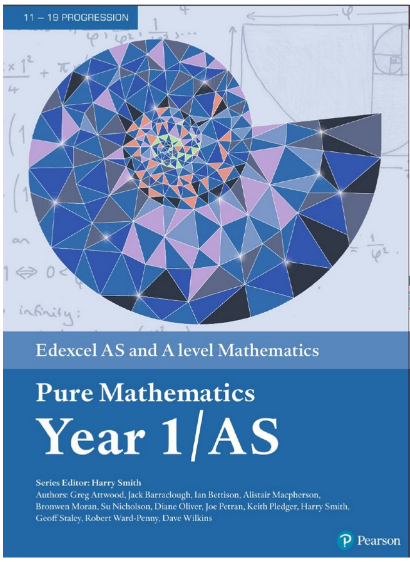
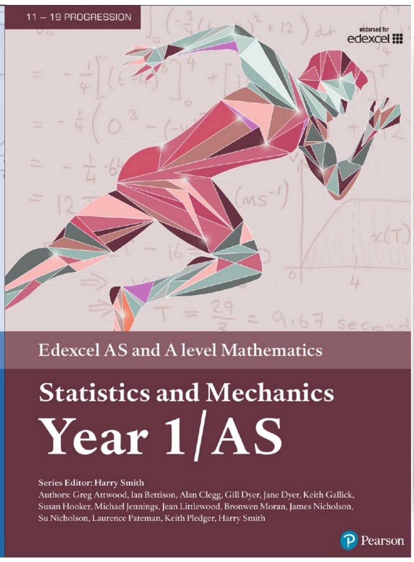
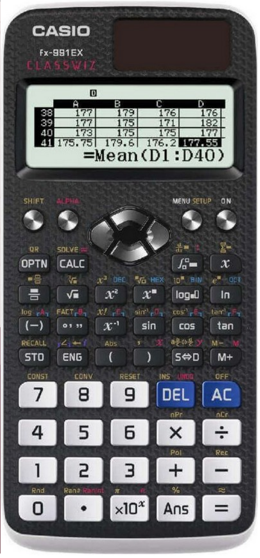
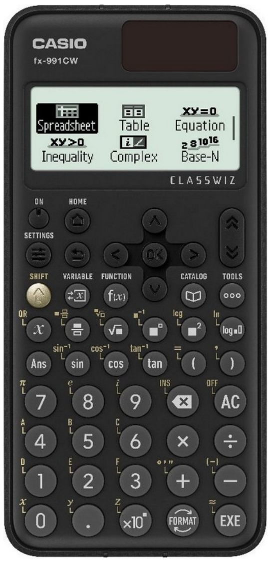
So you are taking A level maths in September……..

Hopefully you will have already got the two text books which you will require for the course and the calculator (Casio fx-911EX ClassWiz or the new fx-991 CW. If possible, pick up the EX version, although both have the same functionality).









To ensure that you make the best start to the A level course, it is expected that you complete the first 3 chapters from the Pure Mathematics text book. It may seem a little daunting but the content is essentially GCSE higher maths.

It is expected that you complete the Review Exercise 1 up to question 23, a copy of which is included here and is on pages 85-88 in the text book.

Your teacher will ask for this to be brought with you in the first week of term so please make sure it is completed.

There is also going to be an assessment on those first 3 chapters at the end of the second week of term, just to keep you on your toes.

If you have any questions about the course or you need to discuss the summer work, please make sure that you get in touch as soon as possible.

All the best

Simon Harris

Post 16 Mathematics Coordinator

spharris@fcc.faringdonlearningtrust.org

Review exercise 1

(E) **1** **a** Write down the value of $8^{\frac{1}{3}}$. **(1 mark)**

b Find the value of $8^{-\frac{2}{3}}$. **(2 marks)**

← Section 1.4

2 **a** Find the value of $125^{\frac{4}{3}}$. **(2 marks)**

b Simplify $24x^2 \div 18x^{\frac{4}{3}}$. **(2 marks)**

← Sections 1.1, 1.4

(E) **3** **a** Express $\sqrt{80}$ in the form $a\sqrt{5}$, where a is an integer. **(2 marks)**

b Express $(4 - \sqrt{5})^2$ in the form $b + c\sqrt{5}$, where b and c are integers. **(2 marks)**

← Section 1.5

(E) **4** **a** Expand and simplify $(4 + \sqrt{3})(4 - \sqrt{3})$. **(2 marks)**

b Express $\dfrac{26}{4 + \sqrt{3}}$ in the form $a + b\sqrt{3}$, where a and b are integers. **(3 marks)**

← Sections 1.5, 1.6

(E/P) **5** Here are three numbers:

$1 - \sqrt{k}$, $2 + 5\sqrt{k}$ and $2\sqrt{k}$

Given that k is a positive integer, find:

a the mean of the three numbers. **(2 marks)**

b the range of the three numbers. **(1 mark)**

← Section 1.5

(E) **6** Given that $y = \dfrac{1}{25}x^4$, express each of the following in the form kx^n, where k and n are constants.

