

CANDIDATE
NAME

--

CENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--

MATHEMATICS

Paper 2 (Extended)

0580/22

May/June 2016

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials:

Electronic calculator

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 an HB pencil for any diagrams or graphs.

Do not use staples, paper clips, 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 70.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **11** printed pages and **1** blank page.

- 1 Write 0.000 057 4 in standard form.

..... [1]

- 2 Calculate.

$$\frac{3.07 + 2^4}{5.03 - 1.79}$$

..... [1]

- 3 Write 3.5897 correct to 4 significant figures.

..... [1]

- 4 A quadrilateral has rotational symmetry of order 2 and no lines of symmetry.

Write down the mathematical name of this quadrilateral.

..... [1]

- 5 8 9 10 11 12 13 14 15 16

From the list of numbers, write down

- (a) the square numbers,

..... [1]

- (b) a prime factor of 99.

..... [1]

- 6 Simplify.

$$\left(\frac{1}{2}x^{\frac{2}{3}}\right)^3$$

..... [2]

- 7 A map is drawn to a scale of 1 : 1 000 000.
A forest on the map has an area of 4.6 cm^2 .

Calculate the actual area of the forest in square kilometres.

..... km^2 [2]

- 8 Solve the inequality $\frac{x}{3} + 5 > 2$.

..... [2]

- 9 A regular polygon has an interior angle of 172° .

Find the number of sides of this polygon.

..... [3]

- 10 Make p the subject of the formula.

$$rp + 5 = 3p + 8r$$

$p =$ [3]

- 11 Shahruk plays four games of golf.
His four scores have a mean of 75, a mode of 78 and a median of 77.

Work out his four scores.

..... [3]

- 12 Write the recurring decimal $0.3\dot{6}$ as a fraction.
Give your answer in its simplest form.
[$0.3\dot{6}$ means $0.3666\dots$]

..... [3]

- 13 The base of a triangle is 9 cm correct to the nearest cm.
The area of this triangle is 40 cm^2 correct to the nearest 5 cm^2 .

Calculate the upper bound for the perpendicular height of this triangle.

..... cm [3]

- 14 **Without using a calculator**, work out $2\frac{5}{8} \times \frac{3}{7}$.

Show all your working and give your answer as a mixed number in its lowest terms.

..... [3]

- 15 $y = x^2 + 7x - 5$ can be written in the form $y = (x + a)^2 + b$.

Find the value of a and the value of b .

$a =$

$b =$ [3]

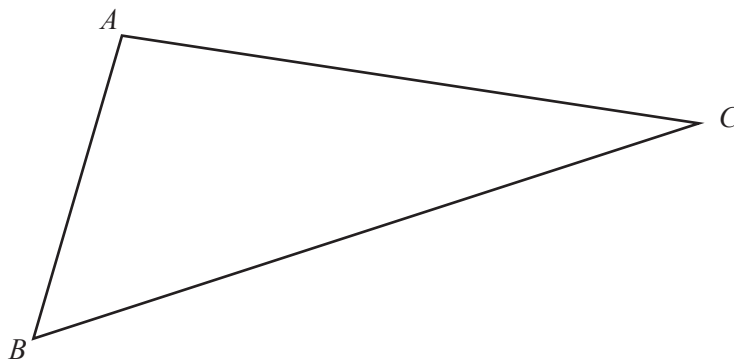
- 16 Solve the simultaneous equations.
Show all your working.

$$\begin{aligned} 3x + 4y &= 14 \\ 5x + 2y &= 21 \end{aligned}$$

$$x = \dots\dots\dots$$

$$y = \dots\dots\dots [3]$$

- 17 The diagram shows triangle ABC .



- (a) Using a straight edge and compasses only, construct the bisector of angle ABC . [2]
- (b) Draw the locus of points **inside** the triangle that are 3 cm from AC . [1]

18 Find the n th term of each of these sequences.

(a) 16, 19, 22, 25, 28, ...

..... [2]

(b) 1, 3, 9, 27, 81, ...

..... [2]

19 It is estimated that the world's population is growing at a rate of 1.14% per year.
On January 1st 2014 the population was 7.23 billion.

