THE LEADING EDGE

VCE

VCE Maths Methods 1 and 2

Pocket Study Guide

Contents

Introduction

What do you *really* need to know for Mathematical Methods 1 & 2?

We've answered that question in this Pocket Study Guide.

This handy guide gives you a summary of the entire course in an easy-to-use form. Keep it with you and look through it whenever you get the chance.

The guide includes:

- diagrams
- formulae
- graphics calculator advice
- frequently asked questions
- study tips
- space for you to include your own examples

Also available for Mathematical Methods 1 & 2 in the Leading Edge series:

Mathematical Methods 1 & 2 Exam 1 Builder
Mathematical Methods 1 & 2 Exam 2 Builder
Ready for Mathematical Methods 1 & 2

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Mathematical Methods 3 & 4 Pocket Study Guide
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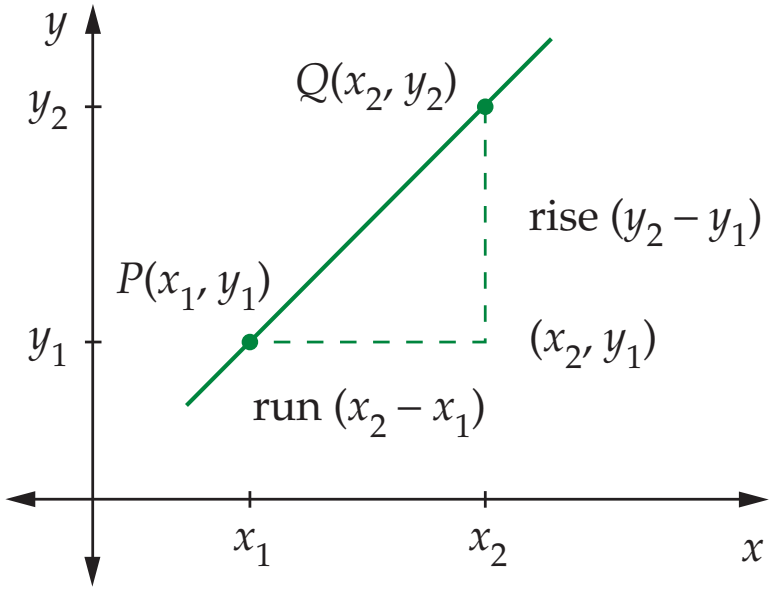
1.1 Equations

- When solving linear equations you must collect all the unknowns on one side first and then undo or reverse the operations.
- If fractions are present you must find the lowest common denominator before collecting terms.
- Simultaneous equations can be solved in three different ways.
    1. By substitution: substituting one equation into the other equation and then solving.
    2. By elimination: eliminating one of the unknowns by adding or subtracting the two equations. (The coefficients of the unknown that is being eliminated must be the same.)
    3. Graphically: sketching both lines on the same set of axes and then finding the point of intersection.

1.2 Coordinate geometry 1

- The gradient of a straight line can be informally defined as $\frac{\text{rise}}{\text{run}}$.
- The gradient of the straight line joining the points $P(x_1, y_1)$ and $Q(x_2, y_2)$ is given by $m = \frac{y_2 - y_1}{x_2 - x_1}$.



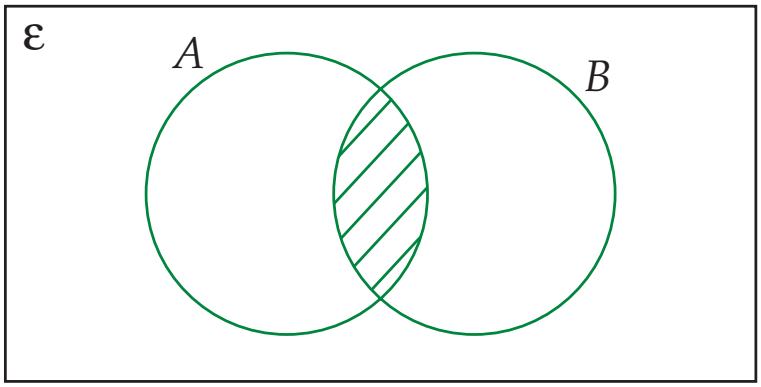
- The angle of inclination of a line is found by solving $\tan\theta = \frac{y_2 - y_1}{x_2 - x_1}$ for θ, where θ is the angle (measured in an anticlockwise direction) that the line makes with the positive direction of the x-axis ($0° \leqslant \theta < 180°$).
- The general equation of a straight line is $y = mx + c$ where m is the gradient of the line and c is the y-intercept.

