UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

MATHEMATICS **0581/43**

Paper 4 (Extended) **May/June 2013**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
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 below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

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 130.

This document consists of **19** printed pages and **1** blank page.

1 **(a)** Ali and Ben receive a sum of money.
They share it in the ratio 5 : 1.
Ali receives $2345.

Calculate the total amount.

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

(b) Ali uses 11% of his $2345 to buy a television.

Calculate the cost of the television.

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

(c) A different television costs $330.

(i) Ben buys one in a sale when this cost is reduced by 15%.

How much does Ben pay?

Answer(c)(i) $ ..... [2]

(ii) $330 is 12% less than the cost last year.

Calculate the cost last year.

Answer(c)(ii) $ ..... [3]

(d) Ali invests $1500 of his share in a bank account.
The account pays compound interest at a rate of 2.3% per year.

Calculate the total amount in the account at the end of 3 years.

Answer(d) $ ..... [3]

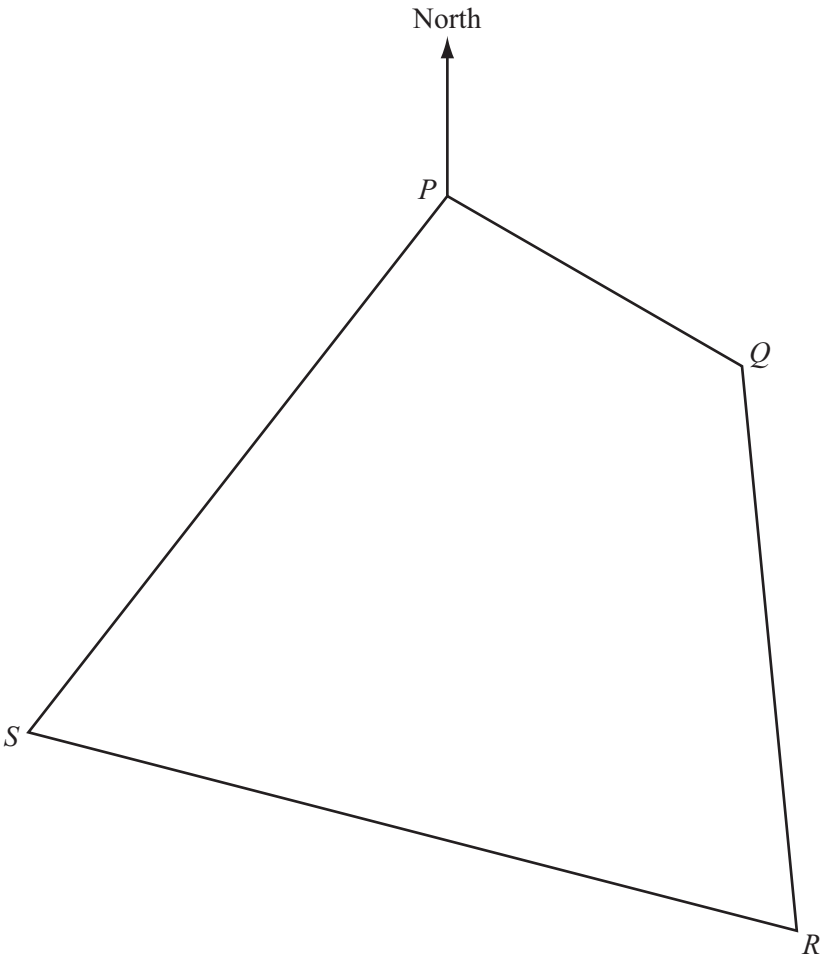
(e) Ali also buys a computer for $325.
He later sells this computer for $250.

Calculate Ali's percentage loss.

Answer(e) ..... % [3]

2 (a) **In this question show all your construction arcs and use only a ruler and compasses the boundaries of your region.**

This scale drawing shows the positions of four towns, P, Q, R and S, on a map where 1 cm represents 10 km.



Scale: 1 cm to 10 km

A nature reserve lies in the quadrilateral $PQRS$.
The boundaries of the nature reserve are:

- equidistant from Q and from R
- equidistant from PS and from PQ
- 60 km from R
- along QR.

(i) Shade the region which represents the nature reserve. [7]

(ii) Measure the bearing of S from P.

