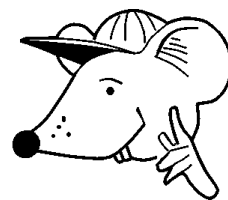


# MATHEMATICS



**N.S. Yr. 6 P.109**

**Recognise positions and directions,  
and use co-ordinates.**

## Equipment

Paper, pencil, ruler

# MathSphere

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## Concepts

Children should be familiar with the following words and should be able to use, read and write them:

***position, direction, ascend, descend, journey, route, map, plan, grid, row, column, origin, x-axis, y-axis, quadrant, co-ordinates, compass, point, north, south, east, west, north-east, north-west, south-east, south-west, horizontal, vertical, diagonal, intersecting, intersection, parallelogram, perpendicular, plane.***

The use of the co-ordinate system is now extended to all four quadrants. The quadrants have the names 'First quadrant, Second Quadrant' etc, starting in the top right corner and moving anti-clockwise.

Second Quadrant	First Quadrant
Third Quadrant	Fourth Quadrant

Children should be able to plot and interpret points in all four quadrants, using negative numbers as appropriate. They should remember at all times that the **first number in the co-ordinate pair is the horizontal distance** from the origin and the **second number is the vertical distance**.

Using the axes as mirror lines, shapes will be reflected from one quadrant to another and the new co-ordinates interpreted.

The concepts of parallel and perpendicular are now extended to the different types of quadrilaterals (parallelograms etc).

Children should know that lines that cross are called 'intersecting' and they should be able to count and predict the number of intersections for a given (simple) set of lines.

N.B. When drawing polygons, the shape should be finished by returning to the first point.

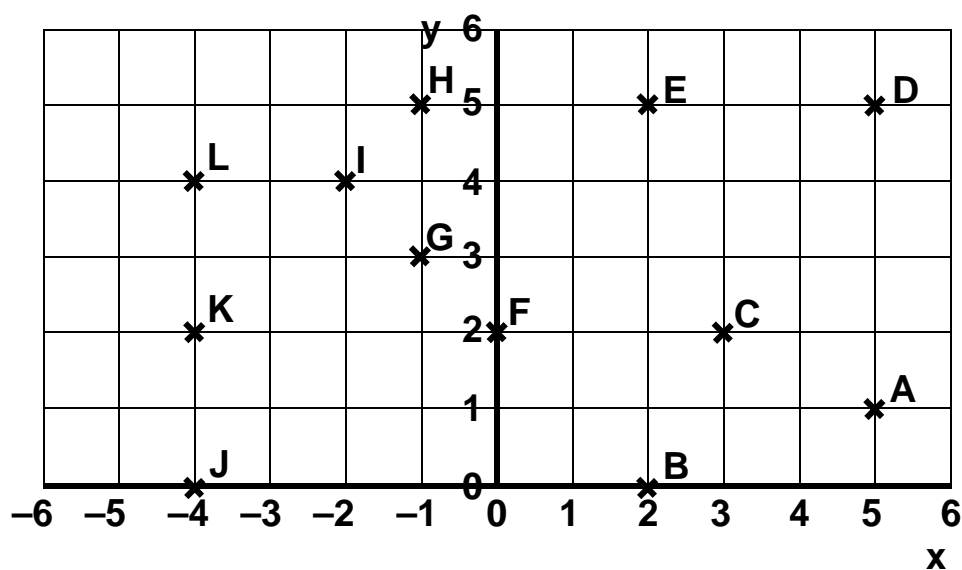
The horizontal axis is often called the x-axis and the vertical axis is the y-axis.



x-axis and y-axis. That sounds simple enough.



Here is a set of axes with positive numbers on the y-axis, but positive and negative numbers on the x-axis.



