A2.A.73: Law of Sines 4: Solve for an unknown side or angle, using the Law of Sines or the Law of Cosines
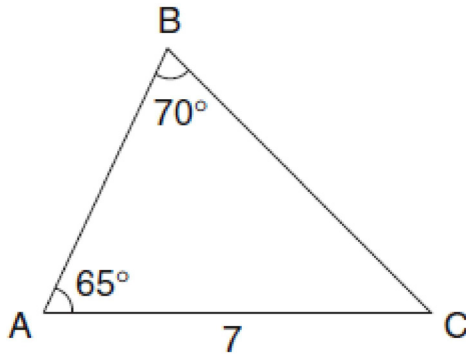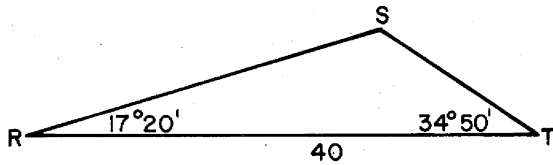
1   In the accompanying diagram of $\triangle ABC$, $m\angle A = 65$, $m\angle B = 70$, and the side opposite vertex B is 7. Find the length of the side opposite vertex A, and find the area of $\triangle ABC$.
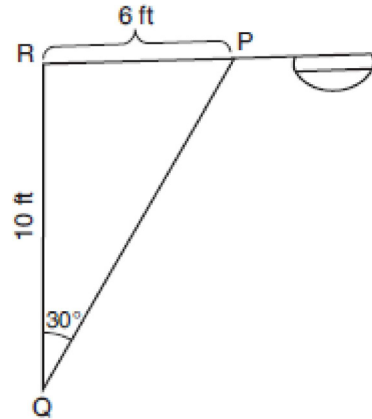

2   In the accompanying diagram of triangle RST, $m\angle R = 17°20'$, $RT = 40$, and $m\angle T = 34°50'$.


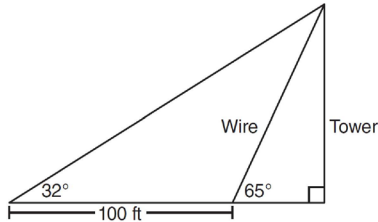What is the length of $\overline{RS}$ to the *nearest integer*?

3   In the accompanying diagram of a streetlight, the light is attached to a pole at R and supported by a brace, $\overline{PQ}$, $RQ = 10$ feet, $RP = 6$ feet, $\angle PRQ$ is an obtuse angle, and $m\angle PRQ = 30$. Find the length of the brace, $\overline{PQ}$, to the *nearest foot.*
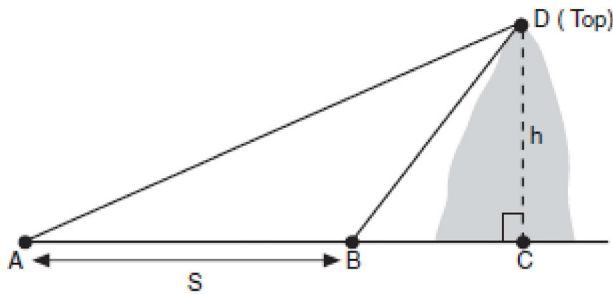

