Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

3434783675

MATHEMATICS **0580/47**

Paper 4 (Extended) **May/June 2014**

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 an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, 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.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

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

1 Ahmed and Ali went on a fishing trip.
They left home at 0645 and took 1 hour 50 minutes to travel the 88 km to their destination.

(a) (i) Write down the time they arrived at their destination.

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

(ii) Calculate the average speed of their journey.

Answer(a)(ii) ..... km/h [2]

(b) Ahmed caught 12 fish.
The numbers of fish caught by Ahmed and Ali are in the ratio Ahmed : Ali = 6 : 7.

Find the number of fish that Ali caught.

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

(c) (i) The total mass of the fish Ahmed and Ali caught is 35 kg.
The fish that Ahmed caught have a mass of 12.4 kg.

Calculate the mass of the fish Ahmed caught as a percentage of 35 kg.

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

(ii) The 12.4 kg is 20% less than the mass of fish Ahmed caught on a previous trip.

Calculate the mass of fish Ahmed caught on the previous trip.

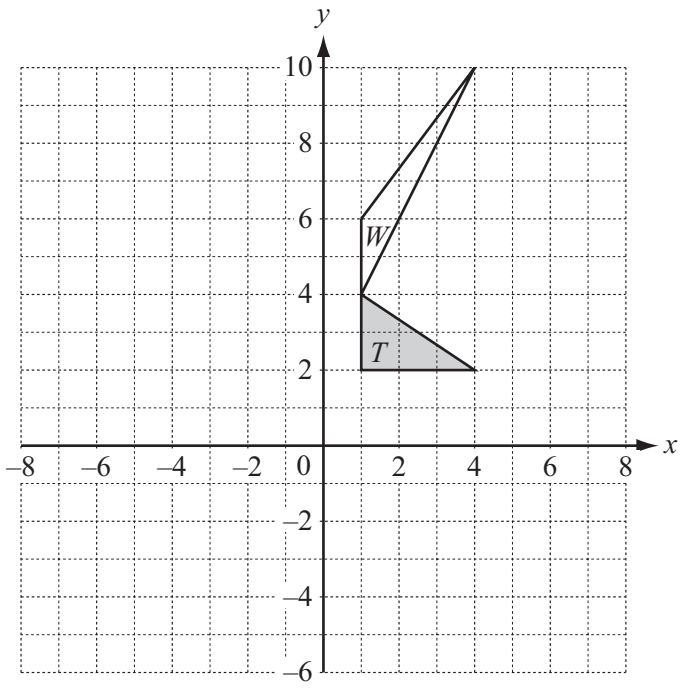
Answer(c)(ii) ..... kg [3]

(d) Ahmed and Ali left for home at 1540.
The average speed for their 88 km journey was 55 km/h.

Work out the time at which Ahmed and Ali arrived home.

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

2



(a) On the grid, draw the image of

(i) triangle T after a translation by $\begin{pmatrix} -8 \\ 2 \end{pmatrix}$, [2]

(ii) triangle T after a reflection in the line $y = -x$. [2]

(b) Describe fully the **single** transformation represented by the matrix $\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$.

Answer(b) .....

..... [3]

(c) **(i)** Describe fully the **single** transformation that maps triangle T onto triangle W.

