Write your name here

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Pearson Edexcel
International GCSE

Centre Number | Candidate Number

Mathematics A

Level 1/2
Paper 1H

Higher Tier

Thursday 24 May 2018 – Morning
Time: 2 hours

Paper Reference
4MA1/1H

You must have:
Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

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.
- Without sufficient working, correct answers may be awarded no marks.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- **Calculators may be used.**
- You must **NOT** write anything on the formulae page.
  Anything you write on the formulae page will gain NO credit.

Information

- The total mark for this paper is 100.
- 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.
- Check your answers if you have time at the end.

Turn over ▶

P54694A

1/1/1/1/

P 5 4 6 9 4 A 0 1 2 4

Pearson

International GCSE Mathematics

Formulae sheet – Higher Tier

Arithmetic series

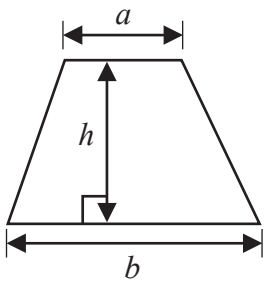
Sum to n terms, $S_n = \frac{n}{2}[2a + (n-1)d]$

The quadratic equation

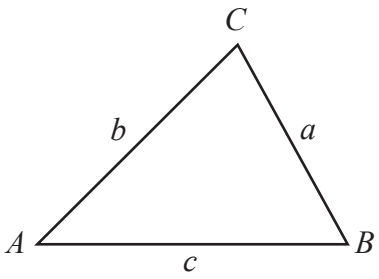
The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$ are given by:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Area of trapezium $= \frac{1}{2}(a+b)h$



Trigonometry



In any triangle *ABC*

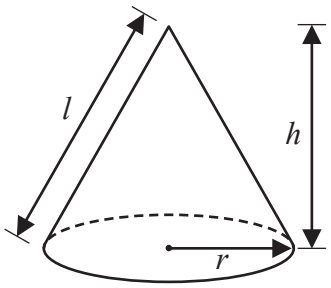
Sine Rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine Rule $a^2 = b^2 + c^2 - 2bc\cos A$

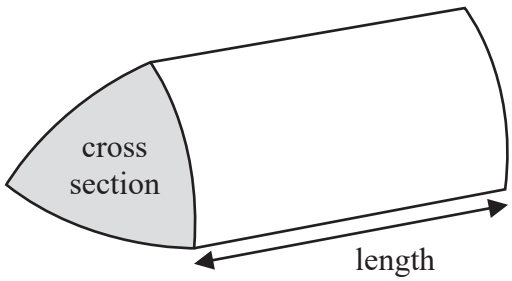
Area of triangle $= \frac{1}{2}ab\sin C$

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

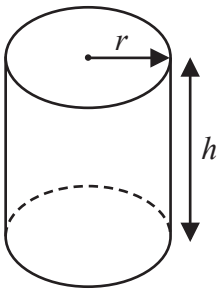
Curved surface area of cone $= \pi r l$



Volume of prism
= area of cross section × length

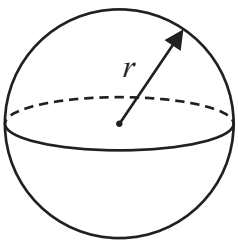


Volume of cylinder $= \pi r^2 h$
Curved surface area of cylinder $= 2\pi r h$



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

Surface area of sphere $= 4\pi r^2$



Answer all TWENTY questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 The table shows information about the weights, in kg, of 40 parcels.

Frequency

Weight of parcel (p kg)	Frequency	M.P. (x)	$x \times f$
$0 < p \leqslant 1$	19	0.5	9.5
$1 < p \leqslant 2$	12	1.5	18
$2 < p \leqslant 3$	5	2.5	12.5
$3 < p \leqslant 4$	2	3.5	7
$4 < p \leqslant 5$	2	4.5	9

(a) Write down the modal class.

$0 < p \leqslant 1$

(1)

(b) Work out an estimate for the mean weight of the parcels.

$$\text{mean} = \frac{9.5 + 18 + 12.5 + 7 + 9}{40}$$

$$\text{mean} = 1.4$$

1.4 kg

(4)

(Total for Question 1 is 5 marks)

2 There are some people in a cinema.

$\frac{3}{5}$ of the people in the cinema are children.

For the children in the cinema,

number of girls : number of boys = 2 : 7

There are 170 girls in the cinema.

Work out the number of adults in the cinema.

girls : boys

2 : 7

170 : ?

No. of boys = $\frac{170 \times 7}{2}$ = 595 boys

Total number of children = 170 + 595 = 765

let the total number of people is k.

$\frac{3}{5} \times k = 795$

$k = 765 \div \frac{3}{5}$ = 1275

Number of adults = 1275 − 765

= 510

510

(Total for Question 2 is 5 marks)

3 (a) Simplify $y^5 \times y^9$

y^{14}

(1)

(b) Simplify $(2m^3)^4$

$16m^{12}$

(2)

(c) Solve $5(x + 3) = 3x - 4$

Show clear algebraic working.

