Sir Harry Smith
COMMUNITY COLLEGE
SUCCESS & ACHIEVEMENT FOR ALL

WELCOME TO A-LEVEL MATHS

GCSE TO A-LEVEL SUMMER TRANSITION

Dear Students,

Welcome to the start of you're A-Level Mathematics Course. The 'A' Level in mathematics is a very demanding subject, requiring that you match the work taught and completed in the classroom with an equal amount of independent study outside too.
Many of the topics you will meet in the first half of year 12 will pick up from where your GCSE Course finished, as well as extending into more advanced branches of these topics.

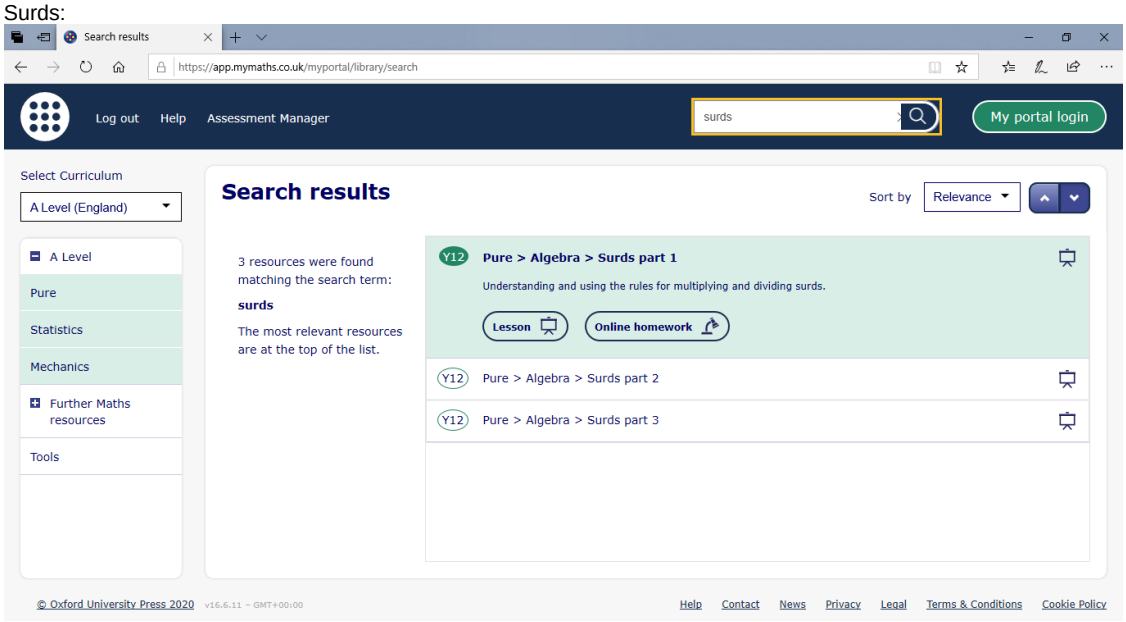
Two such topics are surds and equations of straight lines.

This pack contains a range of past exam questions on these two topics. While they are more demanding than those topics covered at GCSE, they require no extra skills.

Obviously, this work should be attempted after doing some suitable research. You can research and self-study these topics in whatever way you wish. We would strongly recommend working through the appropriate MyMaths lessons.

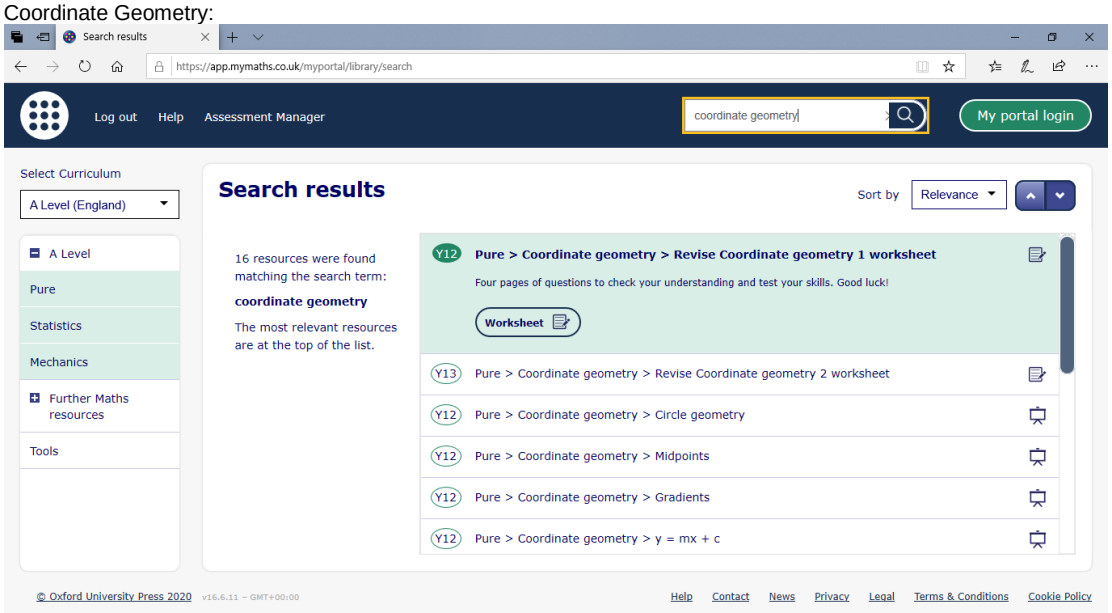
WHAT YOU NEED TO DO:
Complete the appropriate **lessons** in MyMaths, which can be found by selecting "A Level England" in the dropdown "select curriculum" menu, and then searching for the following:

