

NOTES

Name _____

The Cosine Rule

EQ: How do you use the Cosine Rule to find the unknown sides and angles of any triangle?

What do we need to know in order to use the Cosine Rule?

SAS

OR

SSS

What is the Cosine Rule?

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$\text{OR } b^2 = a^2 + c^2 - 2ac \cos B$$

$$\text{OR } c^2 = a^2 + b^2 - 2ab \cos C$$

Example Find the remaining sides and angles in triangle ABC if $b = 13$ cm, $A = 42^\circ$, and $c = 11$ cm.

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$a^2 = 13^2 + 11^2 - 2(13)(11) \cos 42^\circ$$

$$a^2 = 169 + 121 - 286 \cos 42^\circ$$

$$a^2 = 290 - 214.4$$

$$a^2 = 75.6$$

$$a = 8.7$$

$$\sin 42^\circ = \frac{\sin B}{13}$$

$$\sin B = \frac{8.7 \sin 42^\circ}{13} = 0.4885$$

$$\sin 42^\circ = \frac{\sin C}{11}$$

$$\sin C = \frac{8.7 \sin 42^\circ}{11} = 0.3364$$

Cosine Rule

$$\Sigma = 180$$

①

Find 1st Δ first, in order

$$10^2 = 5^2 + 7^2 - 2(5)(7) \cos R$$

$$100 = 25 + 49 - 70 \cos R$$

$$26 = -70 \cos R$$

$$\frac{26}{-70} = \cos R = -0.3714$$

$$\cos^{-1}(-0.3714) = 111.8^\circ$$

② LOS \rightarrow middle Δ

YOU DO: Find the remaining sides and angles in triangle PQR if $p = 4.8$ km, $q = 6.3$ km, and $R = 32^\circ$.

SSS: Let $p = 5$ ft

$q = 7$ ft

$r = 10$ ft

When you have SSS \rightarrow Find 1st Δ first, in order

$$180 - (42 + 81.3) = 180 - 123.3 = 56.7^\circ$$

$$r = 10$$

$$R = \boxed{111.8}$$

Find Q

$$q = 7$$

$$\frac{\sin 111.8}{10} = \frac{\sin Q}{7}$$

$$\sin Q = .6499$$

$$\boxed{Q = 40.5^\circ}$$

③ Use $\Delta \Sigma = 180$
to find 3rd \angle

$$180 - (111.8 + 40.5)$$

$$180 - (152.3)$$

$$\boxed{P = 27.7^\circ}$$

Do they add to 180° ?