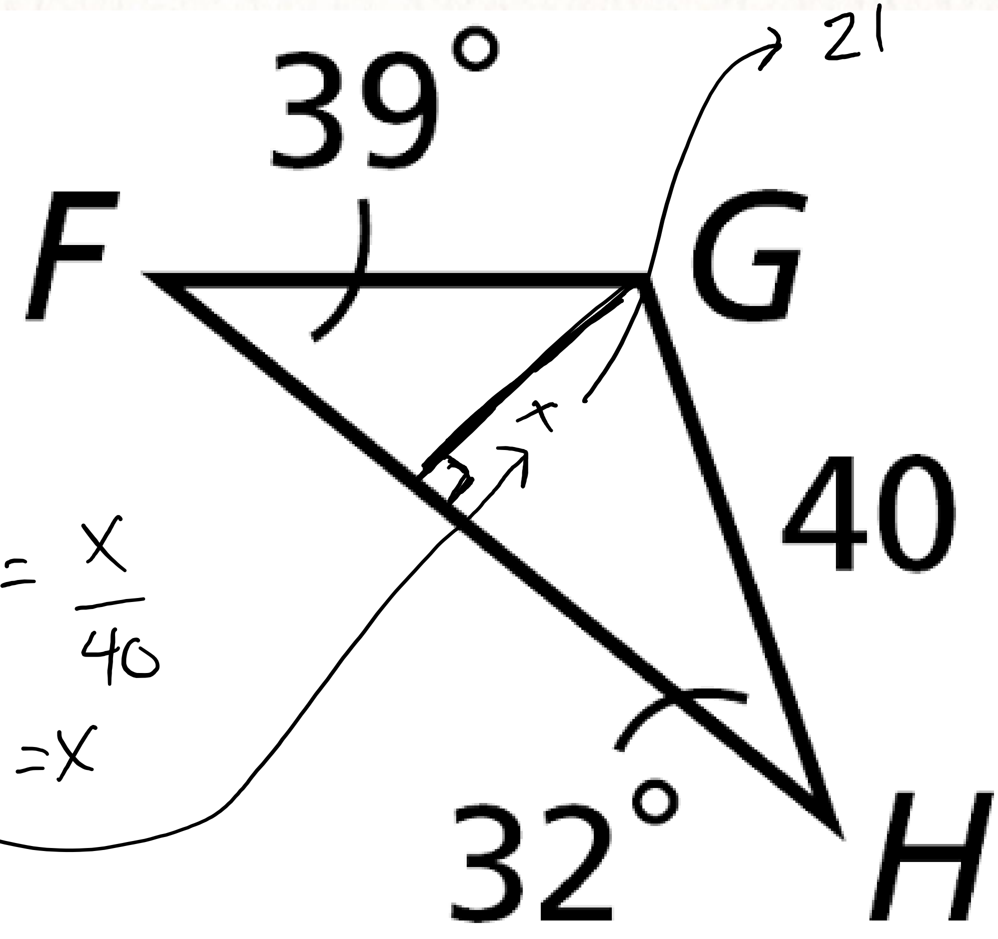
Find the measure of FG



$\sin 39 = \frac{21}{X}$

$X = 21 \sin 39$

$\sin 32 = \frac{X}{40}$

$40 \sin 32 = X$

Objective

Use the Law of Sines and the Law of Cosines to solve triangles.

