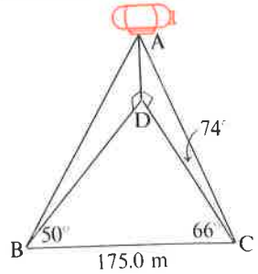
5 A promotion blimp floated above Sheridan Plaza for two days. As a project, a group of students was asked to determine the altitude of the blimp. The data were recorded in their diagram shown at the right. What was the altitude, h, of the blimp? $\triangle BDC$ is a horizontal plane. $\triangle ADB$ and $\triangle ADC$ are vertical planes.



B Be sure to draw a diagram to record the given information.

6 The crows-nest of the yacht *Mutiny* is 50.0 m above the water level. The angle of depression from the crows-nest to a buoy due west of the boat is 40°. The angle of depression to another buoy S 70° W of the yacht is 34°. How far apart are the buoys?

7 Two roads intersect at 34°. Two cars leave the intersection on different roads at speeds of 80 km/h and 100 km/h. After 2 h, a traffic helicopter which is above and between the two cars takes readings on them. The angle of depression to the slower car is 20° and the distance to it is 100 km. How far is the helicopter from the faster car?

8 To estimate the usable lumber in a redwood tree in California, the company officials must first estimate the usable height of the tree. A certain tree has angles of elevation of 41° and 52° respectively determined from points that are 50.0 m apart. If the angle formed at the base of the tree by the positions of the two sightings is a right angle, find the height of the tree.

9 Jennifer and Alex were flying a hot air balloon when they decided to calculate the straight line distance from Beaverton to Tandy. From a height of 340.0 m they recorded the angles of depression of Beaverton and Tandy as 2° and 3° respectively. The angle between the lines of sight to the two towns was 80°. Find the distance from Beaverton to Tandy to one tenth of a kilometre.

10 A Coast Guard helicopter hovers between an island and a damaged sail boat. The angle between the lines from the island to the helicopter and to the sailboat is 73°. The angle subtended at the helicopter by the lines to the island and to the crippled yacht is 40°. A police rescue ship is coming toward the sailboat and is now at a point 800.0 m away. From this point the angle between the lines to the island and the sailboat is 35°. If the angle at the island between the lines of sight to the two boats is 68°, find the distance from the helicopter to the sailboat.

5.14 Problem-Solving: Making Decisions

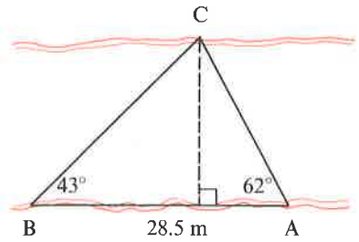
In problem solving, a diagram shows the given information translated from the problem and recorded. Then a decision is made as to which property of triangles applies.

- Right Triangles
- Law of Sines
- Law of Cosines

The same diagram may represent different word problems. For example, each of the following seemingly different problems may be solved using the same diagram.

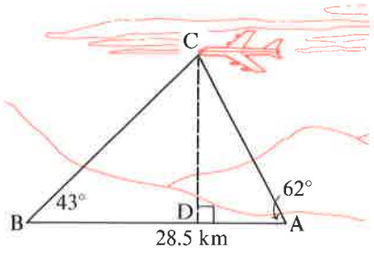
Problem 1

Two points A and B are located on the same bank of a river, 28.5 m apart. A point C on the other bank is determined by the angle measurements shown in the diagram. Use the data to calculate the width of the river.



Problem 2

The angle of elevation of a jet is 43° and 62° from two locations 28.5 km apart. Calculate the height of the jet.

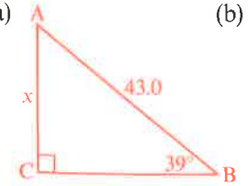


Once you have interpreted the clues given in the word problem and recorded them by constructing a diagram, you can decide which skills to use to solve the problem.

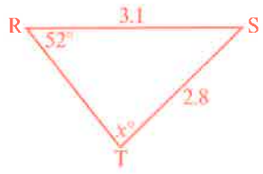
5.14 Exercise

A 1 For each diagram, first decide which skills you need to use to find the missing part and then find the value of x.

