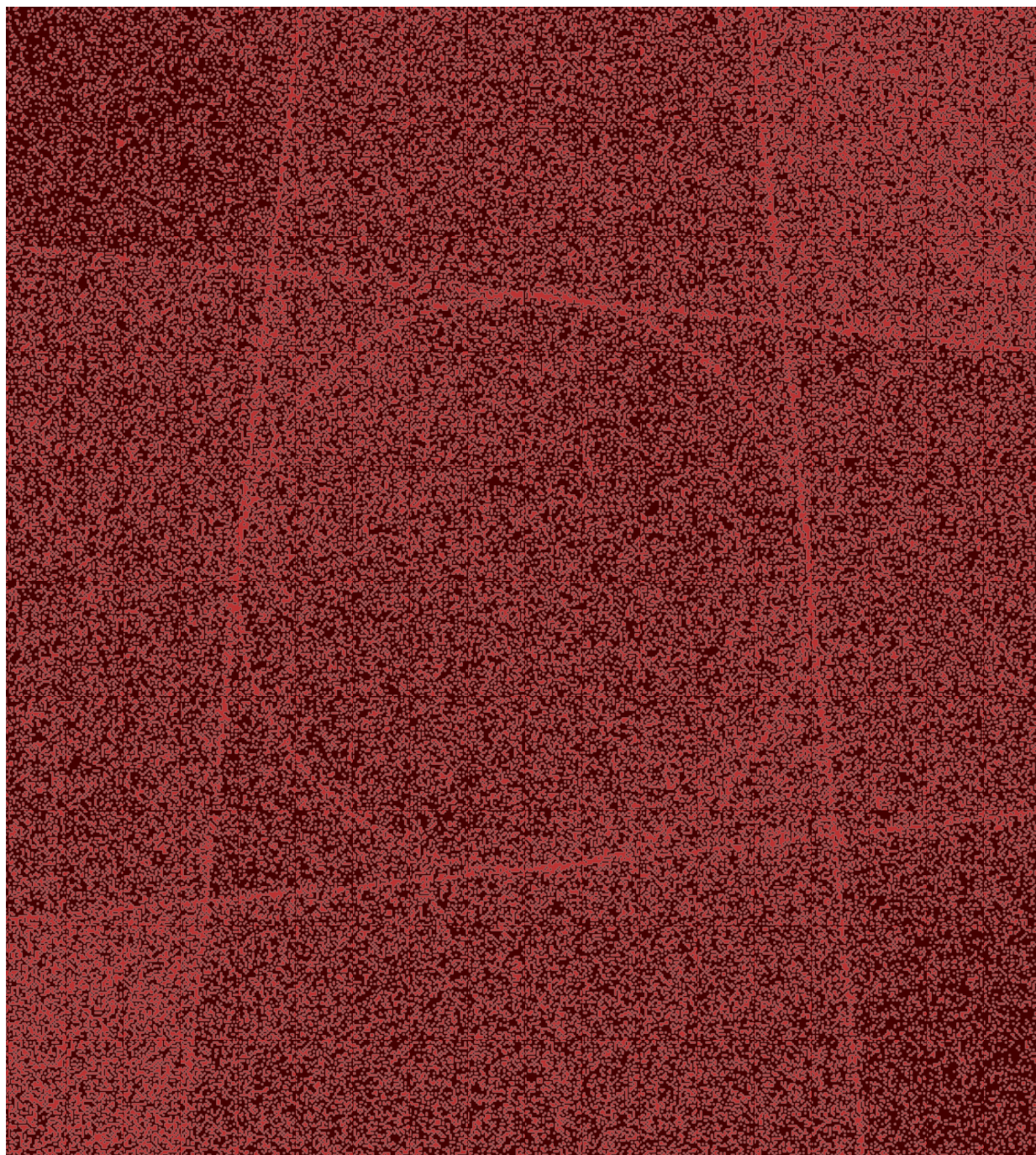


COORDINATE GEOMETRY



Lines • Circles • Curves • Tangents • Normals

COORDINATE GEOMETRY

The Straight Line

Lesson 1

A-Level Pure Mathematics, Year 1
Additional Mathematics
GCSE
Coordinate Geometry

1.1 Gradient of Straight Lines

Most straight lines can be written in the form, $y = mx + c$

where m is the gradient of the line

and c is the y axis intercept

The exception is vertical lines, such as, for example $x = 3$.

