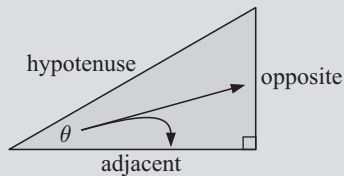


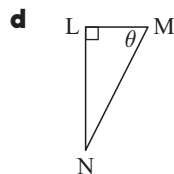
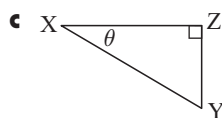
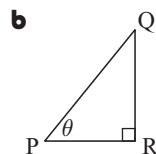
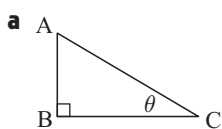
**CHAPTER 17: TRIGONOMETRY**

**17A LABELLING RIGHT ANGLED TRIANGLES**

**REMINDER**



- 1 For each diagram below, name the:
- i hypotenuse
  - ii side opposite angle  $\theta$
  - iii side adjacent to angle  $\theta$ .



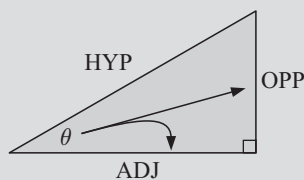
**17B THE TRIGONOMETRIC RATIOS**

**REMINDER**

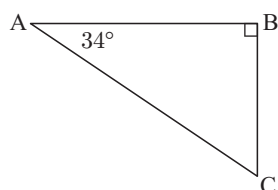
$$\sin \theta = \frac{\text{OPP}}{\text{HYP}}$$

$$\cos \theta = \frac{\text{ADJ}}{\text{HYP}}$$

$$\tan \theta = \frac{\text{OPP}}{\text{ADJ}}$$



- 1 Consider the right angled triangle ABC alongside.
- a Use a ruler to find the length of each side, to the nearest millimetre.



- b Hence estimate the value of:
- i  $\sin 34^\circ$
  - ii  $\cos 34^\circ$
  - iii  $\tan 34^\circ$

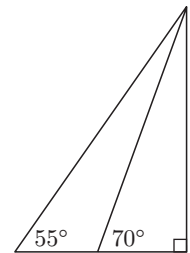
c Check your answers using a calculator.

- d Explain the difference between your results in b and c.

- 2 a Use the diagram alongside to determine which is greater:

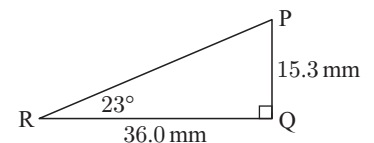
i  $\sin 55^\circ$  or  $\sin 70^\circ$

ii  $\tan 55^\circ$  or  $\tan 70^\circ$



b Check your answers using a calculator.

- 3 Consider the triangle PQR alongside.



- a Use Pythagoras' theorem to find the unknown side length.

Give your answer correct to 1 decimal place.

- b Hence, estimate the value of:
- i  $\sin 23^\circ$
  - ii  $\cos 23^\circ$
  - iii  $\tan 23^\circ$

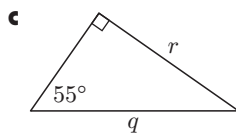
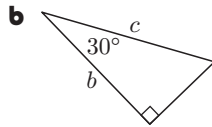
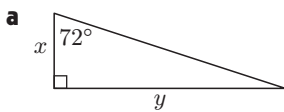
17C

FINDING SIDE LENGTHS

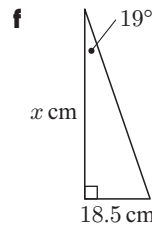
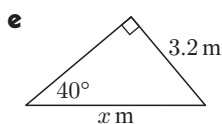
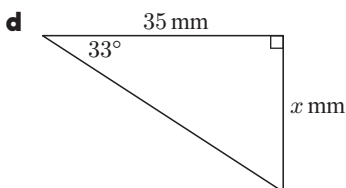
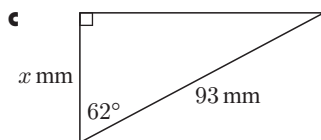
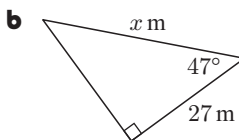
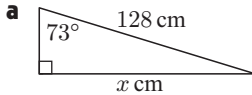
REMINDER