$5x + 15 = 3x - 4$

$5x - 3x = -15 - 4$

$2x = -19$

$x = \frac{-19}{2}$

$x = \frac{-19}{2}$

(3)

(d) (i) Factorise $x^2 + 2x - 24$

$(x+6)(x-4)$

(2)

(ii) Hence, solve $x^2 + 2x - 24 = 0$

$(x+6)(x-4) = 0$

$x+6=0 \quad | \quad x-4=0$

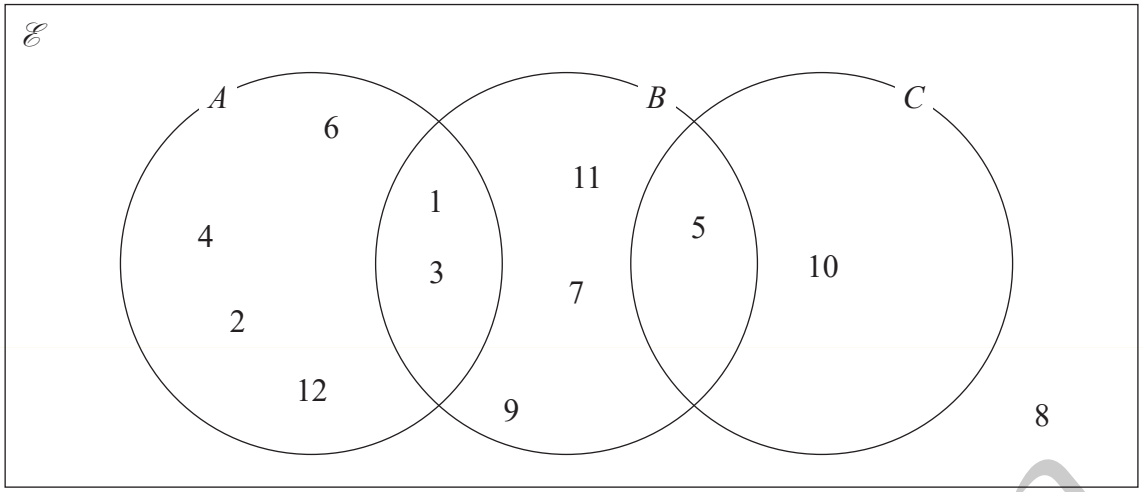
$x=-6 \quad | \quad x=4$

$x=-6$ or $x=4$

(1)

(Total for Question 3 is 9 marks)

4 Here is a Venn diagram.



(a) Write down the numbers that are in the set

(i) A

1, 2, 3, 4, 6, 12

(ii) $B \cup C$

1, 3, 5, 7, 9, 10, 11

(2)

Brian writes down the statement $A \cap C = \emptyset$

(b) Is Brian's statement correct?
You must give a reason for your answer.

Yes, there is no common elements between A & C.

(1)

One of the numbers in the Venn diagram is picked at random.

(c) Find the probability that this number is in set C'

$\frac{10}{12}$ or $\frac{5}{6}$

(2)

(Total for Question 4 is 5 marks)

5 (a) Write 8×10^4 as an ordinary number.

80000

(1)

(b) Work out $(3.5 \times 10^5) \div (7 \times 10^8)$
Give your answer in standard form.

$\frac{3.5 \times 10^5}{7 \times 10^8} = 0.5 \times 10^{-3}$

$= 5 \times 10^{-4}$

5×10^{-4}

(2)

(Total for Question 5 is 3 marks)

6

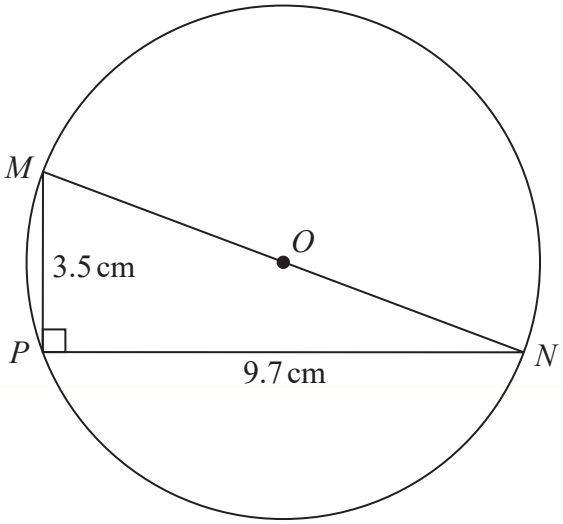


Diagram **NOT** accurately drawn

M, *N* and *P* are points on a circle, centre *O*.
MON is a diameter of the circle.

MP = 3.5 cm
PN = 9.7 cm

Angle *MPN* = 90°

Work out the circumference of the circle.
Give your answer correct to 3 significant figures.

