UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

9086222361

MATHEMATICS (SYLLABUS D) **4024/01**

Paper 1 **October/November 2008**

2 hours

Candidates answer on the Question Paper.

Additional Materials: Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

If working is needed for any question it must be shown in the space below that question.
Omission of essential working will result in loss of marks.

NEITHER ELECTRONIC CALCULATORS NOR MATHEMATICAL TABLES MAY BE USED IN THIS PAPER.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 80.

For Examiner's Use

This document consists of **16** printed pages.

SP (SM/SLM) T54875/2

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NEITHER ELECTRONIC CALCULATORS NOR MATHEMATICAL TABLES MAY BE USED IN THIS PAPER.

1 Evaluate

(a) 0.3×0.06,

(b) $0.4 + 0.3 \times 5$.

Answer (*a*) ....[1]

(*b*) ....[1]

---

2 **(a)** Express 0.45 as a fraction, giving your answer in its lowest terms.

(b) Express $\frac{13}{40}$ as a percentage.

Answer (*a*) ....[1]

(*b*) .... % [1]

---

3 Evaluate

(a) $3\frac{1}{5} - 2\frac{2}{3}$,

(b) $4^{\frac{3}{2}}$.

Answer (*a*) ....[1]

(*b*) ....[1]

For Examiner's Use

4 A basketball stadium has 13 492 seats.
During a season a basketball team played 26 matches and every seat was sold for each match.
At each match a seat costs $18.80.

By writing each value correct to 1 significant figure, estimate the total amount of money paid to watch these matches during the season.

Answer $ ....[2]

---

5 The number of items bought by 10 customers at a local store is shown below.

6 7 5 9 10 7 18 10 7 9

(a) State the mode of this distribution.

(b) Find the median number of items bought.

Answer (*a*) ....[1]

(*b*) ....[1]

---

6 A wooden plank is cut into three pieces in the ratio 2 : 5 : 1.
The length of the longest piece is 125 cm.

Find

(a) the length, in centimetres, of the shortest piece,

(b) the total length, in metres, of the plank.

Answer (*a*) .... cm [1]

(*b*) .... m [1]

For Examiner's Use

7 It is given that $m = 2.1 \times 10^7$ and $n = 3 \times 10^4$.
Expressing your answers in standard form, find

(a) $m \div n$,

(b) $n^2 + m$.

Answer (*a*) ....[1]

(*b*) ....[2]

8 A bag contains red, green and yellow pegs.
A peg is taken at random from the bag.
The probability that it is red is 0.35 and the probability that it is green is 0.4.

(a) Find the probability that it is

(i) yellow,

(ii) not red.

(b) Originally there were 16 green pegs in the bag.
Find the total number of pegs.

Answer (*a*)(i) ....[1]

(ii) ....[1]

(*b*) ....[1]

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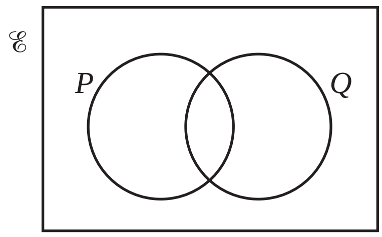
9 **(a)** On the Venn diagram shown in the answer space, shade the set $P \cup Q'$.

Answer (a)



[1]

(b) There are 27 children in a class.
Of these children, 19 own a bicycle, 15 own a scooter and 3 own neither a bicycle nor a scooter.
Using a Venn diagram, or otherwise, find the number of children who own a bicycle but not a scooter.

Answer (b) ....[2]

---

10 T is inversely proportional to the square of L.
Given that $T = 9$ when $L = 2$, find

(a) the formula for T in terms of L,

(b) the values of L when $T = 25$.

Answer (a) $T =$ ....[2]

(b) $L =$ ....[1]

---

11 A rectangular box has dimensions 30 cm by 10 cm by 5 cm.
A container holds exactly 100 of these boxes.

(a) Calculate the total volume, in cubic metres, of the 100 boxes.

(b) Each box has a mass of 1.5 kg to the nearest 0.1 kg.
The empty container has a mass of 6 kg to the nearest 0.5 kg.
Calculate the greatest possible **total** mass of the container and 100 boxes.

Answer (*a*) .... m^3 [1]

(*b*) .... kg [2]

---

12 Given that $f(x) = \dfrac{4x + 3}{2x}$, find

(a) f(3) ,

(b) $f^{-1}(x)$.

