NAM QUANG TUITION
Our Students. Our Passion
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Mathematical Methods

Each week, there's a cover sheet that outlines what the week's topics will be

Unit 1
Week 1

Topic: Polynomial and Power Functions

Linear equations (revision)
Transposing equations
Distance and gradient between two points
Interval midpoints
Parallel and perpendicular lines

Student's name: _____

Student ID: _____

NQT tutor: _____ **Centre:** _____

What you need to know about Mathematical Methods Unit 1

Students are expected to apply techniques, routines and processes involving rational and real arithmetic, algebraic manipulation, equation solving, graph sketching, differentiation and integration.

It is assumed students taking the program are familiar with determining the equation of a straight line, basic factorisation, Pythagoras theorem, indentifying and manipulation of quadratic and exponential functions and sketching graphs of basic functions. Basic concepts of probability are also assumed.

There are four study areas you need to satisfactorily complete in order to accomplish Unit 1:

AREA OF STUDY 1
Functions and graphs

- Define key features of functions and ability to manipulate them.
- The effects of function transformations
- Application of matrices to transformations
- Graphing polynomial functions up to degree 4
- Solving simultaneous equations

At the commencement of each semester, there's an outline of the Unit's key areas of study, as in line with VCAA Study Designs.

AREA OF STUDY 2
Functions and Relations

- Qualitative interpretation of graphs and their families
- Drawing graphs that are not functions, including inequalities
- Calculating key points of functions, such as turning, midpoints, intercepts, etc.
- Determining the rules of functions with given information

AREA OF STUDY 3
Rates of Change

- Determining the rate of change of linear functions
- Finding the approximate rate of change of polynomials of degree 2 and above
- Finding instantaneous rate of change – determination of f'(x)
- Graphs of functions and their f'(x) and indentifying their relations
- Use of motion graphs and applications to rates of change

AREA OF STUDY 4
Probability

- Probability as an expression to long run proportion
- Use of lists, grids, Venn diagrams, karnaugh maps and tree diagrams
- Rules for Independent and conditional events

For all NQT lessons, bring your own Graphics Calculator to each and every class, as well as a notebook/exercise book to be used throughout the year. Also you should bring your Mathematical Methods textbook as an additional resource for your learning.

Distance & Midpoint Between Two Points

Whenever we want to find the length of the hypoenuse of a right-angled triangle, we use Pythagoras' Theorem. We can use the same technique to find the distance between two points on a graph.

As long as you have two different coordinates, we can easily determine the shortest distance (straight line).

Lets say we have points (-1, 3) and (3, -2). Algebraically this can be written as: (x_1, y_1) and (x_2, y_2).

Applying Pythagoras' Therem, we can express the distance as: $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

So, for the above coordinates:

$$dist = \sqrt{(3-(-1))^2 + ((-2)-3)^2}$$
$$= \sqrt{(4)^2 + (-5)^2}$$
$$= \sqrt{16+25}$$
$$= \sqrt{41}$$

There is clearly set out theories as well as tips in speech bubbles to help guide you through commonly made errors and how to tackle them.

The midpoint is simply half of whatever two coordinates added together. It is expressed as:

$$(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2})$$

Using the same points as we have above:

$$(\frac{(-1)+3}{2}, \frac{3+(-2)}{2})$$
$$= (\frac{2}{2}, \frac{1}{2})$$
$$= (1, \frac{1}{2})$$

Students make the common error of mixing up the numbers of the coordinates. Often getting confused as to which is the y-value and which is the x-value.

Ensure that when you approach questions that involve different coordinate points, that you keep track of which numbers you are using for your calculations. A number in the wrong place will likely result in an incorrect answer.

Also keep in mind of negative numbers. A good idea is to place any negative numbers in brackets, so as you calculate you will remember to resolve them.

The gradient is simply

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

Again, using same coordinates:

$$m = \frac{(-2)-3}{3-(-1)}$$
$$m = \frac{-5}{4}$$

Checking Understanding – Show all working

5. Find the midpoint, distance and gradient of the following coordinates

a. (-2, -3) and (5, 6)

b. (3, 3) and (10, -6)

6. Determine the equation of the line that passes through the points in question 5.

a.

b.

7. Another coordinate (1,- 1) is given. Determine the equation of the perpendicular line that passes through the line in question 6.

a.

b.

After all theory has been clearly explained, you have the chance to apply your knowledge in a series of questions, both straightforward as well as those requriing analytical skills.