Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | | | | | |

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T0T8944705

MATHEMATICS **0580/23**

Paper 2 (Extended) **May/June 2016**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

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 **12** printed pages.

DC (NH/CGW) 113547/3

CAMBRIDGE International Examinations

[Turn over

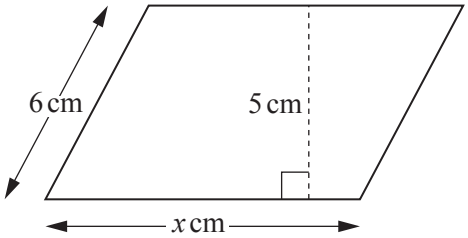
1 Find the cube root of 4913.

17 ..... [1]

2 Write 71 496 correct to 2 significant figures.

71000 ..... [1]

3



NOT TO SCALE

The area of this parallelogram is 51.5 cm^2.

Work out the value of x.

$5x = 51.5$

$x =$ 10.3 ..... [2]

4 Solve the equation.

$6(y + 1) = 9$

$6y + 6 = 9$

$6y = 3$

$y = \frac{3}{6}$

$y =$ 1/2 ..... [2]

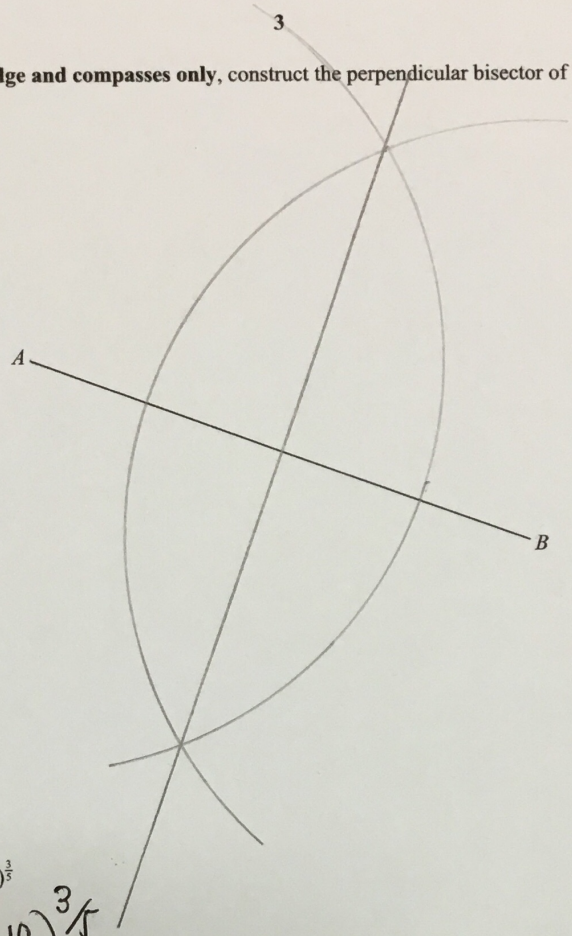
5 **Without using a calculator**, work out $\frac{1}{12} \times 1\frac{1}{5}$.

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

$\frac{1}{12} \times \frac{6}{5} = \frac{6}{60} = \frac{1}{10}$

$\frac{1}{10}$ ..... [2]

6 **Using a straight edge and compasses only**, construct the perpendicular bisector of the line AB.



[2]

7 Simplify.

$(32x^{10})^{\frac{3}{5}}$

$(32)^{\frac{3}{5}}(x^{10})^{\frac{3}{5}}$

$8x^6$ [2]

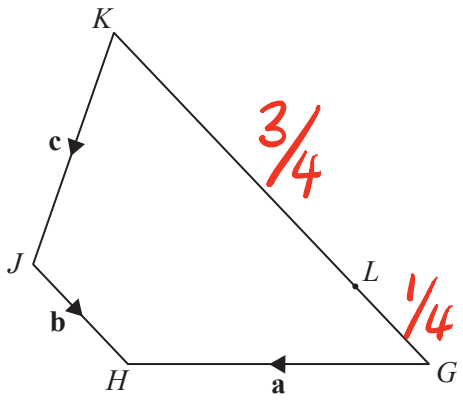
8 Write the recurring decimal $0.3\dot{2}$ as a fraction.
[$0.3\dot{2}$ means $0.3222\ldots$]

$x = 0.32222\ldots$
$10x = 3.22222\ldots$
$100x = 32.22222\ldots$
$100x - 10x = 32.xxxxxx\ldots$
$- \ 3.xxxxxx\ldots$

$90x = 29$
$x = \frac{29}{90}$

$\frac{29}{90}$ [2]

9



NOT TO SCALE

$GHJK$ is a quadrilateral.
$\overrightarrow{GH} = \mathbf{a}$, $\overrightarrow{JH} = \mathbf{b}$ and $\overrightarrow{KJ} = \mathbf{c}$.
L lies on GK so that $LK = 3GL$.

