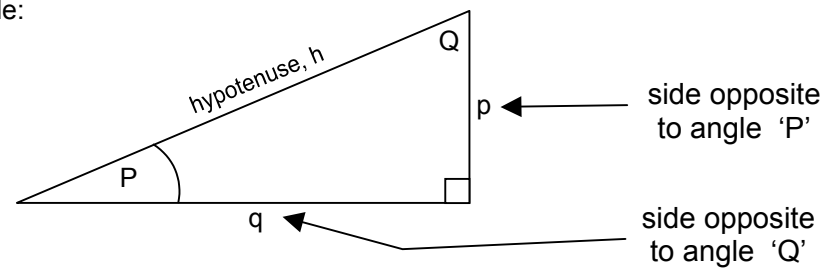
Trigonometry - Activity 13

Sine ratio: Introduction.

Consider this right angled triangle:



Side 'p' is opposite to angle 'P', and side 'q' is opposite to angle 'Q'.

For an angle less than 90º in a right angled triangle, the following ratio: $\frac{\text{opposite}}{\text{hypotenuse}}$ is called the 'sine ratio' of the angle.

For example, the sine ratio of angle 'P' above can be found as follows:

'sine ratio of P' is written as: 'sin P'

$$\sin P = \frac{\text{opposite}}{\text{hypotenuse}} = \frac{p}{h}$$

1) Complete the following:

$$\textbf{sin}\ Q =$$

2) Start Maths Helper Plus and load the 'R2 - Sine ratio 1.mhp' document.
This document calculates sine ratios for right triangles.

3) Press the F5 key to **display the parameters box**:
These edit boxes: 'A', 'B', 'C' and 'X' are used to set up the right triangle as follows:

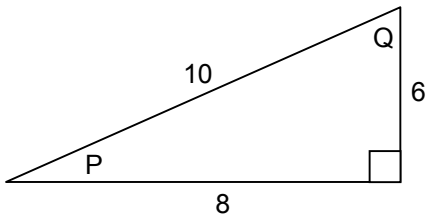
If 'C' = 1, then the vertical leg will be 'A' units long, and the hypotenuse will be 'B' units long.

If 'X' = 1, then the sine ratio is calculated for angle 'P', and the opposite side A×C is vertical.

If 'X' = 2, then the sine ratio is calculated for angle 'Q', and the opposite side A×C is horizontal.

To change a value on the parameters box: (1) **click** in the centre of an edit box, (2) **press** the backspace key to delete the old value, (3) **type** the new value and then (4) **click** the 'Update' button.

4) Complete the sine ratio calculations for the two marked angles in the right angled triangle below:



(a) $\sin P = \dfrac{\text{opposite}}{\text{hypotenuse}}$

$= \dfrac{6}{10}$

$=$ _____

(b) $\sin Q = \dfrac{\text{opposite}}{\text{hypotenuse}}$

$=$ _____

$=$ _____

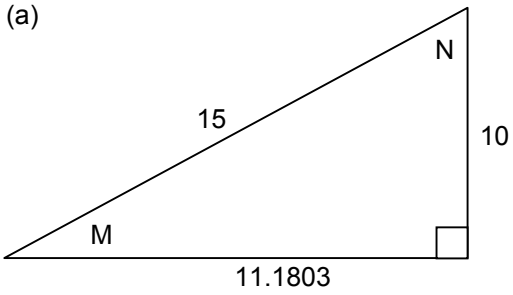
5) Use Maths Helper Plus to **check and correct your work**.

- Enter the parameters box values to create the triangles in question 4:
  Part (a): A = 6, B = 10, C = 1, X = 1 Part (b): A = 8, B = 10, C = 1, X = 2
- Compare the calculations displayed by the computer with yours and correct any mistakes.

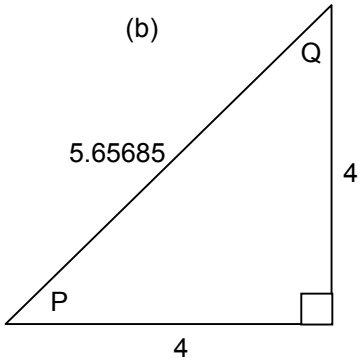
6) Calculate the sine ratios for the two marked angles in these triangles.
Show all working, and use Maths Helper Plus to help you check and correct your work.

Hint: When correcting your work, if the diagram is too big in Maths Helper Plus, then press the F10 key to make it smaller. If it is too small, then hold down a Shift key and press F10 to make it bigger.

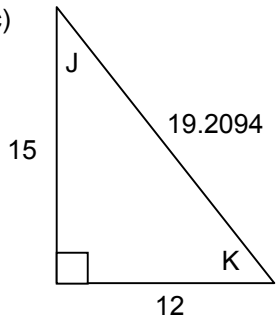
(a)



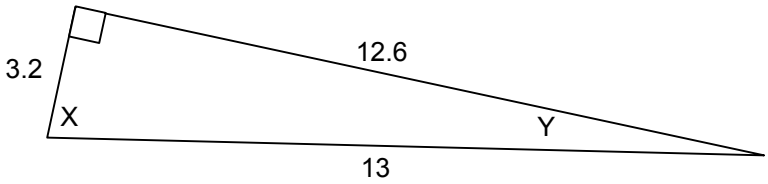
(b)



(c)



(d)



Investigation: If the size of a triangle is changed, what effect will this have on the sine ratios ?

Set the parameters box values to: A = 3, B = 4, C = 1, X = 1
The triangle displayed in Maths Helper Plus now has angle 'P' = 48.5904º, opposite side 3, hypotenuse 5, and calculated value of sin 48.5904º = 0.75.

Gradually change the scale of the triangle measurements, as follows:

(a) Click on the 'C' edit box on the parameters box.
(b) Click on the 'slider' button.
(c) Repeatedly press the keyboard up arrow key to increase the triangle size.
(d) Repeatedly press the keyboard down arrow key to decrease the triangle size.

→ As the triangle changes size, watch the values of angle 'P' and the sine ratio on the computer screen.

7) Does the size of a triangle have any effect on the sine ratio of its angles ? _____ Explain.

Trigonometry - Activity 14

Sine ratio: Finding unknown angles in right triangles.

The sine ratio of an angle θ in a right angled triangle is defined as: $\sin\theta = \frac{\text{opposite}}{\text{hyotenuse}}$

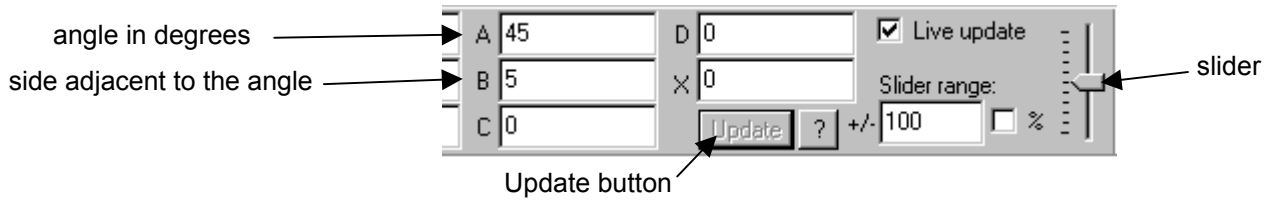
The value of 'sin θ' is found to depend only on the size of the angle, 'θ', so that 'sin 30º' will be the same for all right angled triangles having a 30º angle.

You will now create a table of sine ratios that can be used to find unknown sides and angles in many different triangles.

1) Start Maths Helper Plus and load the 'Trig1 - Sine ratio 2.mhp' document.
This document calculates sine ratios for angles in right angled triangles.

