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

4016/01

Paper 1

October/November 2013

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.
DO **NOT** WRITE IN ANY BARCODES.

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.
The use of an approved scientific calculator is expected, 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.

DC (SLM/JG) 58001/5

[Turn over

Oct/Nov 2013 Paper 1 (1)

For Examiner's Use

Answer **all** the questions.

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1 **(a)** Simplify $5p - 3(p - 2)$.

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

(b) Solve $(2x - 1)(x + 3) = 0$.

Answer (*b*) $x =$ ..... or .....[1]

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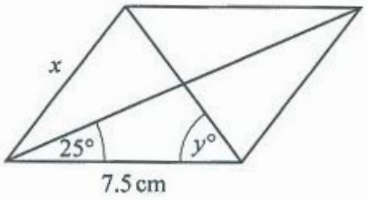
2 The diagram shows a sketch of a rhombus.



(a) Write down the value of x.

Answer (*a*) $x =$ .....cm [1]

(b) Find y.

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

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3 The line $2x - 5y = 20$ crosses the x-axis at A and the y-axis at B.

Find the coordinates of

(a) point A,

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

(b) point B.

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

For Examiner's Use

4 Anne, Brian and Cheryl shared a sum of money between them in the ratio 4 : 7 : 9.
Brian had $42 more than Anne.

How much money did Cheryl have?

Answer $.....[2]

5 **(a)** Given that $8 \times 16^{\frac{1}{4}} = 2^n$, find n.

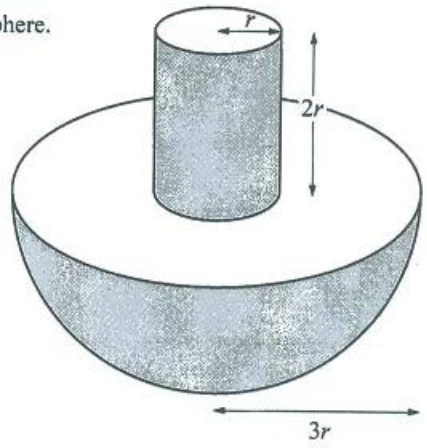
Answer (a) n = ...[1]

(b) Given that $\frac{1}{9} = 3^k$, find k.

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

6 This solid is made from a cylinder and a hemisphere.
The cylinder has radius r and height $2r$.
The hemisphere has radius $3r$.

Find an expression, in terms of π and r, for the **total surface area** of the solid.



Answer .....[3]

For Examiner's Use

7 (a) Express 294 as a product of its prime factors.

For Examiner's Use

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

(b) A number has exactly eight factors.
Two of the factors are 8 and 20.

List all the factors of the number.

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

8 An aeroplane flies a distance of 5572 km from New York to London.
The average speed of the aeroplane is 725 km/h.

Calculate the flight time, in hours and minutes, correct to the nearest minute.

Answer ..... hours ..... minutes [3]

9 (a) List all the integers that satisfy $-3 < x \leqslant 4$.

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

(b) Solve the inequalities $-5 < 2x - 3 \leqslant 7$.

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

For Examiner's Use

10 **(a)** Express $x^2 - 8x + 14$ in the form $(x-p)^2 - q$.

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

(b) Hence write down the minimum value of $x^2 - 8x + 14$.

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

(c) Write down the equation of the line of symmetry of the graph of $y = x^2 - 8x + 14$.

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

---

11 Barry has a bag of marbles.
$\frac{3}{8}$ of the marbles are red.
70% of the **remaining** marbles are yellow.
The other 12 marbles are green.

How many marbles are in the bag altogether?

Answer .....[3]

For Examiner's Use

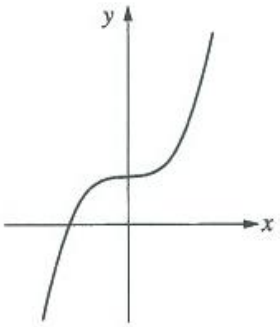
12

$y = x^3 - 5$	$y = 5 - x^3$	$y = 5^x$
$y = 5 - x^2$	$y = x^2 + 5$	$y = x^3 + 5$

For Examiner's Use

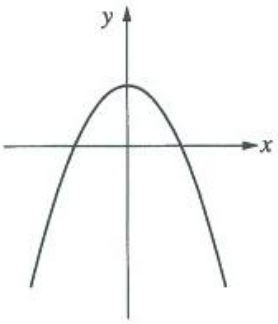
Write down a possible equation for each of the sketch graphs below.
In each case select one of the equations from the box above.