- Step 1: On the figure mark HYP, OPP, and ADJ relative to a given angle.
- Step 2: Choose an appropriate trigonometric ratio, and construct an equation.
- Step 3: Solve the equation to find the unknown side length.

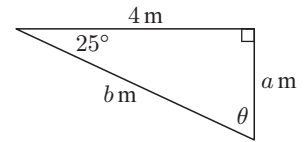
1 Write down a trigonometric equation connecting the angle and the sides given:



2 Find  $x$ , giving your answer rounded to 2 decimal places:



3 Find, rounded to one decimal place, all unknown sides and angles:



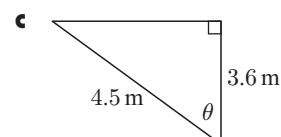
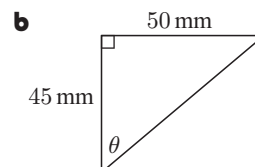
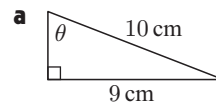
17D

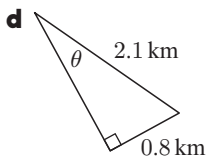
FINDING ANGLES

REMINDER

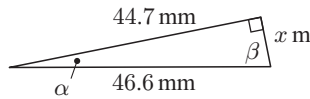
- Step 1: On the figure mark HYP, OPP, and ADJ relative to the angle you are trying to find.
- Step 2: Choose an appropriate trigonometric ratio, and construct an equation. (The LHS will be  $\sin \theta$ ,  $\cos \theta$ , or  $\tan \theta$ .)
- Step 3: Use **inverse sine**, **inverse cosine** or **inverse tangent** on your calculator to find the value of  $\theta$ .

1 Find, to one decimal place, the measure of the angle marked  $\theta$  in:



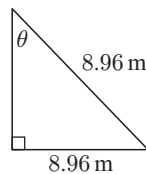


- 2 a** Find, rounded to one decimal place, all unknown sides and angles in the following:



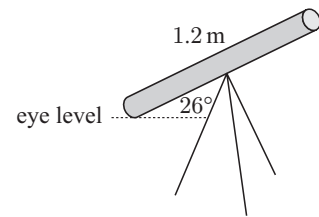
- b** Check your answer for  $x$  using Pythagoras' theorem.

- 3** Try to find  $\theta$  in the following using trigonometry. What conclusions can you draw?



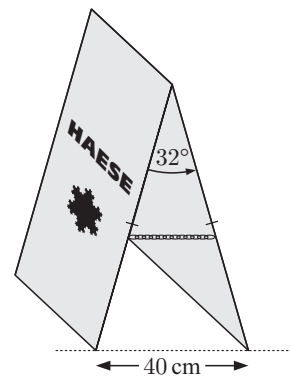
In this section, round your answers to 3 significant figures.

- 1** A telescope is set up to monitor the movement of Venus across the night sky. The telescope is at an angle of  $26^\circ$  to the horizontal, and the telescope is 1.2 m long.

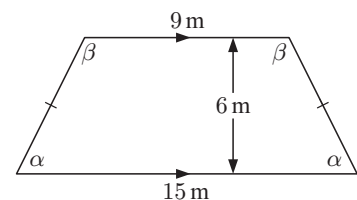


How many centimetres above eye level is the other end of the telescope?