A is the point (5,1)

E is the point (2,5)

H is the point (-1,5)

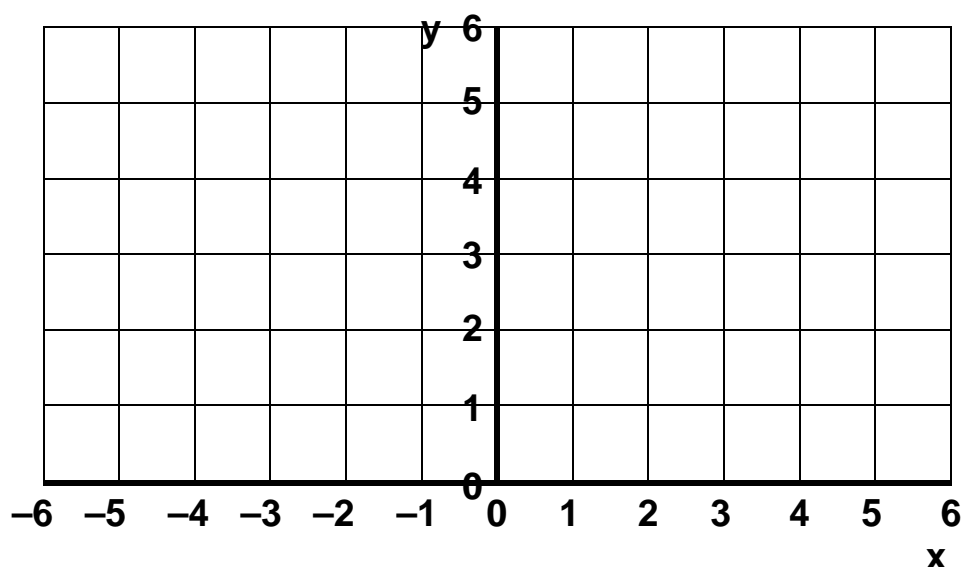
K is the point (-4,2)

Write in the co-ordinates of the points:

B( , ) C( , ) D( , ) F( , ) G( , ) I( , )

J( , ) L( , )

Here is a grid with positive and negative numbers on the x-axis and just positive numbers on the y-axis.



Plot the shape with the following co-ordinates:

(4,2) (5,2) (4,1) (2,1) (1,2) (4,2) (4,5) (2,3) (6,3) (4,5)

Reflect this shape in the y-axis.

Write down the co-ordinates of the new shape (the 'image').

**New Shape co-ordinates:**

( , ) ( , ) ( , ) ( , ) ( , )

( , ) ( , ) ( , ) ( , ) ( , )

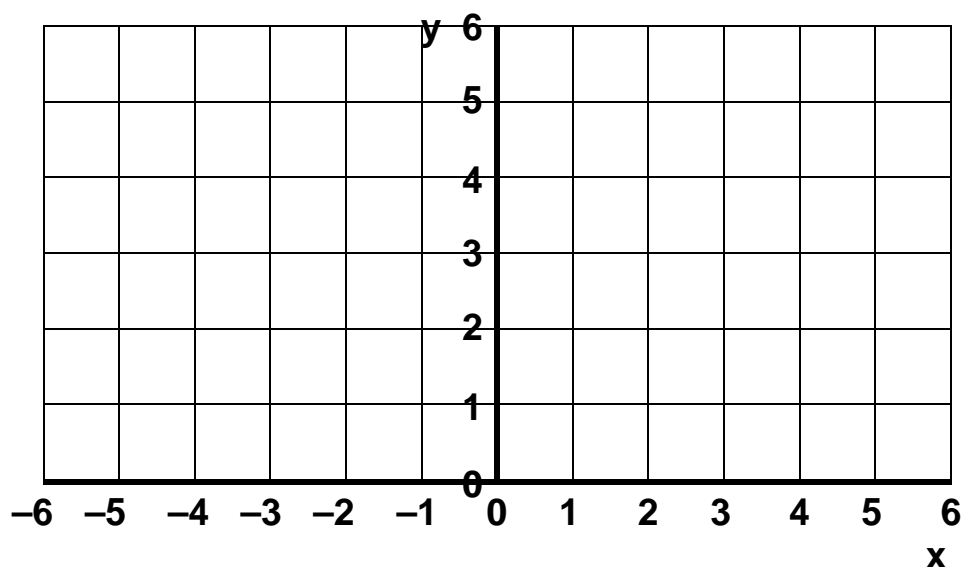
Be careful with those negatives!



