Centre Number	Candidate Number	Name

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

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

Paper 1

May/June 2005

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 in the spaces provided on the Question Paper.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions.
The number of marks is given in brackets [ ] at the end of each question or part question.

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.
The total of the marks for this paper is 80.

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

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

1 **(a)** Express $\frac{13}{20}$ as a decimal.

(b) In a test, Rose scored 56 marks out of 70.
Express this score as a percentage.

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

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

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2 Evaluate

(a) $2\frac{2}{3} \times \frac{1}{7}$,

(b) $\frac{2}{5} \div \frac{7}{12}$.

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

(b) ..... [1]

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3 **(a)** Evaluate $\begin{pmatrix} 4 & 2 \\ 1 & 1 \end{pmatrix}\begin{pmatrix} 1 & -2 \\ -1 & 4 \end{pmatrix}$.

(b) **Write down** the inverse of $\begin{pmatrix} 1 & -2 \\ -1 & 4 \end{pmatrix}$.

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

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

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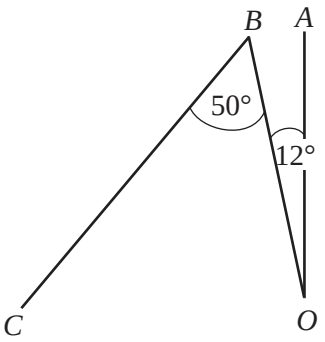
4 *A* is due North of *O*.



(a) A ship sailed from *O* to *B*, where $A\hat{O}B = 12°$.
Write down the bearing of *B* from *O*.

(b) At *B*, the ship turned and sailed to *C*, where $O\hat{B}C = 50°$.
Calculate the bearing of *C* from *B*.

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

(b) ..... [1]

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5 **(a)** When Peter went to Hong Kong, he changed £50 into $616.
Calculate what one British pound (£) was worth in Hong Kong dollars ($).

(b) It takes 8 hours for 5 people to paint a room.
How long would it take 4 people?

Answer (a) £1 = $.....[1]

(b) .....h [1]

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6 **(a)** The population of a city is given as 280 000, correct to the nearest ten thousand.
State the greatest possible error in the given value.

(b) The dimensions of a rectangular card are 7 cm by 4 cm, correct to the nearest centimetre.
Calculate the smallest possible perimeter of the card.

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

(b) .....cm [1]

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7 The number of hours worked each day by Adam and Brenda is shown in the table.

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Adam	7	5	8	9	8	0
Brenda	0	8	9	9	7	5

The number of hours for which they are paid is calculated in the following way.
On each of days 1 to 5, every hour worked after the first 7 hours is counted as $1\frac{1}{2}$ hours.
On day 6, every hour worked is counted as 2 hours.

(a) Calculate the **total** number of hours for which Adam was paid.

(b) The rate of pay is \$14.50 per hour.
How much did Brenda earn on day 6?

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

(b) \$..... [1]

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8 $f(x) = \frac{2x - 1}{3}$.

Find an expression for $f^{-1}(x)$.

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

9 Solve the simultaneous equations

$$3x + y = 95,$$
$$x + y = 29.$$

Answer $x =$ .....

$y =$ .....[2]

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10 Green Line buses run every 10 minutes.
Red Line buses run every 20 minutes.
Purple Line buses run every 35 minutes.
One bus from each Line leaves the city centre at 09 00.
After how many minutes will buses from all three Lines next leave the city centre at the same time?

