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Surname	Other names

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

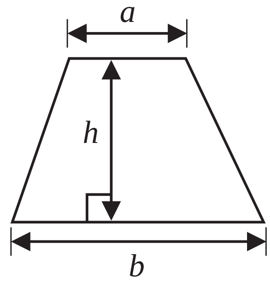
International GCSE Mathematics

Formulae sheet – Higher Tier

Arithmetic series

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

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

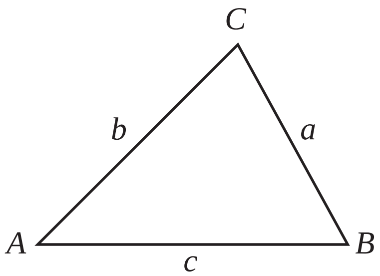


The quadratic equation

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

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

Trigonometry



In any triangle *ABC*

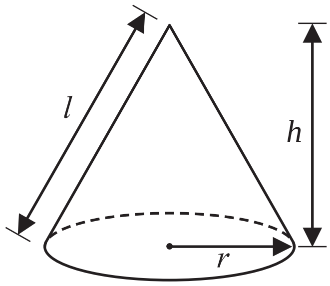
Sine Rule $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

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

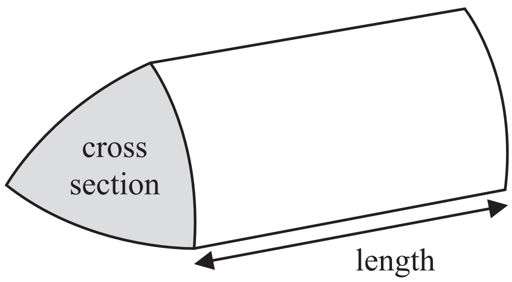
Area of triangle $= \dfrac{1}{2}ab\sin C$

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

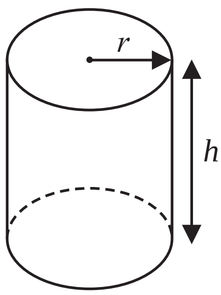
Curved surface area of cone $= \pi r l$



Volume of prism
= area of cross section × length

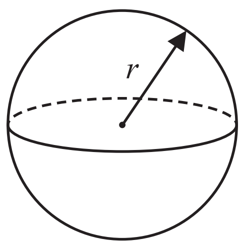


Volume of cylinder $= \pi r^2 h$
Curved surface area of cylinder $= 2\pi r h$



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

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.

Weight of parcel (p kg)	Frequency	mid point	mid point x freq.
$0 < p \leqslant 1$	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.

modal class = $0 < p \leq 1$

class with highest frequency

$0 < p \leq 1$

(1)

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

$$\text{mean} = \frac{\text{Sum of (midpoint} \times \text{frequency)}}{\text{total frequency}}$$

$$= \frac{9.5 + 18 + 12.5 + 7 + 9}{40} = \frac{56}{40}$$

$= 1.4$ kg

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

×85 2 : 7 ×85

170 : 595 → total number of children = 170 + 595

= 765

765 = $\frac{3}{5}$ of people ÷3

255 = $\frac{1}{5}$ of people ×2

510 = $\frac{2}{5}$ of people → number of adults = 510

$\frac{3}{5}$ are children

$1 - \frac{3}{5} = \frac{5}{5} - \frac{3}{5} = \frac{2}{5}$ are adults

510

(Total for Question 2 is 5 marks)

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

$y^5 \times y^9 = y^{5+9} = y^{14}$ $a^m \times a^n = a^{m+n}$

y^{14}
(1)

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

$(2m^3)^4 = 2^4 \times (m^3)^4$
$= 16 \times m^{3\times4}$ → $(a^m)^n = a^{m \times n}$
$= 16 \times m^{12}$
$= 16m^{12}$

$16m^{12}$
(2)

(c) Solve $5(x + 3) = 3x - 4$
Show clear algebraic working.

$5(x+3) = 3x - 4$ expand bracket

$5x + 15 = 3x - 4$
$-3x \quad -3x$

$2x + 15 = -4$
$-15 \quad -15$

$2x = -19$
$\div 2 \quad \div 2$

$x = \frac{-19}{2} = -9.5$

$x =$ -9.5
(3)

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

$x^2 + 2x - 24 = x^2 + 6x - 4x - 24 = x(x+6) - 4(x+6)$
$= (x+6)(x-4)$

$6 \times -4 = -24$

$6 + -4 = 2$

$(x+6)(x-4)$
(2)

