Maths paper 3

Morning (Time: 1 hour 30 minutes) Paper Reference **1MA3/H**

Mathematics
Paper 3
Higher

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, SELECT

Tracing paper may be used.

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
-
- -
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- **Calculators may be used.**
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.

Information

- The total mark for this paper is 80.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

Question 1;

Show that

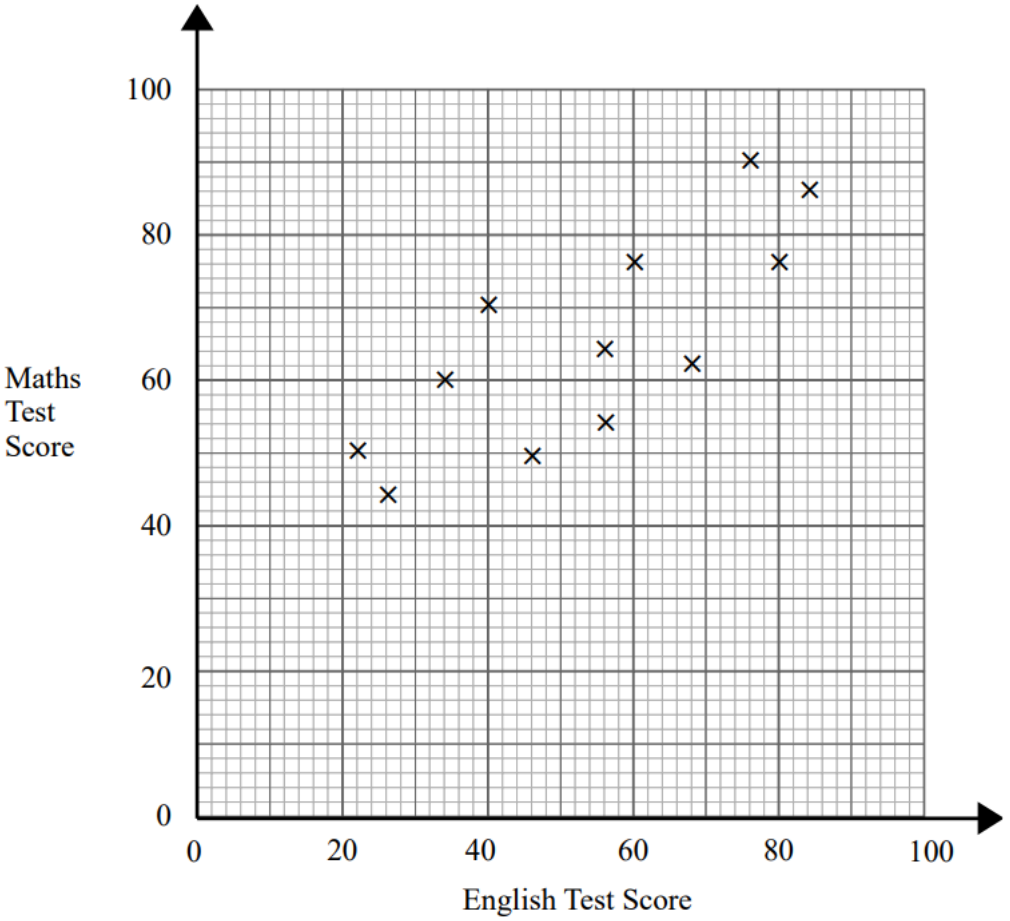
$5\frac{1}{3} \div 2\frac{2}{5} = 2\frac{2}{9}$

_____

(3)

Question 2:

The following scatter graph shows information about the test scores of some students in Maths and English.



a) What type of correlation is shown in the scatter graph?

_____

(1)

b) Use the scatter graph to estimate the score of a student who received 66 in their maths test.

_____

(2)

Question 3:

Mr Ives is organising a charity raffle.

He sells £300 for £3 each.

The probability of someone winning a prize is 20%.

Each prize costs him £8.

The profit is donated to charity.

Work out his percentage profit.

