

Boardwork

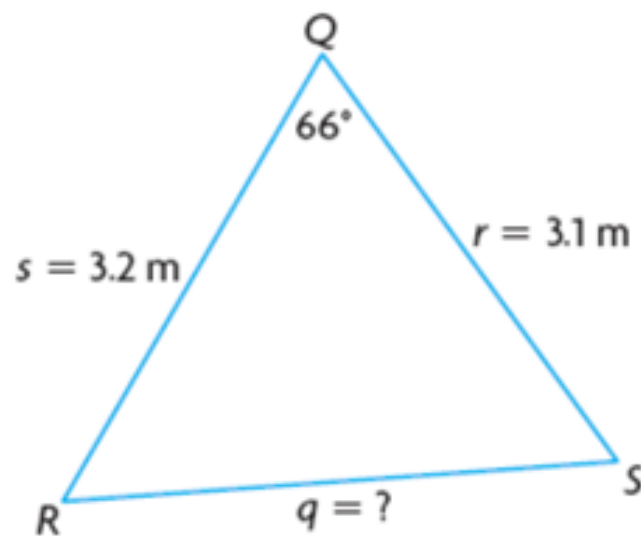
A bush pilot delivers supplies to a remote camp by flying 200 km in the direction $N47^\circ E$. While at the camp, the pilot receives a radio message to pick up a passenger at a village. The village is 105 km $S21^\circ E$ from the camp. The pilot collects the passenger and flies back to his starting point. What is the total distance that the pilot has flown, to the nearest kilometer?

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Unit 3: Acute Triangle Trigonometry

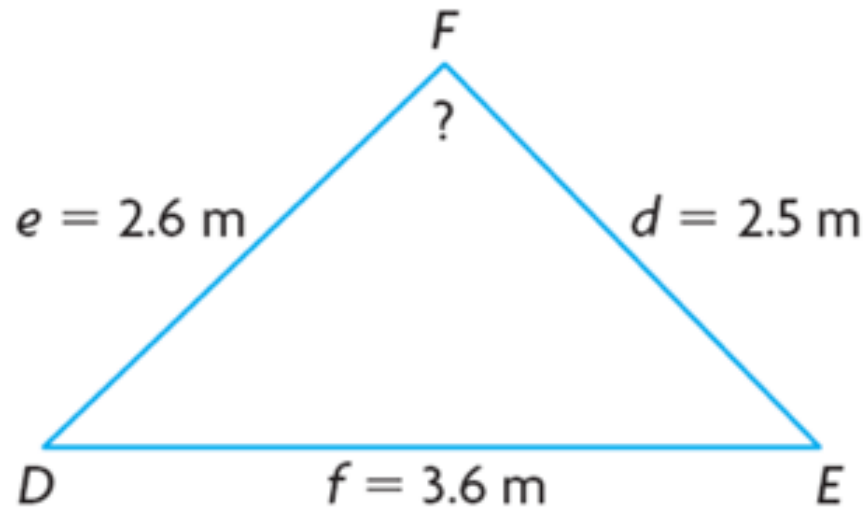
Example (p. 130)

Can you solve for q ?



