

## UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS International General Certificate of Secondary Education

CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	
MATHEMATICS			0581/23
Paper 2 (Extended)		Octo	bber/November 2013
			1 hour 30 minutes
Candidates answer or	n the Question Paper.		
Additional Materials:	Electronic calculator Tracing paper (optional)	Geometrical instrume	nts

## **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  $\pi$ , 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 70.

This document consists of 12 printed pages.



[Turn over

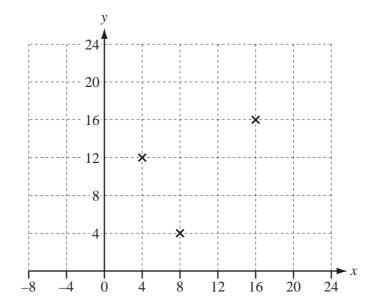
For
Examiner'.
Use

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

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

Answer	 h	[2]	ĺ
11111111111	 		ı

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.

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

$$Answer x = \dots [2]$$

4 Write the following in order of size, smallest first.

$$\cos 100^{\circ}$$
  $\tan 100^{\circ}$   $\frac{1}{100}$   $100^{-0.1}$ 

5	Write	
	(a) 60 square metres in square centimetres,	
		Answer(a) cm <sup>2</sup> [1]
	(b) 22 metres per second in kilometres per hour.	
	(b) 22 metres per second in knometres per nour.	
		Answer(b) km/h [2]
6	In 2012 the cost of a ticket to an arts festival was \$30. This was 20% more than the ticket cost in 2011.	
	Calculate the cost of the ticket in 2011.	
		Answer \$ [3]
	•	
7	The solutions of the equation $x^2 - 6x + d = 0$ are $d$ is a prime number.	both integers.
	Find $d$ .	
		$Answer d = \dots [3]$

8	m varies directly as the cube of $x$ . m = 200 when $x = 2$ .	
	Find $m$ when $x = 0.4$ .	
	A	$Answer m = \dots [3]$
9	(a) Expand and simplify $(a+b)^2$ .	
		Answer(a)[2]
		Answer(u)[2]
	<b>(b)</b> Find the value of $a^2 + b^2$ when $a + b = 6$ and $a$	ab = 7.
		Answer(b)[1]

15°

628 m

10



For Examiner's Use

Calculate the length h.

h

Give your answer correct to 2 significant figures.

Answer 
$$h = \dots m [3]$$

$$\mathbf{11} \quad \mathbf{A} = \begin{pmatrix} 3 & -1 \\ 4 & 2 \end{pmatrix} \qquad \qquad \mathbf{I} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$$

Work out the following.

(a) AI

$$Answer(a) \mathbf{AI} = [1]$$

**(b)**  $A^{-1}$ 

$$Answer(b) \mathbf{A}^{-1} = [2]$$

For
Examiner'.
$II_{SP}$

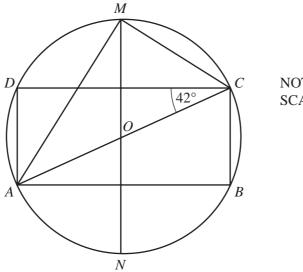
- 12 Write the answer to the following calculations in standard form.
  - (a)  $600 \div 8000$

Answer(a)	 [2]

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

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

13



NOT TO SCALE

The vertices of the rectangle ABCD lie on a circle centre O. MN is a line of symmetry of the rectangle. AC is a diameter of the circle and angle  $ACD = 42^{\circ}$ .

## Calculate

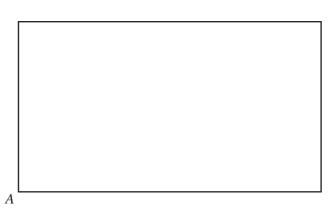
(a) angle CAM,

$$Answer(a)$$
 Angle  $CAM = \dots$  [2]

(**b**) angle DCM.

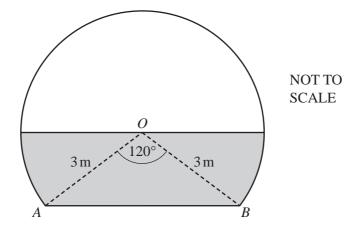
$$Answer(b)$$
 Angle  $DCM = \dots [2]$ 

14	(a)	Simplify $(64q^{-2})^{\frac{1}{2}}$ .		
			Answer(a)	[2]
	(b)	$5^7 \div 5^9 = p^2$		
		Find $p$ .		
			$Answer(b) p = \dots$	[2]



- (a) Construct the locus of all the points which are 3 cm from vertex A and outside the rectangle. [2]
- (b) Construct, using a straight edge and compasses only, one of the lines of symmetry of the rectangle. [2]

16 The diagram shows the entrance to a tunnel. The circular arc has a radius of 3 m and centre O. AB is horizontal and angle  $AOB = 120^{\circ}$ .



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

(a) Calculate the shaded area.

4 ( )	2	г 4 1
Answer(a)	 m²	[4]

**(b)** The tunnel is 50 m long.

Calculate the volume of water in the tunnel.

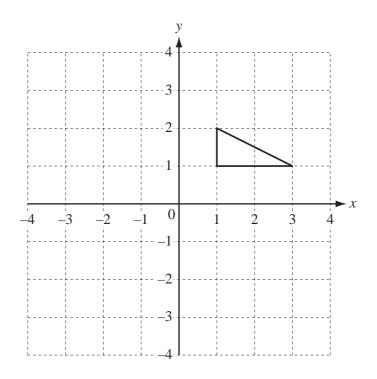
*Answer(b)* ..... m<sup>3</sup> [1]

17 (p, q) is the image of the point (x, y) under this combined transformation.

For Examiner's Use

$$\begin{pmatrix} p \\ q \end{pmatrix} = \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} + \begin{pmatrix} 3 \\ 2 \end{pmatrix}$$

(a) Draw the image of the triangle under the combined transformation.



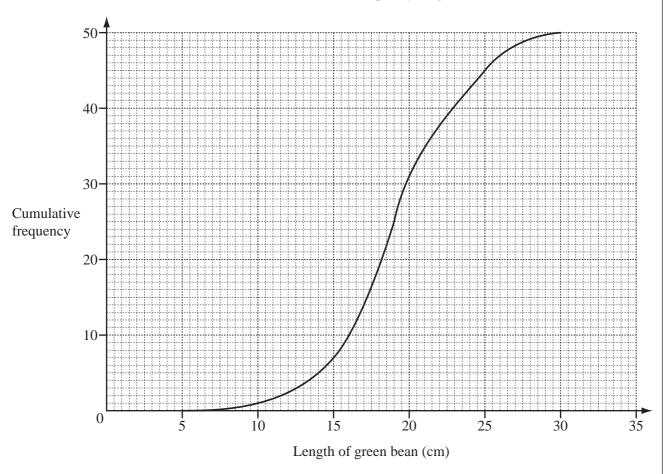
[3]

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

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

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

For Examiner's Use



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 19 is printed on the next page.

19 $f(x) = 2x + 3$ $g(x) = x^2$ (a) Find fg(6).	
(a) Find fg(6).	
Answer(a)[	2]
(b) Solve the equation $gf(x) = 100$ .	
Answer(b) $x =$	3]

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

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

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

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