Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

4177779191

MATHEMATICS **0580/21**

Paper 2 (Extended) **October/November 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.

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CAMBRIDGE International Examinations

[Turn over

1 Write down the temperature which is 5 °C below –2 °C.

-7 ..... °C [1]

2 Write 0.040 190 7 correct to

(a) 3 significant figures,

0.0402 .....[1]

(b) 3 decimal places.

0.040 .....[1]

3 The price of a toy is 12 euros (€) in Germany and 14 Swiss francs in Switzerland.
1 Swiss franc = €0.905

Calculate the difference between these two prices.
Give your answer in euros.

$14 \times 0.905 = 12.67$

$12.67 - 12$

€ 0.67 .....[2]

4 Work out $\frac{2}{3} - \frac{1}{4}$, giving your answer as a fraction in its lowest terms.

Do not use a calculator and show all the steps of your working.

$\frac{2}{3}^{\times 4} - \frac{1}{4}^{\times 3}$

$\frac{8}{12} - \frac{3}{12} = \frac{5}{12}$

$\frac{5}{12}$ .....[2]

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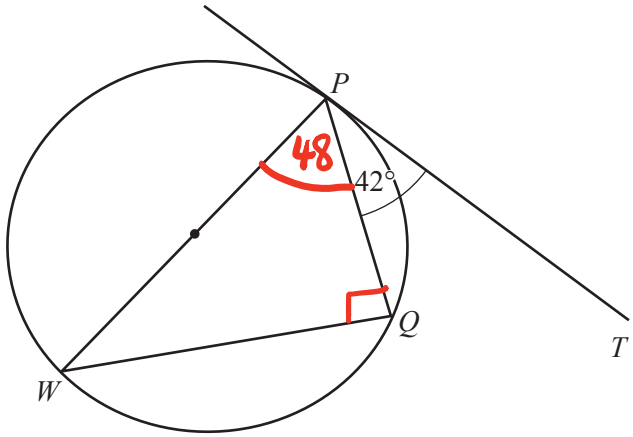
5 **(a)** Write 5^{-3} as a fraction.

$\frac{1}{125}$ ..... [1]

(b) Write 0.004 56 in standard form.

4.56×10^{-3} ..... [1]

6



NOT TO SCALE

In the diagram, PT is a tangent to the circle at P.
PW is a diameter and angle $TPQ = 42°$.

Find angle PWQ.

$180 - 90 - 48$

Angle PWQ = 42 ..... [2]

7 Simplify. $\frac{x^3y + 2xy^3}{x^2y^2}$

$\frac{x^3y}{x^2y^2} + \frac{2xy^3}{x^2y^2} = \frac{x}{y} + \frac{2y}{x}$

$\frac{x}{y} + \frac{2y}{x}$ ..... [2]

8 Write as a single fraction.

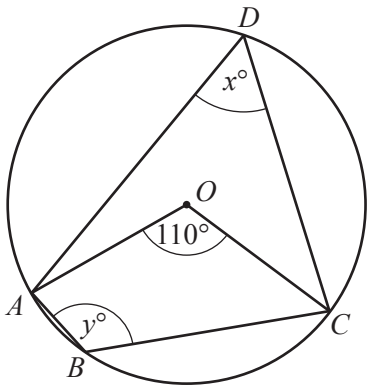
$$1-\frac{2}{p}-\frac{3}{t}$$

$\frac{pt}{pt}-\frac{2t}{pt}-\frac{3p}{pt}$

$\frac{pt-2t-3p}{pt}$

..... [2]

9



NOT TO SCALE

A, B, C and D lie on the circle, centre O.

Find the value of x and the value of y.