(5)

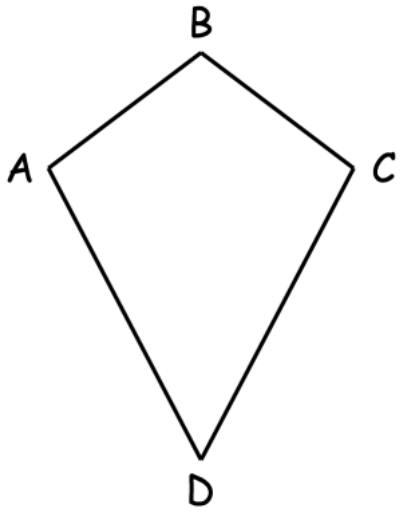
Question 4:

ABCD is a kite.

Length BC is 7cm shorter than CD.

The perimeter of the kite is 52cm.

Work out the length of CD



(4)

Question 5:

The frequency table below shows the piano grade of the 22 students in a class.

Grade	Frequency
2	3
3	3
4	9
5	2
6	4
7	1

Rasheed says that the median for this data set is greater than the mean of the data set.

Is Rasheed correct?

(5)

Question 6:

Below are the equations of five straight lines.

Which 2 of these lines are parallel?

You must show all working

Line A: $y = 2x - 3$

Line B: $2y = x + 3$

Lince C: $4y = 3x - 2$

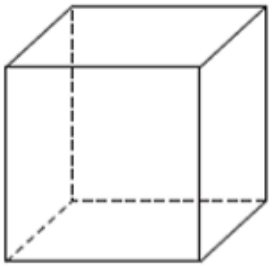
Line D: $2y = 4x - 1$

Line E: $3y = 2x - 2$

_____

(3)

Question 7: The diagram below shows a solid cube placed on a horizontal table.



$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

The pressure exerted by the cube onto the table 650 newtons.

The pressure on the table as a result of the cube is 4.1newtons/cm^2.

a) Find the total surface area of the cube.

_____

(3)

Question 8

a) The ratio of earths diameter to the sun's diameter can be give in the ratio 218000:200.

Write this ratio in the form 1:n.

Give your answer for n as a simplified fraction

_____

(2)

b) The ratio between to separate smaller planets can be written in the ratio $\frac{1}{3} : \frac{2}{5}$.

Write this ratio in the form n:1

_____

(2)

Question 9:

y is an integer.

Write down all solutions to the inequality of $3 \leq 2y + 1 < 13$

_____

(2)

Question 10:

Simplify the following fractions:

a) $\frac{x}{3} - \frac{x-4}{5}$

(2)

b) $\frac{3(x+5)^4}{(x+5)^3}$

(1)

c) $\frac{1}{3x^2+11x+6} \times 2x^2 + x - 15$

(3)

Question 11:

A varies directly to the cube of C.

When A = 108, C = 3

a) Express A in terms of C

_____

(3)

b) Find the value of A when C = 9

_____

(1)

c) Find the value of C when A = 1270. Round your answer to 1 decimal place.

_____

(1)

Question 12:

Prove using algebra, that the sum of squares of any 2 even positive integers is always a multiple of 4.

(3)

Question 13:

Patrick wants to estimate the number of fish in his lake.

He catches a sample of 80 fish, marks them and then puts them back into the lake.

Later that day, in a second sample of 80 fish, he finds that only 10 are marked.

a) Work out an estimate for the number of fish there are in his like.