Can you now draw your own axes and reflect a shape you have designed?

Do not forget to write down the co-ordinates.

## Noughts and Crosses on a Grid



Here is a game you can play. You will need two people.

It is like noughts and crosses, but you need to get **four** noughts or crosses in a row instead of three.

When a person takes a turn, he/she must say the co-ordinates of the point where they are going to put their nought or cross before they do so. If they do not put it in the correct place, it is cancelled and the other person has a go!

First person with four in a row (vertically, horizontally or diagonally) is the winner.

To save printing too many of these sheets, you could use counters.



Counters. Why didn't I think of that?

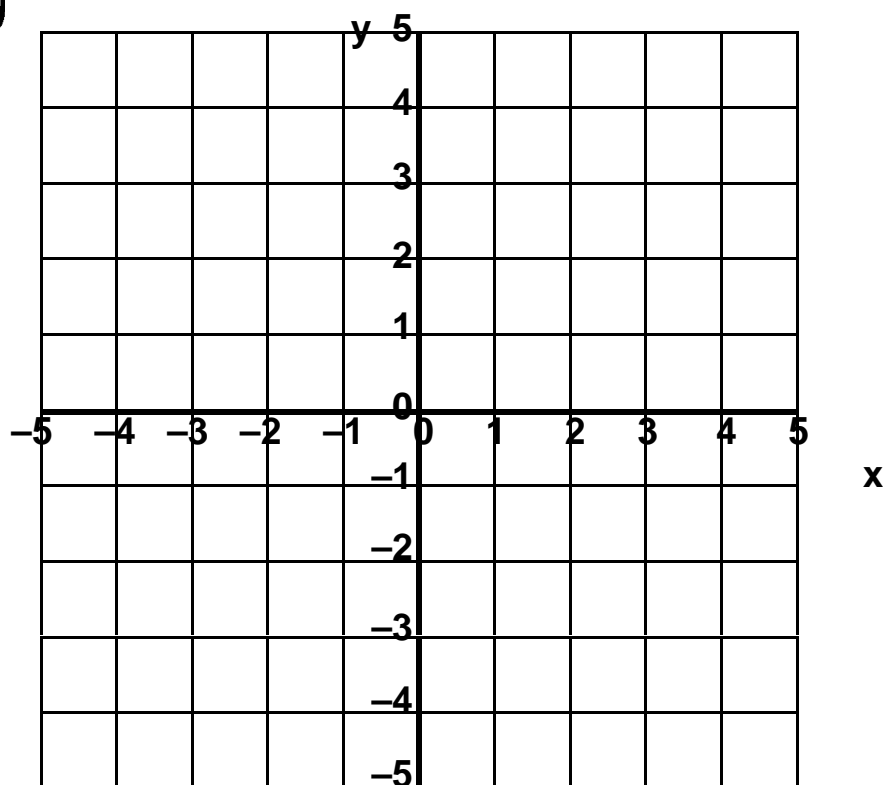
'Cause you're divvy, Divvy!



Okay, you guys. Ready for the heavy stuff?

We are now going to put negative numbers in the y-axis too!

Hold onto your seats!



Such great artists at MathSphere!

