10.1 Area and Law of Sines

Find each missing part of the triangle (sides and angles):

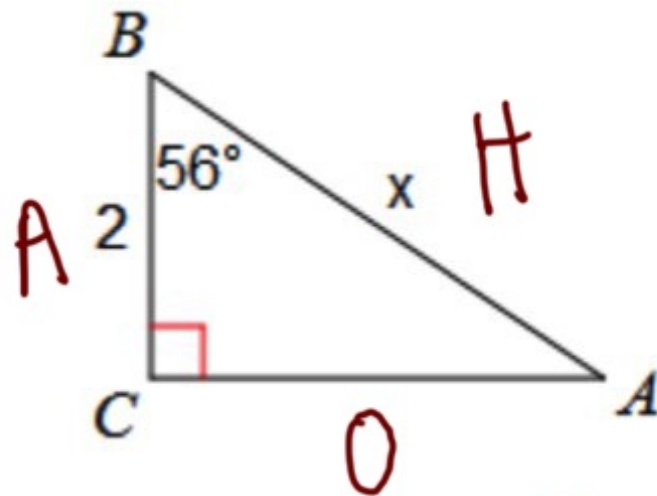A.

H

B —————— A

θ

3

A

4

O

C

$\tan^{-1}(\tan \theta) = \tan^{-1}\left(\frac{4}{3}\right)$

$$\boxed{\theta = 53^\circ}$$

B.
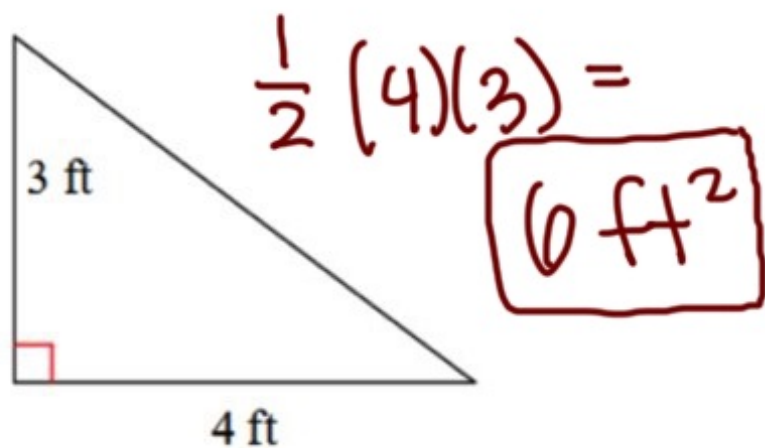
B

56°

x H

A 2

C

O

A
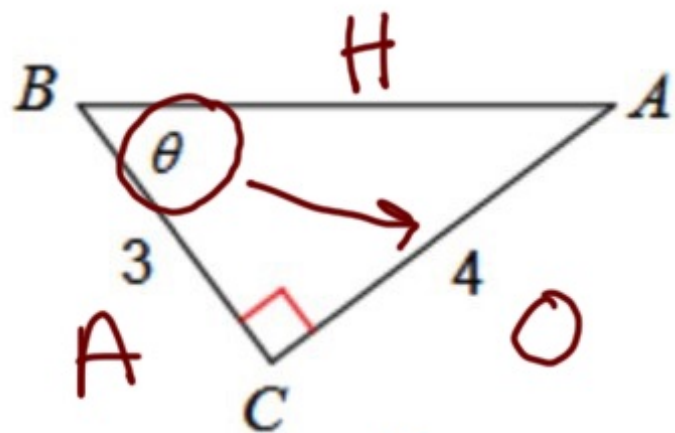
$x \cdot \cos 56^\circ = \frac{2}{x} \cdot x$