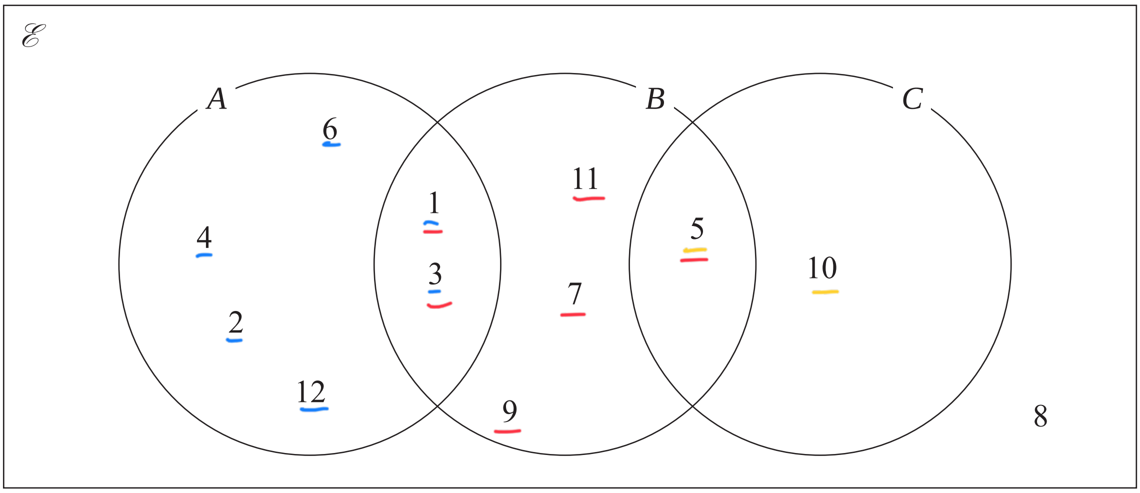
(ii) Hence, solve $x^2 + 2x - 24 = 0$ ⟶ $(x+6)(x-4) = 0$

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

$-6, 4$
(1)

(Total for Question 3 is 9 marks)

4 Here is a Venn diagram.



A
B∪C
C

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

(i) A

1, 2, 3, 4, 6, 12

(ii) $B \cup C$

B or C or both
union

intersection
A and C

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

(2)

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

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

Yes. Brian is correct as there are no numbers in both A and 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'

$P(C) = \frac{2}{12}$ numbers in set C / total no. of numbers in venn diagram

$P(C') = 1 - P(C) = 1 - \frac{2}{12}$

Not C

sum of all probabilities = 1

$= \frac{10}{12}$ //

$\frac{10}{12}$

(2)

(Total for Question 4 is 5 marks)

DO NOT WRITE IN THIS AREA

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

$8 \times 10^4 = 80\,000$

10^4 so move decimal point 4 places to the right

80 000

(1)

(b) Work out $(3.5 \times 10^5) \div (7 \times 10^8)$

Give your answer in standard form.

$(3.5 \times 10^5) \div (7 \times 10^8)$

$= (3.5 \div 7) \times (10^5 \div 10^8) \rightarrow 10^5 \div 10^8 = 10^{5-8}$

$= 0.5 \times 10^{-3}$ multiply front number by 10, so divide power by 10 (subtract 1 from power)

$\times 10 \quad \div 10$

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

standard form $A \times 10^n$ where $1 \leq A < 10$

5×10^{-4}

(2)

(Total for Question 5 is 3 marks)

6

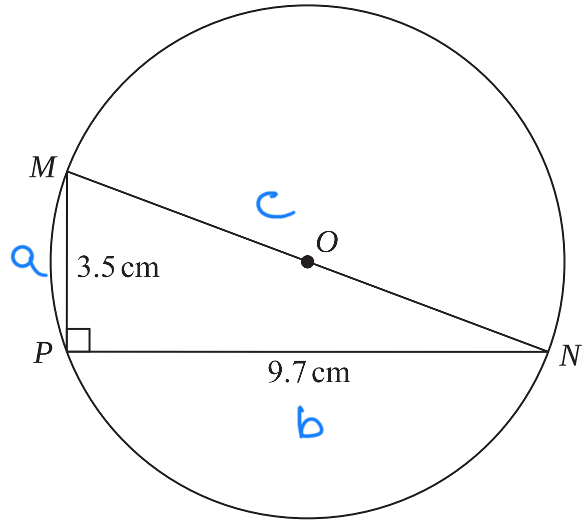


Diagram **NOT** accurately drawn

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.

pythagoras : $a^2 + b^2 = c^2$

$MON^2 = 3.5^2 + 9.7^2 = 106.34$

$MON = \sqrt{106.34} = 10.31...$ cm

diameter

Circumference $= \pi d$

$= \pi \times 10.31$

$= 32.396$

$= 32.4$ cm to 3sf

32.4 cm

(Total for Question 6 is 4 marks)

DO NOT WRITE IN THIS AREA

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$.

depreciates by 4% → 100% − 4% = 96% $\xrightarrow{\div 100}$ 0.96
decreases
multiplier

final value = initial value × multiplier^n
= 160 000 × 0.96^3 → end of 3 years so substitute n=3

$ 141558 to nearest HK $

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.

