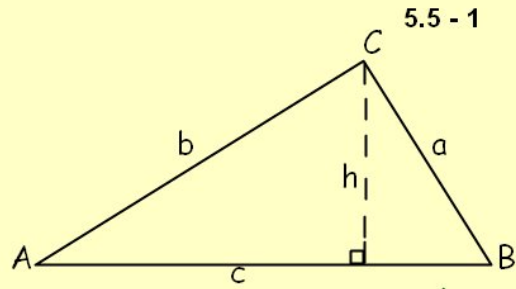


### 5.5 The Law of Sines

If ABC is a triangle with sides a, b, and c, then

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



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

$$b \sin A = h \quad a \sin B = h$$

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

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

$$\sin B = \frac{h}{a} \text{ so, } h = a \sin B$$

$$\sin A = \frac{h}{b} \text{ so, } h = b \sin A$$

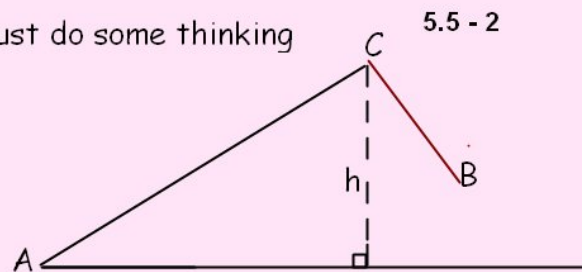
$$\text{so } a \sin B = b \sin A$$

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

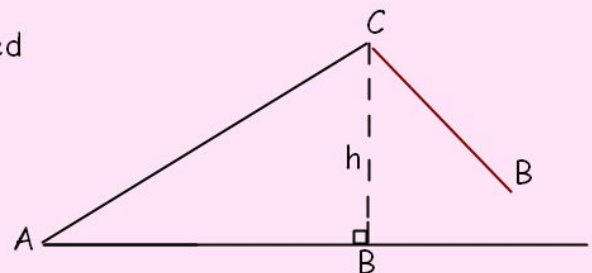
Solving Triangles when you know two angles and a side (AAS or ASA)--  
Use the Law of Sines

If you know two sides and an angle (SSA)--must do some thinking

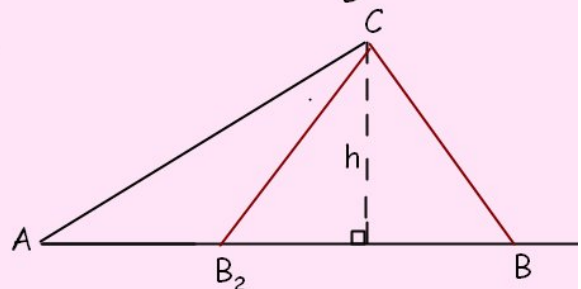
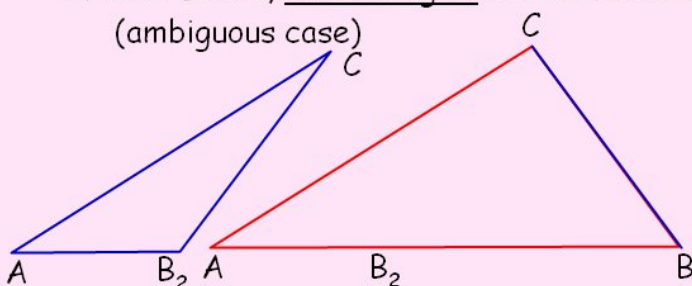
If  $BC < h$ , no triangle can be formed



If  $BC = h$ , one unique triangle can be formed

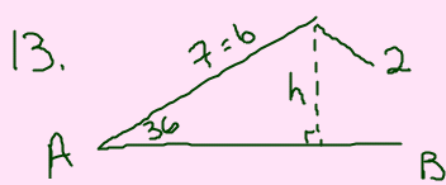


If  $AC > BC > h$ , two triangles can be formed  
(ambiguous case)



