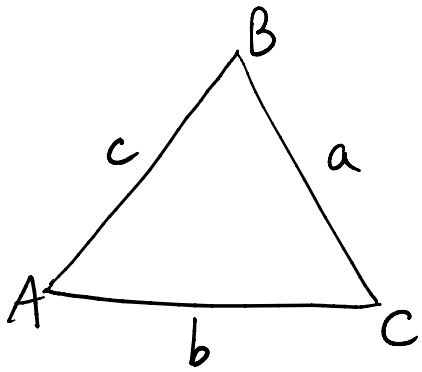
5.6 Cosine Law

The cosine law describes the relationship between the three sides and the cosine of an angle.



$$a^2 = b^2 + c^2 - 2bc\cos A$$
$$b^2 = a^2 + c^2 - 2ac\cos B$$
$$c^2 = a^2 + b^2 - 2ab\cos C$$

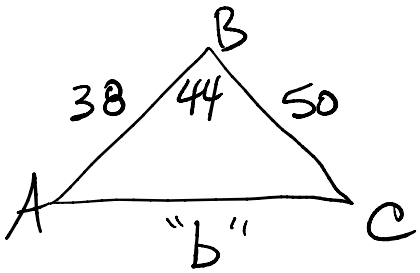
find sides

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$
$$\cos B = \frac{a^2 + c^2 - b^2}{2ac}$$

find angle

ex.1 In $\triangle ABC$, $a = 50\text{cm}$, $c = 38\text{cm}$, $\angle B = 44°$

Find "b" to the <u>nearest cm.</u>



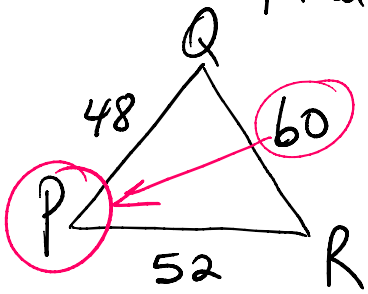
$$b^2 = a^2 + c^2 - 2ac\cos B$$
$$b^2 = 50^2 + 38^2 - 2(50)(38)\cos 44$$
$$b^2 = 1210.51\ldots\ldots$$
$$\boxed{b = 35\text{ cm}}$$

ex.2 In $\triangle PQR$ $p = 60\text{m}$, $q = 52\text{m}$, $r = 48\text{m}$

ex.2 In $\triangle PQR$ $p = 60m$, $q = 52m$, $r = 48m$

Find the largest angle to the nearest degree.

$p = 60 \Rightarrow \angle P = ?$



$$\cos P = \frac{q^2 + r^2 - p^2}{2qr}$$

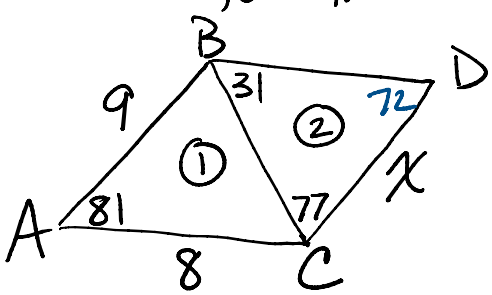
$$\cos P = \frac{52^2 + 48^2 - 60^2}{2(52)(48)}$$

$$(52^2 + 48^2 - 60^2) \div (2 \times 52 \times 48)$$

$$\cos P = 0.282\ldots\ldots$$

$$\boxed{P = 74^\circ}$$

ex.3 Find the measure of the indicated side to the nearest tenth.



in $\triangle$① find BC

$a^2 = 9^2 + 8^2 - 2(9)(8)\cos 81$

$a = 11.1\ldots\ldots$

in $\triangle$② "a" = "d"

$\angle D = 180 - 31 - 77 = 72$

use sine law (opposite info)

$$\frac{11.1\ldots}{\sin 72} = \frac{x}{\sin 31}$$

$$\frac{11.1\ldots \times \sin 31}{\sin 72} = x$$

$$6.0 = x$$

$$\boxed{\text{p 495 \#3, 5, 6, 7}}$$