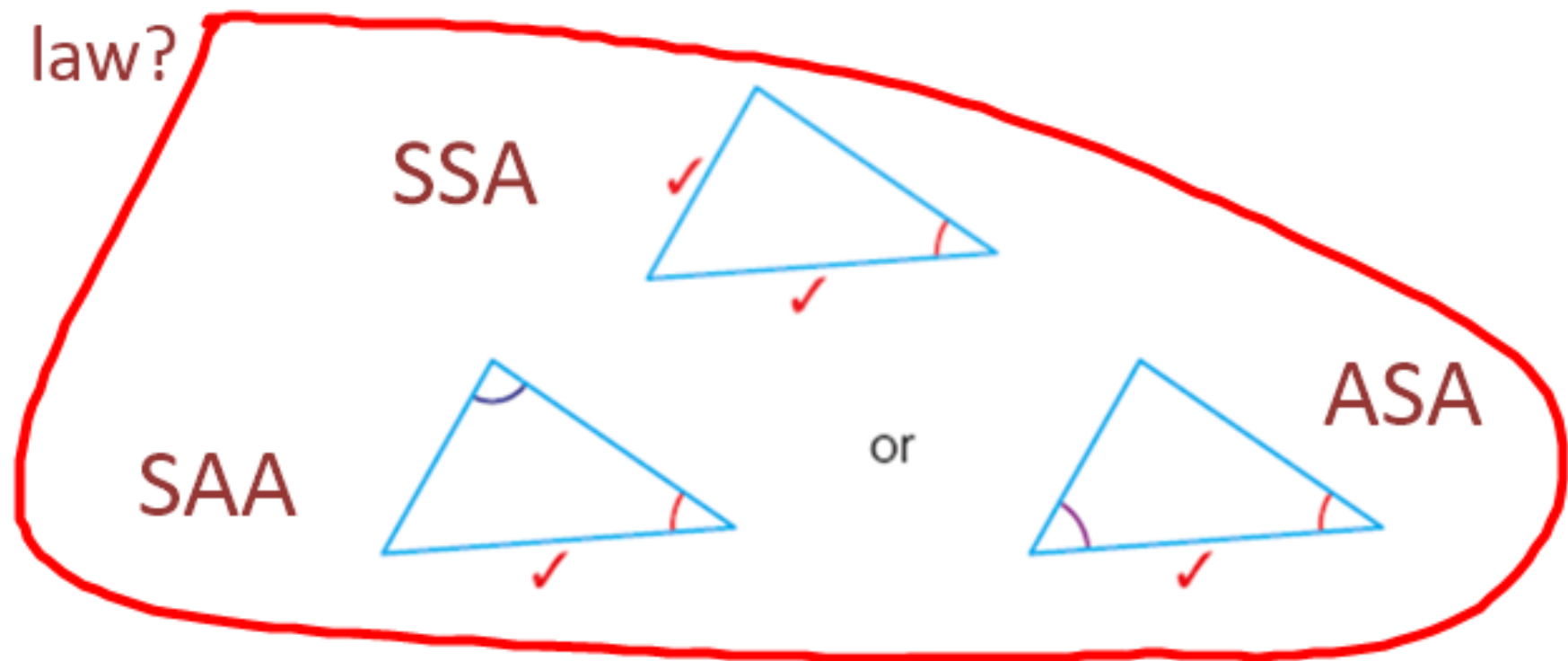
Example (p. 130)

Can you solve for $\angle F$?



Reminder

What information did we need to use the sine law?



What if we have *SAS* – *side angle side* ??

Or *SSS* – *side side side*??