2) Press the F5 key to **display the parameters box**:

Edit boxes: 'A' and 'B' are used as follows:



3) To **calculate the sine ratio for any angle**,

- click on the centre of the edit box for 'A' on the parameters box.
- press backspace to delete the existing angle.
- type the new angle.
- click the 'Update' button.

Use Maths Helper Plus to calculate these sine ratios:

(a) sin 15º = _____ (b) sin 30º = _____ (c) sin 45º = _____ (d) sin 60º = _____

4) Creating a **table of sine ratios**

A table of sine ratios can be used to find unknown angles and sides in right angled triangles.
Use Maths Helper Plus to calculate the sine ratio for the angles in the table below. Write the values in the table.
(In the table, the angle is called 'A'.)

Hint: To quickly change the angle on the parameters box, first click on the 'A' edit box, backspace and change the number to '5', then click on the slider. Now use the up and down keyboard arrows to change the angle.

Aº	sin Aº	Aº	sin Aº	Aº	sin Aº
5		35		65	
10		40		70	
15		45		75	
20		50		80	
25		55		85	
30		60		90	

5) The sine ratio can never be greater than 1. Why is this ?

6) Use the table from question 4 to **find the unknown angles** below:

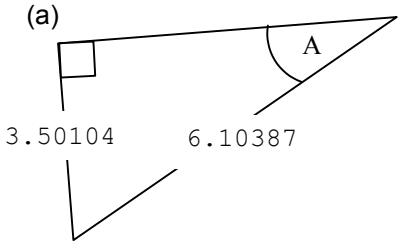
(a) sin A = 0.3746 (b) sin B = 0.8192 (c) sin C = 1 (d) sin D = $\frac{\sqrt{3}}{2}$ (e) sin E = $\frac{1}{2}$

A = _____ B = _____ C = _____ D = _____ E = _____

7) Find the unknown angles in the right angled triangles below.

Use the two sides given to calculate the sine ratio for the unknown angle, then use the table of sine ratios that you created in question 4 to find the angle.

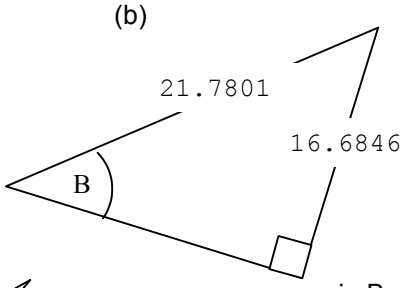
(a)



sin A = _____

so A = _____

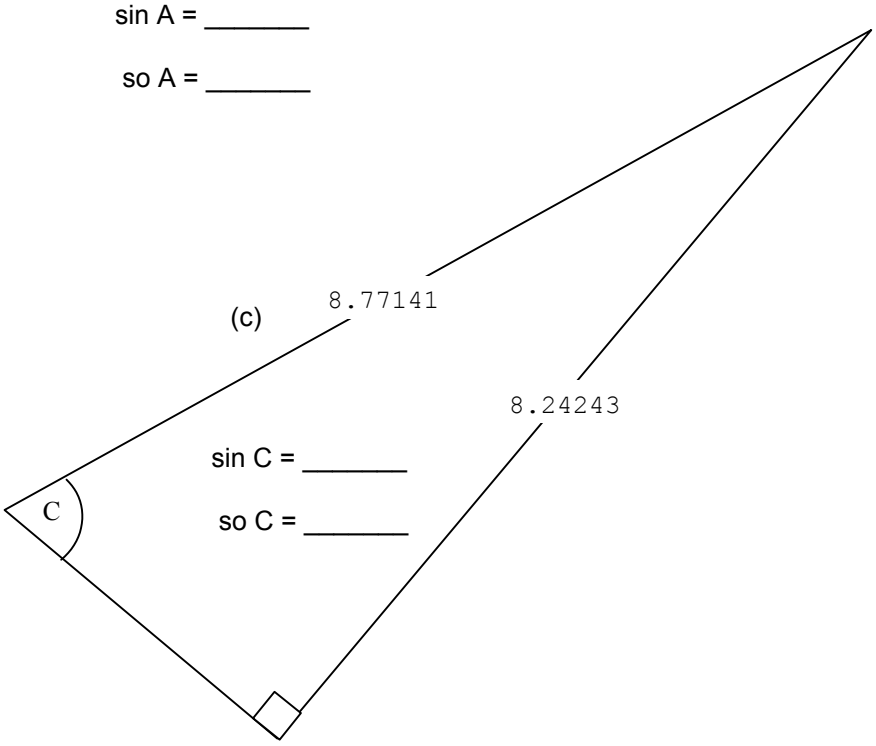
(b)



sin B = _____

so B = _____

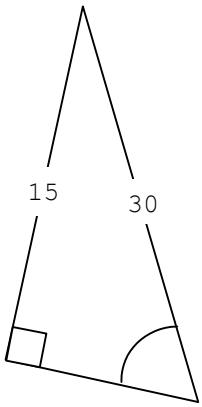
(c)



sin C = _____

so C = _____

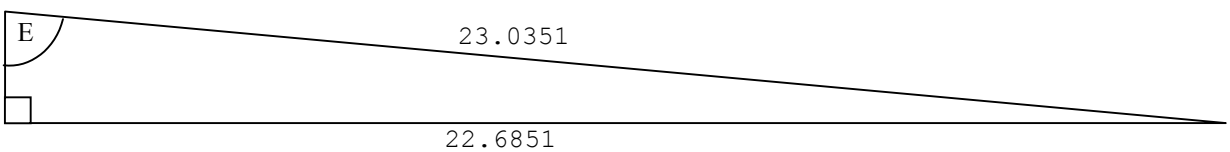
(d)



sin D = _____

so D = _____

(e)



sin E = _____

so E = _____

Trigonometry - Activity 15

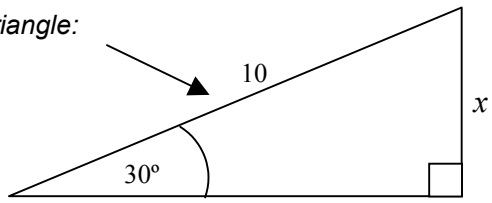
Sine ratio: Finding the unknown opposite side or hypotenuse in right triangles.

In this activity you will practice finding an unknown opposite side or hypotenuse of right triangles using the sine ratio, then you will use Maths Helper Plus to correct your working and answers.

The sine ratio can be used to calculate the length of one of the shorter sides (legs) of a right triangle, or to find the length of the hypotenuse. In both cases you need to know the sine ratio for one of the smaller angles. If you are finding an unknown leg length, then the hypotenuse must be known. If you are finding the hypotenuse, then one leg of the triangle must be known. The steps for both problem types are shown below:

Problem type 1: Finding the opposite side.

Example 1: Use the sine ratio to find the unknown opposite side 'x' in this triangle:



Solution:

$$\sin 30° = \frac{opposite}{hypotenuse} = \frac{x}{10}$$

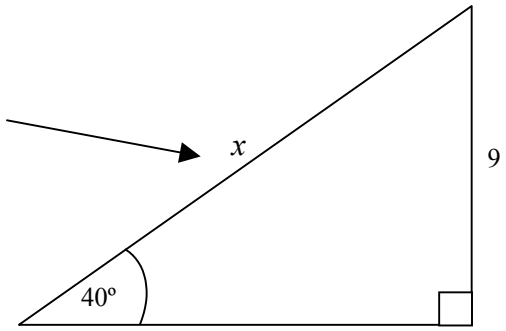
$$so \quad x = 10 \times \sin 30°$$

But $\sin 30º = 0.5$ (From a table of sine ratios, or scientific calculator with a 'sin' button.)

$$\text{so } x = 10 \times 0.5$$
$$= 5$$

Problem type 2: Finding the hypotenuse.