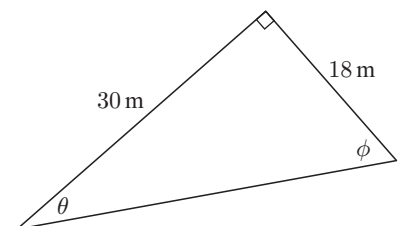
- 2** A sandwich board is set up on the footpath. The angle at the apex is  $32^\circ$ , and the feet are set 40 cm apart. How long are the boards that make up the sign?



- 3** Find the unknown angles in this trapezium.



- 4** A triangular block of land is being measured by a surveyor. What are the values of the unknown angles?



**17E**

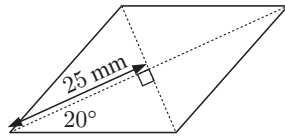
**PROBLEM SOLVING WITH TRIGONOMETRY**

**REMINDER**

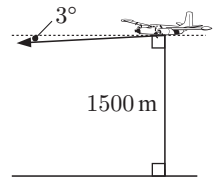
Use these steps to solve problems involving right angled triangles:

- Step 1:* Draw a **diagram** to illustrate the situation.
- Step 2:* Mark on the diagram the **unknown** angle or side that needs to be calculated. We often use  $x$  for a length and  $\theta$  for an angle.
- Step 3:* Locate a **right angled triangle** in your diagram.
- Step 4:* Write an **equation** connecting an angle and two sides of the triangle using an appropriate trigonometric ratio.
- Step 5:* **Solve** the equation to find the unknown.
- Step 6:* Write your answer in sentence form.

- 5 Find the perimeter of the rhombus shown alongside.



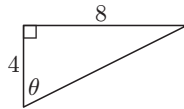
- 6 An aeroplane, currently at altitude 1500 m, starts its final descent into the airport. Its angle of descent is  $3^\circ$ . In kilometres, how far away from the airport runway is the plane when it begins its descent?



**REVIEW OF CHAPTER 17**

- 1 Find the exact value of:

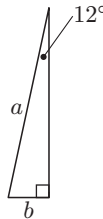
a  $\sin \theta$



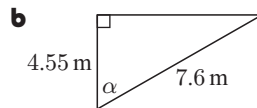
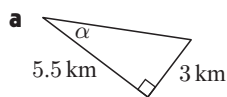
b  $\cos \theta$

c  $\tan \theta$

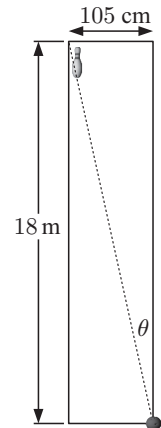
- 2 Write a trigonometric equation connecting the angle and the sides given:



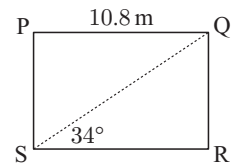
- 3 Find the value of  $\alpha$ :



- 7 A ten pin bowler releases the ball from the right of his lane. It travels in a straight line to hit the 7-pin as shown. What is the angle  $\theta$  between the path of the ball and the side of the lane?

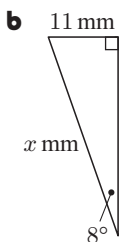
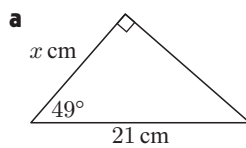


- 8 Find the lengths of the diagonals of this rectangle.

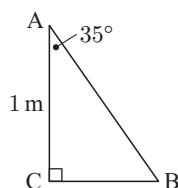


- 9 Determine the height of a boy who casts a 3 metre shadow when the sun is  $20^\circ$  above the horizon.

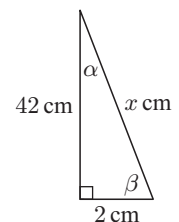
- 4 Find the value of  $x$ :



- 5 Find the remaining side lengths in the given triangle, giving your answer correct to the nearest millimetre:



- 10 a Find the exact value of  $x$  in the triangle given.



- b Hence, or otherwise, find the unknown angles of the triangle.