3.3 Proving and Applying the Cosine Law

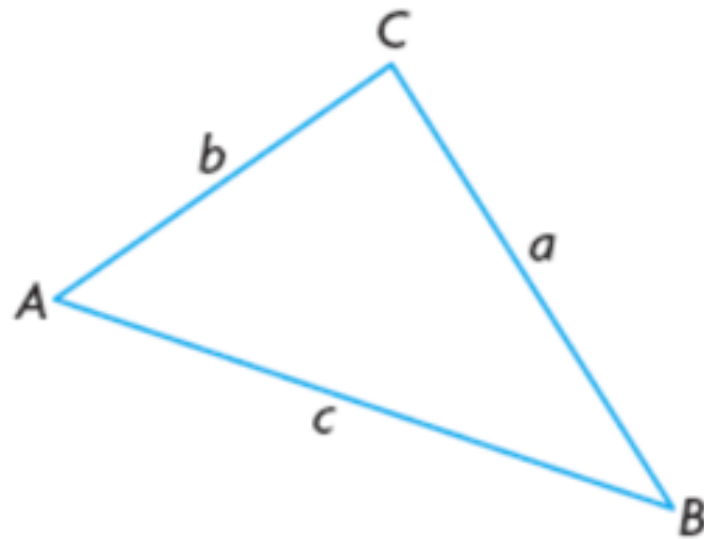
cosine law

In any acute triangle,

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

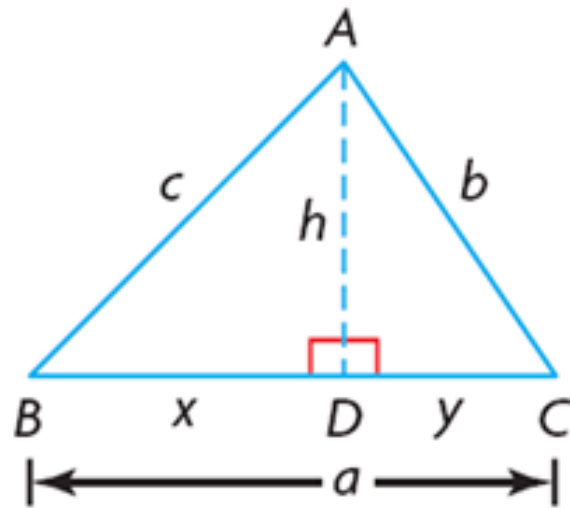
$$b^2 = a^2 + c^2 - 2ac \cos B$$

$$c^2 = a^2 + b^2 - 2ab \cos C$$



Proof: Cosine Law

$$x = a - y$$



$$x^2 + h^2 = c^2$$
$$h^2 = \underline{c^2 - x^2}$$

$$y^2 + h^2 = b^2$$
$$h^2 = \underline{b^2 - y^2}$$

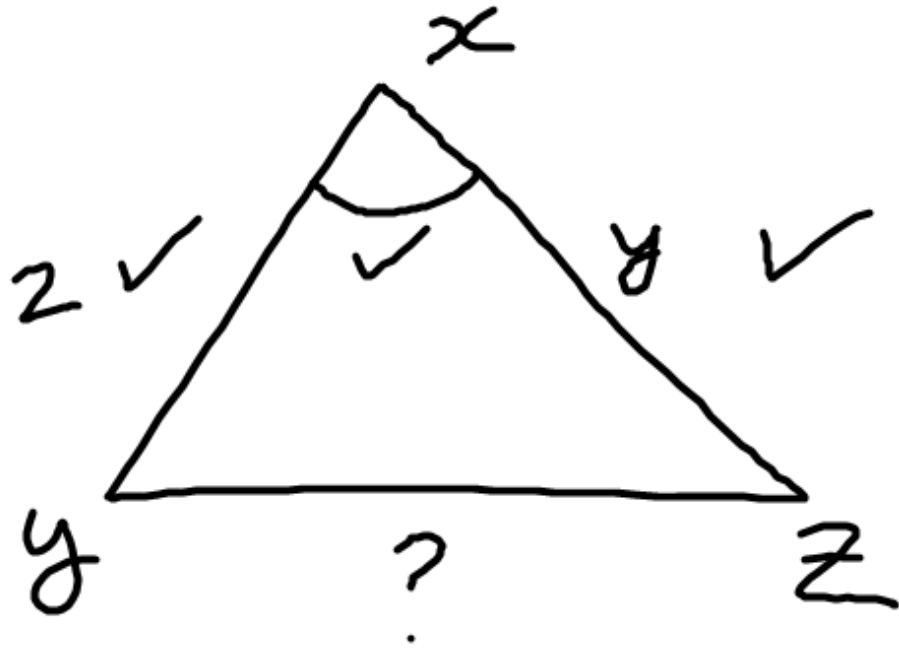
$$c^2 - x^2 = b^2 - y^2$$
$$c^2 = x^2 + b^2 - y^2$$

$$c^2 = (a-y)^2 + b^2 - y^2$$
$$c^2 = a^2 - 2ay + \cancel{y^2} + b^2 - \cancel{y^2}$$
$$c^2 = a^2 + b^2 - 2a\boxed{y}$$

$$\cos C = \frac{y}{b}$$

$$b \cos C = y$$

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

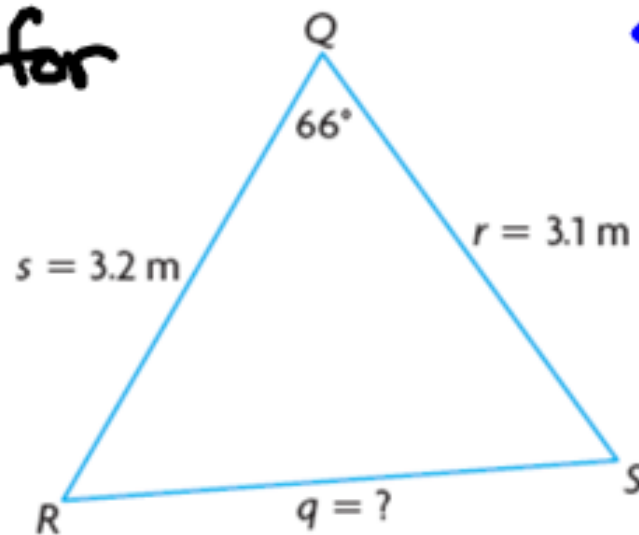


$$x^2 = y^2 + z^2 - 2yz \cos X$$

Example (p. 130)

- Can you solve for q ?