Example 2: Use the sine ratio to find the hypotenuse in this triangle:



Solution:

$$\sin 40° = \frac{opposite}{hypotenuse} = \frac{9}{x}$$

$$so \quad \sin 40° \times x = 9$$

$$and \qquad x = \frac{9}{\sin 40°}$$

But $\sin 40º = 0.642788$ (From a table of sine ratios, or scientific calculator with a 'sin' button.)

$$so \quad x = \frac{9}{0.642788}$$
$$= 14.0015$$

1) Start Maths Helper Plus and load the 'Trig1 - Sine ratio 3.mhp' document.
This document solves for unknown sides in right triangles using the 'sine' ratio.

2) Press the F5 key to **display the parameters box**. (See below.) 'A', 'B' and 'C' have meanings as shown below:

'A', one of the two smaller angles of the triangle:

The **opposite** side to angle 'A':

The **hypotenuse**:

Only one side length can be entered at a time. Set the unknown side length to zero.
To enter a value, click on an edit box, backspace to clear the old value, type the new value then click 'Update'.

NOTE: **If the diagram becomes too big** for your computer screen, press the 'F10' key to make it smaller.
To make the diagram bigger, hold down 'Shift' while you press 'F10'.

3) Use the sine ratio to **find the unknown side 'x'** in each of the triangles below. For each triangle:

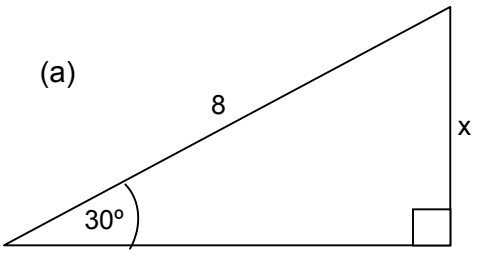
Calculate → Check → Correct

1. Identify the opposite side for the angle given, and the hypotenuse.
2. Obtain the sine ratio of the angle from a calculator or printed table.
3. Write the sine ratio rule and substitute the known values.
4. Calculate the answer, showing all working steps.

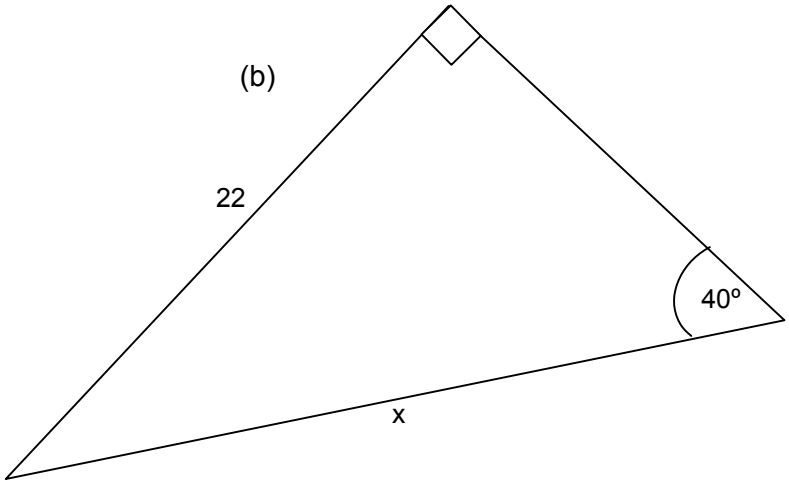
1. Enter the angle and given side into the Maths Helper Plus edit boxes.
2. Set the unknown side to zero.

1. Compare your working steps and answers with Maths Helper Plus.
2. Fix your mistakes.

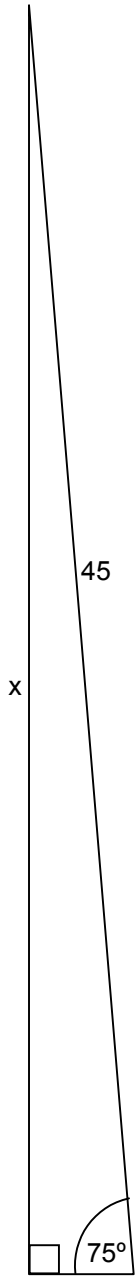
(a)



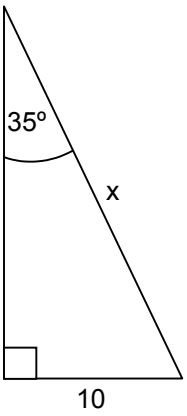
(b)



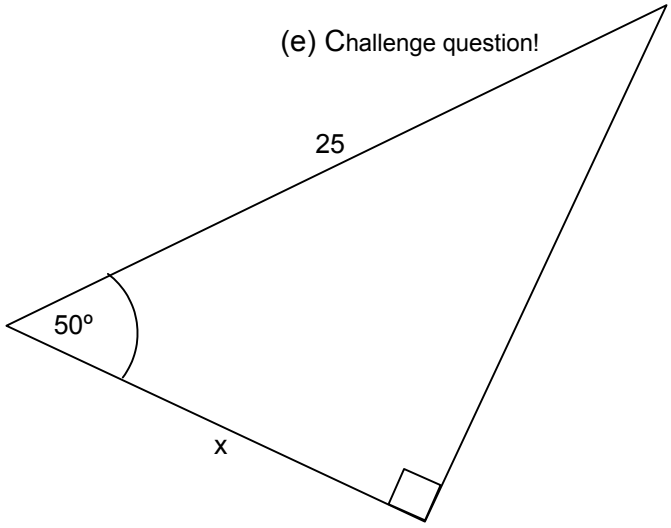
(c)



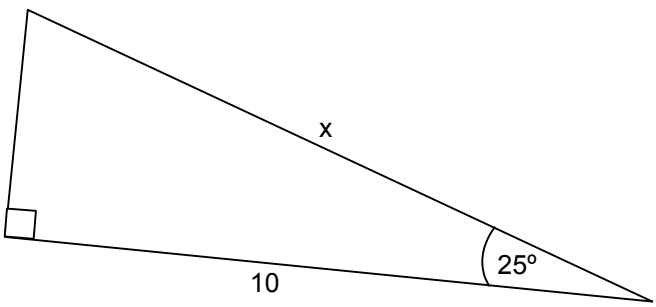
(d)



(e) Challenge question!



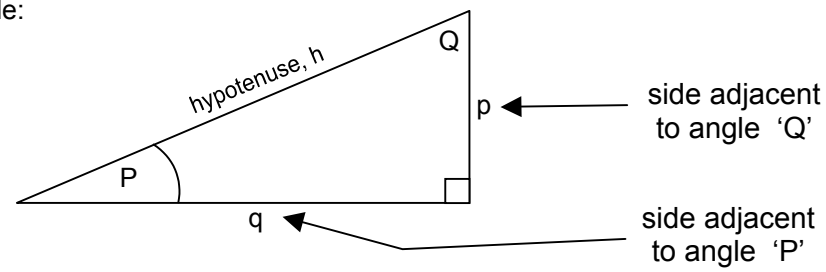
(f) Challenge question!



Trigonometry - Activity 16

Cosine ratio: Introduction.

Consider this right angled triangle:



Side 'p' is adjacent to angle 'Q', and side 'q' is adjacent to angle 'P'. ('Adjacent' means 'beside')

For an angle less than 90º in a right angled triangle, the following ratio: $\frac{\text{adjacent}}{\text{hypotenuse}}$ is called the 'cosine ratio' of the angle.

