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

Total Marks

You must have:
Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser, calculator. 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.
- 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 ▶

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
$0 < p \leqslant 1$	19
$1 < p \leqslant 2$	12
$2 < p \leqslant 3$	5
$3 < p \leqslant 4$	2
$4 < p \leqslant 5$	2

[handwritten working:]

mp

× 0·5   9·5
× 1·5   18
× 2·5   12·5
× 3·5   7
× 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.

$\dfrac{56}{40}$

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.

$$\begin{array}{cc} G & B \\ 2 & 7 \quad \boxed{\times 85} \\ 170 & 595 \end{array}$$

$$+$$

765 children

$$\frac{3}{5} \text{ of people} = 765$$

$$\text{people} = 1275$$

$$\frac{2}{5} \times 1275$$

510

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

$5 + 9$

y^{14}

....
(1)

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

$2^4 = 16$, $3 \times 4 = 12$

$16m^{12}$

....
(2)

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

$5x + 15 = 3x - 4$

$2x \quad = -19$

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

or $\quad -9.5$

$x =$ ....
(3)

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

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

....
(2)

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

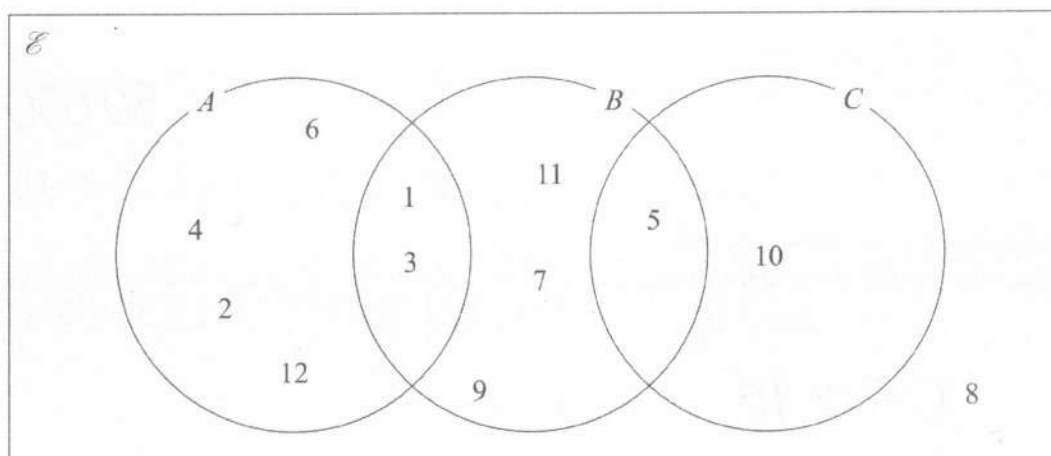$x = 4, \quad x = -6$

....
(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, A and C have no common numbers

(1)

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

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

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

(2)

(Total for Question 4 is 5 marks)

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

80 000

....

(1)

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

0.5×10^{-3}

5×10^{-4}

....

(2)

(Total for Question 5 is 3 marks)

Diagram **NOT**
accurately drawn

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

$MP = 3.5\,\text{cm}$
$PN = 9.7\,\text{cm}$

Angle $MPN = 90°$

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

$$MN = \sqrt{3.5^2 + 9.7^2} = 10.312\ldots = \text{diameter}$$

$$C = \pi \times d$$

$$= 32.3965\ldots$$

32.4 .... cm

(Total for Question 6 is 4 marks)

P 5 4 6 9 4 A 0 8 2 4

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$.

$$160000 \times 0.96^{3} = 141557.76$$

HK$ 141,558

(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.

$$? \times 1.05 = 252000$$

$$252000 \div 1.05 =$$

HK$ 240,000

(3)

(Total for Question 7 is 6 marks)

8 $A = 3^5 \times 5 \times 7^3$ $A = \cancel{3},3,3,3,3,5,\cancel{7},\cancel{7},\cancel{7}$
   $B = 2^3 \times 3 \times 7^4$ $B = 2,2,2,\cancel{3},\cancel{7},\cancel{7},\cancel{7},7$

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

$$3 \times 7 \times 7 \times 7$$

$$= 1029$$

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

$$= 1029 \times 3^4 \times 5 \times 2^3 \times 7$$

$$= 23,337,720$$

(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.