Find an expression, in terms of **a**, **b** and **c**, for $\overrightarrow{GL}$.

$\overrightarrow{GK} = a - b - c$

$\overrightarrow{GL} = \frac{1}{4}(a - b - c)$

$\overrightarrow{GL} =$ $\frac{1}{4}a - \frac{1}{4}b - \frac{1}{4}c$ [2]

10 Find the highest common factor (HCF) of 56 and 70.

56 : 1, 56 2, 28 4, 14 7, 8

70 : 1, 70 2, 30 5, 14 7, 10

14

..... [2]

11 Hattie has a box of coloured pens.
She takes a pen at random from the box.
The probability that she takes a red pen is 0.4 .

(a) Work out the probability that she does not take a red pen.

1 − 0.4

..... 0.6 ..... [1]

(b) The box contains only blue, red and green pens.
There are 15 blue pens and 15 green pens.

Complete the table.

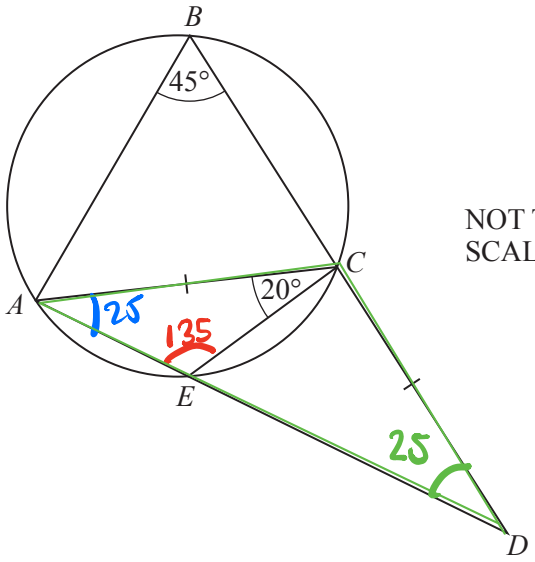
Colour of pen	Blue	Red	Green
Number of pens	15	20	15
Probability	0.3	0.4	0.3

60% = 30

$\frac{30}{60} \times 40 = 20$

[2]

12



NOT TO SCALE

180 − 45 = 135

180 − 20 − 135 = 25

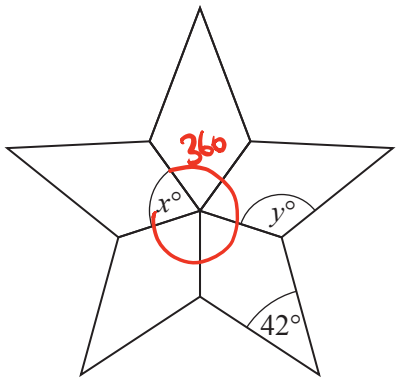
180 − 25 − 25 − 20 = 110

ABCE is a cyclic quadrilateral.
AED and *BCD* are straight lines.
AC = *CD*, angle *ABC* = 45° and angle *ACE* = 20°.

Work out angle *ECD*.

Angle *ECD* = ... 110 ..... [3]

13



NOT TO SCALE

The diagram is made from 5 congruent kites.

Work out the value of

(a) x,

$\frac{360}{5} = 72$

$x =$ 72 [1]

(b) y.

Angles in kite = 360

$\frac{360 - 72 - 42}{2}$

$y =$ 123 [2]

14 **(a)** $\mathscr{E} = \{x: 2 \leqslant x \leqslant 16, x \text{ is an integer}\}$
$M = \{\text{even numbers}\}$
$P = \{\text{prime numbers}\}$

(i) Find n(M).

2, 4, 6, 8, 10, 12, 14, 16

..... 8 ..... [1]

(ii) Write down the set $(P \cup M)'$.

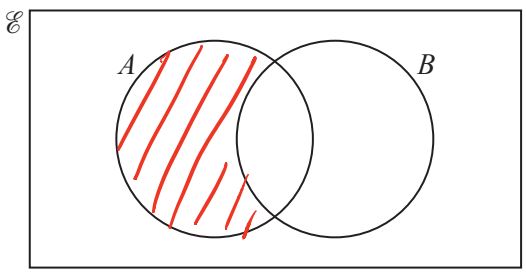
not prime or even

3, 5, 7, 9, 11, 13, 15

$(P \cup M)' = \{$ 9, 15 $\}$ [1]

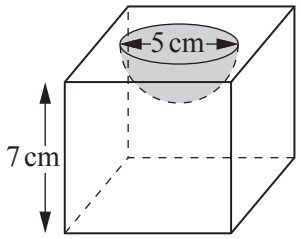
(b) On the Venn diagram, shade $A \cap B'$.

