

ANALYTICAL GEOMETRY; CALCULATION OF THE GRADIENT LINE*

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Free High School Science Texts Project

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1 Analytical Geometry; Calculation of the gradient line

The gradient of a line describes how steep the line is. In the figure, line PT is the steepest. Line PS is less steep than PT but is steeper than PR , and line PR is steeper than PQ .

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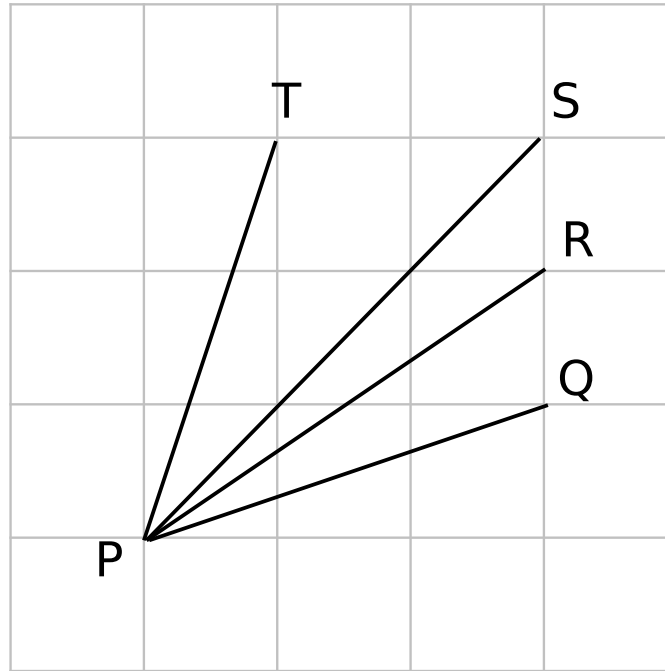


Figure 1

The gradient of a line is defined as the ratio of the vertical distance to the horizontal distance. This can be understood by looking at the line as the hypotenuse of a right-angled triangle. Then the gradient is the ratio of the length of the vertical side of the triangle to the horizontal side of the triangle. Consider a line between a point A with co-ordinates $(x_1; y_1)$ and a point B with co-ordinates $(x_2; y_2)$.

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Figure 2

So we obtain the following for the gradient of a line:

$$\text{Gradient} = \frac{y_2 - y_1}{x_2 - x_1}$$

We can use the gradient of a line to determine if two lines are parallel or perpendicular. If the lines are parallel (Figure 3a) then they will have the same gradient, i.e. $m_{AB} = m_{CD}$. If the lines are perpendicular (Figure 3b) then we have: $-\frac{1}{m_{AB}} = m_{CD}$

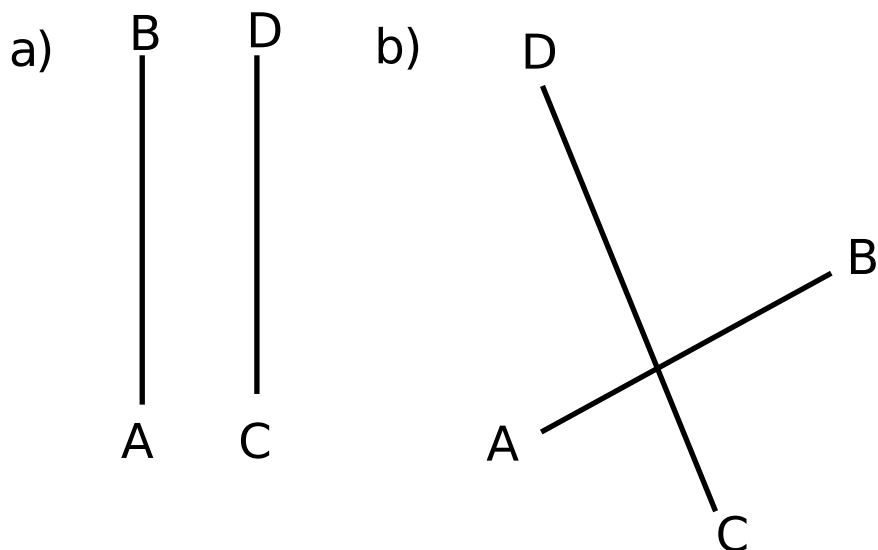


Figure 3

For example the gradient of the line between the points P and Q , with co-ordinates $(2;1)$ and $(-2;-2)$ () is:

$$\begin{aligned}
 \text{Gradient} &= \frac{y_2 - y_1}{x_2 - x_1} \\
 &= \frac{-2 - 1}{-2 - 2} \\
 &= \frac{-3}{-4} \\
 &= \frac{3}{4}
 \end{aligned}
 \tag{1}$$

The following video provides a summary of the gradient of a line.

Gradient of a line

This media object is a Flash object. Please view or download it at
 <<http://www.youtube.com/v/R948Tsyq4vA&rel=0>>

Figure 4