Problem 2

Hint

The maximum width of a triangle is its height.

A triangular plot of land has sides that measure 27 m, 21 m, and 18 m. The longest side lies against the straight edge of a river. What is the maximum width of the land?

A. Show where the 27 m, 21 m, and 18 m go on the diagram.

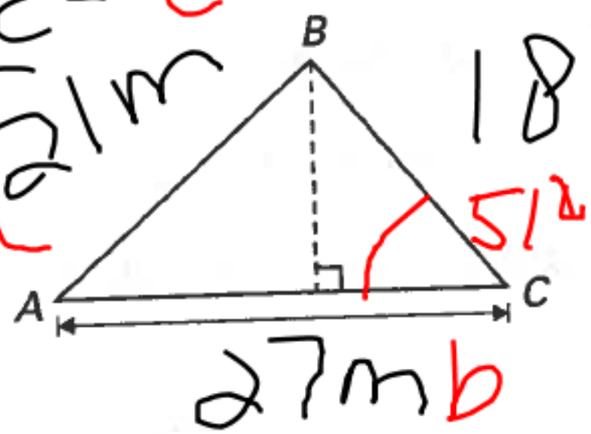
$\cos \angle C = \frac{a^2 + b^2 - c^2}{2ab}$ c

$\cos \angle C = \frac{18^2 + 27^2 - 21^2}{2(18)(27)}$

$\cos \angle C = 0.6296$

$\angle C = 50.9^\circ$

$\angle C = 51^\circ$



B. Show what you need to find on the diagram.

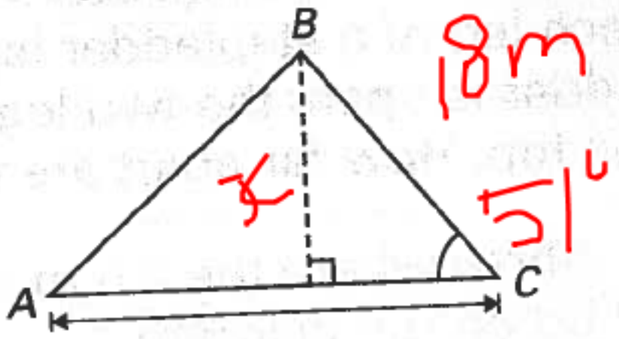
C. Before you can calculate the maximum width of the triangle, you need to determine one angle. Circle the law you can use to calculate $\angle C$.

sine law cosine law

D. Calculate $\angle C$ by completing the table below. Then fill in the blanks.

a	b	c	$a^2 + b^2 - c^2$

E. Use your answers for parts B and D to label the diagram.



F. Circle the trigonometric ratio you can use to calculate the maximum width of the triangle. Then fill in the blanks.

$\sin A = \frac{\text{opposite}}{\text{hypotenuse}}$ $\cos A = \frac{\text{adjacent}}{\text{hypotenuse}}$ $\tan A = \frac{\text{opposite}}{\text{adjacent}}$

$\sin 51^\circ = \frac{O}{H}$

$\frac{\sin 51^\circ}{1} = \frac{x}{18}$

$x = 18 \sin 51$

$x = 14$

$\_\_\_\_ 51.0° = \frac{h}{\_\_\_\_}$

$\_\_\_\_ \times \_\_\_\_ 51.0° = \_\_\_\_ \times \frac{h}{\_\_\_\_}$

$h = \_\_\_\_ \times \_\_\_\_ 51.0°$

$h \doteq \_\_\_\_$

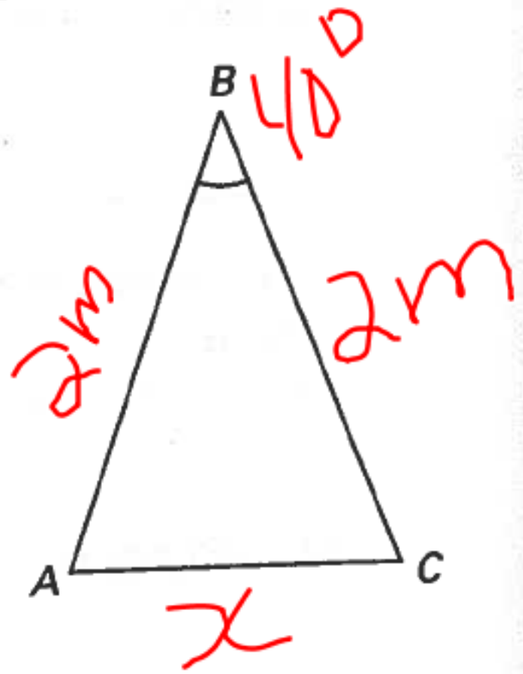
G. Write a conclusion. What is the maximum width of the plot of land?