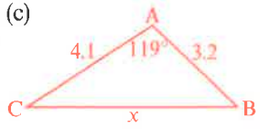
(a)



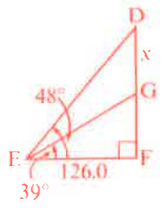
(b)



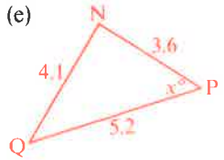
(c)



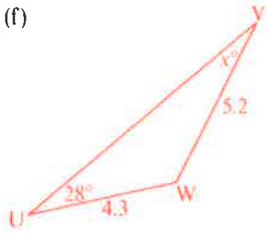
(d)



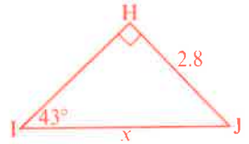
(e)



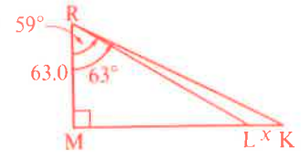
(f)



(g)



(h)



2 (a) In $\triangle ABC$, $\angle A = 43°$, $\angle B = 90°$, and $b = 42.0$. Find c.
(b) In $\triangle PQR$, $\sin P = 0.2$, $p = 1.5$, and $q = 6.0$. Find $\sin Q$.
(c) In $\triangle PQR$, $p = 10.2$, $q = 20.3$, and $r = 12.1$. Find $\cos R$.
(d) In $\triangle PQR$, $\angle Q = 90°$, $\angle R = 23°$, and $p = 4.1$. Find q.
(e) In $\triangle MNP$, $\angle M = 78°$, $\angle P = 32°$, and $p = 96.0$. Find m.
(f) The ratio $s:r$ in $\triangle STR$ is $\sqrt{5}:2$. If $\angle R = 25°$, find $\angle S$.

B Organize the solution to each problem. Refer to the *Steps For Solving Problems*. Remember, to solve a problem you must know the answer to the following questions

I What information does the problem ask me to find?
II What information is given to me in the problem?

3 A roof truss is 9.8 m wide. If the angles formed by the roof beams are 15° and 18°, find the lengths of the roof beams.

4 A ski resort is installing tows on its new ski runs. The baby hill has a vertical height of 500.0 m and is inclined at 42°. Determine the approximate length of the T-bar cable if it goes to the top of the hill and returns.

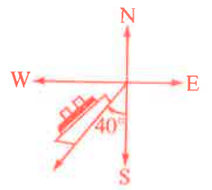
5 A surveyor wishes to find the distance, BC, across a river. He selects a position A so that BA = 86.0 m, and measures $\angle ABC$ and $\angle BAC$ at 39° and 52° respectively. Find the distance, BC, accurate to the nearest metre.

6 A building is situated on the bank of a river. A point X is located directly opposite the building on the other bank of the river. The angle of depression of point X from the top of the building is 39°. If the building is 22.0 m high, how wide is the river?

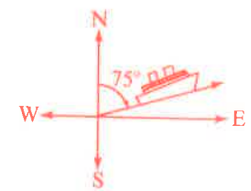
7 A new senior citizens home is under construction and a wheel-chair ramp is being built to the front porch. If the angle of inclination of the ramp will be 20° and the height of the porch is 1.5 m, how far back from the porch must the ramp start?

8 When a ship leaves a port, it is given a heading as shown. A trawler leaves Cap d'Espoir, New Brunswick on a heading of S 78° E. Another trawler leaves North Point, Prince Edward Island with a heading of N 15° E. Cap d'Espoir is approximately 90.0 km from North Point. If the trawlers meet at point A, how far is point A from Cap d'Espoir? Cape d'Espoir is due north of North Point.

Heading S 40° W



Heading N 75° E



9 A hovercraft leaves Cape Ommaney, British Columbia at a heading of S 22° W. A tug leaves Cape Knox in the Queen Charlotte Islands and travels on a heading of N 72° W. Cape Ommaney is 215.0 km from Cape Knox. If the vehicles rendezvous at point A, how far is the rendezvous point from Cape Knox? Cape Knox is due south of Cape Ommaney.