A and not B



[1]

15 A solid consists of a metal cube with a hemisphere cut out of it.



NOT TO SCALE

The length of a side of the cube is 7 cm.
The diameter of the hemisphere is 5 cm.

Calculate the volume of this solid.
[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

Volume of square $= (7)^3 = 343$

Volume of hemisphere $= \frac{4}{3} \times \pi \times (2.5)^3 \times \frac{1}{2} = \frac{125}{12}\pi$

$310.2750765 = 343 - \frac{125}{12}\pi$.

.....310..... cm^3 [3]

16 y is directly proportional to $(x + 2)^2$.
When $x = 8$, $y = 250$.

Find y when $x = 4$.

$y = k(x+2)^2$

when $x = 8$ and $y = 250$

$250 = k(8+2)^2$

$250 = 100k$.

$\frac{250}{100} = k = 2.5$

$y = 2.5(4+2)^2$.

$y = 90$

$y =$ .....90..... [3]

17 **(a)** $V = IR$

In an experiment I and R are both measured correct to 1 decimal place.

When $I = 4.0$ and $R = 2.7$, find the **lower** bound for V.

.....10.4675..... [2]

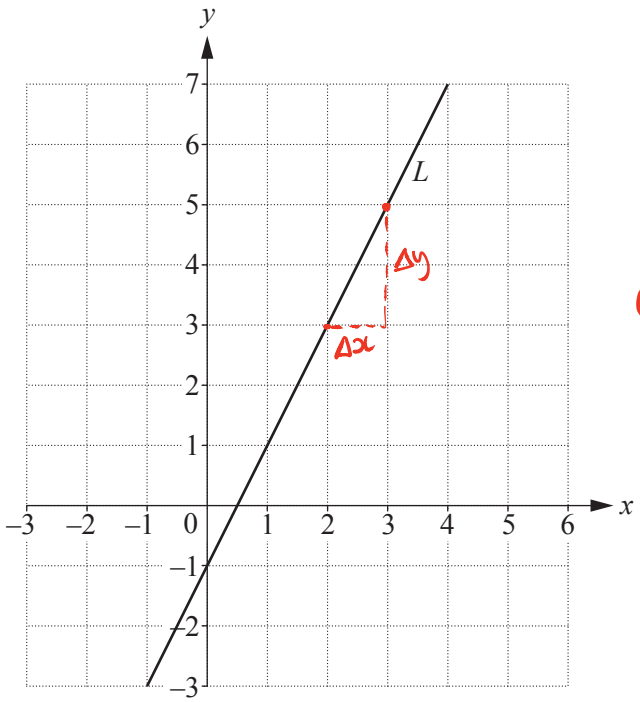
(b) $S = \frac{D}{T}$

In an experiment D and T are both measured correct to 2 significant figures.

When $D = 7.6$ and $T = 0.23$, find the **upper** bound for S.

.....34..... [2]

18



(a) Work out the gradient of the line L.

.....2..... [2]

(b) Write down the equation of the line parallel to the line L that passes through the point (0, 6).

.....y = 2x + 6..... [2]

19 At the start of an experiment there are 20 000 bacteria.
The number of bacteria increases at a rate of 30% per hour.

(a) Work out the number of bacteria after 4 hours.

$100+30=130$

$20\,000 \times \left(\frac{130}{100}\right)^4$

57122 ..... [2]

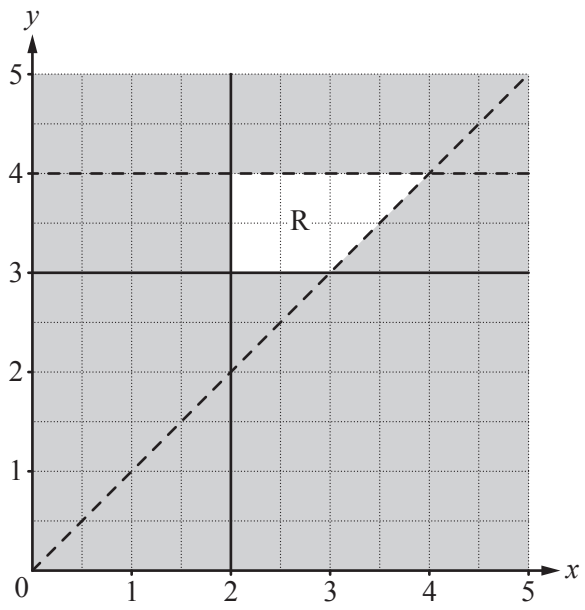
(b) After how many **whole** hours, from the start of the experiment, will the number of bacteria be greater than one million?

