 2 - 4 - 3 - 8 \\ & = (-4) + (-3) + (+2) + (-4) + (-3) + (-8) \\ & = -20 \end{aligned}$$

$$\begin{aligned} 21. & 7 - 3 + 2 - 11 + 4 - 5 + 3 \\ & = (+7) + (-3) + (+2) + (-11) + (+4) \\ & \quad + (-5) + (+3) \\ & = -3 \end{aligned}$$

$$22. -7 + (-8) + 3 = (-7) + (-8) + (+3) = -12$$

$$\begin{aligned} 23. & -7 + (-3) + 4 - 3 + (-2) \\ & = (-7) + (-3) + (+4) + (-3) + (-2) = -11 \end{aligned}$$

$$\begin{aligned} 24. & -4 - 2 + (+8) + |-5| \\ & = (-4) + (-2) + (+8) + (+5) = 7 \end{aligned}$$

$$\begin{aligned} 25. & +|-2 - 3| - 4 + (-8) = +|-5| + (-4) + (-8) \\ & = (+5) + (-4) + (-8) = -7 \end{aligned}$$

$$26. P = (12 + 15 + 10 + 4 + 2 + 11) \text{ km} = 54 \text{ km}$$

$$\begin{aligned} 27. P &= \left( 20 + 10 + 20 + \frac{2\pi(5)}{2} \right) \text{ km} \\ &= (50 + 5\pi) \text{ km} = 65.7 \text{ km} \end{aligned}$$

$$28. x = 180 - 50 - 65 = 65$$

$$29. \frac{21}{5} \times \frac{15}{7} \times \frac{4}{9} = 4$$

$$\begin{aligned} 30. & 25\frac{3}{4} - 20\frac{1}{20} = 25\frac{15}{20} - 20\frac{1}{20} \\ & = 5\frac{14}{20} = 5\frac{7}{10} \text{ in.} \end{aligned}$$

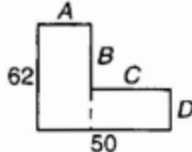
### Practice 7

$$\text{a. } -(-3) - (-4) = (+3) + (+4) = 7$$

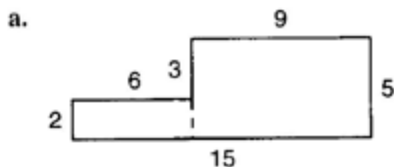
$$\text{b. } +(-5) + [-(-6)] = (-5) + (+6) = 1$$

- c.  $- (+6) - (-8) + 7 - (-3) + (-5)$   
 $= (-6) + (+8) + (+7) + (+3) + (-5) = 7$
- d.  $-(-3) - [ -(-4) ] + [ -(-6) ]$   
 $= (+3) + (-4) + (+6) = 5$

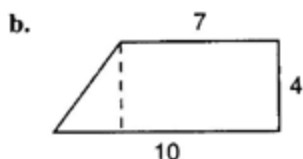
## Problem Set 7

1. (a)  $-2$   
 (b)  $2$   
 (c)  $0$
2. Additive inverse
3. (a)  $\{1, 2, 3, 4, \dots\}$   
 (b)  $\{0, 1, 2, 3, 4, \dots\}$   
 (c)  $\{\dots, -3, -2, -1, 0, 1, 2, 3, \dots\}$
4.  $- (+4) = (-4) = -4$
5.  $-(-4) = (+4) = 4$
6.  $-[-(-4)] = (-4) = -4$
7.  $- \{ -[-(-4)] \} = (+4) = 4$
8.  $2200 \text{ cm} \times \frac{1 \text{ m}}{100 \text{ cm}} = \frac{2200}{100} \text{ m} = 22 \text{ m}$
9.  $3000 \text{ in.} \times \frac{1 \text{ ft}}{12 \text{ in.}} \times \frac{1 \text{ mi}}{5280 \text{ ft}} = \frac{3000}{(12)(5280)} \text{ mi}$   
 $= 0.047 \text{ mi}$
10.  $P = (32 + 16 + 32 + 16) \text{ in.} = 96 \text{ in.}$
11.  $C = 2\pi r = 2\pi(12 \text{ ft}) = 24\pi \text{ ft} = 75.36 \text{ ft}$
12.  $+7 - (-3) + (-2) = (+7) + (+3) + (-2) = 8$
13.  $-3 + (-2) - (-3) = (-3) + (-2) + (+3) = -2$
14.  $-(-3) - [ -(-4) ] - 2 + 7$   
 $= (+3) + (-4) + (-2) + (+7) = 4$
15.  $-2 - (-3) - \{ -[-(-4)] \}$   
 $= (-2) + (+3) + (+4) = 5$
16.  $-(-2) - |-2| = (+2) + (-2) = 0$
17.  $-|-10| - (-10) = (-10) + (+10) = 0$
18.  $-3 - (-3) + |-3| = (-3) + (+3) + (+3) = 3$
19.  $-2 - [ -(-6) ] + |-5| = (-2) + (-6) + (+5) = -3$
20.  $-|-3 - 2| - (-3) - 2 - 5$   
 $= -|-5| + (+3) + (-2) + (-5)$   
 $= (-5) + (+3) + (-2) + (-5) = -9$
21.  $|-2 - 5 - 7| - (-4) = |-14| + 4$   
 $= (+14) + (+4) = 18$
22.   
 $A + C = 50$   
 $B + D = 62$   
 $P = 50 + 62 + A + B + C + D$   
 $= 50 + 62 + (A + C) + (B + D)$   
 $= 50 + 62 + 50 + 62 = 224 \text{ yd}$
23.  $P = \left( 5 + 16 + 5 + \frac{2\pi(8)}{2} \right) \text{ yd}$   
 $= (26 + 8\pi) \text{ yd} = 51.12 \text{ yd}$
24.  $x = 180 - 90 - 60 = 30$
25.  $5\frac{1}{2} + 7\frac{3}{8} - 1\frac{1}{4} = 5\frac{4}{8} + 7\frac{3}{8} - 1\frac{2}{8}$   
 $= 12\frac{7}{8} - 1\frac{2}{8} = 11\frac{5}{8}$
26.  $1\frac{3}{5} \times 12\frac{1}{2} = \frac{8}{5} \times \frac{25}{2} = 20$
27.  $4\frac{1}{4} + 3\frac{2}{5} = \frac{17}{4} + \frac{17}{5} = \frac{17}{4} \times \frac{5}{17} = \frac{5}{4}$   
 $= 1\frac{1}{4}$
28. 
$$\begin{array}{r} 0.00143 \\ 0.012 \\ 443.6 \\ + 0.0007 \\ \hline 443.61413 \end{array}$$
29. 
$$\begin{array}{r} 3.628 \\ \times 0.0404 \\ \hline 14512 \\ 14512 \\ \hline 0.1465712 \end{array}$$
30.  $16\frac{2}{3} + 5\frac{5}{6} = 16\frac{4}{6} + 5\frac{5}{6} = 21\frac{9}{6} = 22\frac{3}{6}$   
 $= 22\frac{1}{2} \text{ cm}$

## Practice 8

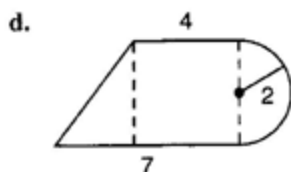


$$\begin{aligned} \text{Area} &= (2 \text{ in.})(6 \text{ in.}) + (9 \text{ in.})(5 \text{ in.}) \\ &= 12 \text{ in.}^2 + 45 \text{ in.}^2 = 57 \text{ in.}^2 \end{aligned}$$



$$\begin{aligned} \text{Area} &= \frac{1}{2}(3 \text{ ft})(4 \text{ ft}) + (7 \text{ ft})(4 \text{ ft}) \\ &= 6 \text{ ft}^2 + 28 \text{ ft}^2 = 34 \text{ ft}^2 \end{aligned}$$

c.  $\text{Area} = \pi r^2 = \pi(5 \text{ cm})^2 = 25\pi \text{ cm}^2 = 78.5 \text{ cm}^2$



$$\begin{aligned} \text{Area} &= \frac{1}{2}(3 \text{ m})(4 \text{ m}) + (4 \text{ m})(4 \text{ m}) + \frac{1}{2}\pi(2 \text{ m})^2 \\ &= 6 \text{ m}^2 + 16 \text{ m}^2 + \frac{1}{2}\pi(4 \text{ m}^2) \\ &= (22 + 2\pi) \text{ m}^2 = 28.28 \text{ m}^2 \end{aligned}$$

## Problem Set 8

1. (a)  $-\frac{1}{2}$

(b)  $\frac{1}{2}$

(c) 0

2. Additive inverse

3. Right angles

4. Straight angle

5.  $36 \text{ ft} \times \frac{12 \text{ in.}}{1 \text{ ft}} \times \frac{2.54 \text{ cm}}{1 \text{ in.}} = 36(12)(2.54) \text{ cm}$   
 $= 1097.28 \text{ cm}$

6.  $44 \text{ in.} \times \frac{2.54 \text{ cm}}{1 \text{ in.}} \times \frac{1 \text{ m}}{100 \text{ cm}} = \frac{44(2.54)}{(100)} \text{ m}$   
 $= 1.12 \text{ m}$

7.  $P = 2l + 2w$   
 $30 \text{ cm} = 2(10 \text{ cm}) + 2w$   
 $30 \text{ cm} = 20 \text{ cm} + 2w$   
 $30 \text{ cm} - 20 \text{ cm} = 2w$   
 $10 \text{ cm} = 2w$   
 $w = \frac{10 \text{ cm}}{2}$   
 $w = 5 \text{ cm}$

8.  $A = lw = (5 \text{ m})(4 \text{ m}) = 20 \text{ m}^2$

9.  $C = 2\pi r = 2\pi(3 \text{ in.}) = 6\pi \text{ in.} = 18.84 \text{ in.}$

10.  $A = \pi r^2 = \pi(4 \text{ ft})^2 = 16\pi \text{ ft}^2 = 50.24 \text{ ft}^2$

11.  $-(-4) + (-2) - (-3) = (+4) + (-2) + (+3) = 5$

12.  $-3 + (-3) + (-6) - 2$   
 $= (-3) + (-3) + (-6) + (-2) = -14$

13.  $-7 + 3 - 2 - 5 + (-6)$   
 $= (-7) + (+3) + (-2) + (-5) + (-6) = -17$

14.  $5 - 3 - (-2) - [ -(-3) ]$   
 $= (+5) + (-3) + (+2) + (-3) = 1$

15.  $-|-2| - (-2) = (-2) + (+2) = 0$

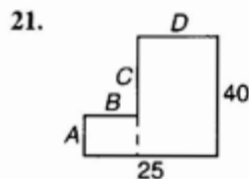
16.  $-|-2| + |2| - (-2) = (-2) + (+2) + (+2) = 2$

17.  $7 - 4 - 5 + 12 - 2 - |-2|$   
 $= (+7) + (-4) + (-5) + (+12) + (-2) + (-2)$   
 $= 6$

18.  $|-4 - 3| - 2 + 7 - (-3)$   
 $= (+7) + (-2) + (+7) + (+3) = 15$

19.  $5 - |-2 + 5| - (-3) + 2$   
 $= (+5) + (-3) + (+3) + (+2) = 7$

20.  $4 - 3 - (-2) - |12 - 3 + 4|$   
 $= (+4) + (-3) + (+2) + (-13) = -10$



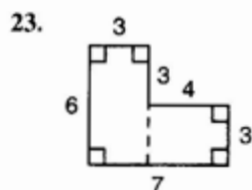
$$A + C = 40$$

$$B + D = 25$$

$$\begin{aligned} P &= 40 + 25 + A + B + C + D \\ &= 40 + 25 + (A + C) + (B + D) \\ &= 40 + 25 + 40 + 25 = \mathbf{130 \text{ yd}} \end{aligned}$$

22. 
$$P = \left( 7 + 14 + 7 + \frac{2\pi(7)}{2} \right) \text{ yd}$$

$$= (28 + 7\pi) \text{ yd} = \mathbf{49.98 \text{ yd}}$$



$$\begin{aligned} \text{Area} &= (6 \text{ cm})(3 \text{ cm}) + (4 \text{ cm})(3 \text{ cm}) \\ &= 18 \text{ cm}^2 + 12 \text{ cm}^2 = \mathbf{30 \text{ cm}^2} \end{aligned}$$

24. 
$$\text{Area} = \frac{1}{2}(8 \text{ cm})(6 \text{ cm}) = \mathbf{24 \text{ cm}^2}$$