5% increase → 100% + 5% = 105% of Original Salary

HK$ 252 000 = 105%
÷105 ÷105
HK$ 2400 = 1%
×100 ×100
HK$ 240 000 = 100%

Jalina's salary before increase = 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.

$A = 3^5 \times 5 \times 7^3$ HCF = product of highest powers of prime factors common to A and B

$B = 2^3 \times 3 \times 7^4$ ↳ 3 is common

↳ 7^3 is common

$\text{HCF} = 3 \times 7^3$

3×7^3

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

$A = 3^5 \times 5 \times 7^3$ LCM = product of highest powers of prime factors in A or B or both

$B = 2^3 \times 3 \times 7^4$

highest power of

$2 = 2^3$

$3 = 3^5$

$5 = 5$

$7 = 7^4$

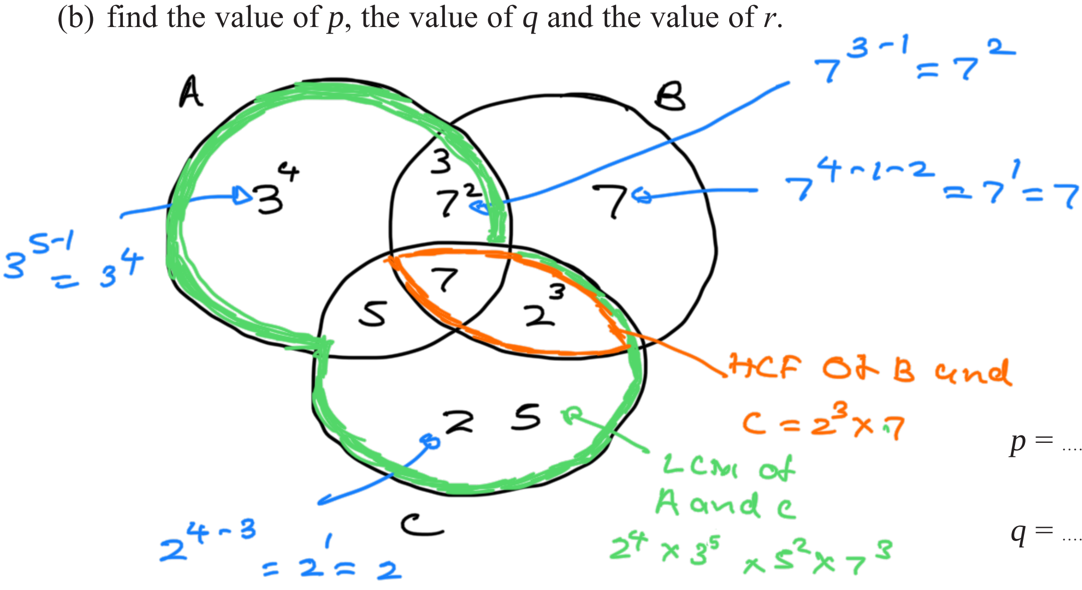
$\text{LCM} = 2^3 \times 3^5 \times 5 \times 7^4$

(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)

