

## **Wits Maths Connect Secondary Project**

### **Card-sorting Activities**



This pack consists of 3 card-sorting activities which focus on working with different representations. Activities 1 and 2 focus on points while Activity 3 focuses on the linear function. The activities are aimed at Grade 9 level but could be used for different purposes at Grade 8 and 10 level. We believe the activities help learners to make connections between different representations of the same mathematical object. The following representations are included:

- Verbal representation – a rule/relationship is described in words. In the case of Activity 2 and 3, this rule describes the relationship between the input value and the output value.
- Algebraic representation – the relationship is expressed in algebraic notation such as an equation or formula.
- Numeric representation – the representation includes numeric values. We have used coordinate pairs and tables of values as example of numeric representations. In Activity 1 points have been placed in the table with x-values in the top row and y-values in the bottom row. Learners must see that the numbers in a column belong to the same coordinate pair. Learners must be able to work with coordinate pairs, knowing that the first number represents the x-coordinate and the second number represents the y-coordinate.
- Graphical representation – involves graphs or points on a set of axes. In Activity 1 and 2 points have been plotted on sets of axes, and each point is labelled. In Activity 3 graphs have been drawn.

### **Activity 1**

This activity focuses on linking representations of points. There are 4 sets of points, and 3 representations for each set – coordinate pairs, table, points on set of axes. There is no rule that applies to all the points in a set. The points have deliberately not been ordered from smallest x-value to largest x-value in the table. The cards have been numbered to help the teacher and learners to talk about them. It's much easier for learners to understand the instruction "pick up card 12" than "pick up the card with negative 4 for the first x-value". Solutions are provided for the teacher.

### **Activity 2**

This activity focuses on linking representations where there is a relationship between the x-value and y-values. There are 3 different representations: verbal, numeric and graphical. There are 2 different numeric forms – coordinate pairs and tables. So there are 4 representations for each set of points. The arrangement of the cards on the master sheet shows the solution – each of the 3 columns contains all 4 representations for a set of points. Note that there are no blank cards in this set.

The task can be extended by asking learners to make up their own point that satisfies the given rule. They must then represent the point as a coordinate pair, in the table, and on the set of axes.

### **Activity 3**

This activity focuses on linking representations of linear functions. There are 4 different representations: verbal, algebraic, numeric and graphical. The arrangement of the cards on the master sheet shows the solution. Note that the columns are spread over several pages. Each column is identical. There is one blank card for each representation. Learners must complete the blank card for each representation.

This task can be extended by asking learners to focus on all the cards for a particular representation and to study them more carefully. For example, ask them questions such as: Can you see the gradient in the tables? Can you get the intercepts from the tables? Can you see the gradient in the graphical representation?

## **Using the card activities with learners**

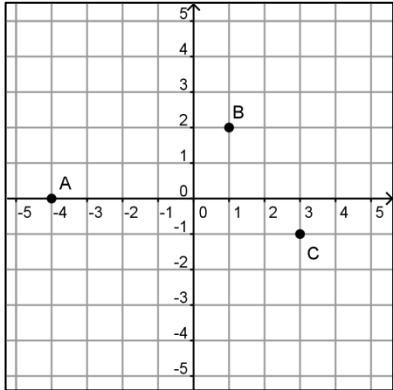
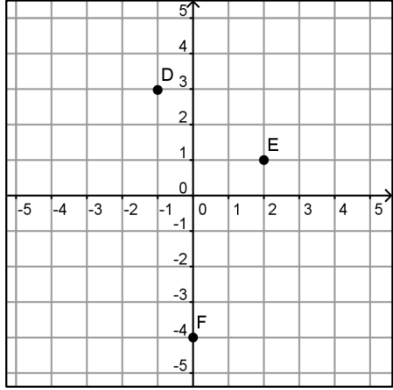
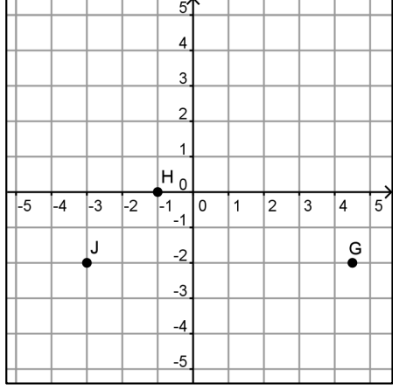
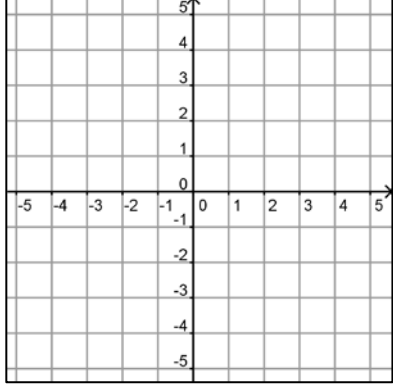
### **Preparing to use the cards**

- 1) Make copies of the master sheet.
- 2) Cut up the cards on each page. Mix up the cards and place them in an envelope. Make sure that all cards from a set have been included.