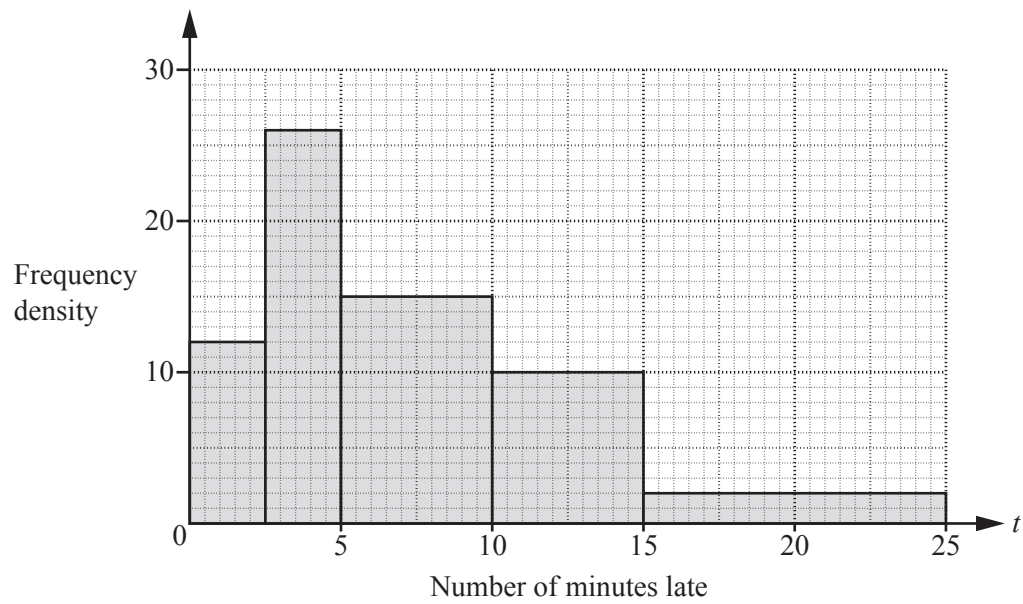
(a) Find the expected population on January 1st 2020.

.....billion [2]

(b) Find the year when the population is expected to reach 10 billion.

..... [2]

- 20 Deborah records the number of minutes late, t , for trains arriving at a station. The histogram shows this information.

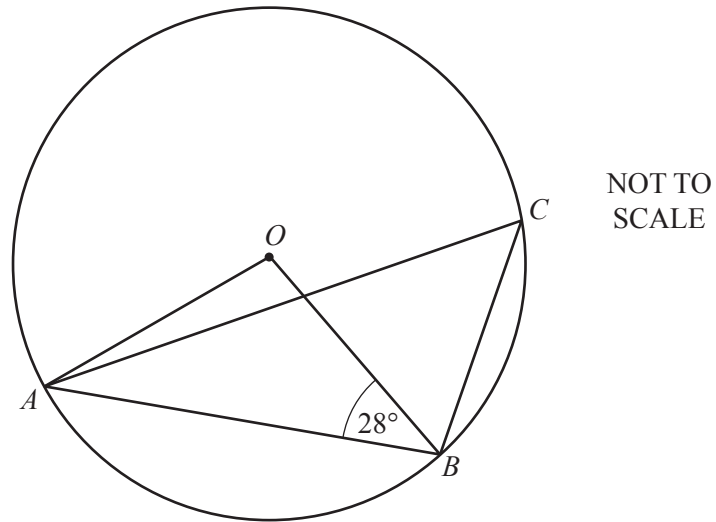


- (a) Find the number of trains that Deborah recorded.

..... [2]

- (b) Calculate the percentage of the trains recorded that arrived more than 10 minutes late.

.....% [2]



In the diagram, A , B and C lie on the circumference of a circle, centre O .

Work out the size of angle ACB .

Give a reason for each step of your working.

Angle $ACB = \dots\dots\dots$ [4]

22 $\mathbf{M} = \begin{pmatrix} 5 & 1 \\ -3 & -2 \end{pmatrix}$

(a) Work out $4\mathbf{M}$.