The gradient between two points $A(x_a, y_a)$ and $B(x_b, y_b)$ is given by,

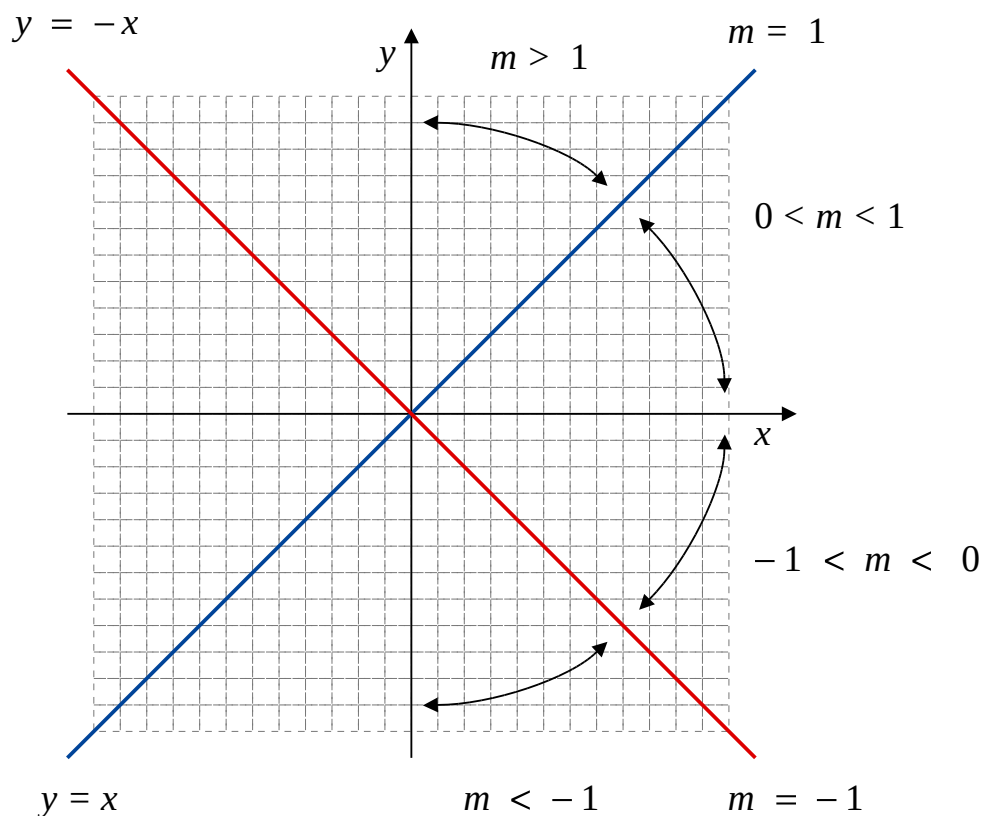
$$m = \frac{y_b - y_a}{x_b - x_a}$$

This is often written, $m = \frac{\Delta Y}{\Delta X}$, which some remember as, $m = \frac{\text{rise}}{\text{run}}$

By eye, graphs are always read from left to right.

A line with height that is increasing, left to right, has a positive gradient.

By making $\Delta X = 1$ the gradient becomes what you go up by, for every 1 moved across.



