

G.SRT.C.8: Using Trigonometry to Find a Side 6

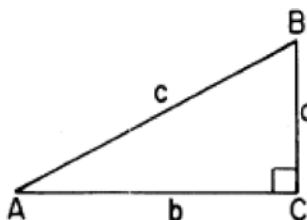
- 1 In right triangle ABC , $m\angle C = 90$, $a = 4$, and $\sin A = \frac{1}{2}$. What is the length of the hypotenuse?

1) $4\sqrt{3}$ 2) $\frac{8\sqrt{3}}{3}$ 3) 8 4) $8\sqrt{2}$

- 2 At Mogul's Ski Resort, the beginner's slope is inclined at an angle of 12.3° , while the advanced slope is inclined at an angle of 26.4° . If Rudy skis 1,000 meters down the advanced slope while Valerie skis the same distance on the beginner's slope, how much longer was the horizontal distance that Valerie covered?

1) 81.3 m 2) 231.6 m 3) 895.7 m 4) 977.0 m

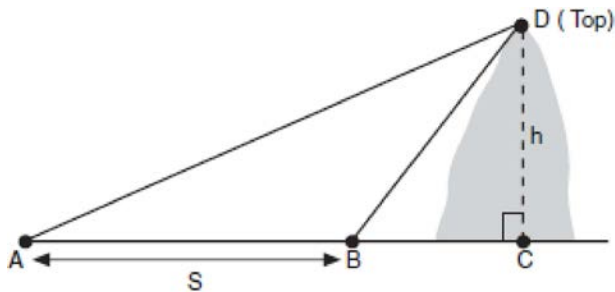
- 3 In right triangle ABC , $m\angle C = 90$. Which equation is true for this triangle?



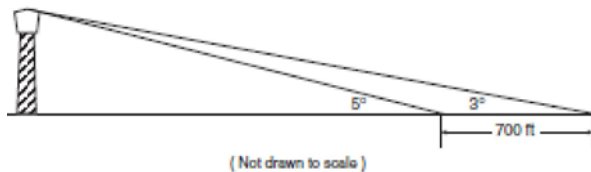
1) $a = b \sin A$ 2) $a = c \tan A$ 3) $a = c \cos A$ 4) $a = c \sin A$

- 4 In triangle ABC , $m\angle A = 40$, $m\angle B = 50$, and side $c = 80$ centimeters. Find side b to the nearest centimeter.

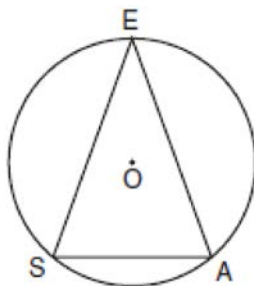
- 5 A ship at sea heads directly toward a cliff on the shoreline. The accompanying diagram shows the top of the cliff, D , sighted from two locations, A and B , separated by distance S . If $m\angle DAC = 30$, $m\angle DBC = 45$, and $S = 30$ feet, what is the height of the cliff, to the nearest foot?



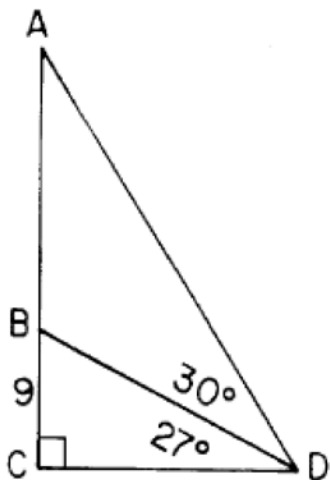
- 6 While sailing a boat offshore, Donna sees a lighthouse and calculates that the angle of elevation to the top of the lighthouse is 3° , as shown in the accompanying diagram. When she sails her boat 700 feet closer to the lighthouse, she finds that the angle of elevation is now 5° . How tall, to the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