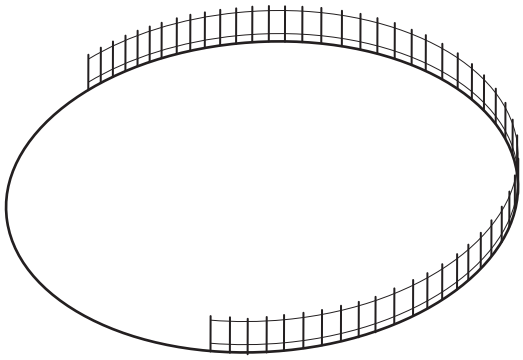
Answer(a)(ii) ..... [1]

(b) A circular lake in the nature reserve has a radius of 45 m.

(i) Calculate the area of the lake.

Answer(b)(i) ..... m^2 [2]

(ii)



NOT TO SCALE

A fence is placed along part of the circumference of the lake.
This arc subtends an angle of 210° at the centre of the circle.

Calculate the length of the fence.

Answer(b)(ii) ..... m [2]

3 **(a)** Luk wants to buy x goats and y sheep.

(i) He wants to buy at least 5 goats.

Write down an inequality in x to represent this condition.

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

(ii) He wants to buy at least 11 sheep.

Write down an inequality in y to represent this condition.

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

(iii) He wants to buy at least 20 animals.

Write down an inequality in x and y to represent this condition.

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

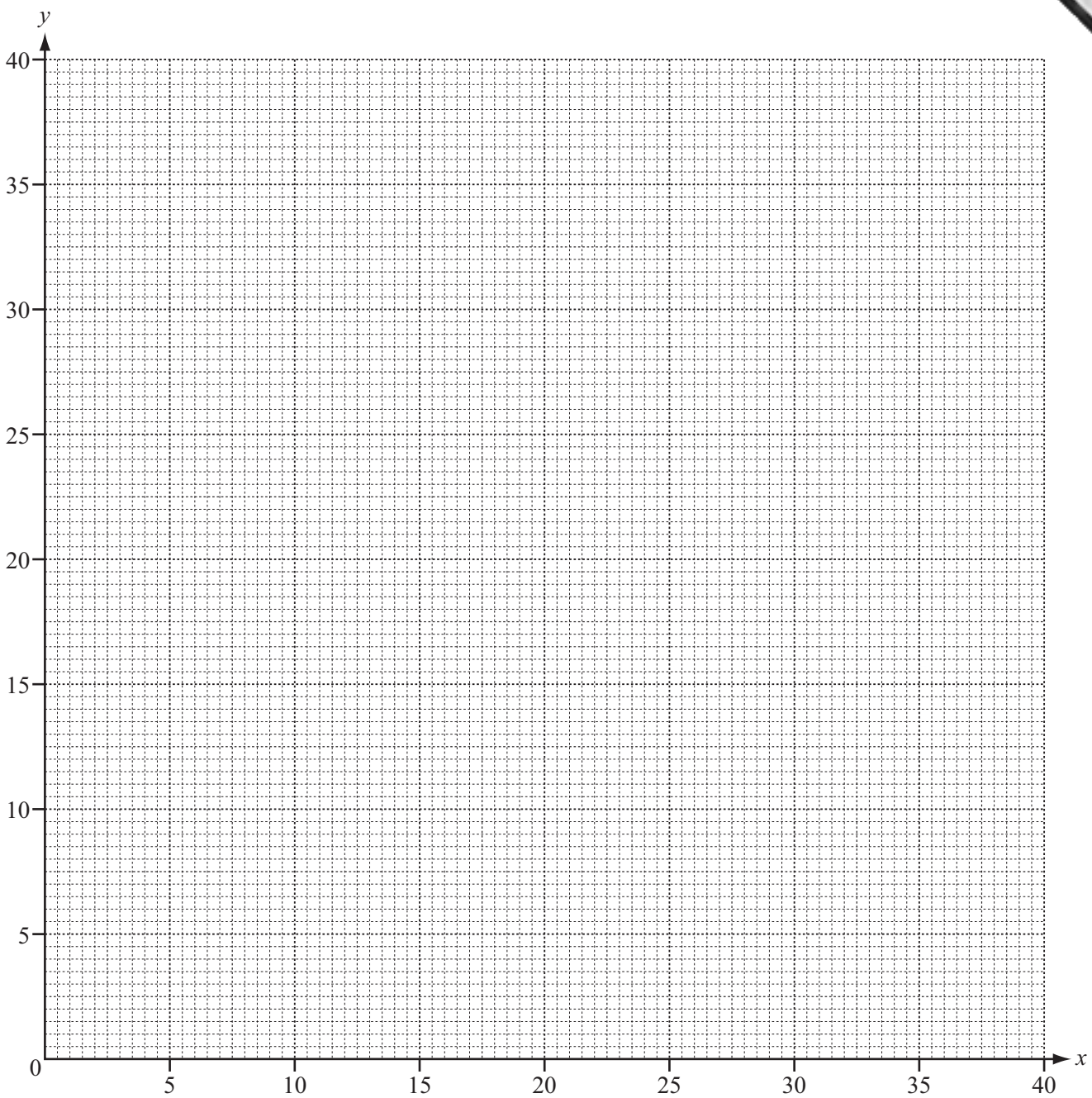
(b) Goats cost \$4 and sheep cost \$8.
The maximum Luk can spend is \$160.

