NHGS SIXTH FORM

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.**

Course Overview

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

Support is available every lunchtime with a designated Mathematics teacher to help you achieve your potential. Each class has a designated Google classroom where classwork and homework will be posted.

Useful Websites

https://www.physicsandmathstutor.com/
https://www.drfrostmaths.com/
https://www.madasmaths.com/
https://www.mathsgenie.co.uk/newalevel.html

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Transition work to be completed

1 Simplify these expressions as far as possible.

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

b $\dfrac{x^2-25}{x^2+6x+8} \div \dfrac{x^2-2x-15}{x^2-16}$ **(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 $\left(\sqrt{p}+2\sqrt{q}\right)\left(2\sqrt{p}-\sqrt{q}\right)$ **(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 $\mathrm{g}(x)=\dfrac{2x}{4-x}$ and $\mathrm{f}(x)=3x-1$

Given that $x \neq 4$, find the value(s) of *x* such that $\mathrm{g}(x)=\mathrm{f}(x)$, 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)**

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 $-180 \leqslant x \leqslant 360°$, showing the points where the graph cuts the axes. **(2 marks)**

b Hence find the exact values of x in the interval $-180 \leqslant x \leqslant 360°$ for which

$\cos x = -\frac{\sqrt{3}}{2}$ **(3 marks)**

Optional Extension Task

Go down a mathematical rabbit hole with this introduction to complex numbers. Record your thinking and progress in any way you feel comfortable so that you can share it with your teachers in September: https://nrich.maths.org/adventures-complex-numbers