UNIT 28 *Straight Lines* Introduction to SIM

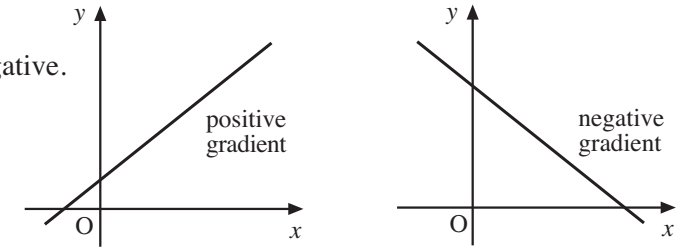
Learning objectives

This is the second unit in this strand on Analytical Geometry, focusing on the straight line. After completing this unit of STUDENT INSTRUCTIONAL MATERIAL (SIM) you should

- be able to identify and use the gradient of a straight line
- be able to calculate and identify gradients of perpendicular lines
- be confident in applying the concept of straight line graphs in a variety of situations, including distance, time, velocity and acceleration
- be able to develop and use the general equation of a straight line.

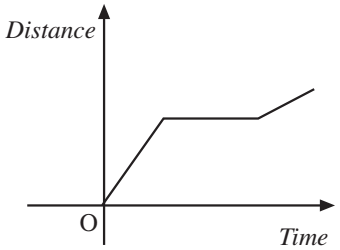
Key points and principles

- The gradient of a line can be positive or negative.



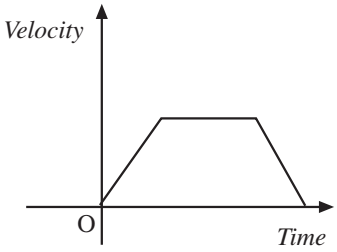
- Parallel lines have the same gradient.
- 'Perpendicular lines' means that the product of their gradients equals -1 (i.e. m and $-\frac{1}{m}$).
- The gradient in a distance-time graph is the *velocity*.

  <u>Note</u>: if the gradient is zero, the object is not moving.



- The gradient in a velocity-time graph is the *acceleration*.

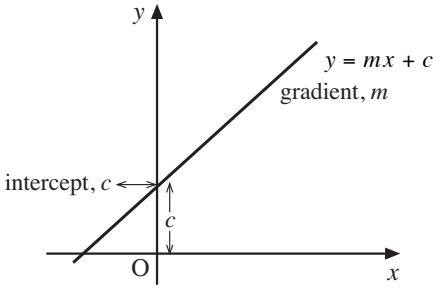
  <u>Note</u>: if the gradient is zero, the object is moving with constant velocity; if the gradient is negative, it is decelerating.



- The area under a velocity-time graph is the distance travelled.
- The general equation of a straight line is of the form

  $y = mx + c$

  where m is its gradient and c the y-axis intercept.



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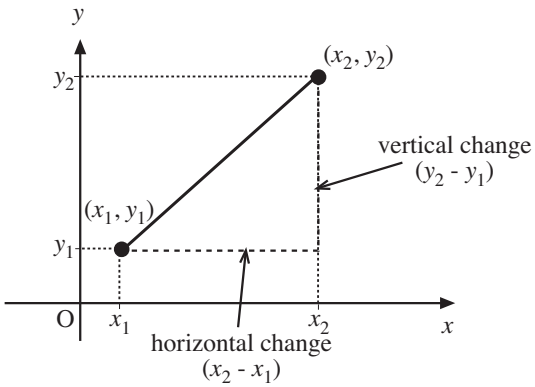
Facts to remember

- The gradient of a straight line

$$= \frac{\text{vertical change}}{\text{horizontal change}}$$

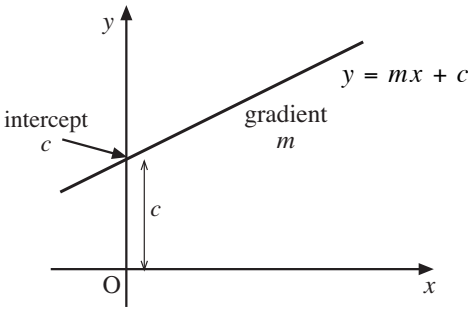
$$= \frac{y_2 - y_1}{x_2 - x_1}$$



- Parallel lines have equal gradients.
- The product of the gradients of perpendicular lines is -1; if m is the gradient of one of the lines $\left(-\frac{1}{m}\right)$ is the gradient of the other line.
- The gradient of a distance-time graph is *velocity*.
- The gradient of a velocity-time graph is *acceleration*.
- The area under a velocity-time graph is the *distance covered*.
- The general equation of a straight line is

$$y = mx + c$$

where m is the gradient and c is the y-axis intercept.