(a)



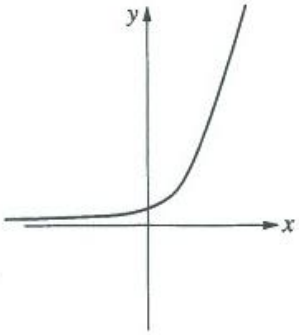
Answer (*a*) .....[1]

(b)



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

(c)



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

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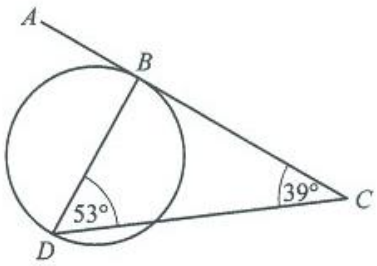
13 (a)



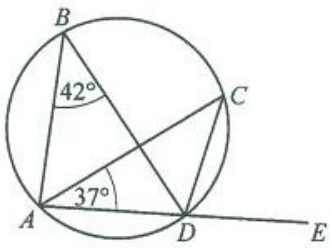
In the diagram, ABC is a tangent to the circle.
D is a point on the circumference of the circle.
Angle $BDC = 53°$ and angle $BCD = 39°$.

Explain why BD is not a diameter of the circle.

Answer (*a*) .....

.....[1]

(b)



In the diagram A, B, C and D are points on the circumference of a circle.
ADE is a straight line.
Angle $ABD = 42°$ and angle $CAD = 37°$.

(i) Find $A\hat{C}D$.

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

(ii) Find $C\hat{D}E$.

Answer (*b*)(ii) $C\hat{D}E$ = ...[1]

For Examiner's Use

14 $\mathscr{E} = \{\text{integers } x : 2 \leqslant x \leqslant 12\}$
$A = \{\text{prime numbers}\}$
$B = \{\text{multiples of 4}\}$

List the elements in

(a) B',

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

(b) $A \cap B'$,

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

(c) $(A \cup B)'$.

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

---

15 Teresa and Robert attend the same school.
They keep a record of the awards they have earned and the points gained.
The matrices show the numbers of awards and the points gained for each award.

$$\begin{array}{c} \\ \text{Teresa} \\ \text{Robert} \end{array} \begin{array}{c} \begin{array}{ccc} \text{Gold} & \text{Silver} & \text{Bronze} \end{array} \\ \begin{pmatrix} 29 & 10 & 5 \\ 30 & 6 & 8 \end{pmatrix} \end{array} \qquad \begin{array}{c} \\ \text{Gold} \\ \text{Silver} \\ \text{Bronze} \end{array} \begin{array}{c} \begin{array}{c} \text{Points} \end{array} \\ \begin{pmatrix} 5 \\ 3 \\ 2 \end{pmatrix} \end{array}$$

(a) Find $\begin{pmatrix} 29 & 10 & 5 \\ 30 & 6 & 8 \end{pmatrix} \begin{pmatrix} 5 \\ 3 \\ 2 \end{pmatrix}$.

Answer (*a*) [2]

(b) Explain what your answer to **(a)** represents.

Answer (*b*).....

.....[1]

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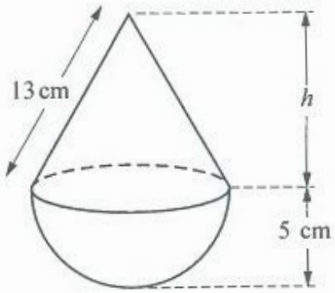
16 The diagram shows a solid made from a cone and a hemisphere.



(a) Show that the height, h, of the cone is 12 cm.

Answer (a)

[1]

(b) Calculate the volume of the solid.

Answer (b) ..... cm^3 [2]

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17 **(a)** Simplify $12x^2y \div 3xy^{-5}$.

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

(b) Write as a single fraction in its simplest form $\frac{3x}{(2x-1)^2} - \frac{2}{2x-1}$.