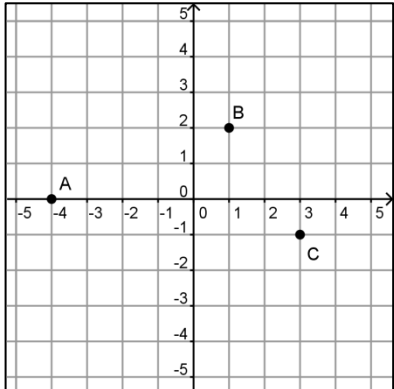
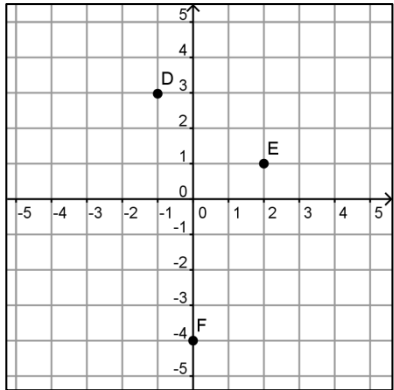
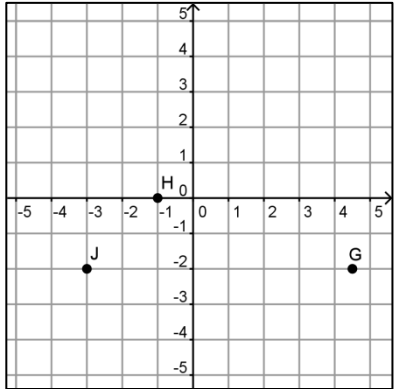
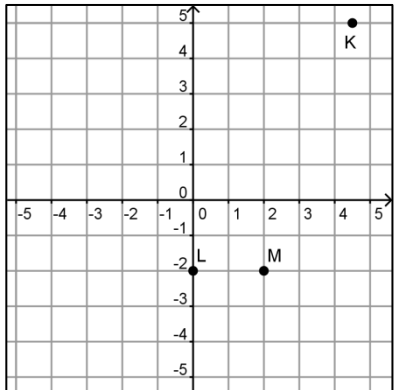
### **Doing the task with learners**

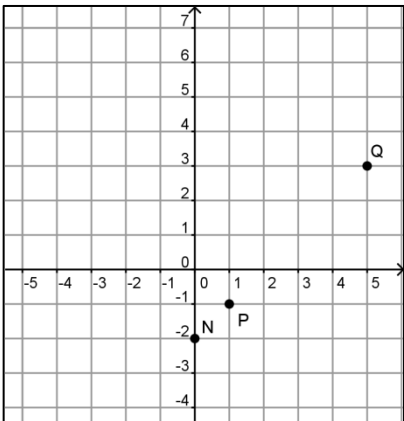
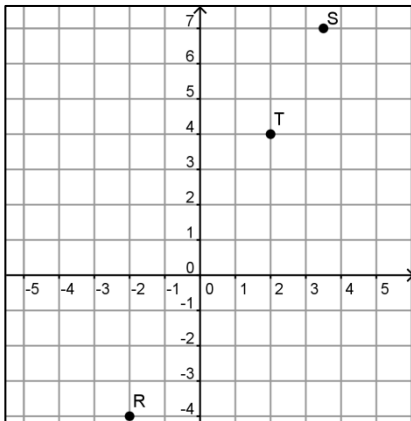
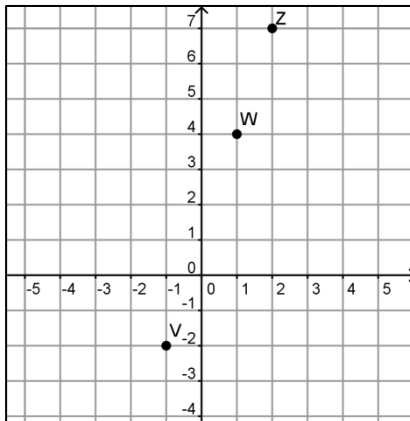
- 1) Learners should work in groups of 2-4.
- 2) Give each group one envelope and ask them to take out all the cards and place them face up.
- 3) Explain the task to learners. Here is an example for Activity 1:
  - There are 4 sets of cards.
  - Each set has 3 different representations – coordinate pairs, table, points on a set of axes.
  - They must make 4 piles of 3 cards that contain the same points. In each pile there will be a card for each representation.
  - In each set, one card has been left “blank”. They must complete the missing representation.
  - Each table contains an empty column. They should choose a new point and represent it in all 3 ways - in the table, as a coordinate pair and on the set of axes. They should label it with a letter that has not been used.