Answer ..... [2]

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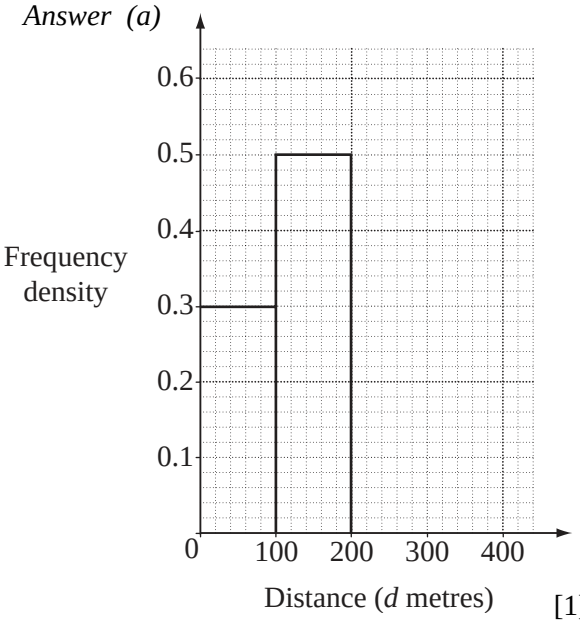
11 One hundred children were asked how far they could swim.
The results are summarised in the table.

Distance (d metres)	$0 < d \leqslant 100$	$100 < d \leqslant 200$	$200 < d \leqslant 400$
Number of children	30	50	20

(a) The histogram in the answer space represents part of this information.
Complete the histogram.

Answer (a)



[1]

(b) A pie chart is drawn to represent the three groups of children.
Calculate the angle of the sector that represents the group of 20 children.

Answer (b) ..... [1]

12 **(a)** A TV programme list shows that a film begins at 21 55.
The film lasts for 100 minutes.
At what time will it end?
Express your answer using the 24 hour clock.

(b) The times taken by an athlete to run three races were 3 minutes 59.1 seconds, 4 minutes 3.8 seconds and 4 minutes 1.6 seconds.
Calculate the mean time.

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

(b) ..... minutes ..... seconds [2]

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13 **(a)** P is the point (–3, 3) and Q is the point (13, –2).
Find the coordinates of the midpoint of PQ.

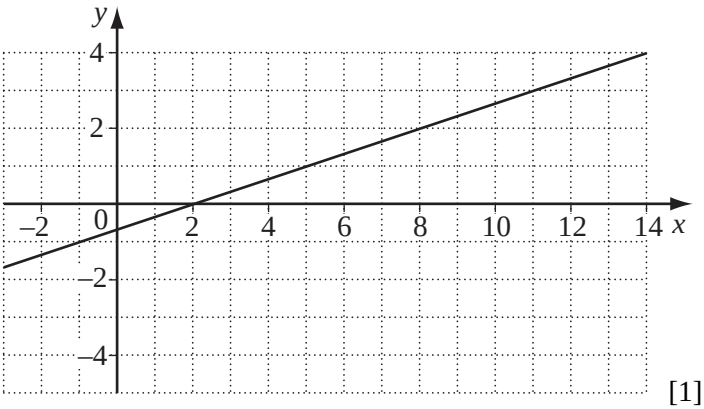
Answer (a) (..... , ...) [1]

(b) The line $x - 3y = 2$ is shown on the diagram in the answer space.
The line $x - 3y = k$ cuts the y-axis at the point (0, –4).

(i) Draw the line $x - 3y = k$ on the diagram.

(ii) Calculate the value of k.

Answer (b)(i)



[1]

(ii) k = ... [1]

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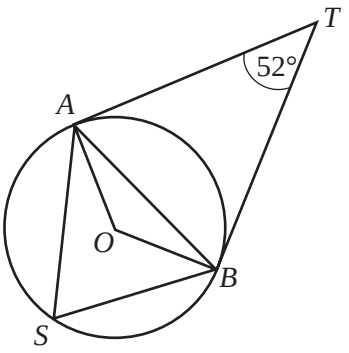
14 *A*, *B* and *S* are points on a circle, centre *O*.
TA and *TB* are tangents.
$A\hat{T}B = 52°$.



Calculate

(a) $A\hat{O}B$,

(b) $O\hat{B}A$,

(c) $A\hat{S}B$.