B/C, HCF, compare $\underline{2^3 \rightarrow 2^p}$ and $\underline{7^r \rightarrow 7^1}$

LCM, compare $\underline{2^4 \rightarrow 2^p}$
              $\underline{5^2 \rightarrow 5^q}$

$p = \underline{4}$

$q = \underline{2}$

$r = \underline{1}$

(2)

(Total for Question 8 is 4 marks)

The diagram shows a right-angled triangle.
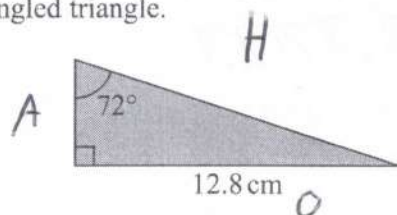
H

A 72°

12.8 cm O

Diagram **NOT**
accurately drawn

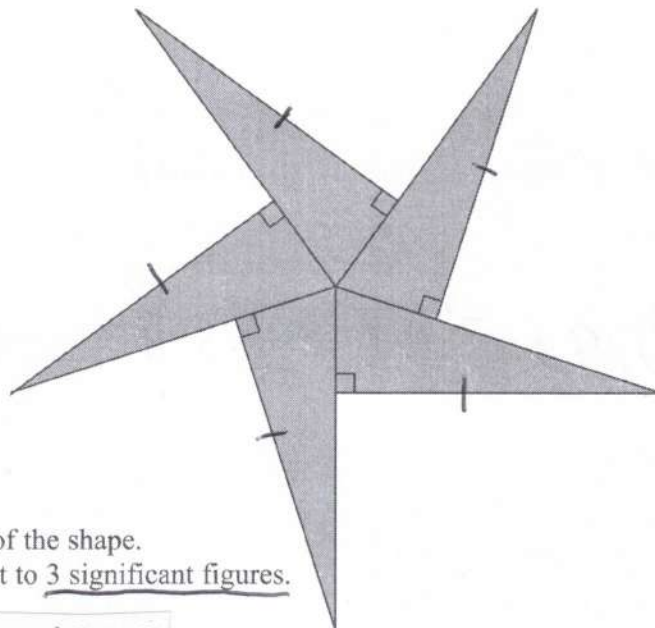Five of these triangles are put together to make a shape.