For example, the cosine ratio of angle 'P' above can be found as follows:

'cosine ratio of P' is written as: 'cos P'

$$\cos P = \frac{\text{adjacent}}{\text{hypotenuse}} = \frac{q}{h}$$

1) Complete the following:

$$\textbf{cos}\ Q =$$

2) Start Maths Helper Plus and load the 'R2 - Cosine ratio 1.mhp' document.
This document calculates cosine ratios for right triangles.

3) Press the F5 key to **display the parameters box**:
These edit boxes: 'A', 'B', 'C' and 'X' are used to set up the right triangle as follows:

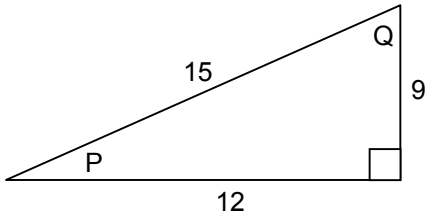
If 'C' = 1, then the vertical leg will be 'A' units long, and the hypotenuse will be 'B' units long.

If 'X' = 1, then the cosine ratio is calculated for angle 'P', and the adjacent side A×C is horizontal.

If 'X' = 2, then the cosine ratio is calculated for angle 'Q', and the adjacent side A×C is vertical.

To change a value on the parameters box: (1) **click** in the centre of an edit box, (2) **press** the backspace key to delete the old value, (3) **type** the new value and then (4) **click** the 'Update' button.

4) Complete the cosine ratio calculations for the two marked angles in the right angled triangle below:



(a) $\cos P = \dfrac{\text{adjacent}}{\text{hypotenuse}}$

$= \dfrac{12}{15}$

$=$ _____

(b) $\cos Q = \dfrac{\text{adjacent}}{\text{hypotenuse}}$

$=$ _____

$=$ _____

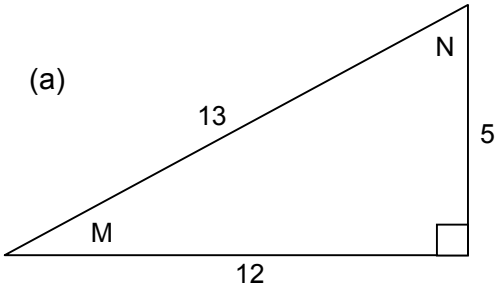
5) Use Maths Helper Plus to **check and correct your work**.

- Enter the parameters box values to create the triangles in question 4:
  Part (a): A = 12, B = 15, C = 1, X = 1 Part (b): A = 9, B = 15, C = 1, X = 2
- Compare the calculations displayed by the computer with yours and correct any mistakes.

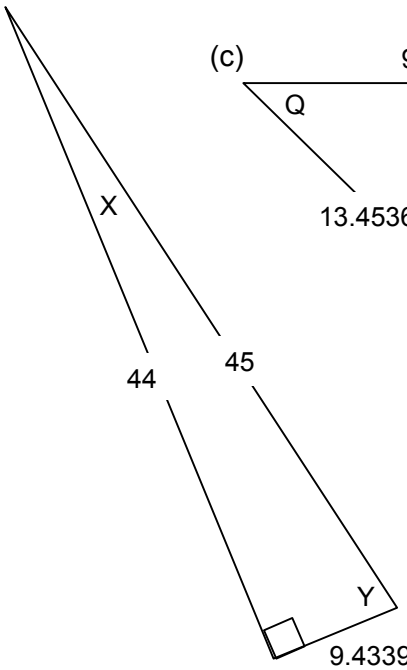
6) Calculate the cosine ratios for the two marked angles in these triangles.
Show all working, and use Maths Helper Plus to help you check and correct your work.

Hint: When correcting your work, if the diagram is too big in Maths Helper Plus, then press the F10 key to make it smaller. If it is too small, then hold down a Shift key and press F10 to make it bigger.

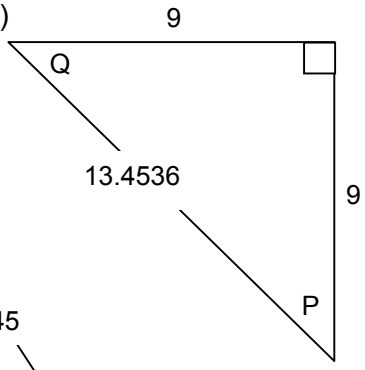
(a)



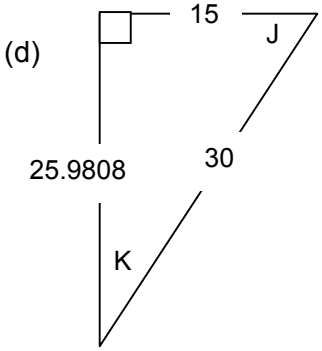
(b)



(c)



(d)



Investigation: If the size of a triangle is changed, what effect will this have on the cosine ratios ?

Set the parameters box values to: A = 3, B = 5, C = 1, X = 1
The triangle displayed in Maths Helper Plus now has angle 'P' = 53.1301º, side adjacent to angle 'P' = 3, hypotenuse = 5, and calculated value of cos 53.1301º = 0.6

Gradually change the scale of the triangle measurements, as follows:

(a) Click on the 'C' edit box on the parameters box.
(b) Click on the 'slider' button.
(c) Repeatedly press the keyboard up arrow key to increase the triangle size.
(d) Repeatedly press the keyboard down arrow key to decrease the triangle size.

→ As the triangle changes size, watch the values of angle 'P' and the cosine ratio on the computer screen.

7) Does the size of a triangle have any effect on the cosine ratio of its angles ? _____ Explain.

Trigonometry - Activity 17

Cosine ratio: Finding unknown angles in right triangles.

The cosine ratio of an angle θ in a right angled triangle is defined as: $\cos\theta = \frac{\text{adjacent}}{\text{hyotenuse}}$

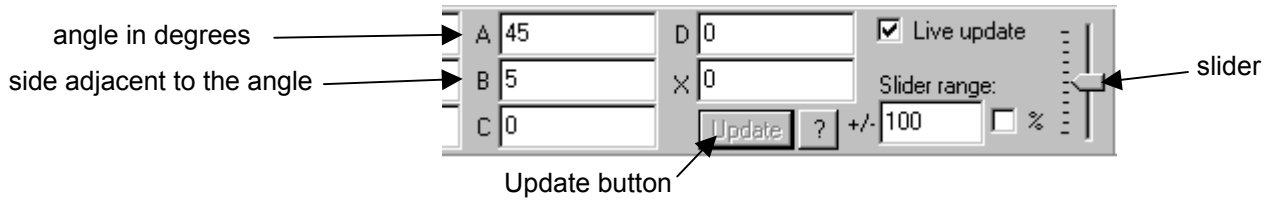
The value of 'cos θ' is found to depend only on the size of the angle, 'θ', so that 'cos 30º' will be the same for all right angled triangles having a 30º angle.

You will now create a table of cosine ratios that can be used to find unknown sides and angles in many different triangles.

1) Start Maths Helper Plus and load the 'R2 - Cosine ratio 2.mhp' document.
This document calculates cosine ratios for angles in right angled triangles.

2) Press the F5 key to **display the parameters box**:

Edit boxes: 'A' and 'B' are used as follows:



3) To **calculate the cosine ratio for any angle**,

- click on the centre of the edit box for 'A' on the parameters box.
- press backspace to delete the existing angle.
- type the new angle.
- click the 'Update' button.

Use Maths Helper Plus to calculate these cosine ratios:

(a) cos 10º = _____ (b) cos 30º = _____ (c) cos 45º = _____ (d) cos 60º = _____

4) Creating a **table of cosine ratios**

A table of cosine ratios can be used to find unknown angles and sides in right angled triangles.
Use Maths Helper Plus to calculate the cosine ratio for the angles in the table below. Write the values in the table. (In the table, the angle is called 'A'.)

