

Answers to Short and Numerical Problems

Chapter 1

Section 1.1 (p. 1-4)

9. a. \overline{PB} b. \overline{AB} c. \overline{PA}
 10. a. Yes b. Yes c. $ABCD, ABCE, ABDE, ABEF, ACDE, BCDE, CDEF$

Section 1.2 (p. 1-9)

2. a. 23 b. 24 3. 10 4. 7 5. 32 6. No. For B to be the midpoint of \overline{AC} , $5x - 3 = 9$, so $x = \frac{12}{5}$;
 7. 3
 9. $\angle WXZ$ and $\angle YXZ$;
 $\angle YXZ$ and $\angle YXW$;
 $\angle YXW$ and $\angle WXZ$ but then $AB = \frac{144}{25} - 3 = \frac{69}{25} \neq 9$
 10. 7 times; $\frac{45}{64}$ 11. a. 42 b. $x - 4$ 14. 8 or 56
 15. 12 or 42 16. (1,3), (2,1) 17. $-\frac{1}{3} < x < 3$

Section 1.3 (p. 1-14)

14. F 15. T 16. a. If it is raining, then I won't need a camel for transportation.
 b. It is not raining.

Section 1.4 (p. 1-20)

9. 35 10. 70 11. a. 33 b. 70 or 178 c. $x = 22, y = 14.4$
 12. a. $x = 50, y = 20$ 13. 64 14. 56 15. 48 16. 55 17. No
 b. $x = 30, y = 70$

Section 1.5 (p. 1-25)

1. a. Yes b. No c. Yes d. No e. Yes f. No
 7. Def. of angle bisector 8. Segment Addition Post. 9. Angle Addition Post.
 10. Th. 1.8 11. Def. of midpoint 12. Angle Addition Post.
 13. Vertical Angle Th. 14. Th. 1.6 15. Addition Prop. of Equality

Chapter 1 Review Exercises (p. 1-28)

5. False 6. 11 or 85 7. A 8. 2 9. $x = 32, y = 88$ 10. 8
 11. 48 12. $67\frac{1}{2}$ 13. 88 14. 48 15. 22.8 or 54
 16. 21 17. (2,18), (4,15), (6,12), (8,9), (10,6), (12,3)
 18. (2,2), (4,7), (6,12), (8,17) 19. $x = 12, y = 8, m\angle AED = 120$ 20. $m < 45$
 21. 30 22. 9 23. 29 24. Angles have measures $\frac{40}{3}, \frac{80}{3}$ 25. $10 \pm 4\sqrt{5}$

Chapter 2

Section 2.1 (p. 2-5)

1. a. $\triangle ACD \cong \triangle ACB$ SSS 2. a. $\triangle WMZ \cong \triangle XMY$ SAS 3. a. $\triangle BAC \cong \triangle DAC$ SAS
 b. $\triangle PQT \cong \triangle RQS$ SAS b. No congruence b. No congruence
 c. $\triangle MHA \cong \triangle THA$ SAS c. $\triangle RUS \cong \triangle TSU$ SAS c. $\triangle ADC \cong \triangle CBA$ SSS

Section 2.2 (p. 2-11)

1. a. $\triangle DBA \cong \triangle DBC$ ASA b. $\triangle PTQ \cong \triangle RTS$ ASA c. $\triangle ZWY \cong \triangle XWY$ AAS

Chapter 2 Review Exercises (p. 2-36)

3. a. No b. Yes 4. a. Only if $x = 6$ b. No

Chapter 3

Section 3.1 (p. 3-2)

1. a. x is odd. b. $\triangle ABC$ has two right angles. c. $a \neq 0$ and $b \neq 0$.

Section 3.2 (p. 3-7)

6. $x = 60, y = 30$ 7. a. $x = 29$ b. $x = 12$ 9. $m\angle APC = 118 = m\angle PQD, CA \rightarrow P$
13. $\overline{BD} \parallel \overline{CD'}$, $\overline{BE} \parallel \overline{CE'}$, $\overline{BG} \parallel \overline{CH'}$

Section 3.3 (p. 3-10)

4. a. 65 b. 68 c. 60 d. 148 5. 95 12. a. $x = 60, y = 61$
b. $x = 30, y = 15$
14. a. -1 or 2 b. 3 c. 3 or $-\frac{3}{2}$ 15. a. $x = 20, y = 33$ b. $x = 43, y = 29$

Section 3.4 (p. 3-14)

3. 30, 60, 90 4. 41, 66, 73
8. a. 49, 70, 61 b. Exterior \angle : 150; Remote int. \angle s: 80, 70; Adj. int. \angle : 30
9. a. $m\angle A = m\angle CBD = m\angle ABD = 36$; $m\angle C = m\angle CBA = m\angle CDB = 72$;
 $m\angle ADB = 108$ b. $1 - x$ 10. $a = 59, b = 82$ 15. 2, 4, 6

Section 3.5 (p. 3-18)

1. b. Yes c. 60° 2. a. 2 b. 3 c. 4 d. 10 e. $x - 2$ 3. 540, 720
4. 360, 24 5. a. 1800 b. 150 6. 10 7. 108 8. $x = 36, \overline{AB} \parallel \overline{DC}$ 9. 180
11. 90, 135, 90, 135, 90 12. 30, 60, 90, 60, 30, 90 13. 162, 144, 126, 108, 108, 126, 144, 162
16. 10 17. 9 & 12; 12 & 18; 18 & 36; 20 & 45; 24 & 72; 30 & 180

Section 3.6 (p. 3-23)

3. F 4. a. F b. F c. T d. T e. T f. T
9. a. 45 b. 45 c. 45 d. 60

Section 3.7 (p. 3-27)