4   In the accompanying diagram of a right triangle ACD, B lies on $\overline{AC}$, $\overline{BD}$ is drawn such that $m\angle CDB = 27$, $m\angle BDA = 30$, and $BC = 9$. Find AB to the *nearest tenth.*
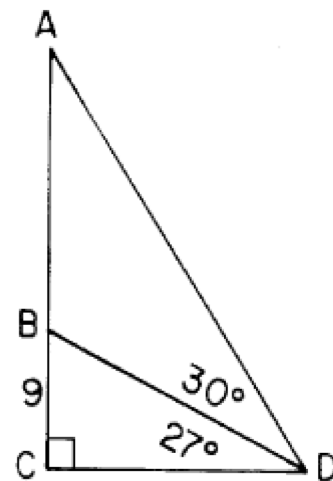
5   The diagram below shows the plans for a cell phone tower. A guy wire attached to the top of the tower makes an angle of 65 degrees with the ground. From a point on the ground 100 feet from the end of the guy wire, the angle of elevation to the top of the tower is 32 degrees. Find the height of the tower, to the *nearest foot*.
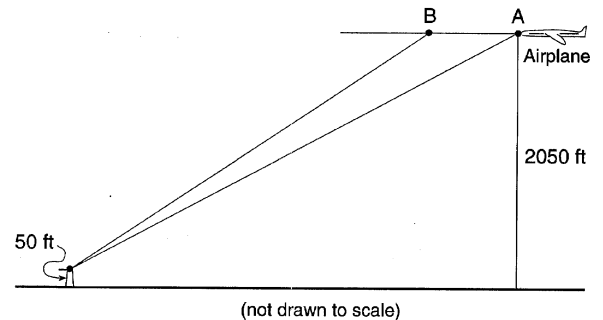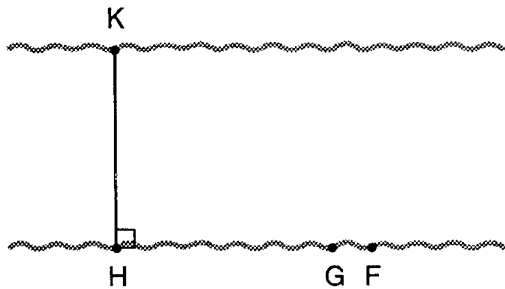
7   While sailing a boat offshore, Donna sees a lighthouse and calculates that the angle of elevation to the top of the lighthouse is 3°, as shown in the accompanying diagram. When she sails her boat 700 feet closer to the lighthouse, she finds that the angle of elevation is now 5°. How tall, to the *nearest tenth of a foot,* is the lighthouse?
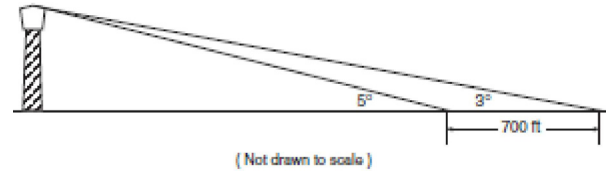
8   An airplane traveling at a level altitude of 2050 feet sights the top of a 50-foot tower at an angle of depression of 28° from point *A*. After continuing in level flight to point *B*, the angle of depression to the same tower is 34°. Find, to the *nearest foot*, the distance that the plane traveled from point *A* to point *B*.

6   A ship at sea heads directly toward a cliff on the shoreline. The accompanying diagram shows the top of the cliff, *D,* sighted from two locations, *A* and *B*, separated by distance *S*. If m∠*DAC* = 30, m∠*DBC* = 45, and *S* = 30 feet, what is the height of the cliff, to the *nearest foot*?

9   To determine the distance across a river, a surveyor marked three points on one riverbank: *H*, *G*, and *F*, as shown below. She also marked one point, *K*, on the opposite bank such that $\overline{KH} \perp \overline{HGF}$, m∠*KGH* = 41, and m∠*KFH* = 37. The distance between *G* and *F* is 45 meters. Find *KH*, the width of the river, to the *nearest tenth of a meter*.

12 A sign 46 feet high is placed on top of an office building. From a point on the sidewalk level with the base of the building, the angle of elevation to the top of the sign and the angle of elevation to the bottom of the sign are 40° and 32°, respectively. Sketch a diagram to represent the building, the sign, and the two angles, and find the height of the building to the *nearest foot*.

13 In parallelogram *ABCD*, *AD* = 11, diagonal *AC* = 15, m∠*BAD* = 63°50′. Find, to the *nearest ten minutes*, the measure of ∠*ACD*. Find, to the *nearest integer*, the area of parallelogram *ABCD*.