$x = \frac{110}{2} = 55$

$y = 180 - 55 = 125$

$x =$ 55

$y =$ 125 [2]

10 Simplify.

$$(36x^{16})^{\frac{1}{2}}$$

$(36)^{1/2}(x^{16})^{1/2}$

$6x^8$ [2]

11 Solve the simultaneous equations.
You must show all your working.

$2x + 3y = 13$
$x + 2y = 9$) $\times 2$

$2x + 3y = 13$
$-\ 2x + 4y = 18$
$-y = -5$
$y = 5$

when $y = 5$
$x + 2(5) = 9$
$x + 10 = 9$
$x = -1$

$x =$ -1

$y =$ 5 [3]

12 **(a)** Write \$0.70 as a fraction of \$5.60, giving your answer in its lowest terms.

$\frac{0.70 \times 10}{5.60 \times 10} = \frac{7}{56}$

$\frac{1}{8}$ [1]

(b) Write the recurring decimal $0.\dot{1}\dot{8}$ as a fraction in its lowest terms.
[$0.\dot{1}\dot{8}$ means 0.181818…]

$x = 0.18181818\ldots$
$100x = 18.18181818\ldots$
$100x - x = 18.18\ldots - 0.18\ldots$
$99 = 18$
$x = \frac{18}{99} = \frac{2}{11}$

$\frac{2}{11}$ [2]

13 Factorise completely.

(a) $4p^2 - 9$

$(2p+3)(2p-3)$ [1]

(b) $2ax - 4bx - ay + 2by$

$2x(a-2b) - y(a-2b)$

$(2x-y)(a-2b)$ [2]

14 y is directly proportional to the square root of $(x + 2)$.
When $x = 7$, $y = 2$.

Find y when $x = 98$.

$y = k\sqrt{(x+2)}$

$x=7$ and $y=2$.

$2 = k\sqrt{9}$

$2 = 3k$

$k = 2/3$

$y = \frac{2}{3}\sqrt{x+2}$

$x=98$

$y = \frac{2}{3}\sqrt{100} = \frac{2}{3} \times 10$

$20/3$ or $6\frac{2}{3}$

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

15 Work out.

(a) $2\begin{pmatrix}3\\5\end{pmatrix} - \begin{pmatrix}1\\2\end{pmatrix}$

$\begin{pmatrix}6\\10\end{pmatrix} - \begin{pmatrix}1\\2\end{pmatrix}$

$\begin{pmatrix}5\\8\end{pmatrix}$ ..... [1]

(b) $\begin{pmatrix}1 & 2\end{pmatrix}\begin{pmatrix}2\\3\end{pmatrix}$

$((1\times2)+(2\times3))$

(8) ..... [2]

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16 Two cups are mathematically similar.
The larger cup has capacity 0.5 litres and height 8 cm.
The smaller cup has capacity 0.25 litres.

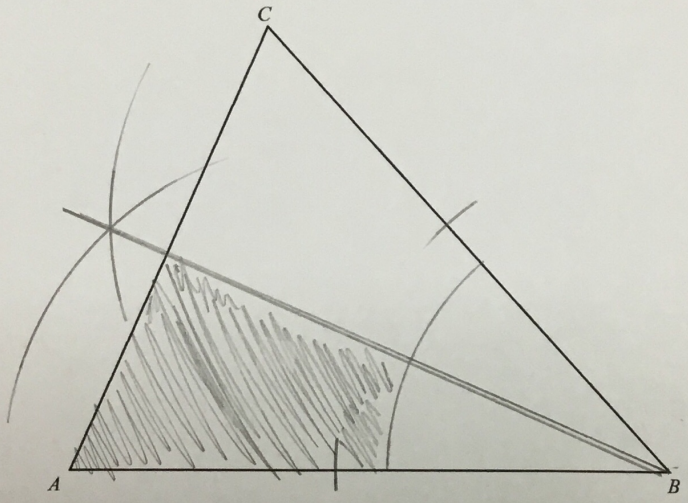
Find the height of the smaller cup.

$\frac{0.5}{0.25} = 2 =$ Volume Scale Factor

$\frac{8}{\sqrt[3]{2}} = 6.349604208$

6.35 ..... cm [3]

17



(a) Construct the locus of points, inside the triangle, that are 5 cm from B. [1]

(b) Construct the locus of points, inside the triangle, that are equidistant from AB and BC. [2]

(c) Shade the region, inside the triangle, containing points that are

- more than 5 cm from B

and

- nearer to AB than to BC. [1]

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18 $y = p^2 + qr$

(a) Find y when $p = -5$, $q = 3$ and $r = -7$.

