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4024/01

October/November 2008

2 hours

Additional Materials: Geometrical instruments

The total of the marks for this paper is 80.

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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]

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- 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]

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- 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) $n^2 + m$.

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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]

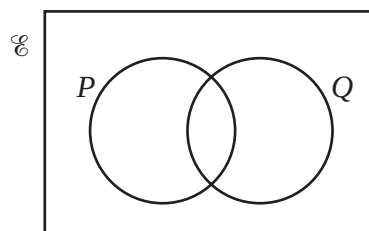
(ii)[1]

(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]For
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- 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) m³ [1]

(b) kg [2]

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

- (a) $f(3)$,
- (b) $f^{-1}(x)$.

Answer (a) $f(3) =$ [1]

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

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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 .

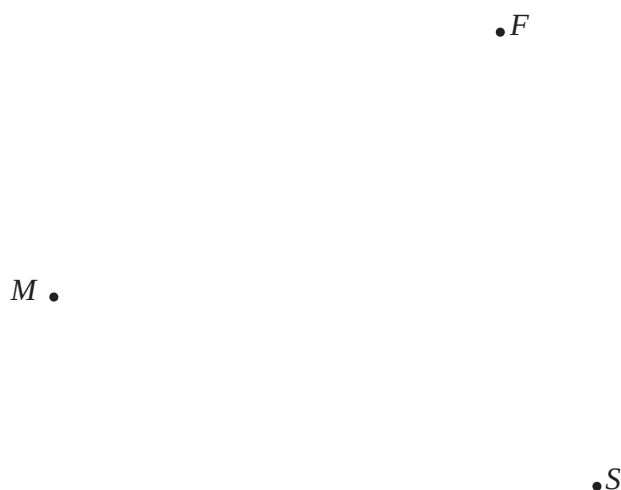
The house needs to be:

- 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]

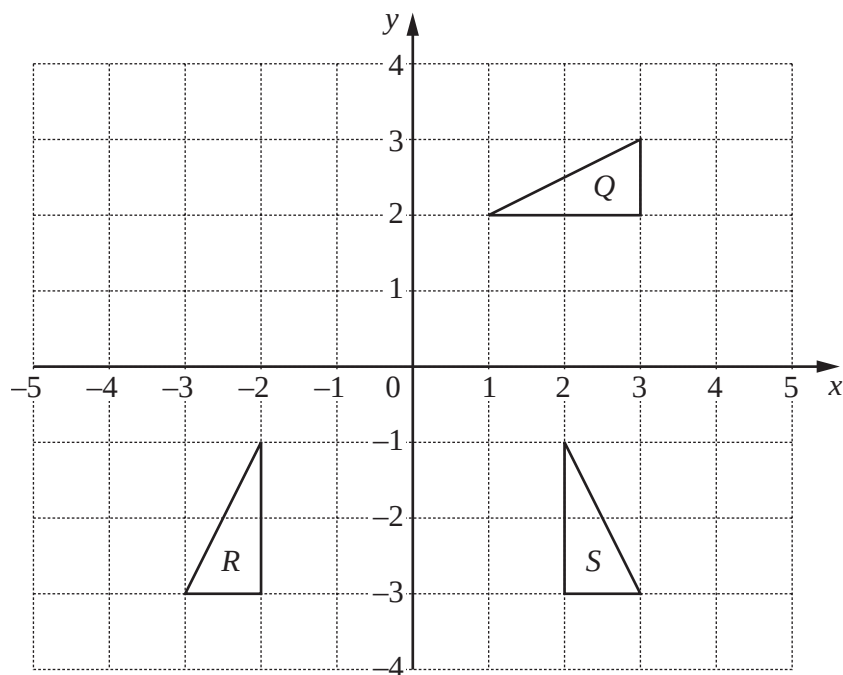
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14 The diagram below shows three triangles Q , R and S .

