A **rate of change** is a comparison of two concepts in the form of a unit rate (or fraction). To say that you are going 100km/hr is a comparison of distance travelled against time. We could also say that you are earning 15$/hr. This is a comparison of money against time. A rate of change has many names such as slope, pitch, rise over run, first difference, etc.

Pitch is the rate of change relating to a roof. It is a comparison of the height of the roof against its respective base (such that it makes a right triangle).

Percent grade is the rate of change relating to a road. It is a comparison of the change in altitude against the horizontal distance of the road. For example, a driver on a 15% grade road is either rising or descending 15 m for every 100 m. This is very important for truck drivers.

Slope (symbolized as **m**) is the standard term used to describe the rate of change in a graph (on a Cartesian Plane). It is a comparison of the change in y (also known as δy or Δy) against the change in x (also known as δx or Δx).

The equation **y = mx + b** is the standard or general equation for all linear systems. The x and the y are simply respective (x,y) coordinates that lie on that respective line. Recall that the y value is the dependent variable and the x value is the independent variable. The **y-intercept or the initial value b** is the point where x = 0. It is the starting point, hence we say that it is the point (0,y). The **slope** is represented by **m** and can be found by the calculation:
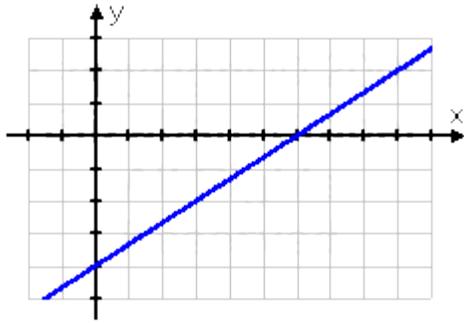
$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

where we are comparing points (x_1,y_1) and (x_2,y_2). We can also say:
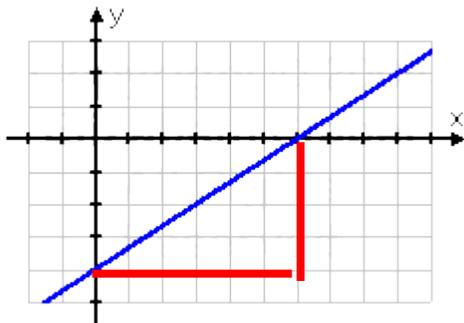
$$m = \frac{\Delta y}{\Delta x}$$

THE BIG THEMATIC QUESTION

How do we find the equation of the line below?

We know that we want the equation y = mx+b. We know that the b value is b = -4 because when x = 0, we see that y = -4.

Now let us chose two points and make a right triangle. To make this easy, we will use the point (0,-4) and (6,0).

Note that the rise Δy is (0-(-4)) or simply Δy = 4 whereas the Δx is (6-0) or simply Δx = 6, hence the slope is therefore:

$$m = \frac{\Delta y}{\Delta x}$$

$$m = \frac{4}{6}$$

$$m = \frac{2}{3}$$

In other words, the slope is such that for every rise of 2 units, the run is 3 units right. Hence the equation of the line below is « $y = \frac{2x}{3} - 4$ »