P 5 4 6 9 4 A 0 1 0 2 4

9 The diagram shows a right-angled triangle.

S $\frac{O}{H}$ C $\frac{A}{H}$ T $\frac{O}{A}$

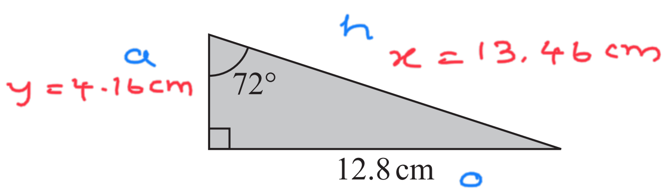


Diagram **NOT** accurately drawn

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

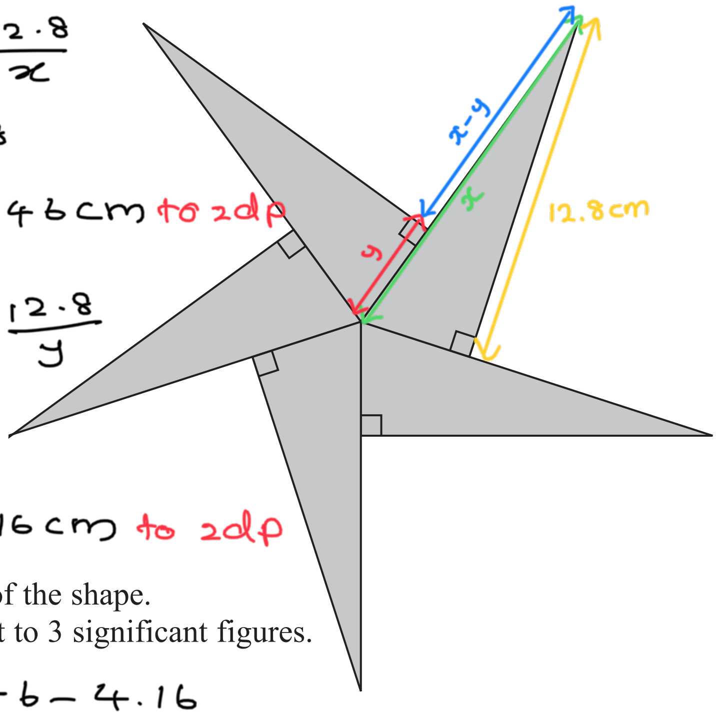


Diagram **NOT** accurately drawn

$\sin 72^\circ = \frac{opp}{hyp} = \frac{12.8}{x}$

$x \sin 72^\circ = 12.8$

$x = \frac{12.8}{\sin 72} = 13.46\text{cm}$ to 2dp

$\tan 72^\circ = \frac{opp}{adj} = \frac{12.8}{y}$

$y \tan 72^\circ = 12.8$

$y = \frac{12.8}{\tan 72^\circ} = 4.16\text{cm}$ to 2dp

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

$(x - y) = 13.46 - 4.16$

$= 9.3\text{ cm}$

$\text{perimeter} = (5 \times 12.8) + (5 \times 9.3)$

$= 64 + 46.5$

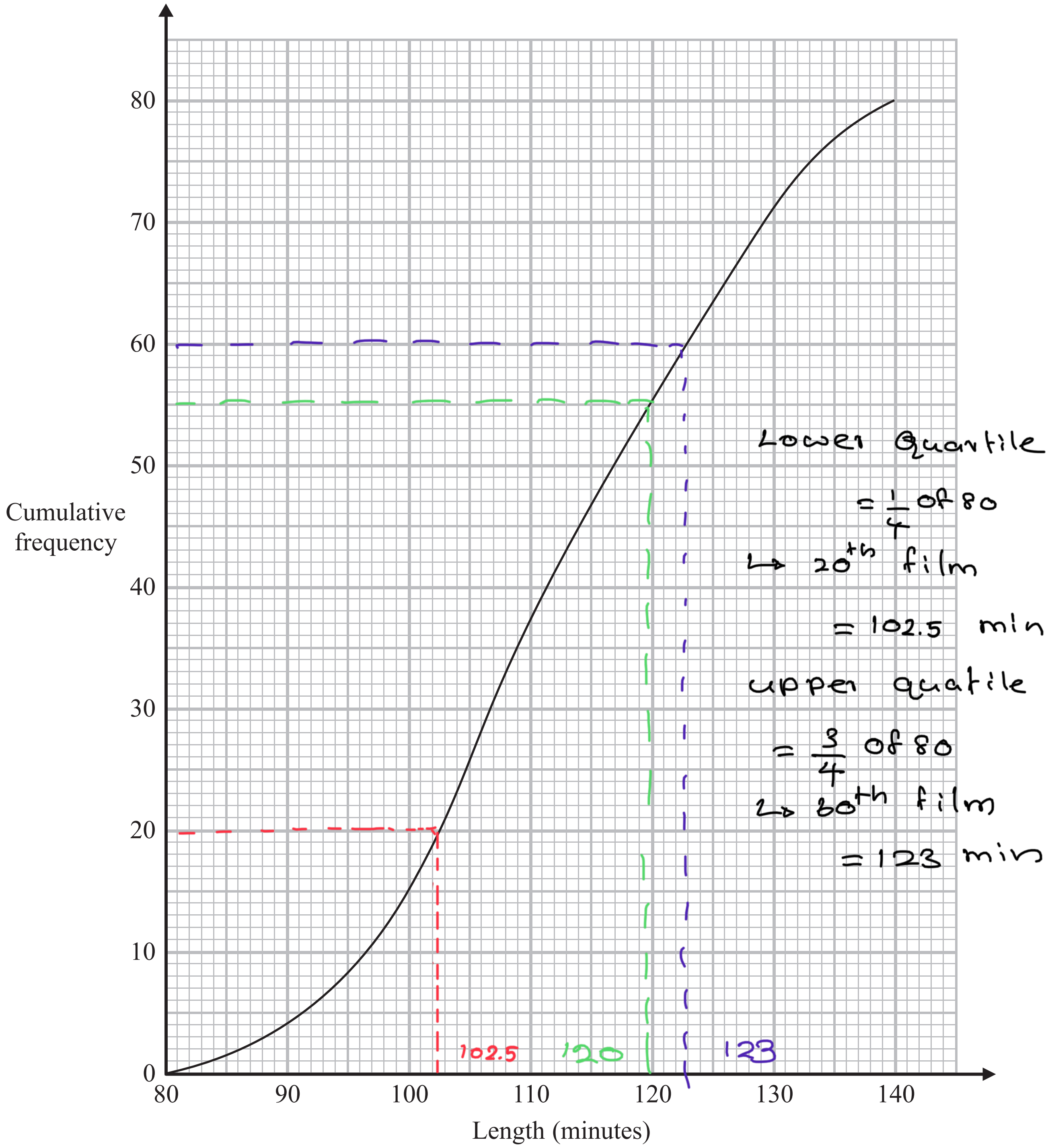
$= 110.5$

$= 111\text{ cm}$ to 3sf

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.