- (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) $\mathbf{AB}$,(b) $\mathbf{B}^{-1}$.For
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Answer (a) $\mathbf{AB} = \begin{pmatrix} & \\ & \end{pmatrix}$ [2]

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

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

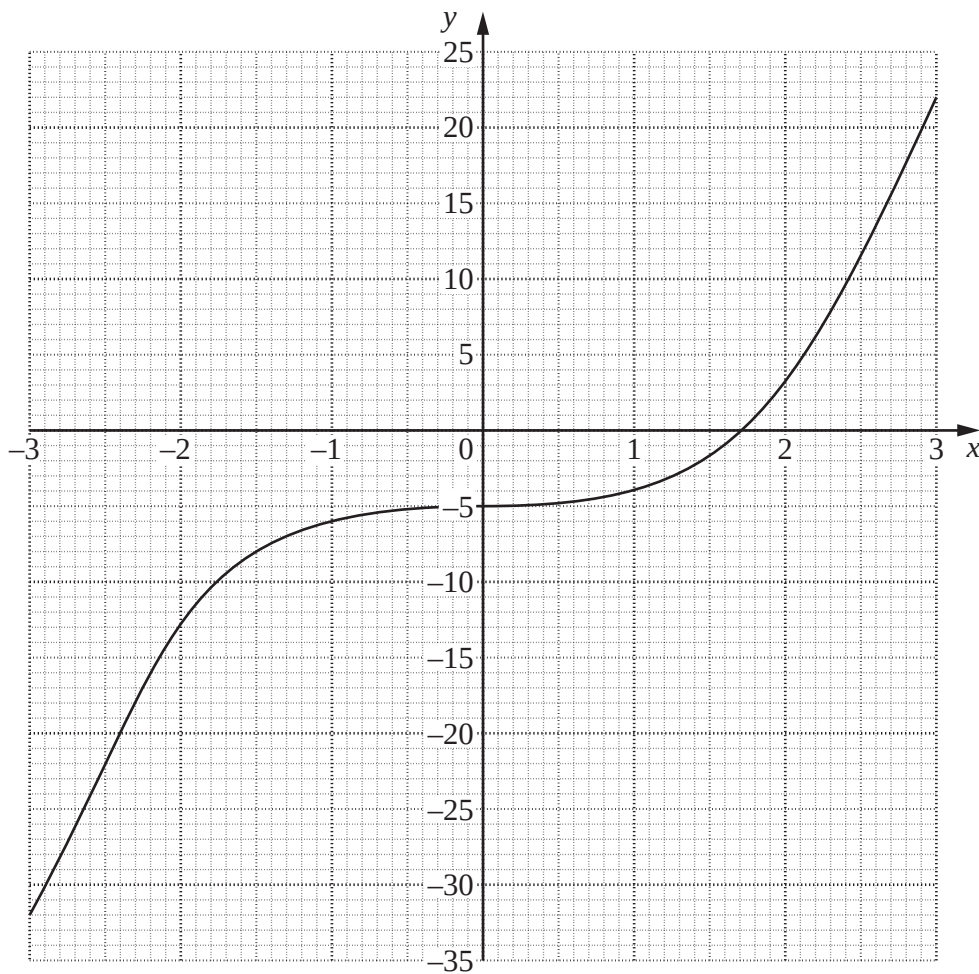
Answer (a) x [2]

(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.

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[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 .

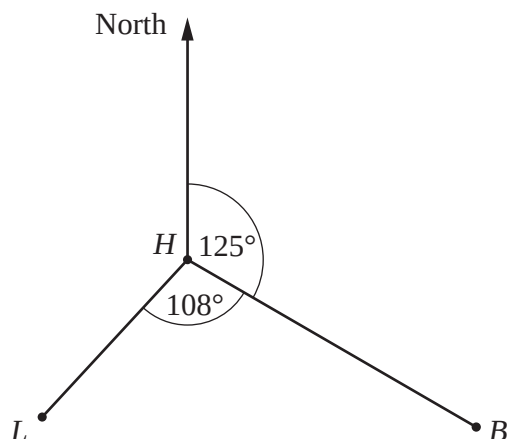
Answer (a)[1]

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

(iii) $a = \dots\dots\dots b = \dots\dots\dots$ [1]

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- 18** The diagram shows the positions of a harbour, H , and a lighthouse, L .
A boat is anchored at B where $\angle LHB = 108^\circ$.

