

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 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

Please have this booklet completed and ready to hand in for marking on Monday 14th September. If you encounter any problems, please email mmurray@st-hildas.co.uk.

Revision for this topic

www.corbettmaths.com/contents

Video 180

Video 181

Video 182



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

St Hilda's Maths.

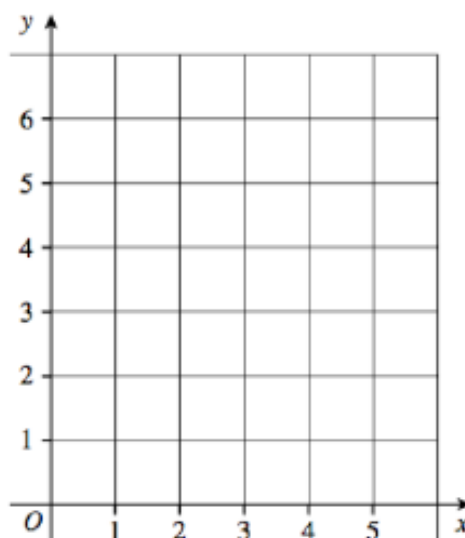
Part 1: graphical inequalities

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

$$x \geq 3$$

$$y \geq 1$$

$$x + y \leq 5$$



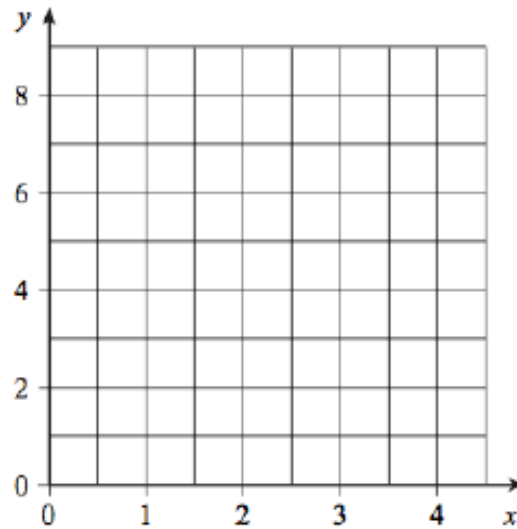
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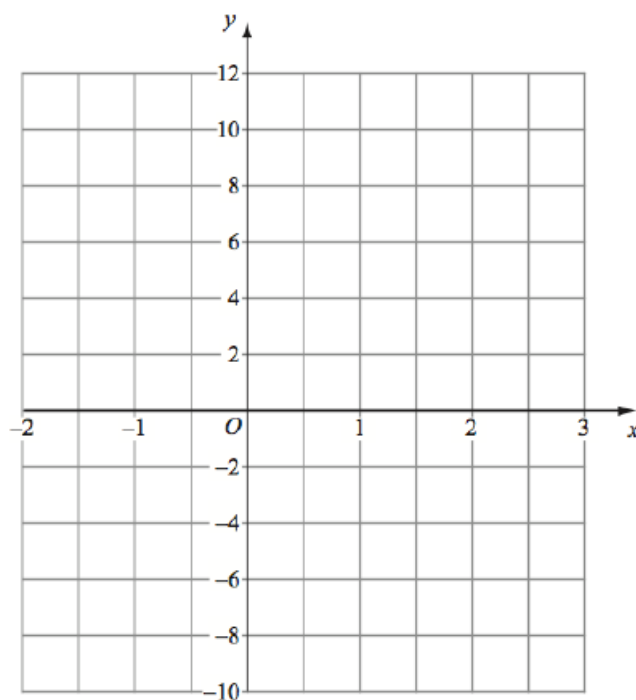
2. On the grid, clearly indicate the region that satisfies all these inequalities.

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



(3)

- 3.