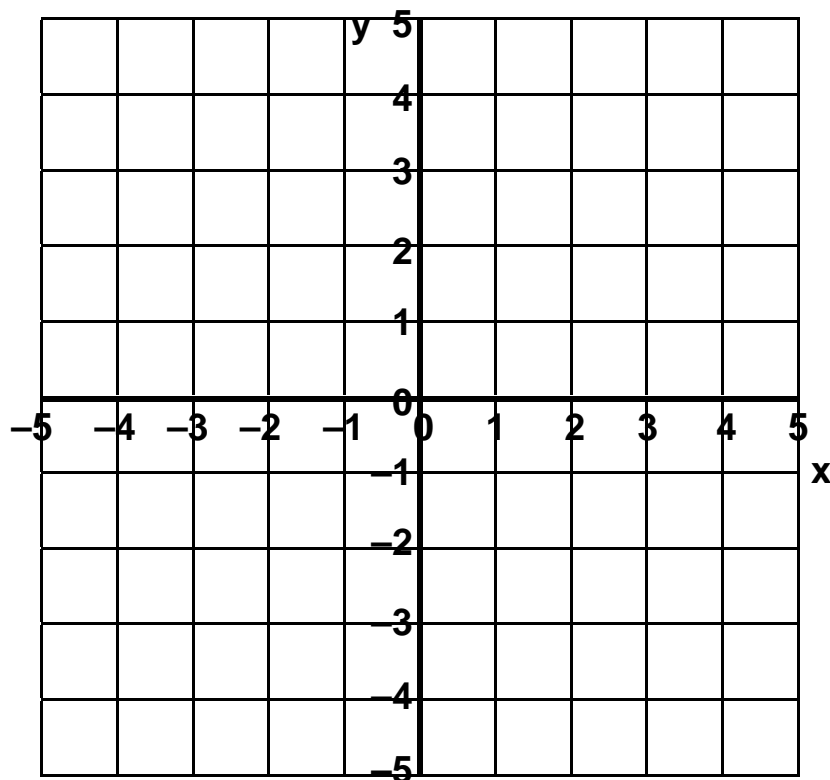
Try drawing this shape:

(3,5) (2,4) (4,2) (5,3) (4,2) (3,3) (1,0) (0,1) (3,3) (0,1) (-1,2) (-1,4)  
 (-4,4) (-4,2) (-5,1) (-5,-3) (-4,-3) (-4,-2) (-2,-2) (-2,-3) (0,-3) (0,-2)  
 (2,-2) (2,-3) (3,-3) (3,-1) (2,-1) (1,0) \*

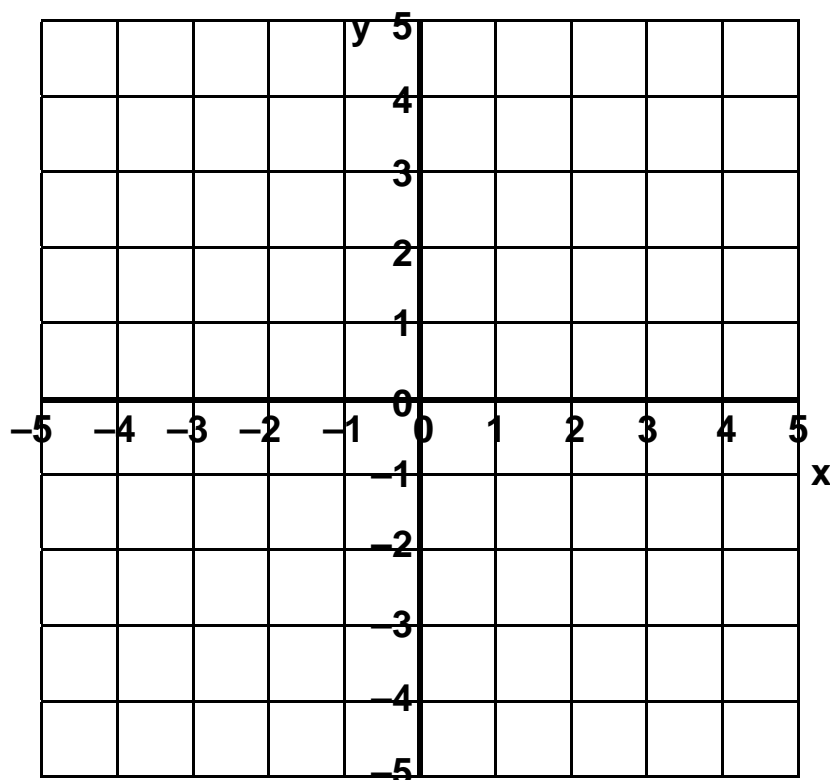
Now draw a rectangle at (-3,1) (-3,3) (-2,3) (-2,1)