14 In $\triangle ABC$, *a* = 19, *c* = 10, and m∠*A* = 111. Which statement can be used to find the value of m∠*C*?

1) $\sin C = \dfrac{10}{19}$

2) $\sin C = \dfrac{19 \sin 69°}{10}$

3) $\sin C = \dfrac{10 \sin 21°}{19}$

4) $\sin C = \dfrac{10 \sin 69°}{19}$

10 Carmen and Jamal are standing 5,280 feet apart on a straight, horizontal road. They observe a hot-air balloon between them directly above the road. The angle of elevation from Carmen is 60° and from Jamal is 75°. Draw a diagram to illustrate this situation and find the height of the balloon to the *nearest foot*.

11 A ship captain at sea uses a sextant to sight an angle of elevation of 37° to the top of a lighthouse. After the ship travels 250 feet directly toward the lighthouse, another sighting is made, and the new angle of elevation is 50°. The ship's charts show that there are dangerous rocks 100 feet from the base of the lighthouse. Find, to the *nearest foot,* how close to the rocks the ship is at the time of the second sighting.

3

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Answer Section

1 ANS:
6.75, 16.71

 REF: 080131b
2 ANS:
29

 REF: 088438siii
3 ANS:
12

 REF: 060728b
4 ANS:
18.2

 REF: 018938siii
5 ANS:

88. $\dfrac{100}{\sin 33} = \dfrac{x}{\sin 32}$. $\sin 66 \approx \dfrac{T}{97.3}$

  $x \approx 97.3$ $t \approx 88$

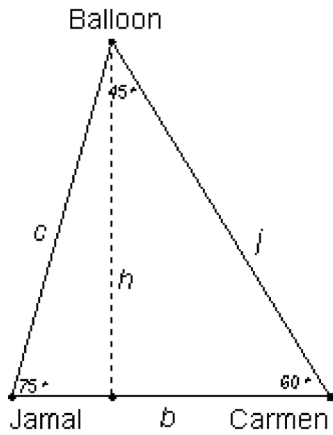 REF: 011236a2
6 ANS:
41

 REF: 060231b
7 ANS:
91.5

 REF: 060332b
8 ANS:
796

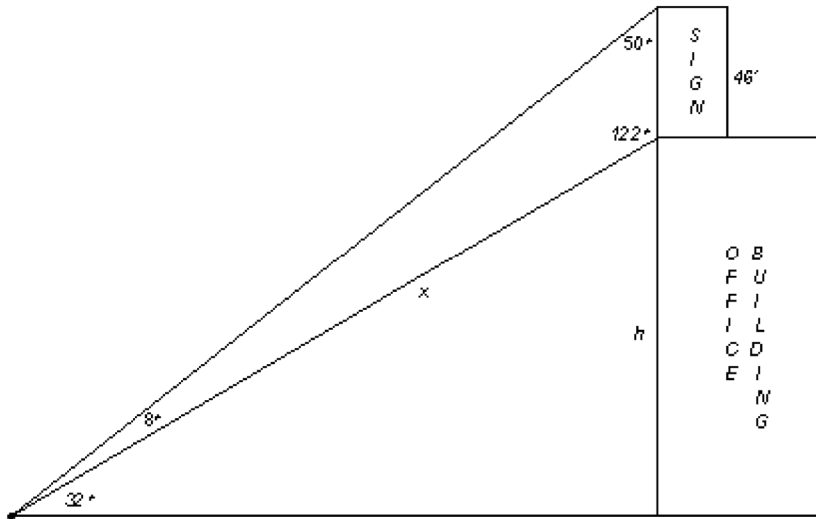 REF: 019642siii
9 ANS:
254.7

 REF: 089941siii

10 ANS:

Balloon
45°
c
h
j
75°
Jamal
b
Carmen
60°

6,246

REF: 080233b

11 ANS:
330

REF: 010334b

12 ANS:

SIGN
50°
46'
122°
x
h
8°
32°
OFFICE BUILDING

134

REF: 010534b

13 ANS:
41°10′, 64

REF: 069439siii

14 ANS: 4   REF: 010407b