UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME									
CENTER NUMBER						CANDIDATE NUMBER				

3673126000

MATHEMATICS (US) **0444/23**

Paper 2 (Extended) **October/November 2013**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Center 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.
CALCULATORS MUST NOT BE USED IN THIS PAPER.
All answers should be given in their simplest form.
If work is needed for any question it must be shown in the space provided.

The number of points is given in parentheses [ ] at the end of each question or part question.
The total of the points for this paper is 70.

This document consists of **12** printed pages.

Formula List

For the equation $ax^2 + bx + c = 0$ $\quad x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Lateral surface area, A, of cylinder of radius r, height h. $\quad A = 2\pi rh$

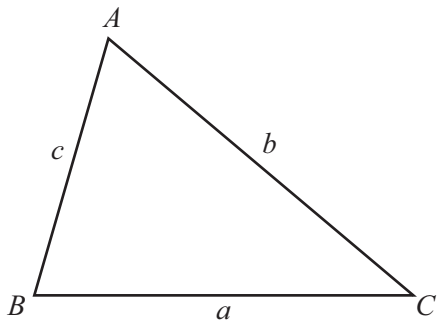
Lateral surface area, A, of cone of radius r, sloping edge l. $\quad A = \pi rl$

Surface area, A, of sphere of radius r. $\quad A = 4\pi r^2$

Volume, V, of pyramid, base area A, height h. $\quad V = \frac{1}{3}Ah$

Volume, V, of cone of radius r, height h. $\quad V = \frac{1}{3}\pi r^2 h$

Volume, V, of sphere of radius r. $\quad V = \frac{4}{3}\pi r^3$



$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$\text{Area} = \frac{1}{2}bc \sin A$$

For Examiner's Use

1 Christa had a music lesson every week for one year.
Each of the 52 lessons lasted for 45 minutes.

Work out the total time that Christa spent in music lessons.
Give your time in hours.

Answer ..... h [2]

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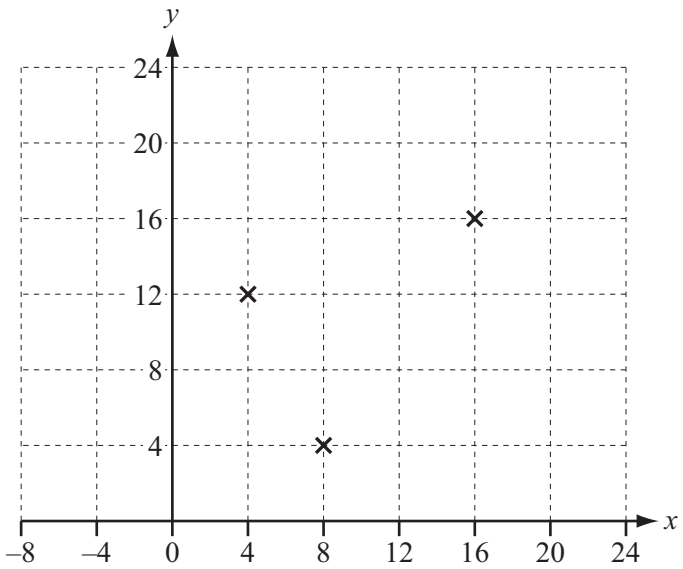
2 Three of the vertices of a parallelogram are at (4, 12), (8, 4) and (16, 16).



Write down the co-ordinates of two possible positions of the fourth vertex.

Answer (..... , ...) and (..... , ...) [2]

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3 Solve the equation $1 + 2x = -15$.