1. Surds:



From the search results, work through "Pure>Algebra>Surds Part 1" and "Pure>Algebra>Surds Part 2".

2. Coordinate Geometry:



Ensure you complete "Pure>Coordinate Geometry>Equation of a Line", "Pure>Coordinate Geometry>Gradients", "Pure>Coordinate Geometry>Intersecting Lines", "Pure>Coordinate Geometry>Midpoints" and "Pure>Coordinate Geometry>Revise Coordinate Geometry".

WHAT YOU NEED TO HAND IN
Your work should be handed in on squared (preferably) A4 paper, with your name on each piece.

Presenting your work

Your work needs to be:

1. Legible – if we cannot read it, we cannot mark it.
2. Logical – The way you present your work needs to be in a structured fashion. We need to see the steps you have taken to reach an answer.
3. Supported by FULL working out – Just like at GCSE, an answer alone will score at most 1 mark. We need to see not only that you can right answers, but also that those answers have been obtained in the correct way. Work without method will score no marks.

HOW WE WILL ASSESS YOUR TRANSITION WORK:

We will mark your task against the examination mark scheme. There are 112 marks in total.

We will not give you a grade. We accept that this work is challenging, and that marks might be difficult to attain, we are using this task to assess your suitability for the course. We are more concerned that we can see evidence of research and self-study rather than how many marks you achieve.

We will comment on your approach to the work, against the criteria:

1. Quality of Working Out. – Is the working clearly presented, can we understand your approach?
2. Legibility – Can we read what you have done?
3. Logical – Does the working out show you have progressed through the question in a structured and relevant manner.
4. Score – How much you attain out of the 112 marks.

Best wishes for the summer, and we look forward to seeing you in September.

The Sir Harry Smith Community College Maths Team

Q1.(a) (i) Express $\sqrt{18}$ in the form $k\sqrt{2}$, where k is an integer.

(1)

(ii) Simplify $\dfrac{\sqrt{8}}{\sqrt{18}+\sqrt{32}}$.

(3)

(b) Express $\dfrac{7\sqrt{2}-\sqrt{3}}{2\sqrt{2}-\sqrt{3}}$ in the form $m + \sqrt{n}$, where m and n are integers.

(4)
(Total 8 marks)

Q2. (a) Show that $\dfrac{\sqrt{50}+\sqrt{18}}{\sqrt{8}}$ is an integer and find its value.

(3)

(b) Express $\dfrac{2\sqrt{7}-1}{2\sqrt{7}+5}$ in the form $m + n\sqrt{7}$, where m and n are integers.

(4)
(Total 7 marks)

Q3.(a) (i) Express $\sqrt{48}$ in the form $n\sqrt{3}$, where n is an integer.

(1)

(ii) Solve the equation

$$x\sqrt{12} = 7\sqrt{3} - \sqrt{48}$$

giving your answer in its simplest form.

(3)

(b) Express $\dfrac{11\sqrt{3} + 2\sqrt{5}}{2\sqrt{3} + \sqrt{5}}$ in the form $m - \sqrt{15}$, where m is an integer.

(4)
(Total 8 marks)

Q4. (a) (i) Express $\sqrt{48}$ in the form $k\sqrt{3}$, where k is an integer.

(1)

(ii) Simplify $\dfrac{\sqrt{48} + 2\sqrt{27}}{\sqrt{12}}$, giving your answer as an integer.