Hint: To quickly change the angle on the parameters box, first click on the 'A' edit box, backspace and change the number to '5', then click on the slider. Now use the up and down keyboard arrows to change the angle.

Aº	cos Aº	Aº	cos Aº	Aº	cos Aº
5		35		65	
10		40		70	
15		45		75	
20		50		80	
25		55		85	
30		60		90	

5) The cosine ratio can never be greater than 1. Why is this ?

6) Use the table from question 4 to **find the unknown angles** below:

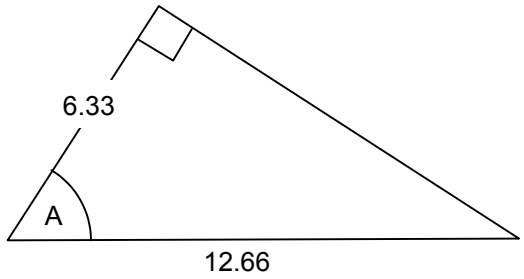
(a) cos A = 1 (b) cos B = $\frac{1}{2}$ (c) cos C = 0.5736 (d) cos D = $\frac{\sqrt{3}}{2}$ (e) cos E = 0.7071

A = _____ B = _____ C = _____ D = _____ E = _____

7) Find the unknown angles in the right angled triangles below.

Use the two sides given to calculate the cosine ratio for the unknown angle, then use the table of cosine ratios that you created in question 4 to find the angle.

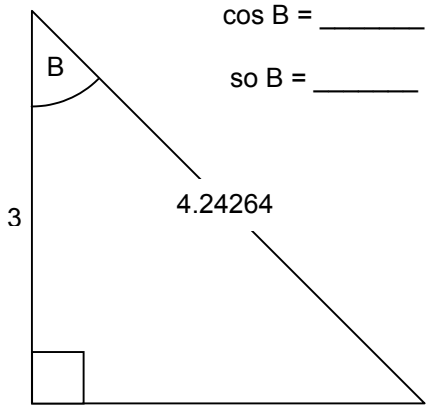
(a)



cos A = _____

so A = _____

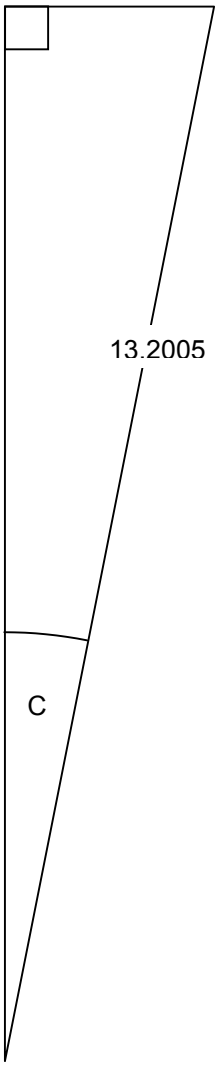
(b)



cos B = _____

so B = _____

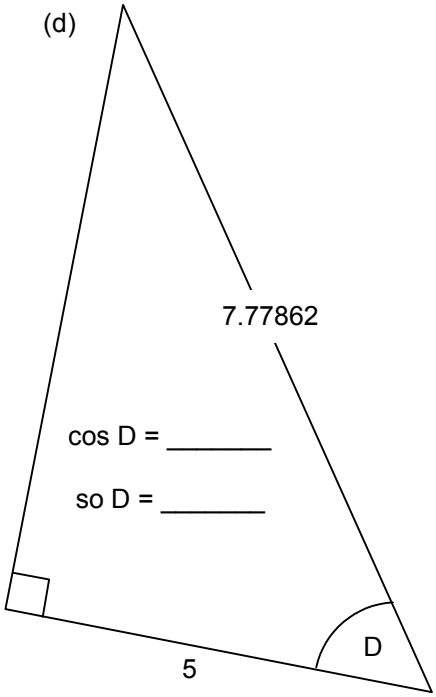
(c)



cos C = _____

so C = _____

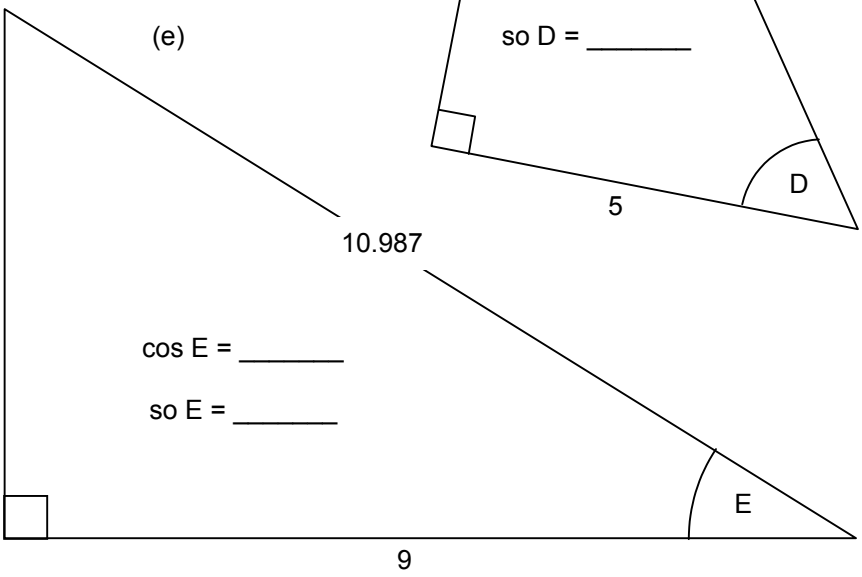
(d)



cos D = _____

so D = _____

(e)



cos E = _____

so E = _____

Trigonometry - Activity 18

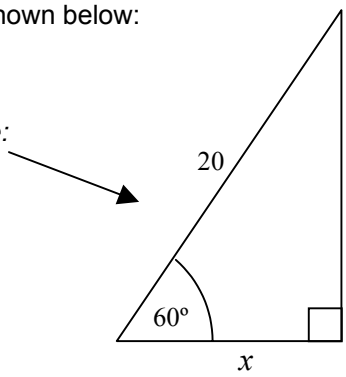
Cosine ratio: Finding the unknown adjacent side or hypotenuse in right triangles.

In this activity you will practice finding an unknown opposite side or hypotenuse of right triangles using the cosine ratio, then you will use Maths Helper Plus to correct your working and answers.

The cosine ratio can be used to calculate the length of one of the shorter sides (legs) of a right triangle, or to find the length of the hypotenuse. In both cases you need to know the cosine ratio for one of the smaller angles. If you are finding an unknown leg length, then the hypotenuse must be known. If you are finding the hypotenuse, then one leg of the triangle must be known. The steps for both problem types are shown below:

Problem type 1: Finding the adjacent side.

Example 1: Use the cosine ratio to find the unknown adjacent side 'x' in this triangle:



Solution:

$$\cos 60° = \frac{adjacent}{hypotenuse} = \frac{x}{20}$$

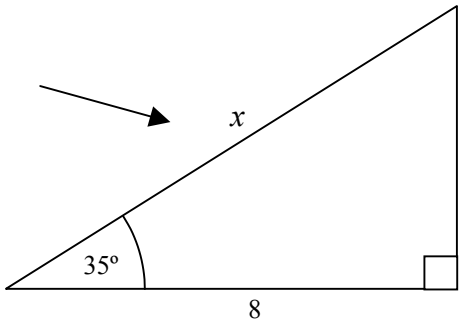
$$so \quad x = 20 \times \cos 60°$$

But $\cos 60º = 0.5$ (From a table of cosine ratios, or scientific calculator with a 'cos' button.)

$$\text{so } x = 20 \times 0.5$$
$$= 10$$

Problem type 2: Finding the hypotenuse.