Answer $x =$ ..... [2]

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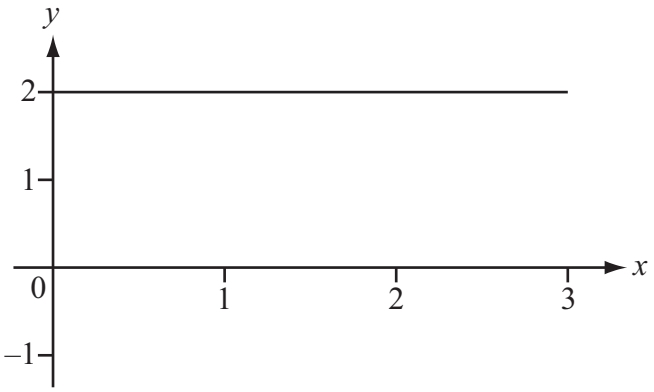
4 Solve the equation.

$$x^{\frac{1}{3}} + 1 = 5$$

Answer $x =$ ..... [2]

5



Write down the domain and range of the function shown in the graph.

Answer domain .....

range ..... [2]

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6 Write

(a) 60 square meters in square centimeters,

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

(b) 25 meters per second in kilometers per hour.

Answer(b) ..... km/h [2]

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7 In 2012 the cost of a ticket to an arts festival was \$24.
This was 20% less than the ticket cost in 2011.

Calculate the cost of the ticket in 2011.

Answer \$ ..... [3]

For Examiner's Use

8 The solutions of the equation $x^2 - 6x + d = 0$ are both integers.
d is a prime number.

Find d.

Answer $d =$ ..... [3]

---

9 m varies directly as the cube of x.
$m = 200$ when $x = 2$.

Find m when $x = 4$.

Answer $m =$ ..... [3]

---

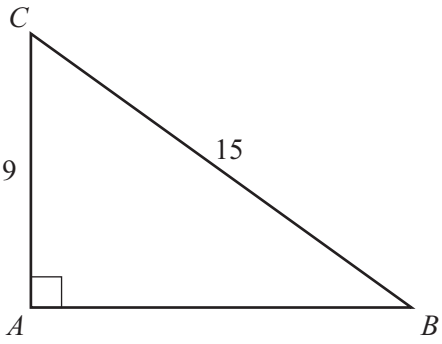
10 **(a)** Expand and simplify $(a + b)^2$.

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

(b) Find the value of $a^2 + b^2$ when $a + b = 6$ and $ab = 7$.

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

11



NOT TO SCALE

Find AB.

Answer AB = ... [3]

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12 **(a)** Write down the amplitude and period of the graph of $y = 2\sin x$.

Answer(a) amplitude = ...

period = ... [2]

(b) The graph of $y = 2\sin x$ is stretched by a factor of 2 with the x-axis invariant.

Write down the equation of the new graph.

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

13

(a) Write down the order of rotational symmetry of the rectangle.

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

(b) Construct, **using a straight edge and compass only**, one of the lines of symmetry of the rectangle. [2]

[Turn over

14 Write the answer to the following calculations in scientific notation.

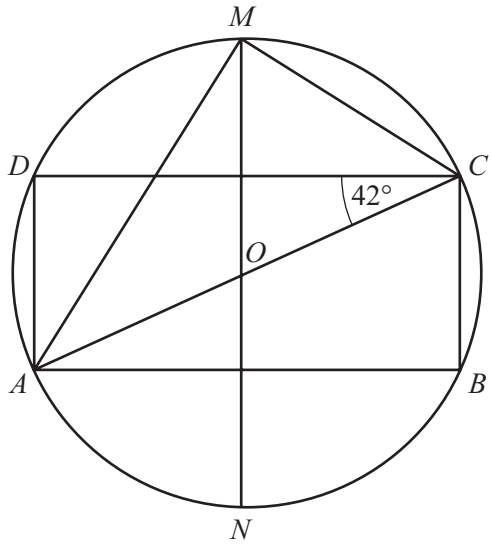
(a) 600×8000

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

(b) $10^8 - 7 \times 10^6$

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

15



NOT TO SCALE

The vertices of the rectangle *ABCD* lie on a circle center *O*.
MN is a line of symmetry of the rectangle.
AC is a diameter of the circle and angle *ACD* = 42°.