Write down an inequality in x and y and show that it simplifies to $x + 2y \leqslant 40$.

Answer(b)

[1]

(c) **(i)** On the grid below, draw four lines to show the four inequalities and shade the **unwanted** regions.

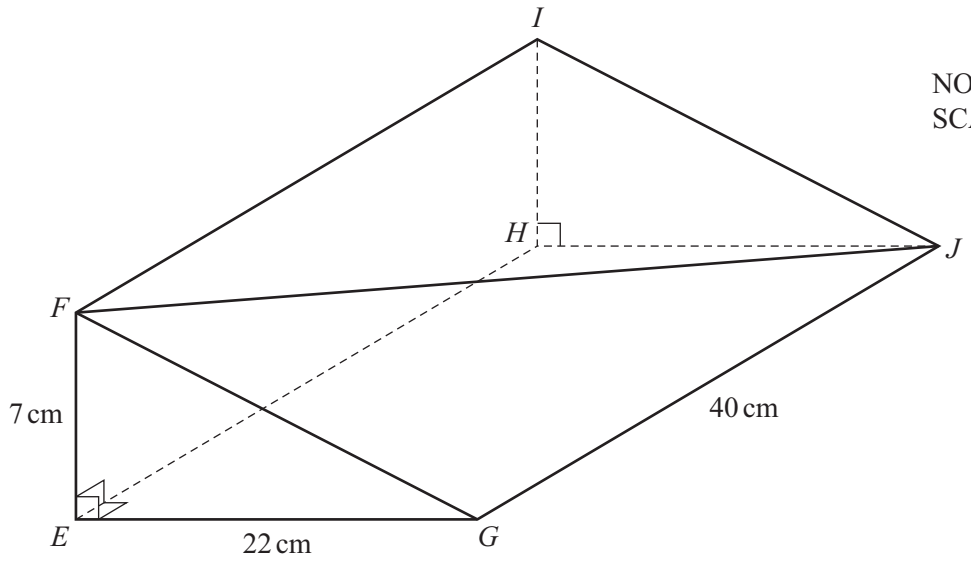


[7]

(ii) Work out the maximum number of animals that Luk can buy.

Answer(c)(ii) ..... [2]

4



NOT TO SCALE

EFGHIJ is a solid metal prism of length 40 cm.
The cross section *EFG* is a right-angled triangle.
EF = 7 cm and *EG* = 22 cm.

(a) Calculate the volume of the prism.

Answer(a) ..... cm^3 [2]

(b) Calculate the length *FJ*.

Answer(b) FJ = ... cm [4]

(c) Calculate the angle between FJ and the base $EGJH$ of the prism.

Answer(c) ..... [3]

(d) The prism is melted and made into spheres.
Each sphere has a radius 1.5 cm.

Work out the greatest number of spheres that can be made.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

Answer(d) ..... [3]

(e) **(i)** A right-angled triangle is the cross section of another prism.
This triangle has height 4.5 cm and base 11.0 cm.
Both measurements are correct to 1 decimal place.

Calculate the upper bound for the area of this triangle.

Answer(e)(i) ..... cm^2 [2]

(ii) Write your answer to **part (e)(i)** correct to 4 significant figures.