Diagram **NOT**
accurately drawn

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

$$S \frac{O}{\textcircled{H}} \quad H = \frac{12.8}{\sin 72} = 13.458...$$

$$T \frac{O}{\textcircled{A}} \quad A = \frac{12.8}{\tan 72} = 4.1589...$$

$$\Big\} = 9.2990...$$

$$Perimeter = (5 \times 12.8) + (5 \times 9.299)$$

$$= 110.495...$$

110

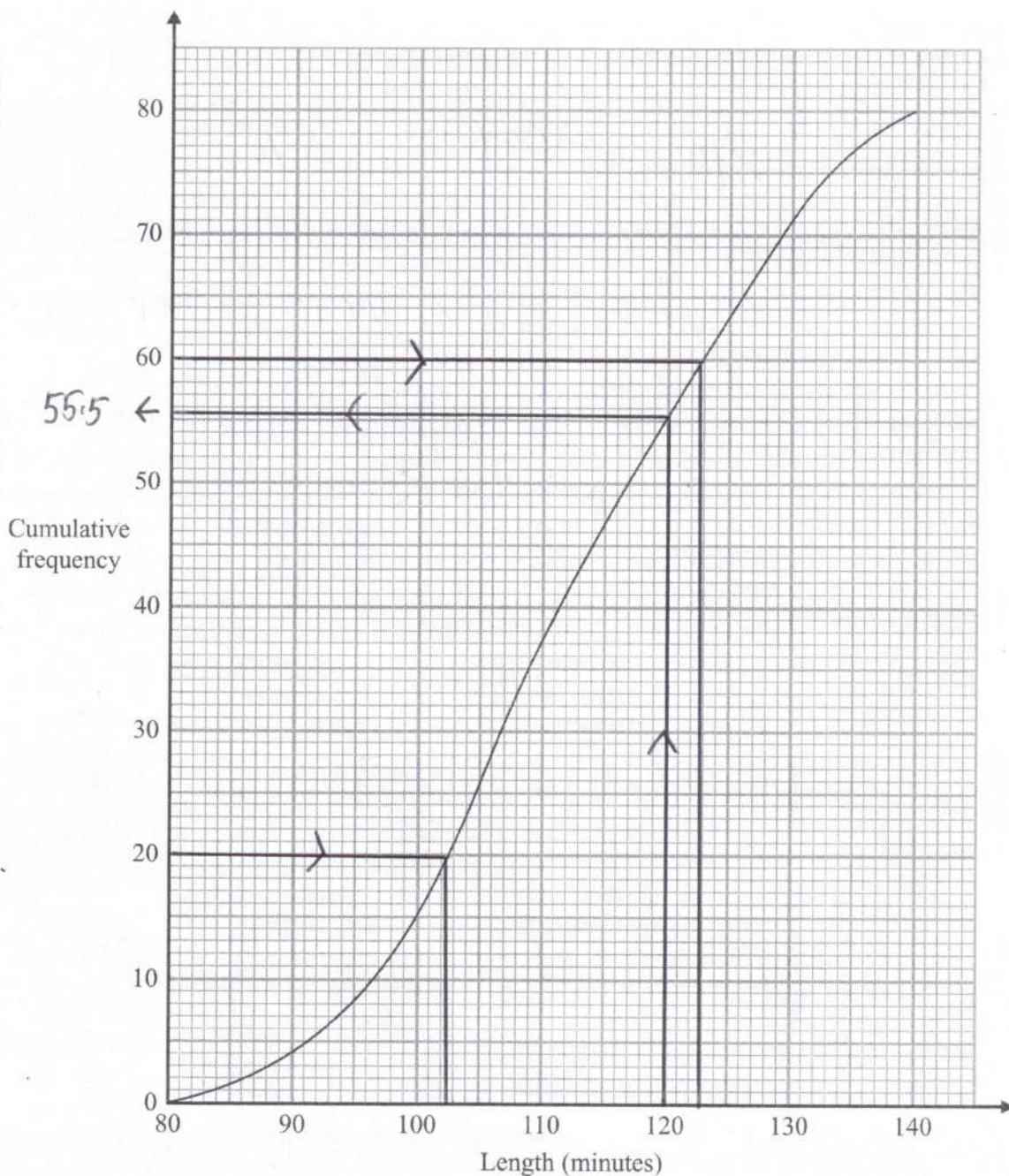... cm

(Total for Question 9 is 5 marks)

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

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

55.5

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

$123 - 102.5$

20.5

[ms: $19 \rightarrow 21$]

.... 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.

$$\frac{80 - 55.5}{80} \times 100 = 30.625 = 31\%$$

so No $<35\%$ were over 120m long.

(3)

(Total for Question 10 is 5 marks)

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

$$2x^2 + 5x \quad - 3$$

$2x^3$	$+5x^2$	$-3x$	x
$-10x^2$	$-25x$	$+15$	-5

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

(3)

$$a \quad b \quad c$$

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

Show your working clearly.