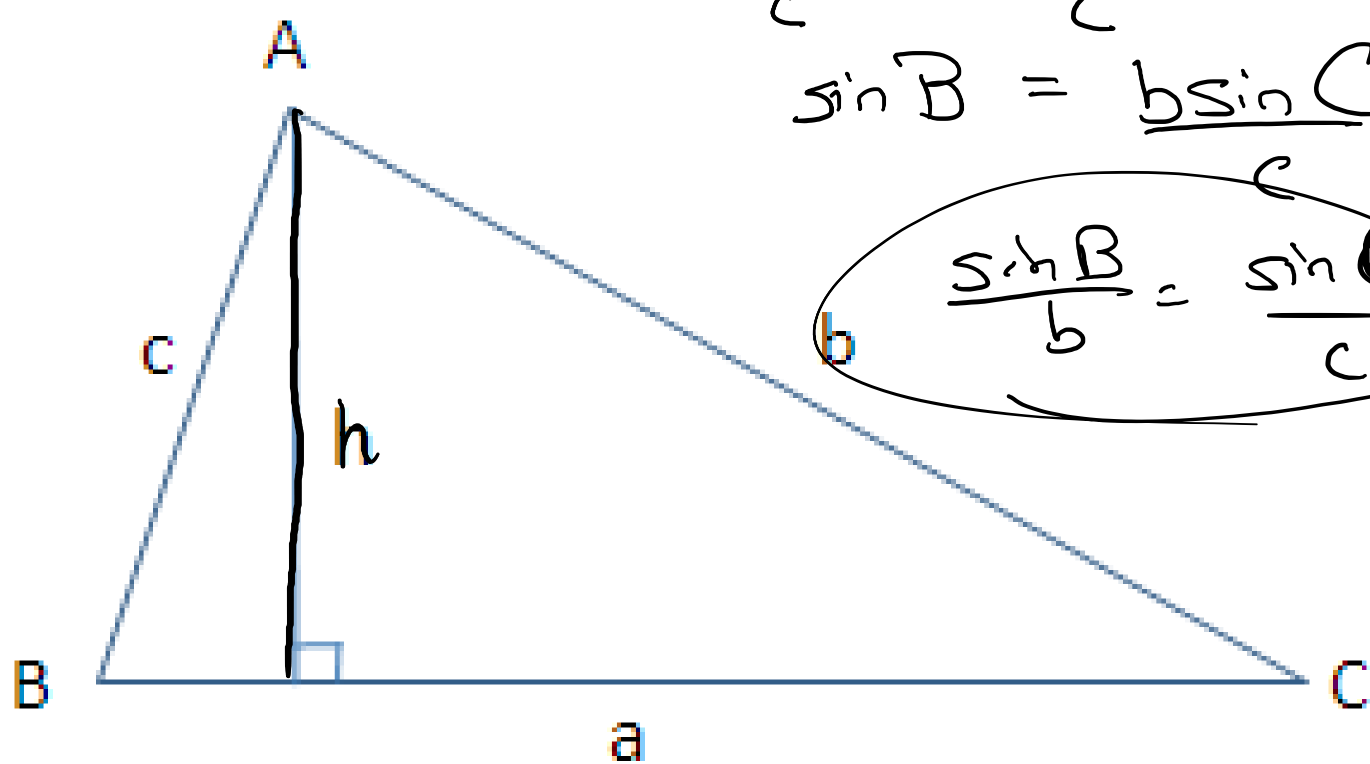
$$\sin B = \frac{h}{c} \qquad c \sin B = h$$

$$\sin C = \frac{h}{b} \qquad b \sin C = h$$

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

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

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

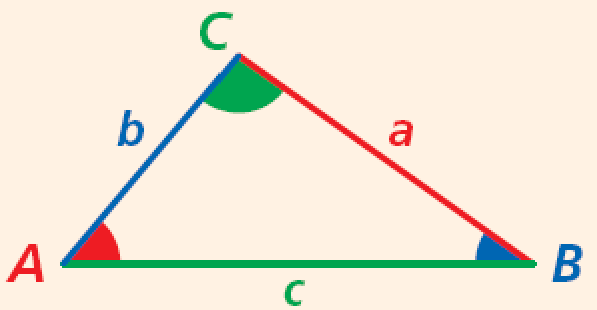


Need to Memorize!!!

Theorem 8-5-1 **The Law of Sines**

For any $\triangle ABC$ with side lengths a, b, and c,

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



You can use the Law of Sines to solve ANY triangle (doesn't have to be right) if you are given

two angle measures and any side length

OR two side lengths and a non-included angle measure

Find the measure of FG.
Round to the nearest tenth.