Solve for
 q .



SAS

- Use $q^2 = s^2 + r^2 - 2rs \cos 66^\circ$

$$g^2 = r^2 + s^2 - 2rs \cos \theta$$

$$g^2 = (3.1)^2 + (3.2)^2 - 2(3.1)(3.2) \cos 66^\circ$$

$$g^2 = 9.61 + 10.24 - (8.07)$$

$$g^2 = 11.78$$

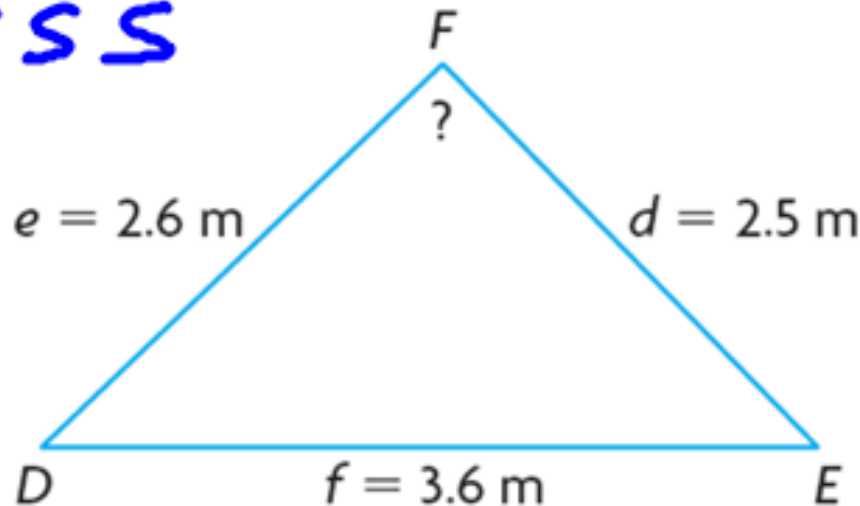
$$g = 3.43$$

Example (p. 130)

- Can you solve for $\angle F$?



SSS



- Use $f^2 = e^2 + d^2 - 2ed \cos F$
- Will need to use algebra to isolate F

$$f^2 = e^2 + d^2 - \underbrace{2ed \cos F}$$

$$\frac{\cancel{2ed} \cos F}{\cancel{2ed}} = \frac{e^2 + d^2 - f^2}{2ed}$$

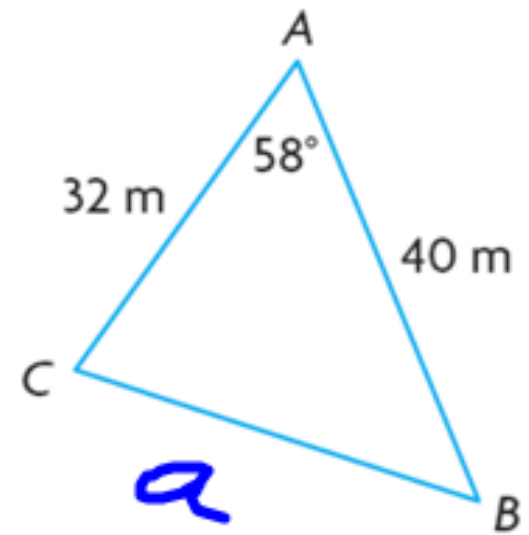
$$\cos F = \frac{(2.6)^2 + (2.5)^2 - (3.6)^2}{2(2.6)(2.5)}$$

$$\cos F = 0.0038$$

$$F = \cos^{-1}(0.0038) \approx 89.7^\circ$$

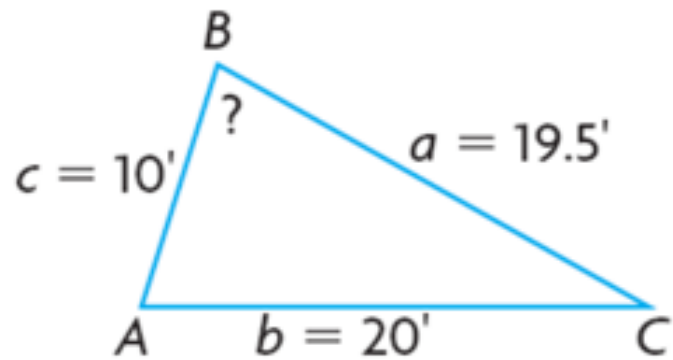
Example (p. 132)

Determine the length of CB to the nearest metre.