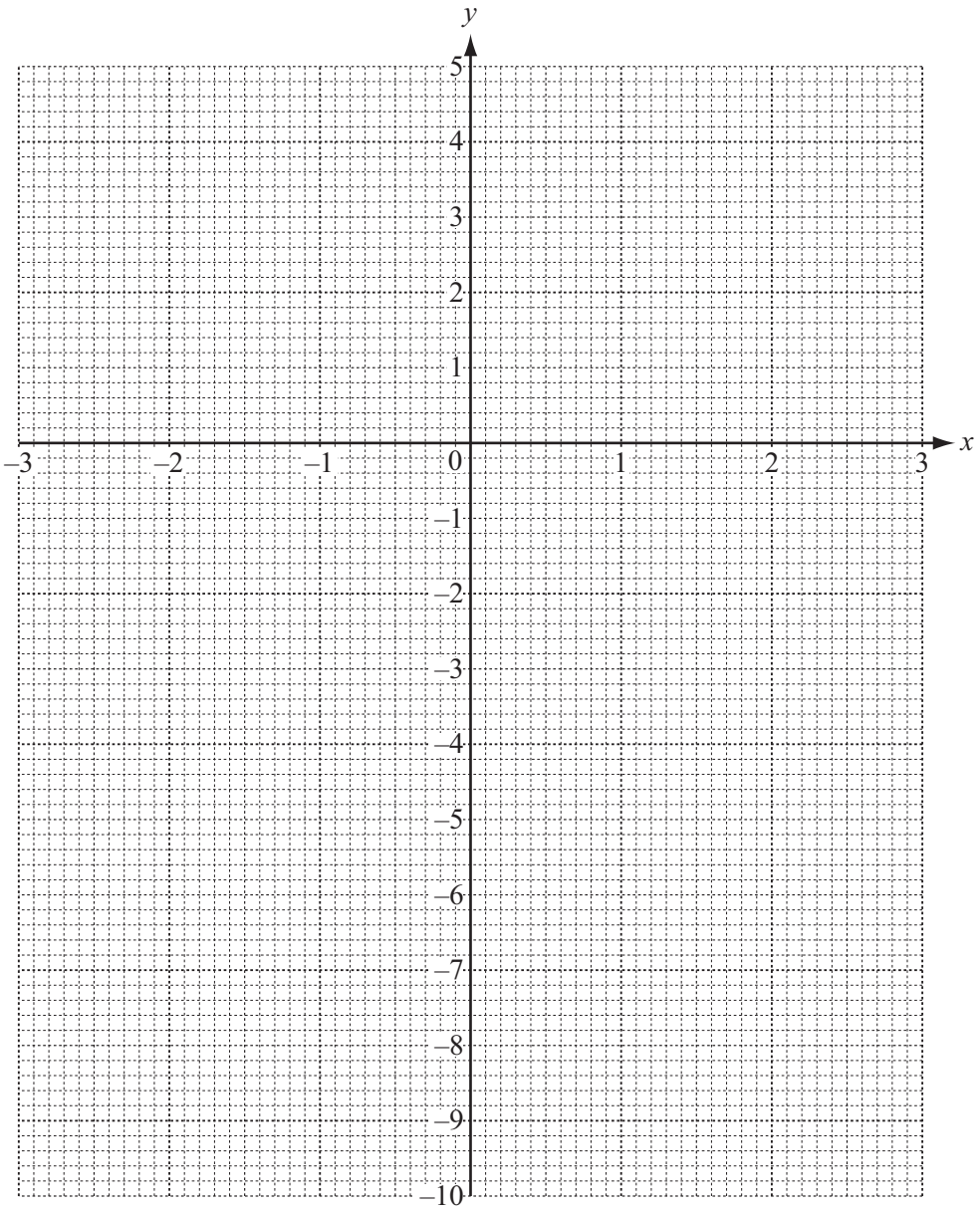
Answer(e)(ii) ..... cm^2 [1]

5 **(a)** Complete this table of values for the function $f(x) = \frac{1}{x} - x^2,\ x \neq 0$.

x	–3	–2	–1	–0.5	–0.2		0.2	0.5	1	2	3
$f(x)$	–9.33	–4.5	–2	–2.25			4.96			–3.5	–8.67

[3]

(b) Draw the graph of $f(x) = \frac{1}{x} - x^2$ for $-3 \leqslant x \leqslant -0.2$ and $0.2 \leqslant x \leqslant 3$.