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

For Examiner's Use

18 **(a)** Factorise completely $3xy - 6ay - 4x + 8a$.

For Examiner Use

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

(b) Factorise $3x^2 + 10x - 8$.

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

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19 The frequency, f Hz, of a note produced by a string is proportional to the square root of the tension, T newtons, of the string.
When the tension is 64 N the string produces a note with a frequency of 360 Hz.

(a) Find an equation connecting f and T.

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

(b) The string produces a note with a frequency of 540 Hz.

Find the tension in the string.

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

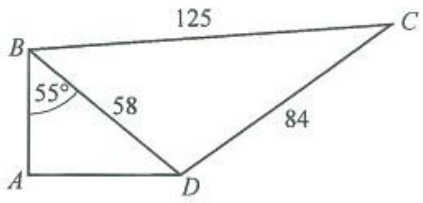
(c) For two identical strings, the ratio of the frequencies of the notes produced is 2 : 1.

Find the ratio of the tensions in the strings.

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

For Examiner's Use

20 $ABCD$ represents a plot of land.



B is due north of A, D is due east of A.
$BC = 125$ m, $CD = 84$ m and $BD = 58$ m.
Angle $ABD = 55°$.

(a) Calculate $B\hat{D}C$.

Answer (*a*) $B\hat{D}C$ = ...[3]

(b) Find the bearing of D from C.

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

For Examiner Use

For Examiner's Use

21 (a) A waterfall has a width of 1370 m.

Write 1370 in standard form.

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

(b) The average volume of water flowing over another waterfall is 8.69×10^3 litres per second.
After a rainstorm the volume of water increased to 2.48×10^4 litres per second.

Calculate the percentage increase in the volume of water flowing over the waterfall.

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

(c) The average volume of water flowing over a third waterfall is 1.82×10^4 litres per second.

Calculate the volume of water flowing over the waterfall in one hour.
Give your answer in standard form, correct to 2 significant figures.

Answer (*c*) .....litres [2]

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22 The cumulative frequency graph shows the distribution of the times of the first 100 runners to finish a city marathon in 2011.

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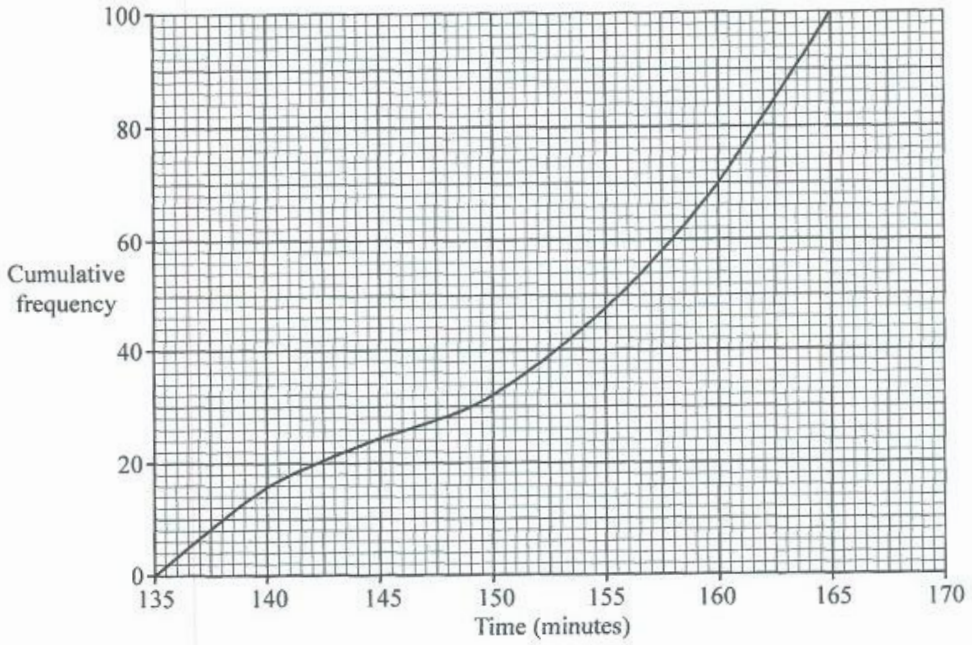
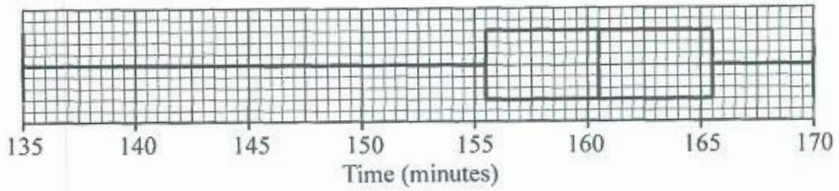


This box-and-whisker plot represents the distribution of the times of the first 100 runners to finish the city marathon in 2012.