$20000 \times \left(\frac{130}{100}\right)^n = 1000000$

$\left(\frac{130}{100}\right)^n = 50$ $n=15$

15 ..... hours [2]

20



Find four inequalities that define the region, R, on the grid.

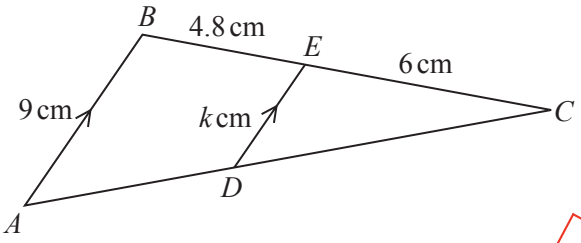
$y<4$

$y>x$

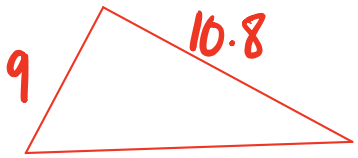
$y\geqslant 3$

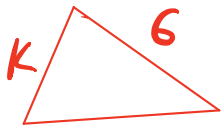
$x\geqslant 2$ ..... [4]

21 (a)



NOT TO SCALE





Triangles *CBA* and *CED* are similar.
AB is parallel to *DE*.
AB = 9 cm, *BE* = 4.8 cm, *EC* = 6 cm and *ED* = *k* cm.

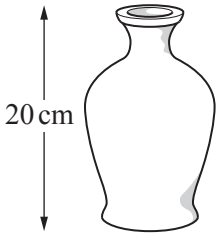
Work out the value of *k*.

Scale Factor = $\frac{10.8}{6}$ = 1.8

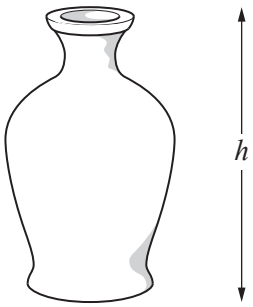
9 ÷ 1.8 = 5

k = 5 [2]

(b)



Vase A



Vase B

NOT TO SCALE

The diagram shows two mathematically similar vases.
Vase A has height 20 cm and volume 1500 cm^3.
Vase B has volume 2592 cm^3.

Calculate *h*, the height of vase B.