Card sorting activity 1

<p>1</p> <p style="text-align: center;"><b>( 1 ; 2 )</b> <b>( -4 ; 0 )</b> <b>( 3 ; -1 )</b></p>	<p>12</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tbody> <tr> <td style="width: 12.5%;"><b>x</b></td> <td style="width: 12.5%;">-4</td> <td style="width: 12.5%;">1</td> <td style="width: 12.5%;">3</td> <td style="width: 12.5%;"></td> </tr> <tr> <td><b>y</b></td> <td>0</td> <td>2</td> <td>-1</td> <td></td> </tr> </tbody> </table>	<b>x</b>	-4	1	3		<b>y</b>	0	2	-1		<p>5</p> 
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<b>y</b>	0	2	-1									
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Card sorting activity 1: Solutions

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<p>9</p> <p>The input is two more than the output</p>	<p>8</p> <p>The output is double the input</p>	<p>1</p> <p>To get the output you multiply the input by 3 and then add 1</p>																								
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Card sorting activity 3

1 <b>Equation</b>	1 <b>Equation</b>	1 <b>Equation</b>
4 $y = \frac{1}{2}x$	4 $y = \frac{1}{2}x$	4 $y = \frac{1}{2}x$
15 $y = -x + 1$	15 $y = -x + 1$	15 $y = -x + 1$
2 $y = -2x + 1$	2 $y = -2x + 1$	2 $y = -2x + 1$
24 $x + y = 2$	24 $x + y = 2$	24 $x + y = 2$

Card sorting activity 3

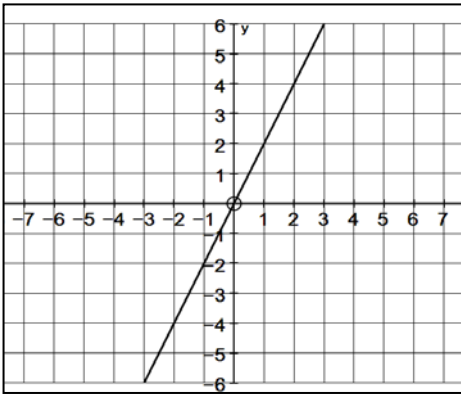
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<b>x</b>	-2	-1	0	1	2	3																																						
<b>y</b>	5	3	1	-1	-3	-5																																						
<p>7</p> <table border="1" data-bbox="185 1800 469 1899"> <tr> <td><b>x</b></td> <td>-4</td> <td>0</td> <td>2</td> </tr> <tr> <td><b>y</b></td> <td>6</td> <td>2</td> <td>0</td> </tr> </table>	<b>x</b>	-4	0	2	<b>y</b>	6	2	0	<p>7</p> <table border="1" data-bbox="568 1800 852 1899"> <tr> <td><b>x</b></td> <td>-4</td> <td>0</td> <td>2</td> </tr> <tr> <td><b>y</b></td> <td>6</td> <td>2</td> <td>0</td> </tr> </table>	<b>x</b>	-4	0	2	<b>y</b>	6	2	0	<p>7</p> <table border="1" data-bbox="983 1800 1267 1899"> <tr> <td><b>x</b></td> <td>-4</td> <td>0</td> <td>2</td> </tr> <tr> <td><b>y</b></td> <td>6</td> <td>2</td> <td>0</td> </tr> </table>	<b>x</b>	-4	0	2	<b>y</b>	6	2	0																		
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<b>y</b>	6	2	0																																									
<b>x</b>	-4	0	2																																									
<b>y</b>	6	2	0																																									