Finally draw two circles 1cm radius at centres (-3,-3) and (1,-3)

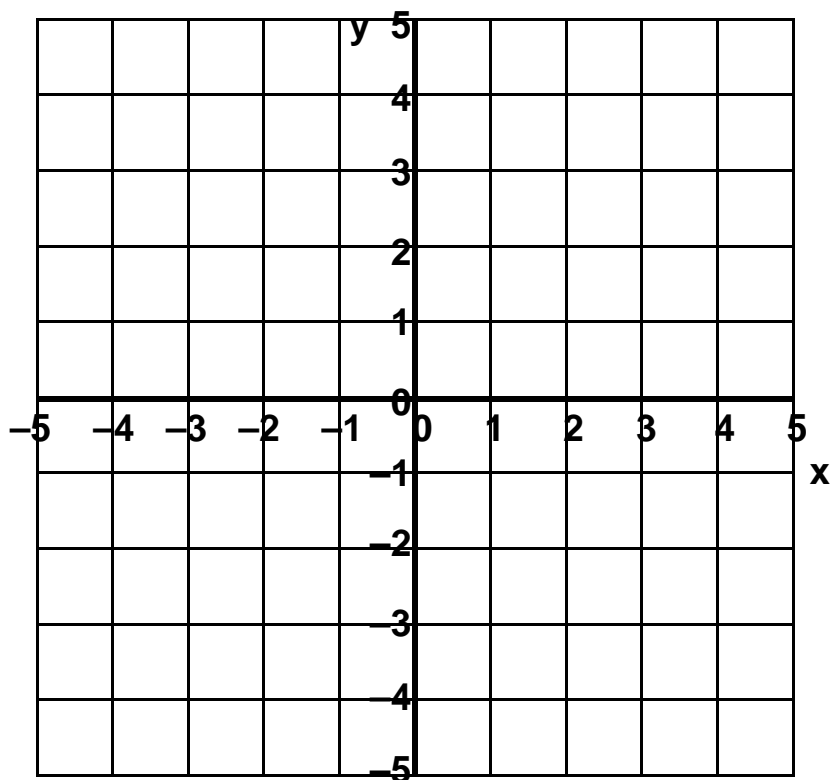
Make two drawings of your own. Write down the co-ordinates of each.



**Co-ordinates:**



**Co-ordinates:**



Draw this polygon on the grid:

(3,1) (5,1) (5,2) (4,2) (4,4) (1,4) What is it called?

Mark the parallel sides with arrows.

Reflect the shape in the y-axis. Write down the co-ordinates of the reflection.

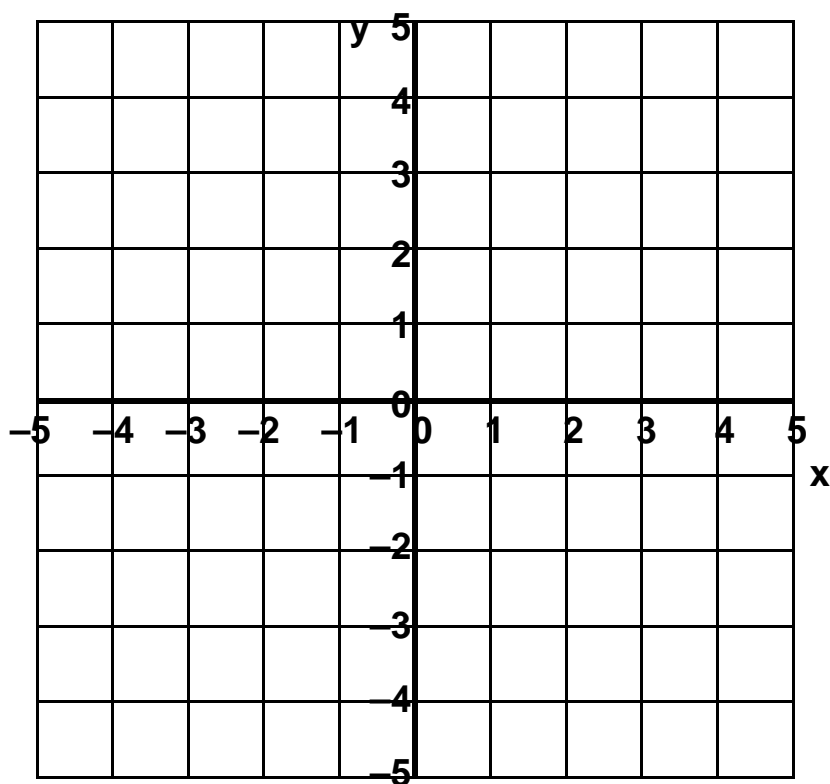
( , ) ( , ) ( , ) ( , ) ( , ) ( , )