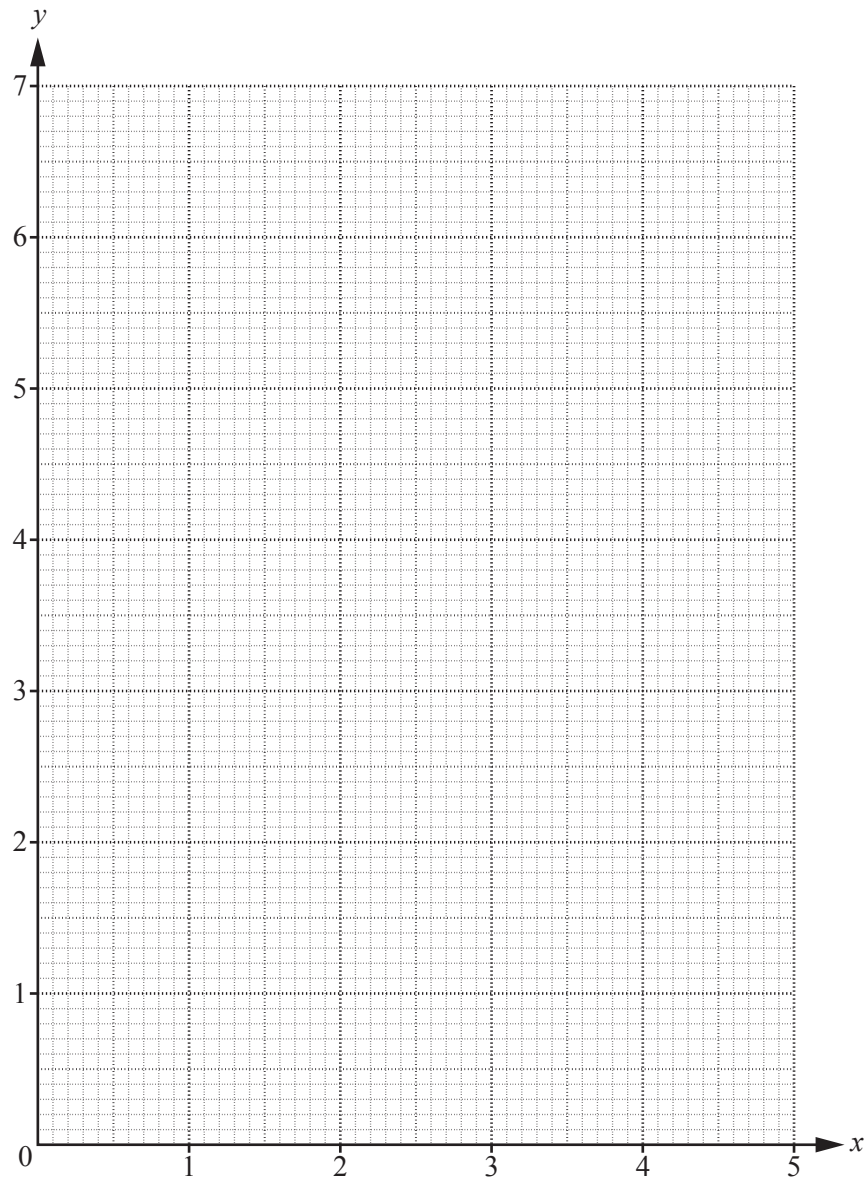
$$\begin{pmatrix} & \\ & \end{pmatrix} \quad [1]$$

(b) Work out $\mathbf{M}^2$.

$$\begin{pmatrix} & \\ & \end{pmatrix} \quad [2]$$

(c) Find $\mathbf{M}^{-1}$, the inverse of $\mathbf{M}$.

$$\begin{pmatrix} & \\ & \end{pmatrix} \quad [2]$$



The region R satisfies these inequalities.

$$y \leq 2x$$

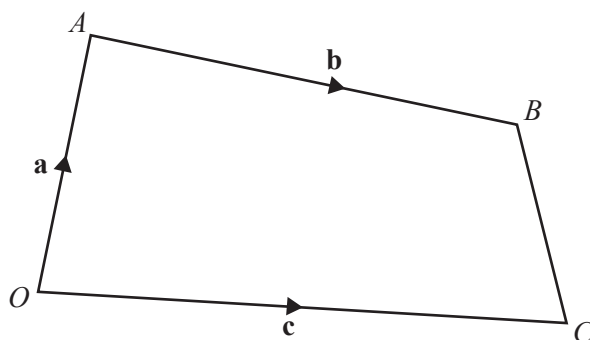
$$3x + 4y \geq 12$$

$$x \leq 3$$

On the grid, draw and label the region R that satisfies these inequalities.
Shade the **unwanted** regions.

[5]

24

NOT TO
SCALE

In the diagram, O is the origin, $\overrightarrow{OA} = \mathbf{a}$, $\overrightarrow{OC} = \mathbf{c}$ and $\overrightarrow{AB} = \mathbf{b}$.

P is on the line AB so that $AP : PB = 2 : 1$.

Q is the midpoint of BC .

Find, in terms of $\mathbf{a}$, $\mathbf{b}$ and $\mathbf{c}$, in its simplest form

(a) $\overrightarrow{CB}$,

$$\overrightarrow{CB} = \dots\dots\dots [1]$$

(b) the position vector of Q ,

$$\dots\dots\dots [2]$$

(c) $\overrightarrow{PQ}$.

$$\overrightarrow{PQ} = \dots\dots\dots [2]$$

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge International Examinations Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cie.org.uk after the live examination series.

Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.