Example 2: Use the cosine ratio to find the hypotenuse in this triangle:



Solution:

$$\cos 35° = \frac{adjacent}{hypotenuse} = \frac{8}{x}$$

$$so \quad \cos 35° \times x = 8$$

$$and \qquad x = \frac{8}{\cos 35°}$$

But $\cos 35º = 0.8192$ (From a table of cosine ratios, or scientific calculator with a 'cos' button.)

$$so \quad x = \frac{8}{0.8192}$$
$$= 9.766$$

1) Start Maths Helper Plus and load the 'Trig1 - Cosine ratio 3.mhp' document.
This document solves for unknown sides in right triangles using the 'cosine' ratio.

2) Press the F5 key to **display the parameters box**. (See below.) 'A', 'B' and 'C' have meanings as shown below:

'A', one of the two smaller angles of the triangle:

The **adjacent** side to angle 'A':

The **hypotenuse**:

Only one side length can be entered at a time. Set the unknown side length to zero.
To enter a value, click on an edit box, backspace to clear the old value, type the new value then click 'Update'.

NOTE: **If the diagram becomes too big** for your computer screen, press the 'F10' key to make it smaller.
To make the diagram bigger, hold down 'Shift' while you press 'F10'.

3) Use the cosine ratio to **find the unknown side 'x'** in each of the triangles below. For each triangle:

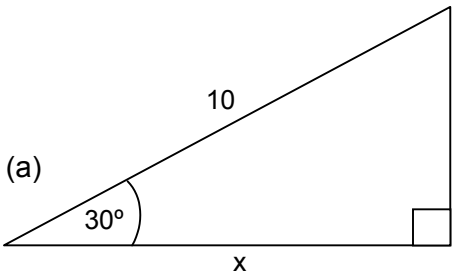
Calculate → Check → Correct

1. Identify the adjacent side for the angle given, and the hypotenuse.
2. Obtain the cosine ratio of the angle from a calculator or printed table.
3. Write the cosine ratio rule and substitute the known values.
4. Calculate the answer, showing all working steps.

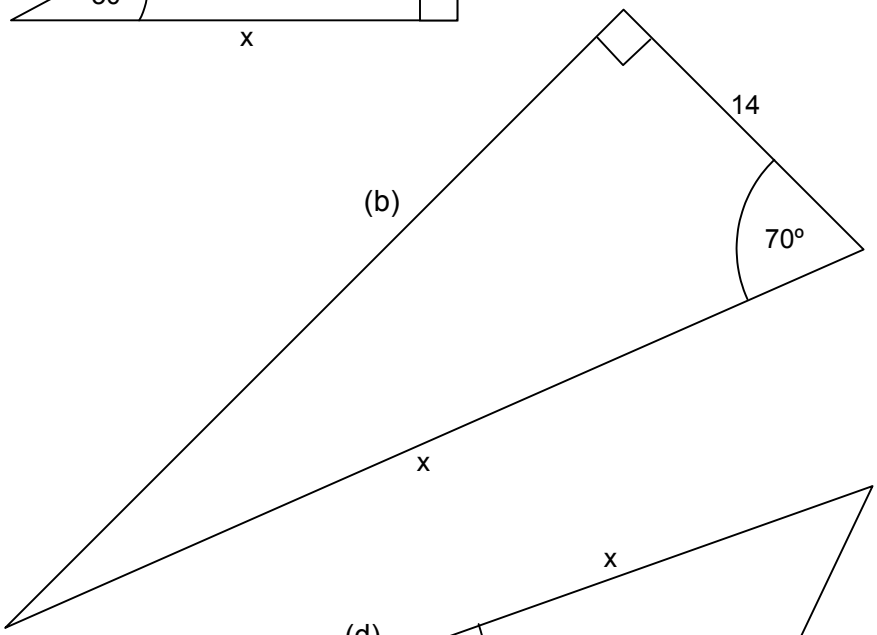
1. Enter the angle and given side into the Maths Helper Plus edit boxes.
2. Set the unknown side to zero.

1. Compare your working steps and answers with Maths Helper Plus.
2. Fix your mistakes.

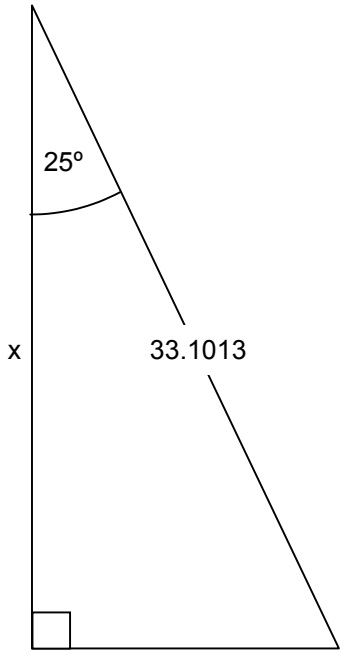
(a)



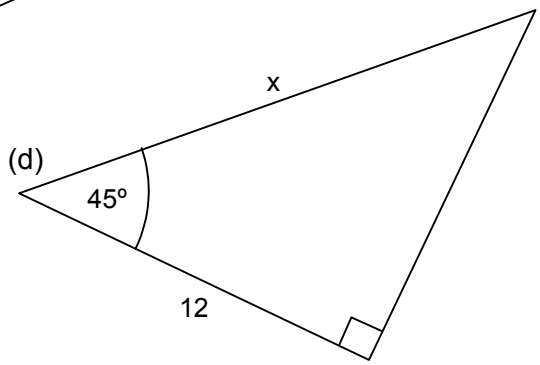
(b)



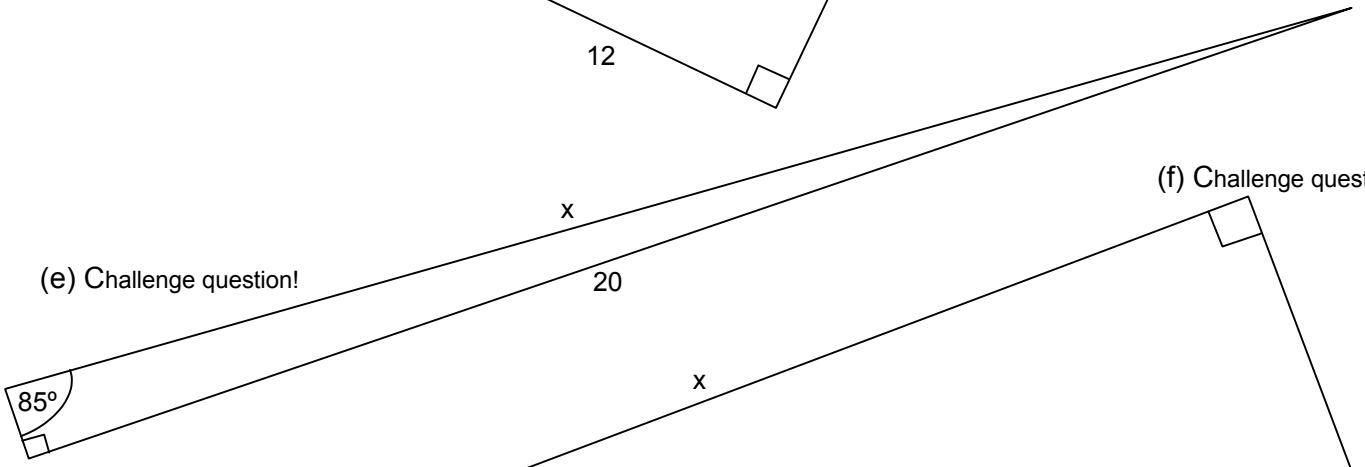
(c)



(d)



(e) Challenge question!