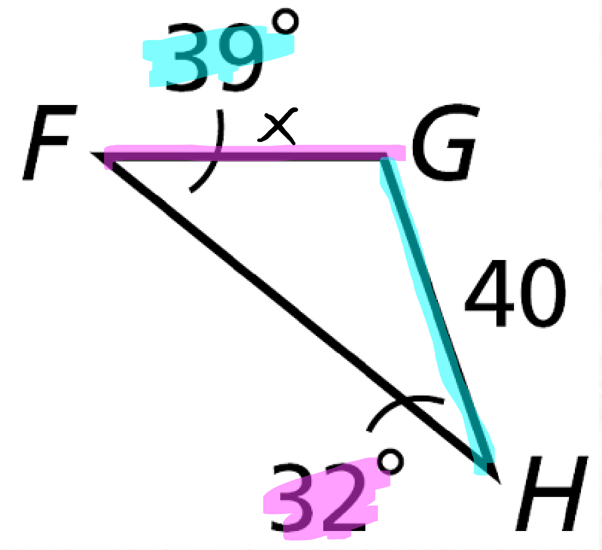
FG

$$\frac{\sin 32}{x} = \frac{\sin 39}{40}$$

$$\frac{40\sin 32}{\sin 39} = \frac{x\sin 39}{\sin 39}$$

$$\frac{40\sin 32}{\sin 39} = x$$

$$33.7 = x$$



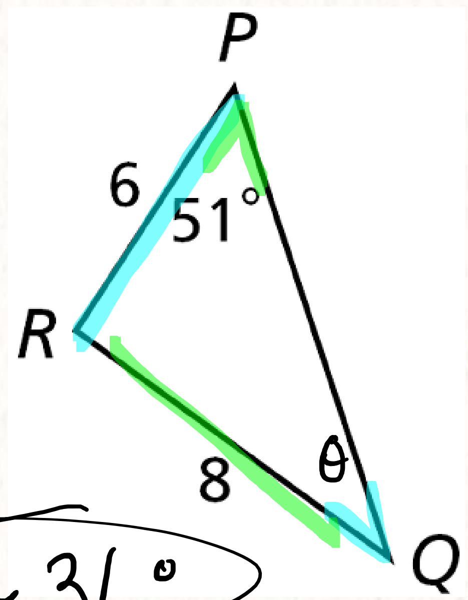
Find the measure of angle Q.
Round to the nearest degree.

$$\frac{\sin 51}{8} = \frac{\sin\theta}{6}$$

$$6\sin 51 = 8\sin\theta$$

$$\frac{6\sin 51}{8} = \sin\theta$$

$$\sin^{-1}\left(\frac{6\sin 51}{8}\right)$$



$$m\angle Q \approx 36^\circ$$

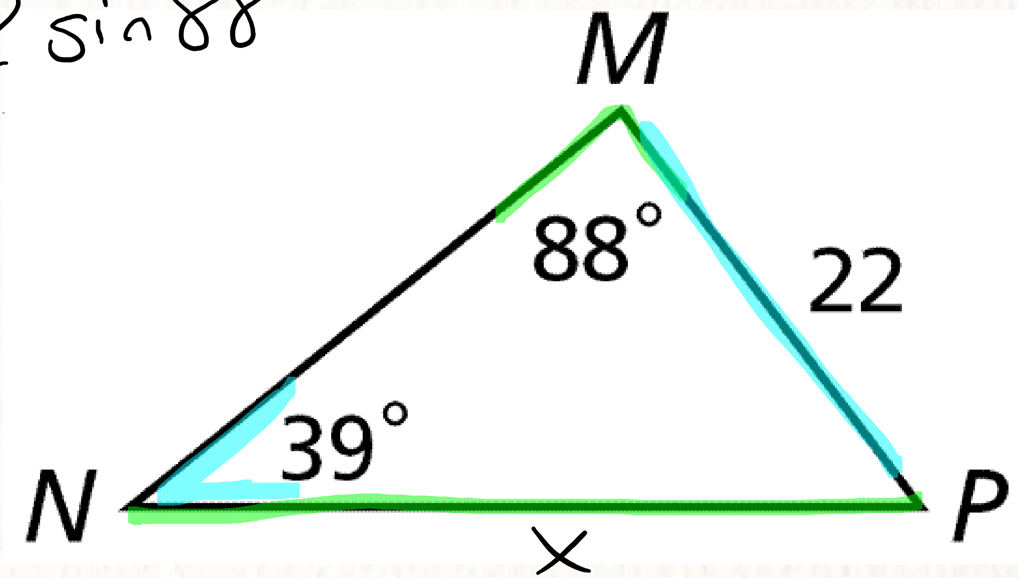
Find *NP*. Round to the nearest tenth.