$$\frac{x \cos 56^\circ}{\cos 56^\circ} = \frac{2}{\cos 5^\circ}$$

$$\boxed{x = 3.58}$$

C. Find the area of the triangle:

$$\frac{1}{2}(4)(3) =$$

$$\boxed{6 \text{ ft}^2}$$
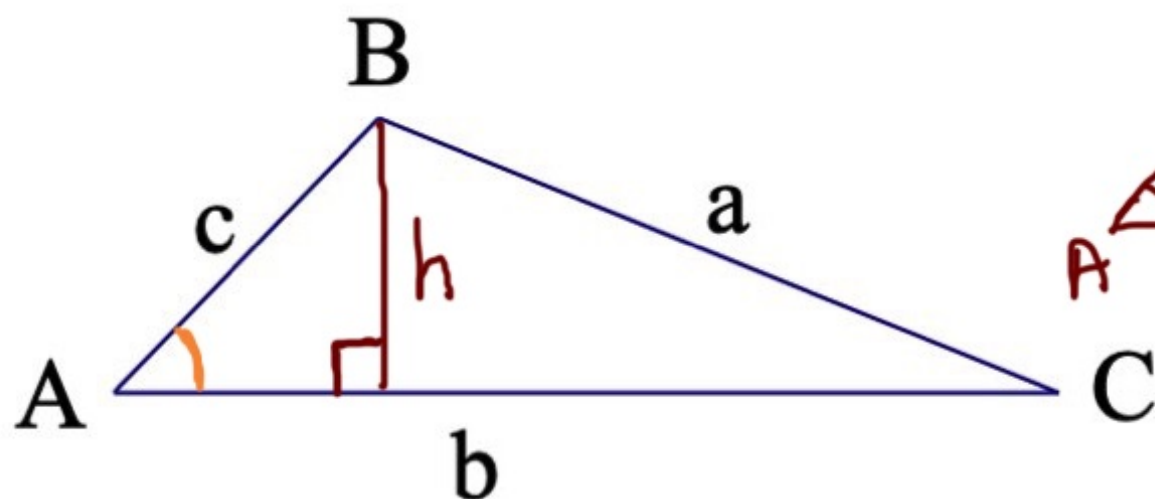
3 ft

4 ft

The area formula: $\frac{1}{2} b \cdot h$

***only works when the height is
perpendicular to the base

Consider the following triangle:

If you know angle A, can you find the height of the triangle?

$$c \cdot \sin A = \frac{h}{c} \cdot c$$

$$\underline{h = c \cdot \sin A}$$
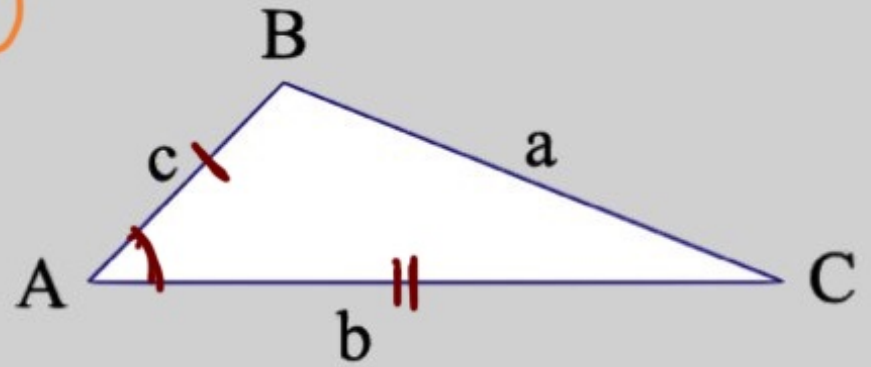
$$A = \frac{1}{2} b \cdot h$$

$$A = \frac{1}{2} \cdot b \cdot c \cdot \sin A$$

Area of Triangle:

(SAS)

$$\frac{1}{2} b \cdot c \cdot \sin A$$
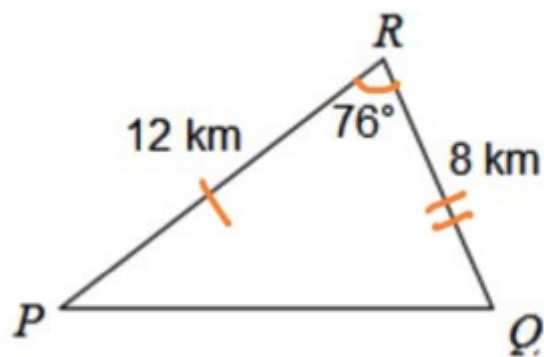
Where *A* is the included angle of 2 consecutive sides, *b*, and *c*.

b & c are the sides that make angle A

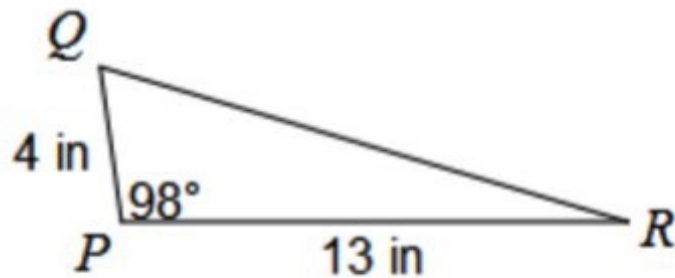**Find the area of each triangle. State if there is not enough information given.**

D.

R

12 km   76°

8 km

P

Q

$$\frac{1}{2}(12)(8)\sin 76°$$

$$\boxed{46.57 \text{ Km}^2}$$

E.

Q

4 in

98°

P   13 in   R

$$\frac{1}{2}(4)(13)\sin 98°$$

$$\boxed{25.75 \text{ in}^2}$$
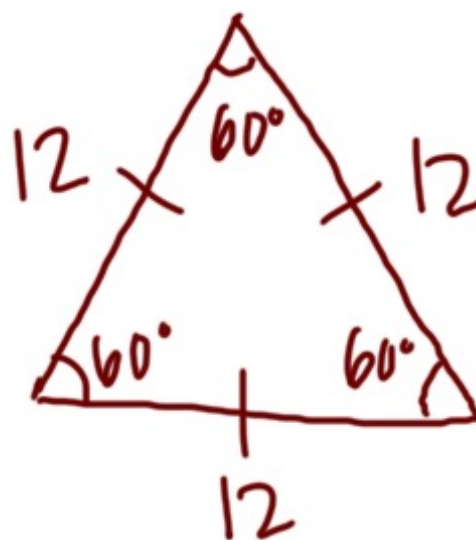
F.

C

14 cm

21 cm

B

19 cm

A
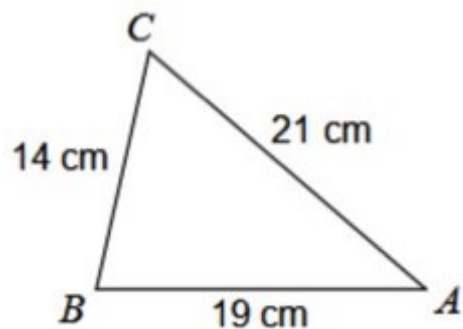
Not enough information

G. Jaron is building a triangular garden in his yard. Each side of the triangle is the same. If the amount of fence he uses on the garden is 36 feet, find the area of the garden he is building.