Answer *(a)* $A\hat{O}B$ = ... [1]

(b) $O\hat{B}A$ = ... [1]

(c) $A\hat{S}B$ = ... [1]

---

15 It is given that $N = 87 \times 132$.

(a) Complete the statements in the answer space.

Answer *(a)* $88 \times 132 = N +$ ..... [1]

$87 \times 131 = N -$ ..... [1]

(b) Hence evaluate $88 \times 132 - 87 \times 131$.

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

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16 **(a)** The number 222.222 is written in the answer space.
Circle the digit which represents the value 2×10^0.

(b) Write 5×10^{-2} as a fraction in its simplest form.

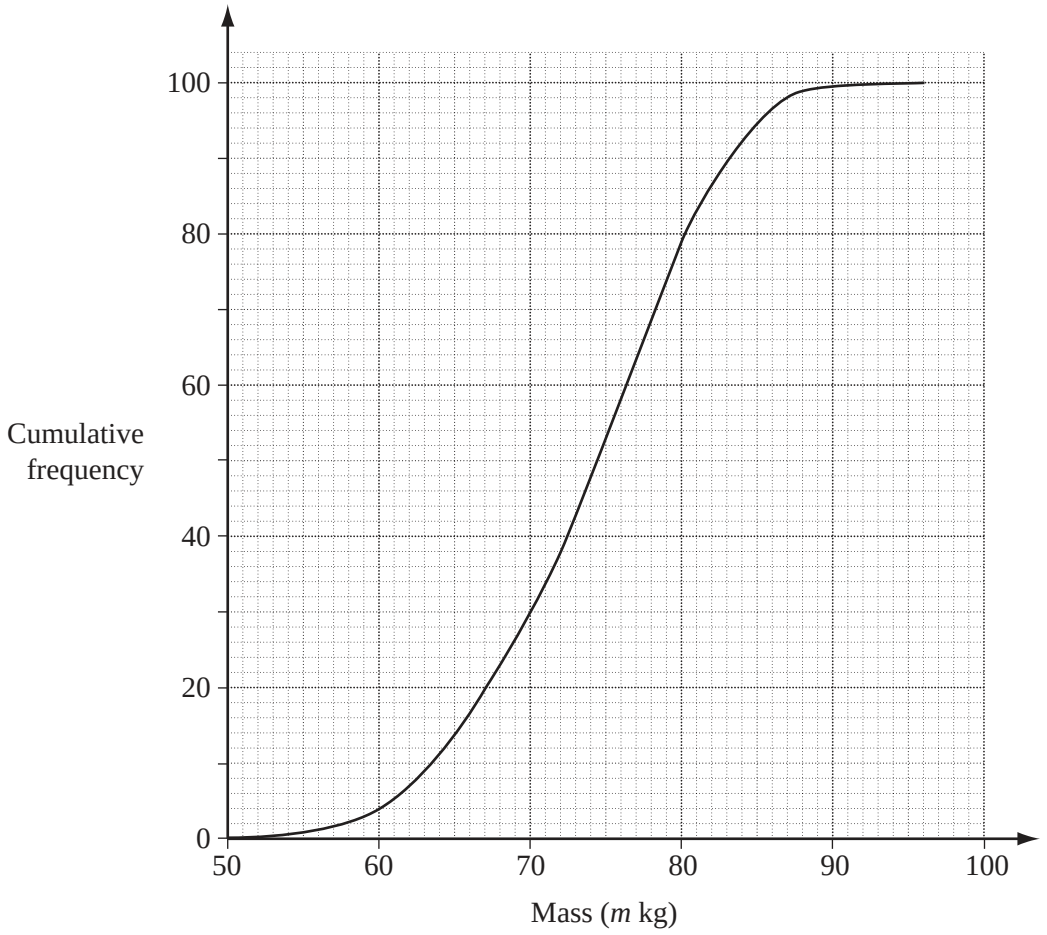
(c) Evaluate $8^{\frac{2}{3}}$.