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

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

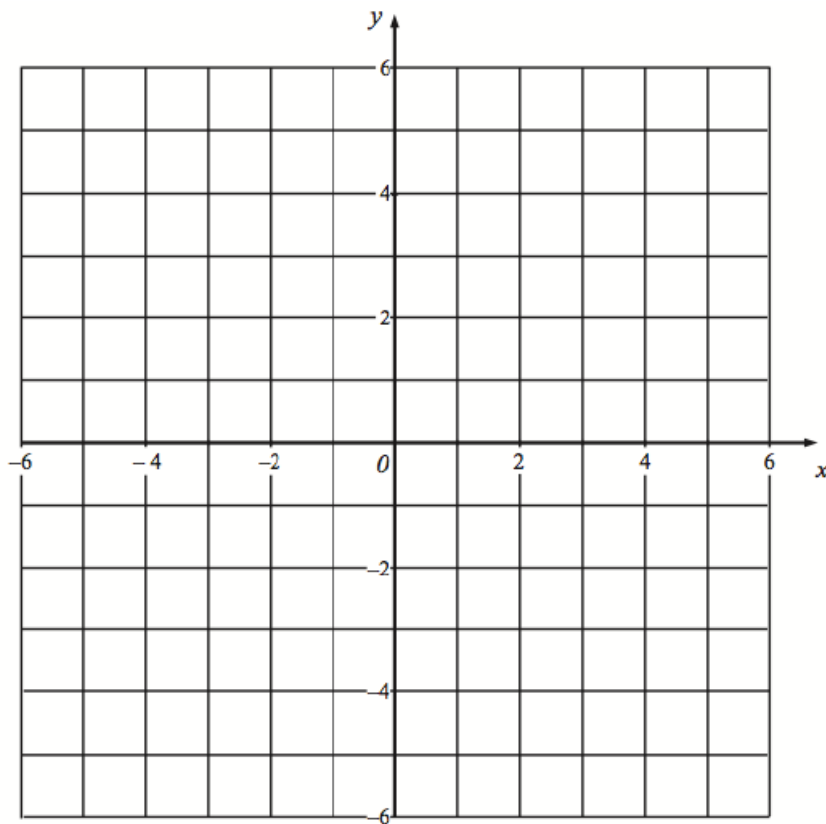
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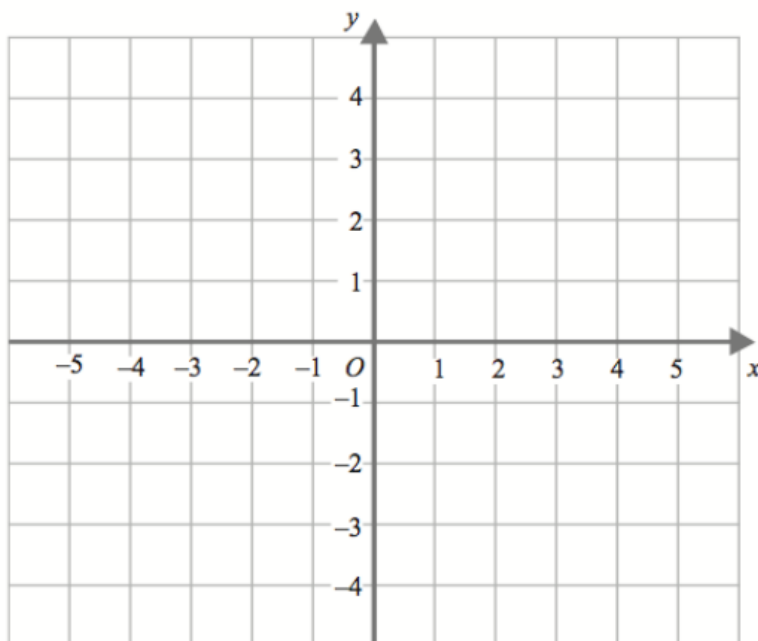
4. On the grid, label the region that satisfies all three of these inequalities