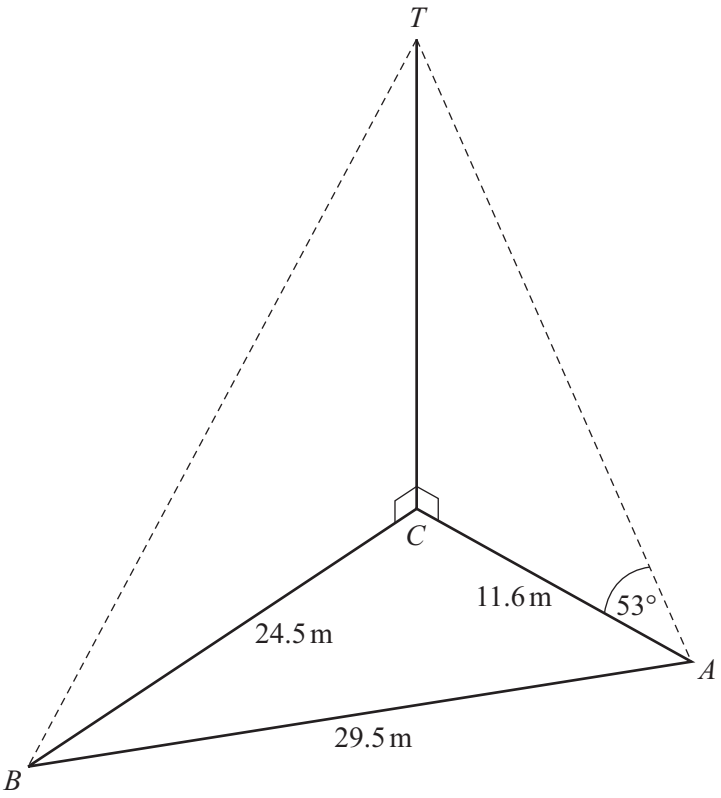
Answer(c)(i) .....

..... [3]

(ii) Find the 2×2 matrix which represents the transformation that maps triangle T onto triangle W.

Answer(c)(ii) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

3



NOT TO SCALE

The diagram shows a vertical flagpole TC.
A, B and C are on horizontal ground.
$AC = 11.6$ m, $BC = 24.5$ m and $AB = 29.5$ m.
The angle of elevation of T from A is 53°.

(a) Calculate the angle of elevation of T from B.

Answer(a) ..... [3]

(b) Calculate angle *ACB* and show that it rounds to 104°, correct to the nearest degree.

Answer(b)

[4]

(c) Calculate the area of triangle *ABC*.

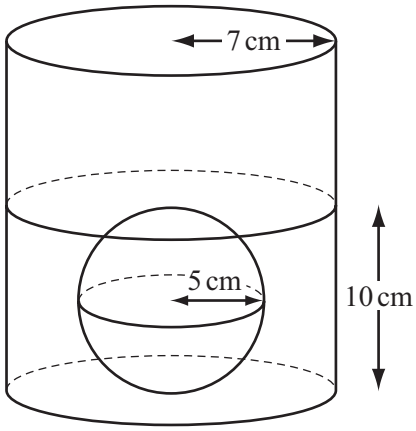
Answer(c) ..... m^2 [2]

(d) *D* is on *CB* so that angle *CDA* = 60°.

Calculate the length of *AD*.

Answer(d) AD = ... m [3]

4



NOT TO SCALE

A solid sphere of radius 5 cm is placed inside a cylinder of radius 7 cm.
A liquid is poured into the cylinder to a depth of 10 cm, as shown in the diagram.

(a) Calculate the volume of liquid in the cylinder and show that it rounds to 1016 cm^3, correct to the nearest cubic centimetre.
[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

Answer(a)

[3]

(b) The sphere is made of metal and 1 cm^3 of the metal has a mass of 7.85 g.
1 cm^3 of the liquid has a mass of 0.85 g.
The mass of the cylinder is 1.14 **kilograms**.

Calculate the total mass of the cylinder, the sphere and the liquid.
Give your answer in kilograms.

Answer(b) ..... kg [4]

(c) The sphere is removed from the cylinder.

Calculate the new depth of the liquid in the cylinder.

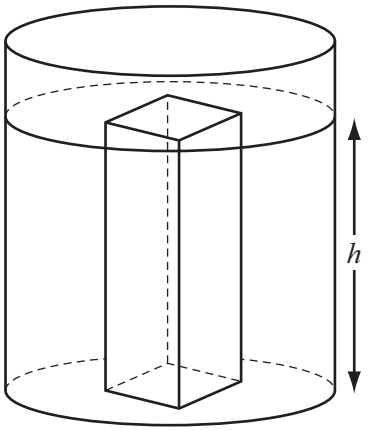
Answer(c) ..... cm [3]

(d) The sphere is melted down and all the metal is used to make a cuboid with a square base of side 6.5 cm.