1.2 “Together” Exercise

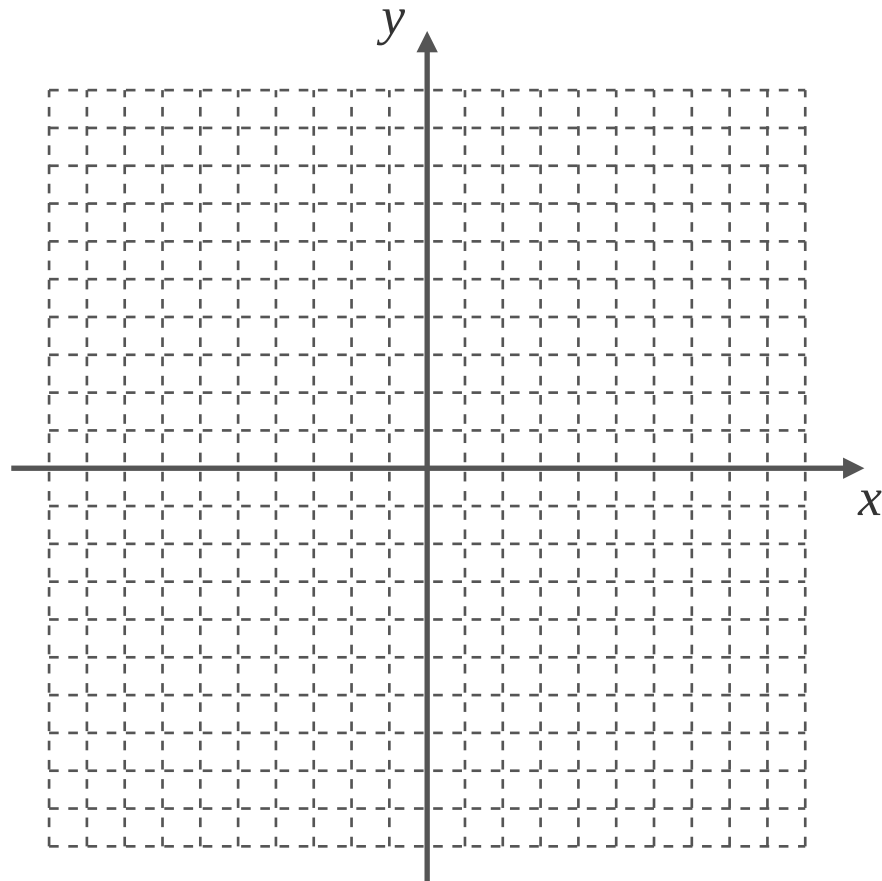
Question 1

- (i) On the graph below plot the lines with equations;

$$y = 3x + 1 \qquad y = \frac{1}{2}x - 4 \qquad y = -2x + 11$$

Clearly show which equation goes with which line

- (ii) Shade in the triangle formed and mark on the triangle's right angle.



[5 marks]

Teaching Video : <http://www.NumberWonder.co.uk/v9033/1a.mp4>



Question 2

Without plotting a graph, find the equation of the line with gradient 2 through (5, 1)

Write your answer in the form $y = mx + c$

[3 marks]

Question 3

Without plotting a graph, find the equation of the line between the points A (2, 11)

and B (5, 20).

[3 marks]

Teaching Video : <http://www.NumberWonder.co.uk/v9033/1b.mp4>



1.3 Exercise

*Any solution based entirely on graphical
or numerical methods is not acceptable*

Marks Available : 50

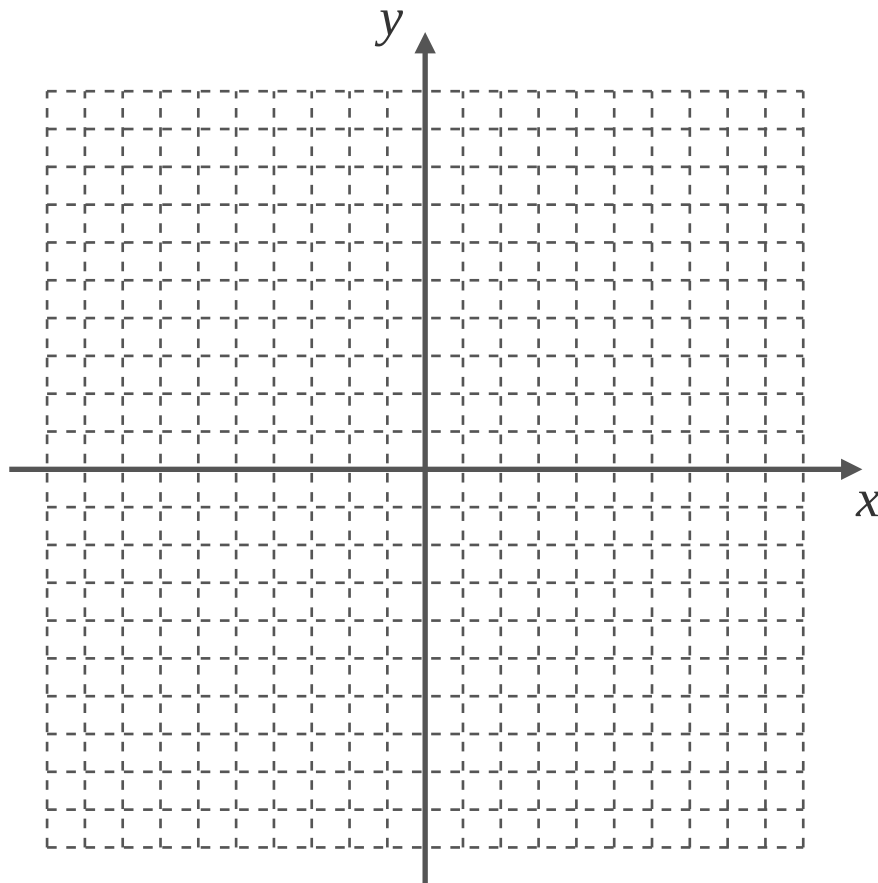
Question 1

- (i) On the graph below plot the lines with equations;