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

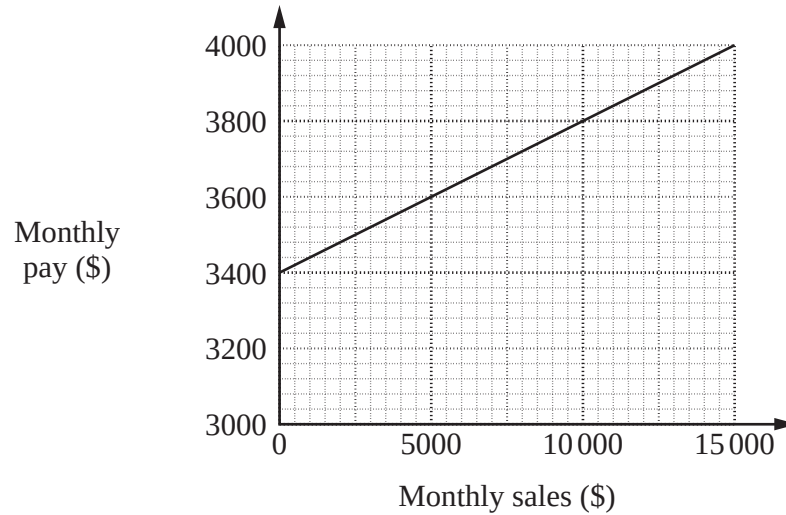
(ii)[1]

(b)[2]

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- 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]

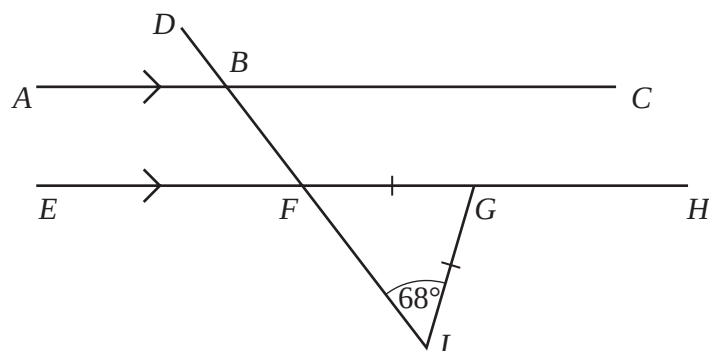
(ii) $m =$ [2]

- (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)

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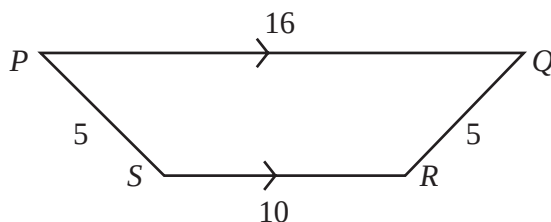
ABC and $EFGH$ are parallel lines.
The line DI intersects AC at B and EH at F .
 $\hat{F}IG = 68^\circ$ and $FG = GI$.

Find

- (i) $\hat{B}FG$,
- (ii) $\hat{F}GI$,
- (iii) $\hat{D}BA$.