Answer *(a)* 222.222 [1]

(b) .....[1]

(c) ..... [1]

17 The cumulative frequency curve shows the distribution of the masses of 100 people.



Find

(a) the median,

(b) the upper quartile,

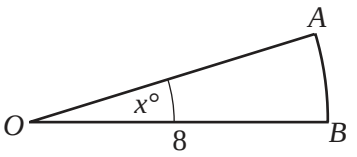
(c) the number of people with masses in the range $65 < m \leqslant 72$.

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

(b) .....kg [1]

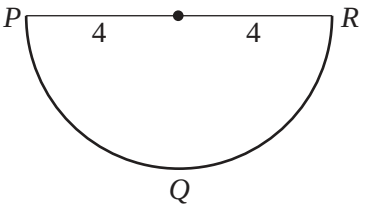
(c) ..... [1]

18 OAB is a sector of a circle with centre O and radius 8 cm.
$A\hat{O}B = x°$.



(a) Write down an expression, in terms of x and π, for the area of the sector OAB.

(b) PQR is a semicircle of radius 4 cm.
The area of the sector OAB is $\frac{1}{3}$ of the area of this semicircle.
Calculate the value of x.



Answer (a) .....cm^2 [1]

(b) x = ... [2]

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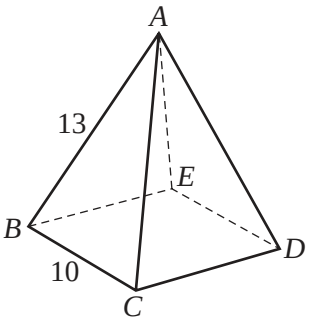
19 $ABCDE$ is a pyramid.
The base $BCDE$ is a square of side 10 cm.
The sloping faces are isosceles triangles.
$AB = AC = AD = AE = 13$ cm.

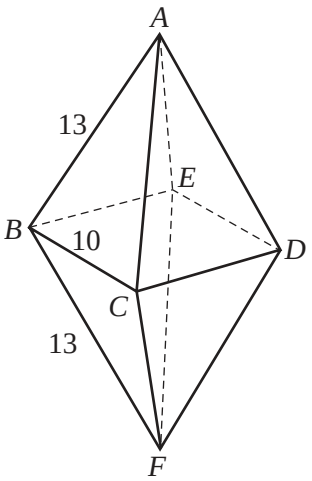


(a) Calculate the area of the sloping face ABC.

(b) The pyramid $ABCDE$ is joined to an identical pyramid $BCDEF$ to form the solid $ABCDEF$.

(i) Calculate the surface area of the solid $ABCDEF$.

(ii) Describe fully the locus of all points which are equidistant from A and F.



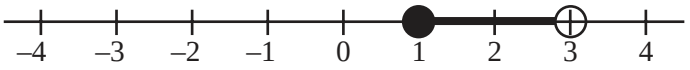
Answer (a) .....cm^2 [2]

(b)(i) .....cm^2 [1]

(ii) .....

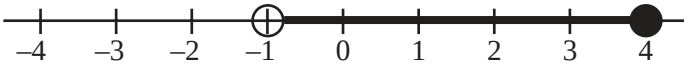
..... [1]

20 **(a)**



The set $A = \{x : 1 \leqslant x < 3\}$ is shown on the number line above.

(i) Set B is shown on the number line below.

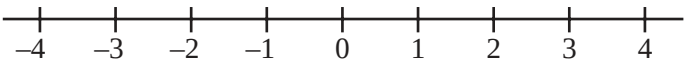


Complete the description in the answer space.

Answer (a)(i) $B = \{x :$ ..... x .....} [1]

(ii) The set $C = \{x : x \leqslant -3\}$.
Illustrate the set C' using the number line in the answer space.