1. a. No b. No c. No d. Yes 2. 3 and 13 3. $\angle R, \angle Q, \angle P$
4. $6 < x < 28$ 5. 11 6. \overline{XY} 7. $\overline{AT}, \overline{AM}, \overline{TM}, \overline{TH}, \overline{HM}$
8. Largest \angle of $\triangle PQT$ is $\angle PQT$; smallest \angle of $\triangle QRS$ is $\angle QRS$. They can't be congruent.
9. Longest is \overline{JK} ; shortest is \overline{HL} . 17. $a - b < x < a + b$

Section 3.8 (p. 3-31)

1. a. $m\angle 3 < m\angle 4$ b. $WZ > WX$ c. $m\angle 3 > m\angle 4$ d. $XY > YZ$
4. a. $DC < 9$ b. $m\angle PAL > 59$ 7. Obtuse

Chapter 3 Review Exercises (p. 3-33)

1. 14 2. 10 4. 2 or 5 5. 20, 60, 100 6. a. 7 b. 8 c. 4
7. $\overrightarrow{PQ} \parallel \overrightarrow{TS}$ 10. 3 or 5 13. 21 14. 35 15. a. $m\angle 1 = 108, m\angle 2 = 36, m\angle 3 = 72$
b. Yes; $m\angle 3 + m\angle A = 180$
16. $m\angle 1 = 80, m\angle 2 = 80, m\angle 3 = 20, m\angle 4 = 60, m\angle 5 = 30, m\angle 6 = 70$
17. $m\angle ACD = 42, m\angle DCE = 98, m\angle CDE = 42, m\angle BDE = 48, m\angle B = 42$
21. $\overline{UN}, \overline{PU}, \overline{PN}, \overline{TN}, \overline{PT}$ 22. a. $5 < x < 45$ b. $0 < y < 77$ c. 119
23. a. $x = \frac{143}{23}, y = \frac{100}{23}$ b. $x = 35, y = 14$ 26. 20

Chapter 4

Section 4.1 (p. 4-2)

10. $x = 20, y = 30$

Section 4.2 (p. 4-7)

2. a. $x = 31, y = 41$ b. $x = 15, y = 7$

Section 4.3 (p. 4-9)

13. Equilateral 14. Yes

Section 4.4 (p. 4-12)

1. a. 8 b. 96 2. a. $x = 8, y = 6$ b. $x = 14, y = 10$
9. \overline{BD} is the perpendicular bisector of \overline{AC} 10. $\triangle APR \cong \triangle PBQ \cong \triangle RQC \cong \triangle BRP$

Section 4.5 (p. 4-15)

1. 5 2. $BF = 4, CG = 8, DH = 12$ 3. $x = 13, y = 39$
8. $ME = 3, EF = 5, FN = 3$ 10. a. $x = 6, y = 9$ b. $w = 3, x = 9, y = 12, z = 15$
14. The long base is twice as long as the short base.

Section 4.6 (p. 4-20)

Angles of Δ	Incenter	Circumcenter	Orthocenter	Centroid
All acute	inside	inside	inside	inside
One right	inside	on	on	inside
One obtuse	inside	outside	outside	inside

5. a. 3 b. 15 c. 8 d. 36
8. a. Midpoint b. Centroid c. $\frac{2}{3}$ of the way d. $BN = \frac{1}{3}(BD)$ 9. 24
15. b. They are the same.
c. The intersection point is equidistant from all the vertices of the rectangles.
d. Yes

Chapter 4 Review Exercises (p. 4-22)

1. a. Rhombus b. Rectangle c. Rhombus d. $PQ = RS = 12, PS = QR = 8$
2. a. $m\angle D = m\angle B = 100, m\angle CAB = 60, m\angle ACB = 20$ b. $x = 8, y = 4$
23. At the circumcenter of $\triangle ABC$

Cumulative Review 1

- $\overline{BC} = 12$ and $\overline{MN} \parallel \overline{BC}$. The Midline Theorem
 - $\overline{PQ} \perp \overline{CD}$. In a plane, a line that is perpendicular to one of two parallel lines is perpendicular to the other.
 - $ABCD$ is a parallelogram. If the diagonals of a quadrilateral bisect each other, then the quadrilateral is a parallelogram.
 - $K < 12$. The Triangle Inequality
- a. F b. T c. T d. T 3. c 4. d
- a. F b. T c. F d. F 7. 72 8. 26 9. 42
- a. 12 b. 36

Cumulative Review 2

- $m\angle B > m\angle C$. If one side of a triangle is longer than another, the opposite angles have unequal measures in the same order.
 - $ABCD$ is a rhombus. A parallelogram whose diagonals are perpendicular is a rhombus
 - $KR = MR = LR = 4$. The midpoint of the hypotenuse of a right triangle is equidistant from all three vertices.
 - $ME = MF$. The Perpendicular Bisector Characterization Theorem
- a. T b. F c. F d. F 3. d 4. b 5. a. 30 b. 90
- $m\angle 1 = 40$, $m\angle 2 = 65$, $m\angle 3 = 40$, $m\angle 4 = 75$, $m\angle 5 = 105$ 7. 105 9. 140

Cumulative Review 3

- $\overline{MN} \parallel \overline{AC}$ and $MN = \frac{1}{2}AC$. The Midline Theorem
 - \overline{AP} bisects $\angle BAC$ and P is the midpoint of \overline{BC} . $\triangle ABP \cong \triangle ACP$ by HL.
 - P is equidistant from A and B . The Perpendicular Bisector Characterization Theorem
 - $\overline{AB} \parallel \overline{CD}$. $AIC \rightarrow P$
- a. T b. F c. F d. T 3. c 4. b 5. b 6. c
- a. $\angle ACB, \angle ECD$ b. $\angle CAB, \angle CED$ c. $\angle BCE$; the four angles of $ACDE$
8. 27 9. 72 10. 18 11. 6 12. $x = 3, y = 15$

