Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

MATHEMATICS **0580/23**

Paper 2 (Extended) **May/June 2014**

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.

1 In March 2011, the average temperature in Kiev was 3°C.
In March 2012, the average temperature in Kiev was 19°C lower than in March 2011.

Write down the average temperature in Kiev in March 2012.

3 − 19

Answer −16 °C [1]

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2 Michelle sells ice cream.
The table shows how many of the different flavours she sells in one hour.

Flavour	Vanilla	Strawberry	Chocolate	Mango
Number sold	6	8	9	7

Total 30

Michelle wants to show this information in a pie chart.

Calculate the sector angle for mango.

$\frac{360}{30} \times 7$

Answer 84 [2]

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3 Chris changes $1350 into euros (€) when €1 = $1.313 .

Calculate how much he receives.

× ÷

$\frac{1350}{1.313} = 1028.179741$

Answer € 1028.18 [2]

---

4 Factorise completely.

$15a^3 - 5ab$

Answer $5a(3a^2 - b)$ [2]

---

5 **(a)** Use your calculator to find the value of $7.5^{-0.4} \div \sqrt{57}$.
Write down your full calculator display.

Answer(a) 0.059161348 [1]

(b) Write your answer to **part (a)** in standard form.

Answer(b) 5.9161348×10^{-2} [1]

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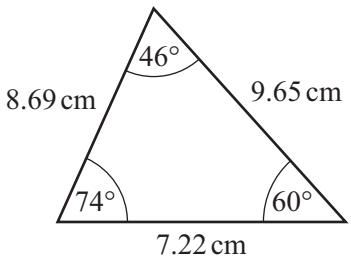
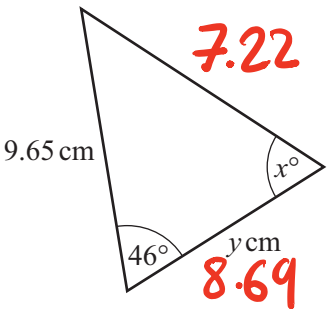
6 Simplify.

$3x^2y^3 \times x^4y$

Answer $3x^6y^4$ [2]

7





NOT TO SCALE

These two triangles are congruent. → Same
Write down the value of

(a) x,

Answer(a) $x =$ 74° [1]

(b) y.

Answer(b) $y =$ 8.69 [1]

---

8 Hans draws a plan of a field using a scale of 1 centimetre to represent 15 metres.
The actual area of the field is 10 800 m^2.

Calculate the area of the field on the plan.

1cm → 15m

$1cm^2 \rightarrow (15m)^2$

$\frac{10800}{(15)^2} = 48$

Answer 48 cm^2 [2]

---

9 Solve the inequality.

$5t + 23 < 17 - 2t$

$5t + 2t < 17 - 23$

$7t < -6$

$t < \frac{-6}{7}$

Answer $t < \frac{-6}{7}$ [2]

---

10 Without using a calculator, work out $1\frac{1}{4} - \frac{7}{9}$.

Write down all the steps in your working.

$\frac{5}{4} \times 9 - \frac{7}{9} \times 4 = \frac{45}{36} - \frac{28}{36} = \frac{17}{36}$

Answer $\frac{17}{36}$ [3]

---

11 y varies as the cube root of $(x + 3)$.
When $x = 5$, $y = 1$.

Find the value of y when $x = 340$.

$y = k\sqrt[3]{x+3}$

So $x=5$ and $y=1$

$1 = k\sqrt[3]{5+3}$

$1 = k\sqrt[3]{8}$

$\frac{1}{2} = k$

$y = \frac{1}{2}\sqrt[3]{340+3}$

$y = \frac{1}{2}\sqrt[3]{343}$

$y = \frac{1}{2} \times 7$

Answer $y =$ 3.5 [3]

---

12 **(a)** Factorise $3x^2 + 2x - 8$.

Product = $3 \times -8 = -24$ } 6 and -4
Sum = 2

$3x^2 + 6x - 4x - 8$

$3x(x+2) - 4(x+2)$

Answer(a) $(x+2)(3x-4)$ [2]

(b) Solve the equation $3x^2 + 2x - 8 = 0$.