$$\frac{\sin 39}{22} = \frac{\sin 88}{x}$$

$$x \sin 39 = 22 \sin 88$$

$$x = \frac{22 \sin 88}{\sin 39}$$

$$x \approx 34.9$$



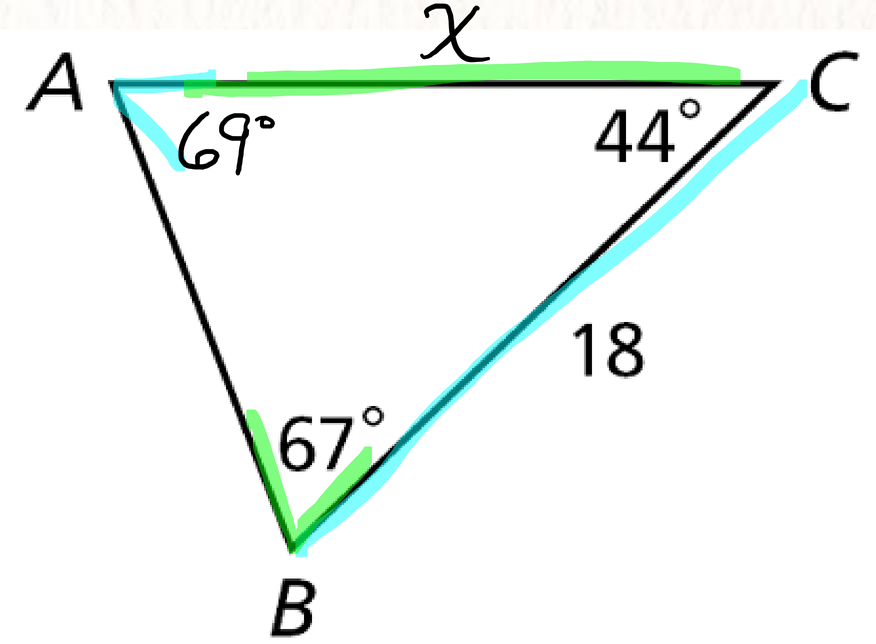
Find AC. Round to the nearest tenth.

$$\frac{\sin 67}{x} = \frac{\sin 69}{18}$$

$$18 \sin 67 = x \sin 69$$

$$\frac{18 \sin 67}{\sin 69} = x$$

$$17.7 \approx x$$

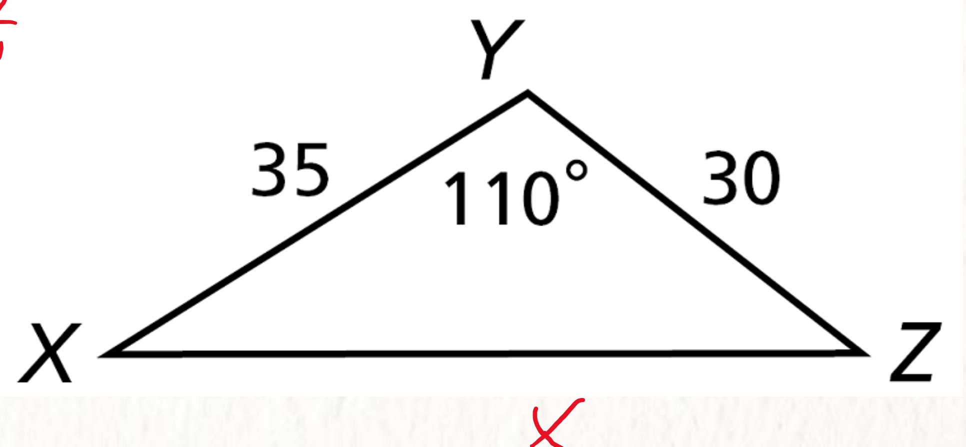


Find the measure of XZ.

We cannot use
Law of Sines
to solve this!

$$\frac{\sin 110}{x} = \frac{\sin Z}{35}$$

two variables!



Do not Need to Memorize!!!

The Law of Sines cannot be used to solve every triangle. **If you know two side lengths and the included angle measure** or **if you know all three side lengths**, you cannot use the Law of Sines. Instead, you can apply the Law of Cosines.