(i) Calculate the height, h, of the cuboid.

Answer(d)(i) h = ... cm [2]

(ii)



NOT TO SCALE

The cuboid is placed inside the cylinder.
More liquid is poured into the cylinder until the liquid just reaches the top of the cuboid.

Calculate the volume of liquid that must be **added** to the liquid already in the cylinder.

Answer(d)(ii) ..... cm^3 [3]

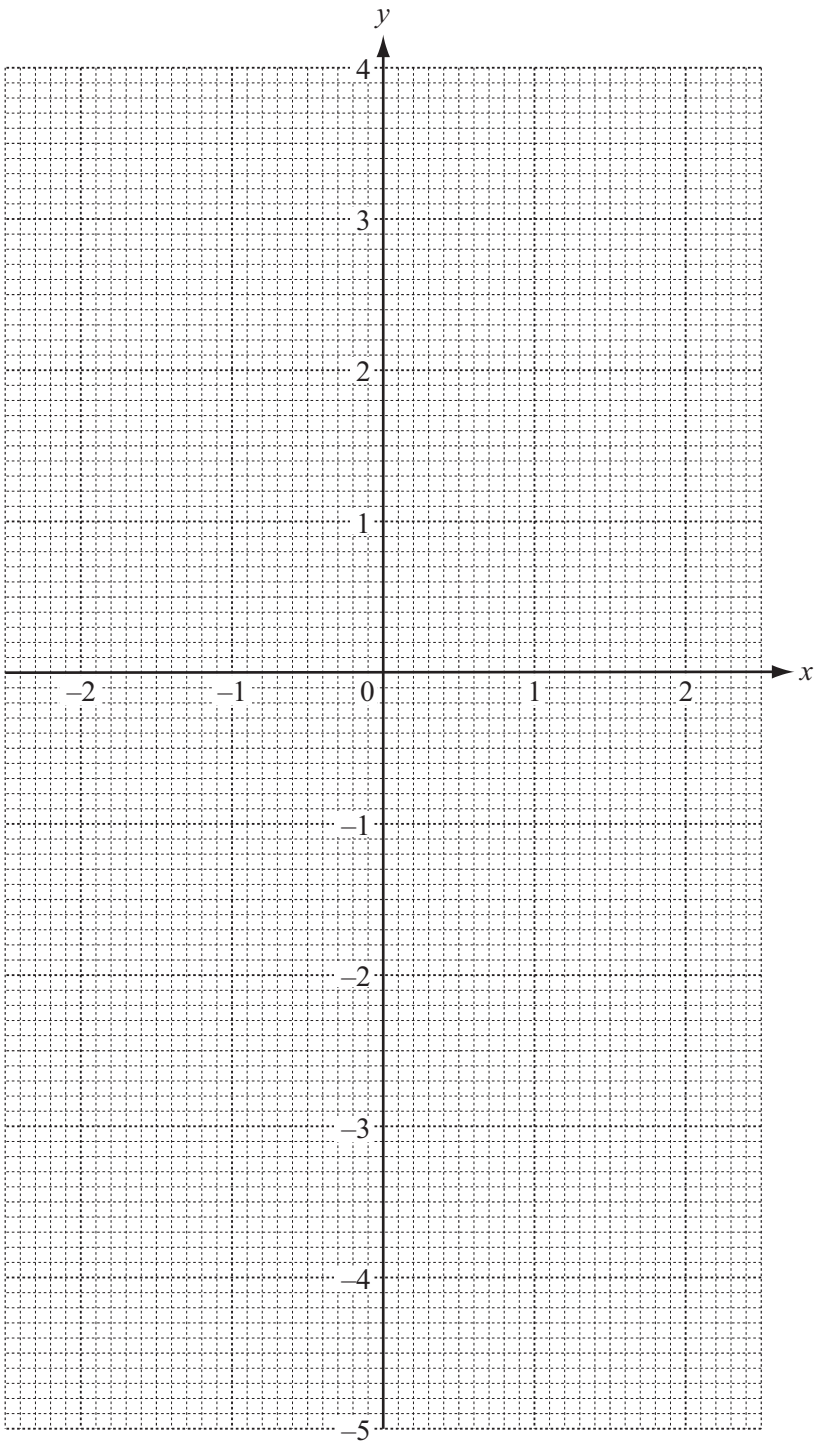
5 $y = \frac{1}{x} - x^2, \ x \neq 0.$

(a) Complete the table of values for y.