$MN^2 = 3.5^2 + 9.7^2$

$MN = \sqrt{3.5^2 + 9.7^2}$

$MN = 10.31\ldots$

radius $(r) = \frac{1}{2} MN = \frac{1}{2} \times 10.31\ldots = 5.15\ldots$

$C = 2\pi r$

$C = 2 \times \pi \times 5.15\ldots$

$C = 32.4 \text{ cm}$

32.4 ..... cm

(Total for Question 6 is 4 marks)

7 Chao bought a boat for HK$160 000
The value of the boat depreciates by 4% each year.

(a) Work out the value of the boat at the end of 3 years.
Give your answer correct to the nearest HK$.

value of the car $= P \times \left(1 - \frac{r}{100}\right)^n$

$= 160000 \times \left(1 - \frac{4}{100}\right)^3$

$= 141557.76$

$= 141558$

HK$ 141558
(3)

Jalina gets a salary increase of 5%
Her salary after the increase is HK$252 000

(b) Work out Jalina's salary before the increase.

Original	:	Increase	:	New
100	:	5	:	105
?	:	?	:	252000

original (before increase):

$\frac{252000 \times 100}{105} = 240000$

HK$ 240 000
(3)

(Total for Question 7 is 6 marks)

8 $A = 3^5 \times 5 \times 7^3$
$B = 2^3 \times 3 \times 7^4$

(a) (i) Find the Highest Common Factor (HCF) of A and B.

3×7^3 or 1029

(ii) Find the Lowest Common Multiple (LCM) of A and B.

$2^3 \times 3^5 \times 5 \times 7^4$ or 233337720

$2^3 \times 3^5 \times 5 \times 7^4$

(2)

$A = 3^5 \times 5 \times 7^3$
$B = 2^3 \times 3 \times 7^4$
$C = 2^p \times 5^q \times 7^r$

Given that
the HCF of B and C is $2^3 \times 7$
the LCM of A and C is $2^4 \times 3^5 \times 5^2 \times 7^3$

(b) find the value of p, the value of q and the value of r.

$p =$ 4

$q =$ 2

$r =$ 1

(2)

(Total for Question 8 is 4 marks)

9 The diagram shows a right-angled triangle.

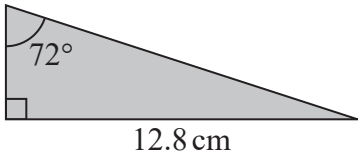


Diagram **NOT** accurately drawn

Five of these triangles are put together to make a shape.

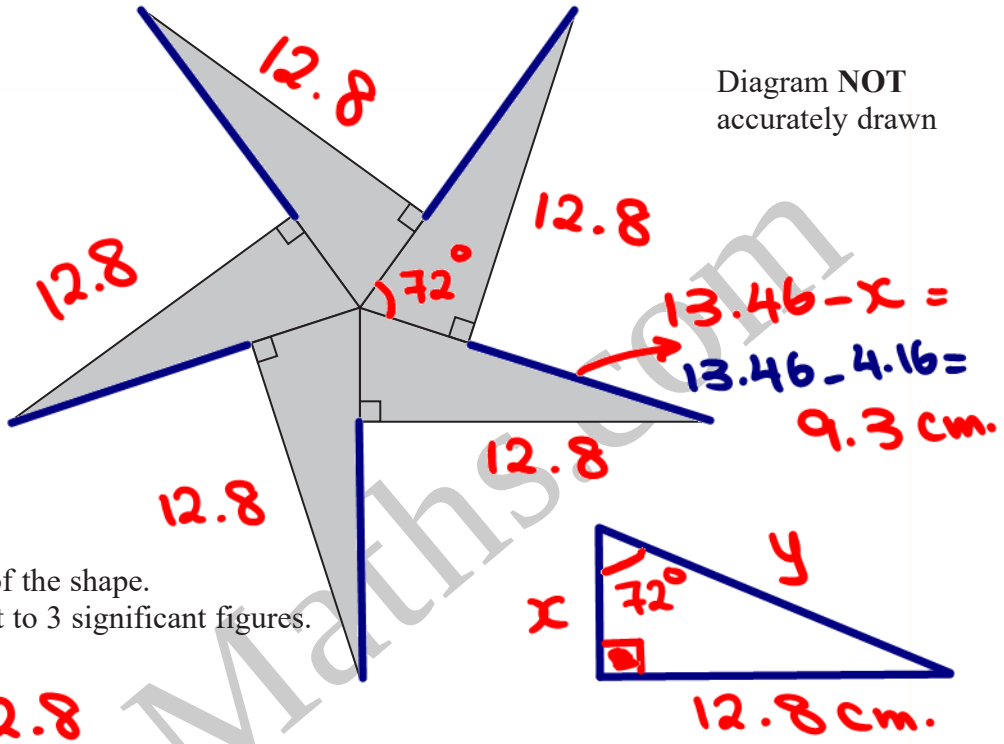


Diagram **NOT** accurately drawn

Calculate the perimeter of the shape.
Give your answer correct to 3 significant figures.