25. 
$$y = 180 - 90 - 45 = \mathbf{45}$$

26. 
$$\begin{aligned} 8\frac{1}{18} - 2\frac{1}{6} - 4\frac{1}{3} &= 8\frac{1}{18} - 2\frac{3}{18} - 4\frac{6}{18} \\ &= 7\frac{19}{18} - 2\frac{3}{18} - 4\frac{6}{18} = 5\frac{16}{18} - 4\frac{6}{18} \\ &= 1\frac{10}{18} = \mathbf{1\frac{5}{9}} \end{aligned}$$

27. 
$$3\frac{2}{3} \times 1\frac{4}{5} \times 2\frac{3}{11} = \frac{11}{3} \times \frac{9}{5} \times \frac{25}{11} = \mathbf{15}$$

28. 
$$\begin{array}{r} 4.016 \\ + 0.984 \\ \hline 5.000 \end{array}$$

29. 
$$\begin{array}{r} 0.02 \\ 416 \overline{)8.32} \\ \underline{8 \ 32} \\ \hline \end{array}$$

30. 
$$\begin{aligned} 33\frac{1}{3} - 5\frac{5}{6} &= 33\frac{2}{6} - 5\frac{5}{6} = 32\frac{8}{6} - 5\frac{5}{6} \\ &= 27\frac{3}{6} = \mathbf{27\frac{1}{2} \text{ m}} \end{aligned}$$

Practice 9

a.  $-4(2) = -8$

b.  $3(-2) = -6$

c.  $-4(+3) = -12$

d.  $(-3)(-5) = 15$

e.  $\frac{4}{2} = 2$

f.  $\frac{-6}{3} = -2$

g.  $\frac{8}{-4} = -2$

h.  $\frac{-16}{-2} = 8$

Problem Set 9

1. (a) **Positive number**

(b) **Negative number**

2. (a) **-3**

(b) **3**

(c) **0**

3. The **opposite** of the number

4.  $(2)(5) = \mathbf{10}$

5.  $-5(+2) = \mathbf{-10}$

6.  $5(-2) = \mathbf{-10}$

7.  $(-3)(-5) = \mathbf{15}$

8.  $-(-2)(-3) = \mathbf{6}$

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

10.  $\frac{-18}{3} = -6$

11.  $\frac{8}{-4} = -2$

12.  $\frac{-16}{-2} = 8$

$$13. 320 \text{ cm} \times \frac{1 \text{ in.}}{2.54 \text{ cm}} \times \frac{1 \text{ ft}}{12 \text{ in.}} = \frac{320}{(2.54)(12)} \text{ ft}$$

$$= 10.50 \text{ ft}$$

$$14. 65 \text{ m} \times \frac{100 \text{ cm}}{1 \text{ m}} \times \frac{1 \text{ in.}}{2.54 \text{ cm}} = \frac{65(100)}{(2.54)} \text{ in.}$$

$$= 2559.06 \text{ in.}$$

$$15. \quad P = 2l + 2w$$

$$40 \text{ in.} = 2l + 2(8 \text{ in.})$$

$$40 \text{ in.} = 2l + 16 \text{ in.}$$

$$40 \text{ in.} - 16 \text{ in.} = 2l$$

$$24 \text{ in.} = 2l$$

$$l = \frac{24 \text{ in.}}{2}$$

$$l = 12 \text{ in.}$$

$$16. \quad A = S^2$$

$$9 \text{ ft}^2 = S^2$$

Each side is 3 ft because  $3 \text{ ft} \times 3 \text{ ft} = 9 \text{ ft}^2$ .

$$17. A = \pi r^2 = \pi(5 \text{ yd})^2 = 25\pi \text{ yd}^2 = 78.5 \text{ yd}^2$$

$$18. -6 - 4 - (3) - (-3) + 3$$

$$= (-6) + (-4) + (-3) + (+3) + (+3) = -7$$

$$19. -6 + (-3) - [ -(-2) ] + 7$$

$$= (-6) + (-3) + (-2) + (+7) = -4$$

$$20. -|-6| - [ -(-2) ] + 5 = (-6) + (-2) + (+5) = -3$$

$$21. -7 - 4 - (-3) + |-3|$$

$$= (-7) + (-4) + (+3) + (+3) = -5$$

$$22. -3 + (-3) - (-5) - |7|$$

$$= (-3) + (-3) + (+5) + (-7) = -8$$

$$23. -|-5 + 3 - 2| + 2 = -|-4| + 2$$

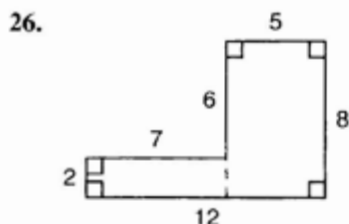
$$= (-4) + (+2) = -2$$

$$24. P = (30 + 25 + 14 + 15 + 16 + 10) \text{ cm}$$

$$= 110 \text{ cm}$$

$$25. P = \left( 20 + 20 + 20 + \frac{2\pi(10)}{2} \right) \text{ cm}$$

$$= (60 + 10\pi) \text{ cm} = 91.4 \text{ cm}$$



$$\text{Area} = (2 \text{ m})(7 \text{ m}) + (5 \text{ m})(8 \text{ m})$$

$$= 14 \text{ m}^2 + 40 \text{ m}^2 = 54 \text{ m}^2$$

$$27. \text{Area} = \frac{1}{2}(5 \text{ m})(6 \text{ m}) = 15 \text{ m}^2$$

$$28. \quad \begin{array}{r} 52.3 \\ - 15.26 \\ \hline 37.04 \end{array}$$

$$29. \quad \begin{array}{r} 4.03 \\ \times 0.220 \\ \hline 000 \\ 806 \\ \hline 806 \\ \hline 0.88660 \end{array}$$

$$30. 20\frac{5}{12} - 6\frac{1}{4} = 20\frac{5}{12} - 6\frac{3}{12} = 14\frac{2}{12}$$

$$= 14\frac{1}{6} \text{ km}$$

## Practice 10

a.  $\frac{-3 - 2}{-2 + 8 - 6} = \frac{-5}{0}$ , which is **undefined**

b.  $\frac{-8 + 6 + 2}{8 - 4 - 4} = \frac{0}{0}$ , which is **indeterminate**

c.  $-(-4)(-1)(-4) = 16$

d.  $2(-6)(10)(-2) = 240$

e.  $44 \text{ mi} \cdot \text{mi} \times \frac{5280 \text{ ft}}{1 \text{ mi}} \times \frac{5280 \text{ ft}}{1 \text{ mi}}$   
 $= 44(5280)^2 \text{ ft}^2 = 1,226,649,600 \text{ ft}^2$

f.  $3500 \text{ cm} \cdot \text{cm} \times \frac{1 \text{ m}}{100 \text{ cm}} \times \frac{1 \text{ m}}{100 \text{ cm}}$   
 $= \frac{3500}{(100)^2} \text{ m}^2 = 0.35 \text{ m}^2$

## Problem Set 10

1. **Commutative property** of multiplication

2. (a) **Subtraction**

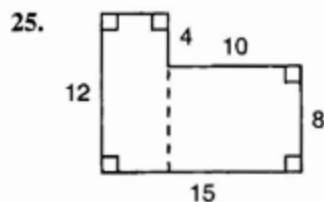
(b) **Addition**

(c) **Division**

(d) **Multiplication**

3. (a)  $-\frac{1}{3}$   
 (b)  $\frac{1}{3}$   
 (c) 0
4. The **opposite** of the number
5.  $-2(3)(4) = -24$
6.  $-4(3)(-2) = 24$
7.  $4(-3)(-4) = 48$
8.  $\frac{-2 + 3}{4 - 5 + 3} = \frac{1}{4 - 5 + 3} = \frac{1}{2}$
9.  $\frac{4 + 7 - 6}{2 + 7 - 3} = \frac{5}{2 + 7 - 3} = \frac{5}{6}$
10.  $\frac{-3 + 6 - 1}{-2 + 4 - 2} = \frac{2}{-2 + 4 - 2} = \frac{2}{0}$   
 which is **undefined**
11.  $50 \text{ in.} \times \frac{2.54 \text{ cm}}{1 \text{ in.}} = 50(2.54) \text{ cm} = 127 \text{ cm}$
12.  $48 \text{ in.} \cdot \text{in.} \times \frac{2.54 \text{ cm}}{1 \text{ in.}} \times \frac{2.54 \text{ cm}}{1 \text{ in.}}$   
 $= 48(2.54)^2 \text{ cm}^2 = 309.68 \text{ cm}^2$
13.  $P = 2l + 2w$   
 $28 \text{ cm} = 2(9 \text{ cm}) + 2w$   
 $28 \text{ cm} = 18 \text{ cm} + 2w$   
 $28 \text{ cm} - 18 \text{ cm} = 2w$   
 $10 \text{ cm} = 2w$   
 $w = \frac{10 \text{ cm}}{2}$   
 $w = 5 \text{ cm}$
14.  $A = (15 \text{ m})(8 \text{ m}) = 120 \text{ m}^2$
15.  $C = \pi D = \pi(16 \text{ in.}) = 16\pi \text{ in.} = 50.24 \text{ in.}$
16.  $A = \pi r^2 = \pi(6 \text{ ft})^2 = 36\pi \text{ ft}^2 = 113.04 \text{ ft}^2$
17.  $\frac{-8}{2} = -4$
18.  $\frac{9}{-3} = -3$
19.  $3 - (-4) + (-3) - (-4)$   
 $= (+3) + (+4) + (-3) + (+4) = 8$

20.  $-[-(-4)] - (-3) + 2 = (-4) + (+3) + (+2) = 1$
21.  $-|-3 - 2| + (-5) = -|-5| + (-5)$   
 $= (-5) + (-5) = -10$
22.  $-[-[-(-2)]] - |-4 - 2| = (+2) + (-6) = -4$
23.  $3 - |-2 - 3| + (-6) - (-3)$   
 $= (+3) + (-5) + (-6) + (+3) = -5$
24.  $P = (31 + 26 + 10 + 18 + 11 + 18 + 10$   
 $+ 26) \text{ yd}$   
 $= 150 \text{ yd}$



$$A = (12 \text{ cm})(5 \text{ cm}) + (10 \text{ cm})(8 \text{ cm})$$

$$= 60 \text{ cm}^2 + 80 \text{ cm}^2 = 140 \text{ cm}^2$$

26.  $A = \frac{1}{2}(8 \text{ cm})(5 \text{ cm}) = 20 \text{ cm}^2$
27.  $A = (4 \text{ cm})(4 \text{ cm}) + \frac{1}{2}\pi(2 \text{ cm})^2$   
 $= 16 \text{ cm}^2 + \frac{1}{2}\pi(4 \text{ cm}^2)$   
 $= (16 + 2\pi) \text{ cm}^2 = 22.28 \text{ cm}^2$
28.  $\frac{3\frac{3}{5}}{2\frac{7}{10}} = \frac{18}{5} \div \frac{27}{10} = \frac{18}{5} \times \frac{10}{27} = \frac{4}{3} = 1\frac{1}{3}$
29.  $\begin{array}{r} 3.03 \\ 28 \overline{)84.84} \\ \underline{84} \phantom{00} \\ 84 \phantom{00} \\ \underline{84} \phantom{00} \\ 0 \phantom{00} \end{array}$
30.  $3\frac{8}{21} + 3\frac{2}{7} = 3\frac{8}{21} + 3\frac{6}{21} = 6\frac{14}{21} = 6\frac{2}{3} \text{ m}$

## Practice 11

- a.  $6 \cdot 3 - 4(5)(6) = 18 - 120 = -102$
- b.  $3 \cdot 5 + 2 + 4(-2) = 15 + 2 - 8 = 9$
- c.  $2 \cdot 4 - 3 \cdot 2 - 7 + 5 \cdot 2 = 8 - 6 - 7 + 10$   
 $= 5$



$$d. 13 - 4(-5) - 3(10) = 13 + 20 - 30 = 3$$

### Problem Set 11

$$1. (a) \frac{1}{2}$$

$$(b) -\frac{1}{2}$$

$$(c) 1$$

#### 2. Multiplicative inverse

3. The only real number that does not have a reciprocal is **zero** because **division by zero is undefined**.

4. **Yes**

5. **An acute angle is an angle that is smaller than a right angle.**

6. **An obtuse angle is an angle that is larger than a right angle and smaller than a straight angle.**

$$7. 25 \text{ m} \times \frac{100 \text{ cm}}{1 \text{ m}} = 25(100) \text{ cm} = 2500 \text{ cm}$$

$$8. 40 \text{ m} \cdot \text{m} \times \frac{100 \text{ cm}}{1 \text{ m}} \times \frac{100 \text{ cm}}{1 \text{ m}} = 40(100)^2 \text{ cm}^2 \\ = 400,000 \text{ cm}^2$$

$$9. l = 49 \text{ in.} + 4 = 12\frac{1}{4} \text{ in.}$$

$$10. A = S^2 \\ 16 \text{ ft}^2 = S^2$$

Each side is **4 ft** because  $4 \text{ ft} \times 4 \text{ ft} = 16 \text{ ft}^2$ .