Volume Scale Factor = $\frac{2592}{1500}$ = 1.728

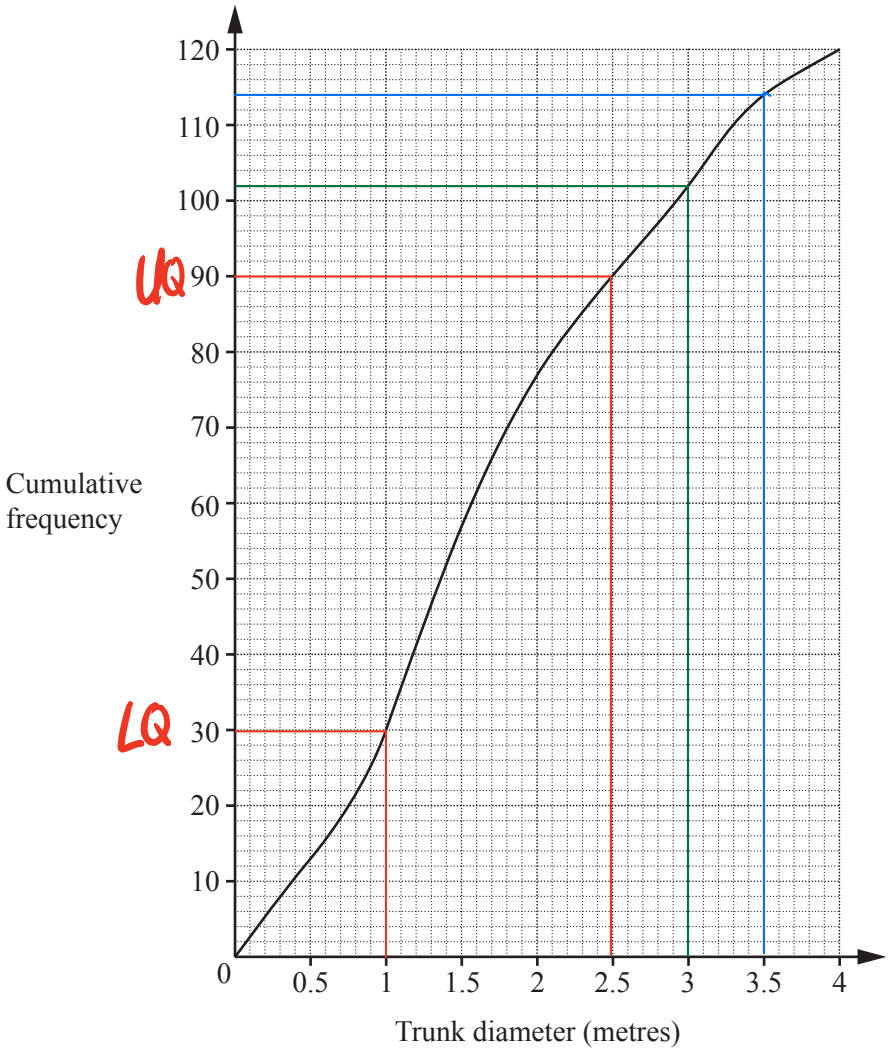
$\sqrt[3]{1.728}$ = length Scale Factor

= 1.2

20 × 1.2 = 24

h = 24 cm [3]

22 The cumulative frequency diagram shows information about the trunk diameter, in metres, of 120 trees.



Find

(a) the inter-quartile range,

UQ − 0.75 × 120 = 90

LQ − 0.25 × 120 = 30

2.5 − 1

1.5 ..... m [2]

(b) the 95th percentile,

0.95 × 120 = 114

3.5 ..... m [2]

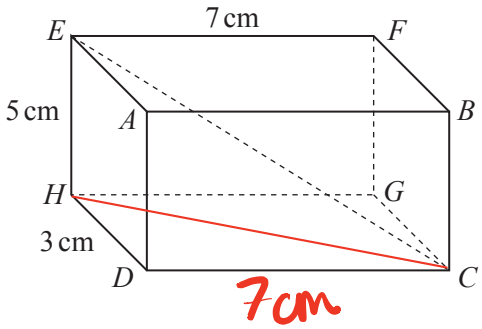
(c) the number of trees with a trunk diameter greater than 3 metres.

120 − 102 = 18

18 ..... [2]

Question 23 is printed on the next page.

23



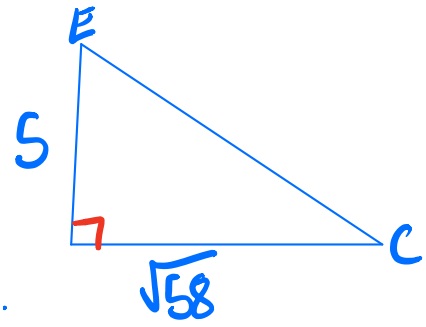
NOT TO SCALE

$\sqrt{3^2+7^2} = \sqrt{58}$

The diagram shows a cuboid.
$HD = 3$ cm, $EH = 5$ cm and $EF = 7$ cm.

Calculate

(a) the length CE,

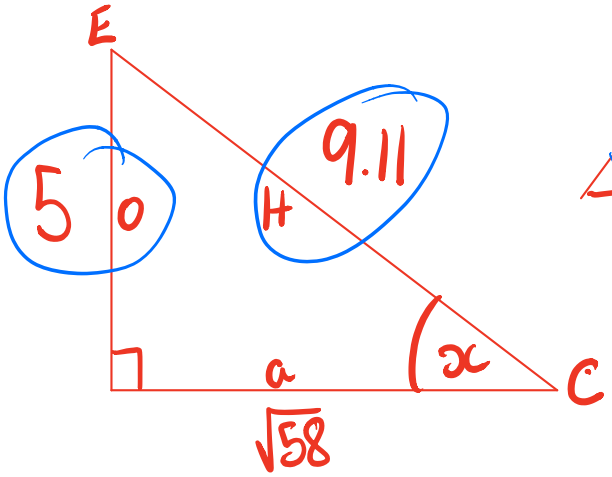


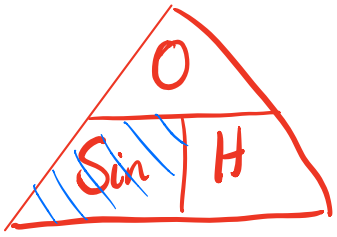
$\sqrt{(\sqrt{58})^2+5^2}$

$= 9.110433579$

$CE =$ 9.11 cm [4]

(b) the angle between CE and the base $CDHG$.





$\sin x = \frac{5}{9.11}$

$x = \sin^{-1}\left(\frac{5}{9.11}\right)$

$x = 33.287977708$

33.3 [3]