Calculate

(a) angle *CAM*,

Answer(a) Angle *CAM* = ... [2]

(b) angle *DCM*.

Answer(b) Angle *DCM* = ... [2]

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16 **(a)** Simplify $(64q^{-2})^{\frac{1}{2}}$.

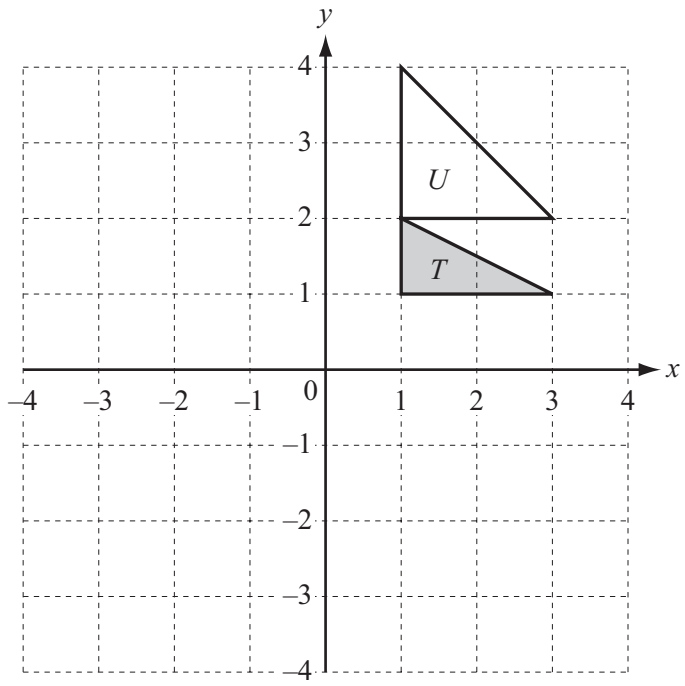
Answer(a) ..... [2]

(b) $5^7 \div 5^9 = p^2$

Find p.

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

17



(a) Draw the rotation of triangle T through 90° anticlockwise about the point (0, 1). [2]

(b) Describe fully the **single** transformation that maps triangle T onto triangle U.

Answer (b) .....

..... [3]

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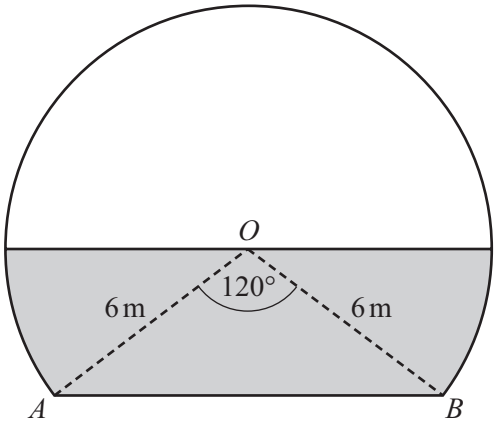
18 The diagram shows the entrance to a tunnel.
The circular arc has a radius of 6 m and center O.
AB is horizontal and angle $AOB = 120°$.



NOT TO SCALE

During a storm the tunnel filled with water, to the level shown by the shaded area in the diagram.

The shaded area is equal to $c\pi + d\sqrt{3}$.

