

WEST COVENTRY ACADEMY SIXTH FORM



SUBJECT TRANSITION BOOK Summer 2022 Mathematics

STUDENT NAME:.....

This booklet has been prepared by Maths staff for you to read and attempt. The work contained in it will ensure that you get off to the best possible start in this subject area at A level, should you decide to enrol. It is very important that you read this booklet carefully and have a thorough attempt at completing the work. We have also made available Examples, Powerpoints and Support links to help you attempt the questions. There are even some optional Extension problem questions too!

You will need to submit this completed booklet to your subject teacher in the very first lesson, if you do enrol to start Maths in Y12. This will be the first impression you create and is a real indicator of how seriously you are prepared to be in your studies.

A-Level Mathematics

The key staff:

Mrs Woodward – Curriculum Leader of Maths, staffjaw@westcoventryacademy.org

Course Details

Course Title: A level Mathematics

Exam board: Edexcel

Exam Code: For AS Mathematics 8MA0 For A Level Mathematics 9MA0

Exam Board web site: qualifications.pearson.com

Assessment method:

The Mathematics AS level is assessed by two final exams in year 12.

The Mathematics A level is assessed by three final exams in year 13.

Minimum requirement:

Standard entry requirements of five A*-C grades (or equivalent 9-1 grades) including English language, along with Mathematics ideally at Grade 7 or above.

About the course

This course will hopefully extend your mathematical thinking and enjoyment of the subject. The course builds strongly upon GCSE Maths, particularly the aspects of algebra, so you must be confident in these skills. You must also be prepared to think! You will have to solve problems by drawing on a number of mathematical topics and be prepared to persevere with some lengthy solutions.

AS Level Mathematics

Pure Mathematics – One 2-hour Exam paper.

Topics included are: Algebra and functions, Coordinate geometry, Trigonometry, Vectors, Exponentials and logarithms, Differentiation and Integration.

Mechanics and Statistics- One 1¼ hour Exam paper.

Topics included in the statistics module are: Statistical sampling, Data presentation and interpretation, Probability, Statistical distributions, Statistical hypothesis testing.

Topics included in the mechanics module are: Quantities and units in mechanics, Kinematics and Forces and Newton's laws.

A Level Mathematics

Pure Maths – Two 2-hour Exam papers.

Topics included are: Algebra and functions, Coordinate geometry, Trigonometry, 2D Vectors, Exponentials and logarithms, Differentiation and Integration. Proof, Algebraic & partial fractions, Functions and modelling, Series & sequences, Binomial theorem, Trigonometry, Parametric equations, Differentiation, Numerical methods, Integration and 3D Vectors.

Mechanics and Statistics - One 2-hour Exam paper.

Topics included in the statistics module are: Statistical sampling, Data presentation and interpretation, Probability, Statistical distributions, Statistical hypothesis testing, Regression and correlation, Normal distribution

Topics included in the mechanics module are: Quantities and units in mechanics, Kinematics, Forces & Newton's laws, Moments and Forces at any angle.

Academic and Career Pathways

Apart from further study of Mathematics itself, many university courses depend on the subject. For example, Science, Computing and Engineering based courses use a great deal of mathematics. Subjects such as Geography, Psychology, Economics and Business make use of Statistics. Mathematics is also a requirement for Finance and Accountancy training. It is reported that people with A Level Mathematics are earning an average of 10% more.

What equipment will be needed for the subject?

An A4 ring binder, with dividers

Lined paper

Pens, pencils, ruler

A scientific calculator, capable of dealing with data analysis of a large data set. We recommend the new Casio Classwiz fx-991EX.

PLEASE CONSULT WITH THE MATHS DEPARTMENT BEFORE BUYING ANY OTHER MODEL.

Text Books

Students are required to hand in a refundable deposit of £10 for each of the two text books needed for AS Maths and £10 deposit for each of the two AL books. The deposits will be returned to the students on return of the text books in a reusable condition.

The Bridge to A level Maths



- Here are the questions for you to attempt.
- There is a document of worked Examples for each section to help.
- There is a document of Support links for each section to help.
- There are some Grade 7 to Grade 9 PowerPoints to help.
- Don't forget, you are expected to hand in this work in the first lesson, if you decide to enrol to do Maths at A level.
- Good luck!