Give your solutions correct to 3 significant figures.
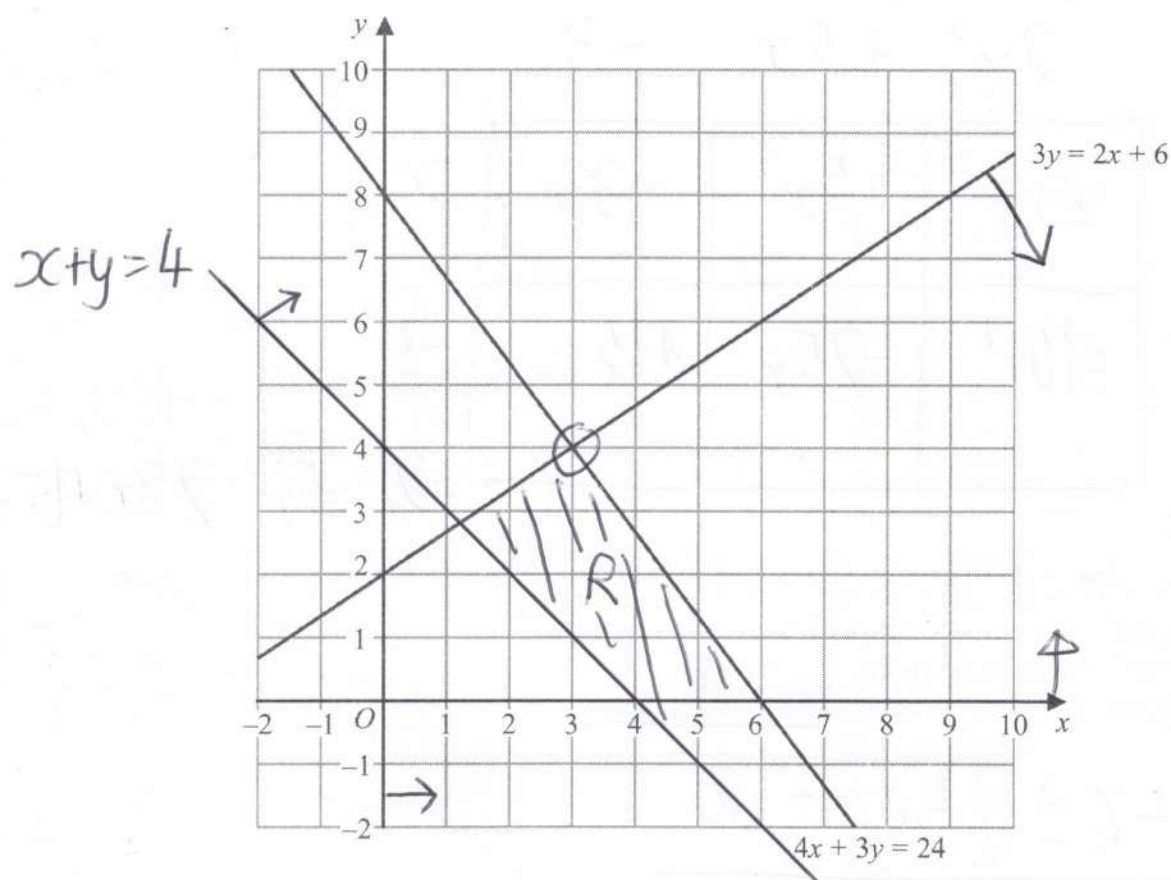
$$\frac{-6 \pm \sqrt{36 - -60}}{6}$$

$$= 0.633, \; -2.63$$

(3)

(Total for Question 11 is 6 marks)

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

$x+y=4$

$3y = 2x + 6$

$4x + 3y = 24$

(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

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

Label the region **R**.

$0 \leqslant 0 + 6$ $\qquad$ $0 + 0 \leqslant 24$

+ve quadrant

(3)

(Total for Question 12 is 4 marks)
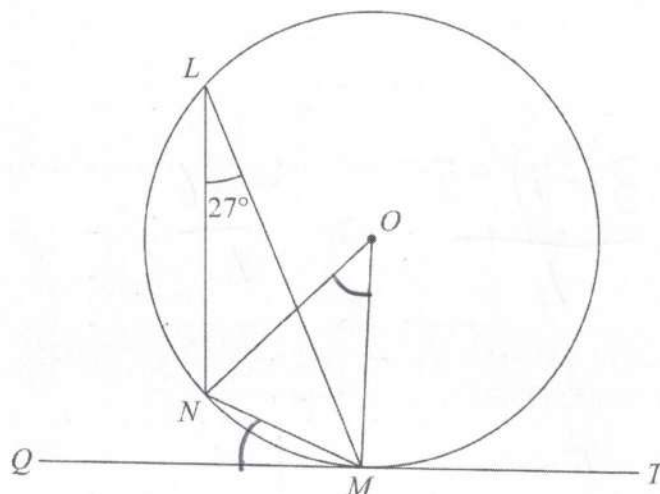
P 5 4 6 9 4 A 0 1 5 2 4

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.

Angle at centre is twice angle at circumference

(2)

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

27 °

(ii) Give a reason for your answer.

