Sometimes you will have a relationship between two variables, which you consider to be a linear relationship, and need to create a quick visual image (graph!) of that relationship.

Examples of this in Economic analysis are the Budget line of a consumer, or the ‘Isocost’ line of a producer.

Other examples from other disciplines are Anatomy (length of femur bone and height of individual), Biology (species population decline over time, humans due to Black Death in Europe), Physics (Millikan’s oil drop experiment, Velocity vs voltage).

**Worked example:**
Say a consumer Fred has a choice of only two products for which he has a budget over the weekend of $12. One may be Liquorice Allsorts at $2 a packet, the other Toblerone chocolate at $4 a packet. If Liquorice Allsorts is given the **pronumeral** X and Toblerone the **pronumeral** Y, then Fred’s budget can be represented by

The value of what Fred spends = The value of Fred’s budget
Or

\[2X + 4Y = 12\]

Note that this is an equivalence of dollar value, not of weight or calories or anything else.

It is often easiest to graph such a relationship by finding the **vertical or “Y” intercept** together with the **horizontal or “X” intercept** rather than other means of graphing.

Watch this Mr Patrick video for the techniques. It involves **substitution** and **algebra**.


Here is the graph you would produce:

**Notes to this graph.** Using the techniques in Mr Patrick’s video, the maximum Y (Toblerone) can be is 3, when Fred buys no Liquorice.
This is the vertical intercept and uses up all the $12 budget.
Again, using the same techniques, the maximum X (Liquorice) can be 6, when Fred buys no Toblerone.
This is the horizontal intercept, and also uses up all his $12 budget.
The line between the two intercepts represents all the combinations of purchases that use his $12 budget.
However, because Fred can only buy **whole** packets of the confectionery, there are only two more feasible purchasing combinations, that of 4 of X with 1 of Y, and that of 2 of X with 2 of Y.
So these types of graphs must be made practical.