UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER			

4733792282

MATHEMATICS **0581/31**

Paper 3 (Core) **October/November 2012**

2 hours

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Mathematical tables (optional)
Geometrical instruments
Tracing paper (optional)

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 104.

This document consists of **15** printed pages and **1** blank page.

For Examiner's Use

1 **(a)** **(i)** Write down two numbers that are multiples of 10.

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

(ii) Find the lowest common multiple of 10 and 15.

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

(b) 4 6 9 15 23 27 32 36

From the list above, write down

(i) a factor of 18,

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

(ii) a cube number,

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

(iii) a prime number.

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

(c) Give an example to show that each of these statements is **not** true.

(i) All square numbers are even.

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

(ii) When two prime numbers are added the answer is always even.

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

(d) Write the following in order of size, starting with the smallest.

2^5 8^0 4^{-2} $\sqrt{169}$

Answer(d) ..... < ..... < ..... < ..... [2]

For Examiner's Use

2 **(a)** Luka earns \$475 each week.

(i) He works for 38 hours each week.

How much does he earn for each hour he works?

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

(ii) Luka pays \$175 in rent each week.

Write the amount he pays in rent as a fraction of his weekly earnings.
Give your answer in its lowest terms.

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

(iii) He spends $\frac{7}{20}$ of his weekly earnings on bills.

How much money does he have left after paying rent and bills?

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

(b) Luka's weekly earnings of \$475 are increased by 6%.

Calculate his new weekly earnings.

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

(c) Luka has saved \$350.
He invests this for 2 years at a rate of 4% per year compound interest.

How much interest does he receive after 2 years?

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

For Examiner's Use

3 **(a)** Amir asked 15 friends how many hours they spent playing sport last weekend. His results are shown in the table below.

Number of hours	0	1	2	3	4	5
Frequency	6	2	3	1	2	1

(i) Write down the mode.

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

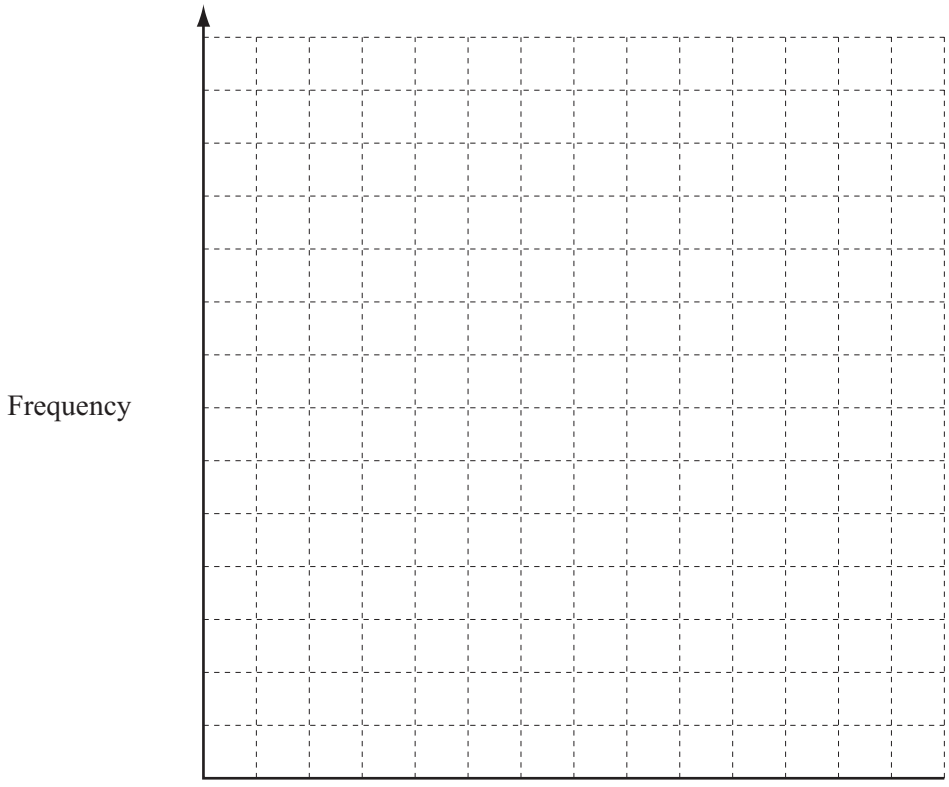
(ii) Find the median.