$$y = 3x - 2 \qquad y = \frac{1}{2}x + 3 \qquad y = -2x - 7$$

Clearly show which equation goes with which line.

- (ii) Shade in the triangle formed and mark on the triangle's right angle.



[5 marks]

Question 2

Without drawing a graph, find the equation of the line with gradient 3 through (2, 13)

Write your answer in the form $y = mx + c$

[3 marks]

Question 3

Without drawing a graph find the equation of the line between the points $A(2, 5)$ and $B(5, 17)$

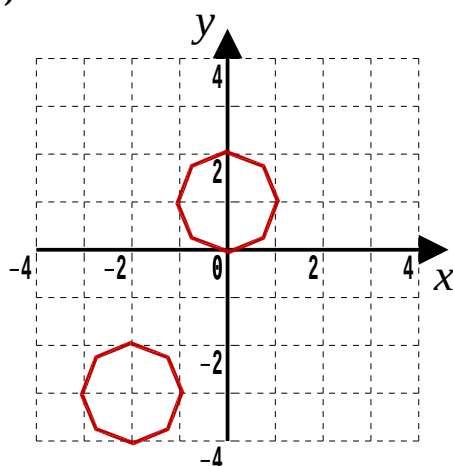
[3 marks]

Question 4

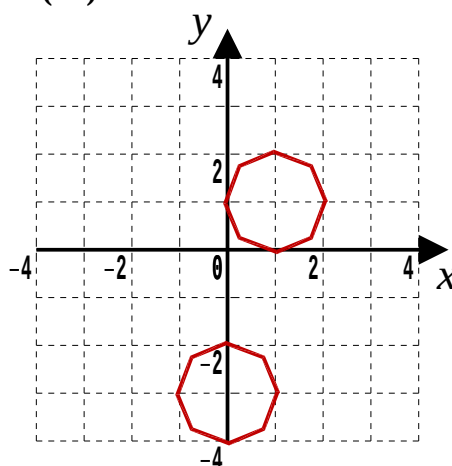
On each of the following graphs,

- (a) Carefully draw a line that passes exactly through the two points at the centre of the octagons
- (b) Write down the equation of the line, where possible, in the form $y = mx + c$

(i)

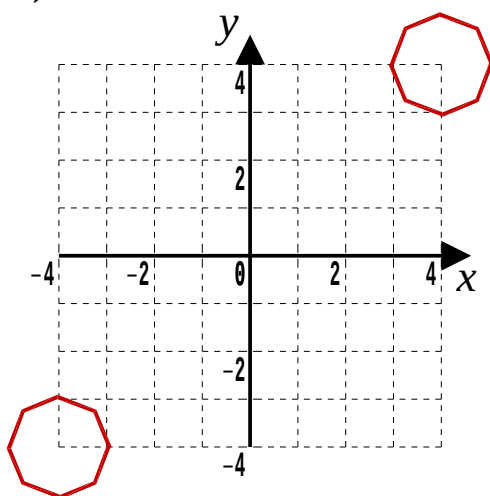


(ii)

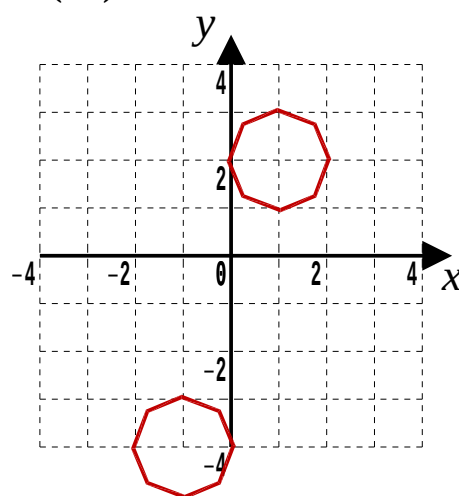


[2, 2 marks]

