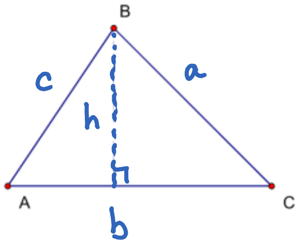
Lesson 2.3

Saturday, February 4, 2017 4:35 PM

PREC 11 **2.3 The Sine Law**



From SOH CAH TOA we know:

From left

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

$$c\sin A = h$$

From right

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

$$a\sin C = h$$

$$\therefore c\sin A = a\sin C$$

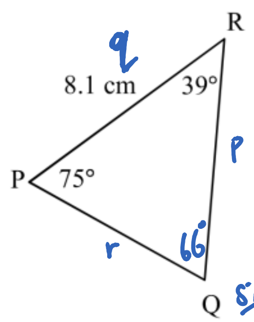
$$\therefore \frac{c}{\sin C} = \frac{a}{\sin A} \quad \text{or} \quad \frac{\sin A}{a} = \frac{\sin C}{c}$$

Therefore, the Sine Law states:

Finding Angles → $\boxed{\dfrac{\sin A}{a} = \dfrac{\sin B}{b} = \dfrac{\sin C}{c}}$

Finding sides → $\boxed{\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}}$

Example 1: In ΔPQR, determine the length of QR to the nearest tenth of a centimetre.



Find $\angle Q = 180 - 75 - 39 = 66°$

Find p

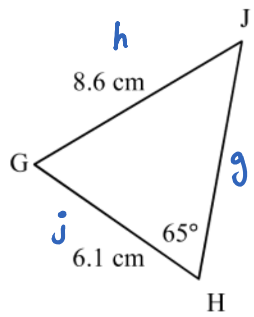
$$\frac{p}{\sin P} = \frac{q}{\sin Q}$$

$$\cancel{\sin 75°} \times \frac{p}{\cancel{\sin 75°}} = \frac{8.1}{\sin 66°} \times \sin 75°$$

$$p = \frac{(8.1)\sin 75°}{\sin 66°}$$

$$p = 8.564 \doteq \boxed{8.6 \text{ cm}}$$

Example 2: In ΔGHJ determine ∠G to the nearest degree.



Find ∠J first

$$\frac{\sin J}{j} = \frac{\sin H}{h}$$

$$\cancel{6.1} \times \frac{\sin J}{\cancel{6.1}} = \frac{\sin 65°}{8.6} \times 6.1$$

$\sin J = 0.642846221$

$J = \sin^{-1}(0.6428...)$

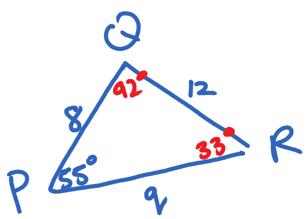
$\angle J = 40°$

Find ∠G

$180 - 65 - 40 = 75°$

Example 3: In ΔPQR, PQ = 8 cm, ∠P = 55° and QR = 12 cm. Solve the triangle.

Find all angles & sides



Find ∠R:

$$\frac{\sin R}{8} = \frac{\sin 55°}{12}$$

$\sin R = 0.546...$

$R = \sin^{-1}(0.546...)$

$R = 33°$

Find ∠Q

$\angle Q = 180 - 55 - 33$

$= 92°$

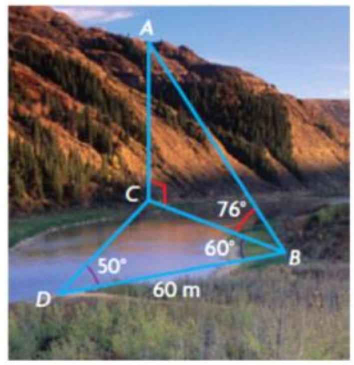
Find side q

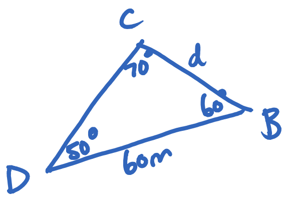
$$\cancel{\sin 92°} \times \frac{q}{\cancel{\sin 92°}} = \frac{12}{\sin 55°} \times \sin 92°$$

$q = 14.64 \approx 14.6\text{ cm}$

Example 4: Brendan and Diana plan to climb the cliff at Dry Island Buffalo Jump, Alberta. They need to know the height of the climb before they start. Brendan stands at point B, as shown in the diagram. He uses a clinometer to determine $\angle ABC$, the angle of elevation to the top of the cliff. Then he estimates $\angle CBD$, the angle between the base of the cliff, himself, and Diana, who is standing at point D. Diana estimates $\angle CDB$, the angle between the base of the cliff, herself, and Brendan.

Determine the height of the cliff to the nearest metre.

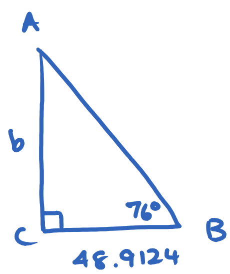




Find c:
$180 - 50 - 60 = 70°$

$$\frac{d}{\sin 50°} = \frac{60}{\sin 70}$$

$d = 48.9124$ m



Find AC

$$\tan B = \frac{O}{A}$$

$$\tan 76° = \frac{b}{48.9124}$$

$b = 196.175$

The cliff is 196 m high.

Assignment: Pg. 108 #1-3, 4ac, 5ac, 10, 13