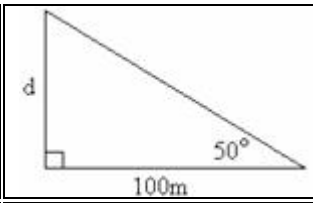
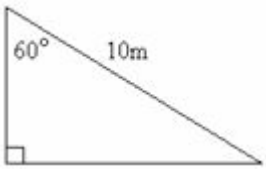
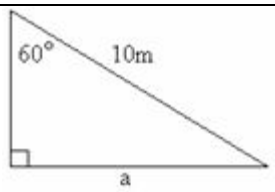
Using Trigonometry Copymaster 3

Matching activity 1

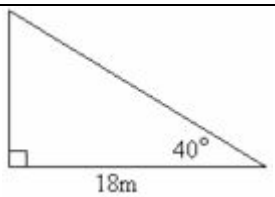
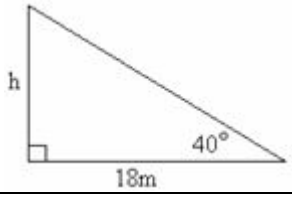
Sue is a surveyor, helping in the construction of a new bypass. This diagram shows a rough sketch from her notebook. Sue needs to find the length of the bypass d in metres.	
From the sketch Sue knows that the side adjacent to the 500 angle is 100m long. The opposite side (d) is the length she wants to find out.	Adjacent side = 100m Opposite side = d Angle = 500
From the information she has, Sue knows to use the trig ratio called 'tan'.	$\tan 500 = \frac{d}{100}$
Sue needs to rearrange this equation to find the length of d, so she multiplies both sides by 100.	$100 \times \tan 500 = 100 \times \frac{d}{100}$
Therefore the length of d equals 100m times the tan of 500.	$\therefore d = 100 \times \tan 500$
On her calculator Sue finds the value of tan 500, then multiplies this answer by 100m. This gives the answer d = 119.175.	$\therefore d = 119.175$
Therefore Sue knows that the length of the bypass is roughly 119 metres.	$\therefore d = 119$ (0dp)

Matching activity 2

This triangle has a right angle, and also an angle of sixty degrees. Its hypotenuse is ten metres long.	

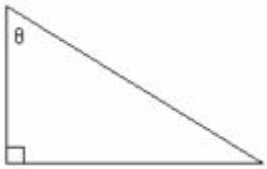
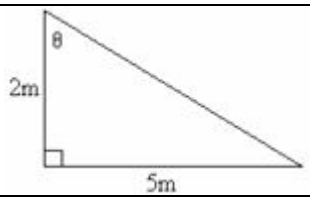
The side opposite the angle of sixty degrees is labelled a.	
Solve the equation: sine of sixty degrees equals a divided by ten.	sin 600 = $\frac{a}{10}$
Multiply both sides by ten.	10 x sin 600 = 10 x $\frac{a}{10}$
a equals ten times the sine of sixty degrees.	a = 10 x sin 600
a equals ten times 0.866.	a = 10 x 0.866
Therefore the length of the side opposite the sixty degree angle is 8.66 metres.	∴a = 8.66

Matching activity 3

In this right-angled triangle, the base is 18m long and the angle of elevation is 400.	
To find the height, we label the side opposite 400 as h.	
Solve the equation: The tan of forty degrees equals h divided by 18.	tan 400 = $\frac{h}{18}$

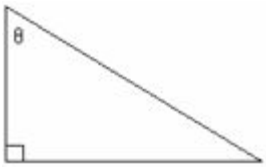
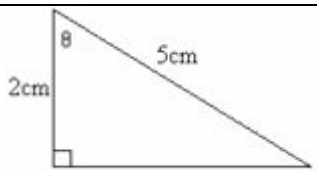
Multiply both sides by 18.	$18 \times \tan 400 = 18 \times \frac{h}{18}$
h equals 18 times the tan of 400.	$h = 18 \times \tan 400$
h equals 18 times 0.8391.	$h = 18 \times 0.8391$
Therefore the height of the triangle is 15.1 metres (to one decimal place).	$\therefore h = 15.1$ (1dp)

Matching activity 4

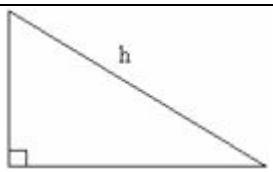
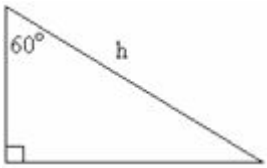
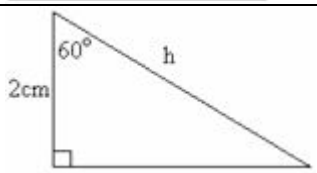
This right-angled triangle has an unknown angle labelled theta.	
The side adjacent to the angle theta measures two metres.	
The opposite side has a length of five metres.	
tan theta equals five divided by two.	$\tan \theta = \frac{5}{2}$
tan theta equals two point five.	$\tan \theta = 2.5$

Theta equals the angle whose tangent is two point five.	$\theta = \tan^{-1} 2.5$
Therefore theta is sixty-eight point two degrees (to one decimal place).	$\therefore \theta = 68.20$ (1dp)

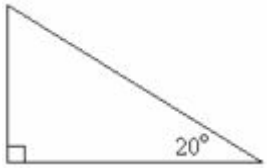
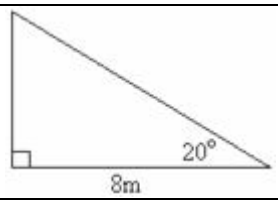
Matching activity 5

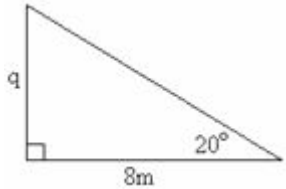
This right-angled triangle has an unknown angle labelled theta.	
The side adjacent to theta is two centimetres long.	
The hypotenuse has a length of five centimetres.	
The cosine of theta equals two divided by five.	$\cos \theta = \frac{2}{5}$
The cosine of theta equals zero point four.	$\cos \theta = 0.4$
Theta equals the angle whose cosine is zero point four.	$\theta = \cos^{-1} 0.4$
Therefore theta is sixty-six point four degrees (to one decimal place).	$\therefore \theta = 66.40$ (1dp)

Matching activity 6

This right-angled triangle has an unknown hypotenuse labelled h.	
One angle equals sixty degrees.	
The side adjacent to this angle measures two centimetres.	
The cosine of the angle equals two divided by h.	$\cos 600 = \frac{2}{h}$
h equals two divided by the cosine of sixty degrees.	$h = \frac{2}{\cos 60}$
h equals two divided by zero point five.	$h = \frac{2}{0.5}$
h equals 4, so the length of the hypotenuse is 4 centimetres.	$h = 4$

Matching activity 7

This right-angled triangle has another angle of twenty degrees.	
The side adjacent to the angle of twenty degrees has a length of eight metres.	

The side opposite to the angle of twenty degrees is labelled q.	
To find the length of q solve the equation: The tan of twenty degrees equals q divided by 8.	tan 200 = $\frac{q}{8}$
Multiply both sides by eight.	8 x tan 200 = 8 x $\frac{q}{8}$
q equals eight times the tan of twenty degrees.	8 x tan 200 = q
q equals eight times 0.36397 which equals 2.91176.	q = 8 x 0.36397 = 2.91176
Therefore the side opposite the twenty degree angle is 2.9 metres long (to one decimal place).	∴ q = 2.9 (1dp)