[5]

(c) Use your graph to solve $f(x) = -3$.

Answer(c) $x =$ ..... or $x =$ ..... or $x =$ ..... [3]

(d) By drawing a suitable line on your graph, solve the equation $f(x) = 2x - 2$.

Answer(d) $x =$ ..... or $x =$ ..... or $x =$ ..... [3]

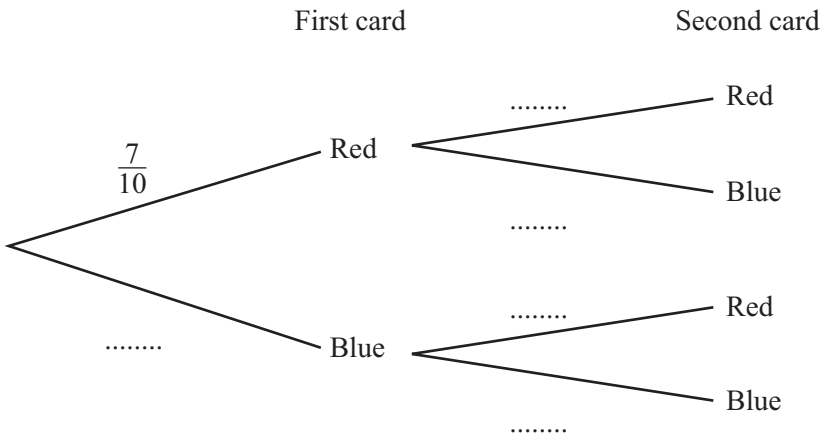
(e) By drawing a suitable tangent, work out an estimate of the gradient of the curve at the point where $x = -2$.

You must show your working.

Answer(e) ..... [3]

6 In a box there are 7 red cards and 3 blue cards.
A card is drawn at random from the box and is not replaced.
A second card is then drawn at random from the box.

(a) Complete this tree diagram.

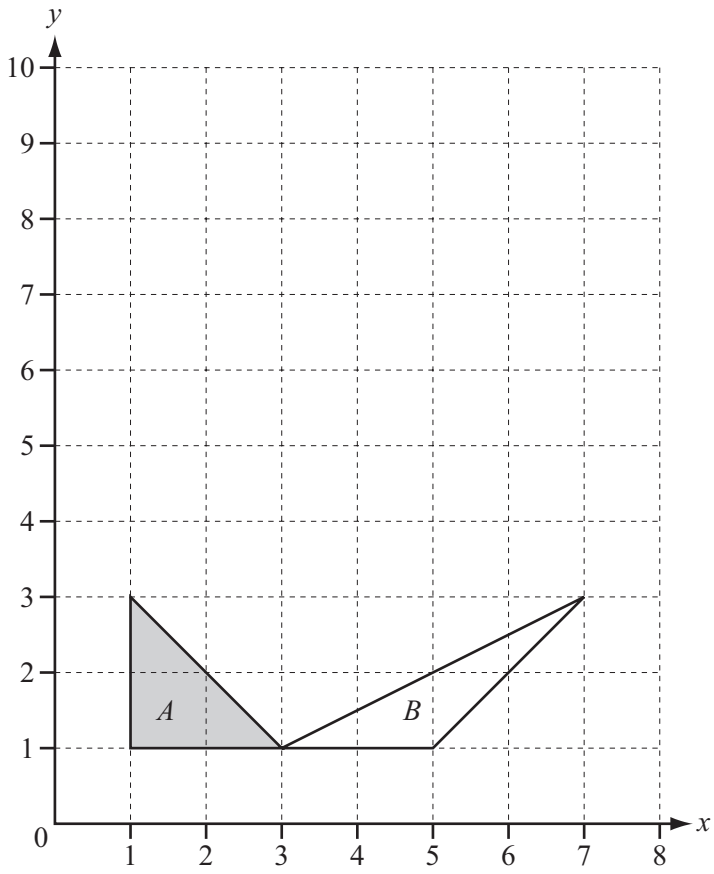


[3]

(b) Work out the probability that the two cards are of different colours.
Give your answer as a fraction.