Cumulative Review 4

- $m\angle ABC + m\angle ABD = m\angle CBD$. The Angle Addition Postulate
 - $\overline{AD} \parallel \overline{BC}$. $AI \rightarrow P$
 - $\angle A \cong \angle C$. The Supplement Theorem
 - $\angle A$ is a right angle. If two lines form congruent adjacent angles, the lines are perpendicular.
- a. F b. T c. T d. F 3. 60
- a. $\frac{40}{3}$ b. $x = 12$ or -5 c. $x = 9, y = 5$
- $m\angle 1 = 70, m\angle 2 = 120, m\angle 3 = 120$
- $m\angle A = 20, m\angle B = 80, m\angle C = 100, m\angle D = 160$; $\overline{AB} \parallel \overline{CD}$
- a. T b. F c. T d. T 11. 21, 39, 120 12. 30 sides
- a. $x = 6, y = 18$ b. $z = 55$ 15. $m\angle EAF = 9, m\angle AFE = 54$

Chapter 5

Section 5.1 (p. 5-2)

1. a. 5 b. 11 c. 12 d. -1, 7 5. a. $\frac{2}{5}$ b. $\frac{b}{c}$ c. $-\frac{4}{1}$ d. $\pm\frac{3}{1}$
6. a. $\frac{23}{11}$ b. $\frac{12}{11}$ 7. $\frac{1}{4}$ 8. 5:7, 25:49 9. 6 and 4 10. 9, 12, and 15
11. $n_1 = 150, n_2 = 225, n_3 = 180, n_4 = 216$ 12. a. $\frac{p}{m+n}$ b. $\frac{a+b}{a-b}$ c. $\frac{b+3}{a-4}$
13. a. 5 b. $7\sqrt{2}$ c. $\frac{3}{4}$ d. 12 14. b only

Section 5.2 (p. 5-5)

1. a. $\angle T$ b. $\frac{PZ}{PT}$ c. $\frac{PZ}{AB}; \frac{PT}{AC}$ 2. a. $\angle X$ b. $\frac{AB}{ZY} = \frac{BC}{YX} = \frac{CD}{XW} = \frac{DA}{WZ}$
3. $PA = 3; LC = \frac{16}{3}$ 4. 2:5 5. $x = \frac{28}{3}, y = \frac{49}{4}, z = \frac{35}{6}$ 6. $\frac{70}{3}$
7. a. T b. F c. F d. T e. F f. T 8. $\frac{x}{x+5} = \frac{6}{x+13}; x = 3$
10. a. $\frac{1}{4}$ b. $\frac{3}{5}$ 11. $\frac{14}{5}$ 12. a. $3+3\sqrt{5}$ b. 1.62 13. $x = 9, y = \frac{27}{2}$

Section 5.3 (p. 5-8)

1. $\triangle FUN \sim \triangle HAW$ 2. $\angle D \cong \angle T$ 3. a. $\triangle ABK \sim \triangle CDK$ b. 4:3 c. 4
5. Yes 7. $AC = \frac{32}{3}, AE = 12, AB = 16$ 11. $x = 24, y = 16$ 13. $x = 9, y = \frac{27}{5}$
17. 12 19. $\frac{2ab}{a+b}$

Section 5.4 (p. 5-13)

1. $\frac{32}{9}$ 2. a. $\frac{35}{2}$ b. $\frac{15}{2}$ c. 6 3. a. $BF = 12, FC = 4$ b. 20 c. 49:51
4. a. 26 b. $\frac{220}{3}$ 5. $PQ = 4, RS = 12$ 6. a. $\frac{320}{9}, \frac{160}{3}, \frac{640}{9}$ b. 11
7. a. 4:5 b. $\frac{16}{3}$ 8. $\frac{21}{4}$ and $\frac{27}{4}$ 9. $\frac{1}{2}$ 10. a. 48 b. 5:4 c. 20 d. 9:4

Section 5.5 (p. 5-18)

1. a. $\triangle NAG \sim \triangle CAL$ (or $\triangle LAC$) by SAS (or AA) b. $\triangle PHW \sim \triangle PAS$ by AA
c. No similarity 4. a. T b. T c. F d. T e. F
5. $\triangle BDA \sim \triangle ADC; AC = 5$ 6. 4
9. Sides of $\triangle ABC$: 8, 12, 18; Sides of $\triangle DEF$: 12, 18, 24 10. c. c^2 12. 150 ft
15. a. SAS b. SAS c. $x = 15, y = 3$

Chapter 5 Review Exercises (p. 5-21)

1. a. No b. Yes; 3:4 c. Yes; 3:8 2. a. $\frac{25}{6}$ b. 8 c. $\frac{10}{3}$
3. a. 4 and 6 b. $\frac{54}{5}$ and $\frac{36}{5}$
4. a. $\angle AEB \cong \angle AEC \cong \angle BDA \cong \angle BDC$ b. $\angle AOD \cong \angle BOE; \angle BDA \cong \angle AEB$
 $\angle AOD \cong \angle BOE; \angle AOB \cong \angle DOE$ $\angle AEC \cong \angle BDC; \angle AOB \cong \angle DOE$
 $\angle OAD \cong \angle OBE$

7. 10 or 22 11. a. $m\angle A = m\angle ABD = m\angle DBC = 36$; $m\angle ADB = 108$ b. $\frac{-1+\sqrt{5}}{2}$
 $m\angle ABC = m\angle C = m\angle BDC = 72$
12. a. $m\angle YBZ = 36$, $m\angle BED = 72$, $m\angle VED = 36$ 13. $\frac{27}{4}$, $\frac{45}{4}$ 16. 25
 b. $EX = \frac{-1+\sqrt{5}}{2}$, $XA = \frac{-1+\sqrt{5}}{2}$, $XY = \frac{3-\sqrt{5}}{2}$ c. $\frac{-1+\sqrt{5}}{1+\sqrt{5}} = \frac{3-\sqrt{5}}{2}$ 18. $\frac{64}{7}$

