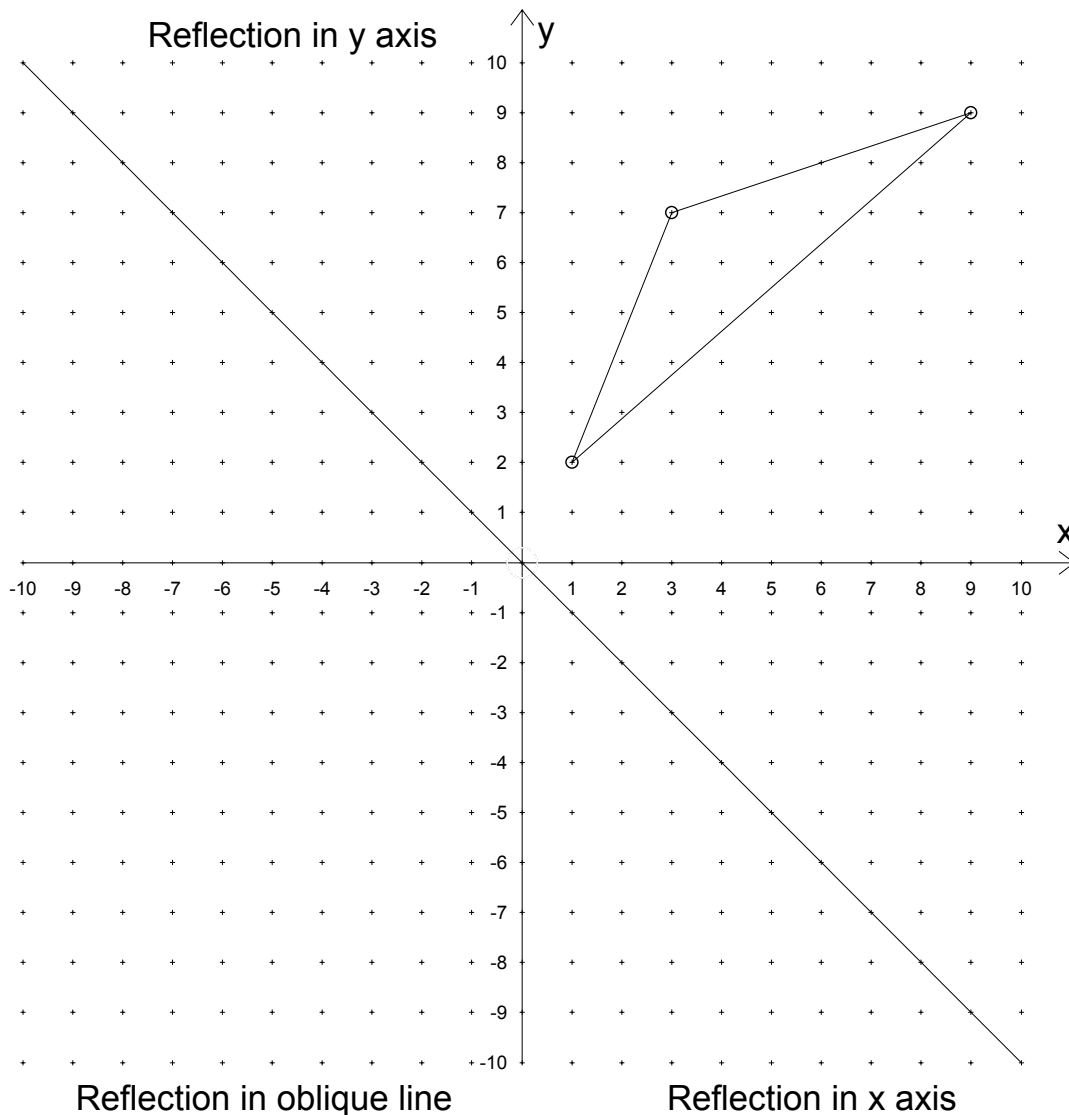


# Transformations in the Plane - Activity 1

Reflections in axes and an oblique line.

1) On the diagram below, draw the reflections of the triangle as if reflected: in the 'x' axis, in the 'y' axis, and in the oblique line.



2) Write down the coordinates of the three corner points making up each reflected triangle in the table below:

Reflected Triangle:	Coordinates of corner points.
Reflection in 'x' axis	
Reflection in 'y' axis	
Reflection in oblique line	

Use Maths Helper Plus to correct your work.

3) Start Maths Helper Plus and load the 'Transformations - reflections 1.mhp' document.  
This displays the same diagram as on the front of this sheet.

4) Plot the three corner points of each reflected triangle in Maths Helper Plus.

Say one of your reflected triangles was given by: (1,2) (3,4) (5,6), then:

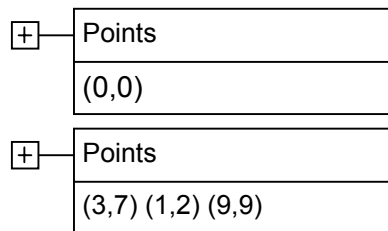
- Click on the input box. (On the text view.)
- Type the points to plot, like this: (1,2) (3,4) (5,6)
- Click outside of the input box.



Repeat for the other two reflected triangles.

5) Display the reflections of the original triangle and correct yours:

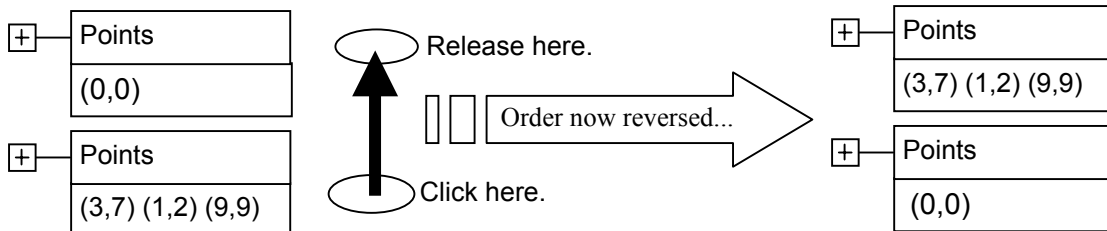
On the text view, there are two sets of points named 'Points':



The set of points called 'Points' nearest to the top is used to create the reflections. Having (0,0) at the top simply hides the answers.

To see the answers and correct your work:

- drag the second 'Points' data set to the top,

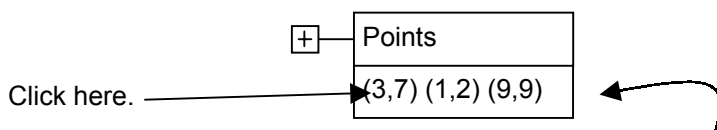


## For Practice

Draw another triangle in the first quadrant on the graph on the front of this sheet, like this:

- Draw three dots to mark the corners of your triangle, and join with lines. The dots must have whole number coordinates. Write the coordinates of the dots here:
- On the same graph, draw the reflections of this triangle in the 'x' axis, the 'y' axis, and the oblique line.