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

7



(a) (i) Draw the image of shape *A* after a stretch, factor 3, *x*-axis invariant. [2]

(ii) Write down the matrix representing a stretch, factor 3, *x*-axis invariant.

Answer(a)(ii) ( ) [2]

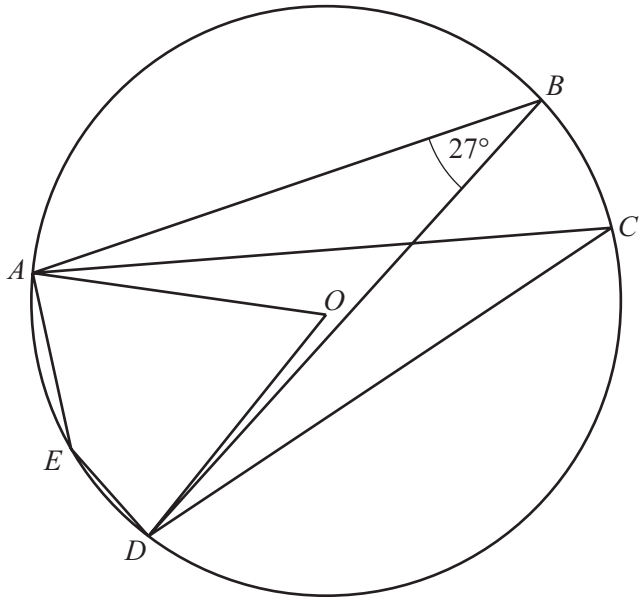
(b) (i) Describe fully the **single** transformation which maps shape *A* onto shape *B*.

Answer(b)(i) ..... [3]

(ii) Write down the matrix representing the transformation which maps shape *A* onto shape *B*.

Answer(b)(ii) ( ) [2]

8 **(a)**



NOT TO SCALE

A, B, C, D and E are points on the circle centre O.
Angle $ABD = 27°$.

Find

(i) angle ACD,

Answer(a)(i) Angle ACD = ... [1]

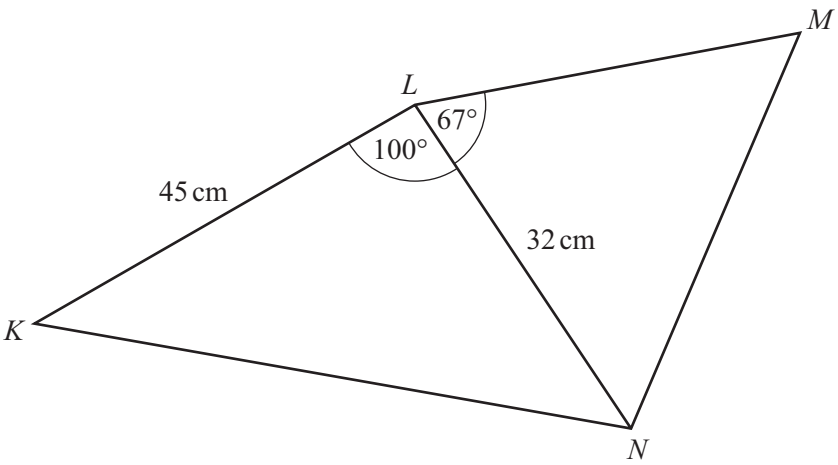
(ii) angle AOD,

Answer(a)(ii) Angle AOD = ... [1]

(iii) angle AED.

Answer(a)(iii) Angle AED = ... [1]

(b)



NOT TO SCALE

The diagram shows quadrilateral $KLMN$.
$KL = 45$ cm, $LN = 32$ cm, angle $KLN = 100°$ and angle $NLM = 67°$.

(i) Calculate the length *KN*.

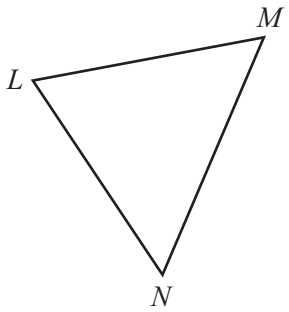
Answer(b)(i) *KN* = ... cm [4]

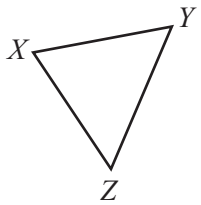
(ii) The area of triangle *LMN* is 324 cm^2.

