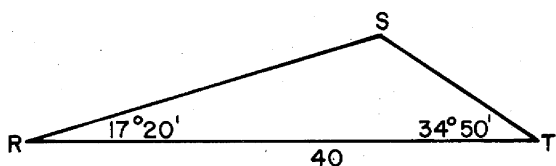


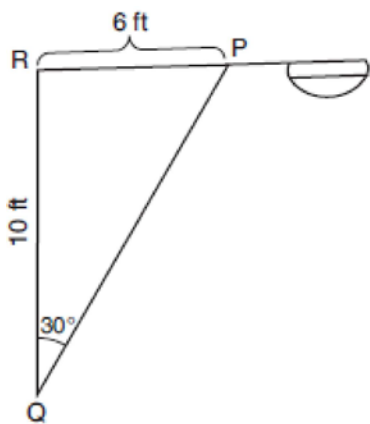
**A2.A.73: Law of Sines 4: Solve for an unknown side or angle, using the Law of Sines or the Law of Cosines**

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

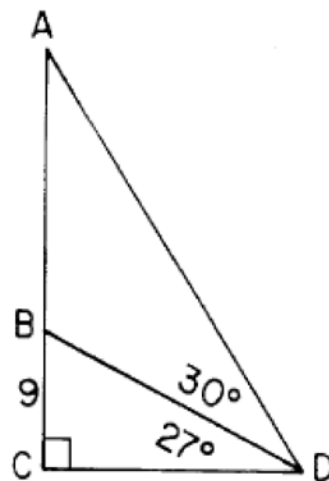


What is the length of  $\overline{RS}$  to the nearest integer?

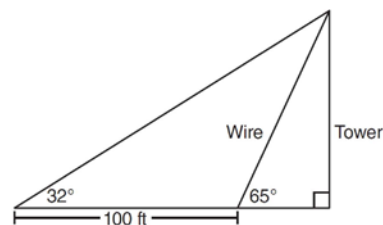
- 2 In the accompanying diagram of a streetlight, the light is attached to a pole at  $R$  and supported by a brace,  $\overline{PQ}$ ,  $RQ = 10$  feet,  $RP = 6$  feet,  $\angle PRQ$  is an obtuse angle, and  $m\angle PQR = 30$ . Find the length of the brace,  $\overline{PQ}$ , to the nearest foot.



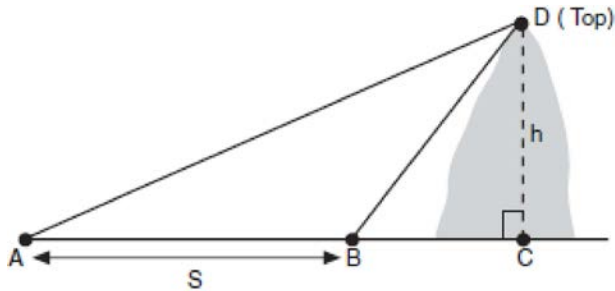
- 3 In the accompanying diagram of a right triangle  $ACD$ ,  $B$  lies on  $\overline{AC}$ ,  $\overline{BD}$  is drawn such that  $m\angle CDB = 27$ ,  $m\angle BDA = 30$ , and  $BC = 9$ . Find  $AB$  to the nearest tenth.



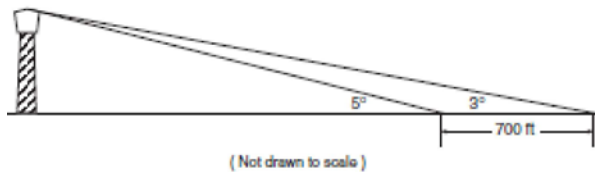
- 4 The diagram below shows the plans for a cell phone tower. A guy wire attached to the top of the tower makes an angle of 65 degrees with the ground. From a point on the ground 100 feet from the end of the guy wire, the angle of elevation to the top of the tower is 32 degrees. Find the height of the tower, to the nearest foot.