$\tan 72^\circ = \frac{12.8}{x}$

$x = \frac{12.8}{\tan 72^\circ} = 4.16 \text{ cm (3s.f.)}$

$\sin 72^\circ = \frac{12.8}{y}$

$y = \frac{12.8}{\sin 72^\circ} = 13.46 \text{ cm (3s.f.)}$

Perimeter $= (5 \times 12.8) + (5 \times 9.3)$

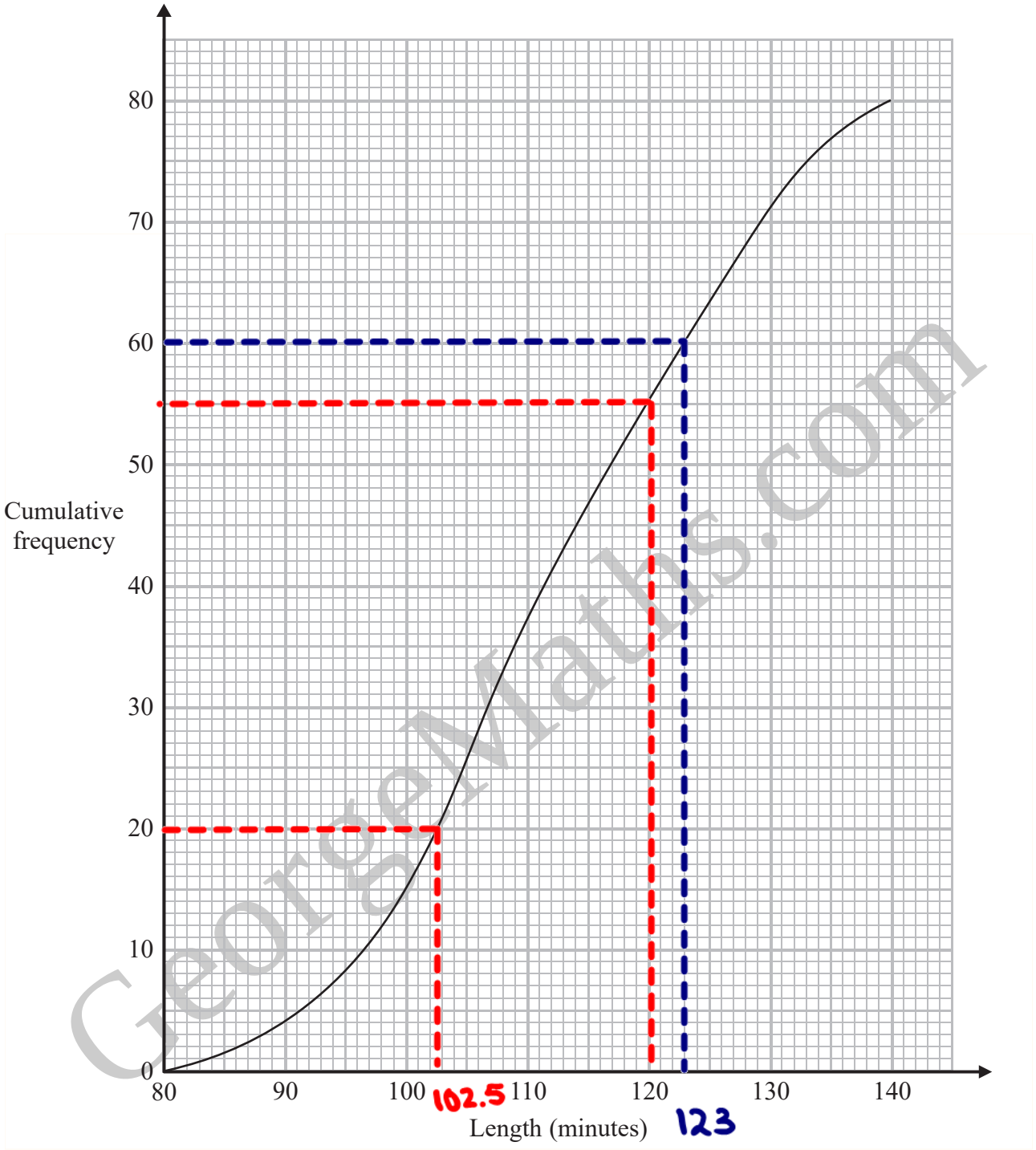
P. $= 110.5$ cm

$= 111$ cm (3s.f.)

111 ..... cm

(Total for Question 9 is 5 marks)

10 The cumulative frequency graph shows information about the length, in minutes, of each of 80 films.



(a) Use the graph to find an estimate for the interquartile range.

UQR = 123

LQR = 102.5

IQR = 123 − 102.5 = 20.5

20.5 minutes

(2)

Clare says,

"More than 35% of these films are over 120 minutes long."

(b) Is Clare correct?
Give a reason for your answer.

(from the graph)

No, $\frac{80-55}{80} \times 100 = 31.25\%$ are over 120 min.