Homework: 5.5A pg 484: 1,5,9,13-19 odd 25

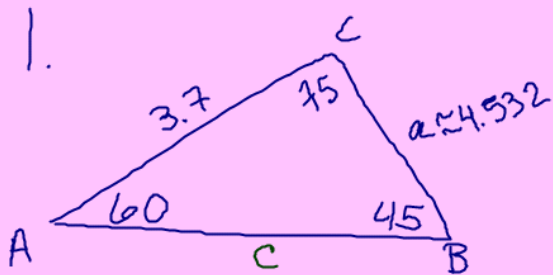
5.5B pg 484: 27-31 odd, 35, 37, 41-45 odd



$$\sin 36 = \frac{h}{7}$$

$$7 \sin 36 = h$$

$$4.114 \approx h$$



$$\frac{\sin 60}{a} = \frac{\sin 45}{3.7}$$

$$3.7 \sin 60 = a \sin 45$$

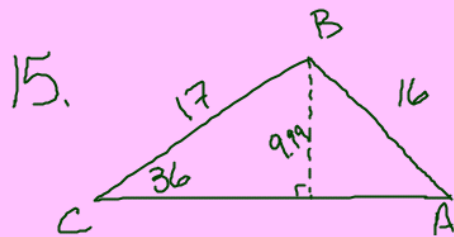
$$\frac{3.7 \sin 60}{\sin 45} = a$$

$$\frac{\sin 45}{3.7} = \frac{\sin 75}{c}$$

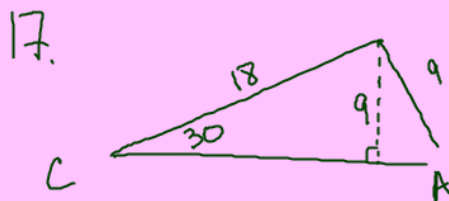
$$c \sin 45 = 3.7 \sin 75$$

$$c = \frac{3.7 \sin 75}{\sin 45}$$

$$c \approx 5.054$$

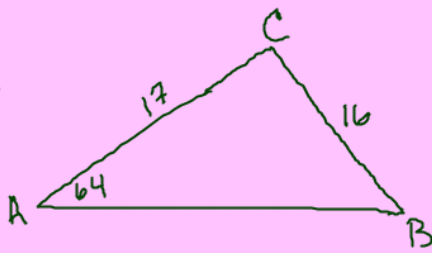


$$\sin 36 = \frac{h}{17}$$
$$17 \sin 36 = h$$
$$\approx h$$



$$\sin 30 = \frac{h}{18}$$
$$18 \sin 30 = h$$
$$9 = h$$

19.



$$\frac{\sin 64}{16} = \frac{\sin B}{17}$$

$$\frac{17 \sin 64}{16} = \sin B$$

$$.955 \approx \sin B$$

$$72.74^\circ \approx B$$

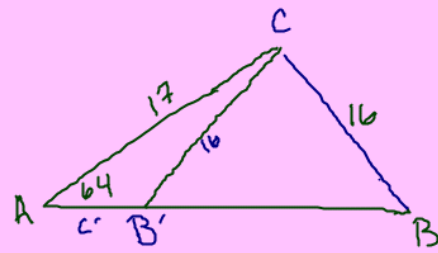
$$43.26^\circ \approx C$$

$$\frac{\sin 43.26}{c} = \frac{\sin 64}{16}$$

$$16 \sin 43.26 = c \sin 64$$

$$\frac{16 \sin 43.26}{\sin 64} = c$$

$$12.2 \approx c$$



$$B' \approx 107.26$$

$$C' \approx 8.74$$

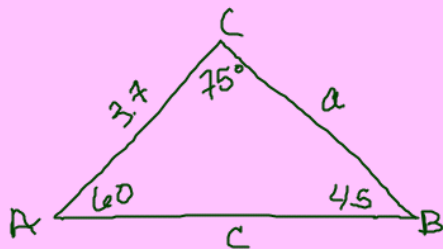
$$\frac{\sin 8.74}{c'} = \frac{\sin 64}{16}$$

$$16 \sin 8.74 = c' \sin 64$$

$$\frac{16 \sin 8.74}{\sin 64} = c'$$

$$2.705 \approx c'$$

1.