10 A tug leaves Ramea Island in Newfoundland and travels 80.0 km into the Gulf of St Lawrence. Another tug leaves Rose Blanche in Newfoundland and travels 70.0 km into the Gulf of St. Lawrence where it meets the first tug. If Ramea Island is 60.0 km due east of Rose-Blanche, what is the heading of the first tug?

Math Tip

It is important to clearly understand the vocabulary of mathematics when solving problems. *You cannot solve problems if you don't know what the clues are.*

- Make a list of all the words you have learned in this chapter.
- Continue to add the remaining new words to your list.
- Provide a simple example to illustrate the meaning of each word.

Practice and Problems: A Chapter Review

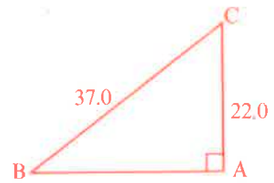
1 Use the relationship $\csc(180° + \theta) = -\csc\theta$ to calculate
(a) $\csc 225°$ (b) $\csc 210°$ (c) $\csc 240°$

2 For all α, prove $\tan\alpha = \dfrac{\sin\alpha + \sin^2\alpha}{\cos\alpha(1 + \sin\alpha)}$.

3 Solve for $0 \leqq \theta \leqq 2\pi$ and $0 \leqq A \leqq 4\pi$. (a) $\cos 2\theta = 1$ (b) $\cos 2A = -1$

4 Solve $\cos\theta(1 - 2\sin\theta) = 0$ for $0 \leqq \theta \leqq 2\pi$.

5 Solve $\triangle ABC$.



6 In $\triangle MNP$, $\dfrac{p}{n} = \dfrac{4}{3}$. If $\angle N = 35°$, find $\angle P$.

7 Solve each triangle.
(a) $\triangle ABC$: $a = 16.0$ m, $b = 19.0$ m, $c = 22.0$ m
(b) $\triangle DEF$: $\angle D = 73°$, $e = 132.0$ m, $f = 112.0$ m

8 At a construction site in downtown Ottawa, two tunnels were excavated starting at the same point. One tunnel was 400.0 m long and the other tunnel was 250.0 m long. Find the distance between the ends of the tunnels if the angle contained between them is 84°.

9 The legs of a step ladder are each 2.0 m long. What is the maximum spread of the legs if the maximum angle at the top is 40°?

10 A surveyor is locating three amusement sections, M, N, and P, around an artificial lake. $\angle MNP$ is measured and recorded as 57°. Length MN is 728.0 m and length MP is 638.0 m. What is the angle at M?

11 In studying the solar system, an astronomical unit (1 A.U.) is given as the distance from the earth to the sun. At one particular position of the planets, Earth, Mars and the Sun form a triangle with the following properties. The angle between the lines of sight from Mars to the Sun and from Mars to Earth is approximately 39°. The angle between the lines of sight from Earth to the Sun and from Earth to Mars is 80°. How many astronomical units is it from Mars to the Sun? Express your answer to two decimal places.

Test for Practice

1 For $\triangle ABC$, write the formulas for the
(a) sine law (b) cosine law

2 Prove each identity.
(a) $\cot\theta\cot\theta \times \tan\theta\tan\theta = 1$
(b) $\tan\theta\sin\theta + \cos\theta = \sec\theta$
(c) $\sin^4\alpha - \cos^4\alpha = \sin^2\alpha - \cos^2\alpha$

3 Solve $2\cos\theta = 1$ for $0 \leqq \theta \leqq 2\pi$.

4 Solve $2\sin^2\theta + \sin\theta - 1 = 0$ for $0 \leqq \theta \leqq 2\pi$ or $0° \leqq \theta \leqq 360°$.

5 In $\triangle DEF$, $\angle D = 52°$, $\angle E = 47°$, and $f = 12$. Find the measure of side e.

6 Solve each triangle.
(a) $\triangle STU$: $\angle T = 90°$, $\angle U = 22°$, $s = 15.1$
(b) $\triangle DEF$: $\angle E = 90°$, DE = 17.2, DF = 27.3

7 If two sides of a triangle measure 30.0 cm and 48.0 cm and the contained angle measures 60°, find the third side.

8 From a balloon, situated directly above a point A, the angle of depression to a second point B is 28°. Points A and B are both on level ground. The balloon rises vertically 58.0 m. Now the angle of depression to B is 42°. What is the distance from A to B?

