



## Graphing tool – Year 7

### Objectives

#### 3.1 Equations, formulae, expressions and identities

- Use simple formulae from mathematics and other subjects; substitute positive integers into linear expressions and formulae and, in simple cases, derive a formula.

#### 3.2 Sequences, functions and graphs

- Generate coordinate pairs that satisfy a simple linear rule; plot the graphs of simple linear functions, where  $y$  is given explicitly in terms of  $x$ , on paper and using ICT; recognise straight-line graphs parallel to the  $x$ -axis or  $y$ -axis.
- Plot and interpret the graphs of simple linear functions arising from real-life situations, e.g. conversion graphs.

#### 4.2 Transformations and coordinates

- Use conventions and notation for 2-D coordinates in all four quadrants; find coordinates of points determined by geometric information.

## 1. Coordinates in four quadrants

**Configuration panel settings: select y axis minimum value as 0.**

- a) Move points onto the graph by pressing on the X next to the bin and dragging them into position. You can show their coordinates by pressing on the point again. Once the coordinates are showing you can drag them into the table.

**Configuration panel settings: select 10 and –10 as the maximum and minimum x and y axis values.**

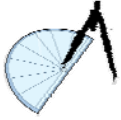
- b) Drag points into all four quadrants of the graph. Ask students to position sets of coordinates on the graph to make sure they can reason which part of the graph each pair should lie in, e.g. (2,3), (-2,3), (2,-3), (-2,-3).
- c) Drag two points onto the graph and ask the class to say where you could put two more points so that they connect up to form a square, rectangle etc. For shapes with only horizontal and vertical sides, ask the perimeter and area.

## 2. Straight lines

**Configuration panel settings: select 2 formulae and 10 and 0 as the maximum and minimum x and y axis values; select formula types  $y = \text{constant}$  and  $x = \text{constant}$ .**

Use the number scrollers to change the constant in the  $x = c$  equation, then press “draw line”. Students should be able to reason that all values of  $c$  are parallel to each other and the  $y$  axis. Repeat for the equation  $y = c$ .

Ask the class to find coordinate pairs that fall on each line. Test whether these coordinates fall on the line by dragging points from the side. If they are correct, drag the coordinates into the table. Drag incorrect points into the bin.



## Graphing tool – Year 8

### Objectives

#### 3.1 Equations, formulae, expressions and identities

- Use graphs and set up equations to solve simple problems involving direct proportion.

#### 3.2 Sequences, functions and graphs

- Generate points in all four quadrants and plot the graphs of linear functions, where  $y$  is given explicitly in terms of  $x$ , on paper and using ICT; recognise that equations of the form  $y = mx + c$  correspond to straight-line graphs.
- Construct linear functions arising from real-life problems and plot their corresponding graphs; discuss and interpret graphs arising from real situations, e.g. distance–time graphs.

#### 4.2 Transformations and coordinates

- Find the midpoint of the line segment AB, given the coordinates of points A and B.

### 1. Gradient of a line

**Configuration panel settings: select 10 and –10 as the maximum and minimum values for the  $x$  and  $y$  axes, 2 formulae, both linear; deselect “show table”.**

- a) Use the number scrollers to change the constants in both equations to 0 and display a number of equations of the form  $y = mx$ . Encourage students to reason the effect of  $m$  as the gradient in the linear equation, at first using positive values for  $m$  to establish gradient, then using negative values for  $m$  to establish direction.

To demonstrate the effect of the constant in the equation, set up both equations with a fixed value for  $m$  and then use the number scrollers to change  $c$  to different values.



## Graphing tool – Year 9

### Objectives

#### 3.1 Equations, formulae, expressions and identities

- Construct and solve linear equations with integer coefficients (with and without brackets, negative signs anywhere in the equation, positive or negative solution).
- Use algebraic methods to solve problems involving direct proportion; relate algebraic solutions to graphs of the equations; use ICT as appropriate.
- Use systematic trial and improvement methods and ICT tools to find approximate solutions to equations such as  $x^2 + x = 20$ .
- Use formulae from mathematics and other subjects; substitute numbers into expressions and formulae; derive a formula and, in simple cases, change its subject.

#### 3.2 Sequences, functions and graphs

- Find the inverse of a linear function.
- Generate points and plot graphs of linear functions, where  $y$  is given implicitly in terms of  $x$  (e.g.  $ay + bx = 0$ ,  $y + bx + c = 0$ ), on paper and using ICT; find the gradient of lines given by equations of the form  $y = mx + c$ , given values for  $m$  and  $c$ .
- Construct functions arising from real-life problems and plot their corresponding graphs; interpret graphs arising from real situations, e.g. time series graphs.

## 1. Linear functions

**Configuration panel settings: select 10 and –10 as the maximum and minimum values for the x and y axes, 2 formulae, both linear; deselect “show table”.**

- a) Use the number scrollers to show the graph  $y = 2x$  and draw the line. Use the vertical line from the second equation as a guide for counting vertical against horizontal steps and determine the gradient. For example, draw the line  $x = 4$  and use this to show that the graph with gradient 2 goes twice as far in the  $y$  direction as in the  $x$  direction. Repeat with a range of values for  $m$ .

**Configuration panel settings: select “show table”.**

- b) Write a linear equation of the form  $ay + bx + c = 0$  on the board and derive some coordinate pairs that lie on the line. Press the bin to remove any lines from the graph and drag points onto the graph (from the X next to the bin) to plot these coordinate pairs. Press on the points to show the coordinates and drag these into the table.

Once you have plotted three points press “draw line” to show a straight line and demonstrate the set of other solutions to the equation.

Find the values of  $m$  and  $c$  (for the graph written in the form  $y = mx + c$ ) and test whether this is correct by selecting a matching equation with the number scrollers. Draw this line and check that it is the same line as the one you drew manually.