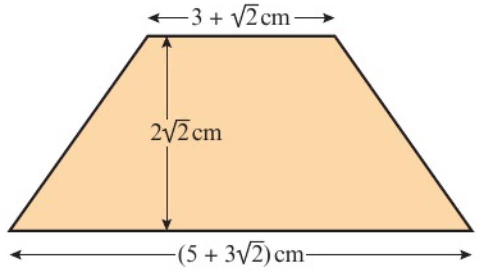
a y^{-1} **(1 mark)**

b $5y^{\frac{1}{2}}$ **(1 mark)**

← Section 1.4

(E/P) **7** Find the area of this trapezium in cm^2. Give your answer in the form $a + b\sqrt{2}$, where a and b are integers to be found. **(4 marks)**

← Section 1.5



(E) **8** Given that $p = 3 - 2\sqrt{2}$ and $q = 2 - \sqrt{2}$, find the value of $\dfrac{p + q}{p - q}$.

Give your answer in the form $m + n\sqrt{2}$, where m and n are rational numbers to be found. **(4 marks)**

← Sections 1.5, 1.6

(E/P) **9** **a** Factorise the expression $x^2 - 10x + 16$. **(1 mark)**

b Hence, or otherwise, solve the equation $8^{2y} - 10(8^y) + 16 = 0$. **(2 marks)**

← Sections 1.3, 2.1

(E) **10** $x^2 - 8x - 29 \equiv (x + a)^2 + b$, where a and b are constants.

a Find the value of a and the value of b. **(2 marks)**

b Hence, or otherwise, show that the roots of $x^2 - 8x - 29 = 0$ are $c \pm d\sqrt{5}$, where c and d are integers. **(3 marks)**

← Sections 2.1, 2.2

E/P **11** The functions f and g are defined as $f(x) = x(x - 2)$ and $g(x) = x + 5, x \in \mathbb{R}$.
Given that $f(a) = g(a)$ and $a > 0$, find the value of a to three significant figures. **(3 marks)**

← Sections 2.1, 2.3

P **12** An athlete launches a shot put from shoulder height. The height of the shot put, in metres, above the ground t seconds after launch, can be modelled by the following function:

$h(t) = 1.7 + 10t - 5t^2 \qquad t \geqslant 0$

a Give the physical meaning of the constant term 1.7 in the context of the model.

b Use the model to calculate how many seconds after launch the shot put hits the ground.

c Rearrange $h(t)$ into the form $A - B(t - C)^2$ and give the values of the constants A, B and C.

d Using your answer to part **c** or otherwise, find the maximum height of the shot put, and the time at which this maximum height is reached.

← Section 2.6

E/P **13** Given that $f(x) = x^2 - 6x + 18, x \geqslant 0$,

a express $f(x)$ in the form $(x - a)^2 + b$, where a and b are integers. **(2 marks)**

The curve C with equation $y = f(x)$, $x \geqslant 0$, meets the y-axis at P and has a minimum point at Q.

b Sketch the graph of C, showing the coordinates of P and Q. **(3 marks)**

The line $y = 41$ meets C at the point R.

c Find the x-coordinate of R, giving your answer in the form $p + q\sqrt{2}$, where p and q are integers. **(2 marks)**

← Sections 2.2, 2.4

E **14** The function $h(x) = x^2 + 2\sqrt{2}x + k$ has equal roots.

a Find the value of k. **(1 mark)**

b Sketch the graph of $y = h(x)$, clearly labelling any intersections with the coordinate axes. **(3 marks)**

← Sections 1.5, 2.4, 2.5

E/P **15** The function $g(x)$ is defined as

$g(x) = x^9 - 7x^6 - 8x^3, x \in \mathbb{R}$.

a Write $g(x)$ in the form $x^3(x^3 + a)(x^3 + b)$, where a and b are integers. **(1 mark)**

b Hence find the three roots of $g(x)$. **(1 mark)**

← Section 2.3

E/P **16** Given that

$x^2 + 10x + 36 \equiv (x + a)^2 + b$,

where a and b are constants,

a find the value of a and the value of b. **(2 marks)**

b Hence show that the equation $x^2 + 10x + 36 = 0$ has no real roots. **(2 marks)**

The equation $x^2 + 10x + k = 0$ has equal roots.