1 Solving quadratic equations

Question 1

Solve $x^2 + 6x + 8 = 0$

(2)

Question 2

Solve the equation $y^2 - 7y + 12 = 0$

Hence solve the equation $x^4 - 7x^2 + 12 = 0$

(4)

Question 3

(i) Express $x^2 - 6x + 2$ in the form $(x-a)^2 - b$

(3)

(ii) State the coordinates of the minimum value on the graph of $y = x^2 - 6x + 2$

(1)

Total / 10

2 Changing the subject

Question 1

Make v the subject of the formula $E = \frac{1}{2}mv^2$

(3)

Question 2

Make r the subject of the formula $V = \frac{4}{3}\pi r^2$

(3)

Question 3

Make c the subject of the formula $P = \frac{c}{c+4}$

(4)

Total / 10

3 Simultaneous equations

Question 1

Find the coordinates of the point of intersection of the lines $y = 3x + 1$ and $x + 3y = 6$

(3)

Question 2

Find the coordinates of the point of intersection of the lines $5x + 2y = 20$ and $y = 5 - x$

(3)

Question 3

Solve the simultaneous equations

$$x^2 + y^2 = 5$$

$$y = 3x + 1$$

(4)

Total / 10

4 Surds

Question 1

(i) Simplify $(3 + \sqrt{2})(3 - \sqrt{2})$

(2)

(ii) Express $\frac{1+\sqrt{2}}{3-\sqrt{2}}$ in the form $a + b\sqrt{2}$ where a and b are rational

(3)

Question 2

(i) Simplify $5\sqrt{8} + 4\sqrt{50}$. Express your answer in the form $a\sqrt{b}$ where a and b are integers and b is as small as possible.

(2)

(ii) Express $\frac{\sqrt{3}}{6-\sqrt{3}}$ in the form $p + q\sqrt{3}$ where p and q are rational

(3)

Total / 10

5 Indices

Question 1

Simplify the following

(i) a^0

(1)

(ii) $a^6 \div a^{-2}$

(1)

(iii) $(9a^6b^2)^{-0.5}$

(3)

Question 2

(i) Find the value of $\left(\frac{1}{25}\right)^{-0.5}$

(2)

(ii) Simplify $\frac{(2x^2y^3z)^5}{4y^2z}$

(3)

Total / 10

6 Properties of Lines

Question 1

A (0,2), B (7,9) and C (6,10) are three points.

(i) Show that AB and BC are perpendicular

(ii) Find the length of AC

(3)

(2)

Question 2

Find, in the form $y = mx + c$, the equation of the line passing through A (3,7) and B (5,-1).

Show that the midpoint of AB lies on the line $x + 2y = 10$

(5)

Total / 10

Sketching curves**Question 1**

In the cubic polynomial $f(x)$, the coefficient of x^3 is 1. The roots of $f(x) = 0$ are -1, 2 and 5.

Sketch the graph of $y = f(x)$

(3)

Question 2

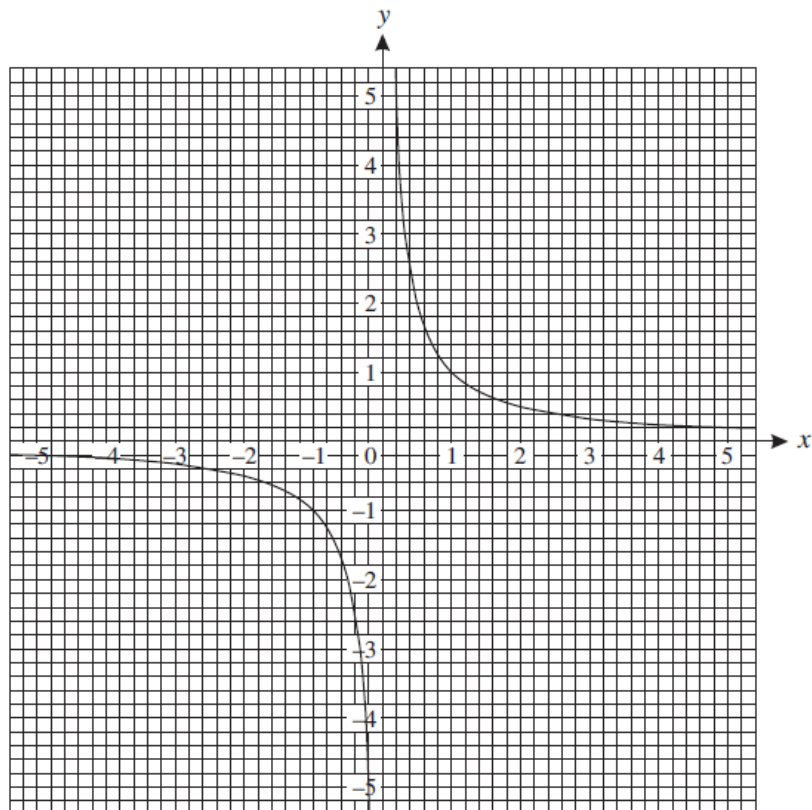
Sketch the graph of $y = 9 - x^2$

(3)