(3)

(Total for Question 10 is 5 marks)

11 (a) Expand and simplify $(2x - 1)(x + 3)(x - 5)$

$(2x-1)(x^2-5x+3x-15)$

$= (2x-1)(x^2-2x-15)$

$= 2x^3-4x^2-30x-x^2+2x+15$

$= 2x^3-5x^2-28x+15$

$2x^3-5x^2-28x+15$

(3)

(b) Solve $3x^2 + 6x - 5 = 0$

Show your working clearly.

Give your solutions correct to 3 significant figures.

$3x^2+6x-5=0$

$a=3, \quad b=6, \quad c=-5$

$$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$$

$$x = \frac{-6 \pm \sqrt{6^2-4(3)(-5)}}{2\times 3}$$

$$x = \frac{-6 \pm 4\sqrt{6}}{6}$$

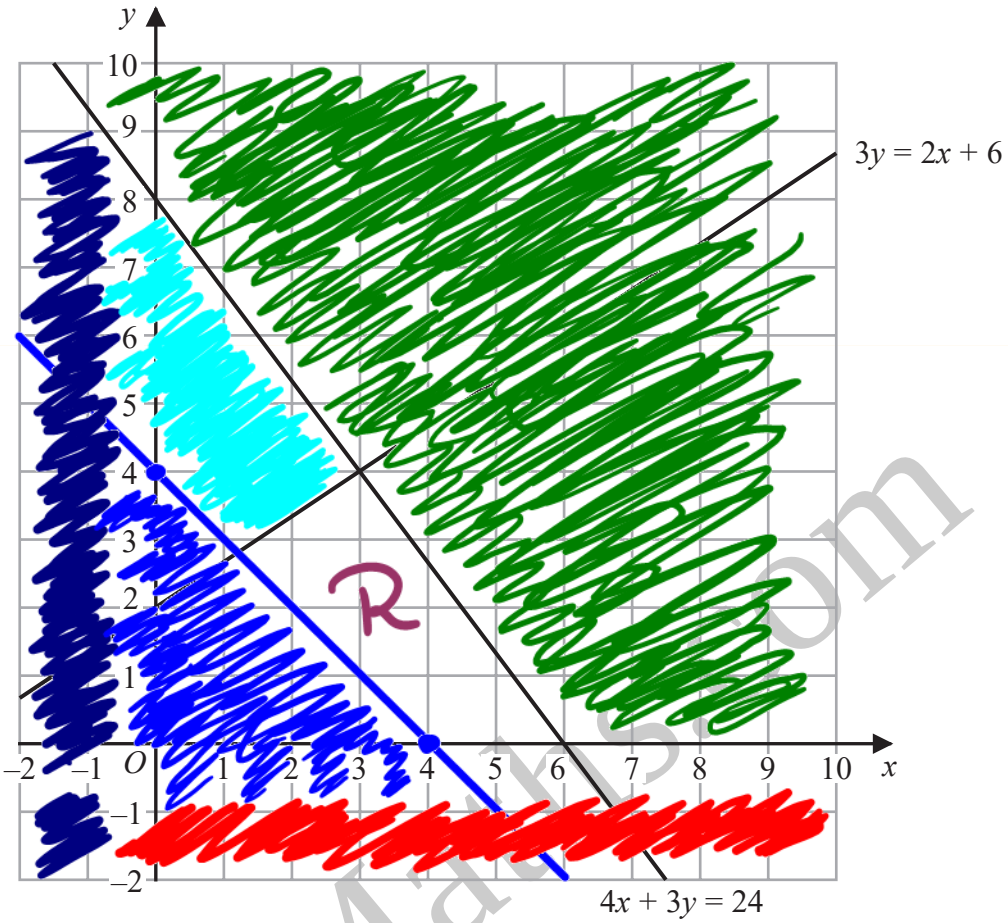
$x = 0.633$ or $x = -2.63$

0.633 or -2.63

(3)

(Total for Question 11 is 6 marks)

12 The diagram shows two straight lines drawn on a grid.



(a) Write down the solution of the simultaneous equations

$$3y = 2x + 6$$
$$4x + 3y = 24$$

$x =$ 3

$y =$ 4

(1)

(b) Show, by shading on the grid, the region defined by all five of the inequalities

$x \geqslant 0$ $y \geqslant 0$ $x + y \geqslant 4$ $3y \leqslant 2x + 6$ $4x + 3y \leqslant 24$

Label the region **R**.

check any Point (coordinates) in the region "R" it will satisfy the five inequalities.

