Mathematics 10D

8.5 – Solving Acute Triangle Problems

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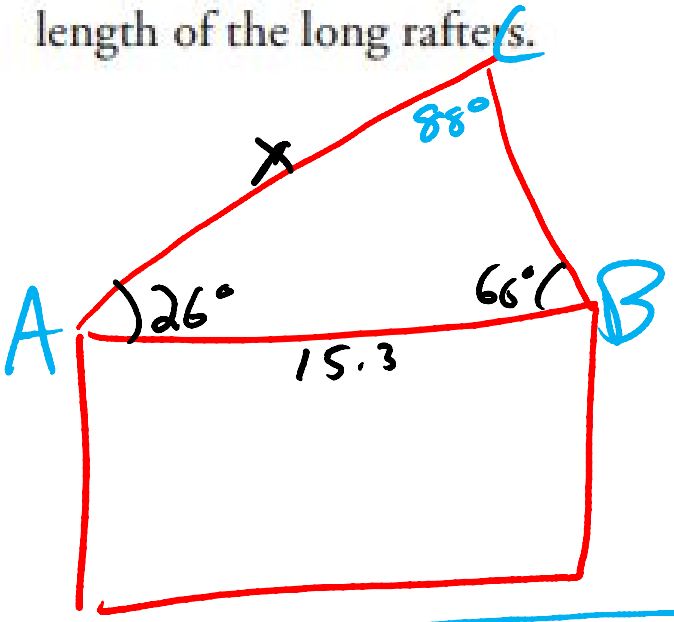
The roof of a new house must be built to exact specifications so that solar panels can be installed. The long rafters at the front of the house must be inclined at an angle of 26° to the horizontal beam. The short rafters at the back of the house must be inclined at an angle of 66°. The house is 15.3 m wide. Determine the length of the long rafters.



$\angle C = 180 - \angle B - \angle A$

$= 180 - 66 - 26$

$= 88°$

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

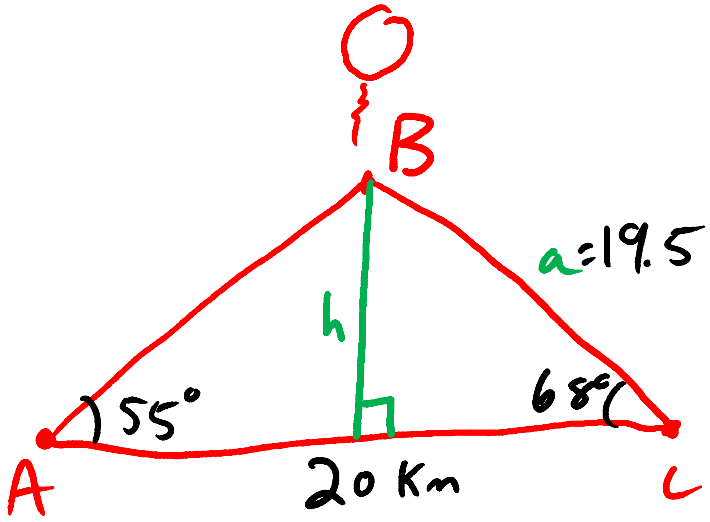
$\frac{x}{\sin 66} = \frac{15.3}{\sin 88}$

$x = \frac{15.3 \sin(66)}{\sin 88}$

$x = 14\text{ m}$

∴ the long rafter is 14 metres long.

A weather balloon is directly between two tracking stations. The angles of elevation from the two tracking stations are 55° and 68°. If the tracking stations are 20 km apart, determine the altitude of the weather balloon.



① $B = 180 - A - C$

$B = 180 - 55 - 68$

$B = 57°$

② $\frac{a}{\sin 55} = \frac{20}{\sin 57}$

$a = \frac{20 \sin 55}{\sin 57}$

$a = 19.5$

③ $\sin\theta = \frac{opp}{hyp}$

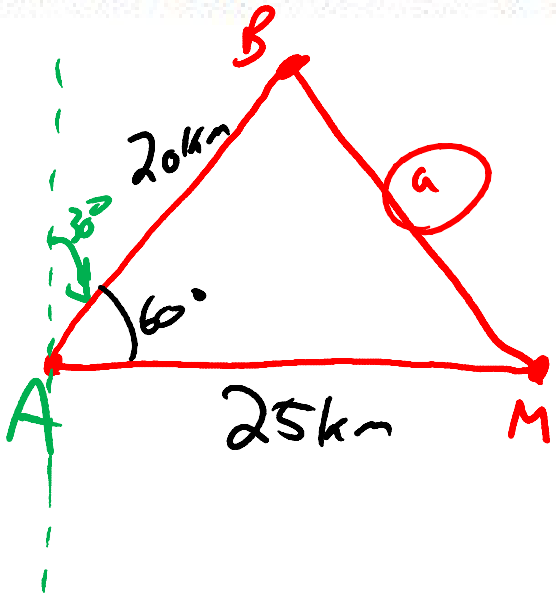
$\sin 68 = \frac{h}{19.5}$

$19.5 \sin 68 = h$

$18.1 = h$

∴ the Weather balloon is 18.1 km above the ground!

The captain of a boat leaves a marina and heads due west for 25 km. Then the captain adjusts the course of his boat and heads N30°E for 20 km. How far is the boat from the marina?



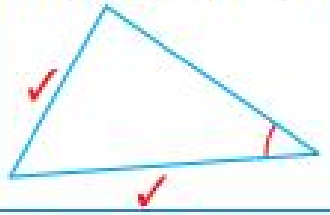
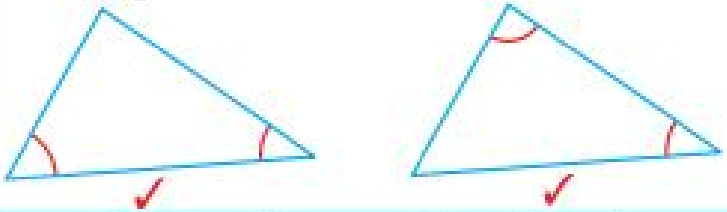
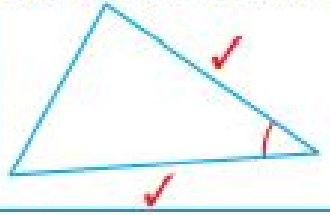
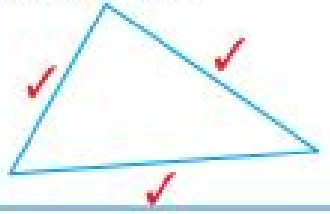
$$a^2 = b^2 + m^2 - 2bm\cos A$$

$$a^2 = 25^2 + 20^2 - 2(25)(20)\cos 60$$

$$a^2 = 525$$

$$a = 22.9$$

∴ The captain is 22.9 km from the Marina.

Information Given	Measurement To Be Determined	Use
two sides and the angle opposite one of the sides 	angle	sine law
two angles and a side 	side	sine law
two sides and the contained angle 	side	cosine law
three sides 	angle	cosine law