Card sorting activity 3

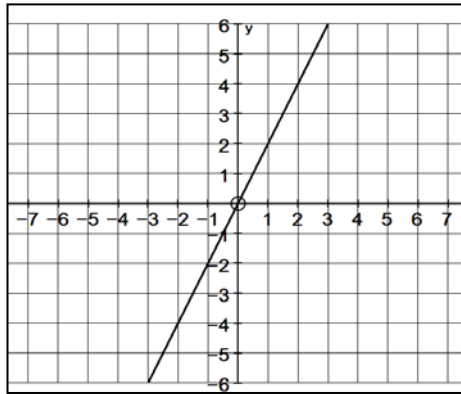
16 <b>y is double x</b>	16 <b>y is double x</b>	16 <b>y is double x</b>
3 <b>To get the output you halve the input</b>	3 <b>To get the output you halve the input</b>	3 <b>To get the output you halve the input</b>
10 <b>Verbal</b>	10 <b>Verbal</b>	10 <b>Verbal</b>
18 <b>Double the input, multiply by negative 1, then increase by 1</b>	18 <b>Double the input, multiply by negative 1, then increase by 1</b>	18 <b>Double the input, multiply by negative 1, then increase by 1</b>
19 <b>The sum of x and y is 2</b>	19 <b>The sum of x and y is 2</b>	19 <b>The sum of x and y is 2</b>



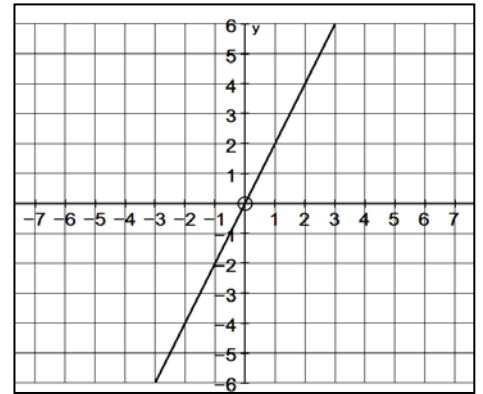
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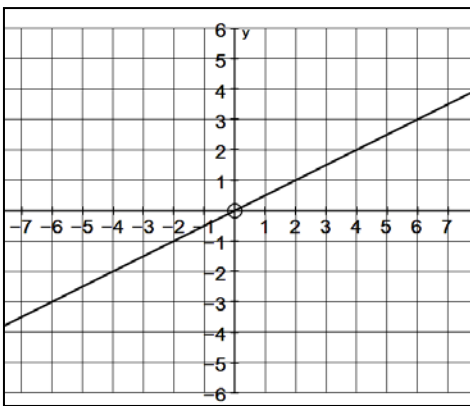
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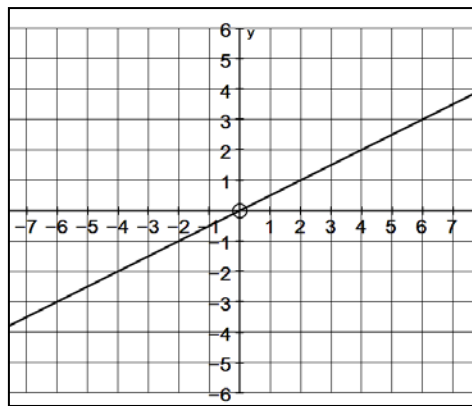
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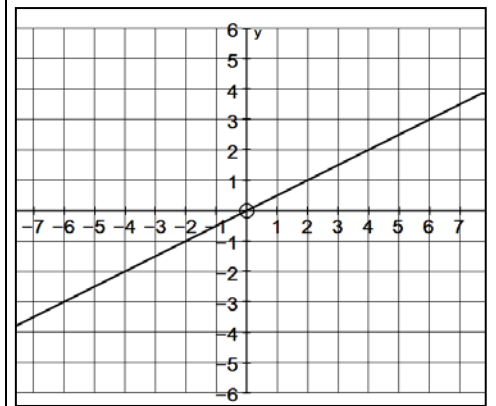
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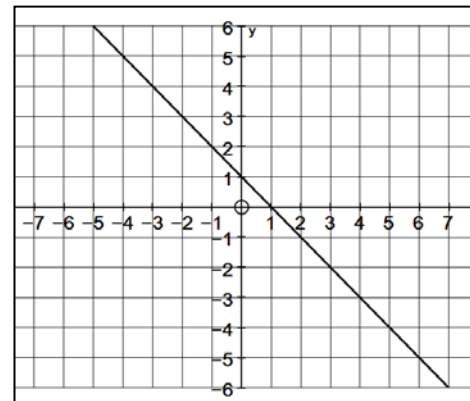
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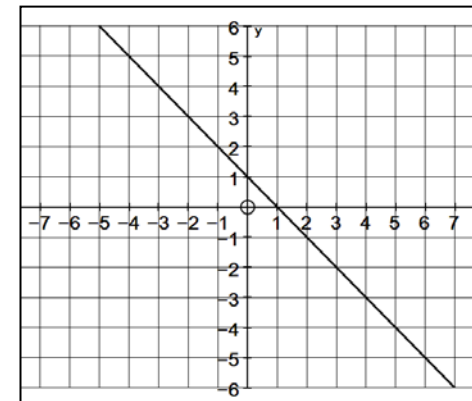
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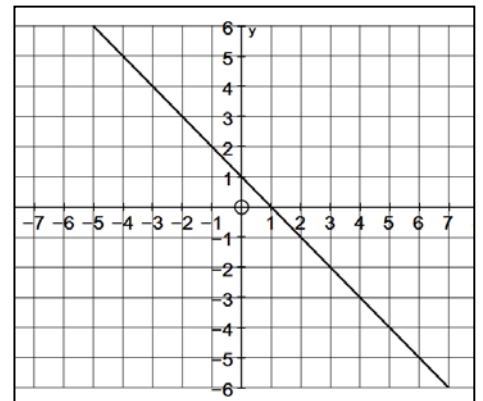
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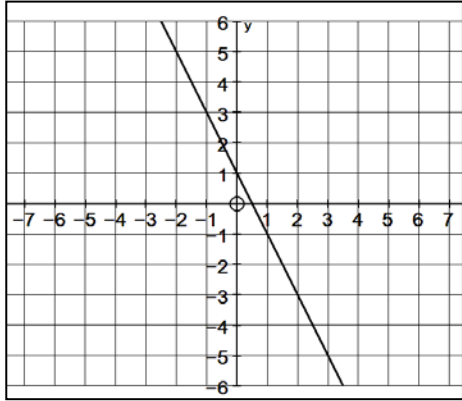