(3)

(Total for Question 12 is 4 marks)

13

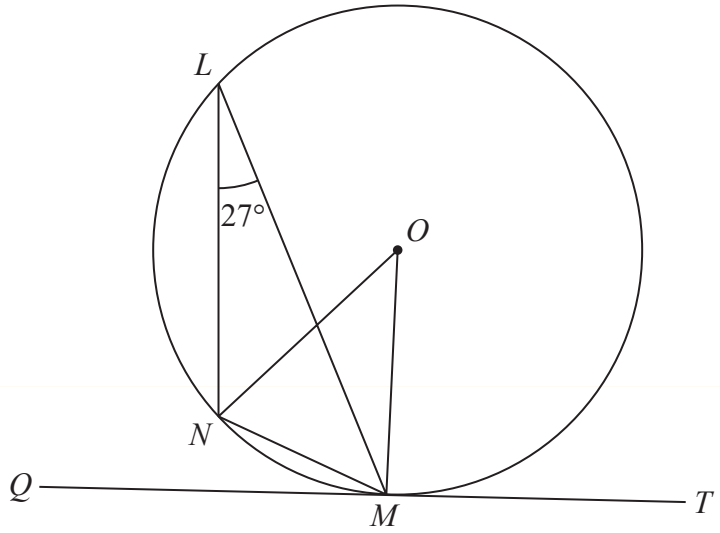


Diagram **NOT** accurately drawn

L, *M* and *N* are points on a circle, centre *O*.
QMT is the tangent to the circle at *M*.

(a) (i) Find the size of angle *NOM*.

54° .....°

(ii) Give a reason for your answer.

Central angle is twice inscribed angle opposite to same arc.

(2)

(b) (i) Find the size of angle *NMQ*.

27° .....°

(ii) Give a reason for your answer.

Angle of tangency is equal to inscribed angle → alternate segment theorem.

(2)

(Total for Question 13 is 4 marks)

14 The function f is such that

$$f(x) = \frac{3x - 5}{4}$$

(a) Find f(–7)

$\frac{3(-7)-5}{4} = \frac{-26}{4}$

$\frac{-13}{2}$

(1)

(b) Express the inverse function f^{-1} in the form $f^{-1}(x) = ...$

let $y = \frac{3x-5}{4}$

Replace x with y

$x = \frac{3y-5}{4}$

Make y subject

$4x = 3y - 5$

$3y = 4x + 5$

$y = \frac{4x+5}{3}$

$f^{-1}(x) = \boxed{\frac{4x+5}{3}}$

(2)

The function g is such that

$$g(x) = \sqrt{19 - x}$$

(c) Find fg(3)

$g(3) = \sqrt{19-3} = 4$

$f(4) = \frac{3(4)-5}{4} = \frac{7}{4}$

$fg(3) = \frac{7}{4}$

(2)

(d) Which values of x cannot be included in any domain of g?

$\sqrt{19-x}$ must be Positive.

x can't be greater than 19.

$x > 19$

(2)

(Total for Question 14 is 7 marks)

15 (a) Simplify fully $\left(\frac{256x^{20}}{y^8}\right)^{-\frac{1}{4}}$

$$\left(\frac{y^8}{256x^{20}}\right)^{\frac{1}{4}} = \frac{y^2}{4x^5}$$

$\frac{y^2}{4x^5}$

(2)

(b) Express $\frac{1}{9x^2 - 25} - \frac{1}{6x + 10}$ as a single fraction in its simplest form.

$$\frac{1 \times 2}{(3x-5)(3x+5)\times 2} - \frac{1\times(3x-5)}{2(3x+5)(3x-5)}$$

$$= \frac{2}{2(3x-5)(3x+5)} - \frac{3x-5}{2(3x-5)(3x+5)}$$

$$= \frac{2-(3x-5)}{2(3x-5)(3x+5)}$$

$$= \frac{2-3x+5}{2(3x-5)(3x+5)}$$

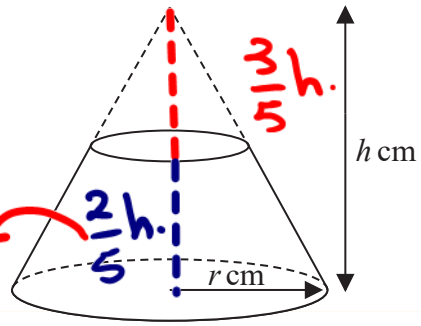
$$= \frac{7-3x}{2(3x-5)(3x+5)}$$

$\frac{7-3x}{2(3x-5)(3x+5)}$

(3)

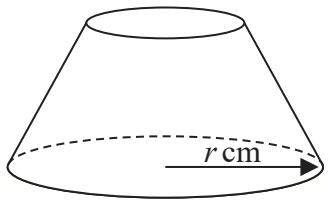
(Total for Question 15 is 5 marks)

16 A frustum is made by removing a small cone from a large cone.
The cones are mathematically similar.



height of frustum

Diagram **NOT** accurately drawn



Frustum

The large cone has base radius r cm and height h cm.

V_L: large cone volume.
V_S: small cone volume.