$$C = 75^\circ$$

$$\frac{\sin 45}{3.7} = \frac{\sin 60}{a}$$

$$a \sin 45 = 3.7 \sin 60$$

$$a = \frac{3.7 \sin 60}{\sin 45}$$

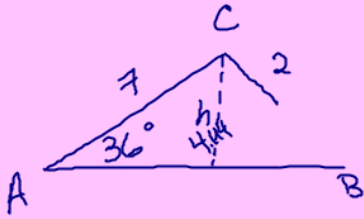
$$a \approx 4.532$$

$$\frac{\sin 45}{3.7} = \frac{\sin 75}{c}$$

$$c \sin 45 = 3.7 \sin 75$$

$$c = \frac{3.7 \sin 75}{\sin 45}$$

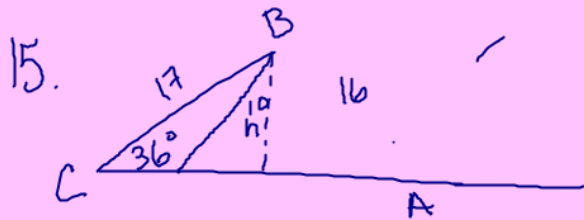
$$c \approx 5.054$$



$$\sin 36^\circ = \frac{h}{7}$$

$$7 \sin 36 = h$$

$$4.114 \approx h$$



$$\sin 36^\circ = \frac{h}{17}$$

$$17 \sin 36 = h$$

$$9.99 = h$$

17.

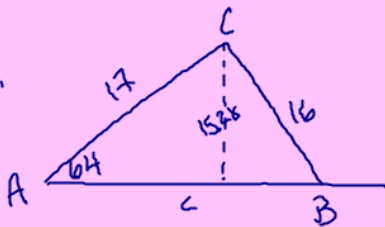


$$\sin 30 = \frac{h}{18}$$

$$18 \sin 30 = h$$

$$9 = h$$

19.



$$\frac{\sin 64}{16} = \frac{\sin B}{17}$$

$$\frac{17 \sin 64}{16} = \sin B$$

$$.955 \approx \sin B$$

$$72.74 \approx B$$

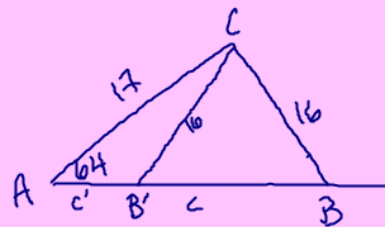
$$43.26 \approx C$$

$$\frac{\sin 43.26}{c} = \frac{\sin 64}{16}$$

$$16 \sin 43.26 = c \sin 64$$

$$\frac{16 \sin 43.26}{\sin 64} = c$$

$$12.2 \approx c$$



$$B' \approx 107.26^\circ$$

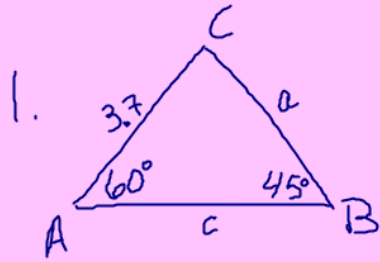
$$C' \approx 8.74^\circ$$

$$\frac{\sin 64}{16} = \frac{\sin 8.74}{c'}$$

$$c' \sin 64 = 16 \sin 8.74$$

$$c' = \frac{16 \sin 8.74}{\sin 64}$$

$$c' \approx 2.705$$



$$C = 75$$

$$\frac{\sin 45^\circ}{3.7} = \frac{\sin 60^\circ}{a}$$

$$a \sin 45 = 3.7 \sin 60$$

$$a = \frac{3.7 \sin 60}{\sin 45}$$

$$a \approx 4.531$$

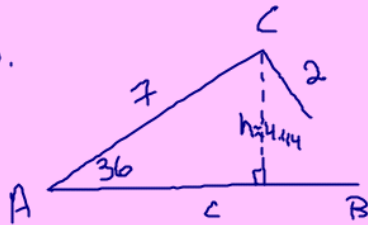
$$\frac{\sin 45}{3.7} = \frac{\sin 75}{c}$$

$$c \sin 45 = 3.7 \sin 75$$

$$c = \frac{3.7 \sin 75}{\sin 45}$$

$$c \approx 5.054$$

13.



$$\sin 36^\circ = \frac{h}{7}$$

$$7 \sin 36 = h$$

$$4.114 = h$$

15.



$$\sin 36 = \frac{h}{17}$$

$$17 \sin 36 = h$$

$$9.992 = h$$

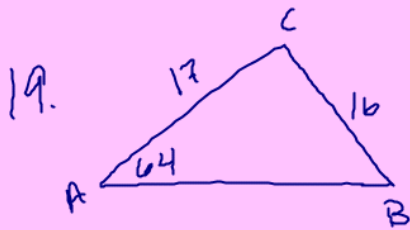
17.