$(x+2)(3x-4) = 0$

Answer(b) $x =$ -2 or $x =$ $\frac{4}{3}$ [1]

---

13 Find the equation of the line passing through the points with co-ordinates $(5, 9)$ and $(-3, 13)$.

(x_1, y_1) (x_2, y_2)

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{13 - 9}{-3 - 5} = \frac{4}{-8} = -\frac{1}{2}$

$y = mx + c$

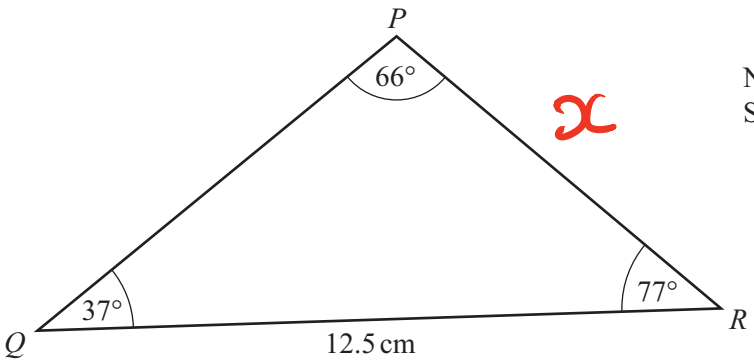
Find m and c

$y = -\frac{1}{2}(x) + c$ Sub (5, 9)

$9 = -\frac{1}{2}(5) + c \rightarrow c = 9 + 2.5$

Answer $y = -\frac{1}{2}x + 11.5$ [3]

14



Calculate *PR*.

$$\frac{x}{\sin(37)} = \frac{12.5}{\sin(66)}$$

$$x = \frac{12.5 \times \sin(37)}{\sin(66)} = 8.234606966$$

Answer PR = ... 8.23 ..... cm [3]

---

15 A rectangle has length 127.3 cm and width 86.5 cm, both correct to 1 decimal place. → $\frac{0.1}{2} = 0.05$

Calculate the upper bound and the lower bound for the perimeter of the rectangle.

127.3 → LB −0.05 → 127.25; UB +0.05 → 127.35

86.5 → LB −0.05 → 86.45; UB +0.05 → 86.55

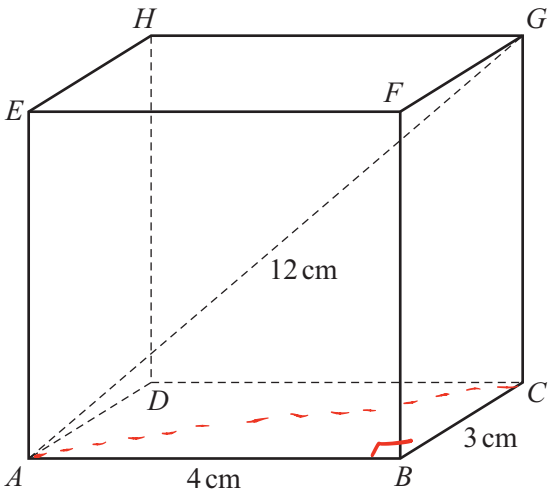
Upper bound = $(2 \times 127.35) + (2 \times 86.55)$

Lower Bound = $(2 \times 127.25) + (2 \times 86.45)$

Answer Upper bound = ... 427.8 ..... cm

Lower bound = ... 427.4 ..... cm [3]

16

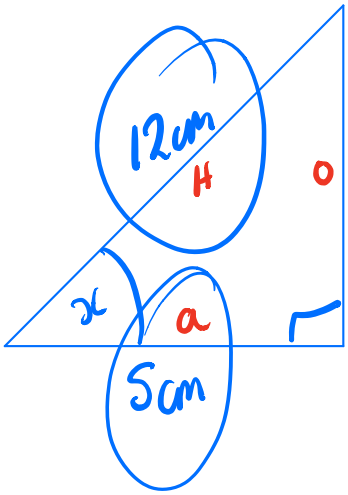


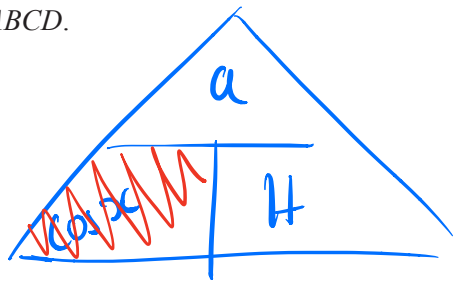
NOT TO SCALE

$\sqrt{4^2+3^2}=5$

ABCDEFGH is a cuboid.
AB = 4 cm, *BC* = 3 cm and *AG* = 12 cm.