$$11. r = D + 2 = 14 \text{ yd} + 2 = 7 \text{ yd}$$

$$A = \pi r^2 = \pi(7 \text{ yd})^2 = 49\pi \text{ yd}^2 = 153.86 \text{ yd}^2$$

$$12. 6 - 8 + 2(3) = 6 - 8 + 6 = 4$$

$$13. -2 - 3(+6) = -2 - 18 = -20$$

$$14. 3 - 2 \cdot 4 + 3 \cdot 2 = 3 - 8 + 6 = 1$$

$$15. -3(-2)(-3) - 2 = -18 - 2 = -20$$

$$16. -4(-3) + (-2)(-5) = 12 + 10 = 22$$

$$17. -2 - 2(-2) + (-2)(-2) = -2 + 4 + 4 = 6$$

$$18. (-5) - (-5) + 2(-2) + 4 = -5 + 5 - 4 + 4 = 0$$

$$19. -3 - (-2) + (-3) - 2(-2) = -3 + 2 - 3 + 4 = 0$$

$$20. (-2)(-2)(-2) - |-8| = -8 - 8 = -16$$

$$21. -(-5) + (-2) + (-5)[-3] = 5 - 2 + (-5)(3) \\ = 3 - 15 = -12$$

$$22. 4 + |-3 - 1| + (-3) - (-2) \\ = 4 + |-4| - 3 + 2 = 4 + 4 - 3 + 2 = 7$$

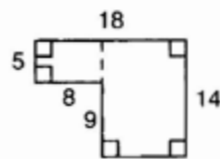
$$23. 3(-2) - |-3 + 6| + 9 - 7(-2) \\ = -6 - |3| + 9 + 14 = -6 - 3 + 9 + 14 = 14$$

$$24. \frac{-3 + 5}{4 - 6 + 5} = \frac{2}{4 - 6 + 5} = \frac{2}{-2 + 5} = \frac{2}{3}$$

$$25. \frac{-6 + 4 + 2}{-2 + 5 + 3} = \frac{-2 + 2}{3 + 3} = \frac{0}{6} = 0$$

$$26. P = \left(15 + 8 + 15 + \frac{2\pi(4)}{2}\right) \text{ cm} \\ = (38 + 4\pi) \text{ cm} = 50.56 \text{ cm}$$

27.



$$A = (5 \text{ m})(8 \text{ m}) + (10 \text{ m})(14 \text{ m}) \\ = 40 \text{ m}^2 + 140 \text{ m}^2 = 180 \text{ m}^2$$

$$28. A = \frac{1}{2}(10 \text{ m})(7 \text{ m}) = 35 \text{ m}^2$$

$$29. \text{Area} = \text{Area}_{\text{rectangle}} - \text{Area}_{\text{square}} \\ = (8 \text{ in.})(11 \text{ in.}) - (5 \text{ in.})(5 \text{ in.}) \\ = 88 \text{ in.}^2 - 25 \text{ in.}^2 = 63 \text{ in.}^2$$

$$30. 26\frac{1}{2} - 8\frac{3}{10} = 26\frac{5}{10} - 8\frac{3}{10} = 18\frac{2}{10} = 18\frac{1}{5} \text{ ft}$$

### Practice 12

$$a. (-3 - 2)(-4 - 1) = (-5)(-5) = 25$$

$$b. (6 - 2) - (4 - 6) = 4 - (-2) = 4 + 2 = 6$$

$$c. -5(-3 - 3) + 2(1 - 3) = -5(-6) + 2(-2) \\ = 30 - 4 = 26$$

$$d. \frac{-3(10 - 8) - (-4)}{4 - 3(-3) - 13} = \frac{-3(2) + 4}{4 + 9 - 13} = \frac{-6 + 4}{13 - 13} \\ = \frac{-2}{0}, \text{ which is undefined}$$

## Problem Set 12

1. (a) 2

(b) -2

(c) 1

2. **Multiplicative inverse**3. The only real number that does not have a reciprocal is zero because **division by zero is undefined**.

4. No

5. (a)  $90^\circ$

(b)  $180^\circ$

(c)  $360^\circ$

6.  $80 \text{ ft} \times \frac{12 \text{ in.}}{1 \text{ ft}} \times \frac{2.54 \text{ cm}}{1 \text{ in.}} = 80(12)(2.54) \text{ cm}$   
 $= 2438.4 \text{ cm}$

7.  $12 \text{ ft} \cdot \text{ft} \times \frac{12 \text{ in.}}{1 \text{ ft}} \times \frac{12 \text{ in.}}{1 \text{ ft}} = 12(12)^2 \text{ in.}^2$   
 $= 1728 \text{ in.}^2$

8.  $A = lw$   
 $18 \text{ cm}^2 = (6 \text{ cm})w$   
 $w = \frac{18 \text{ cm}^2}{6 \text{ cm}}$   
 $w = 3 \text{ cm}$

9.  $C = 2\pi r$   
 $6\pi \text{ m} = 2\pi r$   
 $6(3.14) \text{ m} = 2(3.14)r$   
 $18.84 \text{ m} = 6.28r$   
 $r = \frac{18.84 \text{ m}}{6.28}$   
 $r = 3 \text{ m}$

10.  $(-4 + 7) + (-3 - 2) = 3 + (-5) = -2$

11.  $(-3 - 2) - (-6 + 2) = -5 - (-4) = -5 + 4$   
 $= -1$

12.  $(-2 - 2)(-3 - 4) = (-4)(-7) = 28$

13.  $4(8 + 4) + 7(10 - 8) = 4(12) + 7(2)$   
 $= 48 + 14 = 62$

14.  $5(9 + 2) - (-4)(5 + 1) = 5(11) + 4(6)$   
 $= 55 + 24 = 79$

15.  $-3(-6 - 2) + 3(-2 + 5) = -3(-8) + 3(3)$   
 $= 24 + 9 = 33$

16.  $-2(-5 - 7) - 3(-8 + 2) = -2(-12) - 3(-6)$   
 $= 24 + 18 = 42$

17.  $(-3 - 2)(-2)(-2 - 2) = (-5)(-2)(-4) = -40$

18.  $(6 - 2)(-3 - 5) - (-5) = (4)(-8) + 5$   
 $= -32 + 5 = -27$

19.  $-8 - 4 - (-2) - (+2)(-3) = -12 + 2 + 6 = -4$

20.  $\frac{1}{4}(8 - 4) - 5(8 - 2) - 2 = \frac{1}{4}(4) - 5(6) - 2$   
 $= 1 - 30 - 2 = -31$

21.  $5(12 + 2) - 6(-3 + 8) - (2 + 3)$   
 $= 5(14) - 6(5) - 5 = 70 - 30 - 5 = 35$

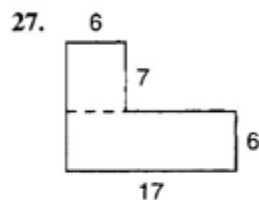
22.  $(2 - 3)(-8 + 2) + |-3 + 5| = (-1)(-6) + |2|$   
 $= 6 + 2 = 8$

23.  $-|-2 - 5 + 3|(5 - 2) = -|-4|(3) = -4(3) = -12$

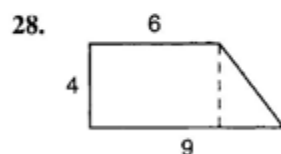
24.  $4 - \frac{(+12)}{(-3)} + 2 = 4 - (-4) + 2 = 4 + 4 + 2$   
 $= 10$

25.  $\frac{-4(5 - 2) - (-8)}{3 - (-3)(3)} = \frac{-4(3) + 8}{3 + 9} = \frac{-12 + 8}{12}$   
 $= \frac{-4}{12} = -\frac{1}{3}$

26.  $P = \left(8 + 10 + 8 + \frac{2\pi(5)}{2}\right) \text{ km}$   
 $= (26 + 5\pi) \text{ km} = 41.7 \text{ km}$



$A = (6 \text{ in.})(7 \text{ in.}) + (17 \text{ in.})(6 \text{ in.})$   
 $= 42 \text{ in.}^2 + 102 \text{ in.}^2 = 144 \text{ in.}^2$



$A = (6 \text{ in.})(4 \text{ in.}) + \frac{1}{2}(3 \text{ in.})(4 \text{ in.})$   
 $= 24 \text{ in.}^2 + 6 \text{ in.}^2 = 30 \text{ in.}^2$

29. Area = Area<sub>large rectangle</sub> - Area<sub>small rectangle</sub>  
 $= (14 \text{ ft})(6 \text{ ft}) - (7 \text{ ft})(2 \text{ ft})$   
 $= 84 \text{ ft}^2 - 14 \text{ ft}^2 = 70 \text{ ft}^2$
30.  $y = 180 - 90 - 30 = 60$

## Practice 13

- a.  $3\{2[(-4 - 3)(-8 - 2) - 4]\}$   
 $= 3\{2[(-7)(-10) - 4]\}$   
 $= 3\{2(70 - 4)\} = 3\{2(66)\} = 396$
- b.  $\frac{-3\{[(-4 - 1)3] - 5\}}{2(4 - 7)} = \frac{-3\{[(-5)3] - 5\}}{2(-3)}$   
 $= \frac{-3(-15 - 5)}{-6} = \frac{-3(-20)}{-6} = \frac{60}{-6} = -10$
- c.  $(-2)(-2)(-3)(-3) = 36$
- d.  $-[-[-(-2)]] = 2$
- e. The product is a **negative number** because **the number of negative signs in the product is odd**.

## Problem Set 13

## 1. Negative number

2. (a)  $\frac{1}{3}$

(b)  $-\frac{1}{3}$

(c) 1

## 3. Reciprocal

4. The only real number that does not have a multiplicative inverse is
- zero**
- because
- division by zero is undefined**
- .

## 5. Equilateral polygons

6.  $60 \text{ mi} \times \frac{5280 \text{ ft}}{1 \text{ mi}} \times \frac{12 \text{ in.}}{1 \text{ ft}} = 60(5280)(12) \text{ in.}$   
 $= 3,801,600 \text{ in.}$

7.  $125 \text{ mi} \cdot \text{mi} \times \frac{5280 \text{ ft}}{1 \text{ mi}} \times \frac{5280 \text{ ft}}{1 \text{ mi}}$   
 $= 125(5280)^2 \text{ ft}^2 = 3,484,800,000 \text{ ft}^2$

8.  $A = lw$   
 $35 \text{ cm}^2 = l(5 \text{ cm})$   
 $l = \frac{35 \text{ cm}^2}{5 \text{ cm}}$   
 $l = 7 \text{ cm}$

9.  $r = D + 2 = 6 \text{ m} + 2 = 3 \text{ m}$   
 $A = \pi r^2 = \pi(3 \text{ m})^2 = 9\pi \text{ m}^2 = 28.26 \text{ m}^2$

10.  $-[-(-2)] = -2$

11.  $-[-[-(-3)]] = 3$

12.  $(-3 - 2) - (5 + 2) = -5 - 7 = -12$

13.  $(-3 + 5)(2 - 3) = (2)(-1) = -2$

14.  $-2(-6 - 3) + \frac{0}{5} = -2(-9) + 0 = 18$

15.  $-2 + (-2) - (-4)5 = -4 + 20 = 16$

16.  $-3 - (2) + (-2) - (-3)(-2) = -3 - 2 - 2 - 6$   
 $= -13$

17.  $-5(-3 - 2) + (-2) - (-3 - 4)$   
 $= -5(-5) - 2 - (-7) = 25 - 2 + 7 = 30$

18.  $(-2)(-3)(-4 + 2) - (3 + 1) = 6(-2) - 4$   
 $= -12 - 4 = -16$

19.  $-2 - (-2) - |-2|(2) = -2 + 2 - 4 = -4$

20.  $\frac{-6}{-10} + (-3)(-2) + 3|-4 - 2|$   
 $= \frac{3}{5} + 6 + 3(6) = \frac{3}{5} + 6 + 18 = 24\frac{3}{5}$