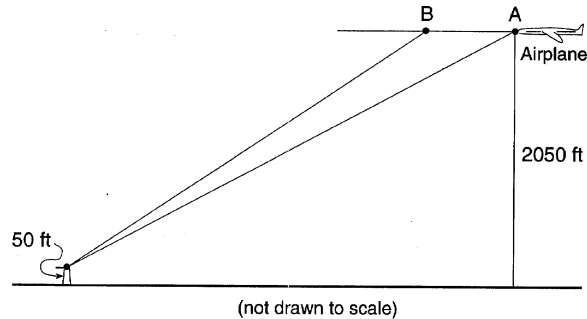
- 7 A machine part consists of a circular wheel with an inscribed triangular plate, as shown in the accompanying diagram. If $\overline{SE} \cong \overline{EA}$, $SE = 10$, and $m\widehat{SE} = 140$, find the length of $\overline{SA}$ to the *nearest tenth*.



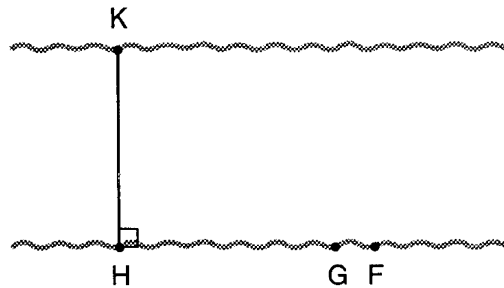
- 8 A parcel of land is in the shape of an isosceles triangle. The base has a length of 673 feet and the two equal legs meet at an angle of 43° . Find, to the *nearest square foot*, the area of the parcel of land.
- 9 A ship captain at sea uses a sextant to sight an angle of elevation of 37° to the top 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.
- 10 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*.
- 11 In the accompanying diagram of a right triangle ACD , B lies on $\overline{AC}$, $\overline{BD}$ is drawn such that $m\angle CDB = 27^\circ$, $m\angle BDA = 30^\circ$, and $BC = 9$. Find AB to the *nearest tenth*.



- 12 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 .



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



- 14 One angle of a rhombus measures 100, and the longer diagonal measures 5.8 meters. To the *nearest tenth* of a meter, find the lengths of a side of the rhombus and the shorter diagonal.

G.SRT.C.8: Using Trigonometry to Find a Side 6**Answer Section**

1 ANS: 3 REF: 088725siii

2 ANS: 1

$$\cos 12.3 = \frac{\text{adjacent}}{1000} \quad \cos 26.4 = \frac{\text{adjacent}}{1000} \quad 977 - 895.7 = 81.3$$

$$\text{adjacent} \approx 977 \text{ feet} \quad \text{adjacent} \approx 895.7 \text{ feet}$$

REF: 080108b

3 ANS: 4 REF: 018933siii

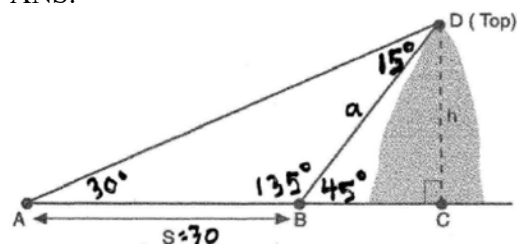
4 ANS:

$$\sin 50 = \frac{x}{80}$$

$$x \approx 61$$

REF: 068218siii

5 ANS:



$$\frac{a}{\sin 30} = \frac{30}{\sin 15}$$

$$a = \frac{30 \sin 30}{\sin 15} \quad \sin 45 \approx \frac{h}{58} \quad \text{or} \quad h \approx 41$$

$$a \approx 58$$

$$\tan 30 = \frac{h}{BC + 30}$$

$$\tan 30(\overline{BC} + 30) = h$$

$$\overline{BC} + 30 = \frac{h}{\tan 30}$$

$$\overline{BC} = \frac{h}{\tan 30} - 30$$

$$\tan 45 = \frac{h}{BC} \quad \frac{h}{\tan 30} - 30 = \frac{h}{\tan 45}$$

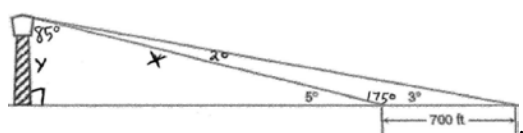
$$\overline{BC} = \frac{h}{\tan 45} \quad \frac{h}{\tan 30} - \frac{h}{\tan 45} = 30$$

