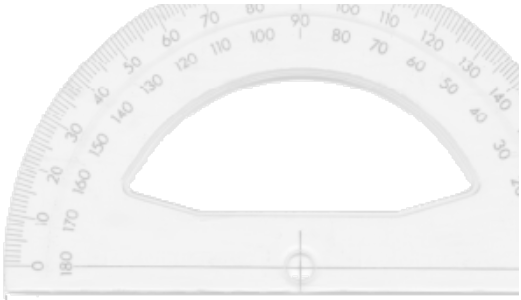
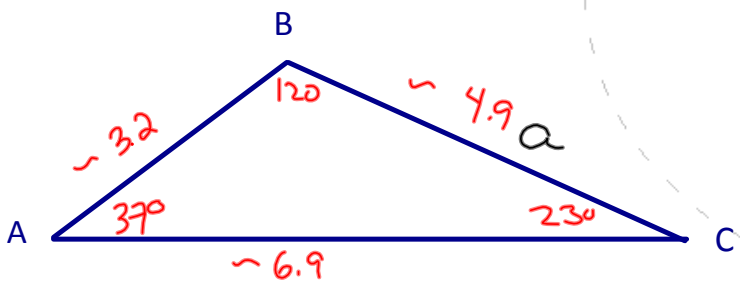
6.5 The Sine Law

Draw an oblique triangle, ΔABC (no 90° angle).
Measure and label all angles and sides.





Now calculate:

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

$\frac{\sin 37}{4.9} = 0.1$

$\frac{\sin 120}{6.9} = 0.1$

$\frac{\sin 23}{3.2} = 0.1$

The Sine Law

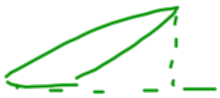
$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$ ← find an angle

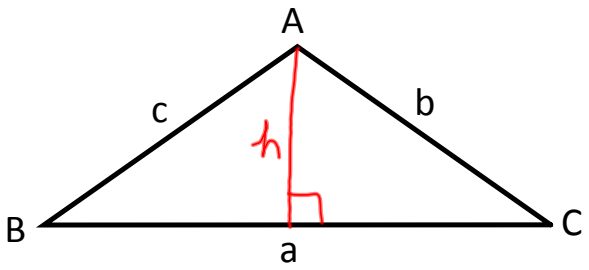
or

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$ ← find a side length

These raos can be used to find unknown sides or angles in oblique triangles.

Development of the Sine Law:





- ☆ Consider ΔABC (no 90° angle).
- ☆ Construct an altude from A.
- ☆ Noce that there are now 2 right triangles.

STEPS:

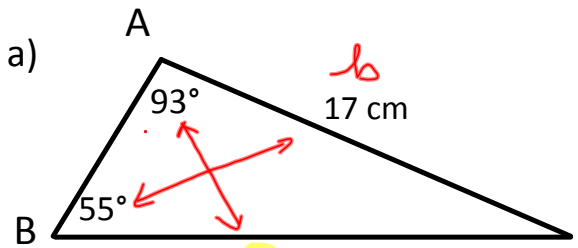
- ➪ 1. Write equaons for sin B and sin C.
- ➪ 2. Solve each equaon for h.
- ➪ 3. Since both equaons = h, they must equal each other.
- ➪ 4. Divide both sides by b and c.

- ➪ $\sin B = \frac{h}{c}$ (×c) $\sin C = \frac{h}{b}$ (×b)
- ➪ $c(\sin B) = h$ $b(\sin C) = h$
- ➪ $\therefore\ c(\sin B) = b(\sin C)$ (÷bc ÷bc)
- ➪ $\frac{\sin B}{b} = \frac{\sin C}{c}$

Ex. 1 Solve for the unknown.

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

a)



b

a

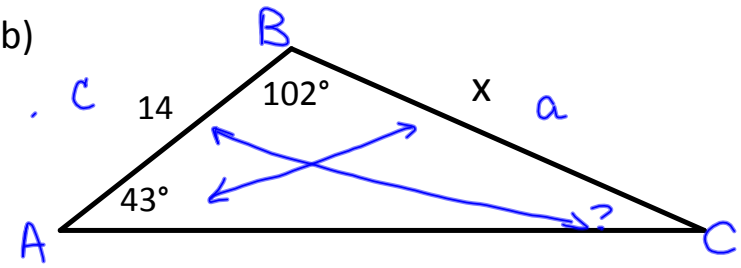
$$\frac{a}{\sin A} = \frac{b}{\sin B}$$

$$\frac{x}{\sin 93} = \frac{17}{\sin 55} \quad \times \sin 93$$

$$x = \frac{17 \sin 93}{\sin 55}$$

$$x \doteq 20.7 \text{ cm}$$

b)