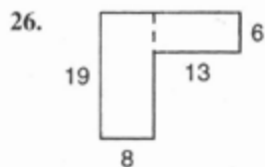
21.  $(-7) - [-(-2)]5 = -7 - 2(5) = -7 - 10 = -17$

22.  $-3 - [-(-2)] + (-3)(5) = -3 - 2 - 15 = -20$

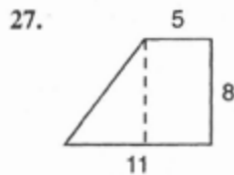
23.  $\frac{-2(-6) - 2}{-3 + (-7 + 2)} = \frac{12 - 2}{-3 + (-5)} = \frac{10}{-8} = -\frac{5}{4}$   
 $= -1\frac{1}{4}$

24.  $\frac{4 + 2 - 3(2)}{3(2) - 6} = \frac{6 - 6}{6 - 6} = \frac{0}{0}$   
 which is **indeterminate**

25.  $P = (34 + 20 + 17 + 16 + 12 + 16 + 5$   
 $+ 20) \text{ in.}$   
 $= 140 \text{ in.}$



$$\begin{aligned} \text{Area} &= (19 \text{ ft})(8 \text{ ft}) + (13 \text{ ft})(6 \text{ ft}) \\ &= 152 \text{ ft}^2 + 78 \text{ ft}^2 = 230 \text{ ft}^2 \end{aligned}$$



$$\begin{aligned} \text{Area} &= \frac{1}{2}(6 \text{ ft})(8 \text{ ft}) + (5 \text{ ft})(8 \text{ ft}) \\ &= 24 \text{ ft}^2 + 40 \text{ ft}^2 = 64 \text{ ft}^2 \end{aligned}$$

28. 
$$\begin{aligned} \text{Area} &= (8 \text{ ft})(6 \text{ ft}) + \frac{1}{2}\pi(3 \text{ ft})^2 \\ &= 48 \text{ ft}^2 + \frac{1}{2}\pi(9) \text{ ft}^2 \\ &= \left(48 + \frac{9\pi}{2}\right) \text{ ft}^2 = 62.13 \text{ ft}^2 \end{aligned}$$

29. 
$$\begin{aligned} \text{Area} &= \text{Area}_{\text{rectangle}} - \text{Area}_{\text{triangle}} \\ &= (12 \text{ yd})(7 \text{ yd}) - \frac{1}{2}(7 \text{ yd})(4 \text{ yd}) \\ &= 84 \text{ yd}^2 - 14 \text{ yd}^2 = 70 \text{ yd}^2 \end{aligned}$$

30. 
$$15\frac{4}{5} - 4\frac{2}{15} = 15\frac{12}{15} - 4\frac{2}{15} = 11\frac{10}{15} = 11\frac{2}{3} \text{ mi}$$

**Practice 14**

- a.  $x - xy = -2 - (-2)(3) = -2 + 6 = 4$
- b.  $a - (ab - a) = -4 - [(-4)(-2) - (-4)]$   
 $= -4 - (8 + 4) = -4 - 12 = -16$
- c.  $x - ab(a - b) = -3 - (-2)(-4)[-2 - (-4)]$   
 $= -3 - 8(-2 + 4) = -3 - 8(2) = -3 - 16 = -19$
- d.  $-xa(a + x) + x$   
 $= -(-4)(-2)[(-2) + (-4)] + (-4)$   
 $= -8(-6) + (-4) = 48 - 4 = 44$

**Problem Set 14**

- 1. A numerical expression contains only numbers. An algebraic expression may contain numbers and may contain letters.

- 2. The value of an expression is the number it represents.
- 3. (a) A variable of an algebraic expression is a letter that represents an unspecified number.

(b) A variable

4. Positive number

5. Equiangular polygons

6. 
$$300 \text{ in.} \times \frac{2.54 \text{ cm}}{1 \text{ in.}} \times \frac{1 \text{ m}}{100 \text{ cm}} = \frac{300(2.54)}{(100)} \text{ m}$$
  
 $= 7.62 \text{ m}$

7. 
$$100 \text{ yd} \cdot \text{yd} \times \frac{3 \text{ ft}}{1 \text{ yd}} \times \frac{3 \text{ ft}}{1 \text{ yd}} = 100(3)^2 \text{ ft}^2$$
  
 $= 900 \text{ ft}^2$

8. 
$$\begin{aligned} A &= lw \\ 44 \text{ in.}^2 &= (11 \text{ in.})w \\ w &= \frac{44 \text{ in.}^2}{11 \text{ in.}} \\ w &= 4 \text{ in.} \end{aligned}$$

9. 
$$\begin{aligned} C &= 2\pi r \\ 8\pi \text{ ft} &= 2\pi r \\ 8(3.14) \text{ ft} &= 2(3.14)r \\ 25.12 \text{ ft} &= 6.28r \\ r &= \frac{25.12 \text{ ft}}{6.28} \\ r &= 4 \text{ ft} \end{aligned}$$

10.  $xm - 2m = (-2)(-3) - 2(-3) = 6 + 6 = 12$

11.  $ma - m - a = (-2)(-4) - (-2) - (-4)$   
 $= 8 + 2 + 4 = 14$

12.  $2abc - 3ab = 2(2)(-3)(4) - 3(2)(-3)$   
 $= -48 + 18 = -30$

13.  $-x(a + b) = -4[-3 + (-5)] = -4(-8) = 32$

14.  $-a + b + ab = -(-5) + (-2) + (-5)(-2)$   
 $= 5 - 2 + 10 = 13$

15.  $x - y(a - x) = -3 - 4[4 - (-3)]$   
 $= -3 - 4(7) = -3 - 28 = -31$

16.  $-(m - x)(a - mx) = -[3 - (-4)][-2 - 3(-4)]$   
 $= (-7)(-2 + 12) = (-7)(10) = -70$

17.  $-xa(x + a) - a = -2(-4)[2 + (-4)] - (-4)$   
 $= 8(-2) + 4 = -16 + 4 = -12$

$$18. -xy - (-x + y) = -(-3)(-4) - [ -(-3) + (-4) ] \\ = -12 - (3 - 4) = -12 - (-1) = -12 + 1 = -11$$

$$19. -2(-1 - 4)(5 - 6) + 3 = -2(-5)(-1) + 3 \\ = -10 + 3 = -7$$

$$20. -4 - [ -(-5) ] + |-6| = -4 - 5 + 6 = -3$$

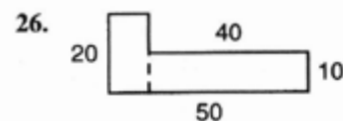
$$21. -|-3|(2 - 5) - [ -(-3) ] = -3(-3) - 3 \\ = 9 - 3 = 6$$

$$22. -2[-3(-2 - 5)(3)] = -2[-3(-7)(3)] = -2(63) \\ = -126$$

$$23. \frac{-2[-(-3)]}{(-2)(-4 + 3)} = \frac{-2(3)}{(-2)(-1)} = \frac{-6}{2} = -3$$

$$24. \frac{(-5 - 2) + (-3 - 2)}{-3 - (-2)} = \frac{-7 + (-5)}{-3 + 2} = \frac{-12}{-1} = 12$$

$$25. P = \left( 16 + 18 + 16 + \frac{2\pi(9)}{2} \right) \text{yd} \\ = (50 + 9\pi) \text{yd} = 78.26 \text{yd}$$



$$A = (20 \text{ cm})(10 \text{ cm}) + (40 \text{ cm})(10 \text{ cm}) \\ = 200 \text{ cm}^2 + 400 \text{ cm}^2 = 600 \text{ cm}^2$$

$$27. A = (5 \text{ cm})(4 \text{ cm}) + \frac{\pi(2 \text{ cm})^2}{2} \\ = (20 + 2\pi) \text{ cm}^2 = 26.28 \text{ cm}^2$$

$$28. \text{Area} = \text{Area}_{\text{large triangle}} - \text{Area}_{\text{small triangle}} \\ = \frac{1}{2}(16 \text{ m})(8 \text{ m}) - \frac{1}{2}(4 \text{ m})(2 \text{ m}) \\ = 64 \text{ m}^2 - 4 \text{ m}^2 = 60 \text{ m}^2$$

$$29. x = 180 - 130 - 25 = 25$$

$$30. \frac{0.06}{\frac{102\sqrt{6.12}}{6.12}}$$

### Practice 15

$$\text{a. S.A.} = 2(\text{Area}_{\text{top}}) + 2(\text{Area}_{\text{front}}) + 2(\text{Area}_{\text{side}}) \\ = 2(4 \text{ in.} \times 3 \text{ in.}) + 2(2 \text{ in.} \times 4 \text{ in.}) \\ + 2(2 \text{ in.} \times 3 \text{ in.}) \\ = 2(12 \text{ in.}^2) + 2(8 \text{ in.}^2) + 2(6 \text{ in.}^2) \\ = 24 \text{ in.}^2 + 16 \text{ in.}^2 + 12 \text{ in.}^2 \\ = 52 \text{ in.}^2$$

$$\text{b. S.A.} = 2(\text{Area}_{\text{triangle}}) + \text{Area}_{\text{bottom}} + \text{Area}_{\text{back}} \\ + \text{Area}_{\text{top}} \\ = 2\left[\frac{1}{2}(8 \text{ ft} \times 6 \text{ ft})\right] + (8 \text{ ft} \times 12 \text{ ft}) \\ + (6 \text{ ft} \times 12 \text{ ft}) + (10 \text{ ft} \times 12 \text{ ft}) \\ = 2(24 \text{ ft}^2) + 96 \text{ ft}^2 + 72 \text{ ft}^2 + 120 \text{ ft}^2 \\ = 48 \text{ ft}^2 + 288 \text{ ft}^2 \\ = 336 \text{ ft}^2$$

$$\text{c. S.A.} = 2(\text{Area}_{\text{base}}) + \text{Lateral Surface Area} \\ = 2[\pi(20 \text{ cm})^2] + (\text{Perimeter}_{\text{base}})(\text{Length}) \\ = 800\pi \text{ cm}^2 + [2\pi(20 \text{ cm})](200 \text{ cm}) \\ = 800\pi \text{ cm}^2 + 8000\pi \text{ cm}^2 \\ = 8800\pi \text{ cm}^2 = 27,632 \text{ cm}^2$$

$$\text{d. S.A.} = 2(\text{Area}_{\text{base}}) + \text{Lateral Surface Area} \\ = 2\left[\frac{1}{2}(6 \text{ m} \times 8 \text{ m}) + \frac{1}{2}\pi(3 \text{ m})^2\right] \\ + (\text{Perimeter}_{\text{base}})(\text{Height}) \\ = 2\left(24 \text{ m}^2 + \frac{9\pi}{2} \text{ m}^2\right) \\ + \left(10 \text{ m} + 8 \text{ m} + \frac{2\pi(3)}{2} \text{ m}\right)(10 \text{ m}) \\ = 2\left(24 \text{ m}^2 + \frac{9\pi}{2} \text{ m}^2\right) \\ + (18 \text{ m} + 3\pi \text{ m})(10 \text{ m}) \\ = 48 \text{ m}^2 + 9\pi \text{ m}^2 + 180 \text{ m}^2 + 30\pi \text{ m}^2 \\ = (228 + 39\pi) \text{ m}^2 = 350.46 \text{ m}^2$$

### Problem Set 15

#### 1. (a) Surface area

(b) To find the lateral surface area of a right solid, multiply the perimeter of a base by the height of the right solid.