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



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

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

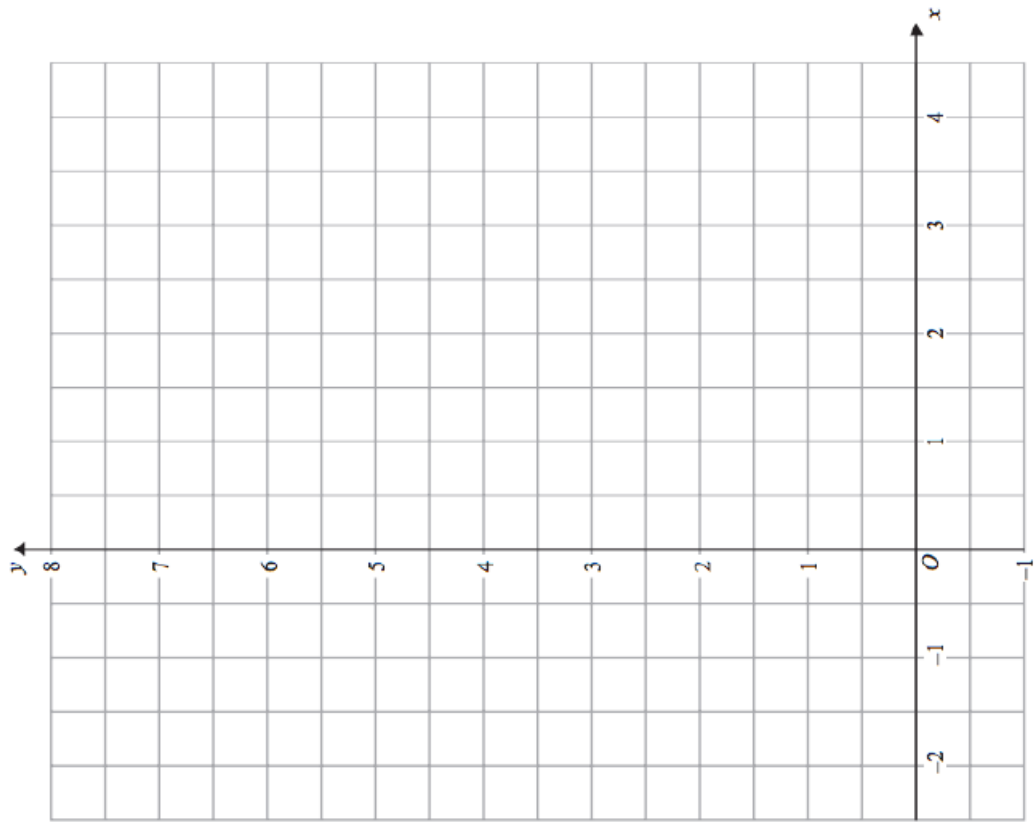


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6. On the grid, clearly label the region which satisfies all three inequalities below

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



(4)