Question 3

The graph below shows the graph of $y = \frac{1}{x}$

On the same axes plot the graph of $y = x^2 - 5x + 5$ for $0 \leq x \leq 5$



(4)

Total / 10

8 Transformation of functions

Question 1

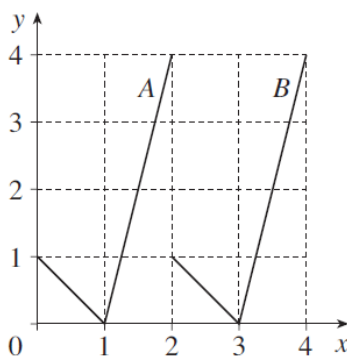
The curve $y = x^2 - 4$ is translated by $\begin{pmatrix} 2 \\ 0 \end{pmatrix}$

Write down an equation for the translated curve. You need not simplify your answer.

(2)

Question 2

This diagram shows graphs A and B.



(i) State the transformation which maps graph A onto graph B

(2)

(ii) The equation of graph A is $y = f(x)$.

Which one of the following is the equation of graph B ?

$$y = f(x) + 2$$

$$y = f(x) - 2$$

$$y = f(x+2)$$

$$y = f(x-2)$$

$$y = 2f(x)$$

$$y = f(x+3)$$

$$y = f(x-3)$$

$$y = 3f(x)$$

(2)

Question 3

(i) Describe the transformation which maps the curve $y = x^2$ onto the curve $y = (x+4)^2$

(2)

(ii) Sketch the graph of $y = x^2 - 4$

(2)

Total / 10



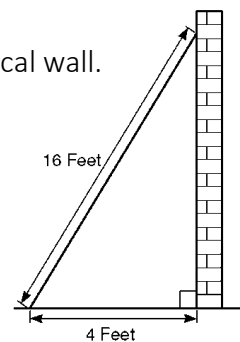
9 Trigonometric ratios

Question 1

Sidney places the foot of his ladder on horizontal ground and the top against a vertical wall.

The ladder is 16 feet long.

The foot of the ladder is 4 feet from the base of the wall.



(i) Work out how high up the wall the ladder reaches. Give your answer to 3 significant figures.

(2)

(ii) Work out the angle the base of the ladder makes with the ground. Give your answer to 3 significant figures

(2)

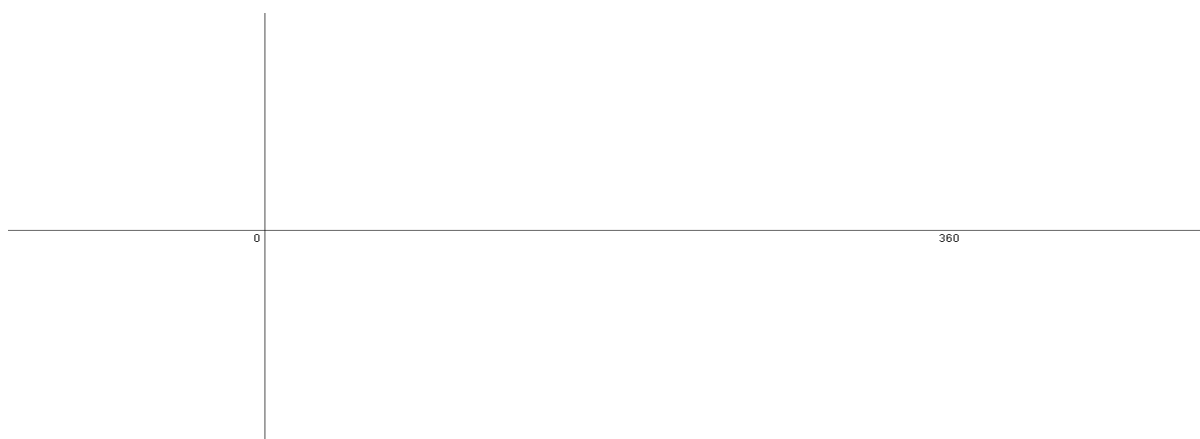
Question 2

Given that $\cos \theta = \frac{1}{3}$ and θ is acute, find the exact value of $\tan \theta$