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

(iii) Calculate the mean.

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

(iv) On the grid, draw a bar chart to show the information given in the table.



[4]

For Examiner's Use

(b) Amir also asked these 15 friends which was their favourite sport.
His results are shown in the table below.

Football	4
Cricket	5
Basketball	2
Badminton	4

Amir picks one of these friends at random.

Write down the probability that his friend's favourite sport is

(i) cricket,

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

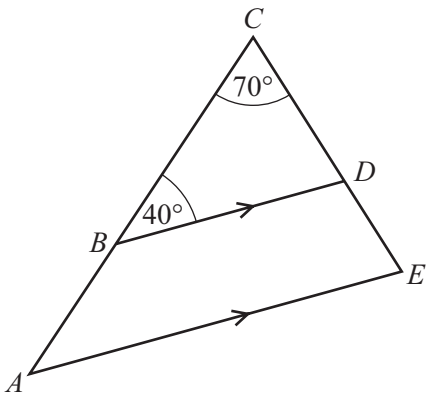
(ii) **not** football,

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

(iii) basketball or badminton.

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

4 (a)



NOT TO SCALE

In the diagram, ACE is a triangle.
B is a point on AC and D is a point on CE.
AE is parallel to BD, angle $ACE = 70°$ and angle $CBD = 40°$.

(i) Find angle BDC.

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

(ii) Write down the mathematical name of triangle BCD.

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

(iii) Find angle CAE.
Give a reason for your answer.

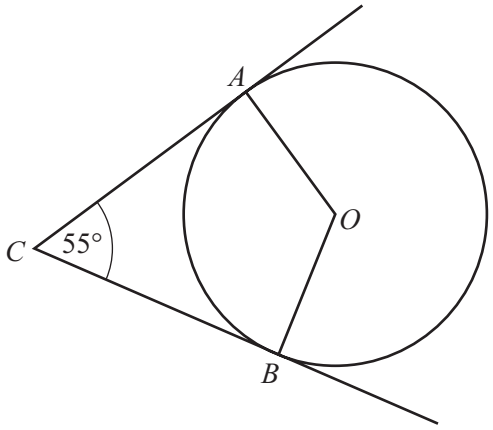
Answer(a)(iii) Angle CAE = ... because .....

..... [2]

(iv) Complete the following statement.

Triangle ACE and triangle BCD are ..... [1]

(b)



NOT TO SCALE

For Examiner's Use

In the diagram, A and B lie on a circle, centre O.
AC and BC are tangents to the circle and angle $ACB = 55°$.

(i) Work out reflex angle ACB.

Answer(b)(i) Reflex angle ACB = ... [1]

(ii) Give a reason why angle OAC = angle $OBC = 90°$.

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

(iii) Work out angle AOB.

Answer(b)(iii) Angle AOB = ... [1]

(iv) Write down the mathematical name of quadrilateral $OACB$.

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

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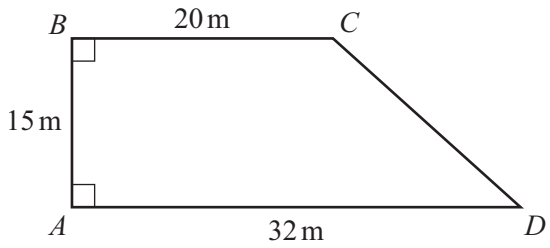

NOT TO SCALE

For Examiner's Use

The diagram shows a plot of land, *ABCD*, in the shape of a trapezium.

(a) Show that $CD = 19.2$ m, correct to 1 decimal place.

Answer(a)

[2]

(b) A fence is built around the perimeter of the plot of land.
The cost of the fence is \$35 for each metre.

Calculate the total cost of the fence.

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

(c) Calculate the area of the plot of land.
Give your answer in square metres.

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

For Examiner's Use

(d) A house is built on the plot of land.
The area of the plot is divided in the ratio house : grounds = 3 : 7 .

Calculate the area of the grounds.

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

(e) **(i)** In the space below, make a scale drawing of the plot of land.
Use a scale of 1 centimetre to represent 4 metres.
The side *AB* has been drawn for you.

[2]

(ii) Measure angle *ADC*.

Answer(e)(ii) Angle *ADC* = ... [1]

(iii) Use your diagram to find the actual length *BD* in metres.