Answer (a)(ii)

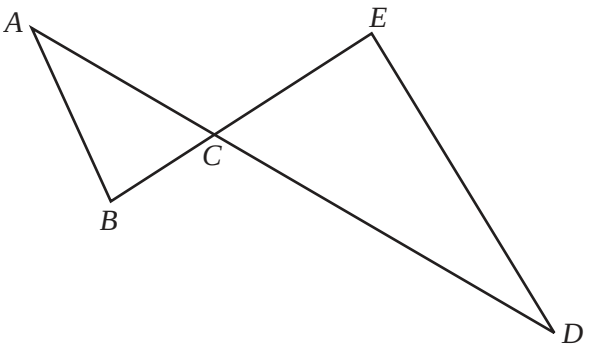


[1]

(b) $X = \{1, 3, 5\}$, $Y = \{3, 5\}$, $Z = \{(x, y) : x \in X, y \in Y, x \neq y\}$.
List the members of Z.

Answer (b) $Z = \{$ .....} [2]

21



In the diagram, ACD and BCE are straight lines.

$\frac{CB}{CE} = \frac{CA}{CD} = \frac{1}{2}$.

(a) Describe fully the **single** transformation that maps ΔCAB onto ΔCDE.

(b) It is given that $\overrightarrow{ED} = \begin{pmatrix} 6 \\ -8 \end{pmatrix}$ and $\overrightarrow{BC} = \begin{pmatrix} 3 \\ 1 \end{pmatrix}$.
Calculate $\overrightarrow{AE}$.

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

(b) $\overrightarrow{AE} = \begin{pmatrix} \\ \end{pmatrix}$ [2]

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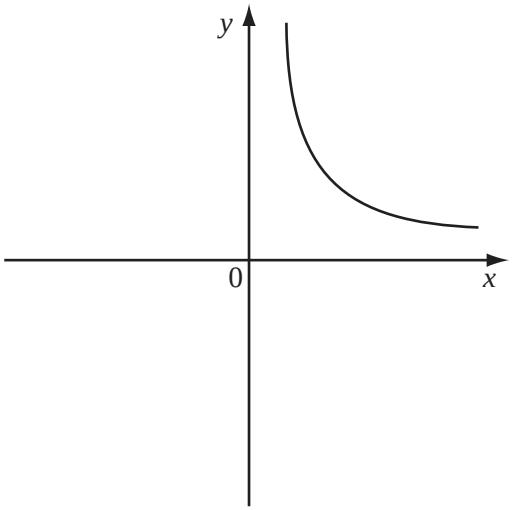
22 **(a)** The diagram in the answer space is a sketch of the graph of $y = \frac{3}{x}$ for $x > 0$. Complete the sketch for $x < 0$.

(b) Sketch the graph of $y = x$ on the diagram in the answer space.

(c) The graphs of $y = \frac{3}{x}$ and $y = x$ meet at $x = k$.
Find the values of k.

Answer (a) (b)



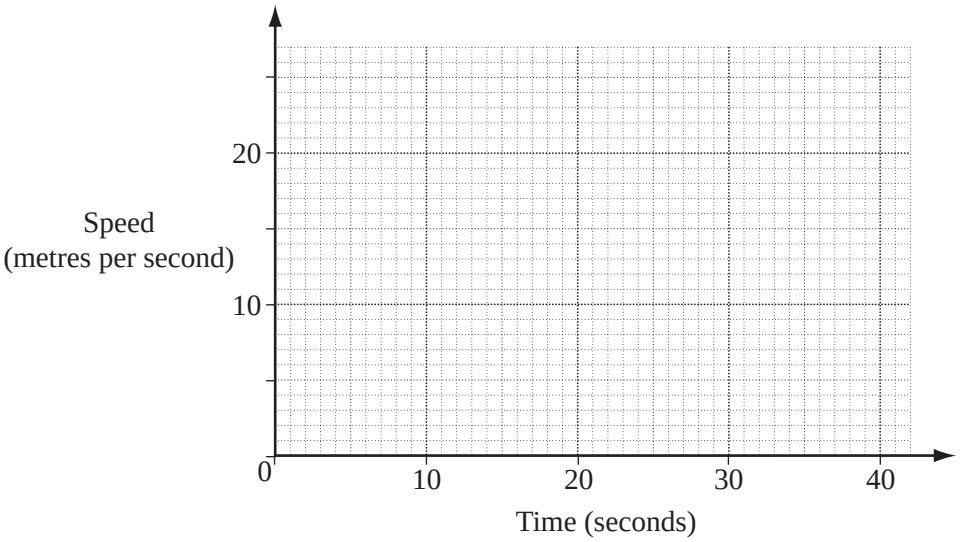
[2]