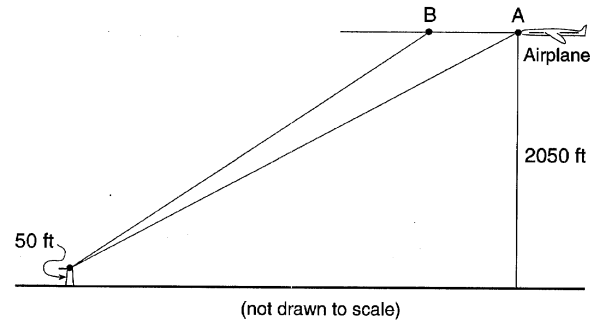
- 5 A ship at sea heads directly toward a cliff on the shoreline. The accompanying diagram shows the top of the cliff,  $D$ , sighted from two locations,  $A$  and  $B$ , separated by distance  $S$ . If  $m\angle DAC = 30$ ,  $m\angle DBC = 45$ , and  $S = 30$  feet, what is the height of the cliff,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



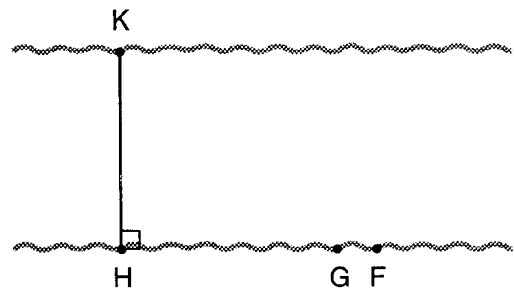
- 6 While sailing a boat offshore, Donna sees a lighthouse and calculates that the angle of elevation to the top of the lighthouse is  $3^\circ$ , as shown in the accompanying diagram. When she sails her boat 700 feet closer to the lighthouse, she finds that the angle of elevation is now  $5^\circ$ . How tall, to the *nearest tenth of a foot*, is the lighthouse?



- 7 An airplane traveling at a level altitude of 2050 feet sights the top of a 50-foot tower at an angle of depression of  $28^\circ$  from point  $A$ . After continuing in level flight to point  $B$ , the angle of depression to the same tower is  $34^\circ$ . Find, to the *nearest foot*, the distance that the plane traveled from point  $A$  to point  $B$ .



- 8 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  $\overline{KH} \perp \overline{HGF}$ ,  $m\angle KGH = 41$ , and  $m\angle KFH = 37$ . The distance between  $G$  and  $F$  is 45 meters. Find  $KH$ , the width of the river, to the *nearest tenth of a meter*.



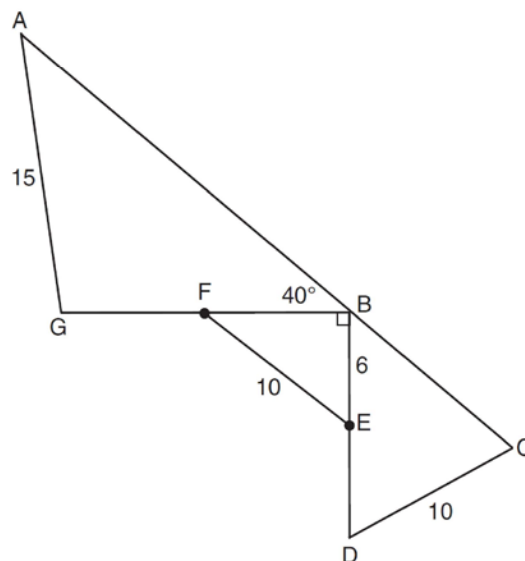
- 9 Carmen and Jamal are standing 5,280 feet apart on a straight, horizontal road. They observe a hot-air balloon between them directly above the road. The angle of elevation from Carmen is  $60^\circ$  and from Jamal is  $75^\circ$ . Draw a diagram to illustrate this situation and find the height of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

- 10 A ship captain at sea uses a sextant to sight an angle of elevation of  $37^\circ$  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  $50^\circ$ . 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.

- 11 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  $40^\circ$  and  $32^\circ$ , 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.