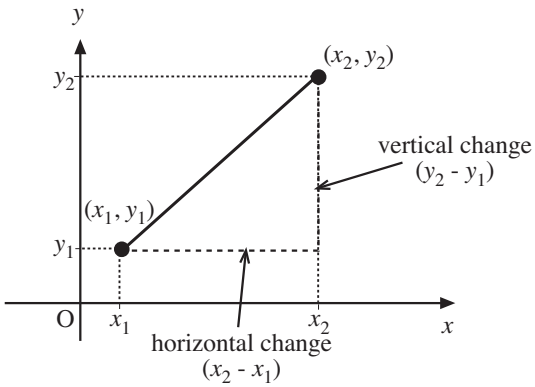


Glossary of terms

Gradient of a straight line describes how steep the line is and is defined as

$$m = \frac{\text{vertical change}}{\text{horizontal change}}$$

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



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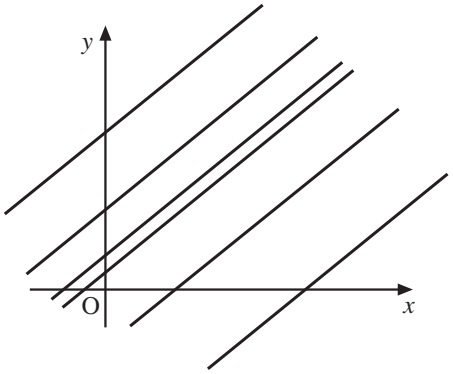
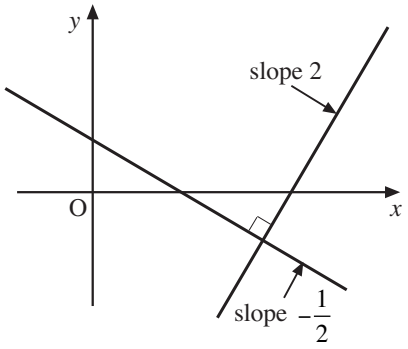
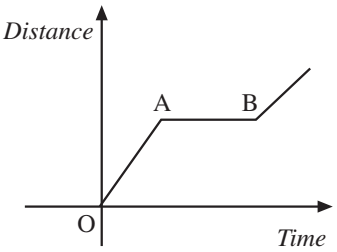
Parallel lines lines with the same gradient are parallel to one another.



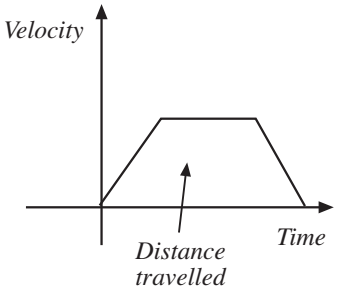
Perpendicular lines the product of their gradients is -1 ; for example, see diagram.



Distance-time graph here the gradient represents the velocity; the velocity is zero when the line has zero gradient (for example, A to B in the diagram opposite).



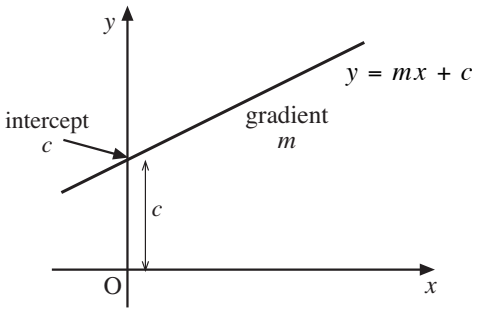
Velocity-time graph here the gradient represents the acceleration; the area under the graph is the distance travelled.



General equation of a straight line is

$$y = mx + c$$

when m is the gradient and c is the y-axis intercept.



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