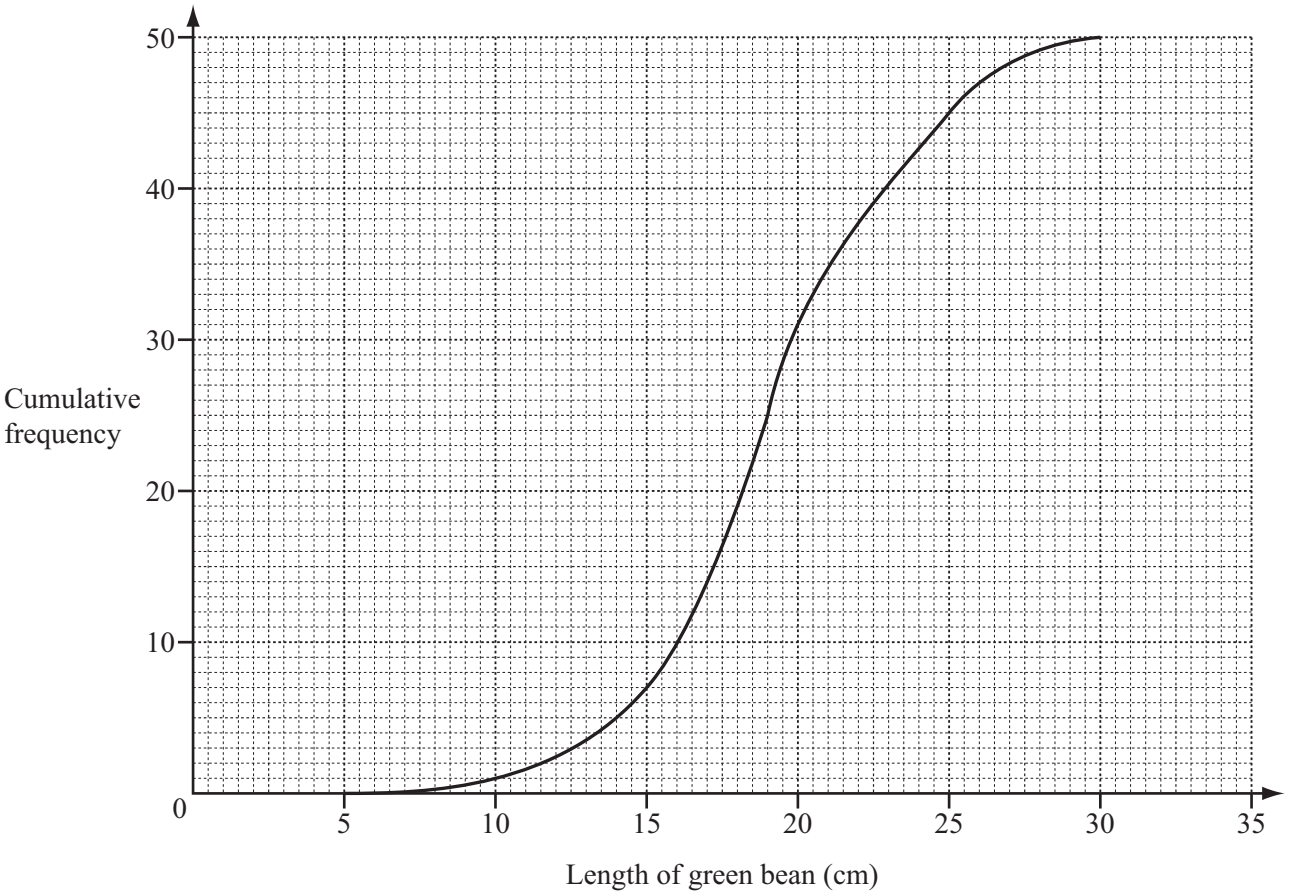
Find the values of c and d.

Answer $c =$ .....

$d =$ ..... [4]

For Examiner's Use

19 A gardener measured the lengths of 50 green beans from his garden.
The results have been used to draw this cumulative frequency diagram.



Work out

(a) the median,

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

(b) the number of green beans that are longer than 26 cm,

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

(c) the inter-quartile range,

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

(d) the probability that a green bean chosen at random is more than 14 cm long.

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

Question 20 is printed on the next page.

For Examiner's Use

20 $f(x) = 2x + 3$ $g(x) = x^2$

(a) Find $f(g(6))$.

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

(b) Solve the equation $g(f(x)) = 100$.

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

(c) Find $f^{-1}(x)$.

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

(d) Find $f(f^{-1}(5))$.

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