Answer(e)(iii) *BD* = ... m [1]

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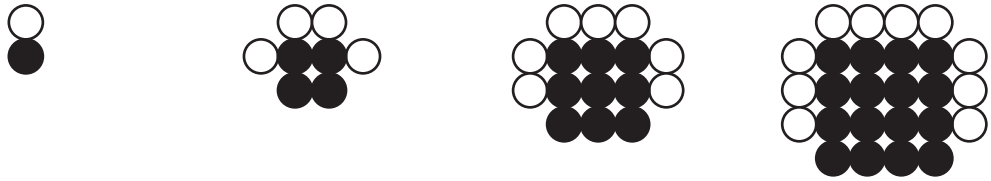


Diagram 1 Diagram 2 Diagram 3 Diagram 4

A sequence of diagrams is made from black counters and white counters.
The first four diagrams in the sequence are shown.

(a) Complete the table.

Diagram	1	2	3	4	5
Number of black counters	1	4			
Number of white counters	1	4			

[4]

(b) Complete the statement.

The numbers of black counters are all ..... numbers. [1]

(c) How many white counters are needed for

(i) Diagram 8,

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

(ii) Diagram *n*?

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

For Examiner's Use

For Examiner's Use

(d) Diagram p contains 58 white counters.

(i) Find the value of p.

Answer(d)(i) $p =$ ..... [2]

(ii) Find the number of **black** counters in Diagram p.

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

For Examiner's Use

7 **(a)** The cost, \$$C$, of hiring a meeting room for n people is calculated using the formula

$$C = 80 + 5n.$$

(i) Calculate C when $n = 12$.

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

(ii) Maria pays \$230 to hire the meeting room.

Work out the number of people at the meeting.

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

(iii) Make n the subject of the formula $C = 80 + 5n$.

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

(b) Expand and simplify $2(3x + 4) - 3(2 - x)$.

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

(c) Solve the simultaneous equations.

$$3x + y = 13$$
$$2x + 3y = 18$$

Answer(c) x = ...

y = ... [3]

For Examiner's Use

8 **(a)** A water tank in the shape of a cuboid measures 55 cm by 40 cm by 75 cm.

(i) Find the volume of the tank.

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

(ii) Write down the volume of the tank in litres.

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

(b) Another water tank contains 260 litres.

(i) The tank is emptied at a rate of 25 litres per minute.

Work out the time taken to completely empty the tank.
Give your answer in minutes and seconds.

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

(ii) 260 litres is given correct to the nearest 10 litres.

Write down the lower bound of this amount.

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

(c) A different tank is in the shape of a cube.
It has a volume of 27 000 cm^3.

Find the height of this tank.

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

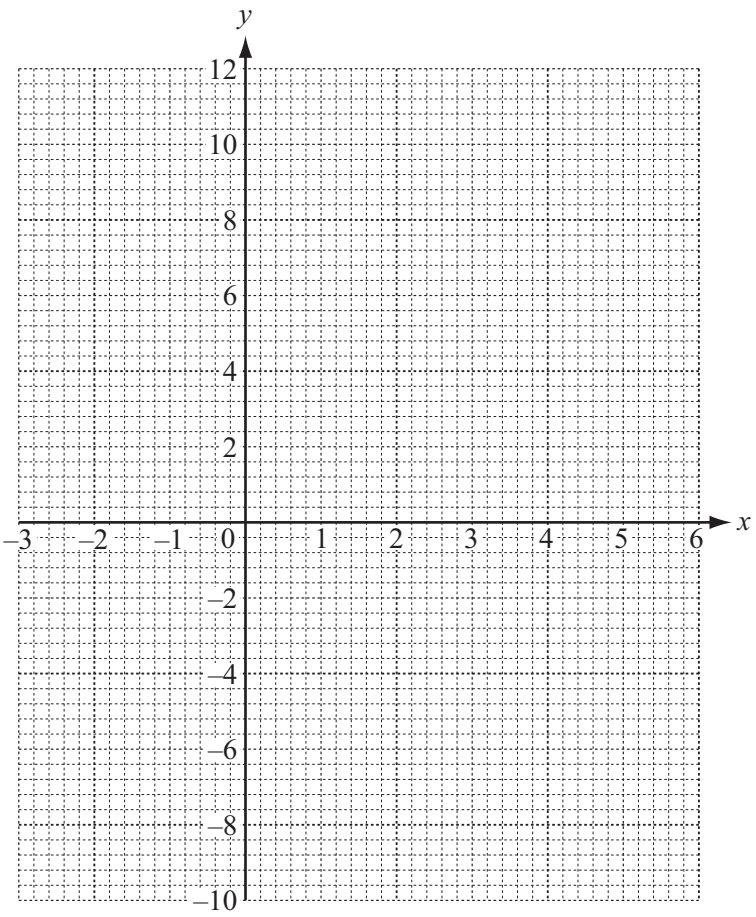
For Examiner's Use

9 **(a)** Complete the table of values for $y = 8 + 3x - x^2$.

