MINISTRY OF EDUCATION, SINGAPORE
in collaboration with
UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE
General Certificate of Education Ordinary Level

CANDIDATE NAME

CENTRE NUMBER | S | | | | |

INDEX NUMBER | | | | |

MATHEMATICS

Paper 1

4016/01

October/November 2012

2 hours

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, index 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.

Answer **all** questions.
If working is needed for any question it must be shown with the answer.
Omission of essential working will result in loss of marks.
Calculators should be used where appropriate.
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, unless the question requires the answer in terms of π.

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 80.

For Examiner's Use

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

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UNIVERSITY of CAMBRIDGE International Examinations

[Turn over

Oct/Nov 2012 Paper 1 (1)

For examiner's Use

Answer **all** the questions.

1 **(a)** Calculate $\frac{11.83^2}{18.52 - 2.79}$.

Write down the first five digits on your calculator display.

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

(b) Write your answer to part **(a)** correct to 2 significant figures.

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

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2 **(a)** The interior angle of a regular polygon is 140°.

Calculate the number of sides that the polygon has.

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

(b) Find the exterior angle of a regular decagon.

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

---

3 A bag contains 10 red marbles, 5 blue marbles and 3 yellow marbles.

(a) A marble is chosen at random and then replaced.

What is the probability that it is a red marble?

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

(b) How many more blue marbles must be placed in the bag so that the probability of choosing a blue marble would be $\frac{1}{2}$?

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

For examiner's Use

4 The stem-and-leaf diagram shows the times, in minutes, taken by some students to complete a task.

For Examiner Use

3	2	4	7	8	9
4	0	0	2	5	6
5	3	7	7	8	
6	4	7			

Key : 3 | 8 represents 38 minutes

For these times, find

(a) the range,

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

(b) the median.

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

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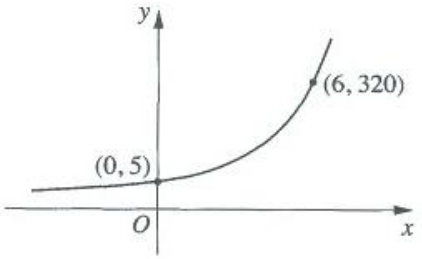
5 The sketch shows the graph of $y = ka^x$.
The points (0, 5) and (6, 320) lie on the graph.



Find the values of k and a.

Answer k = ...

a = ...[2]

For Examiner's Use

6 A cylindrical container has a radius of 6.8 cm and a capacity of 1.5 litres.

Calculate the height of the container.

Answer .....cm [2]

---

7 The first four terms of a sequence are 5, 9, 13 and 17.

(a) Write down the 8th term of the sequence.

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

(b) Find an expression, in terms of n, for the nth term of the sequence.

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

(c) One term in the sequence is 205.

Find the value of n for this term.

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

---

8 Solve the equation $\frac{2x-3}{6} + \frac{x+2}{3} = \frac{5}{2}$.

Answer x = ...[2]

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9 (a) Written as a product of its prime factors, $1008 = 2^x \times 3^y \times 7$.

Find the values of x and y.

Answer (a) $x =$ .....

$y =$ .....[2]

(b) Written as a product of its prime factors, $1350 = 2 \times 3^3 \times 5^2$.

Find the smallest positive integer k such that $\frac{1350}{k}$ is a square number.

Answer (b) $k =$ .....[1]

10 The scale of a map is 4 cm : 1 km.

(a) Write this scale in the form 1 : n.

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

(b) A lake is represented by an area of 236 cm^2 on the map.

Calculate the actual area of the lake in square kilometres.

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

For Examiner's Use

11 **(a)** Simplify $2(3x + 2y) - 5(x - 2y)$.

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

(b) Write as a single fraction in its simplest form $\frac{5}{(x+2)^2} - \frac{1}{(x+2)}$.

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

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12 The table shows the heights of a group of 30 girls.

Height h (cm)	Frequency
$140 \leqslant h < 150$	4
$150 \leqslant h < 160$	9
$160 \leqslant h < 170$	11
$170 \leqslant h < 180$	6

Calculate an estimate for

(a) the mean height of the girls,

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

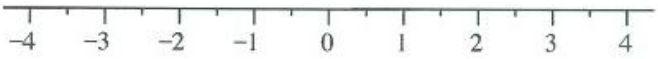
(b) the standard deviation of their heights.