Chapter 6

Section 6.1 (p. 6-3)

4. a. 6 b. 8 5. a. $4\sqrt{3}$ b. 4 6. a. 9, $6\sqrt{2}$, $18\sqrt{2}$ b. 4, $4\sqrt{3}$, $8\sqrt{3}$
 7. a. 9 b. 54 c. $15+6\sqrt{3}$ 8. a. $2\sqrt{7}$ b. $\frac{50}{3}$ 9. a. $4\sqrt{6}$ b. $\frac{95}{12}$
 12. 9 13. $BC = 5$, $GF = \frac{15}{2}$, $CD = \frac{45}{4}$ 14. a. $PS = 4$, $RS = 2\sqrt{5}$ b. $QS = 3$

Section 6.2 (p. 6-7)

1. a. $2\sqrt{13}$ b. 10 c. $3\sqrt{5}$ 2. a. 5 b. 8 c. 20
 3. a. 2 b. $3\sqrt{2}$ c. $6\sqrt{2}$ 4. 7-24-25 & 15-20-25 5. 6-8-10 & $1-3\sqrt{11}-10$
 6. $\sqrt{74}$, $2\sqrt{6}$ 7. 40 8. 10 miles 9. $\sqrt{5}$ 10. a. 4 b. 7 c. 40
 11. a. $5\sqrt{3}$ b. $\sqrt{55}$ 12. alt=12; diag= $3\sqrt{41}$ 13. a. 11 b. 9 c. $3\sqrt{6}$ d. $\sqrt{14}$
 14. a. $6\sqrt{3}$ b. $k\sqrt{3}$ 15. $\sqrt{l^2+w^2+h^2}$ 16. 14 17. $3\sqrt{5}$

Section 6.3 (p. 6-12)

5. a.

n	a	b	c
4	9	40	41
5	11	60	61

8. a.

n	a	b	c
5	12	35	37
6	14	48	50

b.

n	$2n+1$	$2n^2+2n$	$2n^2+2n+1$
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b.

n	$2n+2$	n^2+2n	n^2+2n+2
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6. a. acute b. obtuse c. acute d. acute e. right f. right 7. True
 9. $\sqrt{409}$ 10. a. 3-4-5 b. 120
 12. a. 5, 12, 13 b. 7, 24, 25 c. 4, $\frac{15}{2}$, $\frac{17}{2}$ d. 6, $\frac{35}{2}$, $\frac{37}{2}$

Section 6.4 (p. 6-15)

1. a. $2\sqrt{2}$ b. $10\sqrt{2}$ c. 2 d. 6 2. a. $2\sqrt{2}$ b. $\frac{\sqrt{2}}{2}$ c. $10\sqrt{2}$ d. 6 e. $\frac{D\sqrt{2}}{2}$
 3. a. $\frac{\sqrt{3}}{3}$ b. $\frac{2\sqrt{3}}{3}$ c. 1 d. $\sqrt{5}$ 4. a. $\frac{2\sqrt{3}}{3}$ b. $\frac{4\sqrt{3}}{3}$ c. 2 d. $2\sqrt{5}$
 5. a. $\sqrt{3}$ b. $2\sqrt{3}$ c. 3 d. $3\sqrt{5}$ 6. $AC = 16$, $BD = 32$, $CD = 16\sqrt{3}$, $AB = 16\sqrt{2}$
 7. a. $2\sqrt{3}$ b. $3\sqrt{3}$ c. $x\sqrt{3}$ 8. $a = 3\sqrt{3}$, $b = 4\sqrt{3}$, $c = 3$ 9. $4\sqrt{6}$
 10. $6\sqrt{3}$ by 12 11. a. $4\sqrt{3}$ b. $\frac{k\sqrt{3}}{2}$ 12. a. Yes b. $4\sqrt{6}$
 13. a. $12\sqrt{2}$ b. $6\sqrt{3}$ c. 6 d. $6\sqrt{2}$ 14. a. $2\sqrt{2}$ b. $48\sqrt{2}$

15. $9 + 3\sqrt{2} + 3\sqrt{3}$ 16. $4\sqrt{6}$ 17. $28 + 4\sqrt{6} + 4\sqrt{3}$ 18. $\frac{15}{2}$ 19. $\frac{8}{\sqrt{2}+1}$

21. a. $\frac{1+\sqrt{5}}{2}$ b. $\frac{\sqrt{5+2\sqrt{5}}}{2}$ 22. a. $\frac{1+\sqrt{5}}{4}$ b. $\frac{\sqrt{10-2\sqrt{5}}}{4}$

Section 6.5 (p. 6-23)

1. a. $\frac{1}{2}$ b. $\frac{\sqrt{3}}{2}$ c. $\frac{\sqrt{3}}{3}$ (or $\frac{1}{\sqrt{3}}$) d. $\frac{\sqrt{3}}{2}$ e. $\frac{1}{2}$ f. $\sqrt{3}$

2. a. $\frac{\sqrt{2}}{2}$ (or $\frac{1}{\sqrt{2}}$) b. $\frac{\sqrt{2}}{2}$ (or $\frac{1}{\sqrt{2}}$) c. 1 3. a. $\frac{4}{5}$ b. $\frac{3}{5}$ c. $\frac{4}{3}$ d. 53.1°

5. $\frac{1}{2}$ or $\frac{\sqrt{3}}{2}$ 6. 28° and 62° 7. a. 68° b. $2\sqrt{55}$ 8. $8 + 2\sqrt{3}$

9. a. 6.66 b. 43° 10. a. increases b. decreases c. increases

11. a. 4.10 b. 3.50 c. 10.00 d. 12.20

12. $\sin X = \frac{4}{5}$, $\cos X = \frac{3}{5}$, $\tan X = \frac{4}{3}$; $\sin Y = \frac{3}{5}$, $\cos Y = \frac{4}{5}$, $\tan Y = \frac{3}{4}$