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)

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

$$-6.5$$

.... (1)

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

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

$$4y = 3x - 5$$

$$4y + 5 = 3x$$

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

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

.... (2)

The function g is such that

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

(c) Find fg(3)

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

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

$$= \frac{7}{4} \text{ or } 1.75$$

.... (2)

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

$$19 - x \text{ can't be } < 0$$

$$\text{so } x > 19$$

.... (2)

(Total for Question 14 is 7 marks)

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

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

(2)

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

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

$$= \dfrac{2 - 1(3x-5)}{2(3x+5)(3x-5)}$$

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

(3)

(Total for Question 15 is 5 marks)

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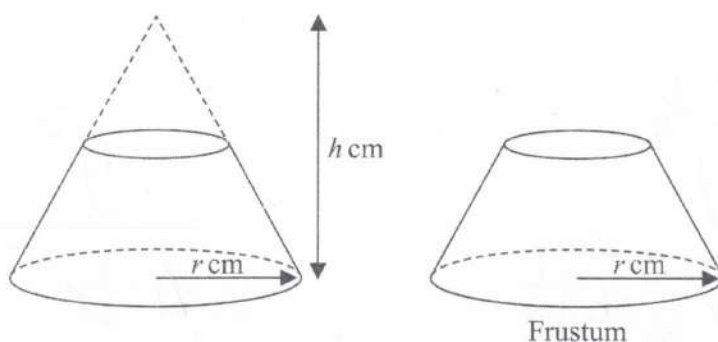The cones are mathematically similar.

Diagram **NOT**
accurately drawn

h cm

r cm

r cm

Frustum

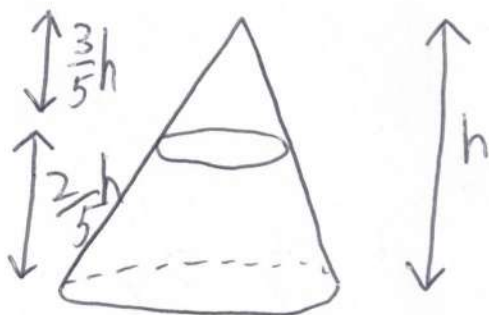The large cone has base radius r cm and height h cm.

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 <u>frustum</u>.

$$\therefore \quad \frac{\text{Volume of small cone}}{\text{Vol. of large cone}} = \frac{27}{125}$$

$$\text{So linear scale factor} = \sqrt[3]{\frac{27}{125}} = \frac{3}{5}$$

$\frac{3}{5}h$

$\frac{2}{5}h$

h

so height of frustum

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

.... cm

(Total for Question 16 is 4 marks)

17 The diagram shows parallelogram $ABCD$.
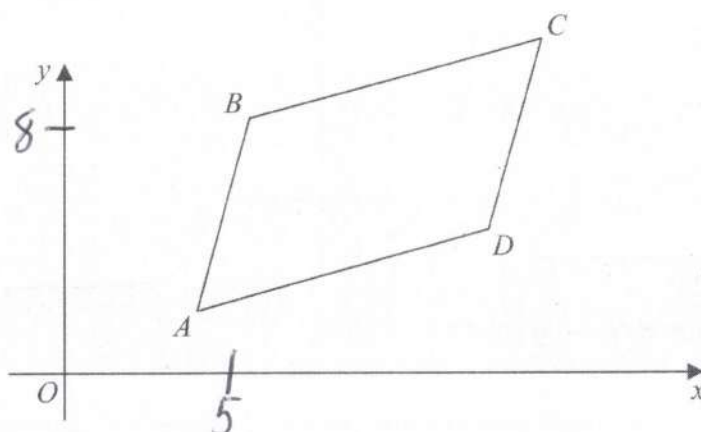
SO $\vec{BC}$
$= \vec{AD}$

Diagram **NOT**
accurately drawn

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

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

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

$\begin{bmatrix} 5 \\ 8 \end{bmatrix} - \begin{bmatrix} 2 \\ 7 \end{bmatrix} + \begin{bmatrix} 10 \\ 11 \end{bmatrix}$

(.....13...... , ...12......)

