YEAR 12 – BRIDGING UNITS

A-LEVEL FURTHER MATHS

ST HILDA'S COLLEGE

The 6th Form
@ St Hilda's

BRIDGING UNITS

Name:

Anything is POSSIBLE

Welcome to A-level Further Mathematics

Setting yourself up for continued success

Completing the "Transition to A-level Mathematics" course, as already explained in the bridging unit for A-level Maths, will secure many of the skills also necessary for Further Maths. In addition, please complete questions in this pack including:

- Graphical inequalities
- Short problems
- Longer problems

Revision for this topic

www.corbettmaths.com/contents

Video 180
Video 181
Video 182

Please have this booklet completed and ready to hand in for marking on Monday 16th September. If you encounter any problems, please email mmurray@st-hildas.co.uk.

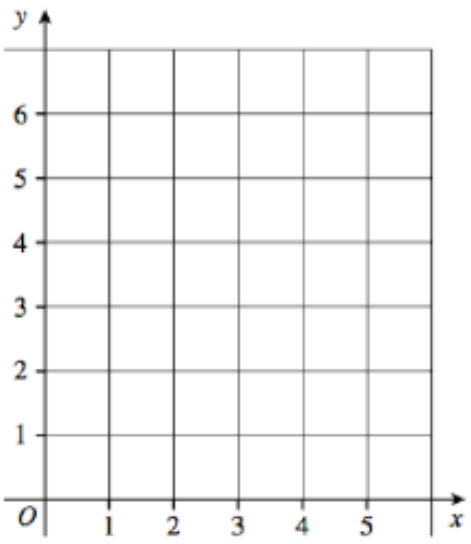
We look forward to meeting you properly in your first lessons in September.

St Hilda's Maths.

Part 1: graphical inequalities

1. On the grid, clearly indicate the region that satisfies all these inequalities.

$x \geq 3$ $y \geq 1$ $x + y \leq 5$

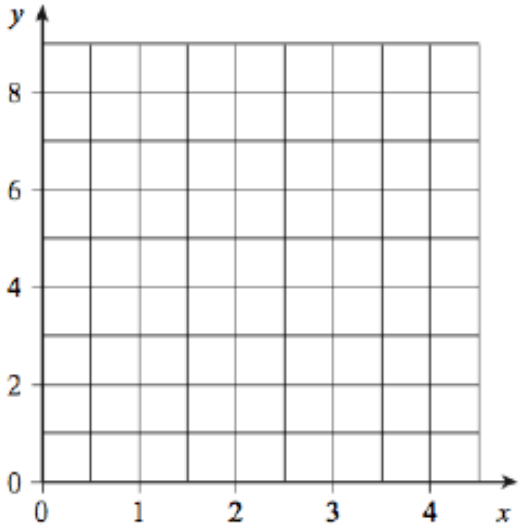


(3)

Anything is POSSIBLE

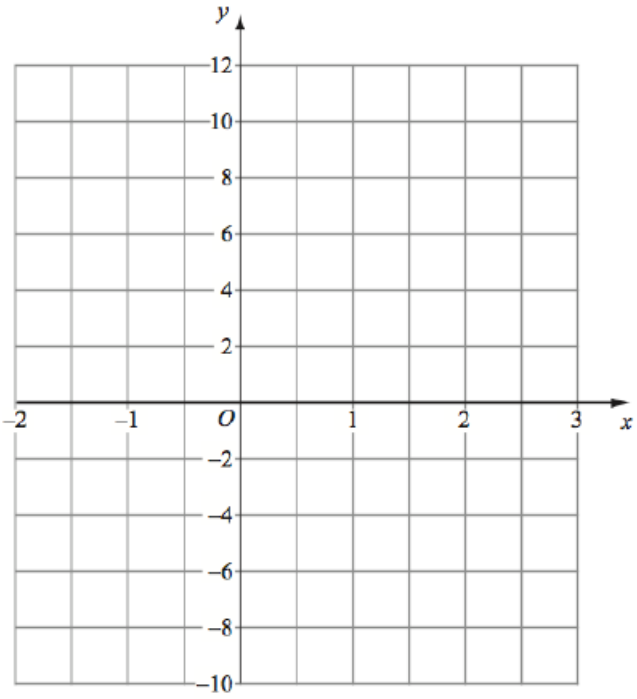
2. On the grid, clearly indicate the region that satisfies all these inequalities.