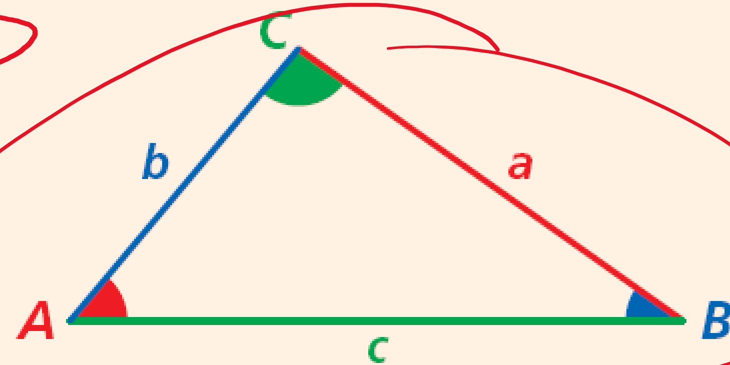
Theorem 8-5-2 The Law of Cosines

For any $\triangle ABC$ with side lengths a, b, and c:

$$a^2 = b^2 + c^2 - 2bc\cos A$$

$$b^2 = a^2 + c^2 - 2ac\cos B$$

$$c^2 = a^2 + b^2 - 2ab\cos C$$

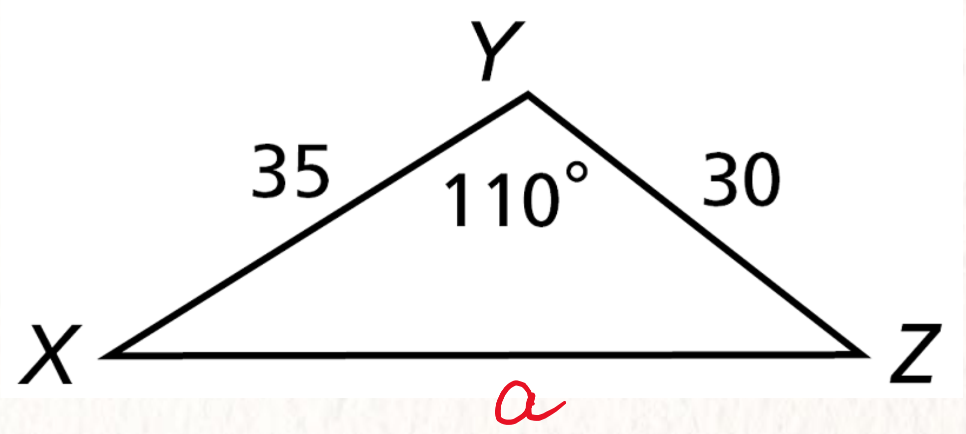


Find the measure of XZ.
Round to the nearest tenth.

$$a^2 = (35)^2 + (30)^2 - 2(35)(30)\cos 110^\circ$$

$$\sqrt{a^2} \approx \sqrt{2843.24\ldots}$$

$$a \approx 53.3$$



Find m∠T. Round to the nearest degree.

Isolate this.

$$7^2 = 13^2 + 11^2 - 2(11)(13)\boxed{\cos\theta}$$

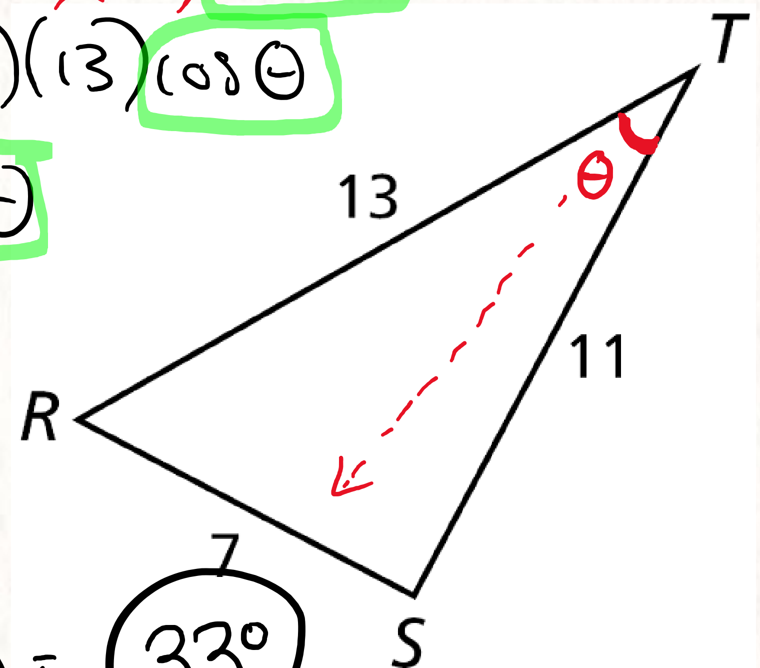
$$49 = 169 + 121 - 2(11)(13)\boxed{\cos\theta}$$