(iii)

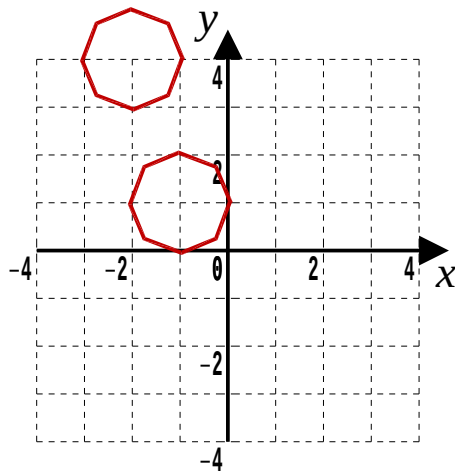


(iv)

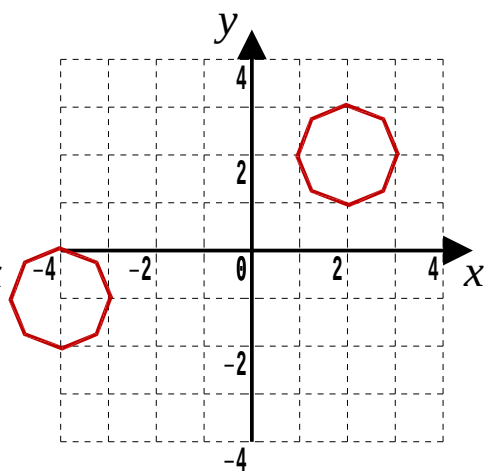


[2, 2 marks]

(v)

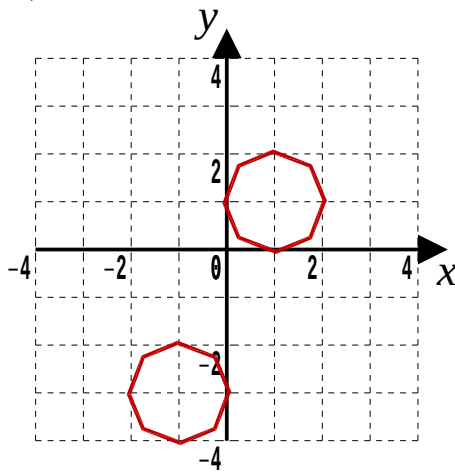


(vi)

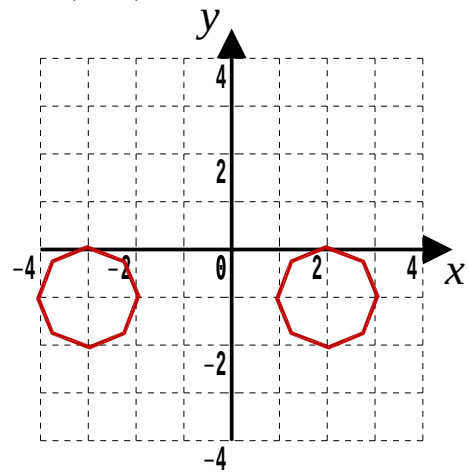


[2, 2 marks]

(vii)

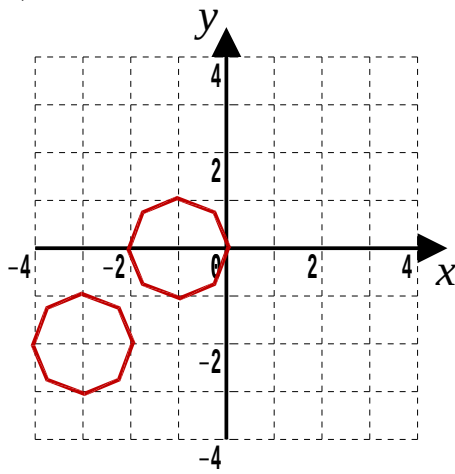


(viii)

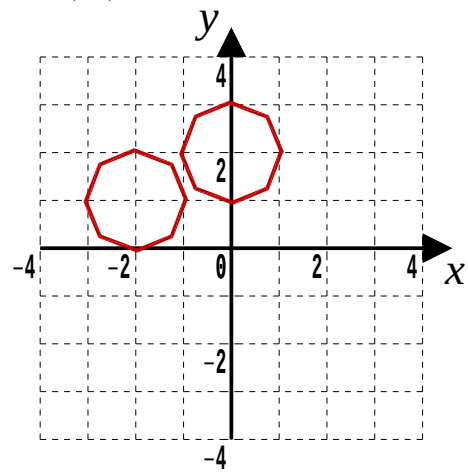


[2, 2 marks]