Now correct your work with Maths Helper Plus. Click on the data box for the previous triangle:

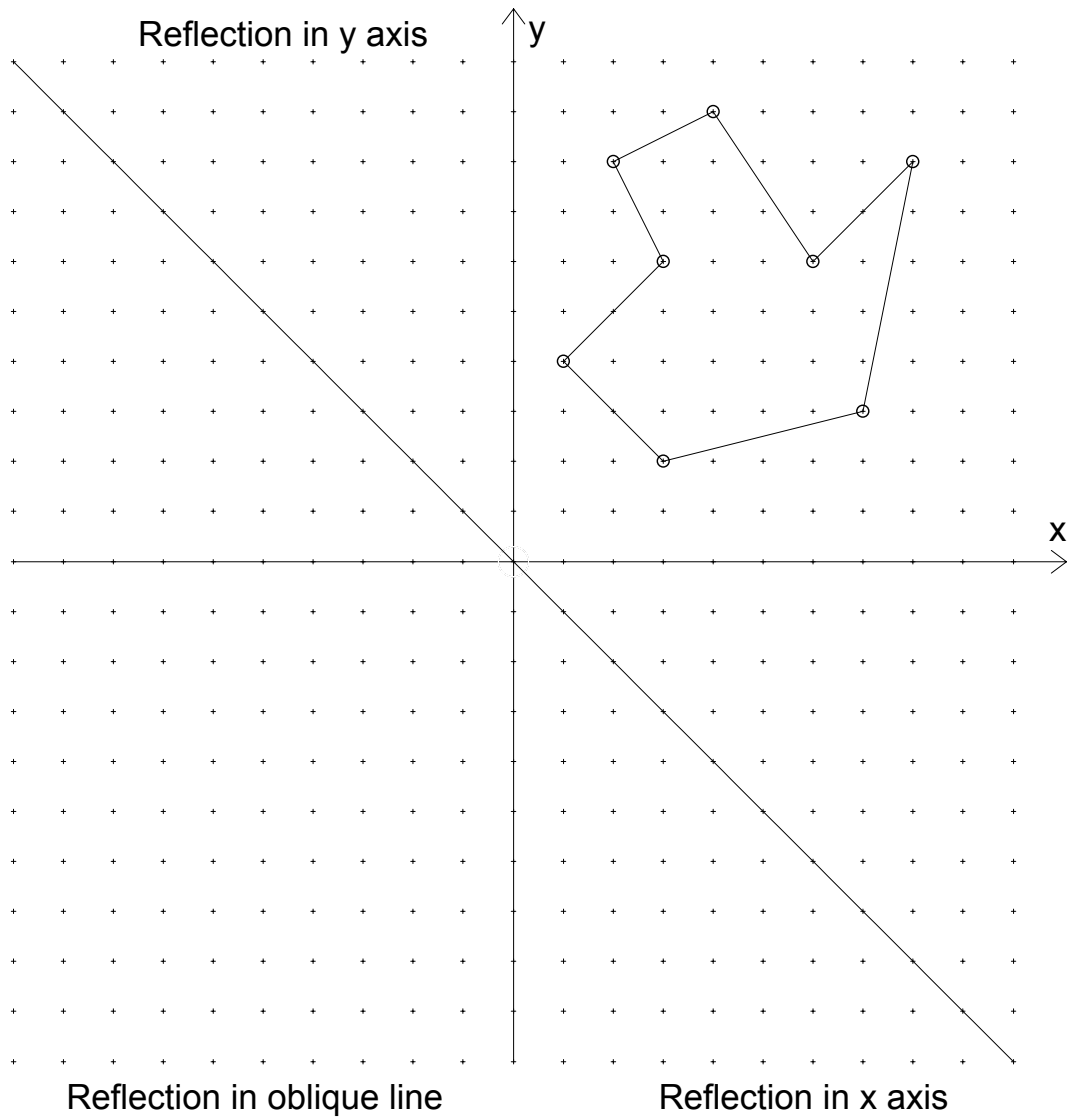


Replace these old points with your new ones, then click OUTSIDE of the data box.  
Maths Helper Plus will draw the new reflected triangles automatically!

# Transformations in the Plane - Activity 2

More difficult reflections in axes and an oblique line.

1) On the diagram below, draw the reflections of the shape shown as if reflected: in the 'x' axis, in the 'y' axis, and in the oblique line:



2) Write down the coordinates of the corner points making up each reflected shape in the table below:

Reflected Shape:	Coordinates of corner points.
Reflection in 'x' axis	
Reflection in 'y' axis	
Reflection in oblique line	

Use Maths Helper Plus to correct your work.

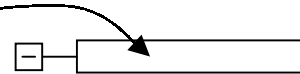
3) Start Maths Helper Plus and load the 'Transformations - reflections 2.mhp' document.

This displays the same diagram as on the front of this sheet.

4) Plot the corner points of each reflected shape in Maths Helper Plus.

Say one of your reflected shapes was given by: (1,2) (3,4) (5,6), then:

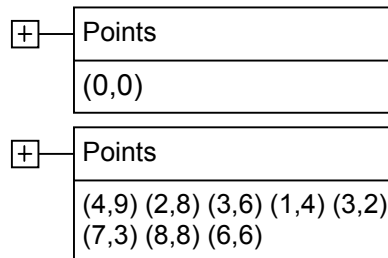
- Click on the input box. (On the text view.)
- Type the points to plot, like this: (1,2) (3,4) (5,6)
- Click outside of the input box.



Repeat for the other two reflected shapes.

5) Display the reflections of the original shape and correct yours:

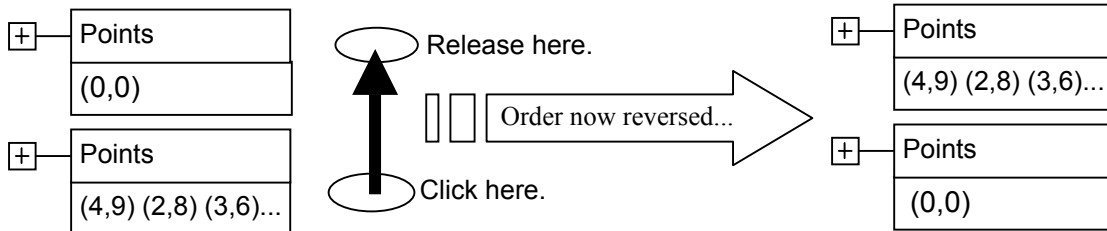
On the text view, there are two sets of points named 'Points':



The set of points called 'Points' nearest to the top is used to create the reflections. Having (0,0) at the top simply hides the answers.