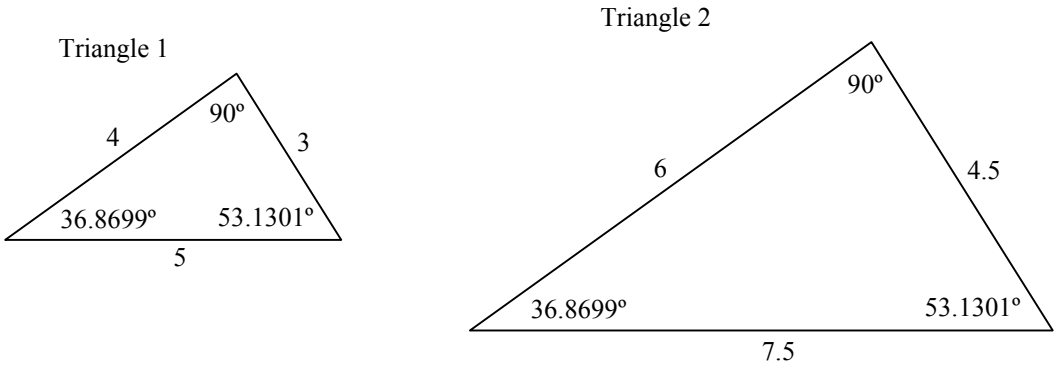
(f) Challenge question!

8.82702

Trigonometry - Activity 19

Similar triangles: Definition, Equivalence of corresponding angles, Scale factor.

'Similar' triangles have the same shape. For example, these two triangles are similar:



Scale drawings of any shape are said to be 'similar' to one another. Features such as points, lines and angles found on one shape can be identified on any other similar shape. Features on one shape are said to correspond to features on a shape similar to it.

The diagrams above show two triangles that are similar. Side '5' is the hypotenuse of triangle 1 . Because the triangles are similar, the hypotenuse in triangle 2 (side 7.5) corresponds to the hypotenuse in triangle 1 (side 5).

The following two properties are always true for a pair of similar triangles.

a. Corresponding angles are equal.
b. The ratio of corresponding sides is a constant. This constant is called the 'scale factor'.

The tables below contain information about the two similar triangles above. Complete the missing entries...

1) Corresponding angles: Write the two unknown angles in the table below...

Angle in triangle 1	Corresponding angle in triangle 2
90º	90º
53.1301º	
36.8699º	

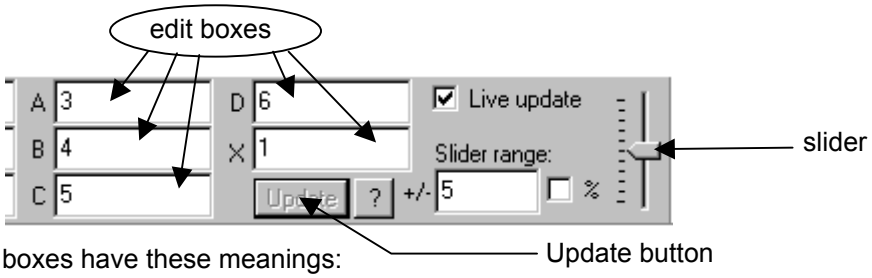
2) Ratio of corresponding sides: Calculate the scale factor for the last two rows of this table.
Write your answers in the table...

s_1 = Side in triangle 1	s_2 = Corresponding side in triangle 2	Scale factor: $r = \frac{s_2}{s_1}$
3	4.5	$r = \frac{4.5}{3} = 1.5$
4	6	
5	7.5	

You will now use Maths Helper Plus to correct these answers and to demonstrate these properties of similar triangles.

3) Start Maths Helper Plus and load the 'R2 - Similarity 1.mhp' document.
This document displays two similar triangles and some calculations.

4) Press the F5 key to **display the parameters box**. (See below.)



The variables in the edit boxes have these meanings:

- 'A', 'B' and 'C' are the side lengths of triangle 1
- 'X' is the ratio of corresponding sides between triangle 1 and triangle 2.
- 'D' shifts triangle 2 to the right. If 'D' = 0, then the two similar triangles lie on top of each other.

To type a new value for A, B, C, D, or X, you: click on the edit box, use the 'Backspace' key to delete the old value, then type the new value and click the Update button.

5) Correct your answers to questions (1) and (2) above.

(a) Set the variables in the parameters box to be as follows:
A = 3, B = 4, C = 5, D = 6, X = 1.5

(b) The sides in the shaded triangle are now 1.5 times larger than the other triangle.
Are the side lengths of the shaded triangle the same as for 'triangle 2' on the front of this sheet?

NOTE: **If the diagram becomes too big** for your computer screen, press the 'F10' key to make it smaller. To make the diagram bigger, hold down 'Shift' while you press 'F10'.

6) Experimenting with the scale factor

- Click on the 'X' edit box, change the value to 1, then click on the slider button.
- Use the up and down keyboard arrow keys to increase and decrease the scale factor.

7) What effect does the scale factor have on the shaded triangle's size when it is:

(a) greater than 1 _____

(b) equal to 1 _____

(c) less than 1 _____

8) How does the scale factor effect the angles in the shaded triangle ?

_____

9) Experimenting with the triangle shape

- Set the scale factor 'X' to 1.5
- Click on the 'A' edit box.
- Click on the slider button with the mouse, then drag it up and down slowly. This will change the length of side 'A' in triangle 1.

(a) Do the two similar triangles always have the same shape ? _____

(b) Stop dragging the slider button at a few different positions. At each position, compare the pairs of corresponding angles in the two similar triangles.

Are the angles in one triangle always the same as the corresponding angles in the other triangle ? _____

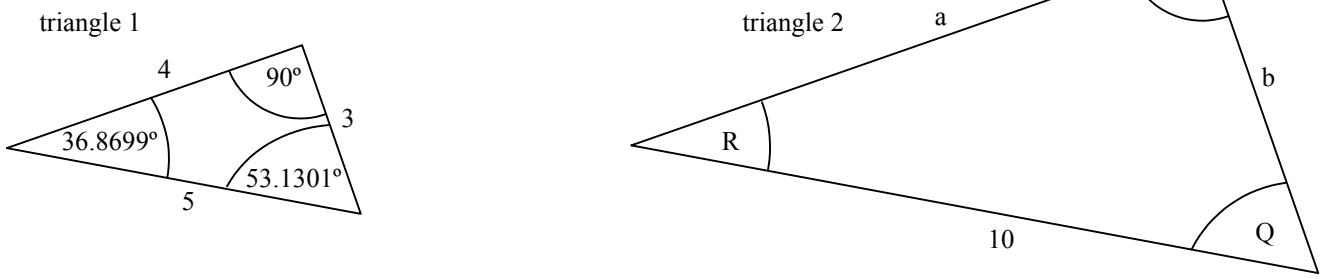
(c) Use the slider to change the other side lengths, 'B' and 'C'. In each case, compare the corresponding angles as you did in (b) above.

Trigonometry - Activity 20

Similar triangles: Applications.

If two triangles are known to be similar, then corresponding angles are equal, and the ratio of corresponding sides is a constant.

Consider these two similar triangles:



If the corresponding angles are equal, what are angles 'P', 'Q' and 'R' ?