9 Two planes flying at the same altitude are 3000.0 m apart when they spot a raft on the sea below them. The angles of depression to the raft are 47° and 38°. Find the distance from the raft to the closest plane.

10 The bridge over the Royal Gorge of the Arkansas River in Colorado is the highest in the world. A person standing under the bridge finds that the angles of elevation to the ends of the bridge are 62° and 71°. If the distances from the ends of the bridge to the person are 420.0 m and 360.0 m, calculate the length of the bridge.

330° b)15°, 75°, 195° 255° c)90°, 210°, 330°
d)53°, 127°, 210°, 330° **17.a)**30°, 330°
b)60°, 150°, 240°, 330° c)45°, 135°, 225°, 315°
d)105°, 165°, 285°, 345° e)45°, 90°, 135°, 225°, 270°, 315°
f)60°, 300° g)60°, 300° **18.a)**$\frac{\pi}{6}, \frac{5\pi}{6}$ or 30°, 150°
b)π or 180° c)$-\frac{\pi}{2}, \frac{\pi}{2}$ or −90°, 90° d)$\frac{\pi}{4}, -\frac{3\pi}{4}, \pm\pi$,
45°, −135°, ±180° e)0, π, $-\frac{\pi}{2}$, $-\pi$ or 0, 180°, −90°,
−180° f)$-\pi, -\frac{\pi}{3}, \frac{\pi}{3}, \pi$ or −180°, −60°, 60°, 180°
19.a)$-\frac{3\pi}{4}, -\frac{\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$ b)$\pm\frac{\pi}{4}, \pm\frac{3\pi}{4}, \pm\frac{5\pi}{4}, \pm\frac{7\pi}{4}$
c)$-\pi, \pi$ d)$-\frac{11\pi}{6}, -\frac{7\pi}{6}, -\frac{\pi}{2}, \frac{\pi}{6}, \frac{5\pi}{6}, \frac{3\pi}{2}$ e)$-\frac{11\pi}{6}$,
$-\frac{7\pi}{6}, \frac{\pi}{6}, \frac{5\pi}{6}$ **20.a)**(i)12 + 24k, $k \in W$ (ii)6 + 24k,
$k \in W$ b)(i)2 s and 10 s (ii)14 s or 22 s **21.a)**24k, $k \in W$
b)12 + 24k, $k \in W$ **22.**30°, 150°, 210°, 330°

5.5 Exercise, page 205

1.a)sec ρ b)csc ρ c)cot ρ d)cos ρ e)tan ρ f)sin ρ
2.a)$\frac{25}{7}$ b)$\frac{24}{25}$ c)$\frac{24}{7}$ **3.a)**14.8 b)23.3 c)96.6 d)58.9
4.a)48° b)65° c)41° d)52° **5.a)**6.1 b)67° c)19°
d)29.8 **6.a)**$\angle R = 23°$, $r = 6.6$, $p = 15.6$
b)$\angle R = 58°$, $p = 6.0$, $r = 5.1$ c)$\angle P = 32°$,
$p = 74.2$, $q = 118.7$ **7.a)**$\angle C = 45°$, $\angle B = 45°$
b)$\angle A = 27°$, $\angle B = 63°$ c)$\angle A = 55°$, $\angle C = 35°$
8.a)$\angle P = 35°$, $\angle R = 55°$, $q = 12.2$ b)$\angle C = 18°$,
$a = 23.1$, $c = 7.1$ c)$\angle A = 58°$, AB = 2.8,
BC = 4.4 **9.a)**97.4 m b)3.5 m c)1.6 m

.6 Exercise, page 208

.84 m **2.**20.9 m **3.b)**12° **4.**60.7 m **5.**39.2 m **6.**Yes, at 73°
7.449 m **8.a)**30.9 m b)29.9 m **9.**27° **10.**52.8 m **11.**446 m
2.192.5 m **13.a)**147.7 m b)1.1 m **14.a)**298.9 m b)324.6 m

7 Exercise, page 212

324.3 m **2.b)**103.7 m **3.**68.5 m **4.**897.8 m
71.2 m **6.**64.0 m **7.**175.5 m **8.**15.7 m **9.**7.3 m