To see the answers and correct your work:

- drag the second 'Points' data set to the top,

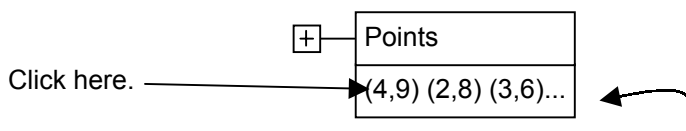


## For Practice

Draw another shape in the first quadrant on the graph on this sheet, like this:

- Draw at least 8 dots to mark the corners of your shape and join with lines. The dots must have whole number coordinates. Write the coordinates of the dots here:
- On the same graph, draw the reflections of this shape in the 'x' axis, the 'y' axis, and the oblique line.

Now correct your work with Maths Helper Plus. Click on the data box for the previous shape:

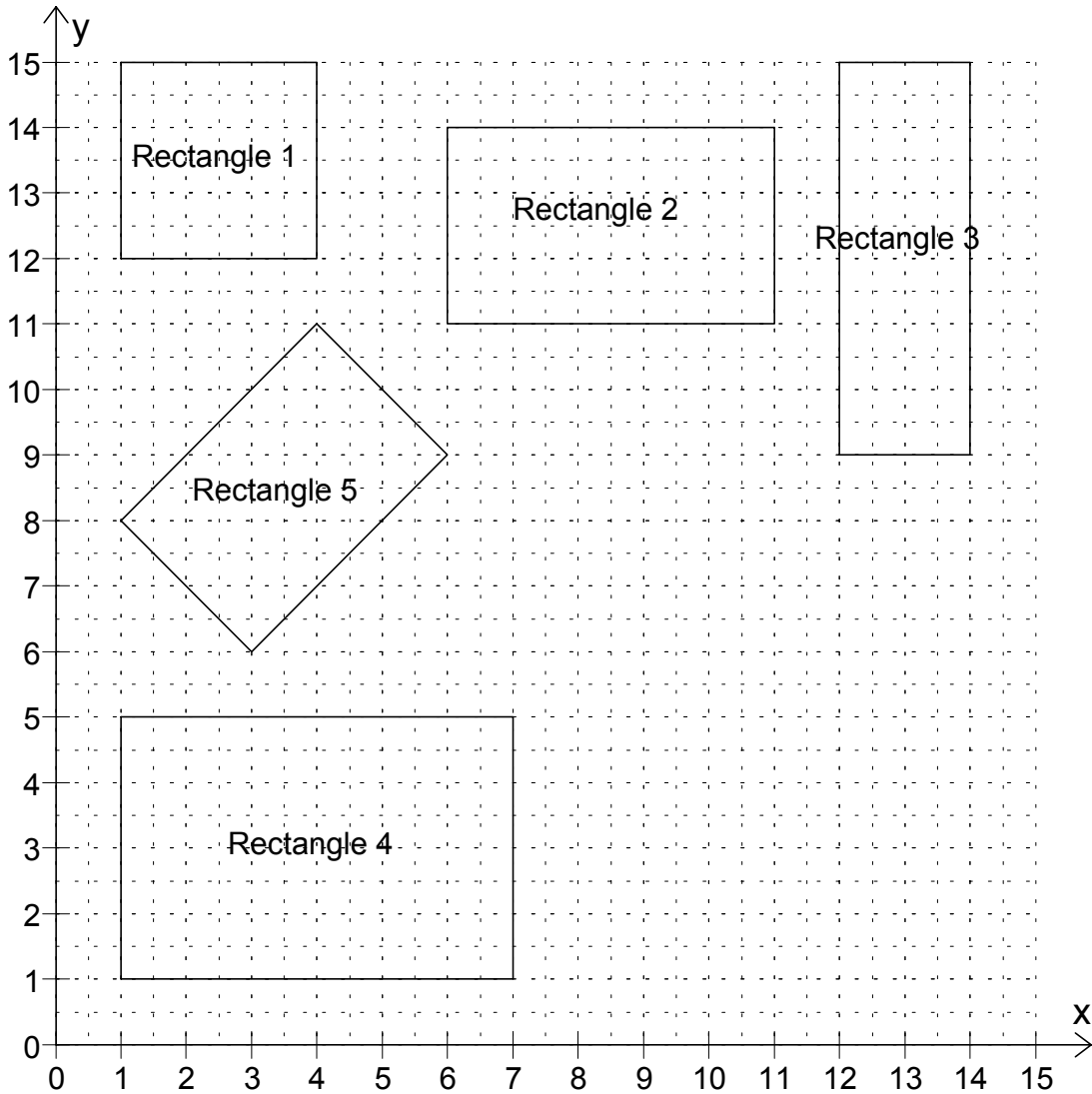


Replace these old points with your new ones, then click OUTSIDE of the data box. Maths Helper Plus will draw the new reflected shapes automatically!

# Plane Shapes - Activity 1

Area and perimeter of rectangles.

1) For each of the rectangles in this diagram (below), write the length, width, area and perimeter in the table provided:



Rectangle:	length	width	area = length × width	perimeter = 2 × (length + width)
1				
2				
3				
4				

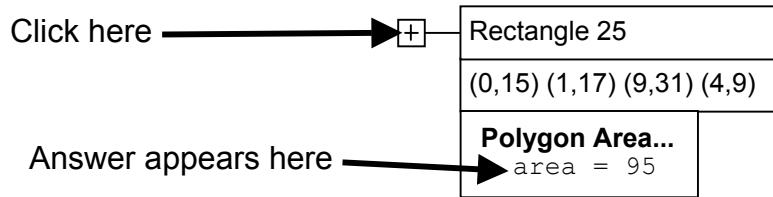
Challenge question. Hint: Use a different method to calculate the area.

5				
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Use Maths Helper Plus to correct your answers.

2) Start Maths Helper Plus and load the 'Area and perimeter - Rectangles.mhp' document. The graph view will display the rectangles from question 1 above.

3) Click on the expand box of the rectangle you want to check. (On the text view.)



Now you will create some rectangles of your own, calculate their area and perimeter, then use Maths Helper Plus to draw the rectangles and correct your work.