13. altitude = 4.82; $YZ = 8.62$ 14. 1.37

15. a. $CP = 7.71$; $PB = 9.19$ b. 16.19 c. 25.5° d. 17.94

16. a. 40 b. 3.86 c. 70 d. 4.11 e. 36.97

17. a. $x = 5$; $h = 12$ b. $m\angle A = 67.4$, $m\angle B = 53.1$, $m\angle C = 59.5$

Section 6.6 (p. 6-27)

1. a. 18.54 b. 14.98 2. a. 2.59 b. 39.52° 3. a. 566.12 m b. 480.10 m

4. 22.02° 5. 31.5 ft 6. a. 50.96° b. 45° c. 36.5° 7. 11,196.15 ft 8. 6.63°

9. 150 ft; 59.0° 10. a. 320.07 ft b. 349.25 ft 11. $x = 28.79$, $y = 82.91$, $z = 77.91$

12. a. 50.17 ft b. 29.73 ft 13. a. 120 ft b. 40° 14. 181.8 ft

15. 16.63 ft 16. a. 305.1 ft b. 249.9 ft c. 480.8 ft 17. About 199,230 ft

18. a. 45 b. 7.39 c. 6.12 19. a. 36 b. $BP = 4.85$, $CP = 3.53$ c. 11.41

20. a. 96 ft b. 73.7° 21. About 299 ft 22. $x = 23.88$, $h = 19.08$

Chapter 6 Review Exercises (p. 6-30)

1. $13 + 5\sqrt{13}$ 2. 4.79 and 13.16 3. $14 + 2\sqrt{3} + 2\sqrt{6}$ 4. $\sqrt{130}$ and $4\sqrt{2}$

5. 20 6. a. $\frac{24}{25}$ b. 73.7 c. $\frac{7}{25}$ d. 16.3 7. $8\sqrt{2 + \sqrt{2}}$, (14.78) 8. $6\sqrt{13}$

9. c. 0.00021 10. $8\sqrt{2}$ 11. $AD = \frac{27}{4}$, $BD = 9$ 12. $x = 2\sqrt{13}$, $y = 7$

13. a. larger b. smaller c. larger d. smaller e. larger 14. 17.17

15. 3 16. $x = 4$, $y = 4\sqrt{3}$ 17. $x = \frac{9}{2}$, $y = \frac{15}{2}$ 18. $x = 9$, $y = 4\sqrt{7}$

19. 32.4 20. 3.57 21. 7 22. $x = 5\sqrt{3}$, $y = 3$, $z = 8\sqrt{3}$ 23. $2\sqrt{3}$

24. $12 + 12\sqrt{3}$ 25. 44.55

Chapter 7

Section 7.1 (p. 7-3)

1. a. T b. F c. T d. T e. F f. T 2. 70

3. They all lie on a single circle. 6. 14 or 4 7. 16 11. a. 8 b. $\sqrt{34}$ 13. 10

Section 7.2 (p. 7-9)

1. 2 2. 3, 4, 5 3. $\frac{5}{2}$ 4. $2\sqrt{3}$ 5. $\sqrt{55}$ 6. a. 16 b. $8\sqrt{2}$
9. b. Yes 10. $3k$ 11. $\frac{3}{2}$ 12. $\frac{r}{2}$ 15. $\frac{a+b-c}{2}$

Section 7.3 (p. 7-13)

1. a. 5, 10, 16 4. a. $XY = 8, YZ = \frac{8}{3}$ 5. a. Infinite number b. 8
b. $XY = 4\sqrt{3}, YZ = 2\sqrt{3}$ 6. a. $XY = 12, YZ = \frac{12}{5}$
c. $XY = 2\sqrt{2}, YZ = 2\sqrt{2}$ b. $XY = \sqrt{77}, YZ = \sqrt{77}$
7. a. 12 b. $2\sqrt{11}$ 8. $XY = 15, YZ = \frac{15}{4}$
9. External: 15 10. External: 24 11. 1:3
Internal: $\sqrt{33}$ Internal: $4\sqrt{21}$
12. a. 4 b. 3 13. a. $5\sqrt{3}$ b. 12 14. b. 5, 10, and 16

Section 7.4 (p. 7-18)

1. 150 6. 10 7. Draw the chord through P that is perpendicular to \overline{OP} .
8. 20, 80, 100, 160 9. $4\sqrt{2}$ 11. $6r$ 12. $4r\sqrt{3}$

Section 7.5 (p. 7-23)

1. a. 90 b. 25 c. 30 d. 15 e. 75 f. 37.5 g. 100 h. 62.5
2. a. 90 b. 40 c. 100 d. 50 e. 20 f. 10 g. 80 h. 10
3. a. 90 b. 25 c. 30 d. 120 5. $m\angle XBD = 40, m\angle XDB = 32$
7. 35, 65, 80 8. $x + y, x + z, y + z$ 10. $PA = \frac{\sqrt{2}}{2}(PB + PD)$
11. a. $C \& G; E \& H$ b. $\angle B, 165$ c. $\frac{1}{2}(50 + 130) = 90$ 19. a. 75 b. 120 c. 105

Section 7.6 (p. 7-28)

1. a. \widehat{YWU} b. $\widehat{YW}, \widehat{YZ}$ c. $\widehat{WU}, \widehat{TZ}$ 2. 90, 90, 25, 65, 55
3. a. 30 b. 80 c. 125 d. 40 125, 35, 60, 90, 60
4. 144, 216 6. 75.5, 75.5, 104.5, 104.5, and 29 7. 108 and 72 8. 100
13. a. 30 b. 120 c. 15 d. 50 e. 130 f. 145
14. a. 38 b. 19 c. 52 d. 14 e. 114 f. 57