the maximum width is 14m

PRACTISING

Text pages 309–311

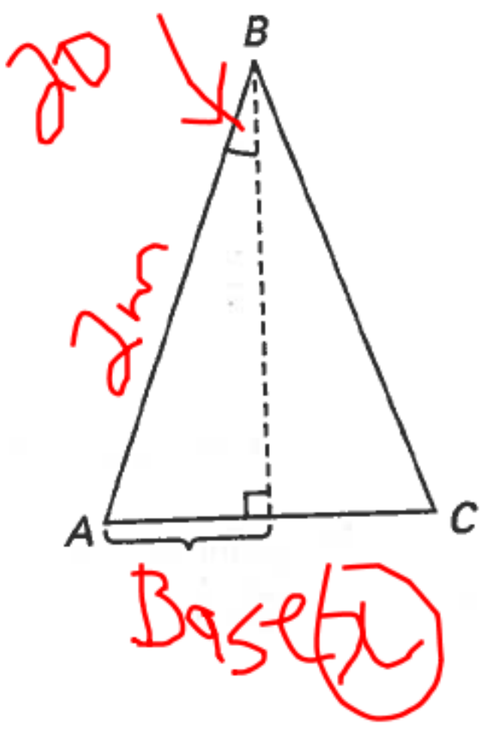
4. Each leg of a stepladder is 2.0 m long. When the ladder is open, the two legs form an angle of 40° at the top. How far apart are the legs at the bottom?



- Show where the 2.0 m and 40° go on the diagram.
- Show what you need to find on the diagram.
- Fill in the blank to complete the sentence.

Since two sides of the triangle are the same length, the triangle is ~~isosceles~~

- This type of triangle can be divided into two right triangles as shown. On one of the right triangles, label the base, the hypotenuse, and the angle shown.



- Circle the trigonometric ratio you can use to calculate the base of the right triangle. Then fill in the blanks.

opposite adjacent

the legs of the ladder are apart

(2)(0.7) = 1.4m

$\sin 20 = \frac{O}{H}$

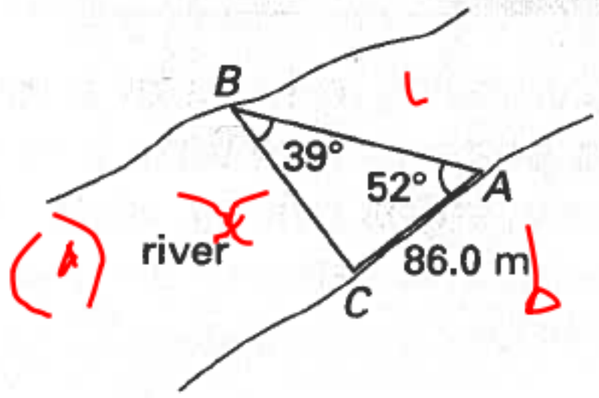
$\frac{\sin 20^\circ}{1} = \frac{x}{2}$

$2 \sin 20 = x$

$x = 0.6840$

$x = 0.7\ m$

12. A surveyor wants to calculate the distance, *BC*, across a river. He measures *AC*, and then ∠*B* and ∠*A* as shown. What is the length of *BC*?



The length of BC is 107.7 m

∠A = 52° a =
∠B = 39° b = 86m
∠C = 89° c =

- Circle the law you can use to calculate *BC*.

sine law cosine law

Calculate *BC* by filling in the blanks.

$\frac{\text{a}}{\sin 52^\circ} = \frac{\text{b}}{\sin 39^\circ}$

$\frac{a}{\sin 52^\circ} = \frac{86}{\sin 39^\circ}$

$\frac{\text{\_\_\_\_\_}}{\text{\_\_\_\_\_}} \times \text{\_\_\_\_\_} = \frac{\text{\_\_\_\_\_}}{\text{\_\_\_\_\_}} \times \text{\_\_\_\_\_}$

$a = \text{\_\_\_\_\_} \times \text{\_\_\_\_\_}$

$a \doteq \text{\_\_\_\_\_}$

$86 \sin 52^\circ = a \sin 39^\circ$

$\frac{86 \sin 52^\circ}{\sin 39^\circ} = \frac{a \sin 39^\circ}{\sin 39^\circ}$

$a = 107.685$

$a = 107.7$

Hint

Round to the nearest