$$\frac{-241}{-2(11)(13)} = \frac{-2(11)(13)\boxed{\cos\theta}}{-2(11)(13)}$$

$$\frac{-241}{-2(11)(13)} = \boxed{\cos\theta}$$

$$.842\ldots = \boxed{\cos\theta}$$

$$\cos^{-1}(.8426\ldots) = 33^\circ$$

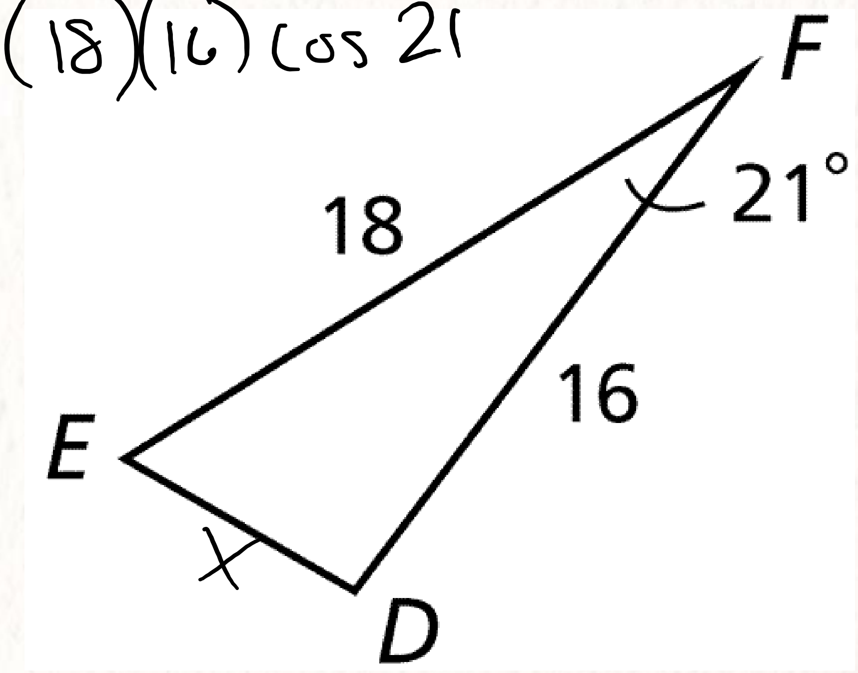


Find the measure. Round lengths to the nearest tenth and angle measures to the nearest degree.

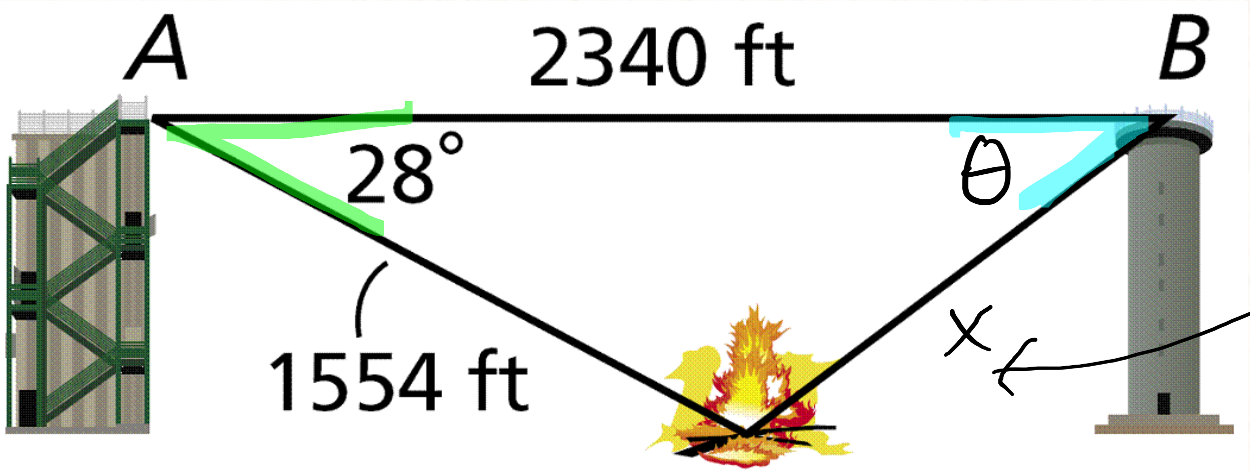
DE $x^2 = (18)^2 + (16)^2 - 2(18)(16)\cos 21$

