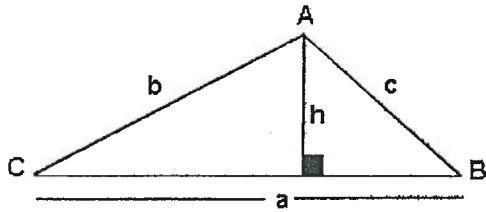


## Section 6.5 The Area of a Triangle

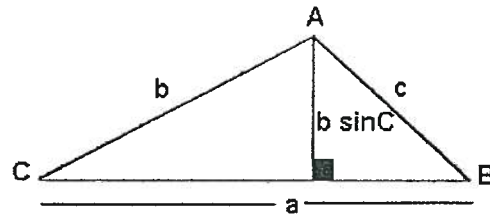
The traditional formula for the area of a triangle is  $A = \frac{1}{2}bh$  where  $b$  is the base and  $h$  is the height (perpendicular to the base)

Look at triangle  $ABC$ .

Its area would be defined as  $A = \frac{1}{2}ah$



Substitute that expression for  $h$ .



According to the triangle above  $\sin C = \frac{h}{b}$ .

Similarly,  $h = b \sin C$ .

Now it can be said that Area =  $\frac{1}{2}a(b \sin C)$

Essentially if you know the lengths of two sides of a triangle and the measure of the angle between the two sides, you can find the area of the triangle. That would give me three formulas...

$$\text{Area} = \frac{1}{2}ab \sin C$$

$$\text{Area} = \frac{1}{2}ac \sin B$$

$$\text{Area} = \frac{1}{2}bc \sin A$$

Just remember... the letters are not important. As long as you have SAS you can use this formula!

Example: Find the area of the triangle below.

Then compute the percent error if Bob approximated the area as  $760 \text{ km}^2$ .

$$\varepsilon = \left| \frac{v_A - v_E}{v_E} \right| \times 100\%, \text{ where } v_E \text{ is the exact value and } v_A \text{ is the approximate value.}$$

Area:

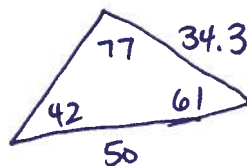
Right now I don't have SAS...  
use Sine Rule to find another side

$$\frac{50}{\sin 77} = \frac{x}{\sin 42}$$

$$50 \sin 42 = x \sin 77$$

$$x \approx 34.3$$

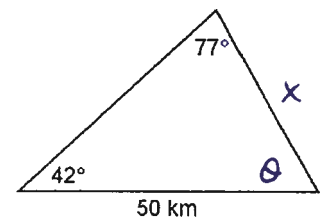
$$\theta = 180 - 42 - 77 = 61^\circ$$



$$A = \frac{1}{2}(50)(34.3)\sin 61^\circ$$

$$A \approx 749.986... \approx \boxed{750 \text{ km}^2}$$

*This is in your formula booklet.*



Percent Error

$$v_E = 750$$

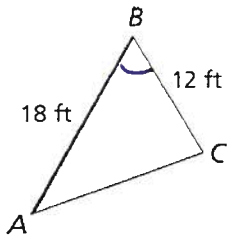
$$v_A = 760$$

$$\varepsilon = \left| \frac{760 - 750}{750} \right| \times 100\%$$

$$= |0.013| \times 100\%$$

$$= \boxed{1.33\%}$$

Example: The triangle below has an area of  $94 \text{ ft}^2$ . Find  $\hat{B}$ .  
 If an 8oz container of paint will cover  $16 \text{ ft}^2$ , how many containers will you need?



$$\hat{B} = \text{angle } B$$

I have SAS

$$A = \frac{1}{2} (18)(12)(\sin B)$$

$$94 = \frac{1}{2} (18)(12) \sin B$$

$$94 = 108 \sin B$$

$$\frac{94}{108} = \sin B$$

$$\sin^{-1} \left( \frac{94}{108} \right) = B$$

$$\hat{B} \approx 60.5^\circ$$

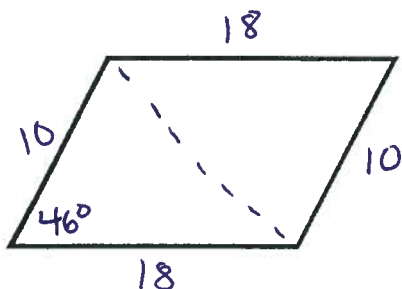
How many containers?

$$\frac{94 \text{ ft}^2}{16 \text{ ft}^2} = 5.875$$

5 is not enough...  
 can't have 0.875 of  
 a container

6 containers

Example: The sides of a parallelogram measure 10 cm and 18 cm. One angle of the parallelogram measures  $46^\circ$ . What is the area of the parallelogram, to the nearest square centimeter?



find the area of one triangle  
 and then double!

$$A = \frac{1}{2} (10)(18) \sin 46$$

$$A \approx 64.74 \dots$$

leave it in calculator  
 and multiply times 2

2. Ans

$$129.48 \dots$$

$$129 \text{ cm}^2$$