- 12 In parallelogram  $ABCD$ ,  $AD = 11$ , diagonal  $AC = 15$ ,  $m\angle BAD = 63^\circ 50'$ . Find, to the nearest ten minutes, the measure of  $\angle ACD$ . Find, to the nearest integer, the area of parallelogram  $ABCD$ .

- 13 Given:  $DC = 10$ ,  $AG = 15$ ,  $BE = 6$ ,  $FE = 10$ ,  $m\angle ABG = 40^\circ$ ,  $m\angle GBD = 90^\circ$ ,  $m\angle C < 90^\circ$ ,  $\overline{BE} \cong \overline{ED}$ , and  $\overline{GF} \cong \overline{FB}$



Find  $m\angle A$  to the nearest tenth. Find  $BC$  to the nearest tenth.

## A2.A.73: Law of Sines 4: Solve for an unknown side or angle, using the Law of Sines or the Law of Cosines

### Answer Section

1 ANS:  
29

REF: 088438siii

2 ANS:  
12

REF: 060728b

3 ANS:  
18.2

REF: 018938siii

4 ANS:

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

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

REF: 011236a2

5 ANS:  
41

REF: 060231b

6 ANS:  
91.5

REF: 060332b

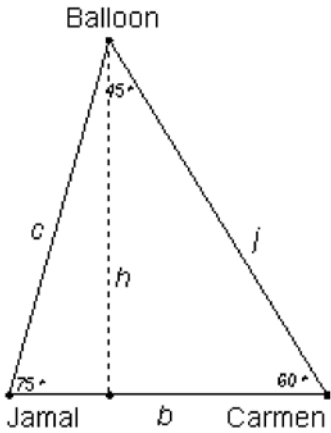
7 ANS:  
796

REF: 019642siii

8 ANS:  
254.7

REF: 089941siii

9 ANS:



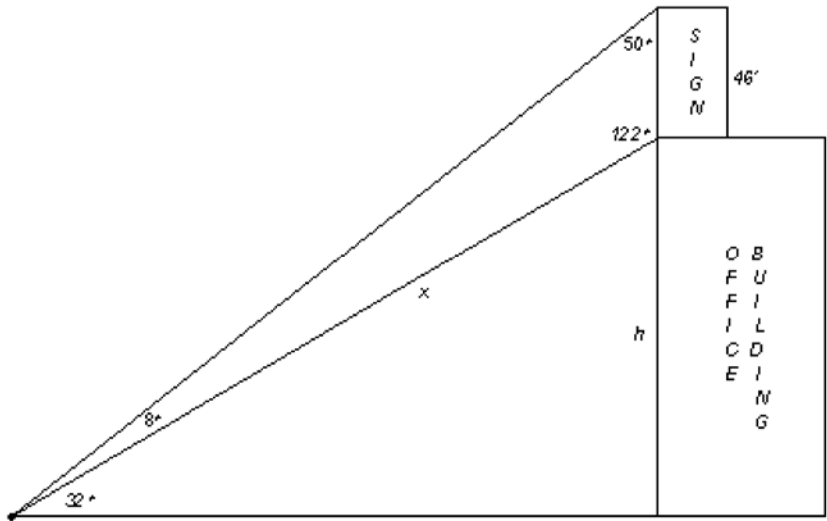
6,246

REF: 080233b

10 ANS:  
330

REF: 010334b

11 ANS:



134

REF: 010534b

12 ANS:  
41°10', 64

REF: 069439siii

13 ANS:

$$\begin{aligned}\frac{16}{\sin A} &= \frac{15}{\sin 40} & \frac{10}{\sin 50} &= \frac{12}{\sin C} & \frac{d}{\sin 63.2} &= \frac{12}{\sin 66.8} \\ \sin A &= \frac{16 \sin 40}{15} & \sin C &= \frac{12 \sin 50}{10} & d &= \frac{12 \sin 63.2}{\sin 66.8} \\ A &\approx 43.3 & C &\approx 66.8 & d &\approx 11.7\end{aligned}$$

REF: 011639a2