Example

Determine $\angle B$



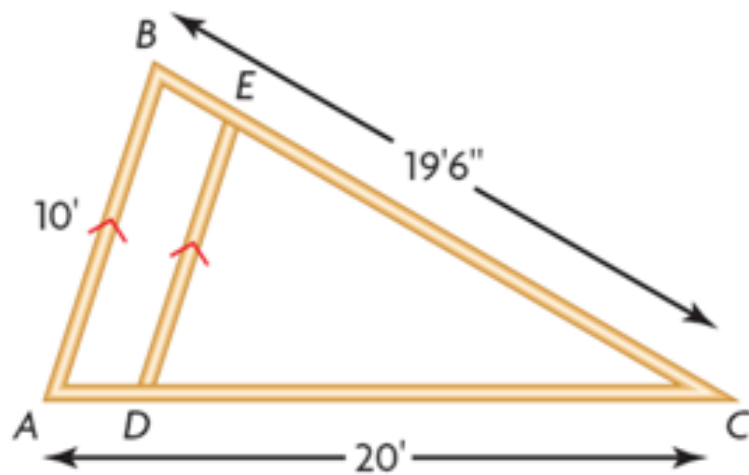
Homework

P. 136-139

1, 4, 5, 6, 7

Example (p. 133)

The diagram at the right shows the plan for a roof, with support beam DE parallel to AB . The local building code requires the angle formed at the peak of a roof to fall within a range of 70° to 80° so that snow and ice will not build up. Will this plan pass the local building code?

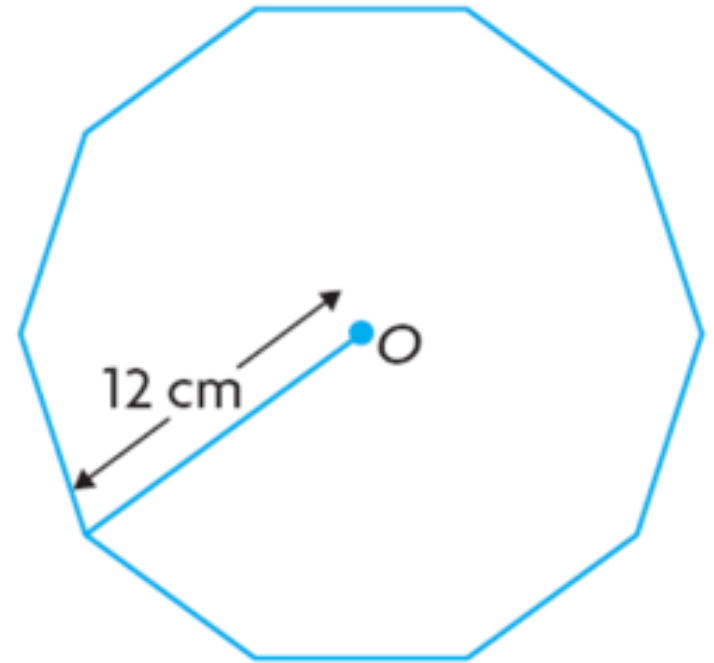


Example 11 (p. 139)

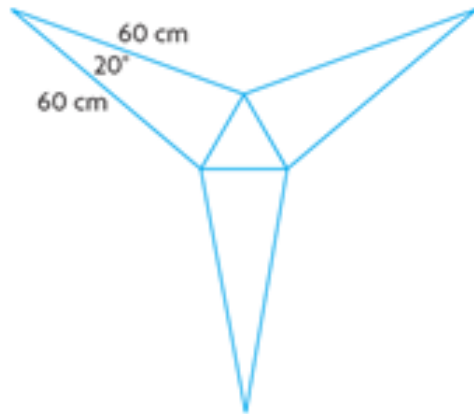
- 11. a)** A clock has a minute hand that is 20 cm long and an hour hand that is 12 cm long. Determine the distance between the tips of the hands at
- i)** 2:00. **ii)** 10:00.

Example 15 (p.139)

The distance from the centre, O , of a regular decagon to each vertex is 12 cm. Determine the area of the decagon. Round your answer to the nearest square centimetre.