$y = 25 + (3)(-7)$

$y = 25 - 21$

$y =$ 4 ..... [2]

(b) Write p in terms of q, r and y.

$y - qr = p^2$

$p = \sqrt{y - qr}$

$p =$ $\sqrt{y - qr}$ ..... [2]

19 Find the nth term of each sequence.

(a) 7, 13, 19, 25, 31, …

1, +6, +6, +6, +6, -6

$6n + 1$ ..... [2]

(b) 9, 16, 25, 36, 49, …

+7, +9, +11, +13

+2, +2, +2

$2a = 2$

$a = 1$

$3a + b = 7$

$3 + b = 7$

$b = 4$

$a + b + c = 9$

$1 + 4 + c = 9$

$c = 4$

$n^2 + 4n + 4$ ..... [2]

or

$(n + 2)^2$

20 A train travels for m minutes at a speed of x metres per second.

(a) Find the distance travelled, in **kilometres**, in terms of m and x. Give your answer in its simplest form.

$\frac{x}{1000} \times 60m$

$\frac{60mx}{1000}$

$\frac{3mx}{50}$

..... km [2]

(b) When $m = 5$, the train travels 10.5 km.

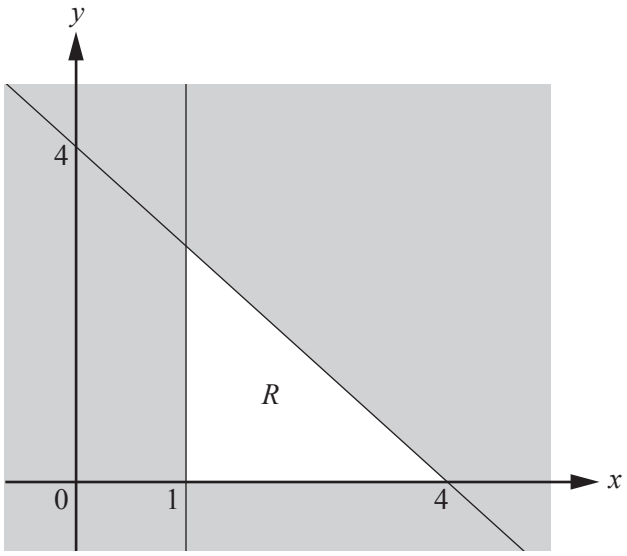
Find the value of x.

$\frac{3 \times 5 \times x}{50} = 10.5$

$x = \frac{10.5 \times 50}{15}$

$x =$ 35 ..... [2]

21



NOT TO SCALE

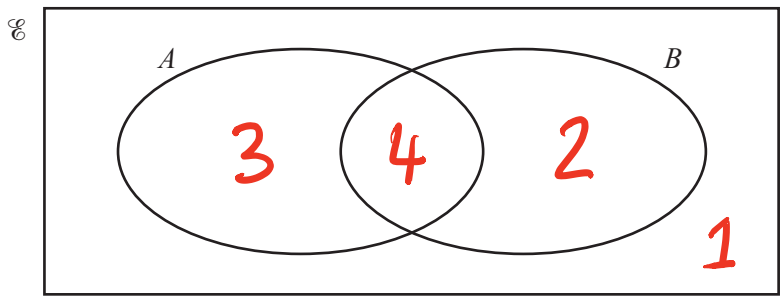
Write down the three inequalities that define the unshaded region, R.

