

Chapter 4 / **Example 7****Modelling with linear functions**

Siria reads her English textbook at a pace of 2 minutes per page and her Biology textbook at 3 minutes per page. She has two hours available to read.

- a** Write an equation that shows the relationship between the number of pages of English (x) and of Biology (y) that Siria can read in this time. Define all the variables.
- b**
 - i** Find the x - and y -intercepts of the graph of your equation.
 - ii** Use these to sketch a graph of the equation.
 - iii** Interpret each intercept in the context of the problem.
- c** Siria ends up reading 45 pages in total. Determine how many pages of English and of Biology she read.

The equation is $2x + 3y = 120$. Change this to gradient-intercept form $y = 40 - \frac{2}{3}x$.

Open a new document and add a Graphs page.

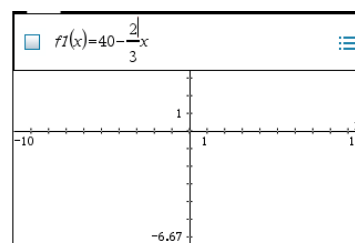
The entry line is displayed at the top of the work area.

The default graph type is function, so ' $f1(x)=$ ' is displayed.

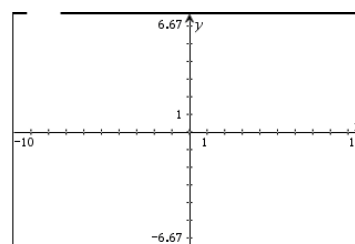
The default axes are $-10 \leq x \leq 10$ and $-6.67 \leq y \leq 6.67$.

Type $40 - \frac{2}{3}x$ and press **enter**.

Press **ctrl** **[$\frac{\Box}{\Box}$]** use the fraction template.



The GDC displays the graph $f1(x) = 40 - \frac{2}{3}x$ with the default axes. However, with the default scales no line is shown.

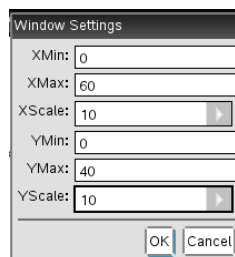


Use the intercepts $(0, 40)$ and $(60, 0)$ to make suitable axes to display the graph.

Press **menu** 4:Window/Zoom | 1:Window Settings...

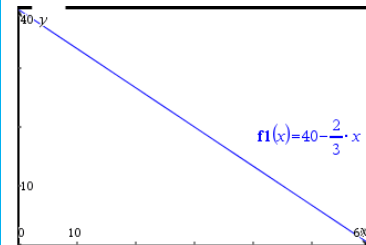
Set the axes so that $0 \leq x \leq 60$ and $0 \leq y \leq 40$ with scales of 10.

Press **enter** when you have finished.



Chapter 4 / **Example 7****Modelling with linear functions**

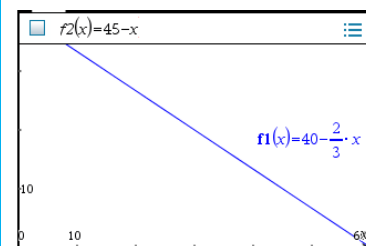
The GDC now displays $y = 40 - \frac{2}{3}x$ in a suitable window.



You now need to plot the line $x + y = 45$ on the same axes and find the intersection point. Change this to gradient-intercept form $y = 45 - x$.

Press **[tab]** to display the entry line again. This time ' $f2(x)=$ ' is displayed.

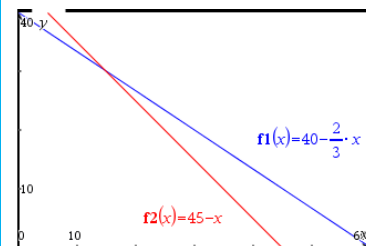
Type $45 - x$ and press **[enter]**.



The GDC now displays both graphs:

$$f1(x) = 40 - \frac{2}{3}x$$

$$f2(x) = 45 - x$$

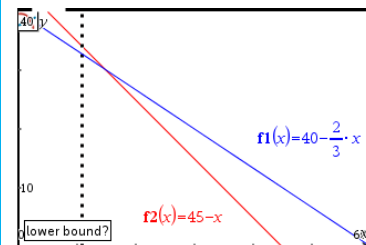


Press **[menu]** 6:Analyse Graph | 4:Intersection.

To find the intersection you need to give the lower and upper bounds of the region that includes the intersection.

The GDC shows a line and asks you to set the lower bound. Move the line using the touchpad and choose a position to the left of the intersection.

Click the touchpad.

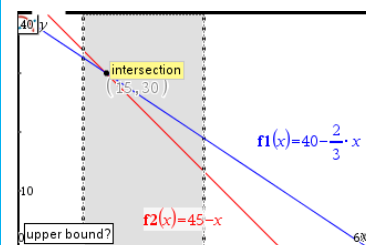


The GDC shows another line and asks you to set the upper bound.

Use the touchpad to move the line so that the region between the lower and upper bounds contains the intersection.

When the region contains the intersection, the calculator will display the word 'intersection' in a box.

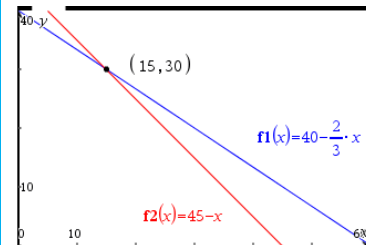
Click the touchpad.



Chapter 4 / **Example 7****Modelling with linear functions**

The GDC displays the intersection of the two lines at $(15, 30)$.

Siria read 15 pages of English and 30 pages of Biology.



The alternative method is to solve the simultaneous equations

$$\begin{cases} 2x + 3y = 120 \\ x + y = 45 \end{cases}$$

Add a new Calculator page to your document by pressing

ctrl **doc** **↓** (**⌂** + **page**) 1: Add Calculator.

Press **menu** 3: Algebra | 2: Solve System of Linear Equations...

The default is 2 equations with x and y as variables.

Press **enter**.

The template has places to type the two equations.

Type $2x + 3y = 120$ and $x + y = 45$

Press **enter**.

The calculator displays the solution $x = 15$ and $y = 30$.

Siria read 15 pages of English and 30 pages of Biology.