Now reflect the first shape in the x-axis. Write down the co-ordinates of this reflection.

( , ) ( , ) ( , ) ( , ) ( , ) ( , )

What do you notice about the co-ordinates?





Draw this shape on the grid:

(0,0) (2,2) (4,2) (4,4) (2,4) (2,2)

Mark the parallel sides with arrows.

Reflect the shape in the y-axis. Write down the co-ordinates of the reflection.

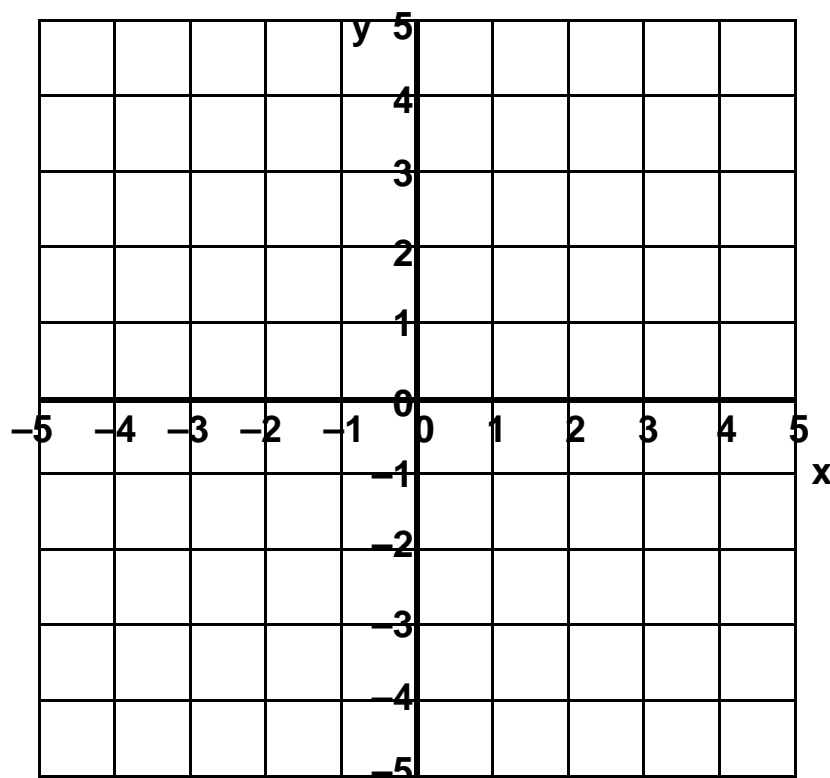
( , ) ( , ) ( , ) ( , ) ( , ) ( , )

Now reflect the first shape in the x-axis. Write down the co-ordinates of this reflection.

( , ) ( , ) ( , ) ( , ) ( , ) ( , )

What do you notice about the co-ordinates?

Can you complete the pattern in all four quadrants? What do you need to do?



Draw this shape on the grid:

(2,0) (3,0) (3,-1) (4,-1) (4,-4) (1,-4) (1,-3) (0,-3) (0,-2) (1,-2) (1,-1)  
(2,-1) (2,0)

Reflect the shape in the x-axis. Write down the co-ordinates of the reflection.