(3)

(b) Express $\dfrac{1 - 5\sqrt{5}}{3 + \sqrt{5}}$ in the form $m + n\sqrt{5}$, where m and n are integers.

(4)
(Total 8 marks)

Q5. The line AB has equation $7x + 3y = 13$.

(a) Find the gradient of AB.

(2)

(b) The point C has coordinates (–1, 3).

(i) Find an equation of the line which passes through the point C and which isparallel to AB.

(2)

(ii) The point $\left(1\frac{1}{2}, -1\right)$ is the mid-point of AC. Find the coordinates of the point A.

(2)

(c) The line AB intersects the line with equation $3x + 2y = 12$ at the point B. Find the coordinates of B.

(3)
(Total 9 marks)

Q6. The triangle ABC has vertices $A(1, 3)$, $B(3, 7)$ and $C(– 1, 9)$.

(a) (i) Find the gradient of AB.

(2)

(ii) Hence show that angle ABC is a right angle.

(2)

(b) (i) Find the coordinates of M, the mid-point of AC.

(2)

(ii) Show that the lengths of AB and BC are equal.

(3)

(iii) Hence find an equation of the line of symmetry of the triangle ABC.

(3)
(Total 12 marks)

Q7. The point A has coordinates (6, −4) and the point B has coordinates (−2, 7).

(a) Given that the point O has coordinates (0, 0), show that the length of OA is less than the length of OB.

(3)

(b) (i) Find the gradient of AB.

(2)

(ii) Find an equation of the line AB in the form $px + qy = r$, where p, q and r are integers.

(3)

(c) The point C has coordinates $(k, 0)$. The line AC is perpendicular to the line AB. Find the value of the constant k.

(3)
(Total 11 marks)

Q8. The line AB has equation $4x - 3y = 7$.

(a) (i) Find the gradient of AB.

(2)

(ii) Find an equation of the straight line that is parallel to AB and which passes through the point $C(3, -5)$, giving your answer in the form $px + qy = r$, where p, q and r are integers.

(3)

(b) The line AB intersects the line with equation $3x - 2y = 4$ at the point D. Find the coordinates of D.

(3)

(c) The point E with coordinates $(k - 2, 2k - 3)$ lies on the line AB. Find the value of the constant k.

(2)
(Total 10 marks)

Q9. The point A has coordinates (−3, 2) and the point B has coordinates (7, k).

The line AB has equation $3x + 5y = 1$.

(a) (i) Show that $k = -4$.

(1)

(ii) Hence find the coordinates of the midpoint of AB.

(2)

(b) Find the gradient of AB.

(2)

(c) A line which passes through the point A is perpendicular to the line AB. Find an equation of this line, giving your answer in the form $px + qy + r = 0$, where p, q and r are integers.

(3)

(d) The line AB, with equation $3x + 5y = 1$, intersects the line $5x + 8y = 4$ at the point C. Find the coordinates of C.

(3)

(Total 11 marks)

Q10. The line AB has equation $3x - 4y + 5 = 0$.

(a) The point with coordinates $(p, p + 2)$ lies on the line AB. Find the value of the constant p.

(2)

(b) Find the gradient of AB.

(2)

(c) The point A has coordinates (1, 2). The point $C(-5, k)$ is such that AC is perpendicular to AB. Find the value of k.

(3)

(d) The line AB intersects the line with equation $2x - 5y = 6$ at the point D. Find the coordinates of D.

(3)
(Total 10 marks)

Q11. (a) (i) Simplify $(3\sqrt{2})^2$.

(1)

(ii) Show that $(3\sqrt{2} - 1)^2 + (3 + \sqrt{2})^2$ is an integer and find its value.

(4)

(b) Express $\dfrac{4\sqrt{5} - 7\sqrt{2}}{2\sqrt{5} + \sqrt{2}}$ in the form $m - \sqrt{n}$, where m and n are integers.

(4)
(Total 9 marks)

Q12. (a) Simplify $(3\sqrt{3})^2$.

(1)

(b) Express $\frac{4\sqrt{3}+3\sqrt{7}}{3\sqrt{3}+\sqrt{7}}$ in the form $\frac{m+\sqrt{21}}{n}$, where m and n are integers.

(4)

(Total 5 marks)

Q13. Express $\frac{5\sqrt{3}-6}{2\sqrt{3}+3}$ in the form $m + n\sqrt{3}$, where m and n are integers.

(Total 4 marks)