$y < x$ $y \geq 1$ $x + y \leq 4$



(3)

3.



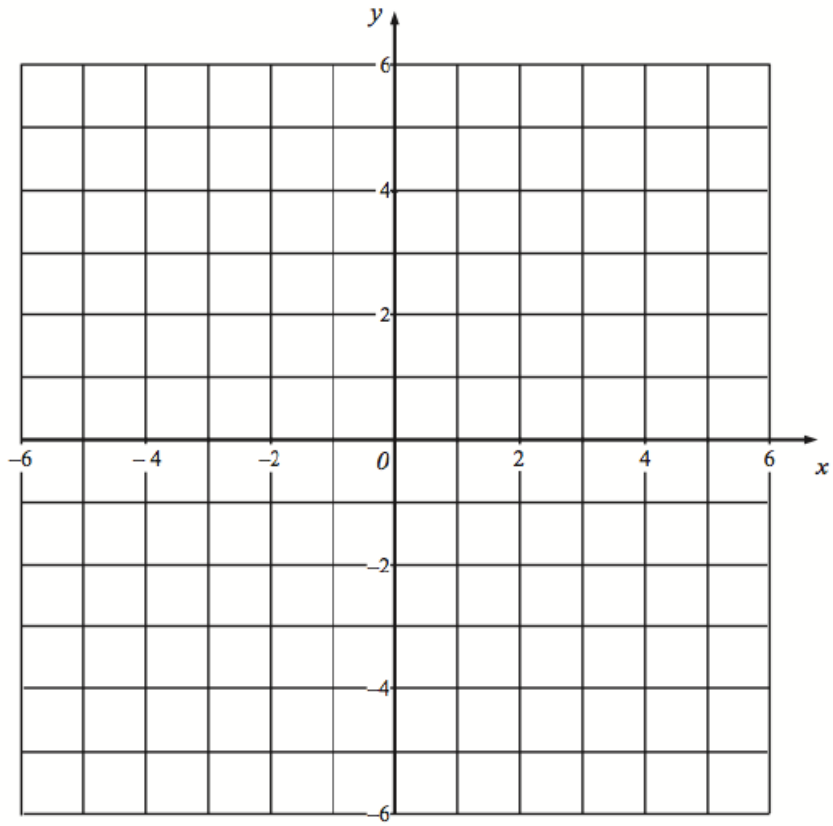
On the grid, label the region that satisfies all three of these inequalities

$-1 < x < 2$ $y \leq 8$ $y \geq 4x - 4$

(4)

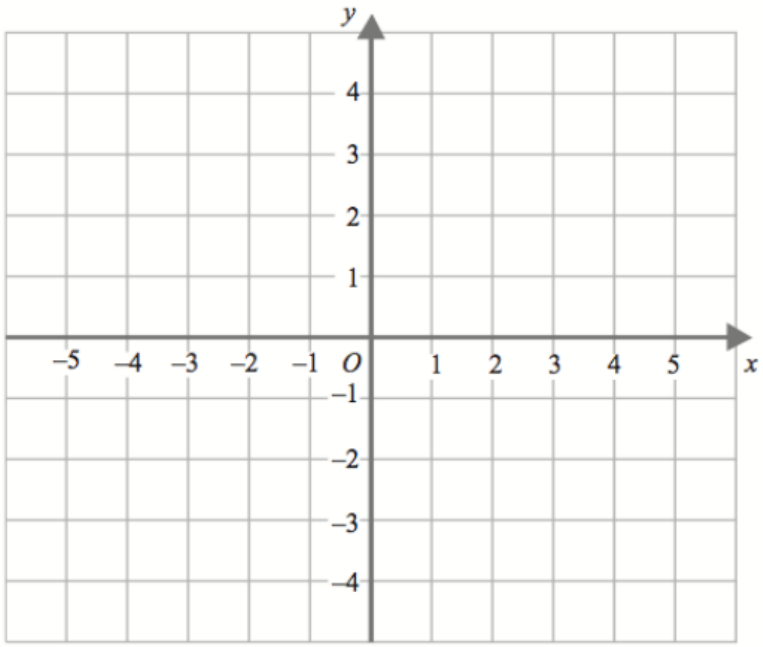
4. On the grid, label the region that satisfies all three of these inequalities