$y \geqslant 0$

$x + y \leqslant 4$

$x \geqslant 1$ ..... [4]

22 **(a)** $n(\mathscr{E}) = 10,\ n(A) = 7,\ n(B) = 6,\ n(A \cup B)' = 1.$



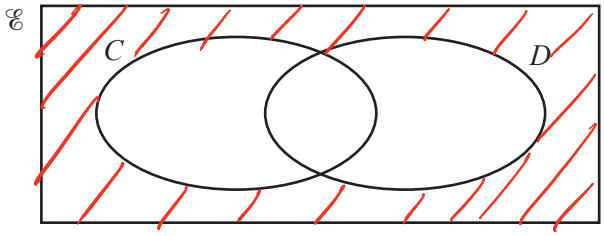
(i) Complete the Venn diagram by writing the number of elements in each subset. [2]

(ii) An element of $\mathscr{E}$ is chosen at random.

Find the probability that this element is an element of $A' \cap B$.

2/10 ..... [1]

(b) On the Venn diagram below, shade the region $C' \cap D'$.



[1]

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23 Solve the equation $2x^2 + 3x - 3 = 0$.
Show all your working and give your answers correct to 2 decimal places.

$$x = \frac{-3 \pm \sqrt{9-(4)(2)(-3)}}{4}$$

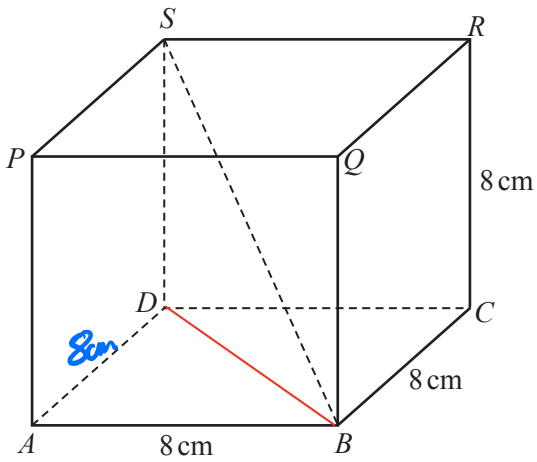
$$x = \frac{-3+\sqrt{33}}{4} \quad \text{or} \quad x = \frac{-3-\sqrt{33}}{4}$$

$$x = 0.6861406616 \quad \text{or} \quad x = -2.186140662$$

$x =$ 0.69 or $x =$ -2.19 [4]

Question 24 is printed on the next page.

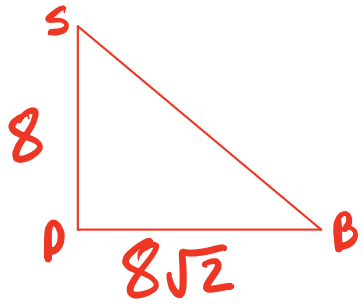
24



NOT TO SCALE

The diagram shows a cube of side length 8 cm.

(a) Calculate the length of the diagonal *BS*.



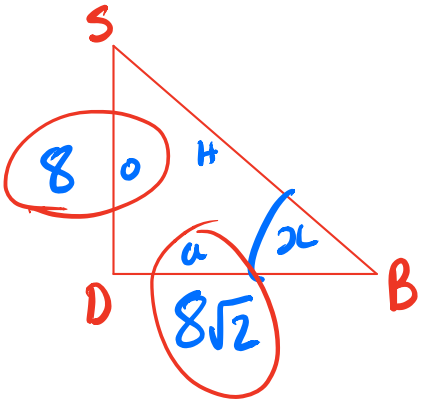
$\sqrt{8^2+8^2} = 8\sqrt{2}$

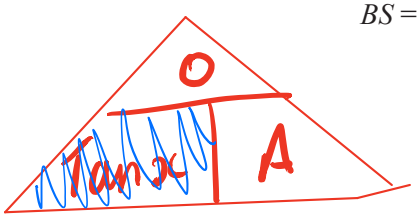
$\sqrt{(8\sqrt{2})^2+(8^2)} = BS$

$BS = 8\sqrt{3}$

BS = 13.9 cm [3]

(b) Calculate angle *SBD*.





$\tan x = \frac{8}{8\sqrt{2}}$

$x = \tan^{-1}\left(\frac{1}{\sqrt{2}}\right)$

Angle *SBD* = 35.3 [2]

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