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

For Examiner's Use

13 **(a)** Represent $-2 < x \leqslant 3\frac{1}{2}$ on the number line below.

Answer (a)



[1]

(b) Solve the inequalities $-9 \leqslant 4x - 3 < 9$.

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

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14 The diagram is a scale drawing showing the positions of two airfields, A and B.

Scale: 1 cm represents 10 km

An aeroplane is 60 km from A on a bearing of 055°.

(a) Mark and label on the diagram the position, P, of the aeroplane. [1]

(b) Find the **actual** distance of the aeroplane from B.

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

(c) Find the bearing of the aeroplane from B.

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

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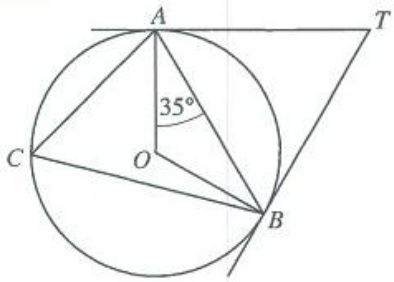
15 O is the centre of the circle passing through A, B and C.
TA and TB are tangents to the circle.
Angle $OAB = 35°$.



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Find

(a) $A\hat{O}B$,

Answer (a) $A\hat{O}B =$ .....[1]

(b) $A\hat{C}B$,

Answer (b) $A\hat{C}B =$ .....[1]

(c) $A\hat{T}B$.

Answer (c) $A\hat{T}B =$ .....[1]

---

16 Simplify

(a) $x^2y \times x^5y^{-2}$,

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

(b) $\left(\frac{64}{x^{15}}\right)^{-\frac{1}{3}}$.

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

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17 The table shows what some pupils chose to do after leaving school.

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	Employment	Polytechnic	College	TOTAL
Males	43	28	34	105
Females	29			
TOTAL	72	42		180

(a) How many females chose to go to college?

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

(b) A pie chart is to be drawn showing the data for the **males**.

Calculate the angle representing the males choosing polytechnic.

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

(c) In which group, males or females, did a greater percentage choose employment, and by how much?

Answer (*c*) ..... by ..... % [2]

---

18 **(a)** Factorise fully $xy - 3x + 2y - 6$.

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

(b) Factorise fully $6x^2 - 15x - 9$.

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

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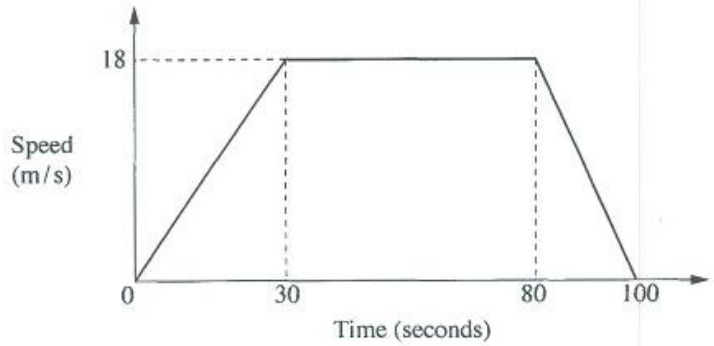
19 The diagram shows the speed–time graph for a train journey.



(a) Calculate the deceleration of the train for the last 20 seconds of the journey.

Answer (*a*) ..... m/s^2 [1]

(b) Calculate the total distance travelled on the journey.

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

(c) The maximum speed of the train was 18 m/s.

Change 18 m/s into km/h.

Answer (*c*) ..... km/h [1]

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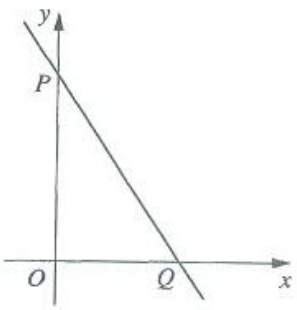
20 The diagram shows a sketch of the graph of $y = 10 - 2x$.
The line crosses the axes at P and Q.



(a) Find the coordinates of P and Q.

Answer (a) P (....., ...)

Q (....., ...) [2]

(b) Calculate the length of the line joining P to Q.