8 Exercise, page 216

a)37.9 b)21.0 c)39.8 **2.a)**61° b)49° c)10° **3.a)**$a = b =$
.1 b)$h = 40.3$ $g = 73.9$ c) $q = 16.6$, $p = 41.2$

$p = 8.5$
6.12.7 **7.**$\angle A = 84°$, $b = 17.7$, $c = 15.1$
8.$\angle B = 50°$ **9.**$\angle P = 41°$ **10.a)**$\angle P = 56°$,
MP = 6.8, MN = 19.2 b)$\angle B = 67°$, AC = 41.9,
AB = 44.9 c)$\angle B = 125°$, AB = 14.2, AC = 44.9
d)$\angle D = 58°$, ED = 10.6, EF = 11.5 **11.a)**$\sqrt{2}$ b)$\frac{\sqrt{6}}{2}$ **12.**49

5.9 Exercise, page 219

1.341.3 km **2.**8.3 m **3.**10.0 m **4.**566.1 m **5.**37.8 m
6 25.9 m from A, 1121.8 m from B **7.**34°
8.16.0 km **9.**273.4 m **10.**62.0 m **11.**1.53×10^8 km
12.2.50×10^8 km **13.**4200 km

5.10 Exercise, page 224

4.a)6.2 b)18.7 c)8.0 **5.a)**35° b)104° c)40°
6.a)$\angle A = 65°$, $\angle B = 43°$, $c = 8.4$ b)$\angle D = 48°$,
$\angle E = 35°$, $\angle F = 97°$ c)$\angle I = 28°$, $\angle L = 44°$,
$j = 15.5$ d)$\angle M = 62°$, $\angle N = 40°$, $\angle Q = 78°$
7.a)$p = 18.0$ b)cos A = 0.0355 **8.a)**$a = 70.2$ m,
$\angle B = 51°$, $\angle C = 67°$ b)$\angle D = 49°$, $\angle E = 60°$,
$\angle F = 71°$ c)$\angle X = 75°$, $\angle Y = 58°$, $\angle Z = 47°$
d)$p = 120.7$ m, $\angle Q = 39°$, $\angle R = 29°$ **9.**22°
10.40.7 **11.**19.4 cm **12.**26°

5.11 Exercise, page 227

1.11° **2.**1621 m **3.**$\angle A = 31°$, $\angle B = \angle C = 74.5°$
4.1.0 km **5.**7.0 m **6.**35° **7.**5.5 m **8.**4.2 m
9.459.1 m **10.**244.0 m **11.**134° **12.**246.9 m **13.**391.2 m

5.12 Exercise, page 232

2.a)1.4 b)none **3.a)**2.4 b)one **4.a)**4.3 b)two
5.a)2 solutions b)1 solution c)no solutions
d)2 solutions **6.a)**$\angle B = 62°$, $\angle C = 47°$, $c = 9.4$
b)no solution c)$\angle B = 67°$, $\angle C = 69°$, $c = 12.5$ or
$\angle B = 113°$, $\angle C = 23°$, $c = 5.2$ d)$\angle E = 103°$,
$e = 12.4$, $\angle F = 35°$ e)$\angle D = 50°$, $\angle F = 92°$,
$f = 21.8$; or $\angle D = 130°$, $\angle F = 12°$, $f = 4.5$
f)no solution **7.a)**1193.1 m **8.**32.0 m **9.**147.5 km or
64.4 km **10.**31.8 km or 5.5 km **11.**125° **12.**10.3 km
or 1.0 km **13.a)**$32.1 < a < 50.0$ b)$a < 104.2$
c)$a = 61.8$ or $a > 73.7$

5.13 Exercise 235

1.34.9 m **2.**35.6 m **3.**30.0 m **4.**119.5 m **5.**520.0 m
6.15.4 m **7.**38.7 km **8.**25.4 km **9.**0.4 km **10.**736.3 m

