

**EVALUATING  
ACADEMIC READINESS  
FOR APPRENTICESHIP TRAINING**  
Revised for  
**ACCESS TO APPRENTICESHIP**

**MATHEMATICS SKILLS  
CARTESIAN CO-ORDINATE SYSTEM**

**AN ACADEMIC SKILLS MANUAL  
for  
The Metal Work Trades**

This trade group includes the following trades:  
Heat & Frost Insulator, Iron Worker,  
Precision Metal Fabricator, Sheet Metal Worker, and  
Welder & Fitter

*Workplace Support Services Branch  
Ontario Ministry of Training, Colleges and Universities*

*Revised 2011*

In preparing these Academic Skills Manuals we have used passages, diagrams and questions similar to those an apprentice might find in a text, guide or trade manual.

**This trade related material is not intended to instruct you in your trade. It is used only to demonstrate how understanding an academic skill will help you find and use the information you need.**

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# MATHEMATICS SKILLS

## CARTESIAN CO-ORDINATE SYSTEM

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*An academic skill required for the study of the  
Metal Work Trades*

Graphs help us to visualize information so we can see the relationships between different, but related measurements. A special kind of graph called a grid shows the relationship between two different sets of numbers or measurements. Usually the information used on the grid comes from a table that lists the two sets of numbers or measurements in a way that shows the connection between them.

### *The Co-Ordinate System*

A **grid** system is used to locate points on a graph. A **grid** consists of a horizontal line crossed by a vertical line.

Graph 1, below, shows a grid.

- ◆ The horizontal line is called the **x-axis**.
- ◆ The vertical line is called the **y-axis**.
- ◆ The x-axis represents one set of measurements and the y-axis represents another set.

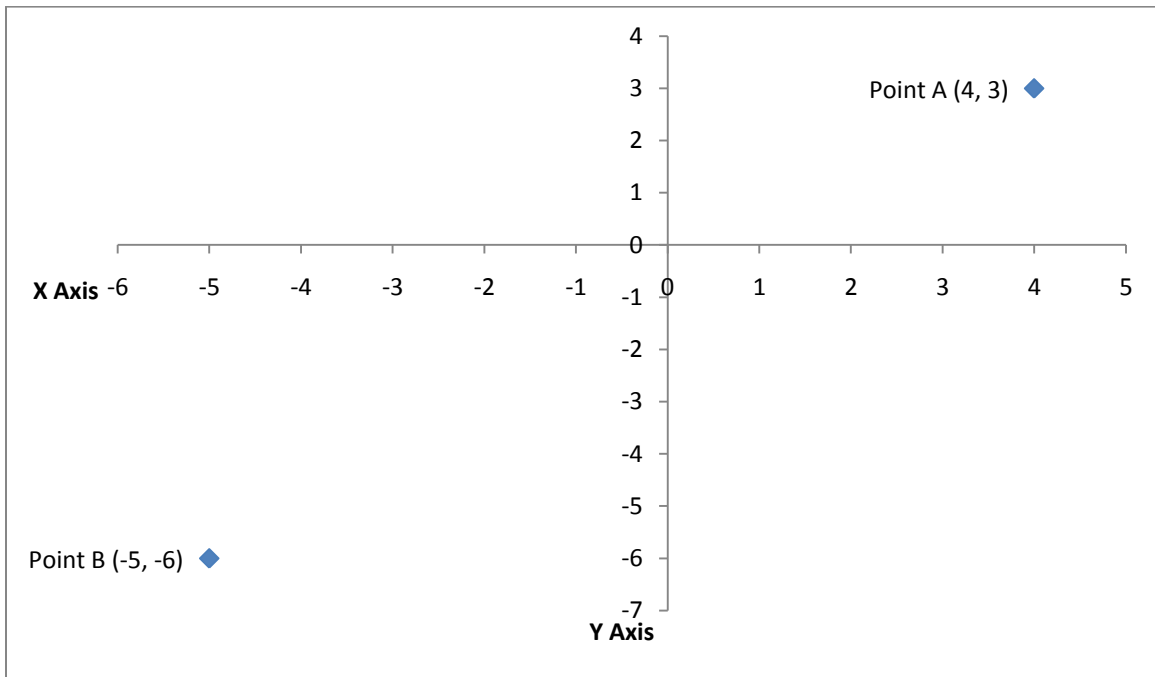
The x- and y-axis each have a **scale**, a graduated series of numbers that include the measurements of the quantities used on the graph.