c Find the value of k. **(2 marks)**

d For this value of k, sketch the graph of $y = x^2 + 10x + k$, showing the coordinates of any points at which the graph meets the coordinate axes. **(3 marks)**

← Sections 2.2, 2.4, 2.5

E/P **17** Given that $x^2 + 2x + 3 \equiv (x + a)^2 + b$,

a find the value of the constants a and b **(2 marks)**

b Sketch the graph of $y = x^2 + 2x + 3$, indicating clearly the coordinates of any intersections with the coordinate axes. **(3 marks)**

c Find the value of the discriminant of $x^2 + 2x + 3$. Explain how the sign of the discriminant relates to your sketch in part **b**. **(2 marks)**

The equation $x^2 + kx + 3 = 0$, where k is a constant, has no real roots.

d Find the set of possible values of k, giving your answer in surd form. **(2 marks)**

← Section 2.2, 2.4, 2.5

E **18** **a** By eliminating y from the equations:

$y = x - 4,$
$2x^2 - xy = 8,$

show that

$x^2 + 4x - 8 = 0.$ **(2 marks)**

b Hence, or otherwise, solve the simultaneous equations:

$y = x - 4,$
$2x^2 - xy = 8,$

giving your answers in the form $a \pm b\sqrt{3}$, where a and b are integers. **(4 marks)**

← Section 3.2

E **19** Find the set of values of x for which:

a $3(2x + 1) > 5 - 2x,$ **(2 marks)**

b $2x^2 - 7x + 3 > 0,$ **(3 marks)**

c **both** $3(2x + 1) > 5 - 2x$ **and** $2x^2 - 7x + 3 > 0.$ **(1 mark)**

← Sections 3.4, 3.5

E/P **20** The functions p and q are defined as $p(x) = -2(x + 1)$ and $q(x) = x^2 - 5x + 2$, $x \in \mathbb{R}$. Show algebraically that there is no value of x for which $p(x) = q(x)$. **(3 marks)**

← Sections 2.3, 2.5

E **21** **a** Solve the simultaneous equations:

$y + 2x = 5$
$2x^2 - 3x - y = 16.$ **(5 marks)**

b Hence, or otherwise, find the set of values of x for which:

$2x^2 - 3x - 16 > 5 - 2x.$ **(2 marks)**

← Sections 3.2, 3.5

E/P **22** The equation $x^2 + kx + (k + 3) = 0$, where k is a constant, has different real roots.

a Show that $k^2 - 4k - 12 > 0.$ **(2 marks)**

b Find the set of possible values of k. **(2 marks)**

← Sections 2.5, 3.5

E **23** Find the set of values for which

$\frac{6}{x + 5} < 2, x \neq -5.$ **(6 marks)**

← Section 3.5

E **24** The functions f and g are defined as $f(x) = 9 - x^2$ and $g(x) = 14 - 6x$, $x \in \mathbb{R}$.

a On the same set of axes, sketch the graphs of $y = f(x)$ and $y = g(x)$. Indicate clearly the coordinates of any points where the graphs intersect with each other or the coordinate axes. **(5 marks)**

b On your sketch, shade the region that satisfies the inequalities $y > 0$ and $f(x) > g(x)$. **(1 mark)**

← Sections 3.2, 3.3, 3.7

E/P **25** **a** Factorise completely $x^3 - 4x$. **(1 mark)**

b Sketch the curve with equation $y = x^3 - 4x$, showing the coordinates of the points where the curve crosses the x-axis. **(2 marks)**

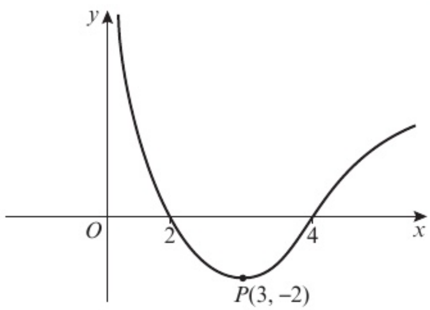
c On a separate diagram, sketch the curve with equation

$y = (x - 1)^3 - 4(x - 1)$

showing the coordinates of the points where the curve crosses the x-axis. **(2 marks)**

← Sections 1.3, 4.1, 4.5

E **26**



The figure shows a sketch of the curve with equation $y = f(x)$. The curve crosses the x-axis at the points (2, 0) and (4, 0). The minimum point on the curve is $P(3, -2)$.

In separate diagrams, sketch the curves with equation

a $y = -f(x)$ **(2 marks)**

b $y = f(2x)$ **(2 marks)**

On each diagram, give the coordinates of the points at which the curve crosses the x-axis, and the coordinates of the image of P under the given transformation.

← Sections 4.6, 4.7