Given that

$$\frac{V_L - V_S}{V_L} \leftarrow \frac{\text{volume of frustum}}{\text{volume of large cone}} = \frac{98}{125}$$

find an expression, in terms of h, for the height of the frustum.

$$\frac{V_L - V_S}{V_L} = \frac{98}{125}$$

$$\frac{V_L}{V_L} - \frac{V_S}{V_L} = \frac{98}{125}$$

$$1 - \frac{V_S}{V_L} = \frac{98}{125}$$

$$\frac{V_S}{V_L} = 1 - \frac{98}{125} = \frac{27}{125}$$

$$\frac{h_S}{h_L} = \sqrt[3]{\frac{27}{125}} = \frac{3}{5}$$

$$\frac{h_S}{h_L} = \frac{3}{5}$$

$$h_S = \frac{3}{5}h$$

height of frustum:

$$h - \frac{3}{5}h = \frac{2}{5}h$$

$\frac{2}{5}h$ ..... cm

(Total for Question 16 is 4 marks)

17 The diagram shows parallelogram $ABCD$.

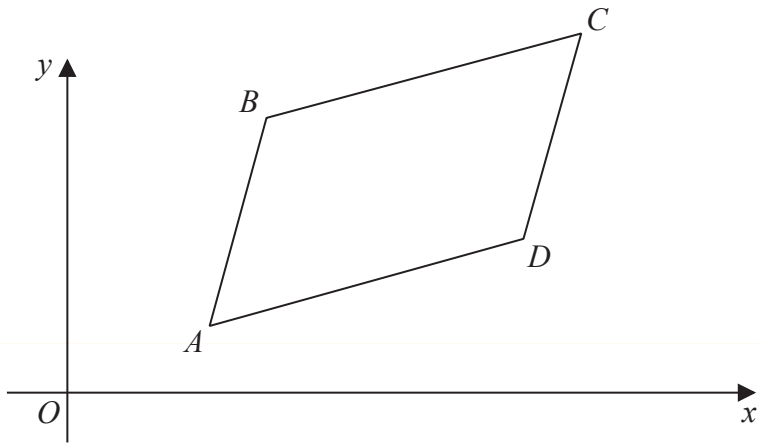


Diagram **NOT** accurately drawn

$\overrightarrow{AB} = \begin{pmatrix} 2 \\ 7 \end{pmatrix}$ $\overrightarrow{AC} = \begin{pmatrix} 10 \\ 11 \end{pmatrix}$

The point B has coordinates (5, 8)

(a) Work out the coordinates of the point C.

$\overrightarrow{AB} = \begin{pmatrix} 2 \\ 7 \end{pmatrix}$

$B - A = \begin{pmatrix} 2 \\ 7 \end{pmatrix}$

$\begin{pmatrix} 5 \\ 8 \end{pmatrix} - A = \begin{pmatrix} 2 \\ 7 \end{pmatrix}$

$A = \begin{pmatrix} 3 \\ 1 \end{pmatrix}$

$\overrightarrow{AC} = \begin{pmatrix} 10 \\ 11 \end{pmatrix}$

$C - A = \begin{pmatrix} 10 \\ 11 \end{pmatrix}$

$C - \begin{pmatrix} 3 \\ 1 \end{pmatrix} = \begin{pmatrix} 10 \\ 11 \end{pmatrix}$

$C = \begin{pmatrix} 10 \\ 11 \end{pmatrix} + \begin{pmatrix} 3 \\ 1 \end{pmatrix}$

$C = \begin{pmatrix} 13 \\ 12 \end{pmatrix}$

(13 , 12)

(3)

The point E has coordinates (63, 211)

(b) Use a vector method to prove that ABE is a straight line.

$\overrightarrow{AB} = \begin{pmatrix} 2 \\ 7 \end{pmatrix}$

$\overrightarrow{BE} = E - B$

$\overrightarrow{BE} = \begin{pmatrix} 63 \\ 211 \end{pmatrix} - \begin{pmatrix} 5 \\ 8 \end{pmatrix}$

$\overrightarrow{BE} = \begin{pmatrix} 58 \\ 203 \end{pmatrix}$

$\overrightarrow{AE} = E - A$

$\overrightarrow{AE} = \begin{pmatrix} 63 \\ 211 \end{pmatrix} - \begin{pmatrix} 3 \\ 1 \end{pmatrix}$

$\overrightarrow{AE} = \begin{pmatrix} 60 \\ 210 \end{pmatrix}$

$\overrightarrow{AB} + \overrightarrow{BE} = \begin{pmatrix} 2 \\ 7 \end{pmatrix} + \begin{pmatrix} 58 \\ 203 \end{pmatrix} = \begin{pmatrix} 60 \\ 210 \end{pmatrix}$

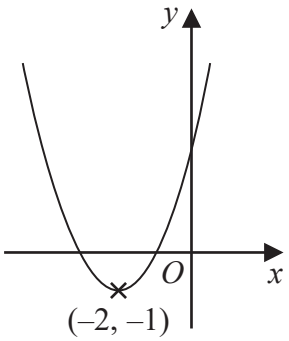
As: $\overrightarrow{AB} + \overrightarrow{BE} = \overrightarrow{AE}$

ABE is a st. line.

