Straight Line Graphs

\[ y = mx + c \]
STRAIGHT LINE GRAPHS

Aim
The aim of this topic is to investigate linear functions of the form:

\[ y = mx + c. \]

Objectives

Mathematical objectives
By the end of this topic you should know:

• how to describe and sketch a straight line by observation of its equation.
• how to calculate the gradient and y-intercept of a function.
• the transformation effects of varying the values of \( m \) and \( c \).

Calculator objectives
By the end of this topic you should:

• be able to graph functions via [Y=].
• be able to draw graphs of straight lines using appropriate settings, in different graph types.
• be able to obtain a table of values from the TI-83.
• be able to execute (run) a program stored on the TI-83.

STUDENT TASK

1. Read the Calculator Skills Sheet (page 3) carefully before you start, this will ensure that your TI-83 will function correctly.

2. On the worksheets (page 4 -7), for each of the given equations you must:
   i. complete the table of values,
   ii. sketch the graph (use a different colour for each of the graphs on a page),
   iii. calculate the gradient,
   iv. note the point where the graph cuts the y-axis,(y-intercept)

3. Using the information you have noted, complete the statements at the bottom of the pages.

4. On the last page you are given a table of values that represent a straight line, you must find the equation of the line.
STRAIGHT LINE GRAPHS

Calculator skills sheet

Before we can start on this topic we must first ensure that your TI-83 is in the correct MODE and that the STAT PLOTS are switched off, this ensures that the TI-83 and is going to operate as we want it to.

1. Press the 2nd and STAT buttons. The display will look like this.
   Choose 4:PlotsOff and press ENTER.
   Now press ENTER again.
   The operation is DONE.

2. Press the MODE button.
   The display should look exactly like this.
   If it does not look like this, then using the cursor keys highlight the correct item in each line and press ENTER to change the selection.
   Notice: There can only be one item in each line highlighted.

3. Now press the ZOOM and 6. This sets the window range to a built in setting which will accommodate all the work in this unit.

4. Press the 2nd and FORMAT . This takes you to the WINDOW FORMAT screen.
   It should look like this.
   If it does not then using the cursor keys highlight the correct item in each line and press ENTER.
   Once the screen looks like this press CLEAR.
   Notice: There can only be one item in each line highlighted.
<table>
<thead>
<tr>
<th>Function</th>
<th>Table of Values</th>
<th>Gradient</th>
<th>Cuts the $y$-axis at</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y = x$</td>
<td>$x$</td>
<td>-3 -2 -1 0 1 2 3 4</td>
<td></td>
</tr>
<tr>
<td>$y = 2x$</td>
<td>$x$</td>
<td>-3 -2 -1 0 1 2 3 4</td>
<td></td>
</tr>
<tr>
<td>$y = 3x$</td>
<td>$x$</td>
<td>-3 -2 -1 0 1 2 3 4</td>
<td></td>
</tr>
<tr>
<td>$y = \frac{1}{2}x$</td>
<td>$x$</td>
<td>-3 -2 -1 0 1 2 3 4</td>
<td></td>
</tr>
</tbody>
</table>

**How do I get a table of values from the calculator?**
See Calculator Hint Sheet 3

**How do I get a draw a graph on the calculator?**
See Calculator Hint Sheet 2
Complete these statements.
In equations of the form \( y = mx \) changing the value of \( m \) changes the ________ of the line.
If \( m \) is positive then the line slopes ____________________________
If \( m \) is negative then the line slopes ____________________________
The larger the value of \( m \) the ____________________________

<table>
<thead>
<tr>
<th>Function</th>
<th>Table of Values</th>
<th>Gradient</th>
<th>Cuts the y-axis at</th>
</tr>
</thead>
</table>
| 5. \( y = -x \) | \( \begin{array}{c|c}
  x & y \\
  \hline
  & \\
\end{array} \) | | |
| 6. \( y = -2x \) | \( \begin{array}{c|c}
  x & y \\
  \hline
  & \\
\end{array} \) | | |
| 7. \( y = -3x \) | \( \begin{array}{c|c}
  x & y \\
  \hline
  & \\
\end{array} \) | | |
| 8. \( y = -\frac{1}{2}x \) | \( \begin{array}{c|c}
  x & y \\
  \hline
  & \\
\end{array} \) | | |
Complete these statements:
In equations of the form \( y = x + c \) changing the value of \( c \), changes were the line cuts the ____________.

If \( c \) is positive then the line cuts the \( y \)-axis ________________________________

If \( c \) is negative then the line cuts the \( y \)-axis ________________________________

<table>
<thead>
<tr>
<th>Function</th>
<th>Table of Values</th>
<th>Gradient</th>
<th>Cuts the ( y )-axis at</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y = x + 3 )</td>
<td>( x )</td>
<td>( y )</td>
<td>( x )</td>
</tr>
<tr>
<td>( y = x + 5 )</td>
<td>( x )</td>
<td>( y )</td>
<td>( x )</td>
</tr>
<tr>
<td>( y = x - 2 )</td>
<td>( x )</td>
<td>( y )</td>
<td>( x )</td>
</tr>
<tr>
<td>( y = x - \frac{1}{2} )</td>
<td>( x )</td>
<td>( y )</td>
<td>( x )</td>
</tr>
</tbody>
</table>
Complete these statements

In equations of the form $y = mx + c$:

- $m$ gives the _________ of the line.
- $c$ gives where the line cuts the ____________.
In these examples you are given a table of values, you have to:

1. calculate the gradient,
2. decide where the function cuts the \( y \)-axis,
3. find the function which would give this table of values.

You can easily check your answers on the TI-83.

<table>
<thead>
<tr>
<th>Table of Values</th>
<th>Gradient</th>
<th>Cuts the ( y )-axis at</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>( x )</td>
<td>-3</td>
<td>-2</td>
<td>-1</td>
</tr>
<tr>
<td>17.</td>
<td>( y )</td>
<td>( y = )</td>
<td></td>
</tr>
<tr>
<td>( x )</td>
<td>-3</td>
<td>-2</td>
<td>-1</td>
</tr>
<tr>
<td>18.</td>
<td>( y = )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( x )</td>
<td>-3</td>
<td>-1</td>
<td>2</td>
</tr>
<tr>
<td>19.</td>
<td>( y = )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( x )</td>
<td>-20</td>
<td>-10</td>
<td>30</td>
</tr>
<tr>
<td>20.</td>
<td>( y = )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( x )</td>
<td>-8</td>
<td>-5</td>
<td>16</td>
</tr>
<tr>
<td>21.</td>
<td>( y = )</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Now run the program **MADLINE**.
This program will generate a a straight line of the form \( y = mx + c \).
You have look at the graph and identify the values of \( m \) and \( c \).
The program will prompt you.
Good Luck