(3)

Question 3

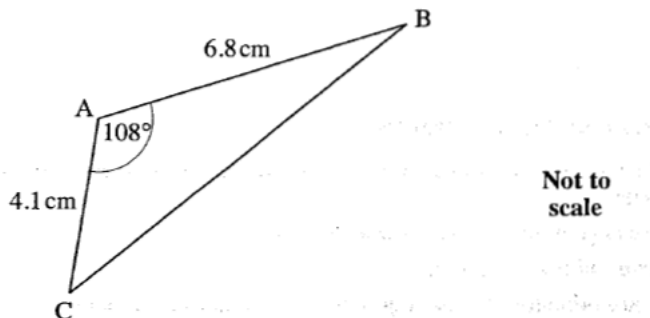
Sketch the graph of $y = \cos x$ for $0 \leq x \leq 360^\circ$



(3)

Total / 10

Question 1



For triangle ABC, calculate

(i) the length of BC

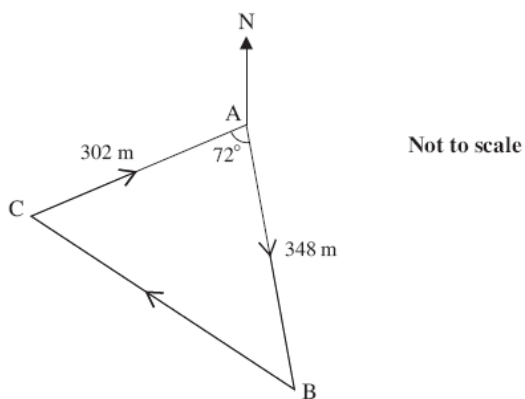
(3)

(ii) the area of triangle ABC

(3)

Question 2

The course for a yacht race is a triangle as shown in the diagram below. The yachts start at A, then travel to B, then to C and finally back to A.



Calculate the total length of the course for this race.

(4)

Total / 10

11 Inequalities

Question 1

Solve

a) $x^2 - 36 \leq 0$

b) $9x^2 - 25 \geq 0$

c) $3x^2 + 10x < 0$

.....
(3)

Question 2

Solve $\frac{21}{x+2} - \frac{5}{x+1} < 4$

.....
(4)

Question 3

Solve $3x^2 - 8 > 2x$

.....
(3)

Total / 10

Question 1

a) If n is a positive integer, write down expressions for the next two consecutive integers.

(1)

b) Use algebra to prove that the sum of three positive consecutive integers is always a multiple of 3.

(3)

Question 2

Prove that the square of an odd number is also odd.

(3)

Question 3

Given that x is a positive integer, prove that $\frac{4x^3+20x}{2x^2+10}$ is always even.

(3)

Total / 10

13 Vectors

Question 1

OAB is a triangle

$\vec{OA} = 2\mathbf{f} + \mathbf{g}$ and $\vec{OB} = 3\mathbf{h}$

P is the point on AB such that AP:PB = 2:1

(a) Find the vector \vec{BA} in terms of \mathbf{f} , \mathbf{g} and \mathbf{h} .

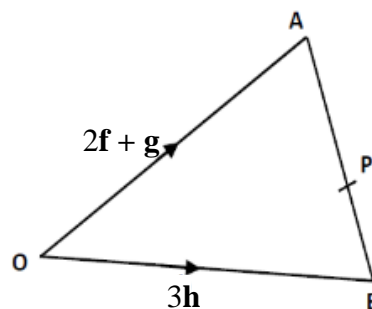


Diagram NOT drawn accurately

.....
(1)

(b) Find the vector \vec{PO} in terms of \mathbf{f} , \mathbf{g} and \mathbf{h}

.....
(2)