$$h \left(\frac{1}{\tan 30} - \frac{1}{\tan 45} \right) = 30$$

$$h = \frac{30}{\frac{1}{\tan 30} - \frac{1}{\tan 45}} \approx 41$$

REF: 060231b

6 ANS:



$$\frac{x}{\sin 3} = \frac{700}{\sin 2}$$

$$x = \frac{700 \sin 3}{\sin 2} \quad \sin 5 \approx \frac{y}{1049.7} \quad \text{or} \quad \tan 5 = \frac{L}{z} \quad \tan 3 = \frac{L}{z+700}$$

$$x \approx 1049.7 \quad y \approx 91.5$$

$$z = \frac{L}{\tan 5} \quad z = \frac{L}{\tan 3} - 700$$

$$\frac{L}{\tan 5} = \frac{L}{\tan 3} - 700$$

$$\frac{L}{\tan 5} - \frac{L}{\tan 3} = -700$$

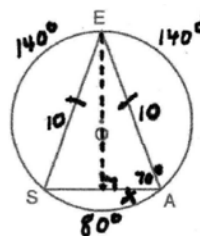
$$L \left(\frac{1}{\tan 5} - \frac{1}{\tan 3} \right) = -700$$

$$L = \frac{-700}{\frac{1}{\tan 5} - \frac{1}{\tan 3}} \approx 91.5$$

REF: 060332b

7 ANS:

6.8. Equal chords intercept equal arcs. If $m\widehat{SE} = 140$, then $m\widehat{AE} = 140$. And $m\widehat{AS} = 80$ ($360 - (140 + 140)$). The measure of an inscribed angle is half that of its intercepted arc. So $m\angle A = 70$. Draw altitude $\overline{EA}$ and use the cosine function to find the leg of the right triangle created,

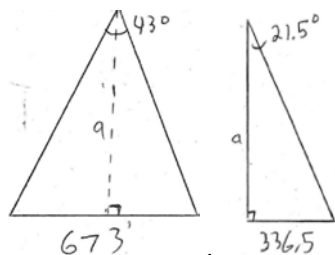


which is half the length of $\overline{SA}$. $\cos 70 = \frac{x}{10}$

$$x \approx 3.4 \times 2 \approx 6.8$$

REF: 080629b

8 ANS:



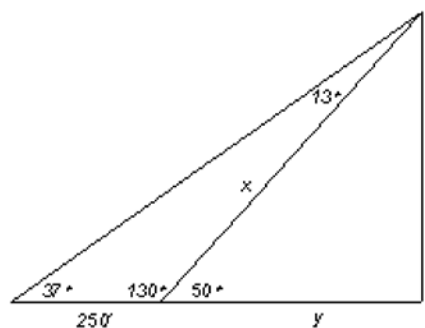
$$\tan 21.5 = \frac{336.5}{a}$$

$$a \approx 854.2550169$$

$$\frac{1}{2} \times 673 \times 854.2550169 \approx 287457$$

REF: 080829b

9 ANS:



$$\frac{250}{\sin 13} = \frac{x}{\sin 37}$$

$$x = \frac{250 \sin 37}{\sin 13} \quad \cos 50 = \frac{y}{668.8} \quad \text{Because the rocks are 100 feet from}$$

$$x \approx 668.8 \quad y \approx 430$$

the base, the ship is 330 (430-100) feet from the rocks at the second sighting. or $\tan 50 = \frac{L}{z + 100}$

$$L = z \tan 50 + 100 \tan 50$$

$$\tan 37 = \frac{L}{z + 350}$$

$$z \tan 37 + 350 \tan 37 = z \tan 50 + 100 \tan 50$$

$$L = z \tan 37 + 350 \tan 37$$

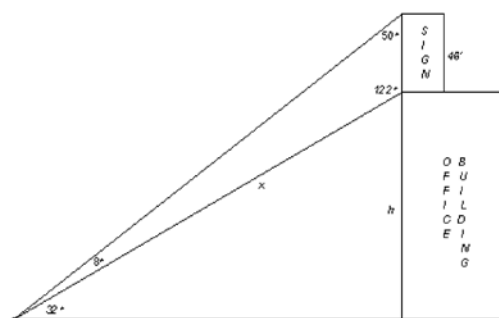
$$z \tan 37 - z \tan 50 = 100 \tan 50 - 350 \tan 37$$