Section 7.7 (p. 7-33)

3. a. 8 b. 3 c. 3 or 6 4. a. 6 b. 2 c. 9 d. 8 e. $\frac{1}{2}$
5. a. 20, 27, 32, 35 b. $(6-x)(6+x), x=0$ 6. a. 9 b. 12 c. 5
7. a. 9 b. 4 c. 9 9. $\frac{3}{2}$
11. a. $AT = \frac{8}{3}, BT = \frac{10}{3}$ b. $\frac{10}{3}$ 12. a. $AT = \frac{27}{4}, BT = \frac{21}{4}$ b. $\frac{21}{4}$
14. 4 15. 5 17. a. 36 b. $(6+x)(6-x)$ 19. 6 or 15 20. 7 or 31

Chapter 7 Review Exercises (p. 7-36)

1. $\frac{a+b-c}{2}$ 2. 7 or 5 4. $\frac{8}{1+\sqrt{3}} = 4(\sqrt{3}-1)$ 5. $\frac{240}{13}$ 6. $4\sqrt{3}$
 7. 3, 6, 8 8. 3, 6, 8 10. 36, 36, 72 11. $\frac{25}{4}$
 12. a. 65 b. 25 c. 25 d. 40 e. 50
 f. 50 g. 110 h. 135 i. 65 j. 70
 14. $AT = 2\sqrt{2}$, $AQ = \frac{4\sqrt{2}}{3}$ 16. $\frac{289}{15}$ 17. 60

Chapter 8

Section 8.1 (p. 8-2)

1. 39 2. $\frac{103}{2}$ 3. a. No b. Yes 4. \$30 per sq. yd. 5. 60 in^2
 6. 1 inch 7. $2a^2$ 8. 6 9. 9 inches by 12 inches 10. 6 12. 4.5 yd.
 13. $10'$ by $18'$ 14. 118 15. 120 in^2 16. $2 + \sqrt{5}$

Section 8.2 (p. 8-9)

1. a. 60 b. $21\sqrt{3}$ c. $36\sqrt{2}$ 2. a. 20 b. $8 + 8\sqrt{3}$ c. 48
 3. a. $16\sqrt{3}$ b. $\frac{r^2\sqrt{3}}{4}$ 4. a. 9 b. 100 5. a. $32\sqrt{3}$ b. $\frac{r^2\sqrt{3}}{2}$
 6. a. $12\sqrt{3}$ b. $9\sqrt{3}$ c. $\frac{3r^2\sqrt{3}}{4}$ 8. $72\sqrt{3}$ 9. 1 10. 1 11. a. $2\sqrt{13}$ b. $\frac{12\sqrt{13}}{13}$
 12. 13, 14, 15 13. 2 14. a. $\frac{16}{3}$ b. $\frac{20}{3}$ c. $\frac{3}{2}$
 15. a. No. $m\angle ABC \neq 60$ b. $5 + 3\sqrt{3} + 9\sqrt{2}$ c. $\frac{45+3\sqrt{3}}{2}$ 16. $a(\triangle ACE) = a(\triangle ACD)$
 17. 5 19. $\frac{3\sqrt{91}}{5}$ 20. 6 inches 21. $12\sqrt{3}$ 22. a. $h = b \sin C$ b. $\text{area} = \frac{1}{2}ab \sin C$
 23. a. 72.4 b. 72.9 27. Either $b = 14$ and $h = 24$ or $b = 48$ and $h = 7$

Section 8.3 (p. 8-14)

1. a. 60 b. $60 + 6\sqrt{13}$ c. 48 2. 36 3. $32\sqrt{2}$ 4. 33 5. 12
 6. $216 \text{ ft}^2 \rightarrow 5 \text{ qts.}$ 7. $33,750 \text{ ft}^2$ 8. 48 9. 33.5, 36.5
 10. a. 120 b. 48 c. 36 11. 90
 14. a. 14 b. $2(\sqrt{5} + \sqrt{13} + \sqrt{26})$ 15. a. $125\sqrt{3}$ b. $25 + 25\sqrt{3}$

Section 8.4 (p. 8-18)

1. a. $3\sqrt{2}$ b. 72 2. a. $2\sqrt{3}$ b. $18\sqrt{3}$ 3. $18\sqrt{3}$ 4. 1:2 5. 4
 6. a. $6\sqrt{2-\sqrt{2}}$ b. $\frac{3\sqrt{2}}{\sqrt{2-\sqrt{2}}}$ c. $72\sqrt{2}$ 7. $3R^2$ 8. $2R^2\sqrt{2}$ 9. 1:4 10. $4:3\sqrt{3}$
 11. a. 30° b. $3\sqrt{3}$ c. $6\sqrt{2-\sqrt{3}}$ d. $\frac{3}{\sqrt{2-\sqrt{3}}}$ 12. a. 45° b. $4 + 4\sqrt{2}$ c. $4\sqrt{2+\sqrt{2}}$
 13. a. 40° b. 416.5 c. 11.3 14. a. 3° b. 0.02617 c. 3.14016 d. 3.14158
 e. 3.141592654 15. $\frac{1}{2}$ 16. $\frac{\sqrt{2}}{2}$ 17. a. 30 b. $2 + 2\sqrt{3}$ c. $2 + \sqrt{3}$
 d. $16 + 8\sqrt{3}$ e. $\sqrt{2} + \sqrt{6}$ 18. 3:4 19. $144(2 - \sqrt{2})$

Section 8.5 (p. 8-22)