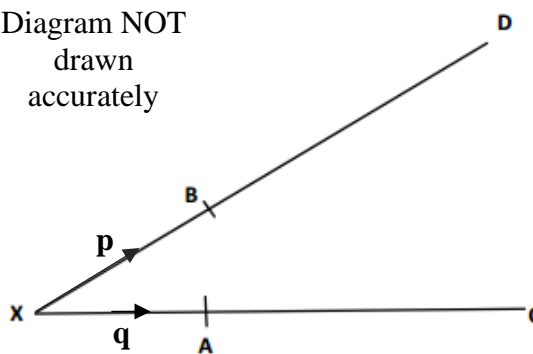
Question 2

B is the point on AD such that XB:BD is 1:2

A is the point on XC such that XA:XC is 1:2

$\vec{XB} = \mathbf{p}$ and $\vec{XA} = \mathbf{q}$

Diagram NOT drawn accurately



Use vectors to explain the geometrical relationships between the line segments BA and DC.

(4)

Question 3

PQRS is a parallelogram.

A is the point on PR such that PA:AR is 2:1

M is the midpoint of RS.

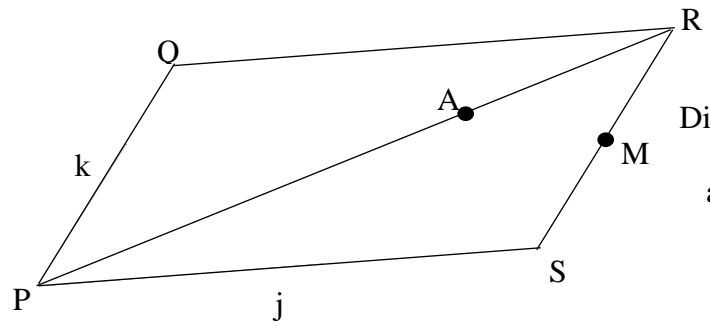


Diagram NOT
drawn
accurately

(b) Prove that Q, A and M are co-linear.

.....
(3)

Total / 10



Question 1

A box contains 3 new batteries, 5 partly used batteries and 4 dead batteries.

Kelly takes two batteries at random.

Work out the probability that she picks two different types of batteries.

.....
(3)

Question 2

Caleb either walks to school or travels by bus.

The probability that he walks to school is 0.75.

If he walks to school, the probability that he will be late is 0.3.

If he travels to school by bus, the probability that he will be late is 0.1.

Work out the probability that he will not be late.

.....
(3)

Question 3

The two way table shows the number of deaths and serious injuries caused by road traffic accidents in Great Britain in 2013.

		Speed Limit			
		20 mph	30 mph	40 mph	Total
Type of Injury	Fatal	6	520	155	681
	Serious	420	11582	1662	13664
	Total	426	12102	1817	14345

Work out an estimate for the probability:

(a) that the accident is serious.

.....
(1)

(b) that the accident is fatal given that the speed limit is 30 mph.

.....
(1)

(c) that the accident happens at 20 mph given that the accident is serious.

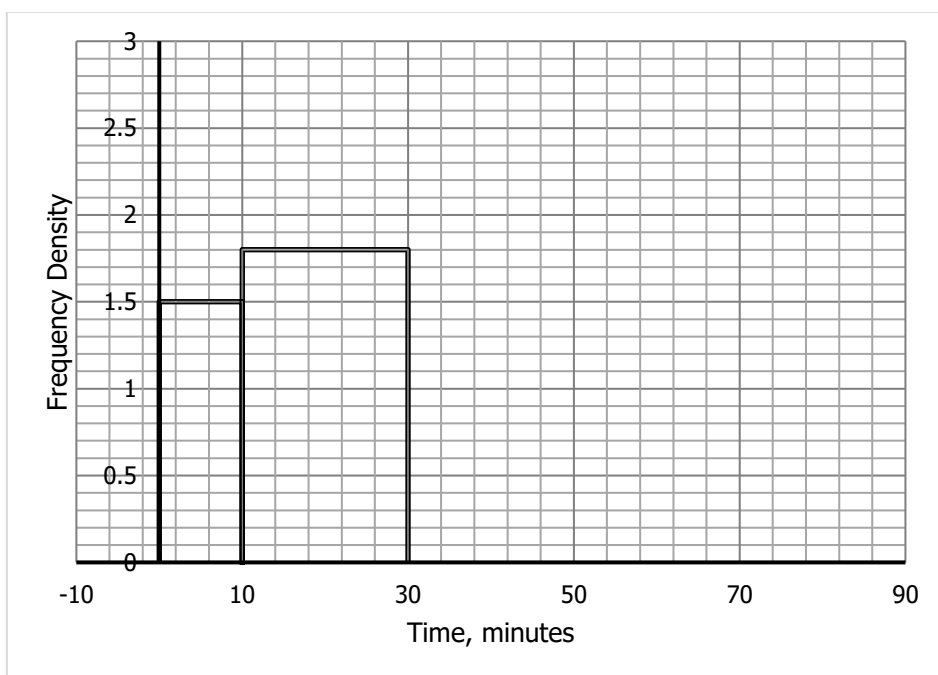
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(2)