5.14 Exercise, page 237

1.a)27.1 b)60° c)6.3 d)37.9 e)52° f)23° g)4.1
h)18.8 **2.a)**30.7 b)0.8 c)0.8928 d)4.5 e)177.2 f)28°
3.4.7 m, 5.6 m **4.**1494 m **5.**68 m **6.**27.2 m **7.**4.1 m
8.23.3 km **9.**80.7 km **10.**S 32° W

6.1 Exercise, page 245

1.a)$0° < x° < 90°$ b)$90° < x° < 180°$
c)$x° = 90°$ d)$x° + y° = 180°$ e)$x° = 180°$

6.2 Exercise, page 249

1.$\triangle DEF \cong \triangle VTU$(ASA), $\triangle MNP \cong \triangle RQS$(ASA),
$\triangle VUL \cong \triangle HGI$(ASA), $\triangle ACT \cong \triangle STM$(SAS),
$\triangle JKL \cong \triangle XWN$(SSS), $\triangle VMT \cong \triangle PAR$(HS),
$\triangle ABC \cong \triangle RQ$[illegible](ASA)
2.a)AC = EF([illegible]) or $\angle C = \angle E$(ASA) or AB = DF(SAS)
b)UT = PQ(S[illegible]) or $\angle R = \angle S$(ASA) or $\angle U = \angle P$(ASA)
c)$\angle U = \angle V$([illegible]SA) or $\angle S = \angle X$(ASA)
d)nothing(AS[illegible]) e)$\angle J = \angle N$(ASA) or $\angle L = \angle M$(ASA)

6.4 Exercise[illegible]ge 257

5.a)$x° = 27$[illegible] b)$x° = 54°$ c)$x = 20°$ d)$x° = 19°$
e)$x° = 60°$[illegible] $= 80°$ **6.a)**$x° = 100°$, $y° = 160°$
b)$x° = 60$, y[illegible]$0°$ c)$x° = 120°$, $y° = 30°$

6.6 Exercis[illegible]age 264

1.a)T b)T [illegible] d)F e)T f)F g)F h)F i)F

6.7 Exercis[illegible]age 268

1.a)1, 5; 2, [illegible], 7; 4, 8; 9, 13; 11, 15; 10, 14;
12, 16 b)3, 6; 4, 5; 11, 14; 13, 12 c)3, 5; 4, 6;
11, 13; 12, 14 **2.a)**3, 4; 1, 2; 1, 3; 2, 4; 9, 10; 10, 12; 9, 11; 11,
12; 5, 6; 6, 8; 7, 8; 5, 7; 13, 14; 14, 16; 15, 16; 13, 15
b)1, 4; 2, 3; 5, 8; 6, 7; 9, 12;
10, 11; 13, 16; 14, 15 **4.a)**$\angle BAC = \angle ACD$,
$\angle B = \angle D$, $\angle CAD = \angle ACB$ b)$\angle P = \angle R$,
$\angle PSQ = \angle RQS$, $\angle PQS = \angle RSQ$ **5.a)**$m° = 96°$, $n° = 36°$
b)$m° = 28°$, $n° = 47°$ **6.**$m° = 36°$, $n° = 144°$

6.8 Exercise, page 272

1.a)AB, CD; EG and FH b)AB, DC; AD, BC

6.10 Exercise, page 279

1.(a), (e); (b), (c); (g), (i); (d), (k); (h), (l); (f), (j)
13.a)(i)A′(−1, 5), B′(−4, 4) (ii)P′(4, −2), Q′(−1, −6), R′(5, −7)

CHAPTER 7

7.1 Exercise, page 293

1.a)$\angle J = \angle S$, $\angle K = \angle T$, $\angle L = \angle U$,
$\frac{JK}{ST} = \frac{KL}{TU} = \frac{JL}{SU}$ b)$\angle A = \angle B$, $\angle C = \angle D$,
$\angle E = \angle F$, $\frac{AC}{BD} = \frac{CE}{DF} = \frac{EA}{FB}$ c)$\angle G = \angle M$,
$\angle H = \angle N$, $\angle J = \angle P$, $\angle K = \angle Q$,
$\frac{GH}{MN} = \frac{HJ}{NP} = \frac{JK}{PQ} = \frac{KG}{QM}$ **2.a)**$\triangle ABC \sim \triangle DEF$
b)$\triangle PQR \sim \triangle SUT$ c)not similar