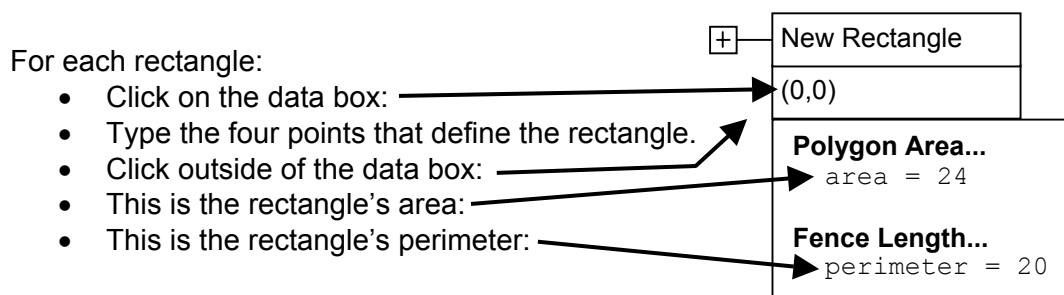
4) Use a pencil and ruler to draw five rectangles anywhere on the graph grid on the front of this sheet. In each case:

- Use only horizontal and vertical sides in your rectangles.
- Mark out your rectangle with four dots. The dots must have whole number coordinates.
- Join the dots with straight lines to make the rectangles
- Label your rectangles: 'a', 'b', 'c', 'd' and 'e'.

5) Calculate the area and perimeter of each rectangle you created, and write the answers in the table below:

Rectangle:	length	width	area = length × width	perimeter = 2 × (length + width)
a				
b				
c				
d				
e				

6) Correct your work with Maths Helper Plus by plotting the rectangles and calculating the areas and perimeters. Use the 'New Rectangle' data set on the text view.



For each rectangle you plot, compare with the rectangle you drew on this sheet. If Maths Helper Plus does not draw the same rectangle, then you need to correct your error.

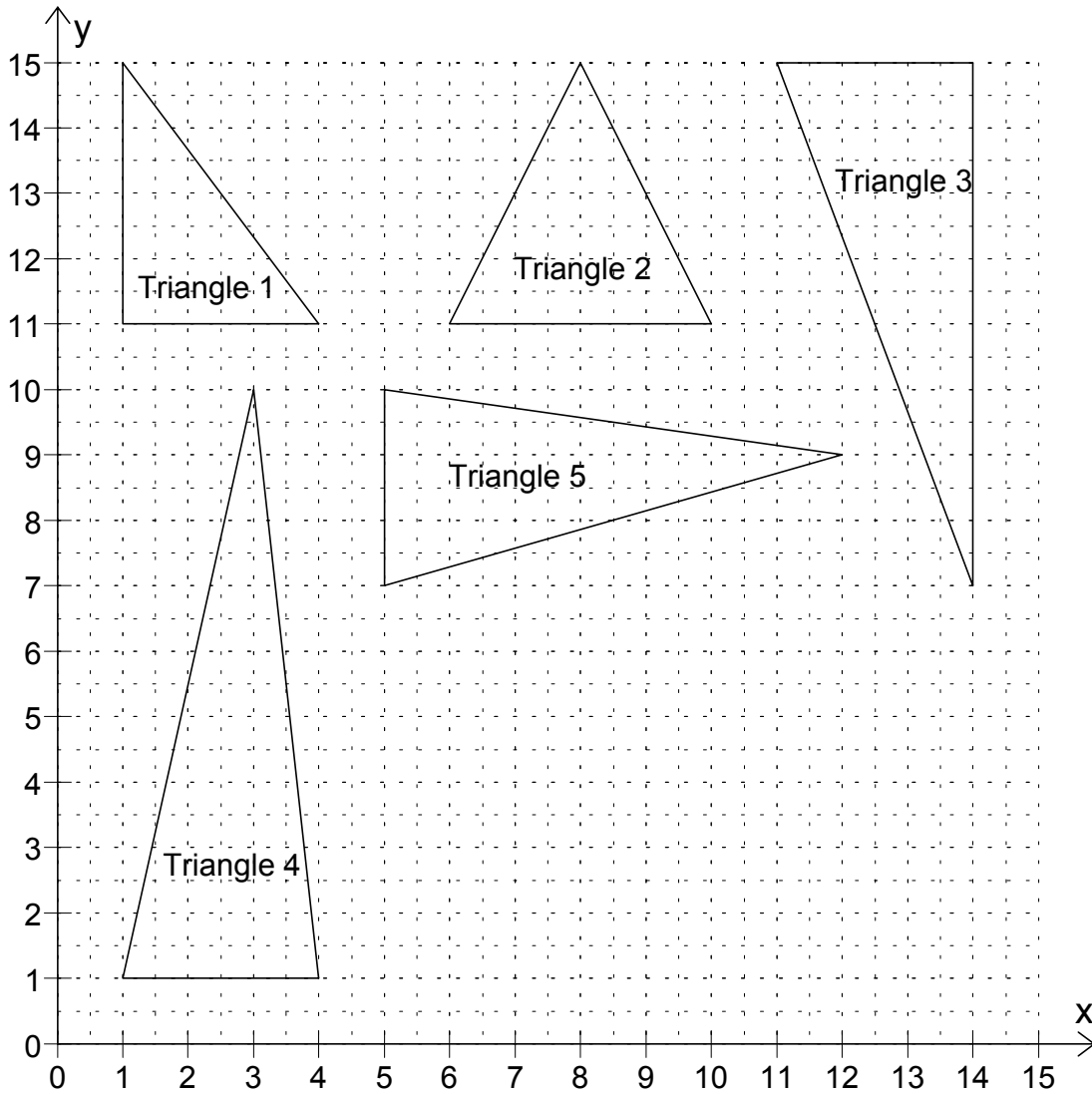
# Plane Shapes - Activity 2

Area of triangles.

1) For each of the triangles in the diagram below, choose a vertical or horizontal side to be the base, and calculate the area using the formula:

$$\text{area} = \frac{1}{2} \text{base} \times \text{perpendicular height}$$

Write the values you calculate in the table provided.

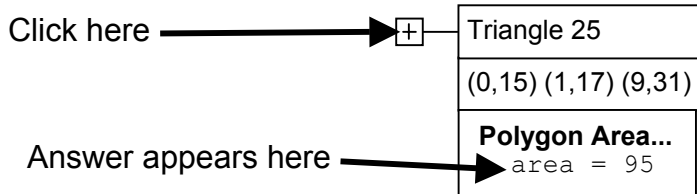


Triangle:	base length	perpendicular height	area = $\frac{1}{2}$ base $\times$ perpendicular height
1			
2			
3			
4			

Use Maths Helper Plus to correct your answers.

2) Start Maths Helper Plus and load the 'Area - Triangles.mhp' document. The graph view will display the triangles from question 1 above.

3) Click on the expand box of the triangle you want to check. (On the text view.)



Now you will create some triangles of your own, calculate their area, then use Maths Helper Plus to draw the triangles and correct your work.