(c) ..... [2]

23 A car accelerates uniformly from rest for 30 seconds.
Its speed after 30 seconds is 18 m/s.
The speed remains constant for the next 10 seconds.

(a) Draw the speed-time graph for the first 40 seconds of the journey.

Answer (a)



[1]

(b) Calculate

(i) the car's acceleration during the first 30 seconds,

(ii) its average speed for the first 40 seconds.

Answer (b)(i) .....m/s^2 [1]

(ii) .....m/s [2]

24 In triangle PLQ, $PL = 14$ cm, $PQ = 10$ cm and $LQ = 7$ cm.
The line PL is drawn in the answer space.

(a) Using ruler and compasses only, complete triangle PLQ where Q is above PL.

(b) Measure and write down $P\hat{Q}L$.

(c) Draw a semicircle with PL as diameter.
The line LQ produced meets the semicircle at M.
Measure and write down the length of QM.

(d) **(i)** Explain why PM is perpendicular to LM.

(ii) Hence write down the value of cos $P\hat{Q}L$.

Answer (a)

P L [1]

Answer (b) $P\hat{Q}L =$ ..... [1]

(c) $QM =$ .....cm [1]

(d)(i) ..... [1]

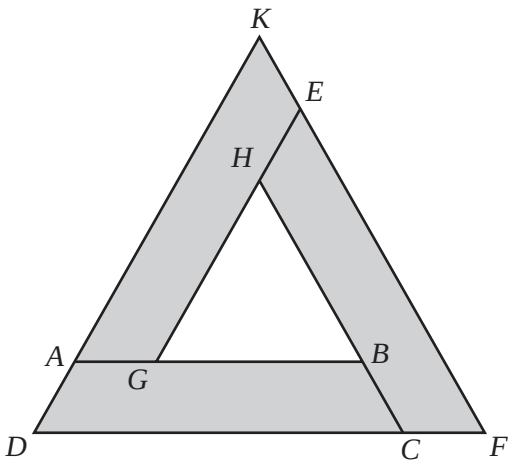
(ii) cos $P\hat{Q}L =$ ..... [1]

25 The trapezium $PQRS$ has one line of symmetry. $S\hat{P}Q = 120°$.

(a) Explain why $P\hat{S}R = 60°$.

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

(b) Three trapezia, each congruent to $PQRS$, are placed together as shown.



Show that KDF is an equilateral triangle.

Answer (b) .....

..... [1]

(c) Given also that $BC = 1$ m, $AB = 4$ m and $DC = 5$ m, find

(i) the length of GB,

(ii) the ratio Area ΔKDF : Area ΔHGB,

(iii) the shaded area as a fraction of the area of ΔKDF.

Answer (c)(i) .....m [1]

(ii) ..... : ..... [2]

(iii) ..... [1]

26 **(a)** Factorise $3tx - 2sx + 15ty - 10sy$.

(b) Solve the equation $\frac{x-2}{4} + \frac{x+1}{3} = 1$.

(c) Factorise $2y^2 - 3y - 2$.

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

(b) $x =$ ..... [2]

(c) ..... [2]