Calculate the length *LM*.

Answer(b)(ii) *LM* = ... cm [3]

(iii) Another triangle *XYZ* is mathematically similar to triangle *LMN*.





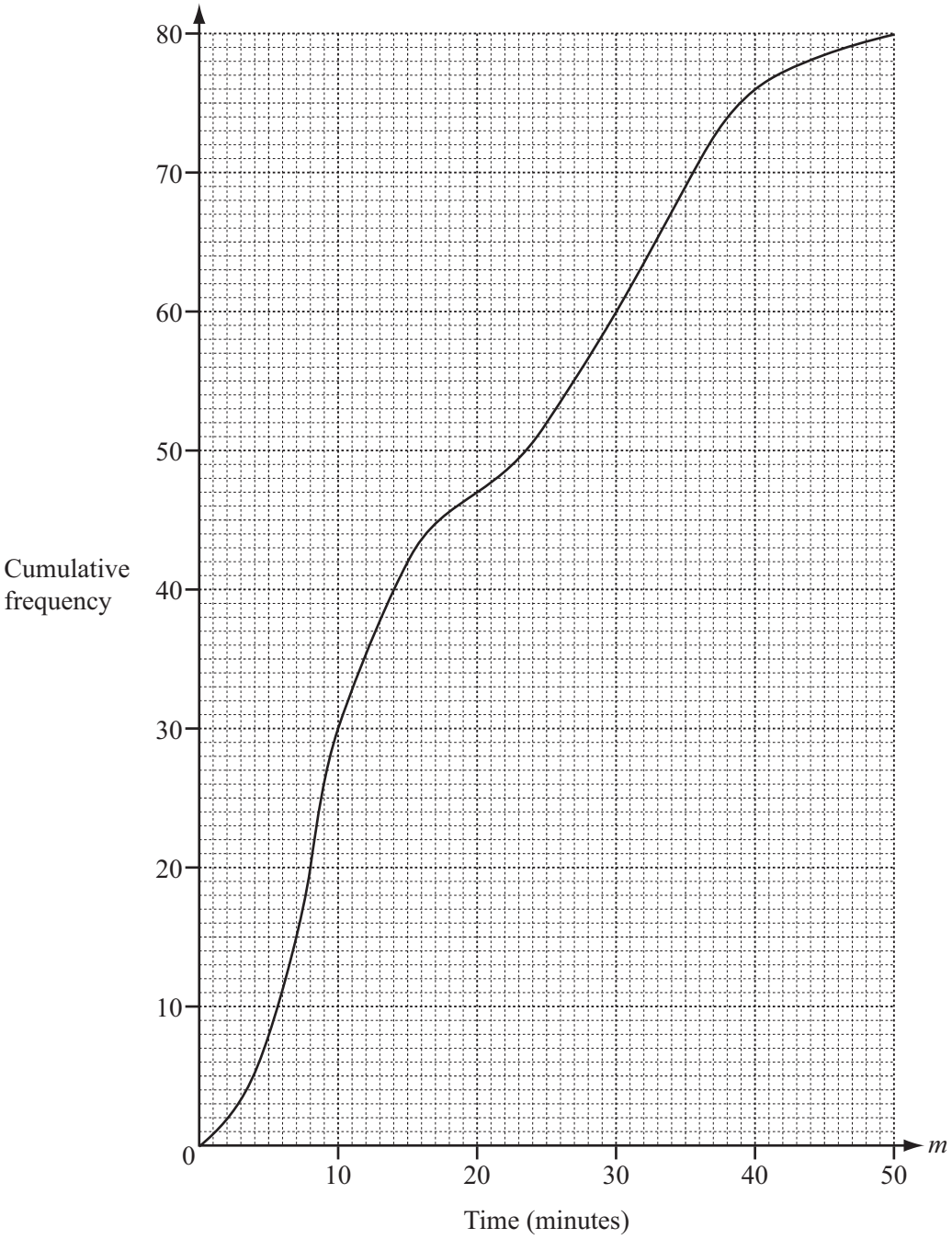
NOT TO SCALE

XZ = 16 cm and the area of triangle *LMN* is 324 cm^2.

Calculate the area of triangle *XYZ*.