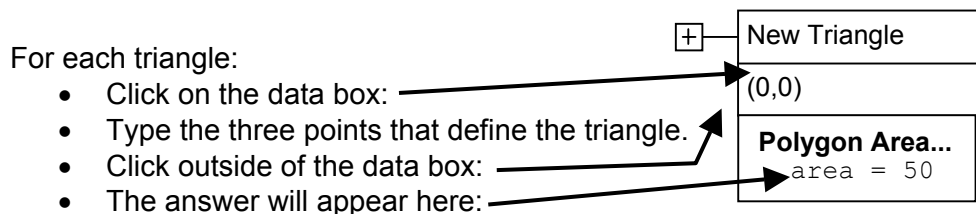
4) Use a pencil and ruler to draw five triangles anywhere on the graph grid on the front of this sheet. In each case:

- Make sure at least one side is vertical or horizontal. (For the base.)
- Mark out your triangle with three dots. The dots must have whole number coordinates.
- Join the dots with straight lines to make the triangles
- Label your triangles: 'a', 'b', 'c', 'd' and 'e'.

5) Calculate the area of each triangle you created, and write the answers in the table below:

Triangle:	base length	perpendicular height	area = $\frac{1}{2}$ base $\times$ perpendicular height
a			
b			
c			
d			
e			

6) Now you can use Maths Helper Plus to plot the triangles and calculate the areas. Use the 'New Triangle' data set on the text view.

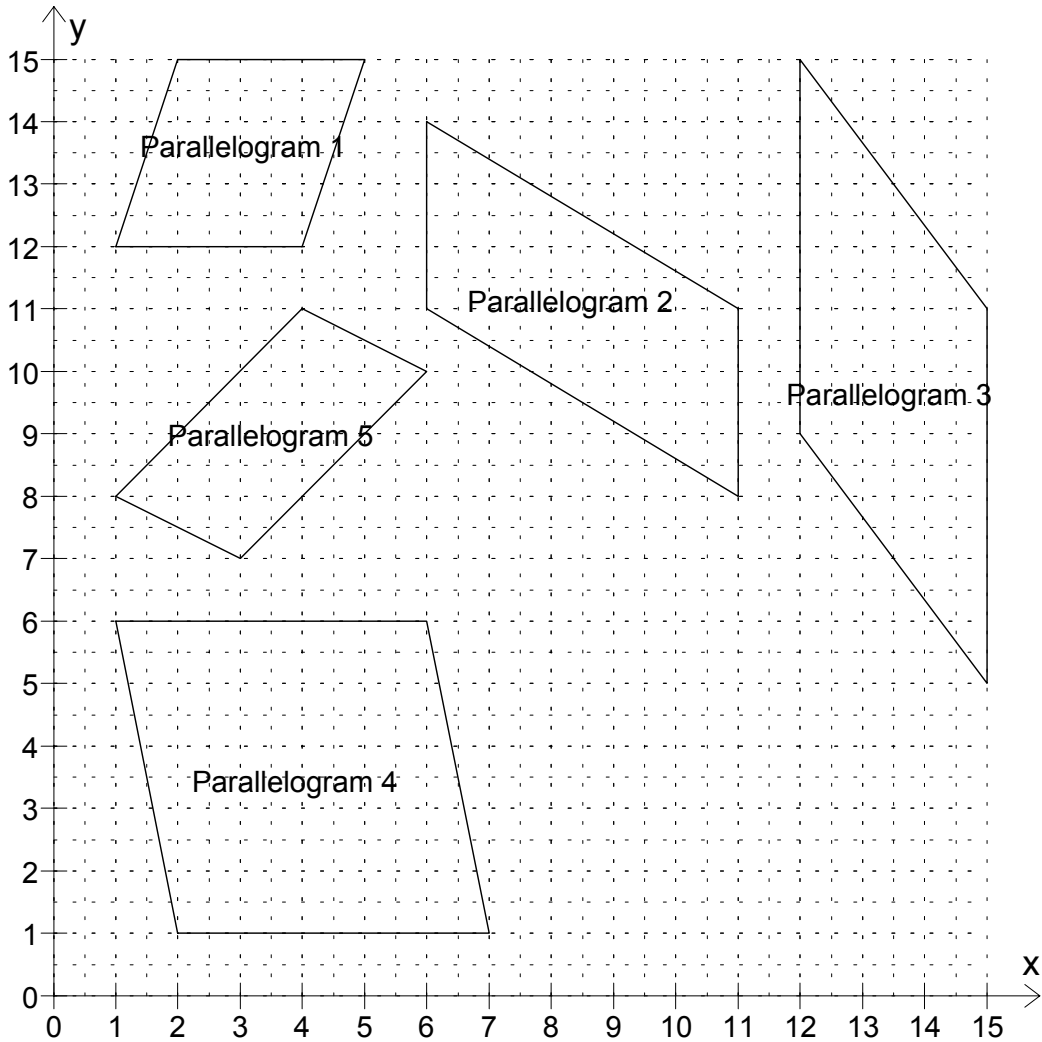


For each triangle you plot, compare with the triangle you drew on this sheet. If Maths Helper Plus does not draw the same triangle, then you need to correct your error.

# Plane Shapes - Activity 3

## Area of parallelograms.

1) For each of the parallelograms in this diagram (below), write the base, perpendicular height and area in the table provided:



Rectangle:	base	perpendicular height, 'h'	area = base × h
1			
2			
3			
4			

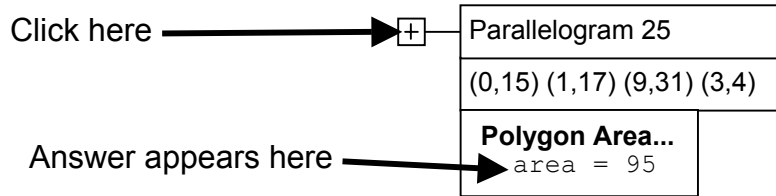
Challenge question. Hint: Use a different method to calculate the area.

5			
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Use Maths Helper Plus to correct your answers.

2) Start Maths Helper Plus and load the 'Area - Parallelograms.mhp' document. The graph view will display the parallelograms from question 1 above.

3) Click on the expand box of the parallelogram you want to check. (On the text view.)



Now you will create some parallelograms of your own, calculate their area, then use Maths Helper Plus to draw the parallelograms and correct your work.