Lower Quartile
$= \frac{1}{4}$ of 80
↳ 20^{th} film
= 102.5 min
upper quatile
$= \frac{3}{4}$ of 80
↳ 60^{th} film
= 123 min

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

IQR = UQ − LQ
= 123 − 102.5
= 20.5 min

20.5 minutes

(2)

P 5 4 6 9 4 A 0 1 2 2 4

Clare says,

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

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

55 films are 120 minutes or less
80 − 55 = 25 films are over 120 minutes long

percentage $= \frac{25}{80} \times 100 = 31.25\%$

No. Claire is incorrect as only 31.25% of films are over 120 minutes long.

(3)

(Total for Question 10 is 5 marks)

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

$(2x-1)(x+3) = 2x^2+6x-x-3$

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

$(2x^2+5x-3)(x-5) = 2x^3-10x^2+5x^2-25x-3x+15$

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

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

(3)

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

Show your working clearly.

Give your solutions correct to 3 significant figures.

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

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

quadratic formula : $x = \dfrac{-b \pm \sqrt{b^2-4ac}}{2a}$

$= \dfrac{-6 \pm \sqrt{6^2-(4\times3\times-5)}}{2\times3}$

$= \dfrac{-6 \pm \sqrt{96}}{6}$

$\rightarrow x = \dfrac{-6+\sqrt{96}}{6} = 0.633$

$\rightarrow x = \dfrac{-6-\sqrt{96}}{6} = -2.63$

$0.633, -2.63$

(3)

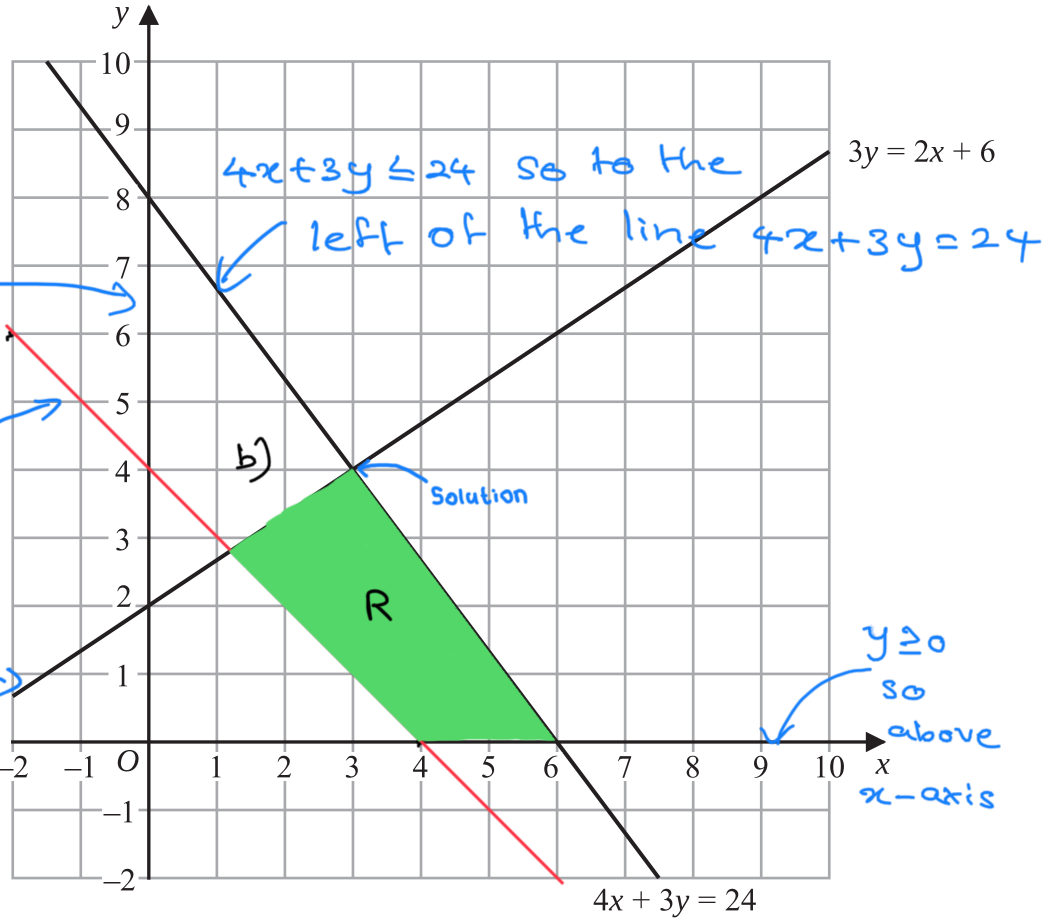
(Total for Question 11 is 6 marks)

