

Edina Tuition – SQA Higher Maths

Maths may be considered to be the hardest SQA Higher to do well in but I believe that with consistent effort any student can improve their mark.

Here is a quick overview of the skills and knowledge required, at least as far as I see it.

Skills/problem solving

Areas for study/revision:

- Algebra skills – these do get constant practice but initially I will want to ensure that you are up to speed in this area
- Trigonometry – is difficult, no doubt about it, but can be tamed if worked at consistently
- Differentiation and integration – practice, practice, and more practice!

Tips for answering questions/problems in exams and in general:

- Think of a simpler or a more concrete example if stuck
- Check your answers as you go
- Ask: did I use all the information given in the question?
- Set out your work neatly

Knowledge

Aside from skills and problem solving techniques what are some of the things that you most need to know?

Some things have to become almost hard-wired in your brain. Examples include:

- Exact values of trig ratios of common angles (in both degrees and radians)
- The meaning of the discriminant of a quadratic expression, and what its value $=$, $>$, < 0 tells you
- The meaning of the [logarithm](#) of a number – it's the exponent, or power, to which a given base must be raised to yield the given number
- How to use laws of logarithms
- The meaning of the derivative — this gives the slope of the tangent to the curve at any given point
- being able to convert from degrees to radians and vice versa
- Trig identities

And some things are good to really get to grips with, including:

- the definition of a radian – the angle subtended by an arc length equal to the radius
- the definition of the derivative – the limit as h tends to 0 of $(f(x + h) - f(x))/h$ – do you see how this gives the gradient at a single point?
- the scalar product of two vectors – see [What does the dot product of two vectors represent?](#) for an explanation of the scalar product

More generally I consider the following to be important concepts:

- [ratio](#)
- the idea that the graph of a function gives a picture of the rule which maps the x value (or co-ordinate) to the y value (or co-ordinate, or height above the x -axis)
- equating expressions
- substituting one expression into another
- both of the above are useful techniques for solving problems which involve equations

Studying

- Ask questions. Even if you don't want to ask your teacher/tutor, ask a classmate. Often just framing a question to someone will help you think of a solution. But even if you don't want to ask a classmate make sure you ask the question of yourself, and then look out for the answer. This is a normal part of thinking/reasoning, and indeed of living in the 21st Century.
- Work really hard to understand calculus as it is one of the underpinnings of much of science and technology and is regarded as a great achievement of human intellectual endeavor. If you are hoping to go on to do maths, science, engineering, economics, or medicine you will have to understand these concepts. You are getting a chance to learn them now, so please make the most of the opportunity.
- Understanding trig and calculus will give you fluency in maths and fluency in maths will lead to a better mark
- Be more meta with your study of maths ie step back from it and try to understand how you best learn. Do diagrams help you more than words? Do you struggle with remembering formulae? Do you have problems concentrating when you are tired, or hungry? What sort of food helps you concentrate, or is there any that makes you feel distracted? What does that point to?
- Use the internet to find resources to help in your studies but please make sure that they are at an appropriate level

- Think positively, envisage a successful outcome to your studies

What to expect from a session

- Revision and practice exercises with questions possibly asked verbally
- Discussion in which you must be prepared to take an active part
- Problem solving with questions from past papers
- A chance to frame and ask questions
- Homework exercises, but possibly investigative eg
 - read a Wikipedia article, or part of an article, on a topic and put the concept into your own words.
 - Or watch a video about a maths topic online and report back on its content.
 - Possibly make up your own problem/question as per a problem exercise currently being worked on, and then solve it.
 - Explain the solution to a homework problem verbally.

Thinking aloud is allowed

Not being sure is allowed

Getting the wrong answer is allowed

Not trying is frowned upon