$x < 3$ $y > -3$ $y > 2x$



5. On the grid, clearly label the region which satisfies all three inequalities below

$x \leq 2$ $y < 2x - 2$ $x + y + 2 > 0$

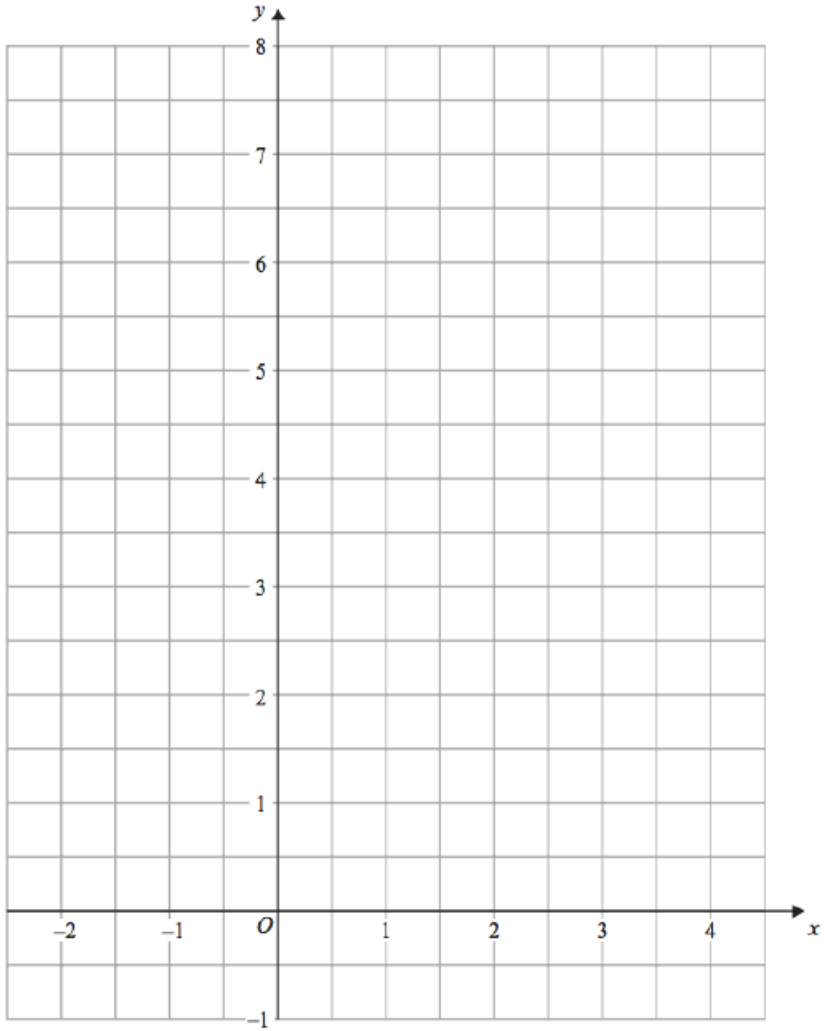


(4)

Anything is POSSIBLE

6. On the grid, clearly label the region which satisfies all three inequalities below

$x > 0$ $y \geq \frac{1}{2}x$ $x + 2y < 4$

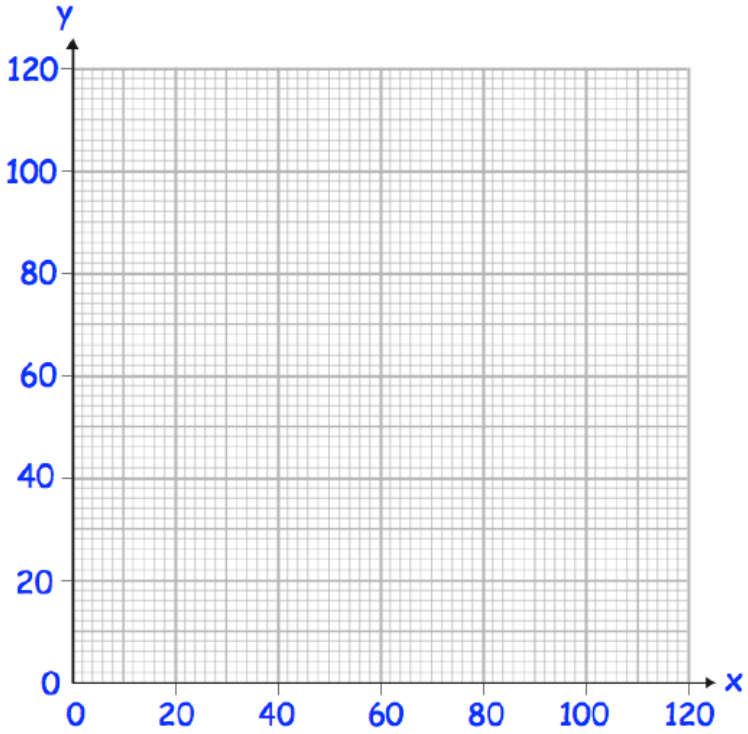


(4)