1.3 Coordinate geometry 2

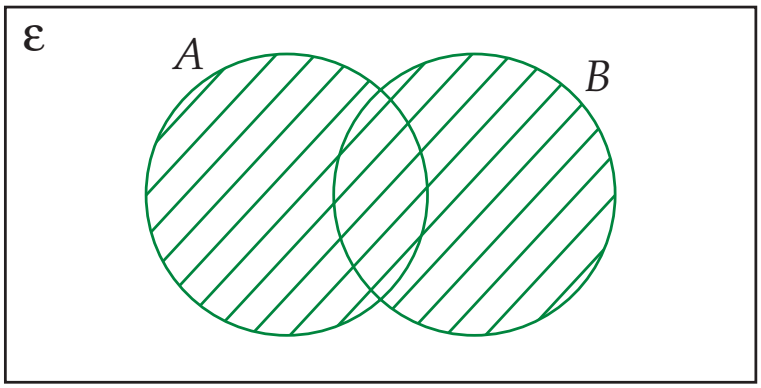
- The equation of a line with a gradient of m and passing through the point (x_1, y_1) is given by $y - y_1 = m(x - x_1)$.
- If the line passes through the points (x_1, y_1) and (x_2, y_2) then the equation of the line is found by $y - y_1 = m(x - x_1)$ where $m = \frac{y_2 - y_1}{x_2 - x_1}$.
- The distance between two points (x_1, y_1) and (x_2, y_2) is:
  Distance $= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
- The midpoint of the line joining (x_1, y_1) and (x_2, y_2) is $(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2})$.
- If two lines are parallel then $m_1 = m_2$.
- If two lines are perpendicular to one another then $m_1 m_2 = -1$, i.e. $m_1 = -\frac{1}{m_2}$.

1.4 Set notation

- { } contains the elements of a set
- $\in$ means 'is an element of'
- $\cap$ means intersection (common to both sets)



- $\cup$ means union (the elements of both sets)



- $\varnothing$ means null set (empty set)
- $[a, b]$ means $a \leqslant x \leqslant b$
- (a, b) means $a < x < b$
- $[a, b)$ means $a \leqslant x < b$
- $(a, b]$ means $a < x \leqslant b$

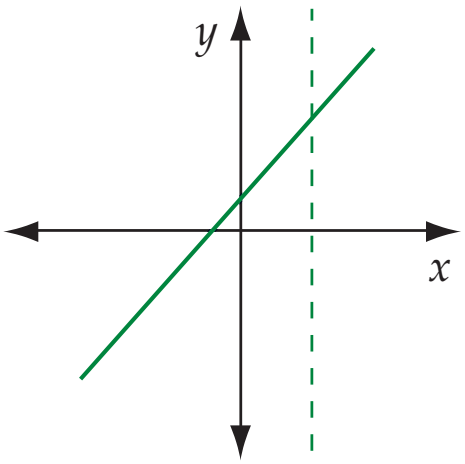
1.5 Sets of numbers

- R is the set of real numbers.
- Q is the set of rational numbers.
- Q' is the set of irrational numbers. These are non-terminating, non-recurring decimals.
- J is the set of integers.
- N is the set of natural numbers.
- R^+ is the set of positive real numbers, R^- is the set of negative real numbers.
- $R^+ \cup \{0\}$ is the set of positive real numbers and zero.

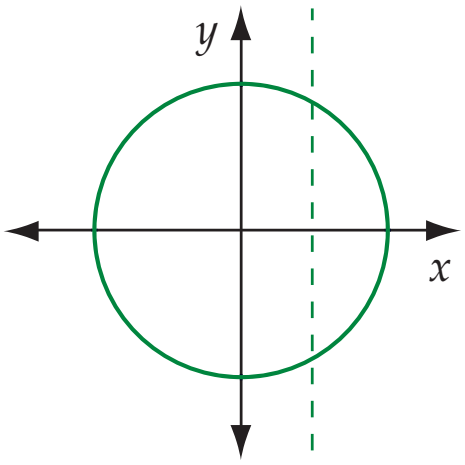
My examples:

1.6 Functions and relations

- (a, b) is called an ordered pair, where a is said to be the first element, and b is the second element.
- A relation is a set of ordered pairs such as $A = \{(1, 1), (2, 3), (2, 7), (4, 6)\}$.
- A function is a relation in which no two ordered pairs have the same first element, i.e. any vertical line will pass through only one point on the graph.



Cuts once ∴ a function



Cuts twice ∴ not a function

1.7 Domain and range

- The domain of a function is the set of all the first elements of the ordered pairs. It is normally stated in the definition of the function.
- If the domain is not stated it is represented by the maximal domain possible (all the possible x values for which the function exists).
- The range of the function is the set of all the second elements of the ordered pairs (normally the y values).

My examples:

1.8 Frequently asked questions

How do I know if I am to use open or closed dots when drawing my graphs?

If the point is included then the dot is closed (filled in). If the point is not included then the dot is open (not filled in).

How do I set up an equation or rule when dealing with linear modelling?

Look for the fixed value (the quantity that will not change). This is c in the equation $y = mx + c$. The quantity that changes depending on use will be mx.

1.9 Study tips

1 To find the range of a linear function with a restricted domain, substitute the value of x into the function to find the starting point. The range will then depend on the slope of the function and the restriction.

For example: If $x > a$, then the range will be $y > f(a)$ if $f(x)$ has a positive gradient and $y < f(a)$ if $f(x)$ has a negative gradient.

If $x < a$, then the range will be $y < f(a)$ if $f(x)$ has a positive gradient and $y > f(a)$ if $f(x)$ has a negative gradient.

2 If x is included in the domain, then y is included in the range.

3 If a function is in the form $y = mx + c$, use the gradient and y-intercept method to sketch the graph.

Express m in the form $\frac{\text{rise}}{\text{run}}$.

If the function is in the form $ax + by + c = 0$, or $ax + by = c$, use the x- and y-intercept method to sketch the graph.

4 For $ax + by + c = 0$, the x-intercept is $(-\frac{c}{a}, 0)$ and the y-intercept is $(0, -\frac{c}{b})$.