2. (a) 3

(b) -3

(c) 1

#### 3. Reciprocal

4. The only real number that does not have a multiplicative inverse is zero because division by zero is undefined.

$$5. 112 \text{ ft} \times \frac{12 \text{ in.}}{1 \text{ ft}} \times \frac{2.54 \text{ cm}}{1 \text{ in.}} \\ = 112(12)(2.54) \text{ cm} = 3413.76 \text{ cm}$$

$$6. 60 \text{ km} \cdot \text{km} \times \frac{1000 \text{ m}}{1 \text{ km}} \times \frac{1000 \text{ m}}{1 \text{ km}}$$

$$= 60(1000)^2 \text{ m}^2 = 60,000,000 \text{ m}^2$$

$$7. A = lw$$

$$72 \text{ cm}^2 = (6 \text{ cm})w$$

$$w = \frac{72 \text{ cm}^2}{6 \text{ cm}}$$

$$w = 12 \text{ cm}$$

$$8. A = \frac{1}{2}(12 \text{ m})(9 \text{ m}) = 54 \text{ m}^2$$

$$9. r = D \div 2 = 16 \text{ km} \div 2 = 8 \text{ km}$$

$$A = \pi r^2 = \pi(8 \text{ km})^2 = 64\pi \text{ km}^2 = 200.96 \text{ km}^2$$

$$10. a - ab = 2 - 2(-3) = 2 - (-6) = 2 + 6 = 8$$

$$11. xy - 3y = 2(4) - 3(4) = 8 - 12 = -4$$

$$12. 2ab - 3abc = 2(-1)(2) - 3(-1)(2)(3)$$

$$= -4 + 18 = 14$$

$$13. -x(a - b) = -(-2)[3 - (-1)] = 2(4) = 8$$

$$14. -x - (-a + b) = -3 - [ -(-2) + 4 ]$$

$$= -3 - (2 + 4) = -3 - 6 = -9$$

$$15. (x - y)(y - x) = (-2 - 3)[3 - (-2)]$$

$$= (-5)(5) = -25$$

$$16. (-x) + (-y) = [ -(-3) ] + (-2) = 3 + (-2) = 1$$

$$17. -c - (p - c) = -2 - (-5 - 2) = -2 - (-7)$$

$$= -2 + 7 = 5$$

$$18. (a - x)(ma - x) = [-3 - (-4)][5(-3) - (-4)]$$

$$= (-3 + 4)(-15 + 4) = (1)(-11) = -11$$

$$19. -2(-6 - 1 - 2) - (-2 + 7)$$

$$= -2(-9) - (5) = 18 - 5 = 13$$

$$20. -[-11] + (-3)|-3 + 5| = -11 - 3(2)$$

$$= -11 - 6 = -17$$

$$21. -3(-3)(-2 - 5 + |-11|) = 9(-7 + 11)$$

$$= 9(4) = 36$$

$$22. -3\{[(-5 - 2)](-1)\} = -3\{(-7)(-1)\} = -3(7)$$

$$= -21$$

$$23. \frac{-4 - (-1 - 3)}{-7 - (-9 + 2)} = \frac{-4 - (-4)}{-7 - (-7)} = \frac{0}{0}$$

which is **indeterminate**

$$24. \frac{3(-5 + 2) + 6(-4 + 10) - 2}{(10 - 2) + 7 + 5}$$

$$= \frac{3(-3) + 6(6) - 2}{8 + 7 + 5} = \frac{-9 + 36 - 2}{20}$$

$$= \frac{25}{20} = \frac{5}{4} = 1\frac{1}{4}$$

$$25. P = (25 + 35 + 25 + 6 + 15 + 13 + 15$$

$$+ 16) \text{ in.}$$

$$= 150 \text{ in.}$$

$$26. A = (7 \text{ ft})(10 \text{ ft}) + \frac{\pi(5 \text{ ft})^2}{2}$$

$$= 70 \text{ ft}^2 + \frac{25\pi \text{ ft}^2}{2}$$

$$= \left(70 + \frac{25\pi}{2}\right) \text{ ft}^2 = 109.25 \text{ ft}^2$$

$$27. -2\frac{2}{3} + 2\frac{3}{5} = 2\frac{3}{5} - 2\frac{2}{3} = 2\frac{9}{15} - 2\frac{10}{15}$$

$$= -\frac{1}{15}$$

$$28. \frac{4\frac{2}{3}}{-3\frac{1}{9}} = \frac{14}{3} + \frac{-28}{9} = \frac{14}{3} \times \frac{-9}{28} = -\frac{3}{2}$$

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

$$29. 5\frac{1}{3} + 8\frac{5}{12} = 5\frac{4}{12} + 8\frac{5}{12} = 13\frac{9}{12} = 13\frac{3}{4} \text{ yd}$$

$$30. S.A. = 2(\text{Area}_{\text{top}}) + 2(\text{Area}_{\text{front}}) + 2(\text{Area}_{\text{side}})$$

$$= 2(6 \text{ cm} \times 8 \text{ cm}) + 2(4 \text{ cm} \times 8 \text{ cm})$$

$$+ 2(4 \text{ cm} \times 6 \text{ cm})$$

$$= 2(48 \text{ cm}^2) + 2(32 \text{ cm}^2) + 2(24 \text{ cm}^2)$$

$$= 96 \text{ cm}^2 + 64 \text{ cm}^2 + 48 \text{ cm}^2$$

$$= 208 \text{ cm}^2$$

## Practice 16

$$a. -a[-a(p - a)] = -2[-2(-4 - 2)]$$

$$= -2[-2(-6)] = -2(12) = -24$$

$$b. pa[-p(-a)] = -2(-4)\{-(-2)[-(-4)]\}$$

$$= 8[2(4)] = 8(8) = 64$$

$$c. -x[-x(x - a) - (a - x)]$$

$$= -(-2)\{-(-2)[-2 - (-5)] - [-5 - (-2)]\}$$

$$= 2[2(-2 + 5) - (-5 + 2)]$$

$$= 2[2(3) - (-3)] = 2(6 + 3) = 2(9) = 18$$

### Problem Set 16

#### 1. Negative number

##### 2. (a) Sum

##### (b) Difference

##### (c) Product

##### (d) Quotient

#### 3. Regular polygons

$$4. 100 \text{ cm} \times \frac{1 \text{ in.}}{2.54 \text{ cm}} = \frac{100}{2.54} \text{ in.} = 39.37 \text{ in.}$$

$$5. 152 \text{ cm} \cdot \text{cm} \times \frac{1 \text{ in.}}{2.54 \text{ cm}} \times \frac{1 \text{ in.}}{2.54 \text{ cm}} \\ = \frac{152}{(2.54)^2} \text{ in.}^2 = 23.56 \text{ in.}^2$$

$$6. P = (31 + 11 + 31 + 11) \text{ in.} = 84 \text{ in.}$$

$$7. A = (17 \text{ ft})(13 \text{ ft}) = 221 \text{ ft}^2$$

$$8. A = \pi r^2 = \pi(9 \text{ yd})^2 = 81\pi \text{ yd}^2 = 254.34 \text{ yd}^2$$

$$9. x - xy = -2 - (-2)(-3) = -2 - 6 = -8$$

$$10. x(x - y) = -2[-2 - (-3)] = -2(-2 + 3) \\ = -2(1) = -2$$

$$11. (x - y)(y - x) = [2 - (-3)](-3 - 2) \\ = (2 + 3)(-5) = 5(-5) = -25$$

$$12. (x - y) - (x - y) = (-2 - 3) - (-2 - 3) \\ = -5 - (-5) = -5 + 5 = 0$$

$$13. -xa(x - a) = -4(-2)[4 - (-2)] = 8(4 + 2) \\ = 8(6) = 48$$

$$14. (-x + a) - (x - a) = [-(-4) + 5] - (-4 - 5) \\ = (4 + 5) - (-9) = 9 - (-9) = 9 + 9 = 18$$

$$15. (p - x)(a - px) = [2 - (-4)][-3 - 2(-4)] \\ = (2 + 4)(-3 + 8) = 6(5) = 30$$

$$16. -a[-a(x - a)] = -(-2)\{-(-2)[3 - (-2)]\} \\ = 2[2(3 + 2)] = 2[2(5)] = 2(10) = 20$$

$$17. -a[(-x - a) - (x - y)] \\ = -(-3)\{[-4 - (-3)] - [4 - (-5)]\} \\ = 3[(-4 + 3) - (4 + 5)] = 3(-1 - 9) \\ = 3(-10) = -30$$

$$18. -3(-1 - 2)(4 - 5) + 6 = -3(-3)(-1) + 6 \\ = -9 + 6 = -3$$

$$19. -2 + (-3) - |-5 + 2|3 = -5 - |-3|3 \\ = -5 - (3)3 = -5 - 9 = -14$$

$$20. 4[2(3 - 2) - (6 - 4)] = 4[2(1) - 2] \\ = 4(2 - 2) = 4(0) = 0$$

$$21. -2(-4) - \{-[-(-6)]\} = 8 + 6 = 14$$

$$22. \frac{3(-2) - 5}{-3(-2)} = \frac{-6 - 5}{6} = \frac{-11}{6} = -1\frac{5}{6}$$

$$23. \frac{-3(-6 - 2) + 5}{-3(-2 + 1)} = \frac{-3(-8) + 5}{-3(-1)} = \frac{24 + 5}{3} \\ = \frac{29}{3} = 9\frac{2}{3}$$

$$24. P = \left(7 + 20 + 7 + \frac{2\pi(10)}{2}\right) \text{ mi} \\ = (34 + 10\pi) \text{ mi} = 65.4 \text{ mi}$$

$$25. A = \frac{1}{2}(12 \text{ cm})(16 \text{ cm}) = 96 \text{ cm}^2$$

$$26. \text{Area} = \text{Area}_{\text{rectangle}} - \text{Area}_{\text{circle}} \\ = (12 \text{ m} \times 20 \text{ m}) - [\pi(6 \text{ m})^2] \\ = 240 \text{ m}^2 - 36\pi \text{ m}^2 \\ = (240 - 36\pi) \text{ m}^2 = 126.96 \text{ m}^2$$

$$27. y = 180 - 40 - 40 = 100$$

$$28. 1\frac{7}{12} + 5\frac{5}{6} - 4\frac{2}{3} = 1\frac{7}{12} + 5\frac{10}{12} - 4\frac{8}{12} \\ = 6\frac{17}{12} - 4\frac{8}{12} = 2\frac{9}{12} = 2\frac{3}{4}$$

$$29. 2\frac{2}{5} \times 11\frac{2}{3} = \frac{12}{5} \times \frac{35}{3} = 28$$

$$30. S.A. = 2(\text{Area}_{\text{triangle}}) + \text{Area}_{\text{bottom}} + \text{Area}_{\text{side}} \\ + \text{Area}_{\text{top}} \\ = 2\left[\frac{1}{2}(3 \text{ km} \times 4 \text{ km})\right] + (8 \text{ km} \times 4 \text{ km}) \\ + (3 \text{ km} \times 8 \text{ km}) + (8 \text{ km} \times 5 \text{ km}) \\ = 2\left[\frac{1}{2}(12 \text{ km}^2)\right] + 32 \text{ km}^2 + 24 \text{ km}^2 \\ + 40 \text{ km}^2 \\ = 2(6 \text{ km}^2) + 96 \text{ km}^2 \\ = 12 \text{ km}^2 + 96 \text{ km}^2 \\ = 108 \text{ km}^2$$

## Practice 17

- a.  $4(5 - 3) = 4(2) = 8$
- b.  $4(5 - 3) = 4(5) + 4(-3) = 20 - 12 = 8$
- c.  $a(b + c) = ab + ac$
- d.  $4(6 - 2 + 5 - 7)$   
 $= 4(6) + 4(-2) + 4(5) + 4(-7)$   
 $= 24 - 8 + 20 - 28 = 8$
- e.  $2m(xy - 3p) = 2m(xy) + 2m(-3p) = 2mxy - 6mp$
- f.  $xy(a + b - 2c) = xy(a) + xy(b) + xy(-2c)$   
 $= axy + bxy - 2cxy$

## Problem Set 17

- The coefficient of an expression is any one factor of the expression, or any product of factors of the expression.
- (a) A numerical coefficient of an expression is a coefficient that consists of numerals only.  
 (b) A literal coefficient of an expression is a coefficient that consists of variables or letters only.
- Commutative property of addition
- Commutative property of multiplication
- $250 \text{ cm} \times \frac{1 \text{ m}}{100 \text{ cm}} = \frac{250}{100} \text{ m} = 2.5 \text{ m}$
- $5000 \text{ cm} \cdot \text{cm} \times \frac{1 \text{ m}}{100 \text{ cm}} \times \frac{1 \text{ m}}{100 \text{ cm}}$   
 $= \frac{5000}{(100)^2} \text{ m}^2 = 0.5 \text{ m}^2$
- $P = 4S$   
 $64 \text{ cm} = 4S$   
 $S = \frac{64 \text{ cm}}{4}$   
 $S = 16 \text{ cm}$
- $A = S^2$   
 $25 \text{ m}^2 = S^2$   
 Each side is **5 m** because  $5 \text{ m} \times 5 \text{ m} = 25 \text{ m}^2$ .
- $A = \frac{1}{2}(6 \text{ in.})(8 \text{ in.}) = 24 \text{ in.}^2$