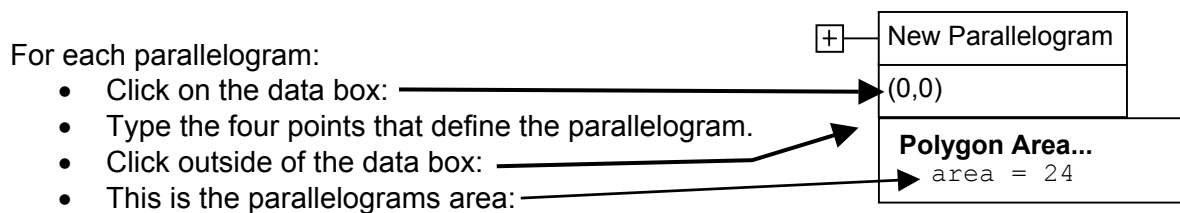
4) Use a pencil and ruler to draw five parallelograms anywhere on the graph on the front of this sheet. In each case:

- Make sure two sides of the parallelogram are horizontal or vertical.
- Mark out your parallelogram with four dots. The dots must have whole number coordinates.
- Join the dots with straight lines to make the parallelograms
- Label your parallelograms : 'a', 'b', 'c', 'd' and 'e'.

5) Calculate the area of each parallelogram you created, and write the answers in the table below:

Rectangle:	base	perpendicular height, 'h'	area = base × h
1			
2			
3			
4			
5			

6) Now you can use Maths Helper Plus to plot the parallelograms and calculate the areas. Use the 'New Parallelogram' data set on the text view.

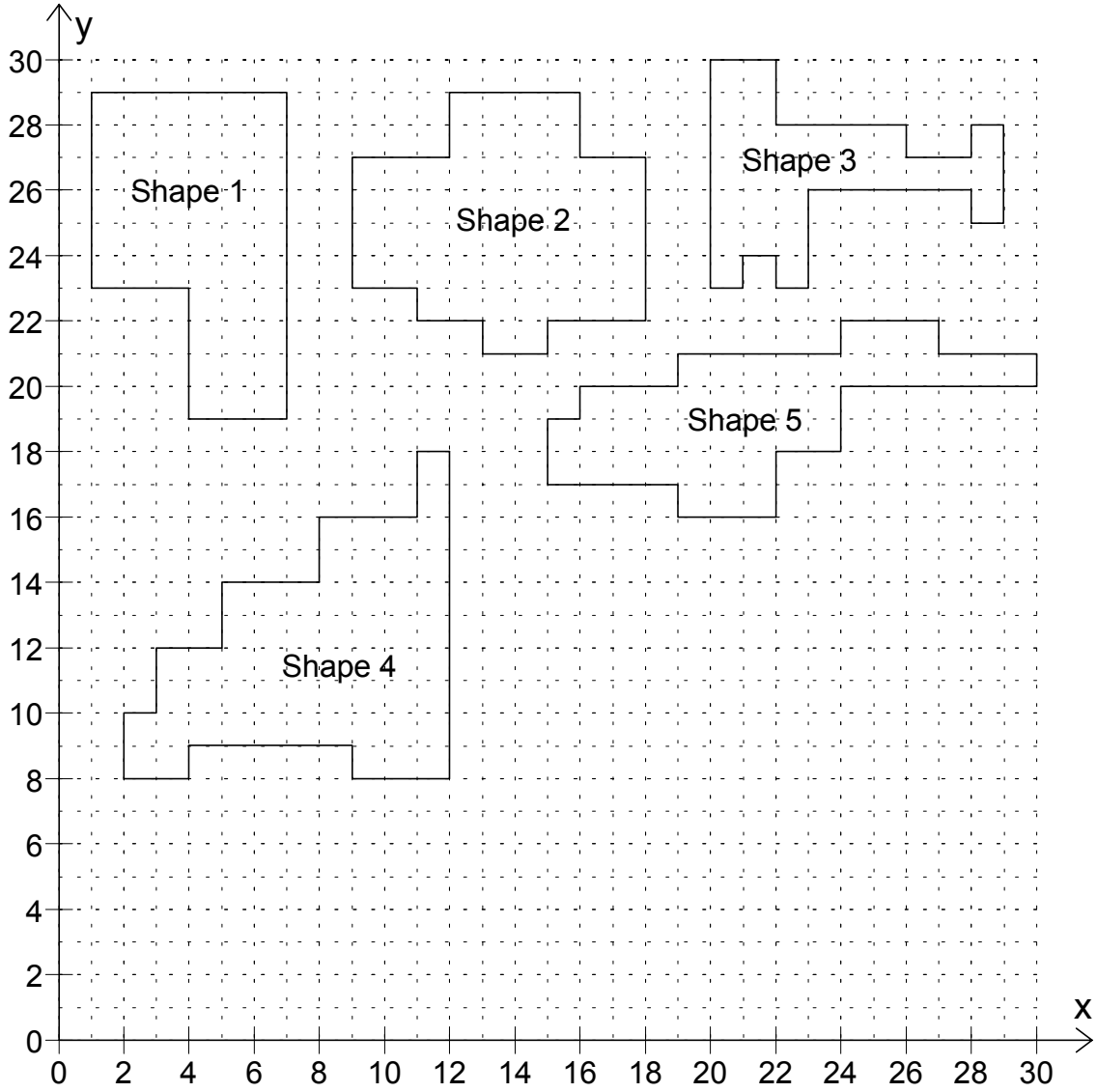


For each parallelogram you plot, compare with the parallelogram you drew on this sheet. If Maths Helper Plus does not draw the same parallelogram, then you need to correct your error.

# Plane Shapes - Activity 4

Area and perimeter of simple compound shapes.

1) For each of the shapes in this diagram (below), write the area and perimeter in the table provided:

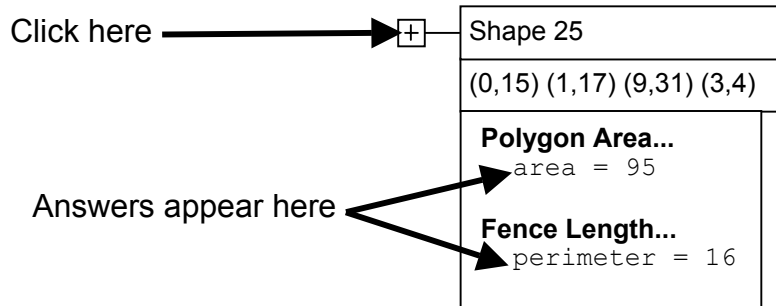


Shape Number:	Area	Perimeter
1		
2		
3		
4		
5		

Use Maths Helper Plus to correct your answers.

2) Start Maths Helper Plus and load the 'Area and perimeter - Simple compound.mhp' document. The graph view will display the shapes from question 1 above.

3) Click on the expand box of the shape you want to check. (On the text view.)



Now you will create some shapes of your own, calculate their area and perimeter, then use Maths Helper Plus to draw them and correct your work.

