

 PROVING AND  APPLYING
the Law of Cosines

 **The Law of Cosines is used when we cannot use the law of sines. In other words, we use it when we do not know any pairs of sides and angles.**

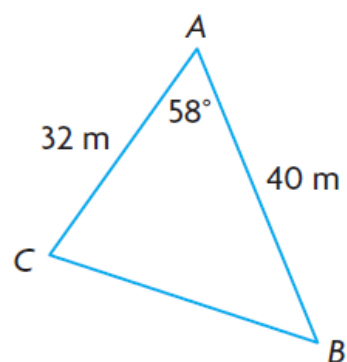
 **The Cosine Law is derived from the Pythagorean Theorem - another tool we use to solve right angle triangles.**

 **Please investigate - Sheet on Proving the Cosine Law**

Proving and Applying Cosine Law

EXAMPLE 1 | Using reasoning to determine the length of a side

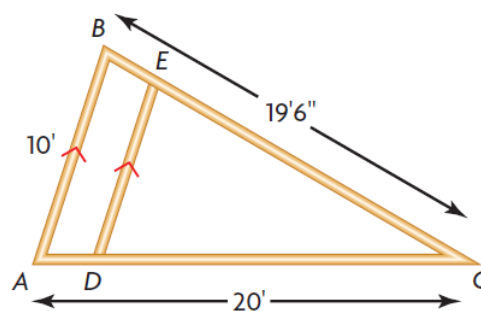
Determine the length of CB to the nearest metre.



Proving and Applying Cosine Law

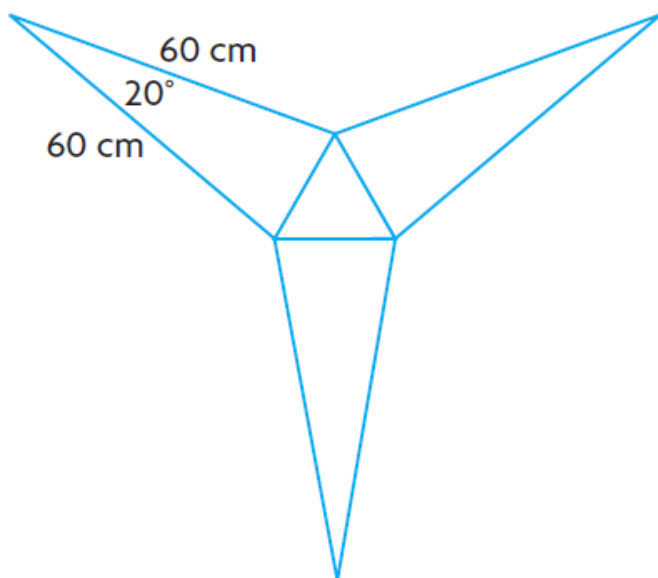
EXAMPLE 2 | Using reasoning to determine the measure of an angle

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 3 Solving a problem using the cosine law

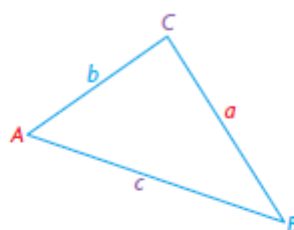
A three-pointed star is made up of an equilateral triangle and three congruent isosceles triangles. Determine the length of each side of the equilateral triangle in this three-pointed star. Round the length to the nearest centimetre.



Proving and Applying Cosine Law

Key Idea

- The cosine law can be used to determine an unknown side length or angle measure in an acute triangle.



$$\begin{aligned}a^2 &= b^2 + c^2 - 2bc \cos A \\b^2 &= a^2 + c^2 - 2ac \cos B \\c^2 &= a^2 + b^2 - 2ab \cos C\end{aligned}$$

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.
 - all three sides.



- The contained angle is the angle between two known sides.
- When using the cosine law to determine an angle, you can:
 - substitute the known values first, then solve for the unknown angle.
 - rearrange the formula to solve for the cosine of the unknown angle, then substitute and evaluate.