- $-7(-8 + 3) = (-7)(-8) + (-7)(3) = 56 - 21 = 35$
- $5(-3 - 6) = 5(-3) + 5(-6) = -15 - 30 = -45$
- $mx(ab - b) = (mx)(ab) + (mx)(-b)$   
 $= mxab - mxb$
- $-4y(d + cx) = (-4y)(d) + (-4y)(cx)$   
 $= -4yd - 4ycx$
- $(a + bc)2x = a(2x) + bc(2x) = 2xa + 2xbc$
- $3a(x + 2y) = 3a(x) + 3a(2y) = 3ax + 6ay$
- $-a(a - b) = -(-2)[-2 - (-7)] = 2(-2 + 7)$   
 $= 2(5) = 10$
- $(x - y) - (y - x) = [-2 - (-4)] - [-4 - (-2)]$   
 $= (-2 + 4) - (-4 + 2) = 2 - (-2)$   
 $= 2 + 2 = 4$
- $x - 2a(-a) = 4 - 2(-3)[-(-3)]$   
 $= 4 + 6(3) = 4 + 18 = 22$
- $-x(a - xa) = -(-4)[-3 - (-4)(-3)] = 4(-3 - 12)$   
 $= 4(-15) = -60$
- $-y[-ay - (xy)] = -(-3)[-(-2)(-3) - 2(-3)]$   
 $= 3(-6 + 6) = 3(0) = 0$
- $4[(2 - 4) - (6 - 3)] = 4(-2 - 3)$   
 $= 4(-5) = -20$
- $-[-(-3)] - 2(-2) + (-3) = -3 + 4 - 3 = -2$
- $-|-2| + (-3) - 3 - (-4 - 2)$   
 $= -2 - 3 - 3 - (-6) = -2 - 3 - 3 + 6 = -2$
- $-5(-2)(-2 - 3) - (-|-2|) = -5(-2)(-5) + |-2|$   
 $= -50 + 2 = -48$
- $\frac{3 - (-2)(4)}{5 - (-3)} = \frac{3 - (-8)}{5 + 3} = \frac{3 + 8}{8} = \frac{11}{8} = 1\frac{3}{8}$
- $\frac{3 + 7(-3)}{-6 - 2(-3)} = \frac{3 - 21}{-6 + 6} = \frac{-18}{0}$ , which is **undefined**
- $P = (31 + 26 + 16 + 18 + 9 + 18 + 6 + 26) \text{ ft}$   
 $= 150 \text{ ft}$
- $A = (5 \text{ yd} \times 8 \text{ yd}) + \frac{1}{2}\pi(4 \text{ yd})^2$   
 $= 40 \text{ yd}^2 + \frac{1}{2}\pi(16 \text{ yd}^2)$   
 $= (40 + 8\pi) \text{ yd}^2 = 65.12 \text{ yd}^2$



$$29. \quad 4\frac{1}{2} + 2\frac{3}{8} + 5\frac{1}{8} = 4\frac{4}{8} + 2\frac{3}{8} + 5\frac{1}{8}$$

$$= 6\frac{7}{8} + 5\frac{1}{8} = 11\frac{8}{8} = 12 \text{ mi}$$

$$30. \quad S.A. = 2(\text{Area}_{\text{base}}) + \text{Lateral Surface Area}$$

$$= 2[\pi(2 \text{ cm})^2] + (\text{Perimeter}_{\text{base}})(\text{Height})$$

$$= 2(4\pi \text{ cm}^2) + [2\pi(2 \text{ cm})](4 \text{ cm})$$

$$= 8\pi \text{ cm}^2 + 16\pi \text{ cm}^2$$

$$= 24\pi \text{ cm}^2 = 75.36 \text{ cm}^2$$

## Practice 18

- a.  $-2xy + 3x + 4 - 4yx - 2x = -6xy + x + 4$
- b.  $2xyz + 3xy - 5zyx = -3xyz + 3xy$
- c.  $3yac - 2ac + 6acy = 9acy - 2ac$
- d.  $4 - x - 2xy + 3x - 7yx = 4 + 2x - 9xy$

## Problem Set 18

- A term of an algebraic expression is a single symbol, a product, or a quotient.
- Terms of an algebraic expression can be called like terms when they have the same variables in the same or equivalent forms.
- (a), (c), (d)
- $a(b + c) = ab + ac$
- $1500 \text{ cm} \times \frac{1 \text{ in.}}{2.54 \text{ cm}} \times \frac{1 \text{ ft}}{12 \text{ in.}} = \frac{1500}{(2.54)(12)} \text{ ft}$   
 $= 49.21 \text{ ft}$
- $1250 \text{ in.} \cdot \text{in.} \times \frac{1 \text{ ft}}{12 \text{ in.}} \times \frac{1 \text{ ft}}{12 \text{ in.}}$   
 $= \frac{1250}{(12)^2} \text{ ft}^2 = 8.68 \text{ ft}^2$
- $$P = 2l + 2w$$

$$76 \text{ in.} = 2(22 \text{ in.}) + 2w$$

$$76 \text{ in.} = 44 \text{ in.} + 2w$$

$$76 \text{ in.} - 44 \text{ in.} = 2w$$

$$32 \text{ in.} = 2w$$

$$w = \frac{32 \text{ in.}}{2}$$

$$w = 16 \text{ in.}$$
- $A = \pi r^2 = \pi(9 \text{ ft})^2 = 81\pi \text{ ft}^2 = 254.34 \text{ ft}^2$

$$9. \quad 3xyz + 2zxy - 7zyx + 2xy = -2xyz + 2xy$$

$$10. \quad 4x + 3 - 2xy - 5x - 7 + 4yx$$

$$= -x + 3 + 2xy - 7 = -x - 4 + 2xy$$

$$11. \quad (4 + 2y)x = 4x + 2yx = 4x + 2xy$$

$$12. \quad 3x(y - 2m) = 3xy + 3x(-2m) = 3xy - 6mx$$

$$13. \quad 2p(xy - 3k) = 2p(xy) + 2p(-3k) = 2pxy - 6pk$$

$$14. \quad -a(x - a) = -(-3)[6 - (-3)]$$

$$= 3(6 + 3) = 3(9) = 27$$

$$15. \quad -x - (-a)(a - x) = -(-2) - (-4)[4 - (-2)]$$

$$= 2 + 4(4 + 2) = 2 + 4(6) = 2 + 24 = 26$$

$$16. \quad -p(-x) - px = -(-3)(-4) - (-3)(4)$$

$$= -12 + 12 = 0$$

$$17. \quad -x(-y) - xy = -3[-(-2)] - 3(-2) = -6 + 6 = 0$$

$$18. \quad (-a)(b)(-a + b) = -6(-3)[-6 + (-3)]$$

$$= 18(-9) = -162$$

$$19. \quad -6 - 2(-3)(-1) - 5(3 - 2 - 2)$$

$$= -6 - 6 - 5(-1) = -6 - 6 + 5 = -7$$

$$20. \quad -\{3(-2)(-4 + 2) - [3 - (-2)]\}$$

$$= -[-6(-2) - (3 + 2)] = -(12 - 5)$$

$$= -(7) = -7$$

$$21. \quad -4 - (-2) - [ -(-2) ] - |-3|$$

$$= -4 + 2 - 2 - 3 = -7$$

$$22. \quad -3 - 2(-4 + 7) - 5 - |-2 - 5|$$

$$= -3 - 2(3) - 5 - 7 = -3 - 6 - 5 - 7 = -21$$

$$23. \quad \frac{-2(-3 + 7)}{(-2)(-3)} = \frac{-2(4)}{6} = \frac{-8}{6} = \frac{-4}{3} = -1\frac{1}{3}$$

$$24. \quad \frac{-2 - 2(3) + 10}{3 - (-2)(-3)} = \frac{-2 - 6 + 10}{3 - 6} = \frac{2}{-3} = -\frac{2}{3}$$

$$25. \quad P = \left(6 + 24 + 6 + \frac{2\pi(12)}{2}\right) \text{ yd}$$

$$= (36 + 12\pi) \text{ yd} = 73.68 \text{ yd}$$

$$26. \quad A = \frac{1}{2}(9 \text{ cm})(12 \text{ cm}) = 54 \text{ cm}^2$$

$$27. \quad \text{Area} = \text{Area}_{\text{triangle}} - \text{Area}_{\text{circle}}$$

$$= \frac{1}{2}(8 \text{ m} \times 16 \text{ m}) - [\pi(3 \text{ m})^2]$$

$$= 64 \text{ m}^2 - 9\pi \text{ m}^2$$

$$= (64 - 9\pi) \text{ m}^2 = 35.74 \text{ m}^2$$

$$\begin{array}{r}
 28. \quad 0.304 \\
 \times 12.5 \\
 \hline
 1520 \\
 608 \\
 304 \\
 \hline
 3.8000
 \end{array}$$

$$\begin{array}{r}
 29. \quad \frac{2.03}{46} \sqrt{93.38} \\
 \frac{92}{138} \\
 \hline
 138
 \end{array}$$

$$\begin{aligned}
 30. \quad S.A. &= 2(\text{Area}_{\text{top}}) + 2(\text{Area}_{\text{side}}) + 2(\text{Area}_{\text{front}}) \\
 &= 2(20 \text{ in.} \times 21 \text{ in.}) + 2(10 \text{ in.} \times 20 \text{ in.}) \\
 &\quad + 2(10 \text{ in.} \times 21 \text{ in.}) \\
 &= 2(420 \text{ in.}^2) + 2(200 \text{ in.}^2) + 2(210 \text{ in.}^2) \\
 &= 840 \text{ in.}^2 + 400 \text{ in.}^2 + 420 \text{ in.}^2 \\
 &= 1660 \text{ in.}^2
 \end{aligned}$$

## Practice 19

- a.  $(-2)^2 = 4$
- b.  $-2^2 = -4$
- c.  $-3^3 - (-2)^2 - 2^2 = -27 - 4 - 4 = -35$
- d.  $\sqrt[3]{-64} = -4$
- e.  $(-3)^3 + \sqrt[3]{-27} = -27 - 3 = -30$
- f.  $-3^2 - \sqrt[3]{-8} - \sqrt{16} = -9 - (-2) - 4$   
 $= -9 + 2 - 4 = -11$
- g.  $x^2z^3y = (-3)^2(-2)^3(-2) = 9(-8)(-2) = 144$
- h.  $b^2 - 4ac = (-4)^2 - 4(-3)(-5) = 16 - 60 = -44$

## Problem Set 19

- Like terms
- Positive number
- A right triangle is a triangle that contains one right angle.
  - An acute triangle is a triangle that contains three acute angles.
  - An obtuse triangle is a triangle that contains one obtuse angle.
  - An equiangular triangle is a triangle in which all angles have equal measure.

$$\begin{aligned}
 4. \quad 10,000 \text{ in.} \times \frac{1 \text{ ft}}{12 \text{ in.}} \times \frac{1 \text{ mi}}{5280 \text{ ft}} &= \frac{10,000}{(12)(5280)} \text{ mi} \\
 &= 0.16 \text{ mi}
 \end{aligned}$$

$$\begin{aligned}
 5. \quad 15,000 \text{ ft} \cdot \text{ft} \times \frac{1 \text{ mi}}{5280 \text{ ft}} \times \frac{1 \text{ mi}}{5280 \text{ ft}} \\
 &= \frac{15,000}{(5280)^2} \text{ mi}^2 = 0.00054 \text{ mi}^2
 \end{aligned}$$

$$\begin{aligned}
 6. \quad A &= lw \\
 92 \text{ cm}^2 &= (23 \text{ cm})w \\
 w &= \frac{92 \text{ cm}^2}{23 \text{ cm}} \\
 w &= 4 \text{ cm}
 \end{aligned}$$

$$7. \quad A = \frac{1}{2}(9 \text{ m})(14 \text{ m}) = 63 \text{ m}^2$$

$$8. \quad (-4)^2 = 16$$

$$9. \quad -4^2 = -16$$

$$10. \quad -2^2 + (-2)^2 = -4 + 4 = 0$$

$$11. \quad -3^2 - (-3)^2 = -9 - 9 = -18$$

$$12. \quad \sqrt[3]{8} = 2$$

$$13. \quad \sqrt[3]{-8} = -2$$

$$14. \quad x^2y^3z = (3)^2(-2)^3(4) = (9)(-8)(4) = -288$$

$$\begin{aligned}
 15. \quad -x^2 - y^3 &= -(-3)^2 - (-2)^3 = -9 - (-8) \\
 &= -9 + 8 = -1
 \end{aligned}$$

$$\begin{aligned}
 16. \quad xym - 3ymx - 4xmy - 3my + 2ym \\
 &= -6mxy - my
 \end{aligned}$$

$$\begin{aligned}
 17. \quad a - 3 - 7a + 2a - 6ax + 4xa - 5 \\
 &= -4a - 8 - 2ax
 \end{aligned}$$

$$18. \quad x(4 - ap) = 4x + x(-ap) = 4x - xap$$

$$\begin{aligned}
 19. \quad (5p - 2c)4xy &= 4xy(5p) + 4xy(-2c) \\
 &= 20pxy - 8cxy
 \end{aligned}$$