4) Use a pencil and ruler to draw two interesting shapes anywhere on the graph grid on the front of this sheet. In each case:

- Use only vertical and horizontal lines.
- Mark out your shape with dots. Use only whole number coordinates.
- Use at least 8 dots for each shape.
- Join the dots with straight lines to make the shapes
- Label your shapes : 'a' and 'b'.

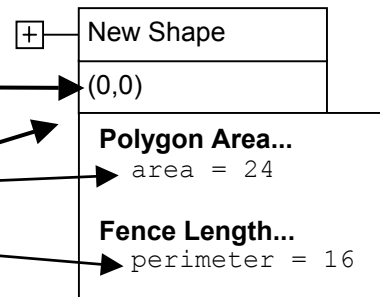
5) Calculate the area and perimeter of each shape you created, and write the answers in the table below:

Shape:	Area	Perimeter
a		
b		

6) Now you can use Maths Helper Plus to plot the shapes and calculate the areas. Use the 'New Shape' data set on the text view.

For each shape:

- Click on the data box:
- Type the points that define the shape.
- Click outside of the data box:
- This is the shape's area:
- This is the shape's perimeter:

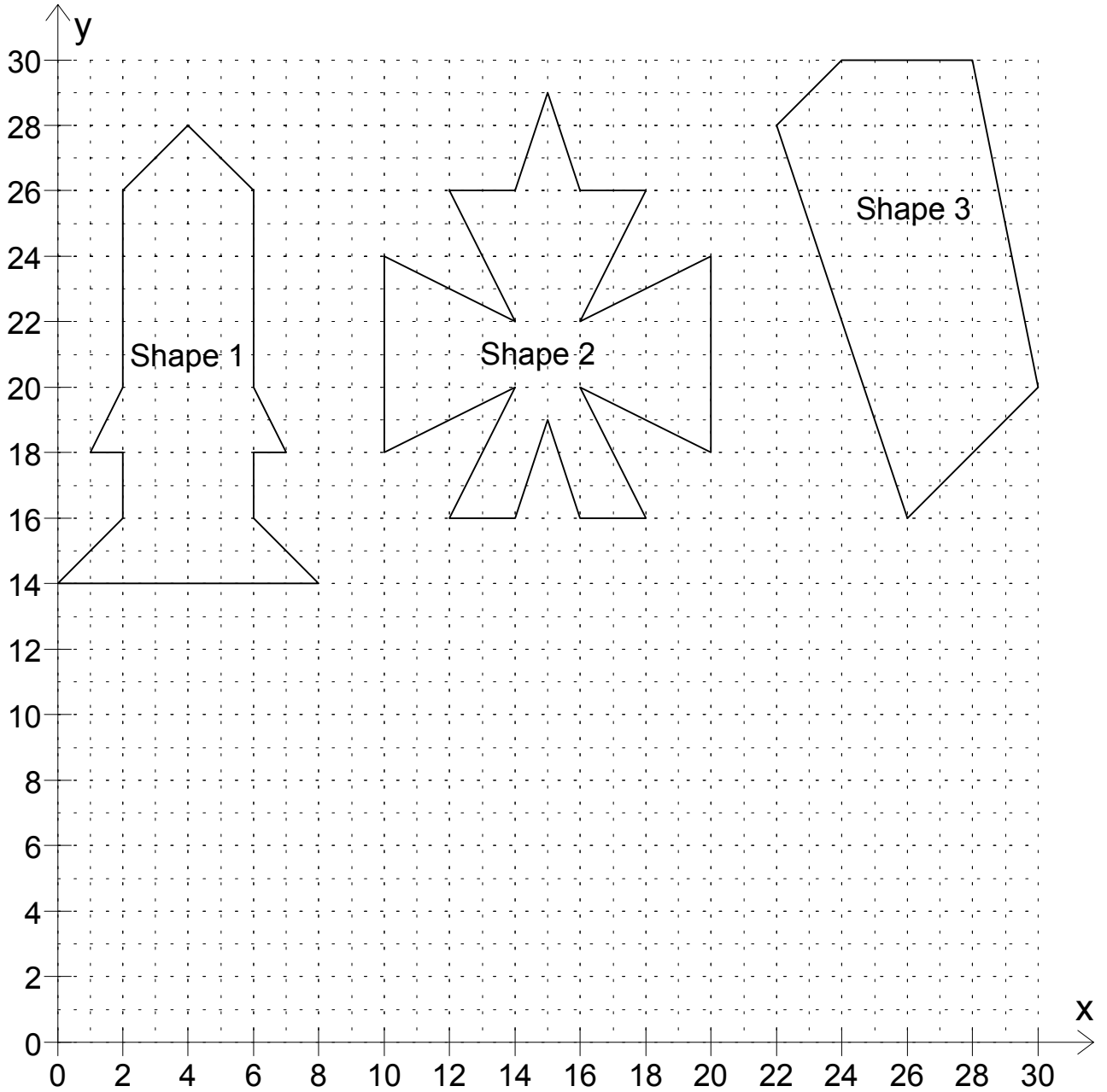


For each shape you plot, compare with the shape you drew on this sheet. If Maths Helper Plus does not draw the same shape, then you need to correct your error.

# Plane Shapes - Activity 5

Area of more complex shapes with oblique lines.

1) Calculate the area of each of the shapes in this diagram, and write your answers in the table:

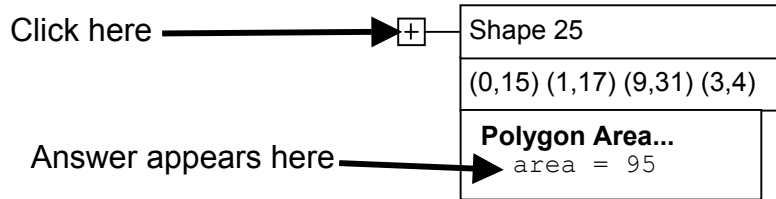


Shape Number:	Area
1	
2	
3	

Use Maths Helper Plus to correct your answers.

2) Start Maths Helper Plus and load the 'Area - Complex compound.mhp' document. The graph view will display the shapes from question 1 above.

3) Click on the expand box of the shape you want to check. (On the text view.)



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Now you will create two shapes of your own, calculate their area, then use Maths Helper Plus to draw them and correct your work.

4) Use a pencil and ruler to draw two interesting shapes anywhere on the graph grid on the front of this sheet. In each case:

- Include oblique lines in the shape.
- Mark out your shape with at least 5 dots. Use only whole number coordinates.
- Join the dots with straight lines to make the shapes.
- Label your shapes : 'a' and 'b'.