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

$x \geq 0$ so to the right of y-axis

$x + y \geq 4$ so to the right of line $x+y=4$

$3y \leq 2x+6$ so below the line $3y = 2x+6$



(a) Write down the solution of the simultaneous equations

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

the Solution is where the lines $3y=2x+6$ and $4x+3y=24$ intersect

intersect at (3,4)

$x =$ 3

$y =$ 4

(1)

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

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

Label the region **R**.

plot $x+y=4$

$x=0 \rightarrow y=4 \quad (0,4)$

$y=0 \rightarrow x=4 \quad (4,0)$

(3)

(Total for Question 12 is 4 marks)

13

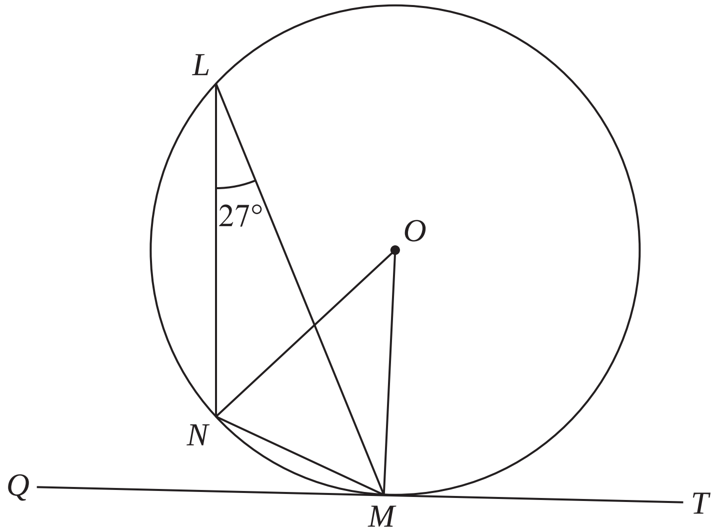


Diagram **NOT** accurately drawn

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.

$2 \times 27 = 54°$

54° °

(ii) Give a reason for your answer.

angle at centre is twice angle at circumference when subtended from the same two points.

(2)

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

angle NMQ = angle MLN = 27°

27 °

(ii) Give a reason for your answer.

alternate segment theorem

the angle between a tangent and a chord is always equal to the angle in the opposite segment.

(2)

(Total for Question 13 is 4 marks)

P 5 4 6 9 4 A 0 1 6 2 4

14 The function f is such that

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

(a) Find f(–7)

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

$= \frac{-21-5}{4} = \frac{-26}{4} = -6.5$

-6.5

(1)

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

$f(x) = y = \frac{3x-5}{4}$ rewrite function with y as the subject.

$4y = 3x-5$ multiply both sides by 4

$+5 \quad +5$ rearrange to make x the subject.

$4y+5 = 3x$

$\div 3 \quad \div 3$

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

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

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

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

(2)

The function g is such that

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

(c) Find fg(3)

$g(3) = \sqrt{19-(3)} = \sqrt{16} = 4$

$fg(3) = f(g(3))$

work out g(3) then put the output into f(x)

$f(4) = \frac{3(4)-5}{4} = \frac{12-5}{4} = \frac{7}{4}$

1.75

(2)

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

$x > 19 \rightarrow$ you can't have a square root of a negative number

domain: all the possible values of x you can put into a function

$x > 19$

(2)

(Total for Question 14 is 7 marks)

P 5 4 6 9 4 A 0 1 7 2 4

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

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

$a^{-n} = \frac{1}{a^n}$

$$= \frac{(y^8)^{1/4}}{256^{1/4} \times (x^{20})^{1/4}}$$

$(a^m)^n = a^{m \times n}$

$a^{1/n} = \sqrt[n]{a}$

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

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

(2)

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

$$\frac{1}{9x^2 - 25} - \frac{1}{6x+10} = \frac{1}{(3x+5)(3x-5)} - \frac{1}{2(3x+5)}$$

$2 \times 3 \times x$ 2×5

difference of two squares

$a^2 - b^2 = (a+b)(a-b)$

$a^2 = 9x^2 \to a = 3x$

$b^2 = 25 \longrightarrow b = 5$

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

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

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

(3)

(Total for Question 15 is 5 marks)

P 5 4 6 9 4 A 0 1 8 2 4

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

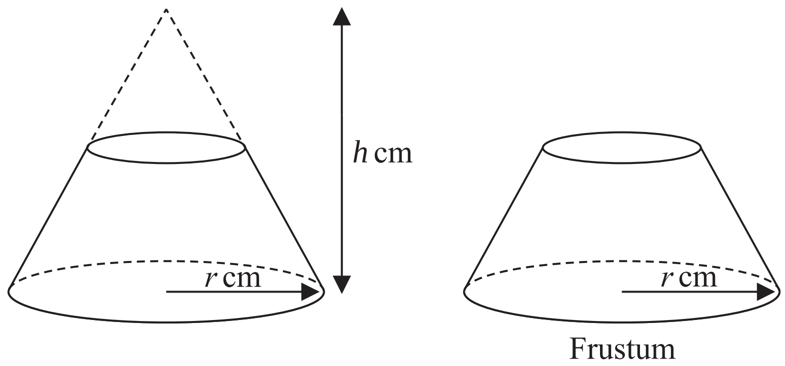


Diagram **NOT** accurately drawn

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

Given that

$$\frac{\text{volume of frustum}}{\text{volume of large cone}} = \frac{98}{125}$$