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

9 Sam asked 80 people how many minutes their journey to work took on one day.
The cumulative frequency diagram shows the times taken (m minutes).



(a) Find

(i) the median,

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

(ii) the lower quartile,

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

(iii) the inter-quartile range.

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

(b) One of the 80 people is chosen at random.

Find the probability that their journey to work took more than 35 minutes.
Give your answer as a fraction.

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

(c) Use the cumulative frequency diagram to complete this frequency table.

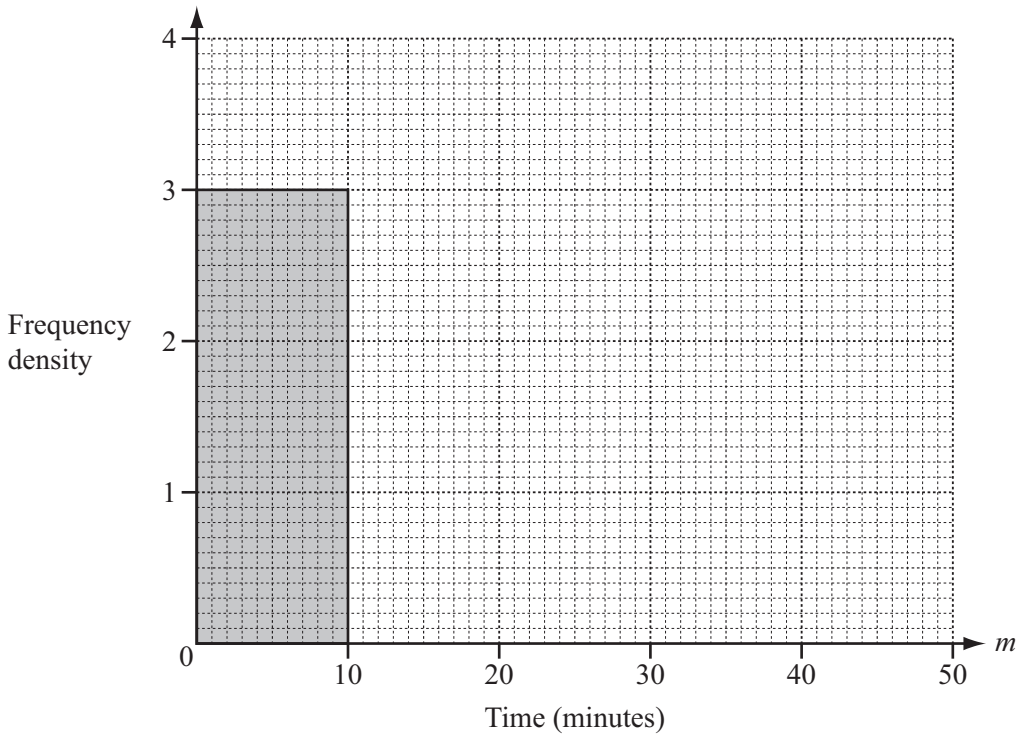
Time (m minutes)	$0 < m \leqslant 10$	$10 < m \leqslant 15$	$15 < m \leqslant 30$	$30 < m \leqslant 40$	$40 < m \leqslant 50$
Frequency	30	12	18		

[2]

(d) Using mid-interval values, calculate an estimate of the mean journey time for the 80 people.

Answer(d) ..... min [3]

(e) Use the table in **part (c)** to complete the histogram to show the times taken by the 80 people.
One column has already been completed for you.



[5]

10 (a) (i) Solve $2(3x - 7) = 13$.

Answer(a)(i) $x =$ ..... [3]

(ii) Solve by factorising $x^2 - 7x + 6 = 0$.

Answer(a)(ii) $x =$ ..... or $x =$ ..... [3]

(iii) Solve $\frac{3x - 2}{5} + \frac{x + 2}{10} = 4$.

Answer(a)(iii) $x =$ ..... [4]

(b) $1^2 = 1$

$1^2 + 2^2 = 5$

$1^2 + 2^2 + 3^2 = 14$

$1^2 + 2^2 + 3^2 + 4^2 = 30$

$1^2 + 2^2 + 3^2 + 4^2 + \ldots\ldots\ldots\ldots + n^2 = an^3 + bn^2 + \frac{n}{6}$

Work out the values of a and b.

Answer(b) $a =$ .....

$b =$ ..... [6]

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