Answer (*a*) f(3) = ...[1]

(*b*) $f^{-1}(x)$ = ...[2]

For Examiner's Use

13 A family wants to move to a new house.
The area where they are going to look depends on the positions of the children's school, *S*, the father's place of work, *F*, and the market, *M*.
The diagram in the answer space is drawn to a scale of 1 cm to 1 km.
It shows the positions of *S*, *F* and *M*.

The house needs to be:

I within 4 km of the children's school,
II nearer to the market than to the father's place of work.

(a) Use I and II to construct the appropriate loci.

(b) Shade the region of your diagram that represents the possible positions of the house.

(c) Find the greatest possible distance between the house and the market.

Answer (*a*) (*b*)

Scale 1 cm to 1 km

[3]

Answer (*c*) .... km [1]

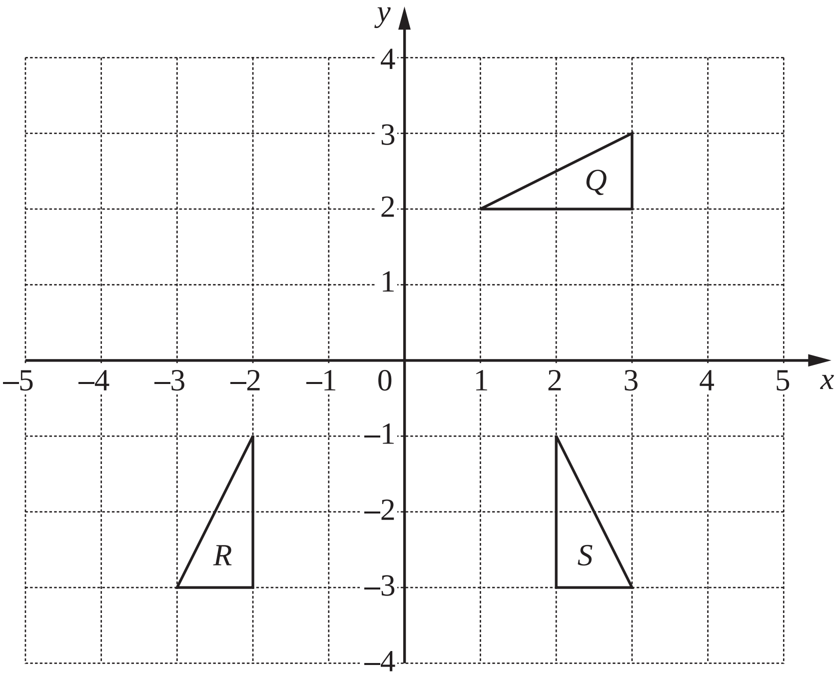
For Examiner's Use

14 The diagram below shows three triangles Q, R and S.

(a) Triangle T is the image of triangle Q under a translation $\begin{pmatrix} -2 \\ 1 \end{pmatrix}$.

Draw and label triangle T.

Answer (a)



[1]

(b) Describe fully the **single** transformation that maps triangle Q onto triangle R.

Answer (b) ....

....[2]

(c) Find the matrix representing the transformation that maps triangle Q onto triangle S.

Answer (c) $\begin{pmatrix} & \\ & \end{pmatrix}$ [1]

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15 $\mathbf{A} = \begin{pmatrix} 2 & -1 \\ 1 & 3 \end{pmatrix}$ and $\mathbf{B} = \begin{pmatrix} 4 & -3 \\ 1 & 0 \end{pmatrix}$.

Find

(a) **AB**,

(b) $\mathbf{B}^{-1}$.

Answer (*a*) $\mathbf{AB} = \begin{pmatrix} & \\ & \end{pmatrix}$ [2]

(*b*) $\mathbf{B}^{-1} = \begin{pmatrix} & \\ & \end{pmatrix}$ [2]

---

16 **(a)** Solve the inequality $3 - 2x < 5$.

Answer (*a*) x ....[2]

(b) Solve the equation $3(y + 2) = 2(2y - 7) + y$.