1. 9π 2. 8π 3. a. 3 b. $\frac{9}{2}$ c. $\frac{5}{\pi}$ d. $\frac{1}{\pi}$ 4. $4\pi\sqrt{3}$, 8π
 5. 9π 6. $12r^2 - 3\pi r^2$ 8. $\frac{2\pi}{\pi-2}$ 9. a. $24 + 6\pi$ b. $72 - 9\pi$
 10. a. $\frac{100}{\pi}$ m. b. $\frac{30,000}{\pi}$ m² 12. b. $\frac{5\pi}{18}$ 13. $\frac{256}{81} \approx 3.16$ 14. b. 63

Section 8.6 (p. 8-25)

1. a. 9π b. 12π c. 24π 2. $\frac{3\pi}{4}$ 3. a. 120° b. No 5. a. 12π b. 12π
 6. a. $6\pi - 9\sqrt{3}$ b. $\frac{1}{6}\pi r^2 - \frac{\sqrt{3}}{4}r$ 7. 8 8. 8 9. $4\pi - 8$
 10. a. $9\sqrt{3} + 6\pi$ b. $12 + 6\sqrt{3} + 2\pi$ 11. $p = 15\pi$, $a = \frac{45\pi}{2} + 9\sqrt{3}$
 12. a. 8π b. $8\pi - 16$ 13. $36(2\pi - 3\sqrt{3})$ 14. a. $16 + 4\pi$ b. $48 + 4\pi$
 15. 87.41 inches

Section 8.7 (p. 8-29)

1. a. $\frac{64}{25}$ b. $\frac{25}{9}$ c. $\frac{16}{33}$ d. $\frac{100}{189}$ 2. $\frac{9}{16}$ 3. 12, 16, 20; $6\sqrt{2}$, $8\sqrt{2}$, $10\sqrt{2}$
 4. $4 + 4\sqrt{2}$ 5. a. $\frac{64}{25}$ b. $\frac{5}{8}$ c. $\frac{1}{1}$ d. $\frac{1}{1}$
 8. a. $\frac{1}{1}$ b. $\frac{1}{1}$ c. $\frac{1}{2}$ d. $\frac{1}{3}$ 9. 3 : 4 10. 9, 27, 45, 63

Chapter 8 Review Exercises (p. 8-32)

1. 240 2. 40, 16 3. $\frac{175\sqrt{3}}{2}$ 4. $16\pi - 12\sqrt{3}$ 5. $\frac{27\sqrt{3}}{2}$ 6. 49
 7. a. T b. T c. T d. F 8. 200 9. $\frac{s^2(4-\pi)}{2}$ 10. 4π 11. $3\pi - 9$
 13. $a(\text{I}) = 16$, $a(\text{II}) = 16$, $a(\text{III}) = 32$, $a(\text{IV}) = 80$ 14. $54 + 54\sqrt{3}$ 15. $3Rr$

Chapter 9**Section 9.1** (p. 9-2)

1. 108 2. 54 3. LA = 72; TA = 84 4. LA = 384; TA = $528 + 144\sqrt{2}$
 5. a. LA = 48; TA = 60 b. LA = 144; TA = $144 + 24\sqrt{5}$ 6. 190 7. $96 + 64\sqrt{3}$
 8. 8 rolls 9. $192 + 48\sqrt{3}$

Section 9.2 (p. 9-6)

1. a. 6 b. $6\sqrt{2}$ c. $2\sqrt{7}$ d. 8 e. 192 2. a. $2\sqrt{10}$ b. 4 c. $2\sqrt{6}$ d. 72
 3. $12\sqrt{2}$ 4. 2688 5. $36\sqrt{3}$ 6. 168
 7. a. 16 b. $24+8\sqrt{3}$ c. $30+8\sqrt{2}+2\sqrt{17}$ d. $26+16\sqrt{2}+2\sqrt{17}$
 8. a. $6+2\sqrt{3}$ b. $168+16\sqrt{3}$ 9. $24+24\sqrt{2}+4\sqrt{3}$ 10. $k^2(12+4\sqrt{3})$
 11. a. 611.6 ft b. 718.9 ft c. 231,087.2 ft² d. 5.3 acres
 12. a. 108 b. 3; 12 c. 96 14. $48+48\sqrt{3}$

Section 9.3 (p. 9-10)

1. 72 2. 16 in^3 3. 6 4. $120\sqrt{2} \text{ in}^3$ 5. a. 256 b. 480 6. $\sqrt[3]{27.027} = \frac{1000}{37}$
 7. a. $\frac{3}{4}$ b. $\frac{1}{4}$ c. $\frac{1}{2}$ 8. $192\sqrt{3}$ 9. 198 10. $9\sqrt{3}:16:6\sqrt{3}$ 11. 4

Section 9.4 (p. 9-14)

1. 96 2. $96\sqrt{7}$ 3. $6\sqrt{2}$ 4. $18\sqrt{2}$ 5. a. $72\sqrt{2}$ b. $\frac{s^3\sqrt{2}}{3}$
 6. 91,544,523.15 ft³ 7. $960\sqrt{2}$ 8. a. $\frac{4}{3}$ b. $\frac{616}{3}$ c. $\frac{2\sqrt{3}}{3}$ 9. $\frac{56}{3}+14\sqrt{2}$
 10. $\frac{20}{3}k^3$ 11. 96 12. a. 30 b. 122

Section 9.5 (p. 9-18)

1. 24π 2. $\sqrt{6}$ 3. 4 4. $\frac{3}{4\pi}$ 5. $1:\sqrt{2}$ 6. a. 16 b. $\sqrt{100+9\pi^2} \approx 13.74$
 7. 16π 8. a. $\frac{\pi}{4}$ b. No 11. a. 45π b. $\frac{80\pi}{3}$ c. $\frac{5\pi r^2(6-r)}{3}$ 12. 1:2
 13. $72\pi, 36\pi, 24\pi$ 14. a. $\frac{\pi}{4}$ b. $\frac{\pi}{4}$ c. $\frac{\pi}{4}$ 15. 3

Section 9.6 (p. 9-22)