Answer (a)(i) $\hat{B}FG = \dots\dots\dots[1]$ (ii) $\hat{F}GI = \dots\dots\dots[1]$ (iii) $\hat{D}BA = \dots\dots\dots[1]$

(b)



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

Answer (b) $\dots\dots\dots \text{cm}^2$ [2]

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

(b) Factorise completely

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

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

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Answer (a)[1]

(b)(i)[2]

(ii)[2]

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]

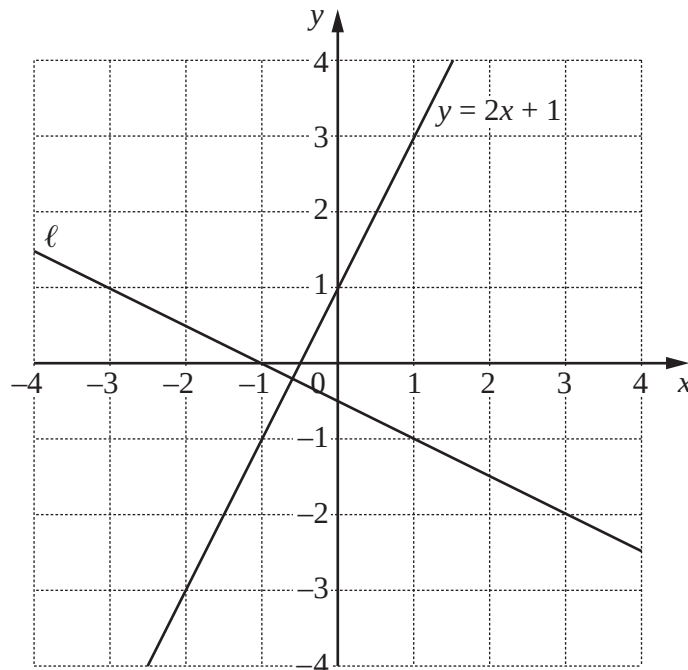
(b)[2]

- (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

$$y \geq -2 \qquad x + 2y \leq -1 \qquad y \geq 2x + 1.$$

Answer (c)(i)(ii)



[2]

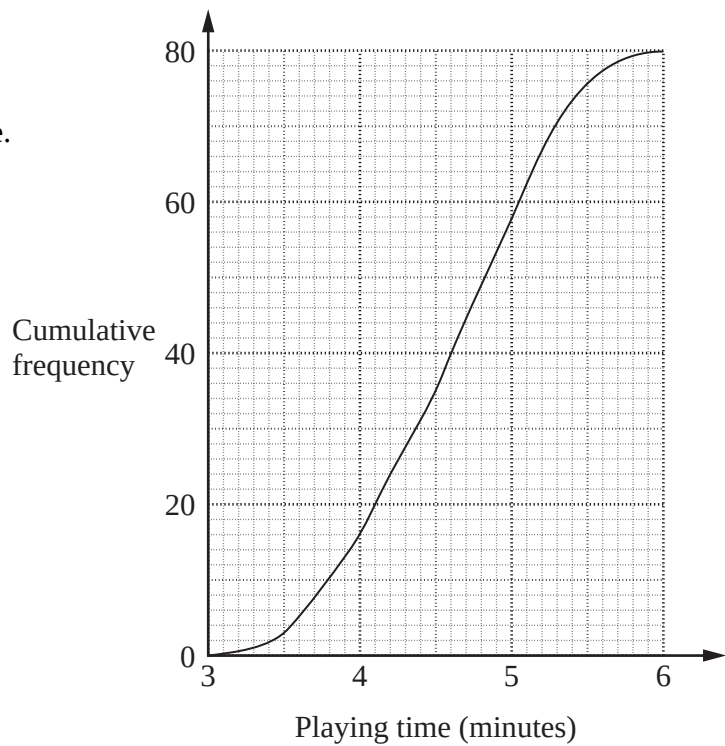
Question 23 is printed on the following page

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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
$2.5 < t \leq 3.5$	5
$3.5 < t \leq 4.5$	30
$4.5 < t \leq 5.5$	50
$5.5 < t \leq 6.5$	15

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

Answer (b) minutes [3]

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