Answer (*b*) $y =$ ....[2]

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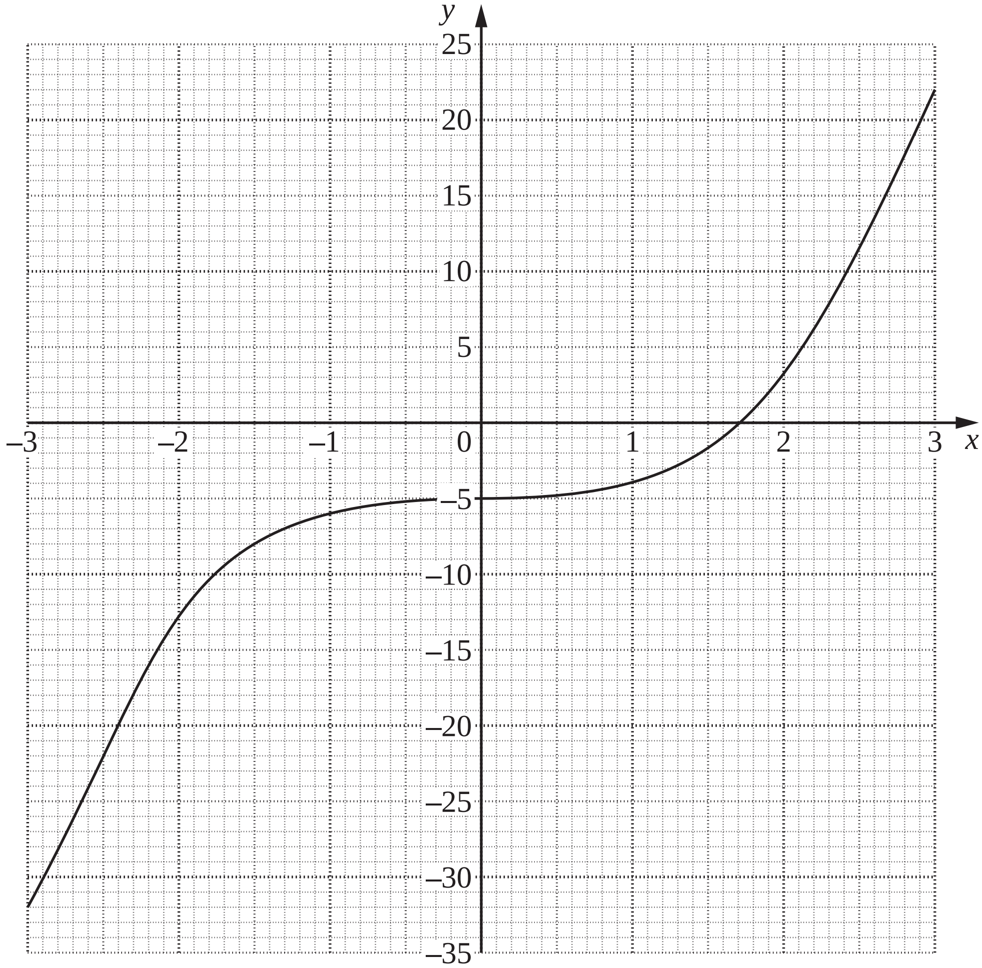
17 The curve $y = x^3 - 5$ is shown on the axes below.



[1]

(a) Use the graph to find an approximate value of $\sqrt[3]{5}$.

(b) **(i)** On the axes above, draw the graph of $y = 15 - 5x$.

(ii) Write down the coordinates of the point where the graphs cross.

(iii) The x coordinate of the point where the graphs cross is a solution of the equation $x^3 = a + bx$.
Find the value of a and the value of b.

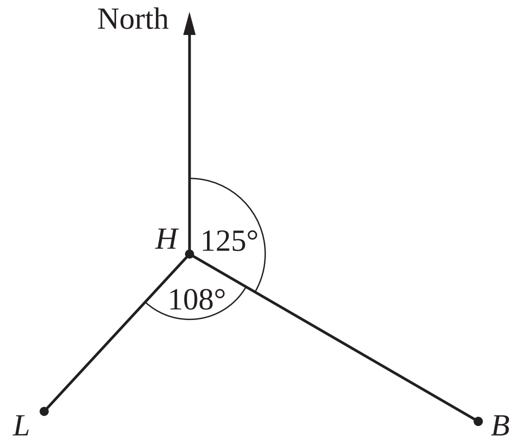
Answer (*a*) ....[1]

(*b*)(ii) (............ , ...) [1]

(iii) a = ... b = ...[1]

For Examiner's Use

18 The diagram shows the positions of a harbour, H, and a lighthouse, L.
A boat is anchored at B where $L\hat{H}B = 108°$.



(a) Given that the bearing of B from H is 125°, find the bearing of

(i) L from H,

(ii) H from B.

(b) At 7 30 a.m. the boat set sail in a straight line from B to H at an average speed of 25 km/h.
Given that $BH = 70$ km, find the time at which the boat reaches the harbour.

