

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.

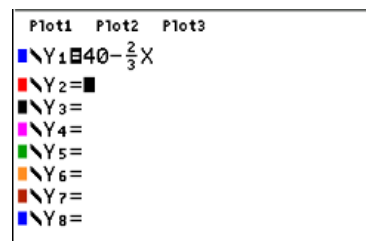
- a** Write an equation that shows the relationship between the number of pages of English (x) and of Biology (y) that Siria can read in this time. Define all the variables.
- b**
 - i** Find the x - and y -intercepts of the graph of your equation.
 - ii** Use these to sketch a graph of the equation.
 - 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 $y = 40 - \frac{2}{3}x$

Press **[F1]** **[Y=]** to display the equation entry screen.

Type $40 - \frac{2}{3}x$ and press **[ENTER]** to enter the equation as Y_1 .

Press **[ALPHA]** **[F1]** 1:n/d to use the fraction template.

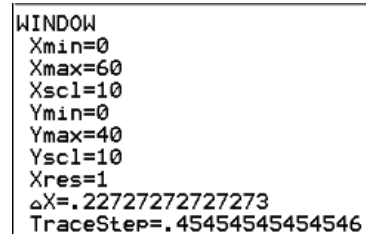


Use the intercepts $0, 40$ and $60, 0$ to make suitable axes to display the graph.

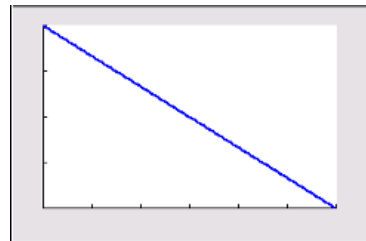
Press **[F2]** **[WINDOW]** and set the axes so that $0 \leq x \leq 60$ and $0 \leq y \leq 40$ with scales of 10.

You can leave the last three items as they are.

Press **[F5]** **[GRAPH]** when you have finished.



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



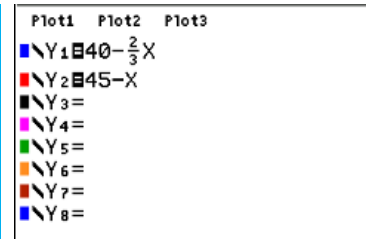
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You now need to plot the line $x + y = 45$ on the same axes and find the intersection point. Change this to gradient-intercept form $y = 45 - x$

Press $[F1]$ $[Y=]$ to display the equation entry screen.

Type $45 - x$ and press $[ENTER]$ to enter the equation as Y_2 .

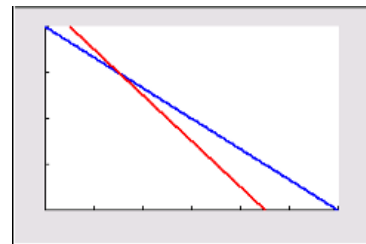


Press $[F5]$ $[GRAPH]$.

The GDC now displays both graphs:

$$Y_1 = 40 - \frac{2}{3}x$$

$$Y_2 = 45 - x$$

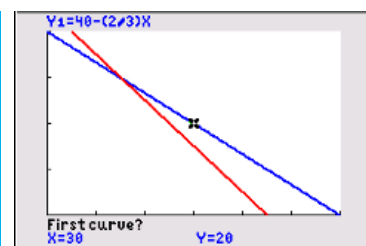


Press $[2nd]$ $[F4]$ $[CALC]$ 5:intersect.

To find the intersection you need to choose the two lines that intersect.

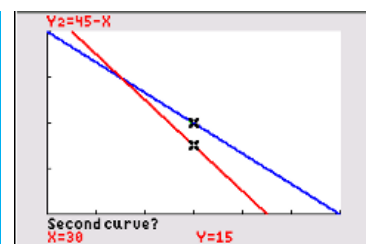
The GDC shows a cross on one of the curves and 'First curve?'.

Press $[ENTER]$.



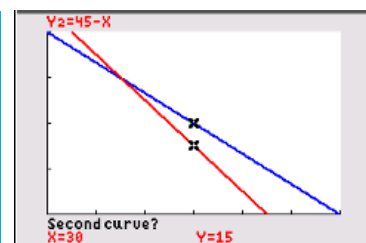
The GDC shows a cross on the line and 'Second curve?'.

Press $[ENTER]$.



The GDC requires an initial guess for the position of the intersection. Choose the default position.

Press $[ENTER]$.

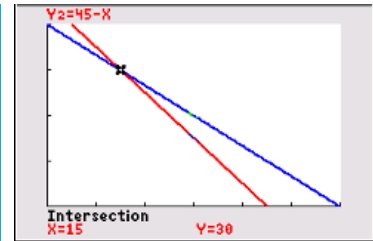


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The GDC displays the intersection of the two lines at (15,30).

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



The alternative method is to solve the simultaneous equations

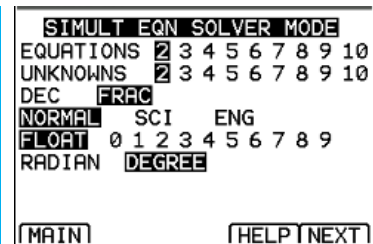
$$\begin{cases} 2x + 3y = 120 \\ x + y = 45 \end{cases}$$

Press **[APPS]** :PlySmlt2

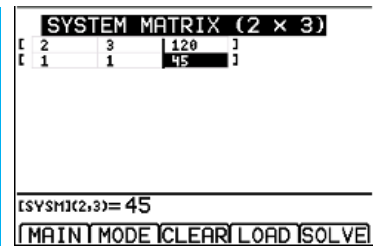
Press **[ENTER]** and select 2:SIMULTANEOUS EQN SOLVER

You are solving 2 equations with 2 unknowns

Press **[F5]** NEXT.



Enter to coefficients 2, 3, 120 and 1, 1, 45 into the matrix.



Press **[F5]** SOLVE.

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

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