x	–3	–2	–1	0	1	2	3	4	5	6
y	–10			8	10	10				–10

[3]

(b) On the grid, draw the graph of $y = 8 + 3x - x^2$ for $-3 \leqslant x \leqslant 6$.



[4]

(c) Write down the equation of the line of symmetry of the graph.

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

(d) **(i)** On the grid, draw the graph of $y = 6$. [1]

(ii) Use your graphs to solve the equation $8 + 3x - x^2 = 6$.

Answer(d)(ii) $x =$ ..... or $x =$ ..... [2]

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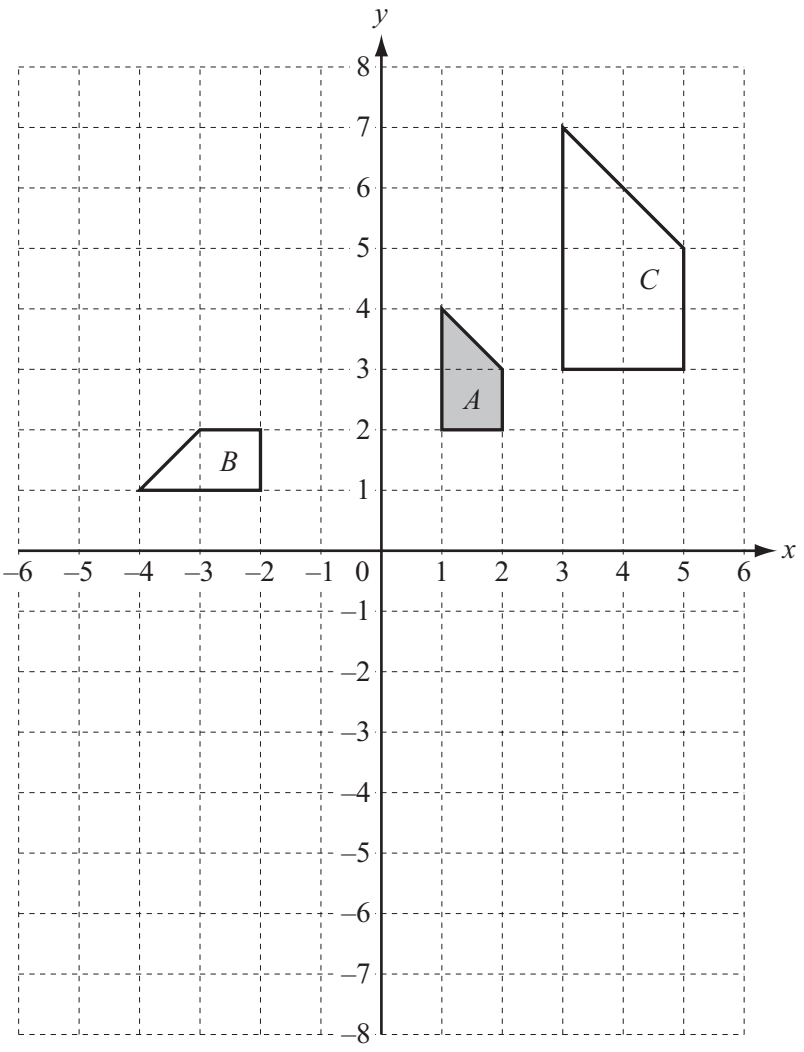
For Examiner's Use



Shapes A, B and C are shown on the grid.

(a) Describe fully the **single** transformation which maps

(i) shape A onto shape B,

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

(ii) shape A onto shape C.

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

(b) On the grid, draw the image of shape A after

(i) translation by the vector $\begin{pmatrix} 3 \\ -4 \end{pmatrix}$, [2]

(ii) reflection in the line $y = -1$. [2]

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