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

Scale factor of volumes

$$\frac{\text{volume of small cone}}{\text{volume of large cone}} = \frac{125-98}{125} = \frac{27}{125} = k^3$$

volume of large cone $\times k^3$ = volume of small cone

$k^3 = \frac{27}{125}$ $k = \sqrt[3]{\frac{27}{125}} = \frac{3}{5}$

height of large cone $\times \frac{3}{5}$ = height of small cone

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

height of large cone

height of frustrum = height of large cone − height of small cone

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

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

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

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

(Total for Question 16 is 4 marks)

P 5 4 6 9 4 A 0 1 9 2 4

17 The diagram shows parallelogram *ABCD*.

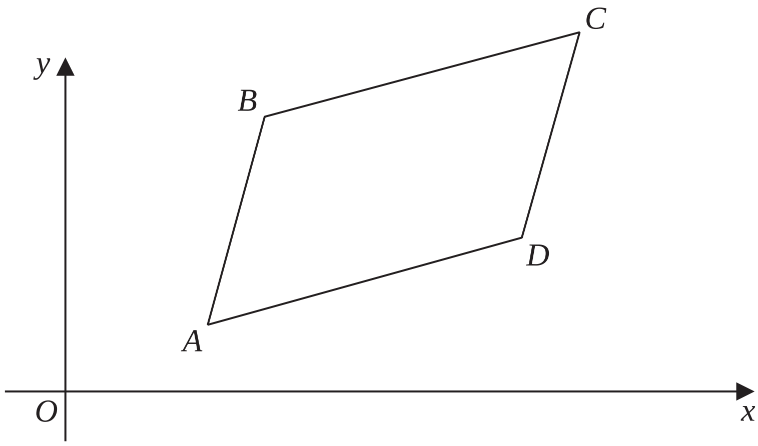


Diagram **NOT** accurately drawn

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

The point *B* has coordinates (5, 8)

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

$\overrightarrow{BC} = \overrightarrow{BA} + \overrightarrow{AC} = -\overrightarrow{AB} + \overrightarrow{AC} = -\begin{pmatrix} 2 \\ 7 \end{pmatrix} + \begin{pmatrix} 10 \\ 11 \end{pmatrix}$

$= \begin{pmatrix} 10-2 \\ 11-7 \end{pmatrix} = \begin{pmatrix} 8 \\ 4 \end{pmatrix}$

$B: (5, 8) \longrightarrow \overrightarrow{OB} = \begin{pmatrix} 5 \\ 8 \end{pmatrix}$

$\overrightarrow{OC} = \overrightarrow{OB} + \overrightarrow{BC} = \begin{pmatrix} 5 \\ 8 \end{pmatrix} + \begin{pmatrix} 8 \\ 4 \end{pmatrix}$

$= \begin{pmatrix} 5+8 \\ 8+4 \end{pmatrix} = \begin{pmatrix} 13 \\ 12 \end{pmatrix}$

(13, 12)

(3)

The point *E* has coordinates (63, 211)

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

$E: (63, 211) \longrightarrow \overrightarrow{OE} = \begin{pmatrix} 63 \\ 211 \end{pmatrix}$

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

$= \begin{pmatrix} 63-5 \\ 211-8 \end{pmatrix} = \begin{pmatrix} 58 \\ 203 \end{pmatrix}$

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

$\overrightarrow{BE} = \begin{pmatrix} 58 \\ 203 \end{pmatrix} = \begin{pmatrix} 29 \times 2 \\ 29 \times 7 \end{pmatrix} = 29 \begin{pmatrix} 2 \\ 7 \end{pmatrix}$

$\overrightarrow{AB}$ and $\overrightarrow{BE}$ are multiples of the same vector so $\overrightarrow{AB}$ is parallel to $\overrightarrow{BE}$ and ABE is a straight line

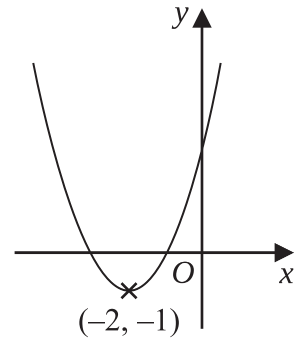
✓ as B is common to both vectors

(2)

(Total for Question 17 is 5 marks)

P 5 4 6 9 4 A 0 2 0 2 4

18



The diagram shows the curve with equation $y = \mathrm{f}(x)$
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