$36 \div 3 = 12$

$180 \div 3 = 60°$

12   60°   12
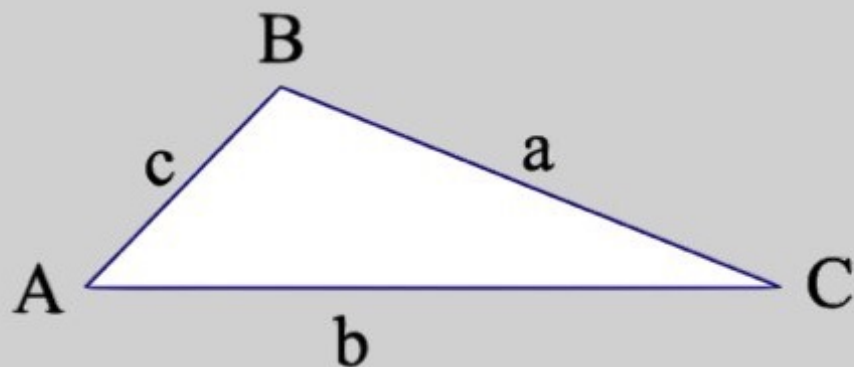
60°   60°

12

12

$\frac{1}{2}(12)(12)\sin 60°$

62.35 ft^2

LAW OF SINES Find angle

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

Find side

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

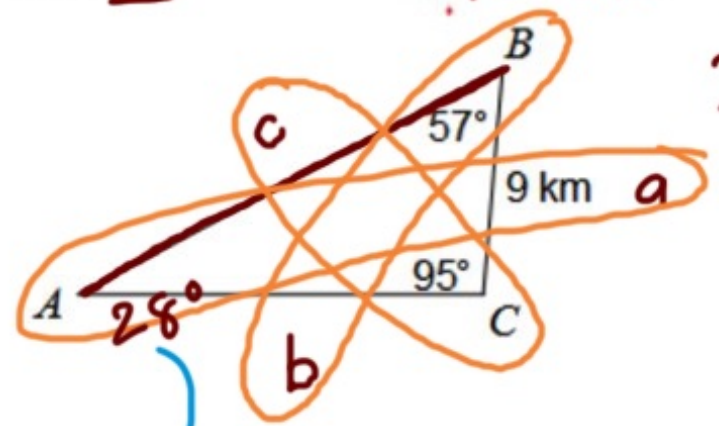***The Law of Sines **ONLY** works when:

you know an angle & the opposite side
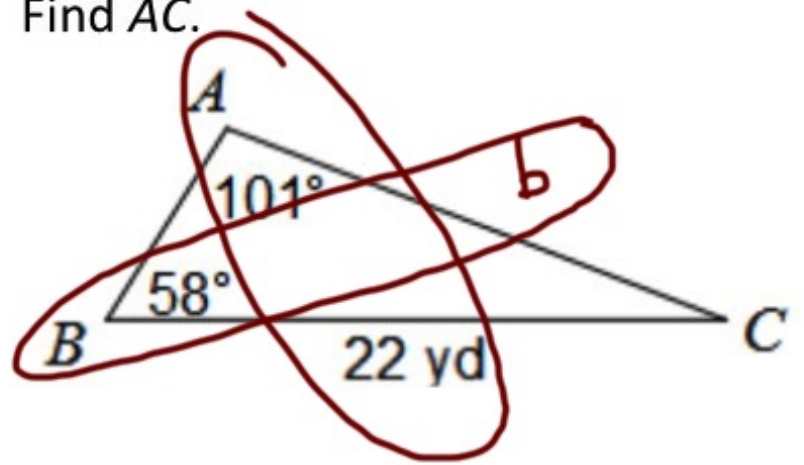
AAS   SSA
ASA

H. Find _AB_.

$A = 180 - 95 - 57$

$28°$

57°

9 km   a

95°

b

28°

c

$$\frac{9}{\sin A} = \frac{b}{\sin 57°} = \frac{c}{\sin 95°}$$

$$\frac{\sin(95) \cdot 9}{1 \quad \sin 28°} = \frac{c}{\sin 95°} \quad \sin 95°$$

$$c = \frac{\sin(95) \cdot 9}{\sin(28°)}$$

$$\boxed{c = 19.10 \text{ km}}$$

I. Find _AC_.

A

101°   b

58°

B   22 yd   C

$$\frac{\sin 58° \quad b}{\sin 58°} = \frac{22}{\sin 101°} \cdot \frac{\sin 58°}{1}$$