(2)

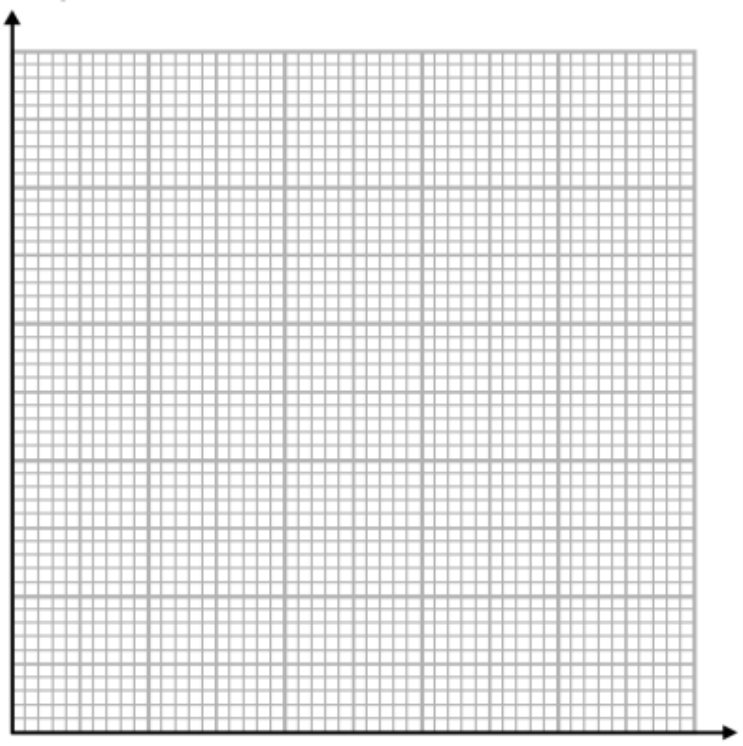
b) Write down one assumption which you have made.

(1)

Question 14: The table below shows the information about the age of 80 workers for a supermarket.

Age (years)	Frequency
$20 < a \leqslant 30$	20
$30 < a \leqslant 35$	22
$35 < a \leqslant 40$	16
$40 < a \leqslant 50$	13
$50 < a \leqslant 65$	9

a) On the grid below, draw a histogram to represent the information from the table.



(3)

b) Calculate an estimate for the number of workers between ages 45 and 55

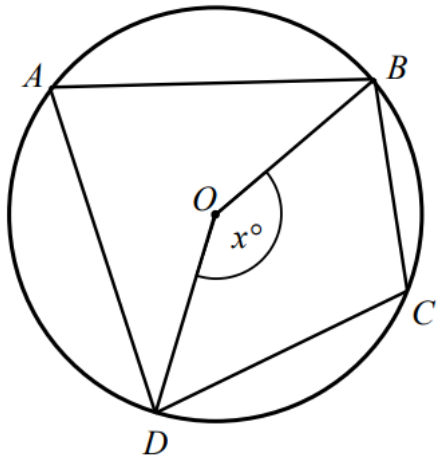
_____

(2)

Question 15:

A, B, C and D are all points on the centre of the circle with centre O.

Angle DOB = x°.



Find the size of angle BCD in terms of x.

Give reasons for each stage of your working.

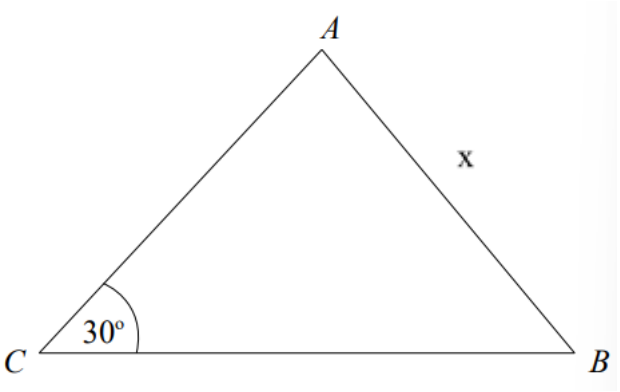
(4)

Question 16:

The ratio of length BC: AC is 2:1.

The area of the triangle is $30cm^2$.