quad WXYZ ~ quad PSRQ **3.a)**$x = \frac{}{3}$, $y = \frac{28}{3}$, $z = \frac{30}{7}$
b)$x = 4.8$, $y = 13$ c)$x = 10$, $y = 12$ d)$a = 7.5$
$b = \frac{21}{2}$, $y = \frac{14}{3}$, $z = 8$ **4.b)**$\triangle ABE \sim \triangle ACD$
c)$x = 8$, $y = 5$ **5.**AB = 4.0, DF = 7.0 **6.**DC = 4.5,
NP = 10.0, MQ = 12.0 **7.**$\angle E = 150°$

7.2 Exercise, page 297

1.a)$\frac{AB}{QR} = \frac{BC}{RP} = \frac{CA}{PQ}$ b)$\frac{UV}{LK} = \frac{VW}{KJ} = \frac{WU}{JL}$
3.a)$\triangle RSV \sim \triangle TPV$ b)$\frac{RS}{TP} = \frac{SV}{PV} = \frac{VR}{VT}$ **4.a)**9 b)16
c)$x = 10$, $y = 6$ d)$x = 4$, $y = 3$ e)$x = 20$, $y = 12$
f)$x = 17.5$, $y = 14$ **5.**$BC = \frac{44}{7}$ **6.**SQ = 7.8
12.$\frac{48}{13}$ m, $\frac{72}{13}$ m **13.**26.2 m

7.3 Exercise, page 300

1.a)similar b)similar c)similar d)similar e)not similar
2.a)$\triangle MNQ \sim \triangle DFE$ b)$\triangle RST \sim \triangle YWX$ c)$\triangle XYZ$
not $\sim \triangle ABC$ d)$\triangle PTO \sim \triangle NCA$ **3.a)**$\angle L = \angle Q$,
$\angle K = \angle R$, $\angle M = \angle P$ b)$\angle D = \angle H$,
$\angle E = \angle G$, $\angle F = \angle I$ **5.**100.0 cm, 120.0 cm,
140.0 cm **6.**13.6 cm, 14.3 cm, 17.0 cm

7.4 Exercise, page 303

1.a)$\triangle PQR \sim \triangle STU$ b)$\triangle XYZ \sim \triangle MNP$ c)$\triangle ABC$
not $\sim \triangle DEF$ **2.a)**$x = 4.0$, $y = 18.0$ b)$x = 6.0$, $y = 2.0$
c)$x° = 71°$ d)$x = 4.5$, $y = 6.0$ e)$x = 9.0$, $y = 4.8$

7.5 Exercise, page 306

1.a)$x = 40.0$, $y = 18.0$ b)$x = 3.8$, $y = 3.0$ c)$x = 1.3$, $y = 1.6$
2.a)2.0 cm b)15.0 cm
c)18.4 cm **4.a)**13 cm b)13 cm

7.6 Exercise, page 308

1.a)9.0 b)12.0 c)12.0 d)6.0 e)12.0

7.7 Exercise, page 310

1.70 m **2.a)**202 m b)4.9 min **3.**110.2 cm **4.**3.6 m
5.10.5 m **6.**10.5 m **7.**63.6 m **10.**52.8 m **11.**147 m

7.8 Exercise, page 315

1.a)9:16 b)25:4 c)9:$\frac{1}{4}$ d)3:16 e)36:5 **2.a)**25 cm^2
b)21 cm^2 **3.**5 cm **4.**36:25 **5.**256:169 **6.**8 **7.**10 cm
10.a)98 cm^2 b)80 cm^2 **11.**6 cm **12.**367.5 cm^2 **13.**4:7
14.a)1 : 4 b)1 : 16 **16.a)**$x° = 75°$, $y° = 60°$ b)33 cm
c)3.6 cm d)3.5 cm e)2.25 cm^2 f)8.4 cm g)3.5 cm
h)12 cm i)$\frac{7}{3}$ j)5 k)12 cm^2 l)$\frac{1}{5}$ m)5.4 cm

7.9 Exercise, page 318

1.a)1:27 b)1:64 c)8:27 d)64:27 **2.a)**$\frac{3}{2}$:1 b)4:5 c)2:$\frac{3}{4}$