7. A greengrocer sells bananas and apples.
In one day he sells
up to 80 bananas
up to 90 apples
no more than a total of 110 pieces of fruit

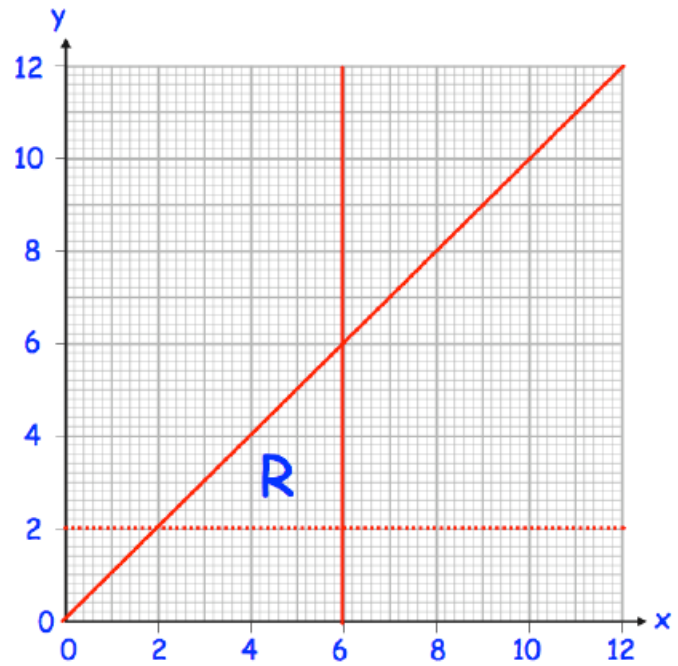
Let x be the number of bananas sold
Let y be the number of apples sold.

Show the region below that satisfies these inequalities



(4)

8.



The region labelled R satisfies three inequalities.

State the three inequalities

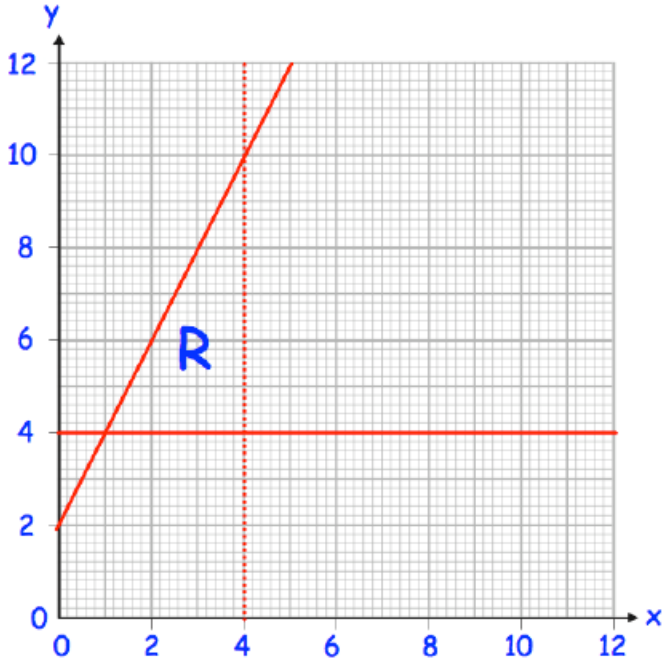
.....

.....

.....

(3)

9.



The region labelled R satisfies three inequalities.