Total / 10

Question 1

The histogram and the frequency table show some information about how much time vehicles spent in a car park.

Time, minutes		Frequency
0	$< x \leq 10$	
10	$< x \leq 30$	
30	$< x \leq 60$	75
60	$< x \leq 80$	24
Total		150



a) Use the information to complete the histogram

(2)

b) Use the histogram to find the missing frequencies in the table

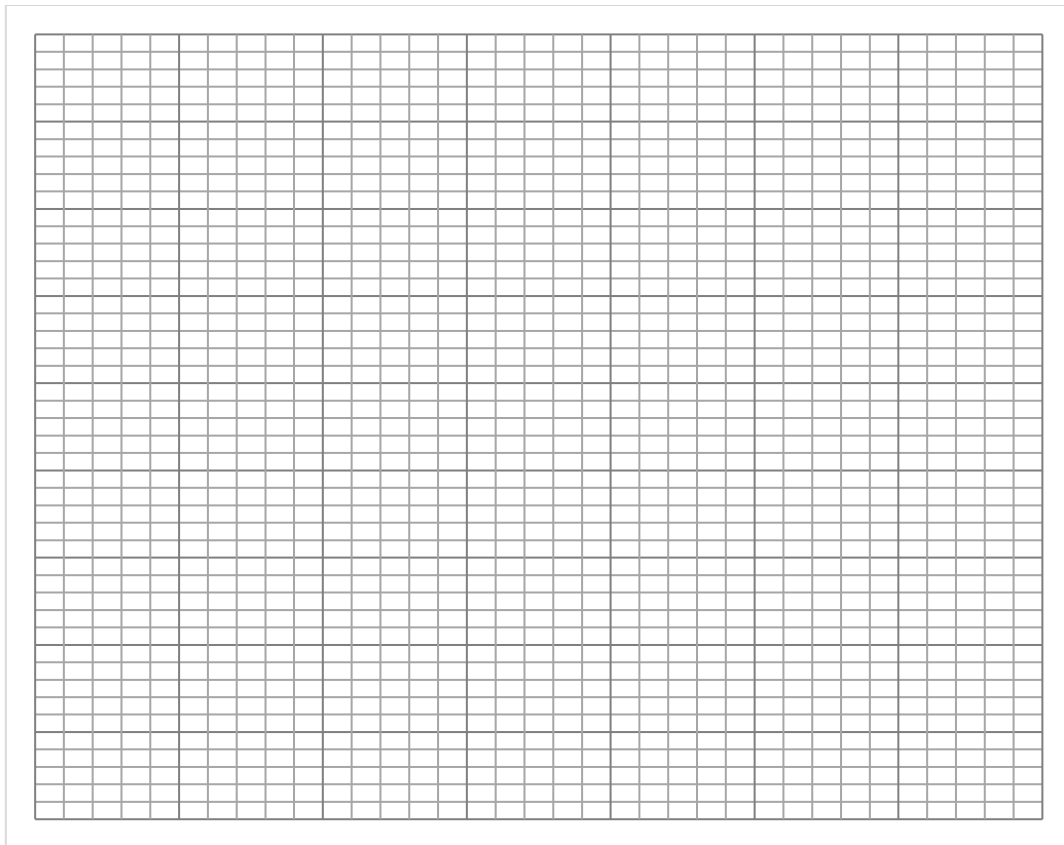
.....
(2)

Question 2

The table shows the length of 678 phone calls made at a call centre

Time, secs			Frequency
0	$< x \leq$	20	20
20	$< x \leq$	60	148
60	$< x \leq$	120	240
120	$< x \leq$	300	270
Total			678

a) Draw a fully labelled histogram to show the length of the phone calls.



(4)

b) Estimate the number of phone calls that lasted more than 4 minutes.

.....
(2)

Total / 10