x	–2	–1.5	–1	–0.5	–0.3		0.3	0.5	1	1.5	2
y		–2.9		–2.3	–3.4		3.2	1.8	0	–1.6	

[3]

(b) On the grid, draw the graph of $y = \frac{1}{x} - x^2$ for $-2 \leq x \leq -0.3$ and $0.3 \leq x \leq 2$.



[5]

(c) (i) On the grid, draw the line $y = x - 1$. [1]

(ii) Complete the statement.

The line $y = x - 1$ is a ..... to the graph of $y = \frac{1}{x} - x^2$ at the point (..... , ...).

[2]

(d) (i) Complete the table of values for $y = 2x^2$.

x	–1	–0.5	0	0.5	1
y	2	0.5	0		

[1]

(ii) On the grid, draw the graph of $y = 2x^2$ for $-1 \leqslant x \leqslant 1$. [2]

(iii) Use your graphs to solve the equation $\frac{1}{x} - x^2 = 2x^2$.

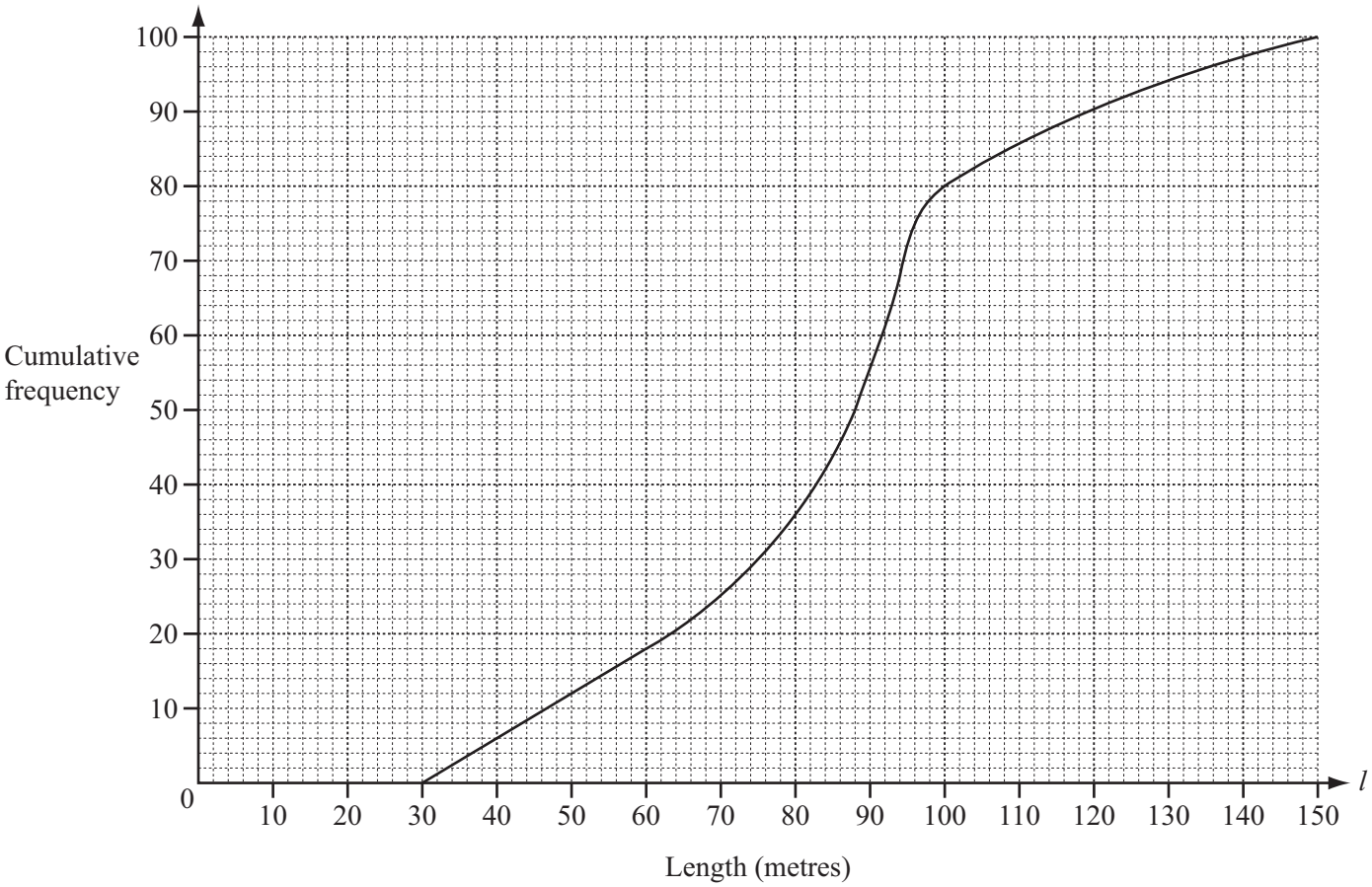
Answer(d)(iii) x = ... [1]