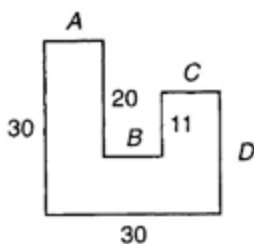
$$\begin{aligned}
 20. \quad 4k(2c - a + 3m) &= 4k(2c) + 4k(-a) + 4k(3m) \\
 &= 8kc - 4ka + 12km
 \end{aligned}$$

$$\begin{aligned}
 21. \quad -x(a - 3x) + x &= -4[3 - 3(4)] + 4 \\
 &= -4(3 - 12) + 4 = -4(-9) + 4 = 36 + 4 = 40
 \end{aligned}$$

$$\begin{aligned}
 22. \quad -(a - x)(x - a) &= -(-5 - 3)[3 - (-5)] \\
 &= -(-8)(3 + 5) = (8)(8) = 64
 \end{aligned}$$

23.  $-a[(x - a) + (2x + a)]$   
 $= -(-4)\{[3 - (-4)] + [2(3) + (-4)]\}$   
 $= 4[(3 + 4) + (6 - 4)] = 4(7 + 2) = 4(9) = 36$
24.  $-3(4 - 3) - 3 - |-3| = -3(1) - 3 - 3 = -9$
25.  $\frac{8 + 2 - 3(2)}{3(2) - 6} = \frac{10 - 6}{6 - 6} = \frac{4}{0}$ , which is **undefined**

26.



$$A + B + C = 30$$

$$20 + D - 11 = 30$$

$$D = 30 - 20 + 11$$

$$D = 21$$

$$P = 30 + 30 + A + 20 + B + 11 + C + D$$

$$= 30 + 30 + 20 + 11 + (A + B + C) + D$$

$$= 30 + 30 + 20 + 11 + 30 + 21$$

$$= 142 \text{ km}$$

27.  $A = (12 \text{ in.})(8 \text{ in.}) + \frac{\pi(4 \text{ in.})^2}{2}$   
 $= (96 + 8\pi) \text{ in.}^2 = 121.12 \text{ in.}^2$

28.  $9\frac{2}{15} - 3\frac{1}{5} - 3\frac{1}{3} = 9\frac{2}{15} - 3\frac{3}{15} - 3\frac{5}{15}$   
 $= 8\frac{17}{15} - 3\frac{3}{15} - 3\frac{5}{15} = 5\frac{14}{15} - 3\frac{5}{15}$   
 $= 2\frac{9}{15} = 2\frac{3}{5}$

29. 
$$\begin{array}{r} 4.002 \\ 304 \overline{)1216.608} \\ \underline{1216} \phantom{00} \\ 608 \\ \underline{608} \\ 000 \end{array}$$

30.  $S.A. = 2(\text{Area}_{\text{triangle}}) + \text{Area}_{\text{top}} + \text{Area}_{\text{bottom}}$   
 $+ \text{Area}_{\text{side}}$   
 $= 2\left[\frac{1}{2}(6 \text{ ft} \times 8 \text{ ft})\right] + (10 \text{ ft} \times 15 \text{ ft})$   
 $+ (15 \text{ ft} \times 8 \text{ ft}) + (6 \text{ ft} \times 15 \text{ ft})$   
 $= 2(24 \text{ ft}^2) + 150 \text{ ft}^2 + 120 \text{ ft}^2 + 90 \text{ ft}^2$   
 $= 48 \text{ ft}^2 + 360 \text{ ft}^2$   
 $= 408 \text{ ft}^2$

## Practice 20

- a.  $V = (\text{Area}_{\text{base}})(\text{Height})$   
 $= \left[(4 \text{ in.} \times 10 \text{ in.}) + \frac{1}{2}\pi(2 \text{ in.})^2\right](10 \text{ in.})$   
 $= (40 \text{ in.}^2 + 2\pi \text{ in.}^2)(10 \text{ in.})$   
 $= (400 + 20\pi) \text{ in.}^3 = 462.8 \text{ in.}^3$
- b.  $V = (\text{Area}_{\text{base}})(\text{Length})$   
 $= [\pi(6 \text{ ft})^2](20 \text{ ft})$   
 $= (36\pi \text{ ft}^2)(20 \text{ ft})$   
 $= 720\pi \text{ ft}^3 = 2260.8 \text{ ft}^3$
- c.  $V = (\text{Area}_{\text{base}})(\text{Height})$   
 $= (50 \text{ cm}^2)(12 \text{ cm})$   
 $= 600 \text{ cm}^3$

## Problem Set 20

1. (a), (d)
2. No
3. (a) {1, 2, 3, ...}  
 (b) {0, 1, 2, 3, ...}  
 (c) {..., -3, -2, -1, 0, 1, 2, 3, ...}
4.  $50 \text{ m} \times \frac{100 \text{ cm}}{1 \text{ m}} \times \frac{1 \text{ in.}}{2.54 \text{ cm}} = \frac{50(100)}{(2.54)} \text{ in.}$   
 $= 1968.50 \text{ in.}$
5.  $600 \text{ ft} \cdot \text{ft} \times \frac{1 \text{ yd}}{3 \text{ ft}} \times \frac{1 \text{ yd}}{3 \text{ ft}} = \frac{600}{(3)^2} \text{ yd}^2$   
 $= 66.67 \text{ yd}^2$
6.  $P = 2l + 2w$   
 $110 \text{ in.} = 2l + 2(14 \text{ in.})$   
 $110 \text{ in.} = 2l + 28 \text{ in.}$   
 $110 \text{ in.} - 28 \text{ in.} = 2l$   
 $82 \text{ in.} = 2l$   
 $l = \frac{82 \text{ in.}}{2}$   
 $l = 41 \text{ in.}$
7.  $C = 2\pi r$   
 $10\pi \text{ ft} = 2\pi r$   
 $\frac{10\pi \text{ ft}}{2\pi \text{ ft}} = r$   
 $r = 5 \text{ ft}$

8.  $3^2 + (-3)^2 = 9 + 9 = 18$
9.  $-2^2 + (-4)^2 = -4 + 16 = 12$
10.  $-2^3 + (-2)^3 = -8 + (-8) = -16$
11.  $-(-3)^2 - (-2)^3 = -9 - (-8) = -9 + 8 = -1$
12.  $\sqrt[3]{-27} = -3$
13.  $(-3)^3 - \sqrt[3]{-27} = -27 - (-3) = -27 + 3 = -24$
14.  $xz^2y^3 = 2(-3)^2(-2)^3 = 2(9)(-8) = -144$
15.  $a^2 - b^2a = (-2)^2 - 3^2(-2) = 4 - 9(-2)$   
 $= 4 - (-18) = 4 + 18 = 22$
16.  $5 - x + xy - 3yx - 2 + 2x = 3 + x - 2xy$
17.  $-3pxk + pkx - 3kpx - kp - 3kx$   
 $= -5kpx - kp - 3kx$
18.  $-3(-x - 4) = (-3)(-x) + (-3)(-4) = 3x + 12$
19.  $(4 - 2p)4x = 4x(4) + 4x(-2p) = 16x - 8px$
20.  $2x(a - 3p + 2) = 2x(a) + 2x(-3p) + 2x(2)$   
 $= 2ax - 6px + 4x$
21.  $-p(-a + 2p) + p = -(-3)[-2 + 2(-3)] + (-3)$   
 $= 3(-2 - 6) + (-3) = 3(-8) - 3$   
 $= -24 - 3 = -27$
22.  $k(ak - 4a) + k = -3[2(-3) - 4(2)] + (-3)$   
 $= -3(-6 - 8) - 3 = -3(-14) - 3$   
 $= 42 - 3 = 39$
23.  $a(x - a) + |x| = -2[-3 - (-2)] + |-3|$   
 $= -2(-3 + 2) + 3 = -2(-1) + 3 = 2 + 3 = 5$
24.  $2[-3(-2 - 4)(3 - 2)] = 2[-3(-6)(1)]$   
 $= 2(18) = 36$
25.  $\frac{(-4)(-3 + 7)(-1)}{(7 - 4 - 1)(2 - 3)} = \frac{(-4)(4)(-1)}{(2)(-1)} = \frac{16}{-2} = -8$
26.  $P = \left(10 + 10 + \frac{2\pi(4)}{2} + \frac{2\pi(4)}{2}\right) \text{ cm}$   
 $= (20 + 4\pi + 4\pi) \text{ cm}$   
 $= (20 + 8\pi) \text{ cm} = 45.12 \text{ cm}$

27.  $A = \frac{1}{2}(8 \text{ m})(15 \text{ m}) = 60 \text{ m}^2$
28.  $\text{Area} = \text{Area}_{\text{rectangle}} - \text{Area}_{\text{triangle}}$   
 $= (10 \text{ km} \times 8 \text{ km}) - \frac{1}{2}(8 \text{ km} \times 5 \text{ km})$   
 $= 80 \text{ km}^2 - 20 \text{ km}^2$   
 $= 60 \text{ km}^2$
29.  $5\frac{1}{2} + 12\frac{3}{10} + 3\frac{2}{5} = 5\frac{5}{10} + 12\frac{3}{10} + 3\frac{4}{10}$   
 $= 20\frac{12}{10} = 21\frac{2}{10} = 21\frac{1}{5} \text{ in.}$
30.  $V = (\text{Area}_{\text{base}})(\text{Height})$   
 $= (45 \text{ ft}^2)(10 \text{ ft})$   
 $= 450 \text{ ft}^3$

## Practice 21

- a.  $xyx^4x^3y^5 = xx^4x^3yy^5 = x^8y^6$
- b.  $x^3xy^2y^5x^7mm = x^3xx^7y^2y^5mm = x^{11}y^7m^2$
- c.  $2x^2y^3 + xy - 8y^3x^2 - 5yx = -6x^2y^3 - 4xy$
- d.  $x^6y + yx^6 + 3xy - 5xy^6 = 2x^6y + 3xy - 5xy^6$

## Problem Set 21

1. Negative number
2.  $a(b + c) = ab + ac$
3. (a) An isosceles triangle is a triangle that has at least two sides of equal length.  
 (b) An equilateral triangle is a triangle that contains three sides of equal length.  
 (c) A scalene triangle is a triangle that contains three sides of unequal length.
4.  $366 \text{ cm} \times \frac{1 \text{ in.}}{2.54 \text{ cm}} \times \frac{1 \text{ ft}}{12 \text{ in.}} = \frac{366}{(2.54)(12)} \text{ ft}$   
 $= 12.01 \text{ ft}$
5.  $5000 \text{ m} \cdot \text{m} \times \frac{1 \text{ km}}{1000 \text{ m}} \times \frac{1 \text{ km}}{1000 \text{ m}}$   
 $= \frac{5000}{(1000)^2} \text{ km}^2 = 0.005 \text{ km}^2$

6.  $A = lw$

$$95 \text{ cm}^2 = l(5 \text{ cm})$$

$$l = \frac{95 \text{ cm}^2}{5 \text{ cm}}$$

$$l = 19 \text{ cm}$$

7.  $A = \pi r^2 = \pi(10 \text{ m})^2 = 100\pi \text{ m}^2 = 314 \text{ m}^2$

8.  $x^2 y y y x^3 y x = x^2 x^3 x y y y y = x^6 y^4$

9.  $xm^2 xm^3 x^3 m = m^2 m^3 m x x x^3 = m^6 x^5$

10.  $ky^2 k^3 k^2 y^5 = k k^3 k^2 y^2 y^5 = k^6 y^7$

11.  $a^2 b a^2 b^3 a b^4 = a^2 a^2 a b b^3 b^4 = a^5 b^8$

12.  $4xyz - 3yz + zxy = 5xyz - 3yz$

13.  $7 - 3k - 2k + 2kx - xk + 8 = 15 - 5k + kx$

14.  $3ab^2 - 2ab + 5b^2a - ba = 8ab^2 - 3ab$

15.  $x^2 - 3yx + 2yx^2 - 2xy + yx$   
 $= x^2 - 4xy + 2x^2y$

16.  $5(2 - 4p) = 5(2) + 5(-4p) = 10 - 20p$

17.  $x(3p - 2y) = x(3p) + x(-2y) = 3px - 2xy$

18.  $(3 - 2b)a = 3a + (-2b)a = 3a - 2ab$

19.  $(a - x)(x - a) = (-3 - 4)[4 - (-3)]$   
 $= -7(4 + 3) = -7(7) = -49$

20.  $m(x - m) - |x| = -3[-4 - (-3)] - |-4|$   
 $= -3(-4 + 3) - 4 = -3(-1) - 4 = 3 - 4 = -1$