(2)

(Total for Question 17 is 5 marks)

18



The diagram shows the curve with equation $y = f(x)$
The coordinates of the minimum point of the curve are $(–2, –1)$

(a) Write down the coordinates of the minimum point of the curve with equation

(i) $y = f(x – 5)$

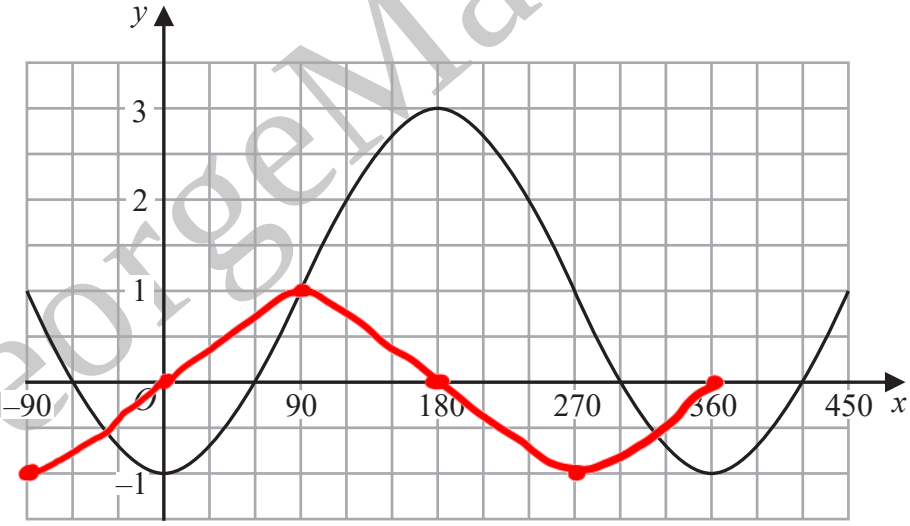
(3 , –1)

(ii) $y = \frac{1}{2} f(x)$

(–2 , $-\frac{1}{2}$)

(2)

The graph of $y = a\sin(x – b)° + c$ for $–90 \leqslant x \leqslant 450$ is drawn on the grid below.



(b) Find the value of a, the value of b and the value of c.

$a =$ 2

$b =$ 90°

$c =$ 1

(3)

(Total for Question 18 is 5 marks)

19 Jack plays a game with two fair spinners, **A** and **B**.

Spinner **A** can land on the number 2 or 3 or 5 or 7
Spinner **B** can land on the number 2 or 3 or 4 or 5 or 6

Jack spins both spinners.
He wins the game if one spinner lands on an odd number **and** the other spinner lands on an even number.

Jack plays the game twice.
Work out the probability that Jack wins the game both times.

$$\left(A_{even} \text{ \& } B_{odd} \text{ or } A_{odd} \text{ \& } B_{even}\right)^2$$

$$= \left(\left(\frac{1}{4} \times \frac{2}{5}\right) + \left(\frac{3}{4} \times \frac{3}{5}\right)\right)^2$$

$$= \left(\frac{2}{20} + \frac{9}{20}\right)^2$$

$$= \left(\frac{11}{20}\right)^2$$

$$= \frac{121}{400}$$

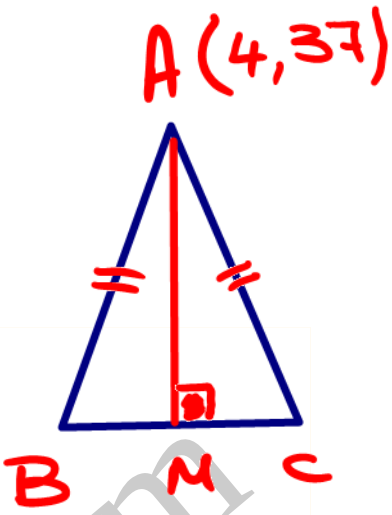
$\frac{121}{400}$

(Total for Question 19 is 4 marks)

20 ABC is an isosceles triangle such that

$AB = AC$
A has coordinates (4, 37)
B and C lie on the line with equation $3y = 2x + 12$

Find an equation of the line of symmetry of triangle ABC.
Give your answer in the form $px + qy = r$ where p, q and r are integers.
Show clear algebraic working.



we need to get eq. of AM.

$3y = 2x + 12 \quad (\div 3)$

$y = \frac{2}{3}x + 4$

$m_{BC} = \frac{2}{3} \longmapsto AM \perp BC \longmapsto m_{AM} = \frac{-3}{2}$

equation of $\overrightarrow{AM}$:

$y = mx + c$

$y = \frac{-3}{2}x + c$

$37 = \frac{-3}{2}(4) + c$

$c = 43$

$y = -\frac{3}{2}x + 43 \quad \times 2$

$2y = -3x + 86$

$3x + 2y = 86$

⇩

equation of line of Symmetry

$3x + 2y = 86$

(Total for Question 20 is 5 marks)

TOTAL FOR PAPER IS 100 MARKS