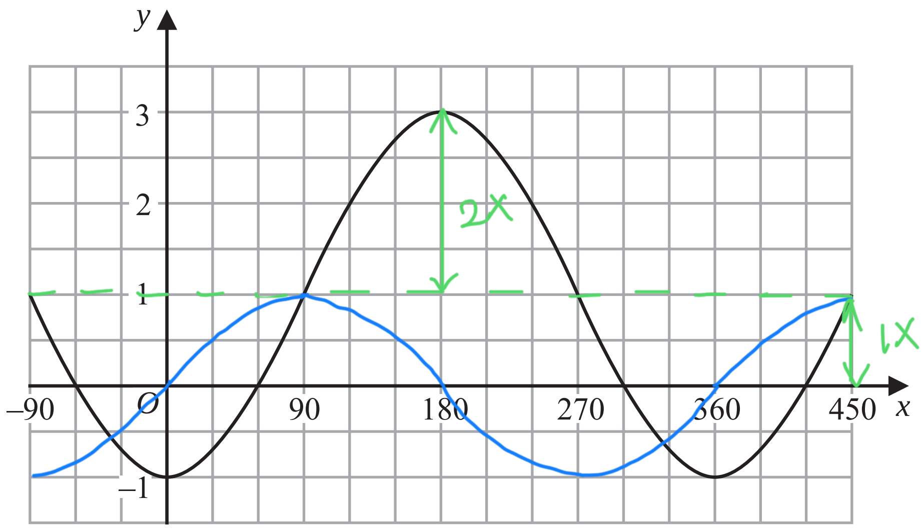
(i) $y = \mathrm{f}(x - 5)$ Translation $\begin{pmatrix} 5 \\ 0 \end{pmatrix}$ 5 units to the right
minimum point = $(3, -1)$
$-2+5$ → no change in y coordinate as translation is only in x direction

(3 , −1)

(ii) $y = \dfrac{1}{2}\mathrm{f}(x)$ strech parallel to y-axis scale factor $\frac{1}{2}$

(−2 , −0.5)
(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 = stretch parallel to y-axis, scale factor a
$(x - b)$ = translation $\begin{pmatrix} b \\ 0 \end{pmatrix}$ b units right.
c = translation $\begin{pmatrix} 0 \\ c \end{pmatrix}$ c units up.

$a =$ 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.

Spinner A: 2 3 5 7

odd number

$p(A \text{ even}) = \frac{1}{4}$ $\quad p(A \text{ odd}) = \frac{3}{4}$

Spinner B = 2 3 4 5 6

odd number

$p(B \text{ even}) = \frac{3}{5}$ $\quad p(B \text{ odd}) = \frac{2}{5}$

p (win)

$p(A \text{ even}) \times p(B \text{ odd}) = \frac{1}{4} \times \frac{2}{5} = \frac{2}{20}$

Jack wins if A = odd and B = even or A = even and B = odd

$p(A \text{ odd}) \times p(B \text{ even}) = \frac{3}{4} \times \frac{3}{5} = \frac{9}{20}$

'and' rule so multiply

$p(\text{win}) = \frac{2}{20} + \frac{9}{20} = \frac{11}{20}$

'or' rule so add

$p(\text{win twice}) = p(\text{win}) \times p(\text{win})$

p(win and win)

$= \frac{11}{20} \times \frac{11}{20}$

$= \frac{121}{400}$

$\frac{121}{400}$

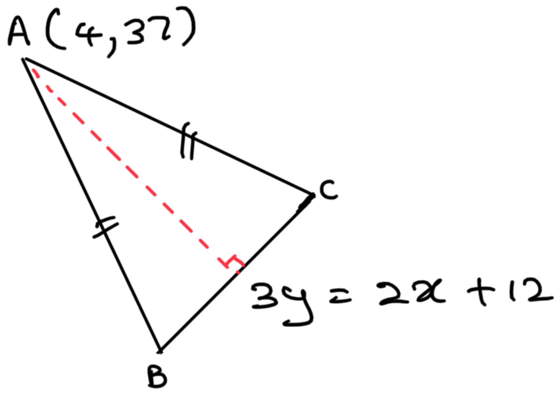
(Total for Question 19 is 4 marks)

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.

line of symmetry is perpendicular to BC



BC $3y = 2x + 12$

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

$y = mx + c$

$m =$ gradient $= \frac{2}{3}$

perpendicular gradient $= -\frac{3}{2}$ → negative reciprocal

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

(4, 37) & substitute into equation

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

$37 = -6 + c$
+6 +6
$43 = c$

$y = -\frac{3}{2}x + 43$
×2 ×2

$2y = -3x + 86$
+3x +3x

$3x + 2y = 86$ in the form $px + qy = r$
where $p = 3$
$q = 2$
$r = 86$

$3x + 2y = 86$

(Total for Question 20 is 5 marks)

TOTAL FOR PAPER IS 100 MARKS

P 5 4 6 9 4 A 0 2 3 2 4

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