Trig  5.6

Solve triangles using the law of sines
Find area of a triangle given 3 parts

Geom Ch. 8

**Oblique (non-right)**

ratio

$$\frac{3}{5} = \frac{x}{10}$$

$x = 6$

proportion

triangle nomenclature

$$\frac{30}{5} = \frac{5x}{5}$$

Law of Sines (proportion)

included angle

included side

right triangle

oblique triangle

whiteboards
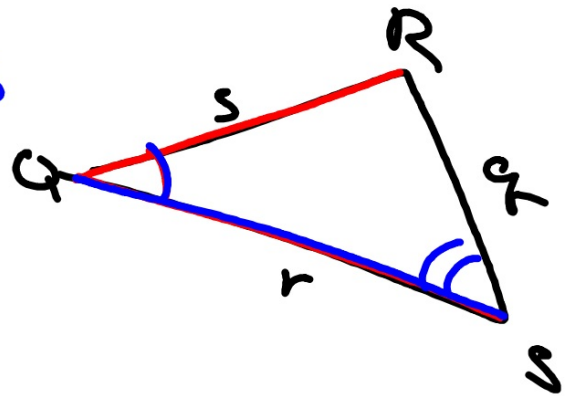
ratio
proportion
how do you solve a
proportion?

Longest side...largest angle, etc.

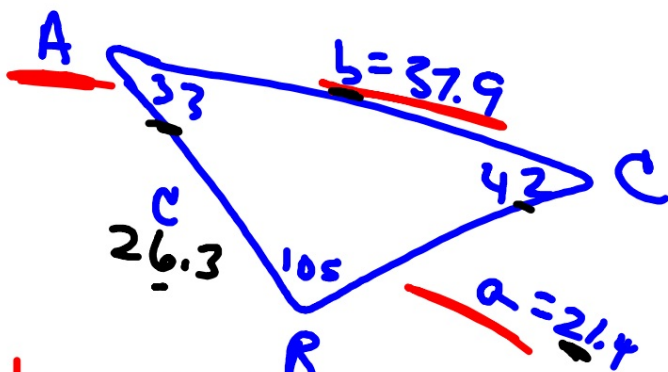| | |
|---|---|
| **Law of Sines** | Let $\triangle ABC$ be any triangle with $a$, $b$, and $c$ representing the measures of the sides opposite the angles with measures $A$, $B$, and $C$, respectively. Then, the following is true.<br><br>$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$ |

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

Applies to oblique (non-right) triangles

**1** Solve $\triangle ABC$ if $A = 33°$, $B = 105°$, and $b = 37.9$.

Is this a right triangle?

A
33

b = 37.9

42    C

c
26.3    105

a = 21.4

B

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

$$\frac{37.9}{\sin 105} = \frac{c}{\sin 42}$$

$$\frac{c \cdot \sin 105}{\sin 105} = \frac{\boxed{37.9 \sin 42}}{\sin(105)}$$

$$C = 26.3$$

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

$$\frac{37.9}{\sin 105} = \frac{a}{\sin 33}$$

$$\frac{a \cdot \sin 105}{\sin 105} = \frac{\boxed{37.9 \sin 33}}{\sin(105)}$$
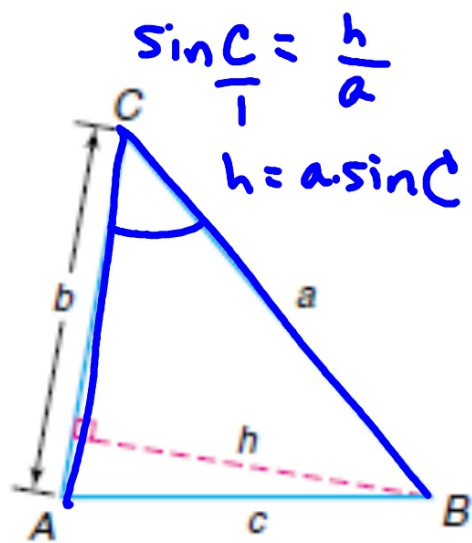
$$a = 21.4$$

**Solve each triangle. Round to the nearest tenth.**

**11.** $A = 40°$, $C = 70°$, $a = 20$                 **12.** $B = 100°$, $C = 50°$, $c = 30$

**13.** $b = 12, A = 25°, B = 35°$     **14.** $A = 65°, B = 50°, c = 12$

$$\sin C = \frac{h}{1} = \frac{h}{a}$$

$$h = a \cdot \sin C$$



Area = 1/2 bh
How can I find h?
hint: Is there a right triangle. that h is part of?

$$K = \frac{1}{2} b h = \frac{b \cdot h}{2}$$

$a \cdot \sin C$

$$K = \frac{1}{2} a b \sin C$$

sinA=h/c
sinC=h/a

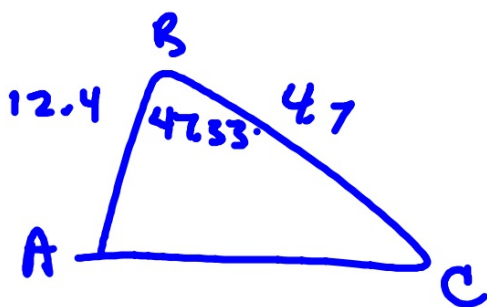| | |
|---|---|
| **Area of Triangles** | Let $\triangle ABC$ be any triangle with $a$, $b$, and $c$ representing the measures of the sides opposite the angles with measurements $A$, $B$, and $C$, respectively. Then the area $K$ can be determined using one of the following formulas. |

$$K = \frac{1}{2}bc \sin A \qquad\qquad K = \frac{1}{2}ac \sin B$$

$$K = \frac{1}{2}ab \sin C$$

**SAS**

Is this really 3 equations? Or is it just 3 versions of the same equation?

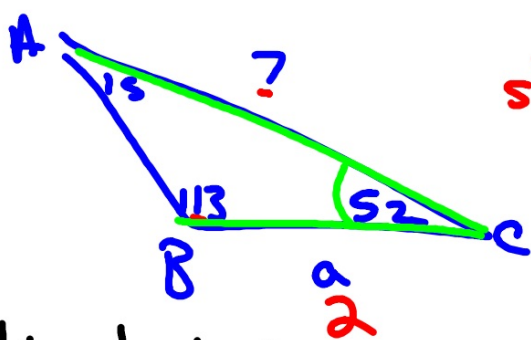**3** Find the area of $\triangle ABC$ if $a = 4.7$, $c = 12.4$, and $B = 47° 20'$.

B

12.4   47°33'   4.7

A

C

$$K = \frac{1}{2}ab\sin C$$
$$= \frac{1}{2}(12.4)(4.7)\sin(47°33')$$
$$= 21.4$$

Find missing info...

**21.** $A = 15°, B = 113°, b = 7$          **22.** $b = 146.2, c = 209.3, A = 62.2°$

$$\frac{7}{\sin 113} = \frac{a}{\sin 15}$$

$$a \sin 113 = 7 \sin 15$$

$$\frac{a \sin 113}{\sin 113} = \frac{7 \sin 15}{\sin 113}$$

$$a = 2$$

$$K = \frac{1}{2} ab \sin C$$

$$= \frac{1}{2} \cdot 2 \cdot 7 \cdot \sin 52$$

$$= 5.5$$

missing info...

**4** Find the area of $\triangle DEF$ if $d = 13.9$, $D = 34.4°$, and $E = 14.8°$.

**Find the area of each triangle. Round to the nearest tenth.**

**19.** $A = 28°, b = 14, c = 9$

**20.** $a = 5, B = 37°, C = 84°$