14.4 Law of Sines

Feb 21-8:50 AM
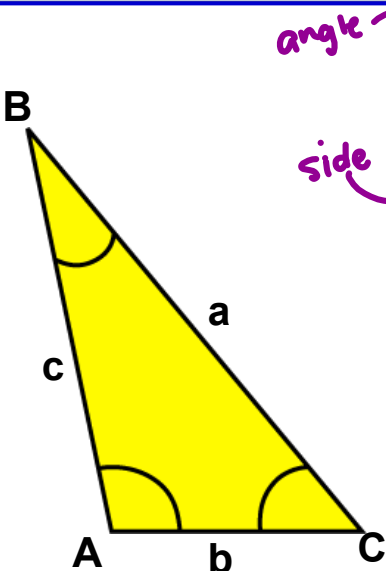
If you are not given a right triangle, can you still use SOH, CAH, TOA? Why or why not?

→ *How do you find the sides and angles of a triangle, if it's not a right triangle?*

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Law of Sines

angle
side

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$
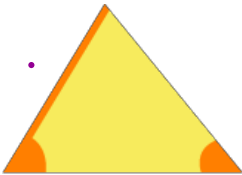
OR

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

B

a

c

A   b   C

HINT

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The Law of Sines can be used when the following are given:

- two angles and a side (AAS or ASA)

AAS   **ASA**
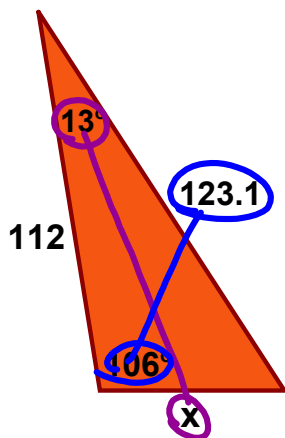
- two sides and a non-included angle (SSA)

SSA

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Use the law of sines to find a missing side

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

13°

123.1

112

106°

x
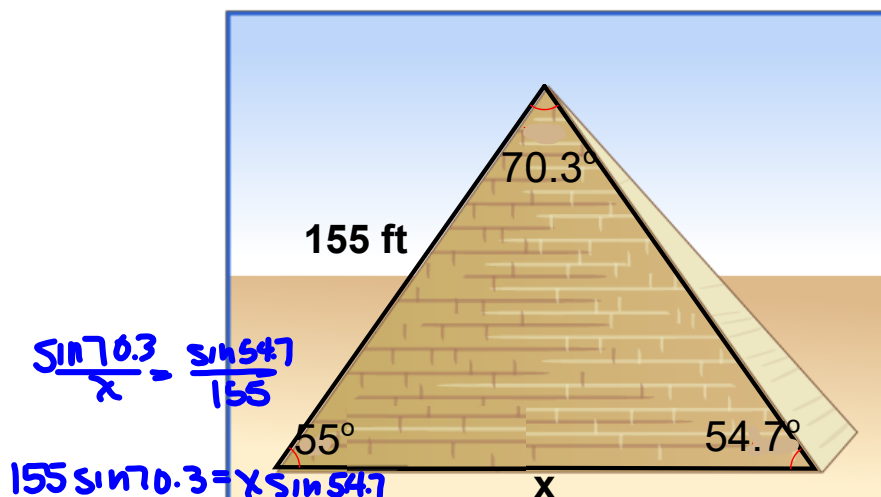
$$\frac{\sin(\;13\;)}{x} = \frac{\sin(\;106\;)}{123.1}$$

$$\frac{123.1\;\sin 13}{\sin 106} = \frac{x \sin 106}{\sin 106}$$

$$28.81 = x$$

x = 28.81 units

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Calculate the base of the pyramid (to the nearest foot)

70.3°

155 ft

55°

54.7°

x

$$\frac{\sin 70.3}{x} = \frac{\sin 54.7}{155}$$

$$155 \sin 70.3 = x \sin 54.7$$

$$\frac{155 \sin 70.3}{\sin 54.7} = x$$
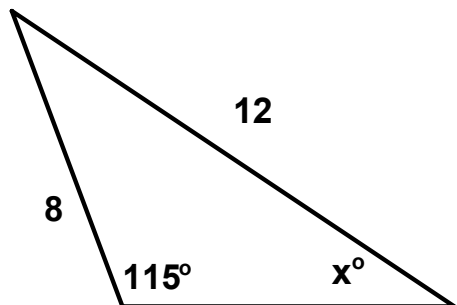
x = 179 ft

DRAG

How would you find x?
(click to reveal)

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Use the law of sines to find a missing angle.