(3)

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

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

$\vec{BE} = \begin{bmatrix} 63 \\ 211 \end{bmatrix} - \begin{bmatrix} 5 \\ 8 \end{bmatrix} = \begin{bmatrix} 58 \\ 203 \end{bmatrix}$ $= 29 \begin{bmatrix} 2 \\ 7 \end{bmatrix}$
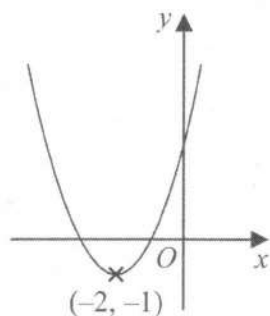
$= 29 \times AB$

hence straight line.

(2)

(Total for Question 17 is 5 marks)

The diagram shows the curve with equation $y = f(x)$

The coordinates of the minimum point of the curve are $(-2, -1)$

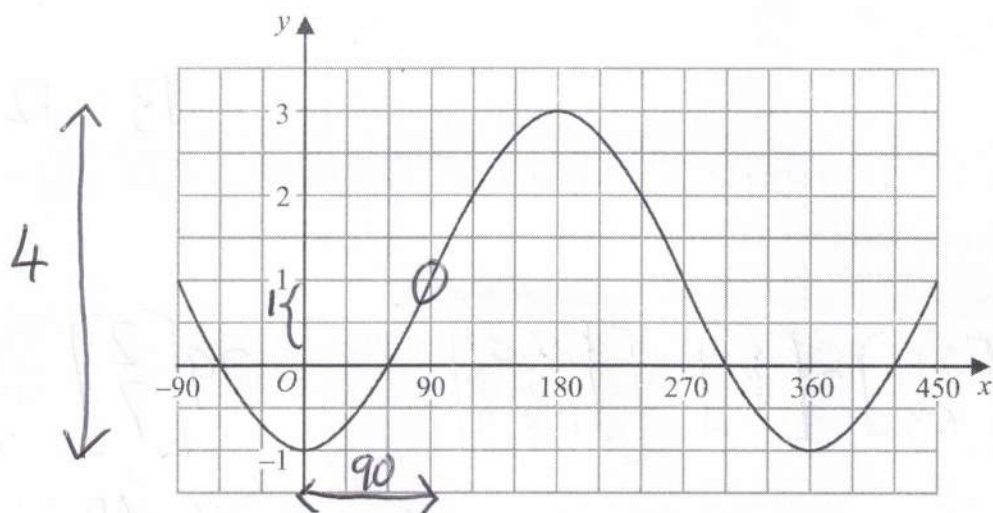(a) Write down the coordinates of the minimum point of the curve with equation

(i) $y = f(x - 5)$ = "right 5"

(3 , -1)

(ii) $y = \frac{1}{2} f(x)$ = scale factor of ×0·5

(-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)

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

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.

$$\rightarrow E = \frac{1}{4}$$

$$\rightarrow E = \frac{3}{5}$$

$$\text{Win} = \begin{array}{cc} A & B \\ O & E \end{array} + \begin{array}{cc} A & B \\ E & O \end{array}$$

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

$$= \frac{9}{20} + \frac{2}{20}$$

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

$$\text{Win twice} = \frac{11}{20} \times \frac{11}{20}$$

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

(Total for Question 19 is 4 marks)

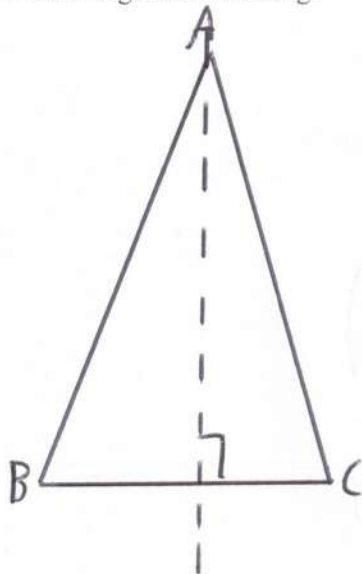**20** *ABC* is an isosceles triangle such that

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

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

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

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
$\left(\text{so } m = -\frac{3}{2}\right)$

and passes through A
$(4, 37)$

so use $y = mx + c$

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

so $c = 43$

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

$2y = -3x + 86$

$$3x + 2y = 86$$

(Total for Question 20 is 5 marks)

TOTAL FOR PAPER IS 100 MARKS