Welcome from the Maths Department

West Kirby Grammar School
Mathematics

Dear A level Maths Student,

We are delighted that you are choosing to study this exciting subject for A level at WKGS and we would like to help you build on and consolidate the transition skills required to take the step from GCSE to A level.

Read/Do

How Are Prime Numbers Used In Cryptography? » Science ABC

Produce

You must complete the 'Math 101' question paper below, this covers some (but not all!) of the prerequisite skills needed for A level. Remember to show **all relevant working out**. This work should take about an hour to complete but do not worry if you need more time. You must bring this work, marked, to your **first lesson** in September to hand to your teacher.

Listen

The Curious Cases of Rutherford & Fry - Series 21 - The Impossible Number - BBC Sounds

(If you enjoyed this podcast there is an interesting episode on Pi that's worth listening to! You can also download the podcasts via the podcast app on your phone if you do not have a BBC sounds account).

Assessment

You will complete a baseline assessment at the beginning of September that will cover the key skills you will require to succeed at A level. By completing 'Math 101' you will be strengthening these skills. More details about the assessment will follow from your class teacher In September.

Finally, there are some slides that those considering Further Maths may wish to have a look at for a bit of fun!

Good luck with the work, stay safe over the Summer and we look forward to you joining us for A level.

Maths Department

West Kirby Grammar School
Mathematics

Math 101

Complete these questions on paper, showing all relevent working out. This work should take about an hour to complete but do not worry if you need more time. Remember to bring this work, marked, to your first lesson in September to hand to your teacher. The mark scheme contains answers only so you must show how you have obtained your answers.

1 Simplify

$$\frac{9x^{\frac{1}{2}}}{(27x^{-2})^{\frac{2}{3}}}$$

2 **a** Write $\sqrt{240}$ in the form $a\sqrt{15}$, where *a* is an integer.

b Expand and simplify $(2-\sqrt{3})(5+2\sqrt{3})$.

c Simplify $\frac{2+\sqrt{5}}{3-\sqrt{5}}$ giving your answer in the form $a+b\sqrt{c}$, where *a*, *b* and *c* are rational numbers.

3 The area of a triangle is given as $(7+3\sqrt{3})$ cm^2.

The base of the triangle is $(5-\sqrt{3})$ cm, and the perpendicular height is $(p+q\sqrt{3})$ cm.

Find the values of *p* and *q*.

4 Solve these equations.

a $x^2-6x+5=0$

b $2x^2-5x+1=0$

5 Solve the pair of simultaneous equations.

c $2x-y=9$

$x^2+y^2=17$

6 Solve these inequalities.

b $3x + 2 \geqslant 7x - 4$

c $x^2 + 12x - 28 > 0$

7 The function f is defined as $\mathrm{f}(x) = 5x + 2$

Find the value of $\mathrm{f}(-4)$.

8 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*.

9 Expand and simplify $\left(\sqrt{p} + 2\sqrt{q}\right)\left(2\sqrt{p} - \sqrt{q}\right)$

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

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

11 Prove algebraically that the product of three consecutive **odd** numbers is always an odd number.

12 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*.

b Find the equation of the line l_2 perpendicular to l_1 which passes through the point *P*(−1, −2).

The line l_2 intersects l_1 at the point *C*.

c Find the midpoint of the line segment *AC*.

Once you have completed these questions use the mark scheme to mark your answers.