



North Halifax Grammar School – A Level Transition Work

A Level Further Mathematics

Specification: Pearson Edexcel Level 3 GCE 9FMO (option E)

<https://qualifications.pearson.com/en/qualifications/edexcel-a-levels/mathematics-2017.html>

| | |
|-------------------------|-------------------|
| Core Pure Mathematics 1 | 1 hour 30 minutes |
| Core Pure Mathematics 2 | 1 hour 30 minutes |
| Further Statistics 1 | 1 hour 30 minutes |
| Further Mechanics 1 | 1 hour 30 minutes |

You will be issued with the Pearson Edexcel Textbooks. Students will be expected to use a **Casio fx-991 Classwiz calculator**, a bulk order will be made for these in September if you do not already own one.

Course Overview

| Year 12 | Year 13 |
|--|---|
| Complex numbers | Complex numbers |
| Proof | Hyperbolic functions |
| Matrices | Polar Co-ordinates |
| Roots of polynomials | Series expansions |
| Series | Further calculus |
| Volumes of revolution | Differential equations |
| 3 Dimensional vectors lines and planes | Momentum & Impulse in vector form |
| Momentum and impulse | Elastic strings and Elastic Potential Energy |
| Work, Energy, Power | Elastic collisions oblique impacts |
| Elastic collisions | Discrete Random variables |
| Discrete Random variables | Discrete distributions |
| Poisson distribution | Geometric and negative binomial distributions |
| Hypothesis testing | Hypothesis testing |
| Chi squared tests | Central limit |
| | Probability generating functions |
| | Quality of tests |

Expectations

You will have two teachers, both will set you written homework tasks every week to be handed in on a strict schedule, Mathematics is a practice heavy subject. You will have termly progress tests which you will have to resit if you fail to reach a threshold mark.

Support is available every lunchtime with a designated Mathematics teacher to help you achieve your potential. Each class has a designated Google classroom and there is also a Year group revision classroom.



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Useful Websites

<https://www.physicsandmathstutor.com/>

<https://www.drfrostmaths.com/>

<https://www.madasmaths.com/>

<https://www.mathsgenie.co.uk/newalevel.html>

Transition work to be completed

1 Simplify these expressions as far as possible.

a $\frac{x^2 - 2x - 3}{x^2 + 2x + 1}$ (3 marks)

b $\frac{x^2 - 25}{x^2 + 6x + 8} \div \frac{x^2 - 2x - 15}{x^2 - 16}$ (4 marks)

2 The line l is a tangent to the circle $x^2 + y^2 = 20$ at the point $P(2, 4)$.

The tangent intersects the y -axis at point A . Find the area of the triangle OPA . (5 marks)

3 Expand and simplify $(\sqrt{p} + 2\sqrt{q})(2\sqrt{p} - \sqrt{q})$ (3 marks)

4 a Write $3x^2 - 12x + 7$ in the form $a(x+b)^2 + c$ (3 marks)

b Hence, or otherwise, write down the coordinates of the turning point of the graph of $y = 3x^2 - 12x + 7$ (1 mark)

5 Prove algebraically that the product of three consecutive **odd** numbers is always an odd number. (4 marks)

6 The functions g and f are defined as $g(x) = \frac{2x}{4-x}$ and $f(x) = 3x - 1$

Given that $x \neq 4$, find the value(s) of x such that $g(x) = f(x)$, giving your answer(s) to 2 decimal places. (6 marks)

7 The line l_1 has equation $y = -\frac{1}{2}x + 3$ and intersects the x - and y -axes at the points A and B respectively.

a Find the exact length of the line segment AB . (3 marks)



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- b** Find the equation of the line l_2 perpendicular to l_1 which passes through the point $P(-1, -2)$. **(2 marks)**
- The line l_2 intersects l_1 at the point C .
- c** Find the midpoint of the line segment AC . **(4 marks)**
- 8** A triangle ABC has side lengths $AB = 10$ cm, $BC = 15$ cm and $AC = 8$ cm.
- a** Find the size of the largest angle, giving your answer to 2 decimal places. **(3 marks)**
- b** Find the area of the triangle, giving your answer to 2 decimal places. **(2 marks)**
- 9** **a** Sketch the graph of $y = \cos x$ for $-180 \leq x \leq 360^\circ$, showing the points where the graph cuts the axes. **(2 marks)**
- b** Hence find the exact values of x in the interval $-180 \leq x \leq 360^\circ$ for which $\cos x = -\frac{\sqrt{3}}{2}$ **(3 marks)**