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

12

8

115°   x°

$$\frac{\sin(115)}{12} = \frac{\sin(x)}{8}$$

$$\frac{8\sin 115}{12} = \frac{12\sin x}{12}$$

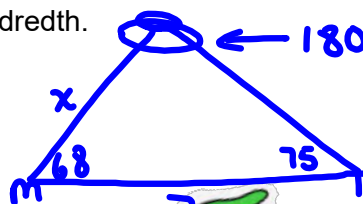$$.6042 = \sin x \qquad x = 37.2°$$

$$\sin^{-1}(.6042) = x$$

$$x = 37.17$$

Page 6

Draw a diagram with labels, write a trig equation and then solve.

Marcy and Timmy, who live 7 miles apart, are both looking up at a UFO in the sky, which is hovering in the air somewhere between their two homes. Marcy is looking up at an angle of elevation of 68°, and Timmy is looking up at an angle of elevation of 75°. Determine the distance of the UFO from Marcy's house, to the nearest hundredth.
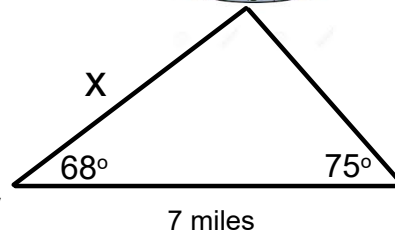
← 180 - 68 - 75 = 37°

x

68   75

M   7

$$\frac{7}{\sin 37} = \frac{x}{\sin 75}$$

$$7\sin 75 = x\sin 37$$

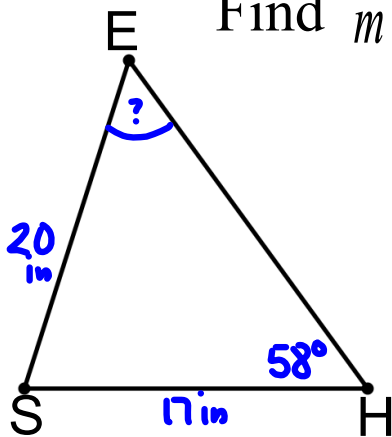$$x = \frac{7\sin 75}{\sin 37}$$

$$= 11.24 \text{ miles}$$

X

68°   75°

Marcy   7 miles   Timmy

Answer: 11.24 miles

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If more practice is needed:

In $\triangle EHS$, $m\angle H = 58^o$, $h = 20in$, and $e = 17$.

Find $m\angle E$, to the nearest whole degree.

$$\frac{\sin 58}{20} = \frac{\sin x}{17}$$

$$\frac{17 \sin 58 = 20 \sin x}{20 \qquad 20}$$

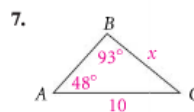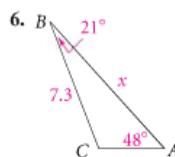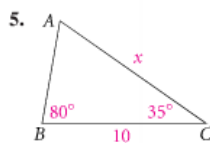$$\sin^{-1}\left(\frac{17 \sin 58}{20}\right) = x$$

$$m\angle E = 46^0$$

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GO COUGARS!

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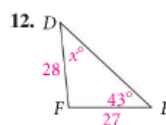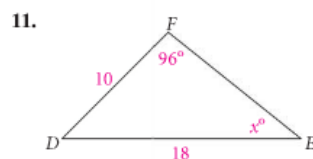Use the Law of Sines. Find the measure x to the nearest tenth.

5. Triangle ABC with $\angle B = 80°$, $\angle C = 35°$, side $BC = 10$, side x.

6. Triangle with $\angle B = 21°$, side 7.3, $\angle A = 48°$, side x.

7. Triangle ABC with $\angle B = 93°$, $\angle A = 48°$, side $AC = 10$, side x.

8. In $\triangle RST$, $m\angle R = 78°$, $m\angle T = 39°$, and $TS = 19$ in. Find RS.

9. In $\triangle JKL$, $m\angle L = 64°$, $j = 18$ m, and $m\angle K = 36°$. Find k.

10. In $\triangle RNP$, $m\angle N = 58°$, $n = 20$ in., and $m\angle R = 42°$. Find r.

Use the Law of Sines. Find the measure x to the nearest tenth.

11. Triangle DEF with $\angle F = 96°$, side $DF = 10$, side $DE = 18$, angle $x°$ at E.

12. Triangle DEF with side 28, angle $x°$ at D, $\angle E = 43°$, side 27.

13. In $\triangle DEF$, $m\angle F = 43°$, $d = 16$ mm, and $f = 24$ mm. Find $m\angle D$.

14. In $\triangle ABC$, $m\angle A = 52°$, $c = 10$ ft, and $a = 15$ ft. Find $m\angle C$.

15. In $\triangle XYZ$, $m\angle Z = 33°$, $z = 35$ cm, and $x = 31$ cm. Find $m\angle X$.

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