(ix)



(x)



[2, 2 marks]

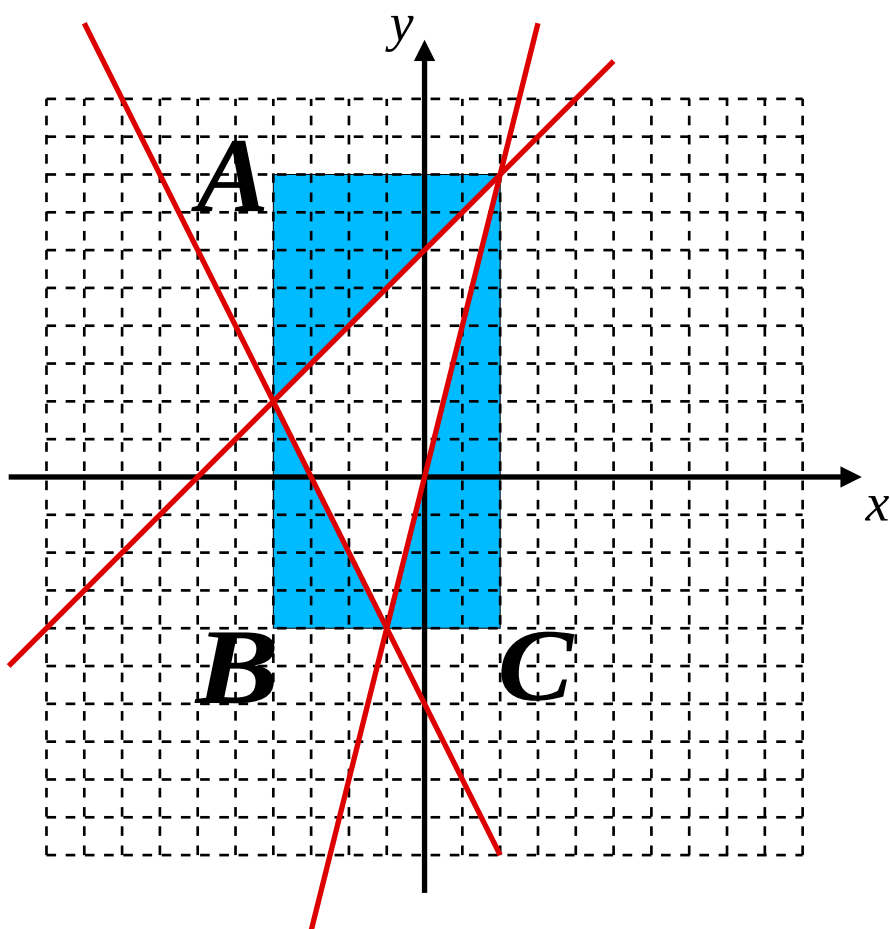
Question 5

A question on the “throw a box around” method to find the area of a triangle.

On the graph below the x -axis runs from -10 to $+10$ and the y -axis does the same. Three straight lines are plotted.

- (i) Next to each line, at a suitable place, write that line's equations. [3 marks]
- (ii) Calculate the area of triangle A [1 mark]
- (iii) Calculate the area of triangle B [1 mark]
- (iv) Calculate the area of triangle C [1 mark]

Hence, or otherwise, determine the area of the triangle enclosed by the three lines [3 marks]



Question 6

Find the distance between the points $A (2, 11)$ and $B (5, 20)$.

Give your answer in the form $p \sqrt{10}$ where p is an integer to be found.

HINT : The Theorem of Pythagoras

[3 marks]

Question 7

Without drawing a graph, find the equation of the line with gradient 0.5 that passes through the point $(12, 2)$, writing your answer in the form $y = mx + c$

[3 marks]

Question 8

Without drawing a graph, find the equation of the line between the points $A (3, 5)$ and $B (7, - 11)$. Show your working.

[4 marks]

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In October 2020, Shrewsbury School was voted “**Independent School of the Year 2020**”

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Teachers may obtain detailed worked solutions to the exercises by email from MHHShrewsbury@Gmail.com