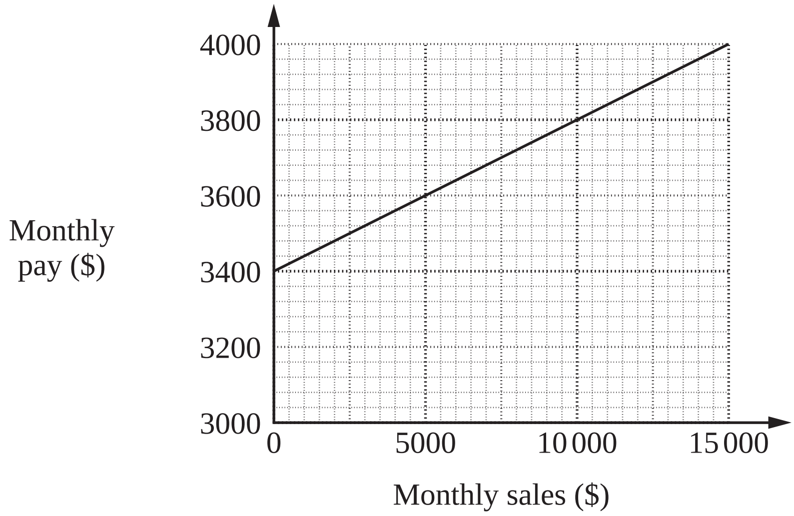
Answer (*a*)(i) ....[1]

(ii) ....[1]

(*b*) ....[2]

19 Every month a salesman's pay is made up of a fixed amount plus a bonus.
The bonus is a percentage of his monthly sales.

(a) In 2006 the bonus paid was *m*% of his monthly sales.
The graph shows how the salesman's monthly pay varied with his monthly sales.



Use the graph to find

(i) the fixed amount,

(ii) the value of *m*.

Answer (*a*)(i) $ ....[1]

(ii) *m* = ...[2]

(b) In 2007 the fixed amount was $3500 per month and the bonus was 5% of his monthly sales.
In July his sales were $12 000.
Calculate the salesman's pay for July.

Answer (*b*) $ ....[2]

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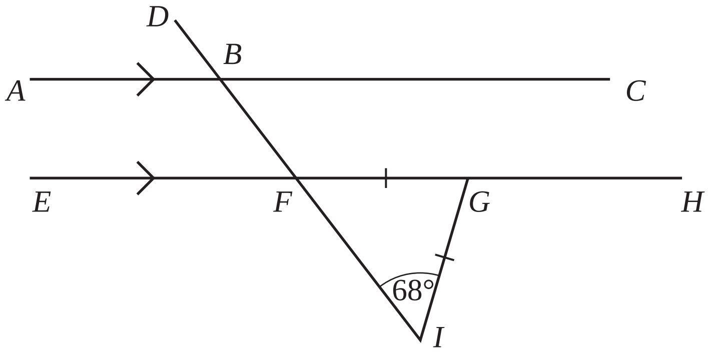
20 **(a)**



ABC and *EFGH* are parallel lines.
The line *DI* intersects *AC* at *B* and *EH* at *F*.
$F\hat{I}G = 68°$ and $FG = GI$.

Find

(i) $B\hat{F}G$,

(ii) $F\hat{G}I$,

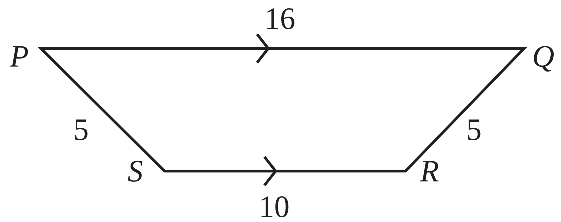
(iii) $D\hat{B}A$.

Answer (*a*)(i) $B\hat{F}G$ = ...[1]

(ii) $F\hat{G}I$ = ...[1]

(iii) $D\hat{B}A$ = ...[1]

(b)



PQRS is a trapezium.
PS = *QR* = 5 cm, *PQ* = 16 cm and *SR* = 10 cm.
Find the area of the trapezium.

Answer (*b*) .... cm^2 [2]

For Examiner's Use

21 **(a)** Expand and simplify $(p - 5)(p + 4)$.

(b) Factorise completely

(i) $4x^2 + 12xy + 9y^2$,

(ii) $3m^2 - 48$.

Answer (*a*) ....[1]

(*b*)(i) ....[2]

(ii) ....[2]

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22 The equation of a line ℓ is $x + 2y = -1$.

(a) Write down the gradient of the line ℓ.

(b) Find the equation of the line parallel to ℓ that passes through the point $(0, 5)$.