The point where the x and y-axis cross, called the point of intersection or the **origin**, usually has the value of 0.

- ◆ Numbers to the right of 0 on the x-axis are positive, while numbers to the left of the origin are negative.
- ◆ Numbers above 0 on the y-axis are positive, while numbers below the origin are negative.

Often only positive quantities are shown on a graph.

- A graph like this will not show negative numbers.
- The y-axis will be at the left hand side and the x-axis is at the bottom of the graph.



**GRAPH 1: A grid with an X axis and a Y axis**

### Points on a grid

A vertical line can be drawn from any point on the x-axis to meet a horizontal line drawn from any point on the y-axis. *Where the two lines meet, a **point** is formed on the grid.*

- A point can be formed at every place where a vertical line from the x-axis crosses a horizontal line extending from the y-axis,.

### Coordinates

Every point has two **coordinates** that describe where, on the graph, each point is:

- The first coordinate shows the measurement on the x-axis.
- The second shows the measurement on the y-axis.
- Point coordinates are listed inside brackets.

**Example:** Look back to Graph 1. Point A on the graph is listed as Point A (4, 3).

1. If you look down to the x axis below Point A, you will see the point is directly above 4 on the axis.
  - 4 is the x coordinate.
2. If you look across to the Y axis you will see that Point G is directly across from the 3.
  - 3 is the y coordinate.

Point A (4,3) is the point where 4 is the x co-ordinate and 5 is the y co-ordinate.

### Plotting points on a grid

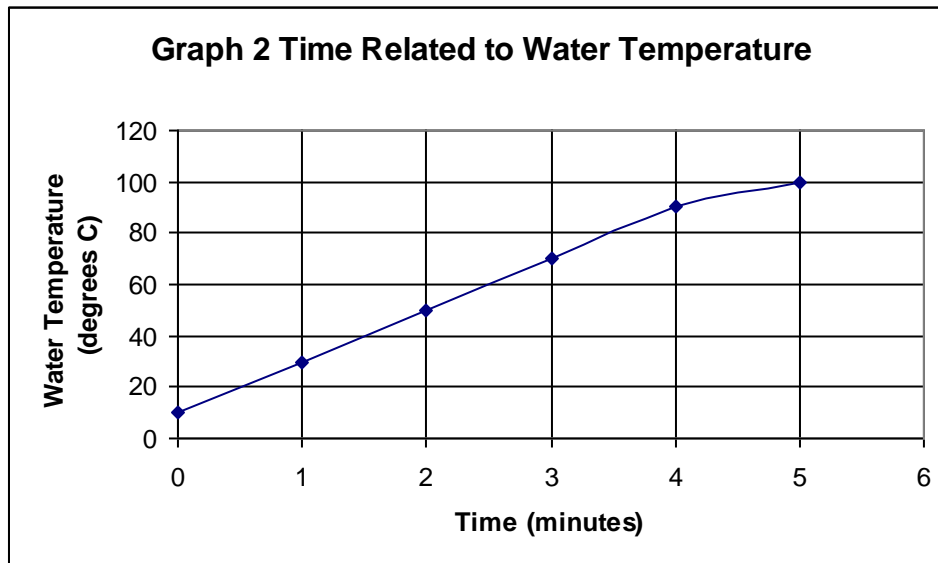
In general, the information that is used to form the points on a grid comes from a table. The table will list two sets of numbers or measurements in a way that shows the connection between them.

**Example:** Say you fill an electric kettle with water and plug it in. You could measure the temperature of the water in the kettle every minute, starting at time 0 minutes until the water boils. A table could be made recording the temperature at the different minute intervals.

The table, which relates the water temperature to the number of minutes the kettle has been plugged in, might look like this:

no. of minutes	temperature of water
0 min	10° C
1 min	30° C
2 min	50° C
3 min	70° C
4 min	90° C
5 min	100° C

These points can be placed on a grid with an x and y-axis, like this:



The grid shows the horizontal x-axis and the vertical y-axis. The scale of the x-axis shows the time in minutes. The scale of the y-axis shows the temperature in °C.