(a) Use the two diagrams to complete this table for the two marathons.

Year	Lower quartile	Median	Upper quartile	Interquartile range
2011		155.5		
2012	155.5		165.5	10

[3]

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(b) Below are two statements comparing these times over the two years.
For each one, write whether you agree or disagree, giving a reason for each answer.

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Statement	Agree/disagree	Reason
The runners in 2012 were quicker on average		
The times of the first 25 runners were closer together in 2011		

[2]

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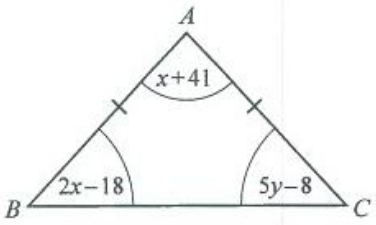
23 Triangle ABC is isosceles with $AB = AC$.
The angles are as shown on the diagram.



(a) Write down two simultaneous equations, in terms of x and y, to represent this information.

Answer (a) .....

.....[2]

(b) Solve the simultaneous equations to find the sizes of the angles of the triangle.

Answer (b) $\hat{A}$ = ...

$\hat{B}$ = ...

$\hat{C}$ = ...[3]

[Question 24 is printed on the next page]

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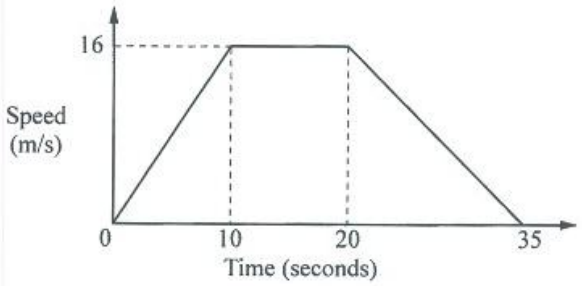
24 The diagram shows the speed–time graph for a car journey between two road junctions.



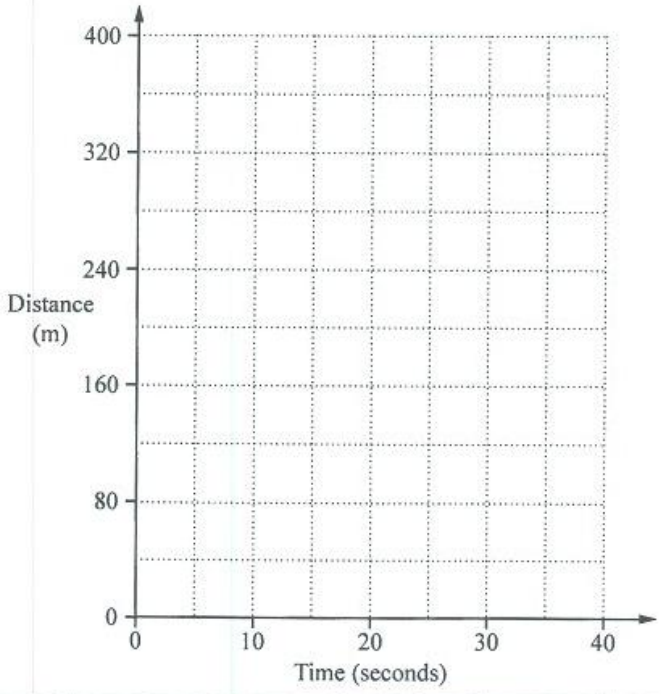
(a) Calculate the acceleration of the car after 5 seconds.

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

(b) Calculate the total distance travelled between the two road junctions.

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

(c) Use the grid below to sketch the distance–time graph for the journey.



[3]