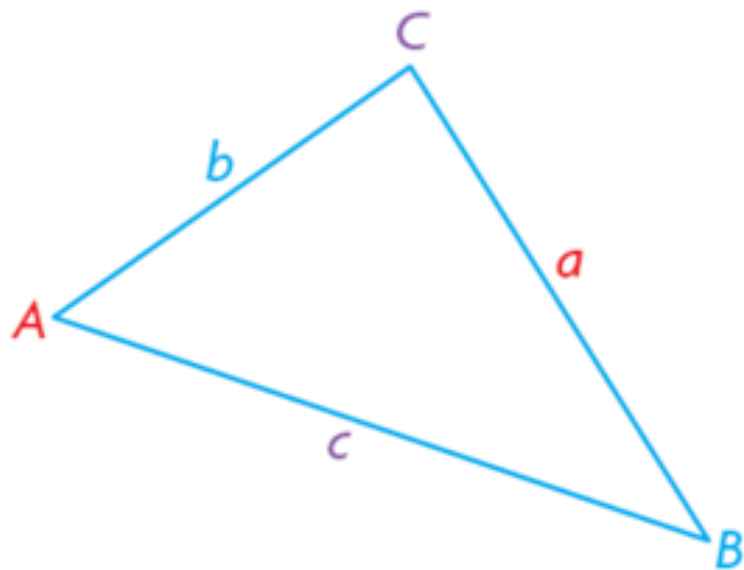
Example (p. 135)



A three-pointed star is made up of an equilateral triangle and three congruent isosceles triangles. Determine the length of each side of the equilateral triangle in this three-pointed star. Round the length to the nearest centimetre.

Key Idea

The cosine law can be used to determine an unknown side length in acute triangles



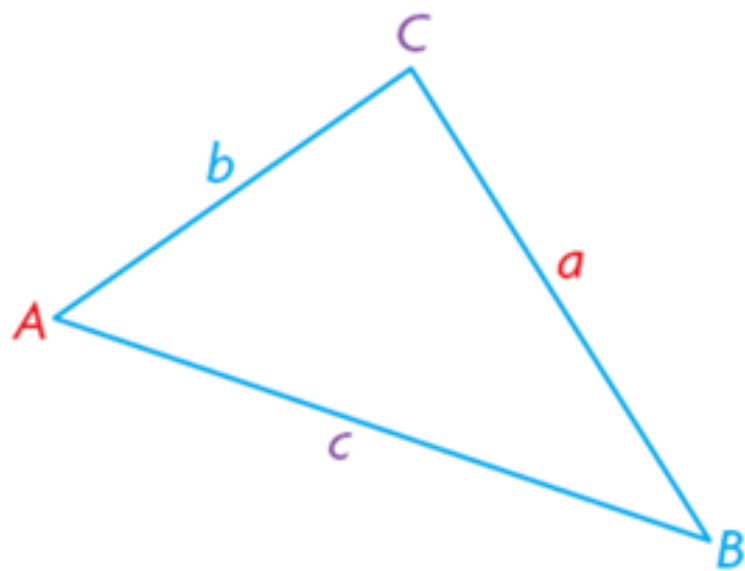
$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$b^2 = a^2 + c^2 - 2ac \cos B$$

$$c^2 = a^2 + b^2 - 2ab \cos C$$

Key Idea

The cosine law can be used to determine an unknown angles in acute triangles

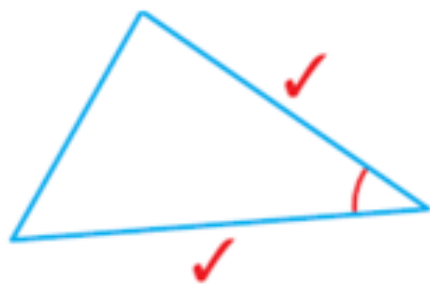


$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

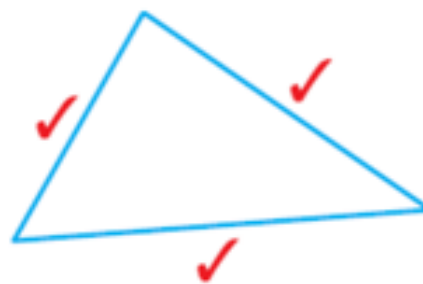
Need to Know

You can use the cosine law to solve a problem that can be modelled by an acute triangle when you know:

Two sides and
the contained
angle - SAS



All three sides -
SSS



Homework

P. 136-139

1, 4, 5, 6, 7

2, 3, 8, 9, 10, 13

Reminder: perimeter is the sum of all sides of a polygon