$\sqrt{x^2} \approx \sqrt{42.25\ldots}$

$x \approx 6.5$



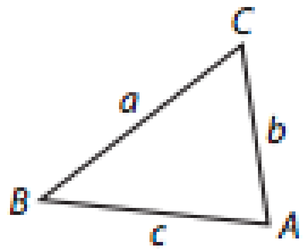
An observer in tower *A* sees a fire 1554 ft away at an angle of depression of 28° . To the nearest foot, how far is the fire from an observer in tower *B*? To the nearest degree, what is the angle of depression to the fire from tower *B*?



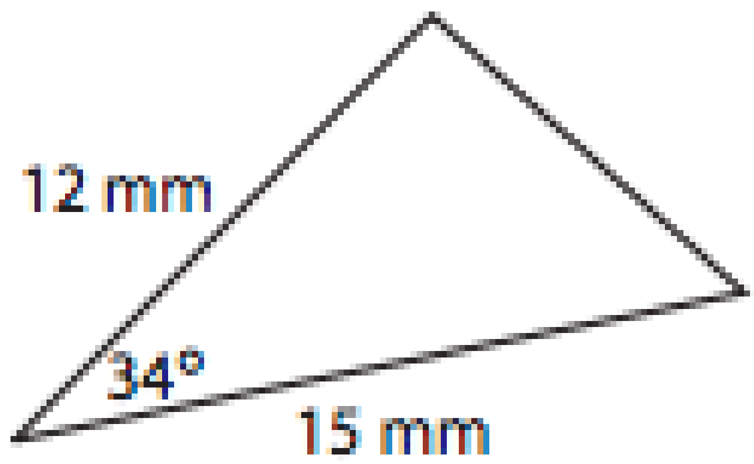
$x = 1212$ ft

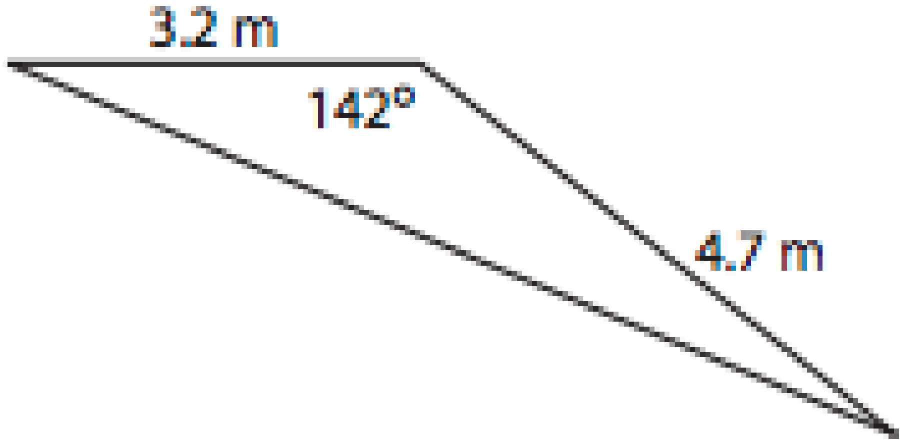
Area Formula for a Triangle in Terms of its Side Lengths

The area of $\triangle ABC$ with sides a, b, and c can be found using the lengths of two of its sides and the sine of the included angle: Area $= \frac{1}{2}bc \sin A$, Area $= \frac{1}{2}ac \sin B$, or Area $= \frac{1}{2} ab \sin C$.

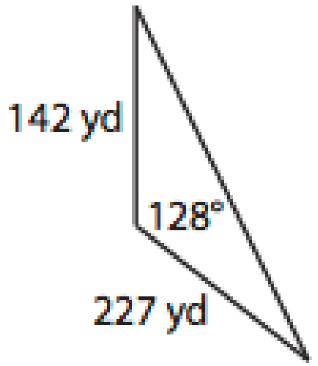


You can use any form of the area formula to find the area of a triangle, given two side lengths and the measure of the included angle.


12 mm
34°
15 mm


3.2 m
142°
4.7 m

Surveying A plot of land is in the shape of a triangle, as shown. Find the area of the plot, to the nearest hundred square yards.



Homework

- Worksheet