21.  $x^2 - y^2 = (-3)^2 - (-2)^2 = 9 - 4 = 5$

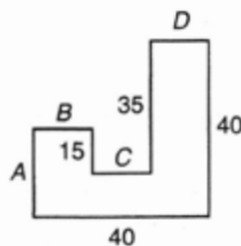
22.  $-5 - (-5)^2 - 3 + (-2) = -5 - 25 - 3 - 2$   
 $= -35$

23.  $-3^2 - 2^2 - (-3)^3 - \sqrt[3]{-8}$   
 $= -9 - 4 - (-27) - (-2)$   
 $= -9 - 4 + 27 + 2 = 16$

24.  $\frac{3 - [ -(-3) ]}{ -(-2) } = \frac{3 - 3}{2} = \frac{0}{2} = 0$

25.  $\frac{5(-6 + 4) + 7(-3 + 9)}{(5 - 3) + 6} = \frac{5(-2) + 7(6)}{2 + 6}$   
 $= \frac{-10 + 42}{8} = \frac{32}{8} = 4$

26.



$$B + C + D = 40$$

$$35 + A - 15 = 40$$

$$A = 40 - 35 + 15$$

$$A = 20$$

$$\begin{aligned}
 P &= 40 + 40 + A + B + 15 + C + 35 + D \\
 &= 40 + 40 + 15 + 35 + A + (B + C + D) \\
 &= 40 + 40 + 15 + 35 + 20 + 40 \\
 &= 190 \text{ in.}
 \end{aligned}$$

27.  $A = (5 \text{ ft})(10 \text{ ft}) + \frac{1}{2}(10 \text{ ft})(5 \text{ ft})$   
 $= 50 \text{ ft}^2 + 25 \text{ ft}^2 = 75 \text{ ft}^2$

28.  $\frac{-1\frac{3}{4}}{2\frac{1}{3}} = -\frac{7}{4} \div \frac{7}{3} = -\frac{7}{4} \times \frac{3}{7} = -\frac{3}{4}$

29. 
$$\begin{array}{r} 0.012 \\ \times 0.004 \\ \hline 0.000048 \end{array}$$

30.  $S.A. = 2(\text{Area}_{\text{base}}) + \text{Lateral Surface Area}$   
 $= 2[\pi(3 \text{ yd})^2] + (\text{Perimeter}_{\text{base}})(\text{Length})$   
 $= 2(9\pi \text{ yd}^2) + [2\pi(3 \text{ yd})](10 \text{ yd})$   
 $= 18\pi \text{ yd}^2 + (6\pi \text{ yd})(10 \text{ yd})$   
 $= 18\pi \text{ yd}^2 + 60\pi \text{ yd}^2$   
 $= 78\pi \text{ yd}^2 = 244.92 \text{ yd}^2$

## Practice 22

a.  $(-2) - 2 = 0 \quad 2 - 2 = 0$   
 $-4 \neq 0 \quad 0 = 0$

Therefore, 2 satisfies the equation.

b.  $(-2)^2 + 7(-2) = -10 \quad (-5)^2 + 7(-5) = -10$   
 $4 - 14 = -10 \quad 25 - 35 = -10$   
 $-10 = -10 \quad -10 = -10$

Therefore, -2 and -5 are roots of the equation.

## Problem Set 22

1. (a) An equation is an algebraic statement consisting of two algebraic expressions connected by an equals sign.

(b) A conditional equation is an equation whose truth or falsity depends on the replacement values of the variables within it.

## 2. Roots

3. (a), (b), (d)

$$4. 72 \text{ in.} \times \frac{2.54 \text{ cm}}{1 \text{ in.}} = 72(2.54) \text{ cm} = 182.88 \text{ cm}$$

$$5. 55 \text{ m} \cdot \text{m} \times \frac{100 \text{ cm}}{1 \text{ m}} \times \frac{100 \text{ cm}}{1 \text{ m}} = 55(100)^2 \text{ cm}^2 = 550,000 \text{ cm}^2$$

6.  $P = 2l + 2w$

$124 \text{ cm} = 2(45 \text{ cm}) + 2w$

$124 \text{ cm} = 90 \text{ cm} + 2w$

$124 \text{ cm} - 90 \text{ cm} = 2w$

$34 \text{ cm} = 2w$

$w = \frac{34 \text{ cm}}{2}$

$w = 17 \text{ cm}$

7.  $A = \pi r^2$

$4\pi \text{ m}^2 = \pi r^2$

$4(3.14) \text{ m}^2 = (3.14)r^2$

$12.56 \text{ m}^2 = 3.14r^2$

$\frac{12.56 \text{ m}^2}{3.14} = r^2$

$4 \text{ m}^2 = r^2$

The radius is **2 m** because  $2 \text{ m} \times 2 \text{ m} = 4 \text{ m}^2$ .

8.  $(-1) - 1 = 0$      $1 - 1 = 0$

$-2 \neq 0$      $0 = 0$

Therefore, **1** satisfies the equation.

9.  $(-3)^2 - (-3) = 12$      $(2)^2 - 2 = 12$

$9 + 3 = 12$      $4 - 2 = 12$

$12 = 12$      $2 \neq 12$

Therefore, **-3** is the root of the equation.

10.  $x^2xy^2xy^3 = x^2xxx^2y^3 = x^5y^5$

11.  $a^2aba^3b^2a^5 = a^2aa^3a^5bb^2 = a^{11}b^3$

12.  $p^2m^5ypp^3my^2 = p^2pp^3m^5my^2 = p^6m^6y^3$

13.  $4p^2x^2kpx^3k^2k = 4p^2pkk^2kx^2x^3 = 4p^3k^4x^5$

14.  $-8 - py + 2yp + 4 - y = -4 + py - y$

15.  $m + 4 + 3m - 6 - 2m + mc - 4mc = 2m - 2 - 3mc$

16.  $xy - 3xy^2 + 5y^2x - 4xy = -3xy + 2xy^2$

17.  $-3x^2ym + 7x - 5ymx^2 + 16x = -8mx^2y + 23x$

18.  $a(3x - 2) = a(3x) + a(-2) = 3ax - 2a$

19.  $4xy(5 - 2a) = 4xy(5) + 4xy(-2a) = 20xy - 8axy$

20.  $2x(4a + b - 3m) = 2x(4a) + 2x(b) + 2x(-3m) = 8ax + 2bx - 6mx$

21.  $cy(cx - y) = -2(3)[-2(-3) - 3] = -6(6 - 3) = -6(3) = -18$

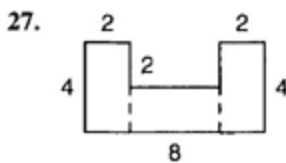
22.  $|x - a| - a(-x) = |4 - 3| - 3(-4) = 1 + 12 = 13$

23.  $a - b(a^2 - b) = -2 - 3[(-2)^2 - 3] = -2 - 3(4 - 3) = -2 - 3(1) = -2 - 3 = -5$

24.  $(-3)^3 + (-2)^3 - |-2| = -27 - 8 - 2 = -37$

25.  $-3^2 - (-2)^2 + \sqrt[3]{-27} = -9 - 4 - 3 = -16$

26.  $P = \left(4 + 4 + 4 + \frac{2\pi(2)}{2}\right) \text{ km} = (12 + 2\pi) \text{ km} = 18.28 \text{ km}$



$$A = (2 \text{ in.} \times 4 \text{ in.}) + (2 \text{ in.} \times 4 \text{ in.}) + (2 \text{ in.} \times 4 \text{ in.}) = 8 \text{ in.}^2 + 8 \text{ in.}^2 + 8 \text{ in.}^2 = 24 \text{ in.}^2$$

$$28. \text{Area} = \text{Area}_{\text{triangle}} - \text{Area}_{\text{circle}} = \frac{1}{2}(15 \text{ ft})(20 \text{ ft}) - \pi(5 \text{ ft})^2 = 150 \text{ ft}^2 - 25\pi \text{ ft}^2 = (150 - 25\pi) \text{ ft}^2 = 71.5 \text{ ft}^2$$

29.  $x = 180 - 115 - 45 = 20$

$$30. \text{Volume} = (\text{Area}_{\text{base}})(\text{Height}) = \left[\frac{1}{2}(9 \text{ in.})(6 \text{ in.})\right](10 \text{ in.}) = (27 \text{ in.}^2)(10 \text{ in.}) = 270 \text{ in.}^3$$

## Practice 23

$$\begin{array}{r} \text{a. } x + 5 = 17 \\ -5 \quad -5 \\ \hline x = 12 \end{array}$$

$$\begin{array}{r} \text{b. } k - 27 = -38 \\ +27 \quad +27 \\ \hline k = -11 \end{array}$$

$$\begin{array}{r} \text{c. } x - \frac{1}{2} = \frac{3}{8} \\ +\frac{1}{2} \quad +\frac{1}{2} \\ \hline x = \frac{3}{8} + \frac{1}{2} \\ x = \frac{3}{8} + \frac{4}{8} \\ x = \frac{7}{8} \end{array}$$

$$\begin{array}{r} \text{d. } d + 4\frac{1}{7} = 3\frac{1}{6} \\ -4\frac{1}{7} \quad -4\frac{1}{7} \\ \hline d = 3\frac{1}{6} - 4\frac{1}{7} \\ d = \frac{19}{6} - \frac{29}{7} \\ d = \frac{133}{42} - \frac{174}{42} \\ d = -\frac{41}{42} \end{array}$$

## Problem Set 23

- To solve an equation means to find the value(s) of the unknown that makes the equation true.
- Two equations are said to be equivalent if every solution of either one of the equations is also a solution of the other equation.
- $180^\circ$
- $150 \text{ m} \times \frac{100 \text{ cm}}{1 \text{ m}} = 150(100) \text{ cm} = 15,000 \text{ cm}$
- $116 \text{ in.} \cdot \text{in.} \times \frac{2.54 \text{ cm}}{1 \text{ in.}} \times \frac{2.54 \text{ cm}}{1 \text{ in.}}$   
 $= 116(2.54)^2 \text{ cm}^2 = 748.39 \text{ cm}^2$

$$\begin{array}{l} \text{6. } A = lw \\ 209 \text{ in.}^2 = (19 \text{ in.})w \\ w = \frac{209 \text{ in.}^2}{19 \text{ in.}} \\ w = 11 \text{ in.} \end{array}$$

$$\begin{array}{l} \text{7. } A = \pi r^2 \\ 9\pi \text{ ft}^2 = \pi r^2 \\ 9(3.14) \text{ ft}^2 = (3.14)r^2 \\ 28.26 \text{ ft}^2 = 3.14r^2 \\ \frac{28.26 \text{ ft}^2}{3.14} = r^2 \\ 9 \text{ ft}^2 = r^2 \end{array}$$

The radius is 3 ft because  $3 \text{ ft} \times 3 \text{ ft} = 9 \text{ ft}^2$ .

$$\begin{array}{r} \text{8. } x - 4 = 10 \\ +4 \quad +4 \\ \hline x = 14 \end{array}$$

$$\begin{array}{r} \text{9. } x + \frac{1}{5} = -\frac{1}{10} \\ -\frac{1}{5} \quad -\frac{1}{5} \\ \hline x = -\frac{1}{10} - \frac{1}{5} \\ x = -\frac{1}{10} - \frac{2}{10} \\ x = -\frac{3}{10} \end{array}$$

$$\begin{array}{r} \text{10. } x + 1\frac{1}{4} = -\frac{5}{8} \\ -1\frac{1}{4} \quad -1\frac{1}{4} \\ \hline x = -\frac{5}{8} - 1\frac{1}{4} \\ x = -\frac{5}{8} - \frac{5}{4} \\ x = -\frac{5}{8} - \frac{10}{8} \\ x = -\frac{15}{8} \end{array}$$

$$\begin{array}{l} \text{11. } (-2) + 2 = 0 \quad 2 + 2 = 0 \\ 0 = 0 \quad 4 \neq 0 \end{array}$$

Therefore,  $-2$  satisfies the equation.

$$\begin{array}{l} \text{12. } (-2)^2 - 2(-2) = 3 \quad (3)^2 - 2(3) = 3 \\ 4 + 4 = 3 \quad 9 - 6 = 3 \\ 8 \neq 3 \quad 3 = 3 \end{array}$$

Therefore, 3 is a root of the equation.

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