$$\boxed{b = 19.01 \text{ yd}}$$

J. Find $m\angle B$.

A, 47 m, c, b, 17 m, 138°, C, a, B
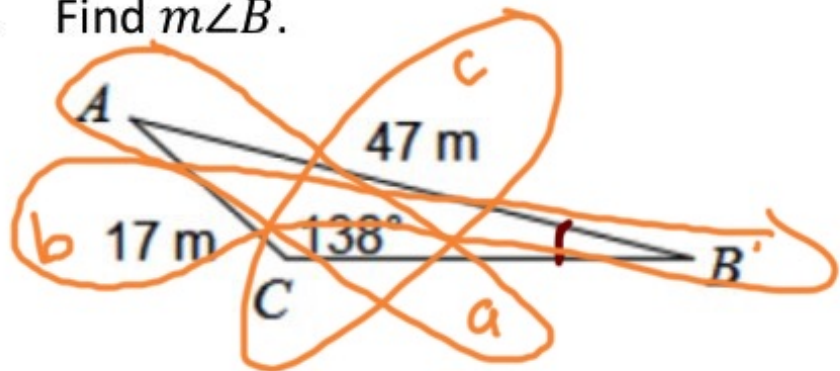
$$17 \frac{\sin B}{17} = \frac{\sin(138°)}{47} \cdot \frac{17}{1}$$

$$\sin^{-1}(\sin B) = \overset{\sin^{-1}}{(0.242)}$$

$$\boxed{B = 14°}$$

K. Find $m\angle B$.

39 yd, C, B, 103°, 35 yd, A
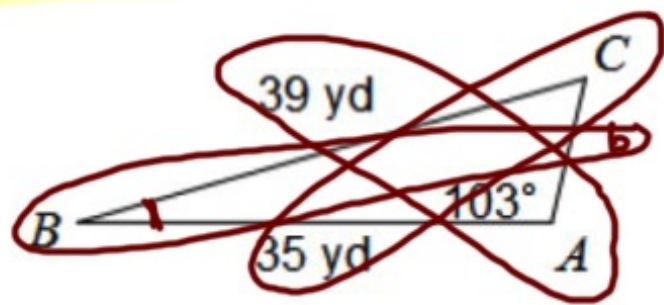
Find $\angle C$

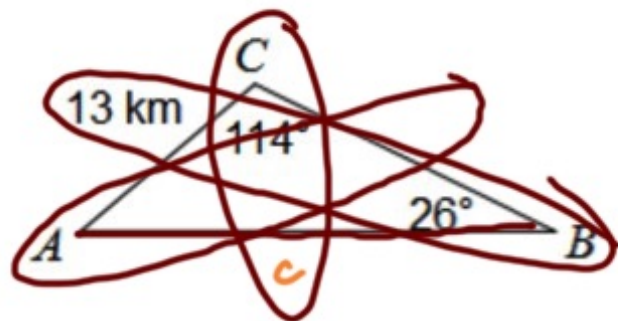$$35 \frac{\sin C}{35} = \frac{\sin 103°}{39} \cdot \frac{35}{1}$$

$$\sin^{-1}(\sin C) = \overset{\sin^{-1}}{(0.874)}$$

$$C = 61°$$

$$B = 180 - 61 - 103$$

$$\boxed{B = 16°}$$

L. Find AB.

$$\frac{\sin 114°}{\sin 26°} \cdot \frac{13}{1} = \frac{c}{\sin 114°} \cdot \frac{\sin 114°}{1}$$

$$\boxed{c = 27.09 \text{ Km}}$$

M. Find $m\angle A$.

$$\frac{\sin A}{9} \cdot \frac{9}{1} = \frac{\sin 28°}{10} \cdot \frac{9}{1}$$

$$\sin^{-1}(\sin A) = \sin^{-1}(0.422)$$

$$\boxed{A = 25°}$$