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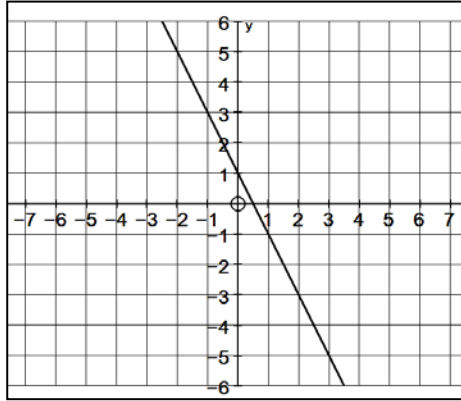


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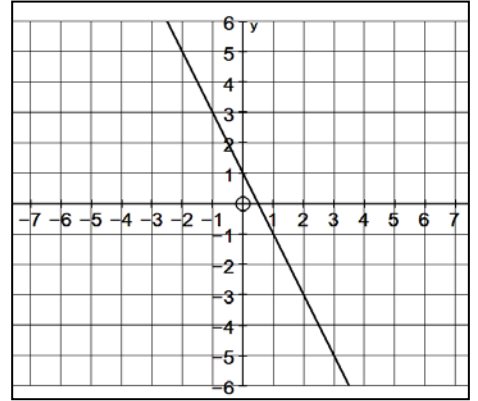
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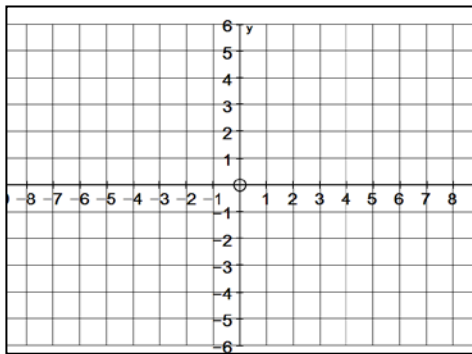
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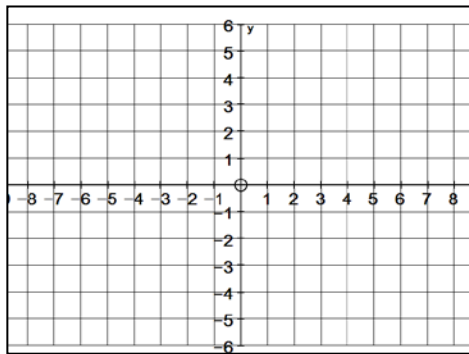
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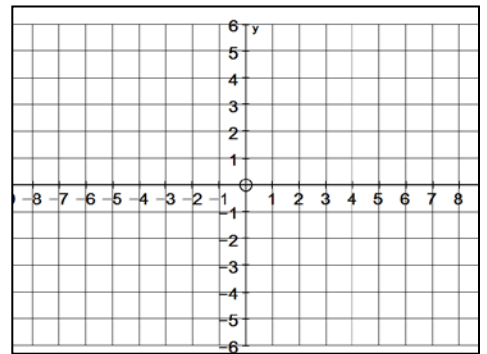
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13



13



13