State the three inequalities

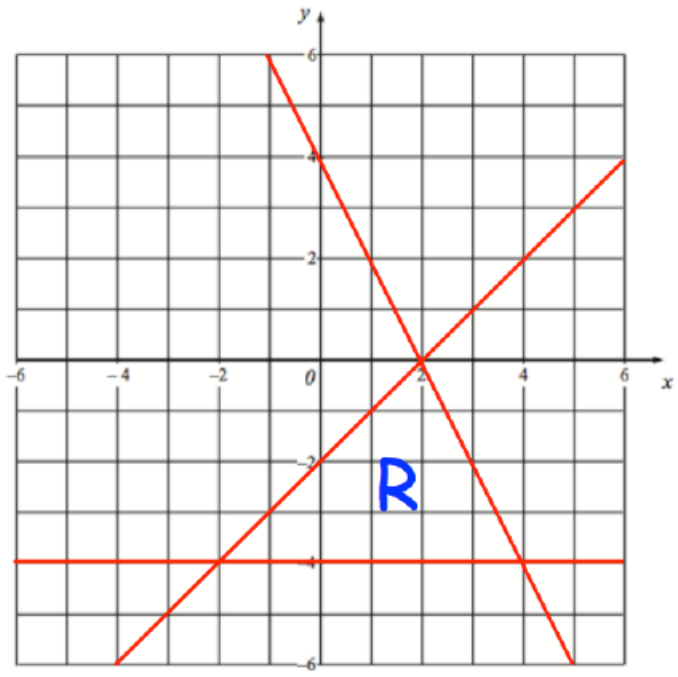
.....

.....

.....

(3)

10.



The region labelled R satisfies three inequalities.

State the three inequalities

.....

.....

.....

(3)

Part 2: short problems

Question 1

Find the value of

$$\frac{99}{100} \times \frac{80}{81} \times \frac{63}{64} \times \frac{48}{49} \times \frac{35}{36} \times \frac{24}{25} \times \frac{15}{16} \times \frac{8}{9} \times \frac{3}{4}.$$

Write your answer in the form $\frac{a}{b}$, where a and b are positive integers with no common factors other than 1.

Question 2

A point E lies outside the rectangle $ABCD$ such that CBE is an equilateral triangle. The area of the pentagon $ABECD$ is five times the area of the triangle CBE.

What is the ratio of the lengths $AB : AD$?

Write your answer in the form $a : 1$.

Question 3

A sequence is defined as follows:

$u_1 = 123$.

For $n \geq 1$, define u_{n+1} = the sum of the squares of the digits of u_n.

For example, $u_2 = 1^2 + 2^2 + 3^2 = 14$, $u_3 = 1^2 + 4^2 = 17$.

What is the value of u_{100}?

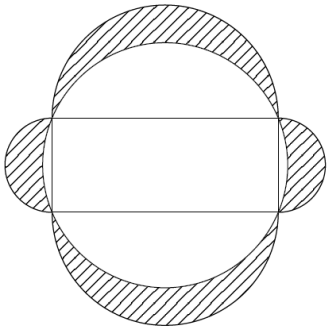
Question 4

Find the value of

$$\left(\left(2^{\frac{3}{4}}+1\right)^2+\left(2^{\frac{3}{4}}-1\right)^2\right)\left(\left(2^{\frac{3}{4}}+1\right)^2+\left(2^{\frac{3}{4}}-1\right)^2-2^2\right).$$

Question 5

Four semicircles are drawn on the sides of a rectangle with width 10 cm and length 24 cm. A circle is drawn that passes through the four vertices of the rectangle.



What is the value, in cm^2, of the shaded area?

Question 6

The points $A(1,2)$ and $B(-2,1)$ are two vertices of a rectangle $ABCD$. The diagonal CA produced passes through the point $(2,9)$. Calculate the coordinates of the vertices C and D.

Part 3: longer problems

Question 1

(i) Find all real solutions of the equation

$$(x^2 - 7x + 11)^{(x^2-11x+30)} = 1.$$

(ii) Find all real solutions of the equation

$$(2 - x^2)^{(x^2-3\sqrt{2}x+4)} = 1.$$

Question 2

Evaluate the sum

$$\frac{1}{\sqrt{1}+\sqrt{2}}+\frac{1}{\sqrt{2}+\sqrt{3}}+\frac{1}{\sqrt{3}+\sqrt{4}}+\cdots+\frac{1}{\sqrt{15}+\sqrt{16}}.$$

(You might want to use a calculator to get an estimate of the answer, but in order to get the exact answer you will have to do it by hand!)

Can you find a similar sum that evaluates to 5?

Can you find a similar sum that evaluates to a number that is not an integer?