(iv) The equation $\frac{1}{x} - x^2 = 2x^2$ can be simplified to $kx^3 - 1 = 0$.

Find the value of k.

Answer(d)(iv) k = ... [2]

6 100 students estimate the length, l metres, of a sports field.
The cumulative frequency diagram shows the results.



(a) Find

(i) the median,

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

(ii) the inter-quartile range,

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

(iii) the number of students who give estimates of more than 80 m.

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

(b) (i) Use the cumulative frequency diagram to complete the frequency table.

Length (l metres)	$30 < l \leqslant 60$	$60 < l \leqslant 80$	$80 < l \leqslant 90$	$90 < l \leqslant 100$	$100 < l \leqslant 150$
Frequency	18		20		20

[2]

(ii) Calculate an estimate of the mean value of l.

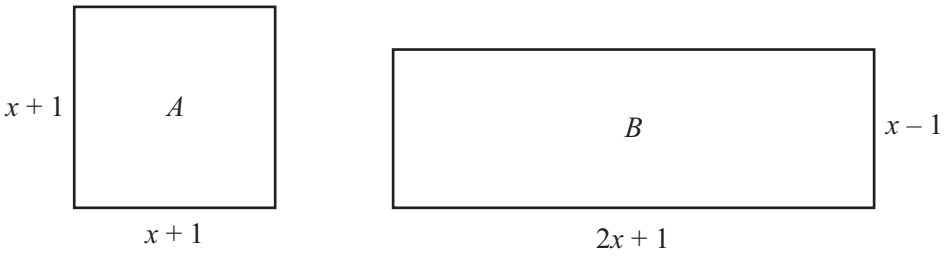
Answer(b)(ii) ..... m [4]

(iii) Use the frequency table in **part (b)(i)** to complete the frequency density table.

Length (l metres)	$30 < l \leqslant 80$	$80 < l \leqslant 100$	$100 < l \leqslant 150$
Frequency density			

[3]

7 **(a)** In the diagrams below, all the lengths are measured in centimetres.



NOT TO SCALE

The area of rectangle B is $8\,\text{cm}^2$ more than the area of square A.

(i) Show that $x^2 - 3x - 10 = 0$.

Answer(a)(i)

[3]

(ii) Factorise $x^2 - 3x - 10$.

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

(iii) Find the perimeter of square A.

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

(b) (i) Lia cycles 20 km at an average speed of x km/h.

Write down an expression, in terms of x, for the time it takes Lia to complete the journey.

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

(ii) Lia cycles another 20 km at an average speed of $(x + 1)$ km/h.
This journey takes $\frac{1}{4}$ hour less than the journey in **part (b)(i)**.