Calculate the angle that *AG* makes with the base *ABCD*.





$\cos x = \frac{5}{12}$

$x = \cos^{-1}\left(\frac{5}{12}\right)$

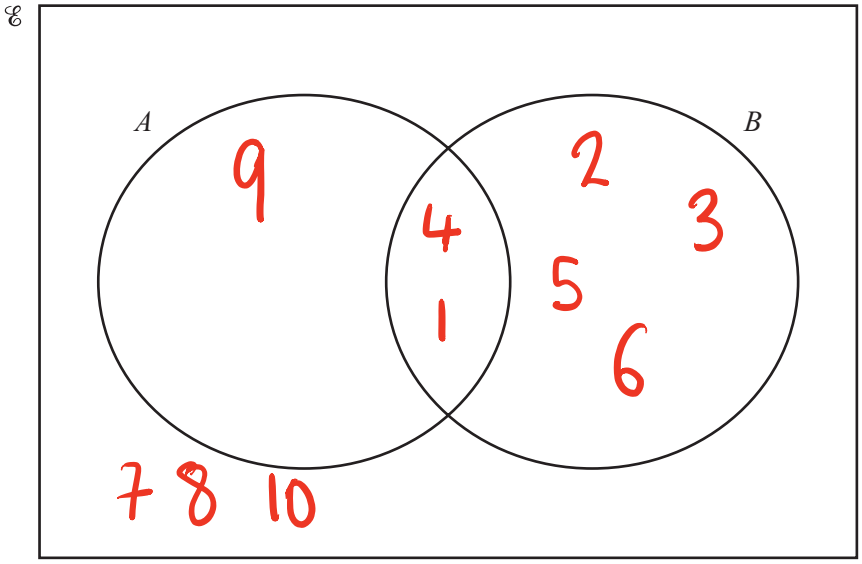
Answer 65.4 [4]

17 $\mathscr{E} = \{x : 1 \leqslant x \leqslant 10$, where x is an integer$\}$

$A = \{$square numbers$\}$ → 1, 4, 9

$B = \{1, 2, 3, 4, 5, 6\}$

(a) Write all the elements of $\mathscr{E}$ in their correct place in the Venn diagram.



[2]

(b) List the elements of $(A \cup B)'$.

Answer(b) 7, 8, 10 [1]

(c) Find $n(A \cap B')$.

Answer(c) 1 [1]

18 $\mathbf{A} = \begin{pmatrix} 5 & 2 \\ 4 & 3 \end{pmatrix}$

(a) Calculate $\mathbf{A}^2$.

$\begin{pmatrix} 5 & 2 \\ 4 & 3 \end{pmatrix}\begin{pmatrix} 5 & 2 \\ 4 & 3 \end{pmatrix} = \begin{pmatrix} (5\times5)+(2\times4) & (5\times2)+(2\times3) \\ (4\times5)+(3\times4) & (4\times2)+(3\times3) \end{pmatrix}$

Answer(a) $\begin{pmatrix} 33 & 16 \\ 32 & 17 \end{pmatrix}$ [2]

(b) Calculate $\mathbf{A}^{-1}$, the inverse of $\mathbf{A}$.

$\frac{1}{(5\times3)-(2\times4)}\begin{pmatrix} 3 & -2 \\ -4 & 5 \end{pmatrix}$

Answer(b) $\frac{1}{7}\begin{pmatrix} 3 & -2 \\ -4 & 5 \end{pmatrix}$ [2]

---

19 Robbie pays \$10.80 when he buys 3 notebooks and 4 pencils.
Paniz pays \$14.50 when she buys 5 notebooks and 2 pencils.

Write down simultaneous equations and use them to find the cost of a notebook and the cost of a pencil.