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

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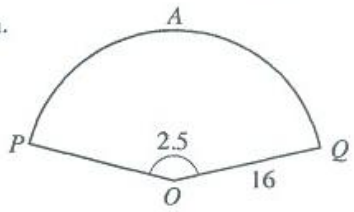
21 $OPAQ$ is a sector of a circle, centre O, of radius 16 cm.
The angle at the centre is 2.5 radians.



(a) Calculate the length of the arc PAQ.

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

(b) The sector is formed into a cone by joining the two radii, OP and OQ, together.

Calculate the radius of the base of the cone.

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

(c) Change 2.5 radians to degrees.

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

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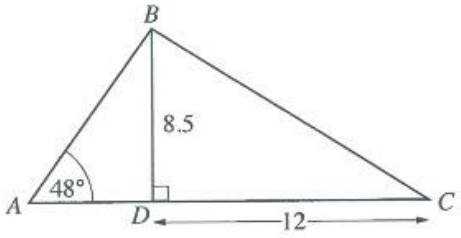
22



In triangle ABC, BD is perpendicular to AC.
Angle $BAD = 48°$, $BD = 8.5$ cm and $DC = 12$ cm.

Calculate

(a) $B\hat{C}D$,

Answer (a) $B\hat{C}D =$ .....[2]

(b) AB.

Answer (b) $AB =$ .....cm [2]

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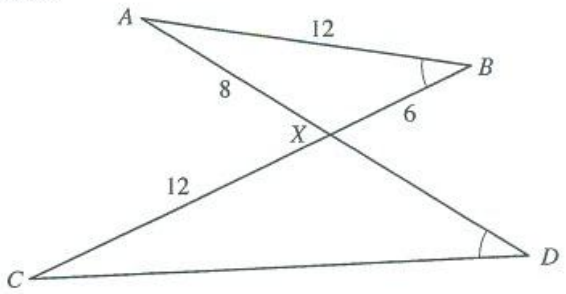
23 In the diagram, triangle ABX is similar to triangle CDX.
Angle ABX = angle CDX.
All measurements are in centimetres.



Calculate

(a) CD,

Answer (*a*) CD = ...cm [1]

(b) AD.

Answer (*b*) AD = ...cm [2]

(c) The area of triangle ABX is 21.3 cm^2.

Calculate the area of triangle CDX.

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

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24 A group of solid cylinders have equal heights.
The mass, M grams, of each cylinder is directly proportional to the square of its radius, r centimetres.
The cylinder with radius 4 cm has a mass of 720 grams.

(a) (i) Find a formula for M in terms of r.

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

(ii) Find the mass of the cylinder with a radius of 6 cm.

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

(b) One of the cylinders, A, has a radius 50% greater than cylinder B.

Write down the ratio of the mass of cylinder A to the mass of cylinder B.

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

[Question 25 is printed on the next page]

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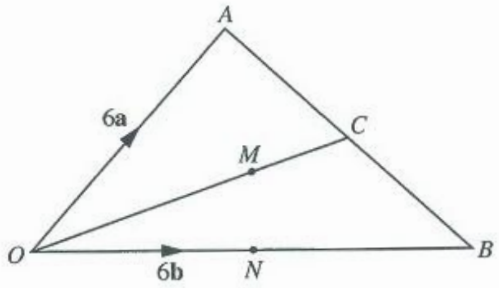
25



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The position vectors of A, B and C, relative to O, are $6\mathbf{a}$, $6\mathbf{b}$ and $(3\mathbf{a} + 3\mathbf{b})$ respectively. $ON = NB$ and $MC = \frac{1}{3}OC$.

(a) Express in terms of **a** and **b**, as simply as possible,

(i) $\overrightarrow{OM}$,

Answer (a)(i) $\overrightarrow{OM}$ = ...[1]

(ii) $\overrightarrow{AM}$,

Answer (a)(ii) $\overrightarrow{AM}$ = ...[1]

(iii) $\overrightarrow{AN}$.

Answer (a)(iii) $\overrightarrow{AN}$ = ...[1]

(b) Use your answers to parts **(a)(ii)** and **(a)(iii)** to explain why A, M and N lie in a straight line.

.....

.....[1]

(c) Write down the ratio $AM : AN$.

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