Work out the value of x, giving your answer to 1 decimal place



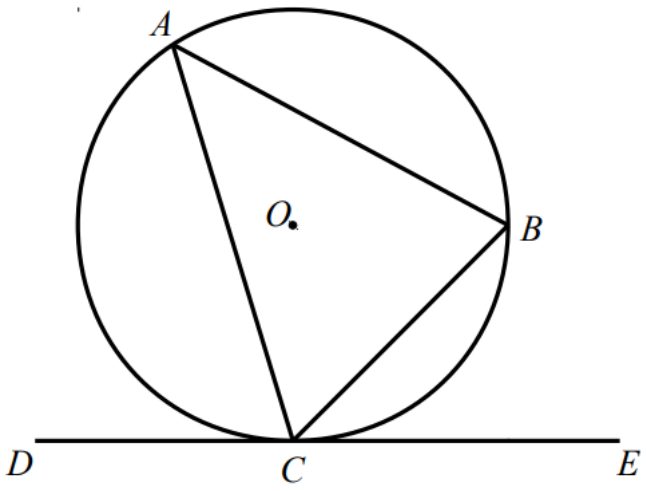
(4)

Question 17:

A, B and C are points on the circumference of a circle, with centre o.

DCE is a tangent to the circle.

Prove that angles CAB and BCE are equal.



(3)

Question 18:

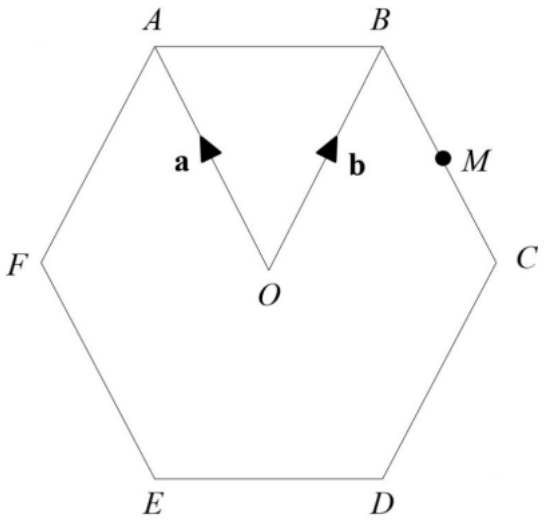
ABCDEF forms a regular hexagon, with centre O.

$\overrightarrow{OA} = a$ $\overrightarrow{OB} = b$

Point M is the midpoint of the line BC

X is the point where AB has been extended, such that AB:BX is 3:2

Prove that E, M and X are along a straight line.



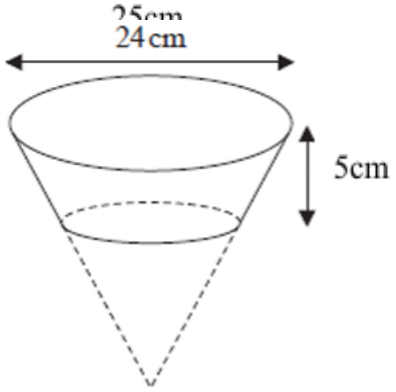
(4)

Question 19:

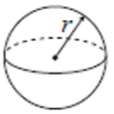
The diagram below (shape F) shows a frustum of a cone.

The frustum is made by removing a cone with a height of 10 cm from a larger solid cone with a height of 15cm, and base diameter 25cm.

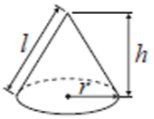
Shape F



Volume of sphere = $\frac{4}{3}\pi r^3$

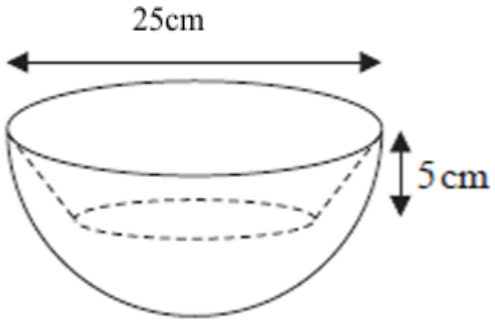


Volume of cone = $\frac{1}{3}\pi r^2 h$



Shape S (seen below) is formed from removing the frustum seen in shape F, from a hemisphere with a height of 5cm, and a diameter based of 25cm.

Shape S



Find the volume of shape S

(5

TOTAL FOR PAPER IS **80** MARKS

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