( , ) ( , ) ( , ) ( , ) ( , ) ( , ) ( , )  
( , ) ( , ) ( , ) ( , ) ( , ) ( , )

Now reflect the first shape in the y-axis. Write down the co-ordinates of this reflection.

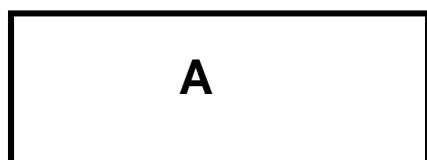
( , ) ( , ) ( , ) ( , ) ( , ) ( , ) ( , )  
( , ) ( , ) ( , ) ( , ) ( , ) ( , )

Can you complete the pattern in all four quadrants? What do you need to do?

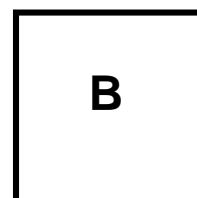
Name these quadrilaterals.

Mark the parallel lines in them with arrows.

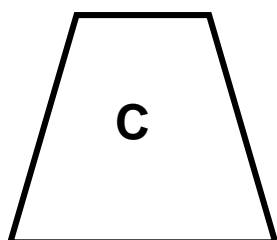
Colour the perpendicular lines (those at right angles to each other).



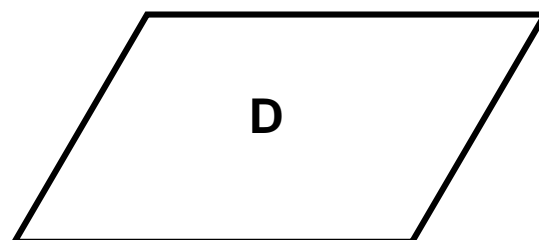
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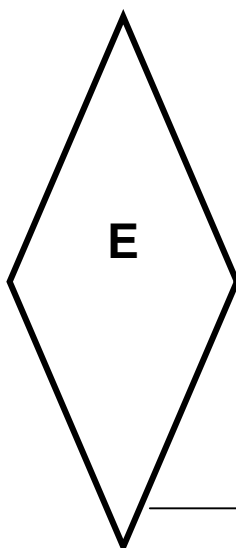
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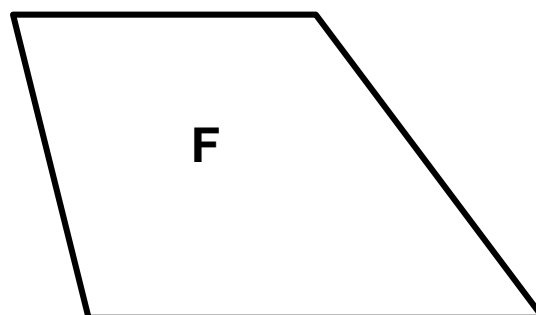
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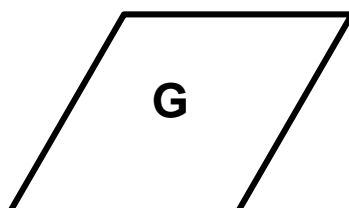
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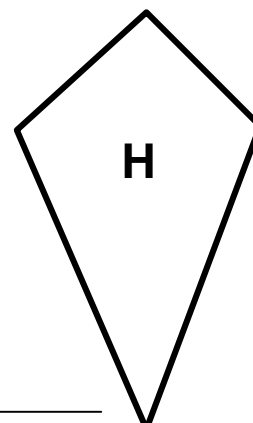
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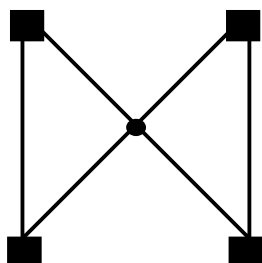


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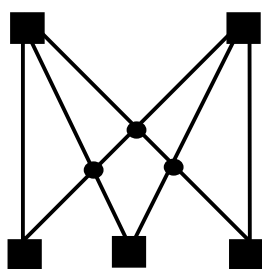
Two points at the top of a diagram are joined to two points at the bottom.