Show that $x^2 + x - 80 = 0$.

Answer(b)(ii)

[3]

(iii) Solve the equation $x^2 + x - 80 = 0$.
Show your working and give your answers correct to 2 decimal places.

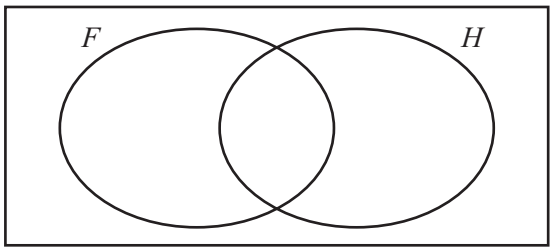
Answer(b)(iii) x = ... or x = ... [4]

(iv) Find the total time taken by Lia to complete both journeys.
Give your answer in hours and minutes correct to the nearest minute.

Answer(b)(iv) ..... h ..... min [2]

8 In a class of 24 students,

16 students play football (F),
12 students play hockey (H),
3 students do not play either football or hockey.



[In this question you may use the Venn diagram to help you.]

(a) Work out how many students play

(i) football or hockey,

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

(ii) football and hockey.

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

(b) Find $\mathrm{n}(F' \cap H)$.

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

(c) Two students from the class of 24 are chosen at random.

Find the probability that they both play football.
Give your answer as a fraction in its lowest terms.

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

(d) A student who plays hockey is chosen at random.

Find the probability that this student plays football.

Answer(d) ..... [1]

(e) A student who plays football or hockey is chosen at random.

Find the probability that this student plays football.

Answer(e) ..... [1]

9 **(a)** $\mathbf{p} = \begin{pmatrix} 2 \\ 3 \end{pmatrix}$ $\mathbf{q} = \begin{pmatrix} 5 \\ 12 \end{pmatrix}$

Find

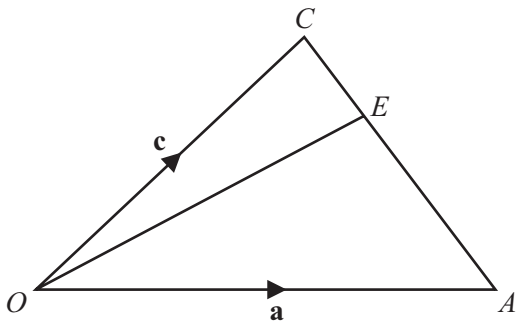
(i) $\mathbf{p} - 2\mathbf{q}$,

Answer(a)(i) $\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [2]

(ii) the value of k when $k\mathbf{p} + \mathbf{q} = \begin{pmatrix} 1 \\ 6 \end{pmatrix}$.

Answer(a)(ii) $k =$ ..... [2]

(b)



NOT TO SCALE

In triangle OAC, $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OC} = \mathbf{c}$.
E lies on AC so that $AE : EC = 2 : 1$.

Find the following, in terms of **a** and **c**, in their simplest form.

(i) $\overrightarrow{AC}$

Answer(b)(i) $\overrightarrow{AC} =$ ..... [1]

(ii) $\overrightarrow{AE}$

Answer(b)(ii) $\overrightarrow{AE} =$ ..... [1]

(iii) $\overrightarrow{OE}$

Answer(b)(iii) $\overrightarrow{OE} =$ ..... [2]

Question 10 is printed on the next page.

10 (a) (i) Complete the table for the 5th term and the nth term of each sequence.

Term	1	2	3	4	5		n
Sequence A	3	8	13	18			
Sequence B	1	3	9	27			

[6]

(ii) Find which term in sequence A is equal to 633.

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

(iii) Find the 9th term in sequence B.
Give your answer in standard form.

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

(b) The first four terms of a sequence are $-1, \quad 4, \quad 11, \quad 20$.

The nth term of this sequence is $n^2 + pn + q$.

(i) Find the values of p and q.

Answer(b)(i) p = ...

q = ... [4]

(ii) Find the value of the 100th term of this sequence.

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