$$z(\tan 37 - \tan 50) = 100 \tan 50 - 350 \tan 37$$

$$z = \frac{100 \tan 50 - 350 \tan 37}{\tan 37 - \tan 50} \approx 330$$

REF: 010334b

10 ANS:



$$134. \quad \frac{x}{\sin 50} = \frac{46}{\sin 8}$$

$$x = \frac{46 \sin 50}{\sin 8}$$

$$x \approx 253.2$$

$$\sin 32 \approx \frac{h}{253.2} \quad \text{or} \quad \tan 32 = \frac{h}{z}$$

$$h \approx 134$$

$$z = \frac{h}{\tan 32}$$

$$\tan 40 = \frac{h + 46}{z}$$

$$\frac{h}{\tan 32} = \frac{h + 46}{\tan 40}$$

$$z = \frac{h + 46}{\tan 40}$$

$$h \tan 40 = h \tan 32 + 46 \tan 32$$

$$h \tan 40 - h \tan 32 = 46 \tan 32$$

$$h(\tan 40 - \tan 32) = 46 \tan 32$$

$$h = \frac{46 \tan 32}{\tan 40 - \tan 32} \approx 134$$

REF: 010534b

11 ANS:

$$\tan 27 = \frac{9}{CD} \quad \tan 57 = \frac{x + 9}{CD} \quad \frac{9}{\tan 27} = \frac{x + 9}{\tan 57}$$

$$\frac{9}{\tan 27} = \frac{x + 9}{\tan 57} \quad \tan 27(x + 9) = 9 \tan 57$$

$$x + 9 = \frac{9 \tan 57}{\tan 27}$$

$$x = \frac{9 \tan 57}{\tan 27} - 9 \approx 18.2$$

REF: 018938siii

12 ANS:

$$\begin{aligned}
 \tan 34 &= \frac{2000}{x} & \tan 28 &= \frac{2000}{x+y} & \frac{2000}{\tan 34} &= \frac{2000 - y \tan 28}{\tan 28} \\
 x &= \frac{2000}{\tan 34} & x \tan 28 + y \tan 28 &= 2000 & \frac{2000 \tan 28}{\tan 34} &= 2000 - y \tan 28 \\
 & & x \tan 28 &= 2000 - y \tan 28 & & \\
 & & x &= \frac{2000 - y \tan 28}{\tan 28} & \frac{2000 \tan 28}{\tan 34} - 2000 &= -y \tan 28 \\
 & & & & y &= \frac{\frac{2000 \tan 28}{\tan 34} - 2000}{-\tan 28} \approx 796
 \end{aligned}$$

REF: 019642siii

13 ANS:

$$\begin{aligned}
 \tan 41 &= \frac{KH}{x} & \tan 37 &= \frac{KH}{x+45} & \frac{KH}{\tan 41} &= \frac{KH - 45 \tan 37}{\tan 37} \\
 x &= \frac{KH}{\tan 41} & x \tan 37 + 45 \tan 37 &= KH & KH \tan 37 &= KH \tan 41 - 45 \tan 37 \tan 41 \\
 & & x \tan 37 &= KH - 45 \tan 37 & KH \tan 37 - KH \tan 41 &= -45 \tan 37 \tan 41 \\
 & & x &= \frac{KH - 45 \tan 37}{\tan 37} & KH(\tan 37 - \tan 41) &= -45 \tan 37 \tan 41 \\
 & & & & KH &= \frac{-45 \tan 37 \tan 41}{\tan 37 - \tan 41} \approx 254.7
 \end{aligned}$$

REF: 089941siii

14 ANS:

$$\begin{aligned}
 \cos 40 &= \frac{2.9}{s}, \quad \tan 40 = \frac{d}{2.9} \quad \text{The shorter diagonal is about 4.9.} \\
 s &\approx 3.8 & d &\approx 2.43
 \end{aligned}$$

REF: 069240siii