- Notice that the y scale is smaller or closer together than the x scale on the graph.
- Also note that only positive values are shown in this graph.

The points are plotted on the grid like this: look at final point on the graph

- It relates the temperature  $100^{\circ}\text{C}$  to the time 5 minutes.
  - The grid shows that at the time 5 minutes, the temperature of the water in the kettle is  $100^{\circ}\text{C}$ .
  - This point has an x coordinate, 5 min, and a y coordinate,  $100^{\circ}\text{C}$ . The point is listed as (5 min,  $100^{\circ}\text{C}$ ).

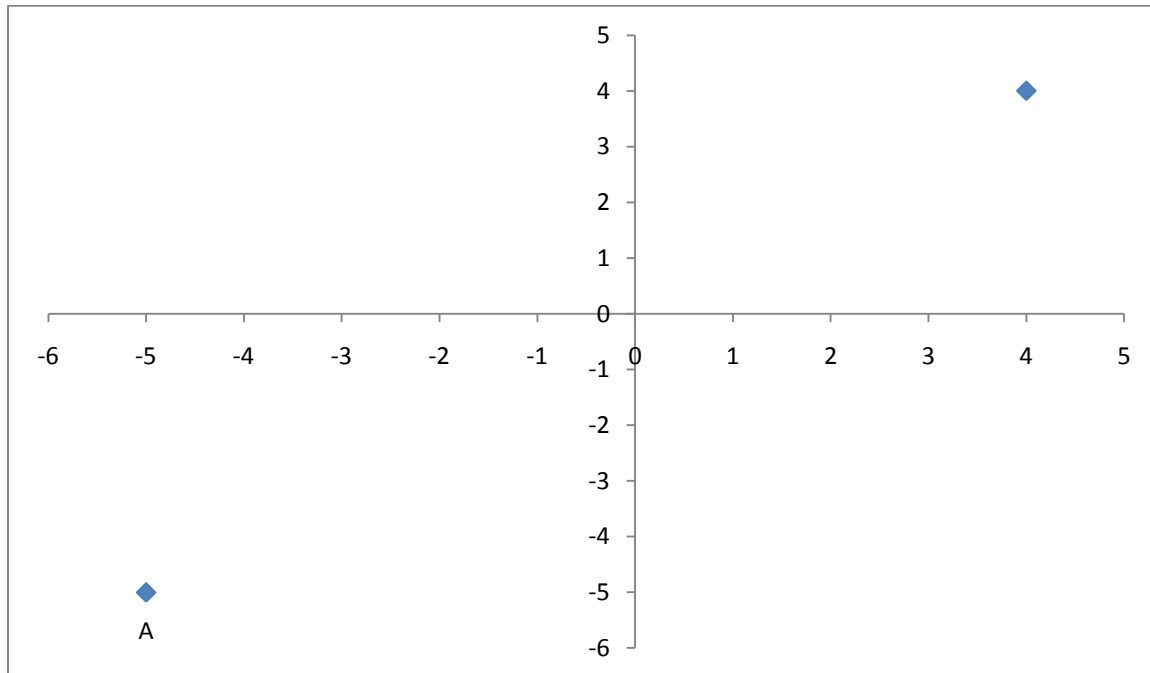
### **Finding a point on a grid without a table**

The x and y scales on a grid can also be simple number intervals without any measurements. In this case, a point would be listed first by the number of the x co-ordinate and then the number of the y co-ordinate. A point might be listed as (2, 50). To find this point on the grid, you would draw a vertical line extending from the number 2 on the x-axis. Then you would draw a horizontal line extending from the number 50 on the y-axis and the point (2, 50) is where the two lines meet.

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**Answer the questions based on the graphs shown. Answers are on the last page.**

1. a) Give the coordinates of Point A, located on the Graph below.  
b) Find the location and draw point C (3, -2) on the Graph below.



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**ANSWER PAGE**

1. a) The x co-ordinate of point A is -5 and the y co-ordinate is -6.  
The location of Point A is (-5, -6).

b) The location of Point C (3, -2) is shown below.