ASTT

$\angle C = 180 - 102 - 43$

$\angle C = 35°$

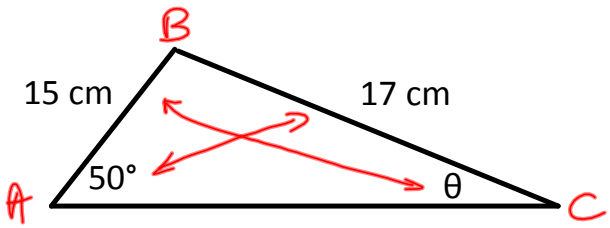
$$\frac{a}{\sin A} = \frac{c}{\sin C}$$

$$\frac{x}{\sin 43} = \frac{14}{\sin 35}$$

$$x = \frac{14 \sin 43}{\sin 35}$$

$$x \doteq 16.6 \text{ units}$$

c)



We need to find an angle,
∴ use:

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

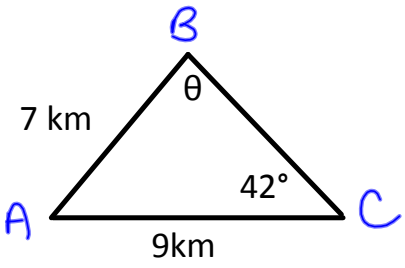
$$\frac{\sin 50}{17} = \frac{\sin \theta}{15}$$

$$\frac{15 \sin 50}{17} = \sin \theta$$

$$\sin^{-1}\left(\frac{15 \sin 50}{17}\right) = \theta$$

$$43^\circ \doteq \theta$$

d)



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

$$\frac{\sin \theta}{9} = \frac{\sin 42}{7}$$

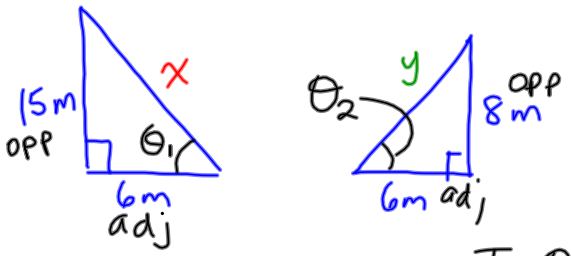
$$\sin \theta = \frac{9 \sin 42}{7}$$

$$\theta = \sin^{-1}\left(\frac{9 \sin 42}{7}\right)$$

$$\theta \doteq 59^\circ$$

Homework
Pg. 401 # C2, C3, 2b, 3a, 4b, 6b, 9, 10, 12, 15, 20

P. 381 #7



a) $\tan\theta = \frac{opp}{adj}$

$\tan\theta_1 = \frac{15}{6}$

$\theta_1 = \tan^{-1}\left(\frac{15}{6}\right)$

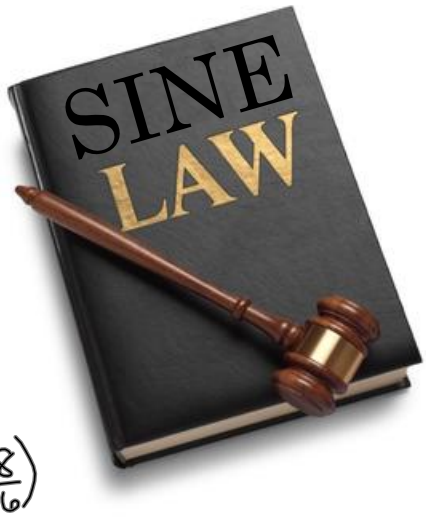
$\boxed{\theta_1 = 68°}$

$\tan\theta = \frac{opp}{adj}$

$\tan\theta_2 = \frac{8}{6}$

$\theta_2 = \tan^{-1}\left(\frac{8}{6}\right)$

$\boxed{\theta_2 = 53°}$



b) $a^2 + b^2 = c^2$

$15^2 + 6^2 = x^2$

$x = \pm\sqrt{251}$

$x = 6.4m, x > 0$

$a^2 + b^2 = c^2$

$8^2 + 6^2 = y^2$

$y = \pm\sqrt{100}$

$y = 10m, y > 0$