$$\sin 30 = \frac{h}{18}$$

$$18 \sin 30 = h$$

$$9 = 18 \left( \frac{1}{2} \right) = h$$



$$\frac{\sin 64}{16} = \frac{\sin B}{17}$$

$$\frac{17 \sin 64}{16} = \sin B$$

$$.954 \approx \sin B$$

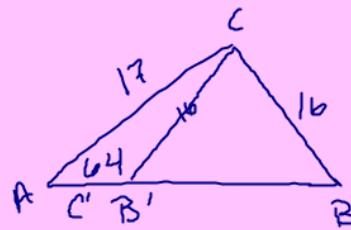
$$72.74 \approx B$$

$$43.26 \approx C$$

$$\frac{\sin C}{c} = \frac{\sin 64}{16}$$

$$\frac{16 \sin 43.26}{64} = \frac{c \sin 64}{64}$$

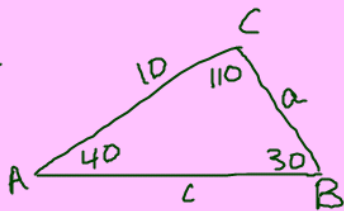
$$12.199 \approx c$$



$$B' \approx 107.26$$

$$C' \approx 8.74$$

5.



$$C = 110^\circ$$

$$\frac{\sin 30^\circ}{10} = \frac{\sin 110}{c}$$

$$c \sin 30^\circ = 10 \sin 110$$

$$c = \frac{10 \sin 110}{\sin 30}$$

$$c \approx 18.794$$

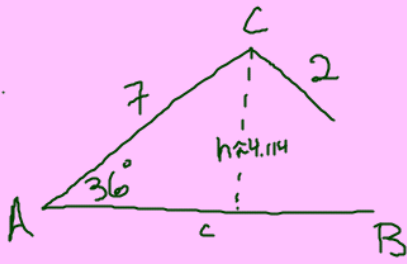
$$\frac{\sin 40}{a} = \frac{\sin 30}{10}$$

$$a \sin 30 = 10 \sin 40$$

$$a = \frac{10 \sin 40}{\sin 30}$$

$$a \approx 12.856$$

13.

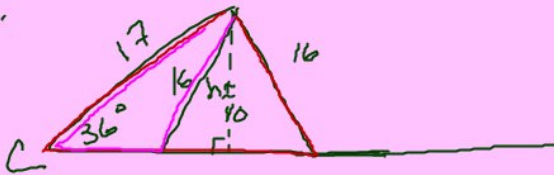


$$\sin 36 = \frac{h}{7}$$

$$7 \sin 36 = h$$

$$4.114 \approx h$$

15.

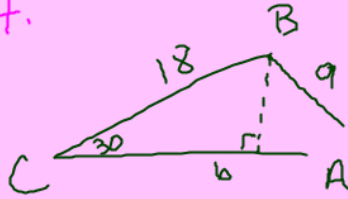


$$\sin 36 = \frac{h}{17}$$

$$17 \sin 36 = h$$

$$9.99 = h$$

17.



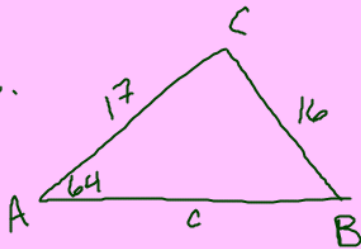
$$\sin 30 = \frac{h}{18}$$

$$18 \sin 30 = h$$

$$18 \left( \frac{1}{2} \right) = h$$

$$9 = h$$

19.



$$\frac{\sin 64}{16} = \frac{\sin B}{17}$$

$$\frac{17 \sin 64}{16} = \sin B$$

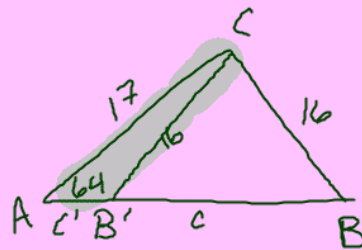
$$.955 = \sin B$$

$$72.74 \approx B \xrightarrow{\text{calc}} B$$

$$43.26 \approx C$$

$$\frac{\sin 64}{16} = \frac{\sin 43.26}{c}$$

$$c = \frac{16 \sin 43.26}{\sin 64} \approx 12.7$$



$$B' = 107.25$$

$$C' = 8.74$$

$$\frac{\sin 8.74}{c} = \frac{\sin 64}{16}$$