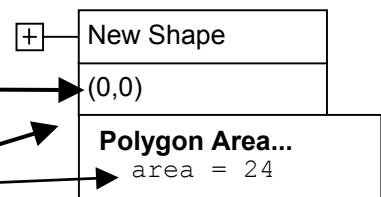
5) Calculate the area of each shape you created, and write the answers in the table below:

Shape:	area
a	
b	

6) Use Maths Helper Plus to plot the shapes and calculate the areas. Use the 'New Shape' data set on the text view.

For each shape:

- Click on the data box: →
- Type the points that define the shape.
- Click outside of the data box: →
- This is the shape's area: →



For each shape you plot, compare with the shape you drew on this sheet. If Maths Helper Plus does not draw the same shape, then you need to correct your error.

# Solids - Activity 1

An investigation of area and volume of rectangular prisms.

1) Start Maths Helper Plus, then load the file: 'Area and volume - rectangular prism.mhp'.

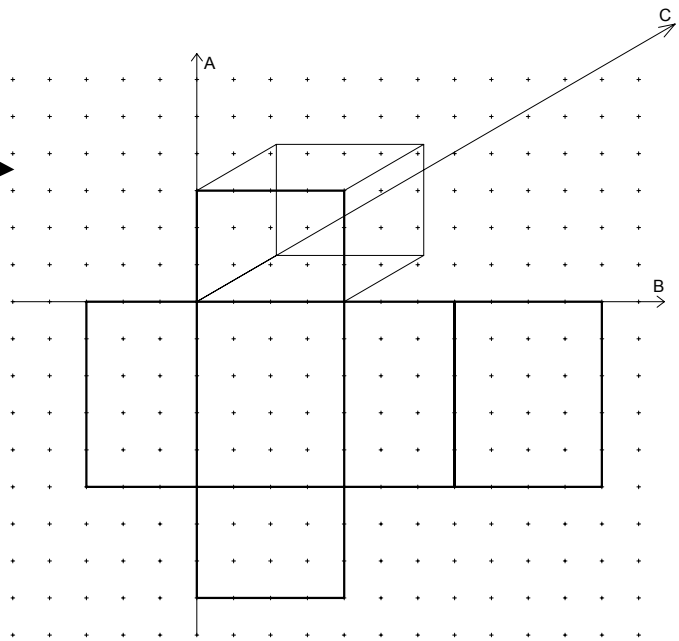
The graph view displays a 3d drawing (blue) and a net (pink) of a rectangular prism. (See right:)

The dots on the graph area are spaced at 1cm intervals when printed, but may be scaled on the screen to see the whole prism and net.

2) Practice changing the scale of the graph view. Click the '+' toolbar button to enlarge, and the '-' toolbar button to reduce.

Whenever you change the measurements of the prism, you may need to scale the graph view in order to view the whole drawing.

( For now, leave the graph view scaling so that the drawing is all visible but not smaller than necessary. )



3) Assume that the horizontal and vertical distance between the dots on the graph area is 1cm. Use the diagram above to calculate:

a) the surface area of the rectangular prism. \_\_\_\_\_  $\text{cm}^2$

b) the volume of the rectangular prism. \_\_\_\_\_  $\text{cm}^3$

4) If the side lengths of the prism are 'A', 'B' and 'C', as shown on the diagram above, write formulas for its surface area and volume:

a) Surface area = \_\_\_\_\_

b) Volume = \_\_\_\_\_

5) The text view in Maths Helper Plus shows the formulas and calculations for the surface area and volume of the rectangular prism:

Volume Area		
y = x		
x	ABC	2 (AB+AC+BC)
1	60	94

Volume of rectangular prism: \_\_\_\_\_

Surface area of rectangular prism: \_\_\_\_\_

Were your answers to questions 3 and 4 correct ?

6) Other side lengths 'A', 'B' and 'C' can make a rectangular prism with the same volume of  $60\text{cm}^3$ . For example, if  $A = 1\text{cm}$ ,  $B = 1\text{cm}$  and  $C = 60\text{cm}$ .

Find A, B and C for 4 different rectangular prisms with volume =  $60\text{cm}^3$  and no dimension bigger than 10cm. Also calculate the surface area for each prism.

Write your answers in the table below.

(NOTE: Swapping the numbers for A, B and C does NOT count as a different prism.)

Prism number:	A (cm)	B (cm)	C (cm)	Volume ( $\text{cm}^3$ )	Surface Area ( $\text{cm}^2$ )
1	3	4	5	60	94
2				60	
3				60	
4				60	
5				60	

7) Use Maths Helper Plus to correct your answers. Use the 'parameters box' to set the A, B and C values for each of your answers, like this:

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

To set the 'A' value you:

- Click on the 'A' edit box,
- Type the value for 'A',
- Click the 'Update' button.



Use the same procedure for 'B' and 'C'.

Whenever you change A, B or C, the 3d drawing and net will be redrawn immediately, and the new volume and surface area values will appear on the text view.

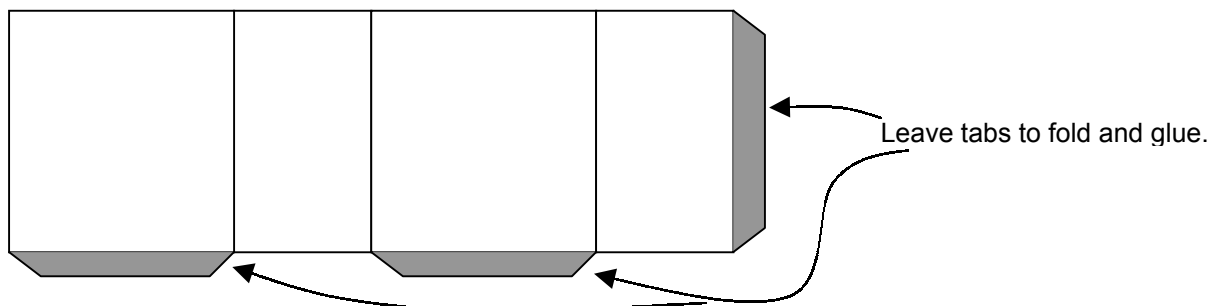
8) Print out the net for one of the prisms in the table above, cut out and construct the prism.

Make sure that the entire net lies within the dotted area so that it will fit on one printed A4 sized page. If it doesn't fit a page, you can try swapping the parameters.

The 'File' menu contains commands for print previewing the graph view and printing the graph view.

Before cutting out the net, write its surface area on one of its sides, like this: S.A. = \_\_\_\_\_

When cutting out the net, you may find it helpful to leave tabs that can be folded and glued:



9) What is the smallest surface area you found for a rectangular prism of volume  $60\text{cm}^3$  ?

10) Find out what kind of rectangular prism of a given volume has the smallest possible surface area.