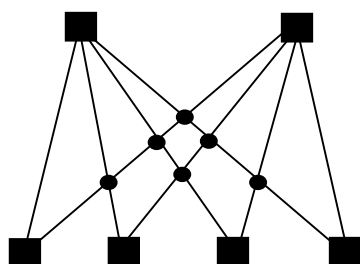
Put a dot where the lines intersect.  
How many intersections are there?

Why, just one of course!

How many intersections are there when there are three points at the bottom of the diagram?



Continue this for four points at the bottom, five points and so on.



Number of points at the bottom	Number of intersections

Keep going until you have six points at the bottom.

Put your results in the table.

What pattern do you notice?

Can you complete the pattern for up to ten dots without drawing the diagrams?

**Answers**

<p><b>Page 3</b>  <b>B</b>(2,0) <b>C</b>(3,2) <b>D</b>(5,5) <b>F</b>(0,2) <b>G</b>(-1,3)  <b>I</b>(-2,4) <b>J</b>(-4,0) <b>L</b>(-4,4)</p>	<p><b>Page 9</b>  (0,0) (-2,2) (-4,2) (-4,4) (-2,4) (-2,2)  (0,0) (2,-2) (4,-2) (4,-4) (2,-4) (2,-2)  When the shape is reflected in the y-axis,  the first number in each co-ordinate  becomes negative.  When the shape is reflected in the x-axis,  the second number in each co-ordinate  becomes negative.  To complete the pattern either a) the first  reflection must be reflected in the x-axis or  b) the second reflection must be reflected in  the y-axis.</p>																				
<p><b>Page 4</b>  Shape is a sailing boat with sail displaced to  the right.  (-4,2) (-5,2) (-4,1) (-2,1) (-1,2)  (-4,2) (-4,5) (-2,3) (-6,3) (-4,5)  (Not necessarily in this order)</p>	<p><b>Page 10</b>  (2,0) (3,0) (3,1) (4,1) (4,4) (1,4) (1,3)  (0,3) (0,2) (1,2) (1,1) (2,1) (2,0)   (-2,0) (-3,0) (-3,-1) (-4,-1) (-4,-4)  (-1,-4) (-1,-3) (0,-3) (0,-2) (-1,-2)  (-1,-1) (-2,-1) (-2,0)   To complete the pattern either a) the first  reflection must be reflected in the y-axis or  b) the second reflection must be reflected in  the x-axis.</p>																				
<p><b>Page 6</b>  The drawing is a simplified digger.</p>	<p><b>Page 11</b>  <b>A</b> Rectangle      <b>B</b> Square  <b>C</b> Trapezium      <b>D</b> Parallelogram  <b>E</b> Parallelogram <b>F</b> Trapezium  <b>G</b> Rhombus      <b>H</b> Kite</p>																				
<p><b>Page 8</b>  The shape is a hexagon.  (-3,1) (-5,1) (-5,2) (-4,2) (-4,4) (-1,4)   (3,-1) (5,-1) (5,-2) (4,-2) (4,-4) (1,-4)   When the shape is reflected in the y-axis,  the first number in each co-ordinate  becomes negative.  When the shape is reflected in the x-axis,  the second number in each co-ordinate  becomes negative.</p>	<p><b>Page 12</b></p> <table> <tr> <th>Number of points</th><th>Number of intersections</th></tr> <tr><td>2</td><td>1</td></tr> <tr><td>3</td><td>3</td></tr> <tr><td>4</td><td>6</td></tr> <tr><td>5</td><td>10</td></tr> <tr><td>6</td><td>15</td></tr> <tr><td>7</td><td>21</td></tr> <tr><td>8</td><td>28</td></tr> <tr><td>9</td><td>36</td></tr> <tr><td>10</td><td>45</td></tr> </table>	Number of points	Number of intersections	2	1	3	3	4	6	5	10	6	15	7	21	8	28	9	36	10	45
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2	1																				
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