Answer (*a*) ....[1]

(*b*) ....[2]

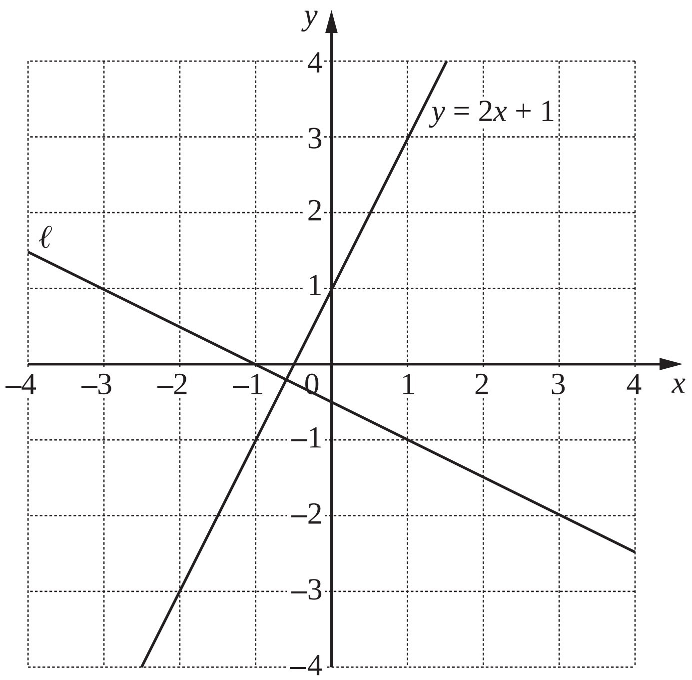
(c) The diagram in the answer space shows the line ℓ and the line $y = 2x + 1$.
On this diagram,

(i) draw the line $y = -2$,

(ii) shade and label the region, R, defined by the three inequalities

$y \geqslant -2$ $\quad x + 2y \leqslant -1$ $\quad y \geqslant 2x + 1$.

Answer (*c*)(i)(ii)



[2]

Question 23 is printed on the following page

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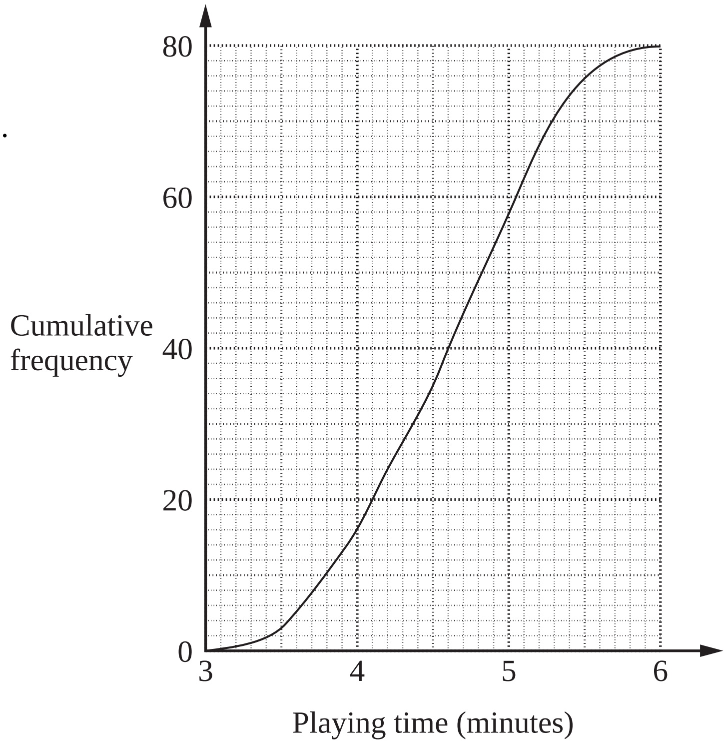
23 **(a)** The graph shows the cumulative frequency curve for the playing times of the individual tracks on Andrew's MP3 player.

Use the graph to find

(i) the median,

(ii) the interquartile range.



Answer (*a*)(i) .... minutes [1]

(ii) .... minutes [2]

(b) The table summarises the playing times of each of the 100 tracks on Tom's MP3 player.

Playing time (t minutes)	Frequency
$2.5 < t \leqslant 3.5$	5
$3.5 < t \leqslant 4.5$	30
$4.5 < t \leqslant 5.5$	50
$5.5 < t \leqslant 6.5$	15

Calculate an estimate of the mean playing time of the individual tracks.

Answer (*b*) .... minutes [3]