7. A greengrocer sells bananas and apples.
In one day he sells

up to 80 bananas

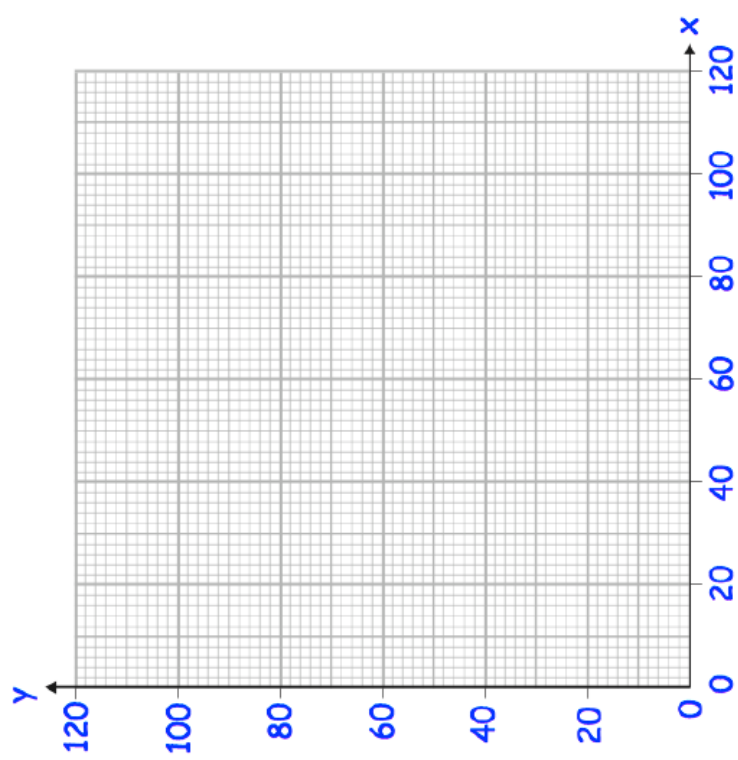
up to 90 apples

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

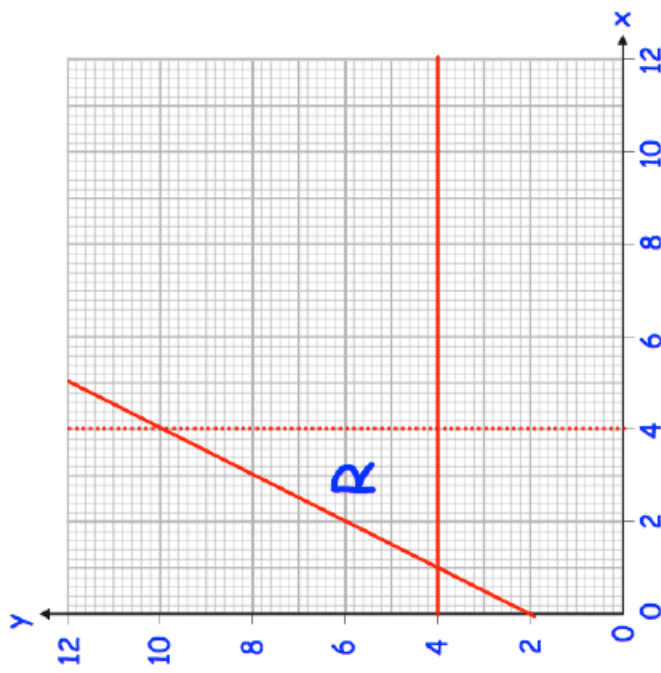


(4)

Anything is

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9.



The region labelled R satisfies three inequalities.

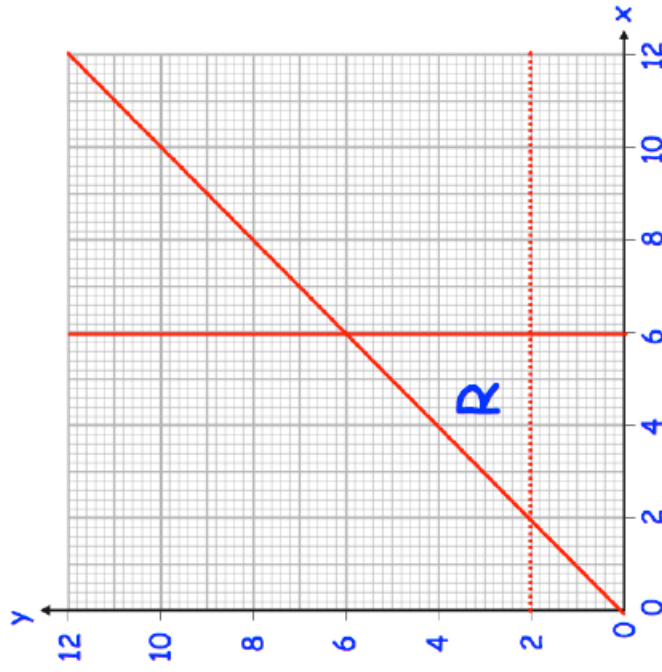
State the three inequalities

.....

.....

..... (3)

8.



The region labelled R satisfies three inequalities.

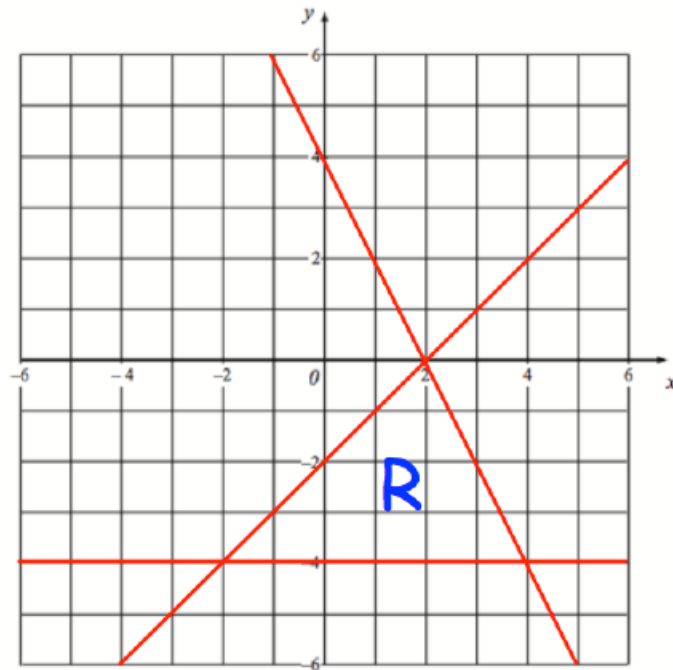
State the three inequalities

.....

.....

..... (3)

10.



The region labelled R satisfies three inequalities.

State the three inequalities

.....

.....

.....

(3)

Anything is

POSSIBLE

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

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

Anything is

POSSIBLE

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

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

Anything is

POSSIBLE

Question 2

Evaluate the sum

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

(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?