1. 30π 2. $V = \frac{55\pi}{3}$; $LA = 6\pi\sqrt{11}$ 3. $A = 32\pi\sqrt{2}$; $V = \frac{128\pi}{3}$
 4. a. 69π b. $45\pi + 3\pi\sqrt{34}$ 5. $\frac{45\pi}{4}$ 6. a. 37π b. $7\pi\sqrt{10}$
 7. a. 16π b. $6\pi\sqrt{13} + 24\pi$ 8. 1:4

Section 9.7 (p. 9-25)

1. a. $V = \frac{32\pi}{3}$; $A = 16\pi$ 2. 3 4. a. $\frac{3}{2}$ 6. 2.25 in^3
 b. $V = 36\pi$; $A = 36\pi$ 3. a. 3 b. $\frac{3}{2}$
 c. $V = \frac{4}{3}\pi^4$; $A = 4\pi^3$ b. $\frac{33}{50}$ 7. Halfway between the sphere's center and
 d. $V = \frac{\pi^2\sqrt{2\pi}}{3}$; $A = 2\pi^2$ c. $\frac{54}{125}$ the center of the cap on the sphere.
 8. $\frac{64\pi}{3}$ 9. a. $\frac{9}{32}$ b. $\frac{9}{16}$ 10. No 11. They are π , 2π , and 3π .
 12. a. 36π b. 36π c. 36π d. 36π

Section 9.8 (p. 9-27)

1. $\frac{27}{125}; \frac{9}{25}$ 2. a. 1:8 b. 1:4 c. 1:4 3. a. 1:64 b. 1:16 c. 1:16
 4. 1:3 5. a. 8:27 b. 8:19 c. 4:9 d. 4:5 6. a. .995 b. .005
 7. Half as much 8. a. 4 b. 1:27 c. 1:8 9. a. 8:27 b. 4:9 c. 2:3

Chapter 9 Review Exercises (p. 9-29)

1. 108 2. $A = 224\pi; V = 392\pi$ 3. a. $512 - 72\pi$ b. $384 + 30\pi$ 4. 90
 5. $LA = 160\pi; V = \frac{200\pi\sqrt{39}}{3}$ 6. 12π 8. $144\sqrt{2}$ 9. $\frac{16\pi+6\sqrt{3}}{4\pi} \approx 4.83$ 10. 6:7
 7. a. $LA = 128 + 64\sqrt{2}; V = \frac{512\pi}{3}$ b. $LA = 64 + 64\sqrt{5}; V = \frac{512\pi}{3}$
 11. It is multiplied by 4 12. It is divided by 4 13. 36π 15. a. 120 b. 224
 16. 8 units along the cylinder (14 units from the far left, 8 from the right)

Cumulative Review 5

1. a. 10 2. a. 9 3. 27 4. a. 60 5. a. $x = 70$ b. $x = 13$
 b. $\frac{15}{2}$ b. $x = 10$ b. $\frac{120}{13}$ $y = 70$ $y = 9$
 c. 21 $y = 24$ $z = 40$ $z = 5\sqrt{10} - 13$
 6. a. 8 b. $4\sqrt{3}$ 7. $\triangle QPR \sim \triangle QSP$ 8. $AB = 2\sqrt{13}, AD = 6$
 c. $48\sqrt{3}$ d. $36\sqrt{3}$ 9. $2\sqrt{6}$ 10. $2\sqrt{11}$ or $2\sqrt{61}$
 e. $12\sqrt{3}$ f. $24\sqrt{3}$
 11. perimeter = 62.72 12. $400\sqrt{3}$ 13. AP and BP are 3 and 4
 apothem = 9.95 CP and DP are 2 and 6
 14. $24\sqrt{3}$ or $16\sqrt{3}$ 15. Side = $2 - 2\sqrt{2}$ 16. $r = 2$
 Area = $8\sqrt{2} - 8$

Cumulative Review 6

1. a. $\frac{15}{2}$ 2. a. $2\sqrt{5}$ 3. a. A b. S c. A d. N e. S
 b. 20 b. $\sqrt{19}$ 4. $36\pi - 108$
 c. 26 c. $6\sqrt{19}$
 d. $8\sqrt{3}$
 5. a. 12 b. $6\sqrt{3}$ c. $3\sqrt{3}$ d. 9 e. 120 6. 52
 f. $6\sqrt{7}$ g. $\frac{\sqrt{3}}{2}$ h. 40.9 i. 19.1 j. 81.8 7. 3
 9. a. 12 10. a. 20 11. a. 5.64 12. 96
 b. 6 b. $\frac{2\pi}{3}$ b. 45.11 13. 3
 c. 30 c. 7.52
 14. a. 26 b. $2\sqrt{30}$ c. $20\sqrt{30}$ 15. a. 2 b. $n(m - n)$

Cumulative Review 7

1. a. 4 2. a. F 3. a. $\frac{28}{3}$ 4. a. 2:1 5. 40
b. 12 b. T b. $\frac{52}{3}$ b. 1:1 6. Area = $\frac{217\pi}{4}$
c. $4\sqrt{10} - 4$ c. T c. $\frac{15}{4}$ c. 4:5 Perimeter = $6 + \frac{217\pi}{6}$
d. T d. $\frac{65}{4}$
7. a. 9:12:10:8:6 8. $\triangle UBR \sim \triangle RBN$
9. a. 60 b. 104 c. 52 d. 77 e. 68
10. a. $2\sqrt{3}$ b. $3\sqrt{3}$ c. 9 d. 4π e. $4\pi - 3\sqrt{3}$
11. Equation: $\sqrt{10^2 - x^2} = \sqrt{17^2 - (21 - x)^2}$
 $x = 6$
 $h = 8$
12. b. 1:4
c. 1:3
d. Ratio of lateral areas of 4 separate parts is 1:3:5:7