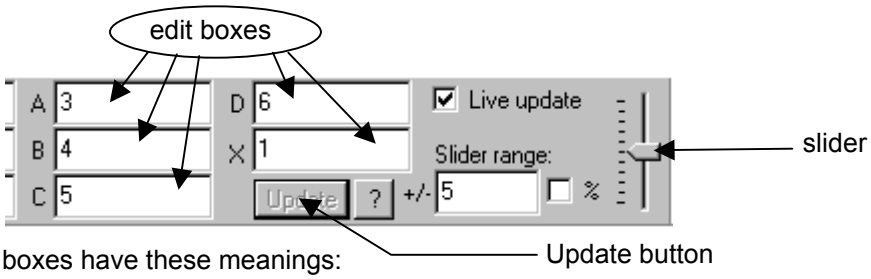
P = _____ Q = _____ R = _____

The ratio of corresponding sides is: $\frac{10}{5} = 2$. Side 'a' corresponds to length '4'. So $\frac{a}{4} = 2$, and 'a' = 8.

1) Calculate the length of side 'b'. _____

2) Start Maths Helper Plus and load the 'R2 - Similarity 1.mhp' document.
This document displays two similar triangles and some calculations.

3) Press the F5 key to **display the parameters box**. (See below.)



The variables in the edit boxes have these meanings:

- 'A', 'B' and 'C' are the side lengths of triangle 1
- 'X' is the ratio of corresponding sides between triangle 1 and triangle 2.
- 'D' shifts triangle 2 to the right. If 'D' = 0, then the two similar triangles lie on top of each other.

To type a new value for A, B, C, D, or X, you: click on the edit box, use the 'Backspace' key to delete the old value, then type the new value and click the Update button.

4) Correct your answer to question (1) above.

(a) Set the variables in the parameters box to be as follows:
A = 3, B = 4, C = 5, D = 6, X = 2

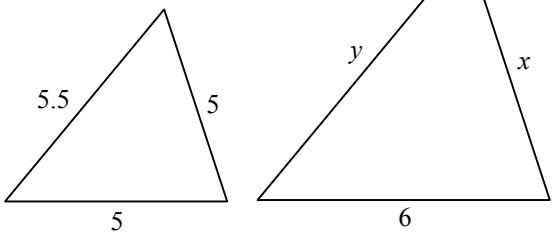
(b) The sides in the shaded triangle are all 2 times larger than the other triangle.
Was your answer for question (1) correct ?

NOTE: **If the diagram becomes too big** for your computer screen, press the 'F10' key to make it smaller. To make the diagram bigger, hold down 'Shift' while you press 'F10'.

5) Six pairs of similar triangles are shown below.
For each pair, calculate the ratio of corresponding sides, then find the unknown side lengths.

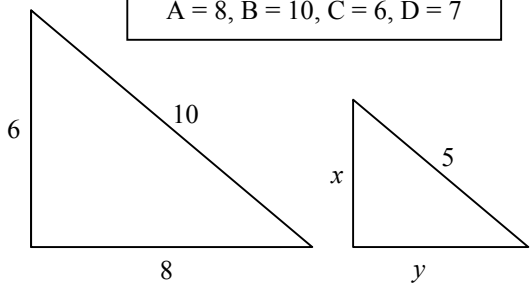
(a)

A = 5, B = 5.5, C = 5, D = 6

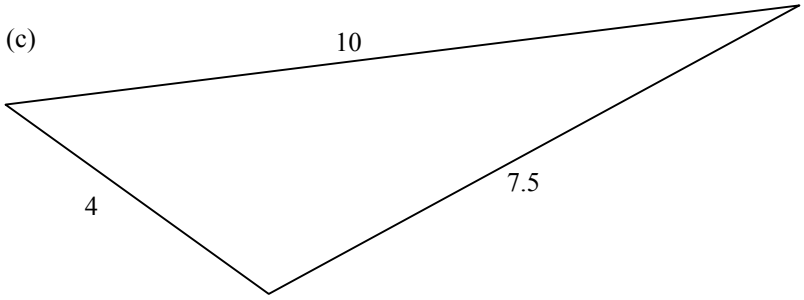


(b)

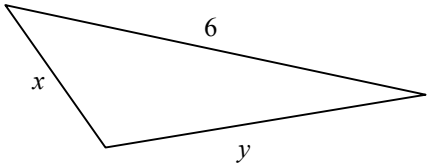
A = 8, B = 10, C = 6, D = 7



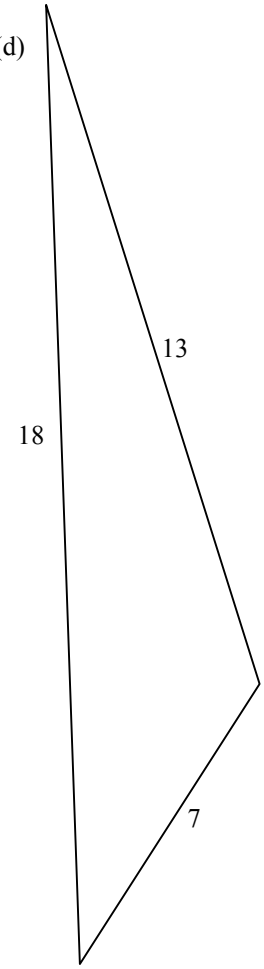
(c)

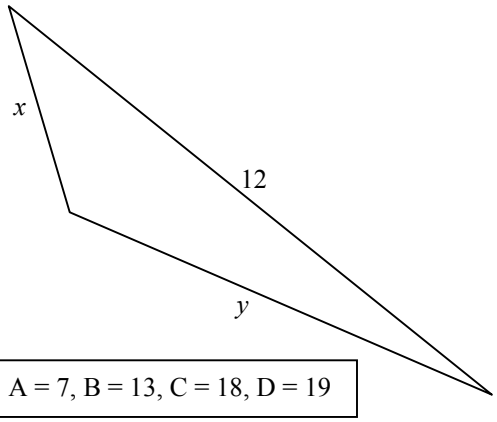


A = 4, B = 7.5, C = 10, D = 11



(d)

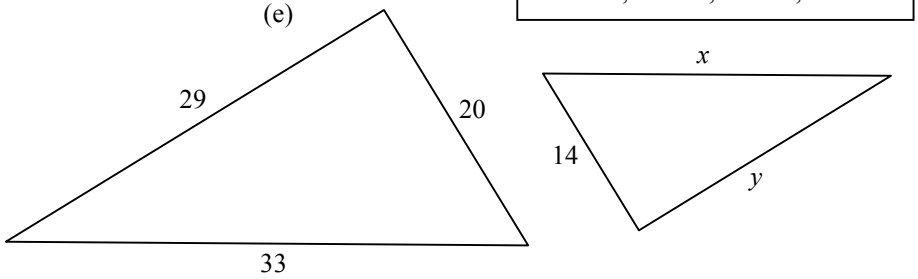




A = 7, B = 13, C = 18, D = 19

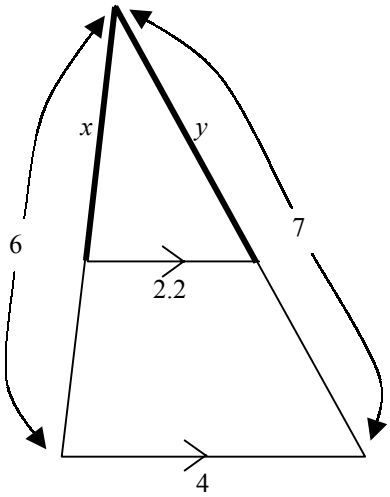
(e)

A = 20, B = 29, C = 33, D = 36



(f)

A = 4, B = 7, C = 6, D = 0



6) Use Maths Helper Plus to **check and correct your work**.

- Enter the parameters box values included with each question above to create the triangles.
- Enter the scale factor you calculated in edit box 'X'.
- Click the 'Update' button on the parameters box.
- Compare your calculations and answers with those displayed by the computer. Correct your mistakes.