$3n + 4p = 10.80$
$(5n + 2p = 14.50)\times2$

$3n + 4p = 10.80$
$-\ 10n + 4p = 29$
$-7n = -18.2$
$n = 2.6$

$5(2.6) + 2p = 14.50$
$13 + 2p = 14.50$
$p = \frac{14.50 - 13}{2}$
$p = 0.75$

Answer Cost of a notebook = \$ 2.60

Cost of a pencil = \$ 0.75 [5]

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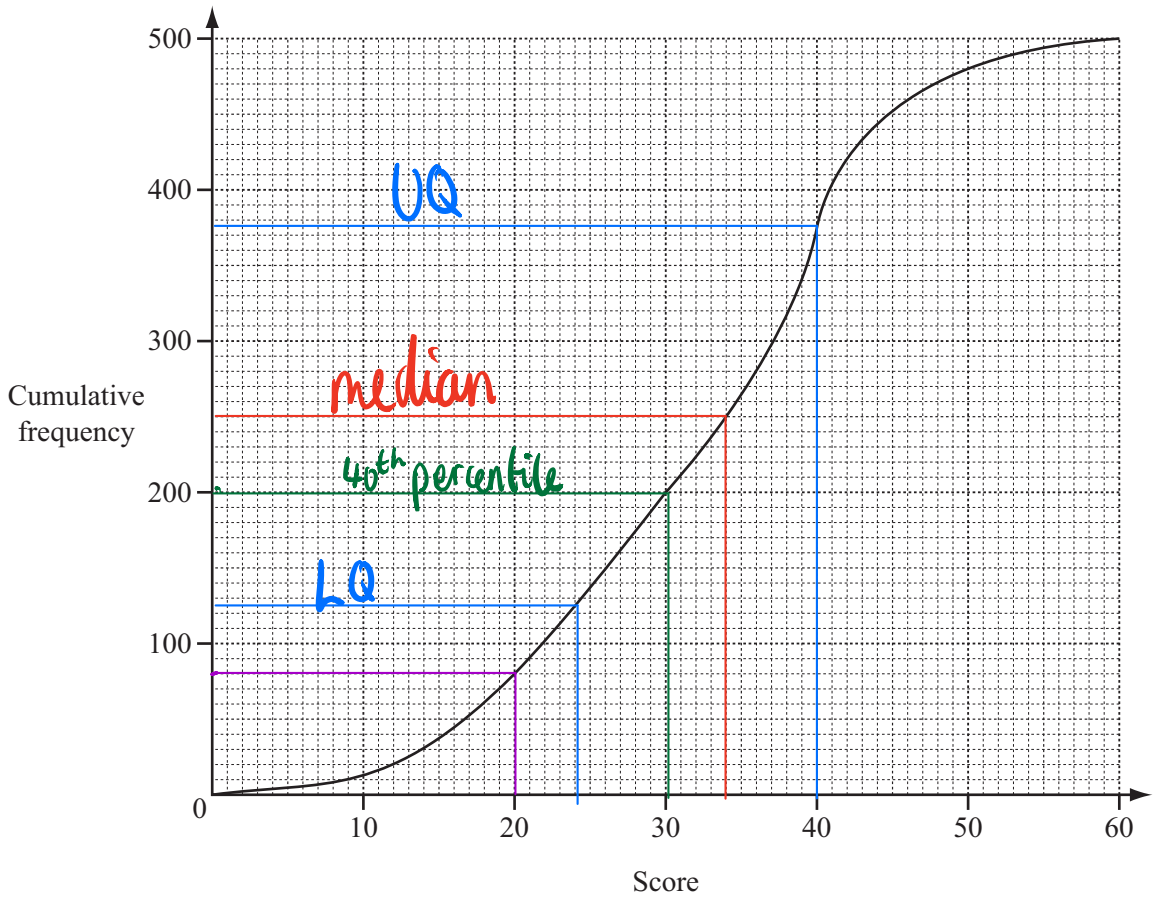
20 Jenna draws a cumulative frequency diagram to show information about the scores of 500 people in a quiz.



Use the diagram to find

(a) the median score,

$\frac{500}{2} = 250$

Answer(a) 34 [1]

(b) the inter-quartile range,

$\frac{500}{4} = 125$ $\frac{500}{4} \times 3 = 375$ $40 - 24$

Answer(b) 16 [2]

(c) the 40th percentile,

$0.4 \times 500 = 200$

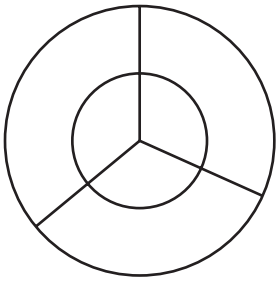
Answer(c) 30 [1]

(d) the number of people who scored 30 or less but more than 20.

$200 - 80$

Answer(d) 120 [1]

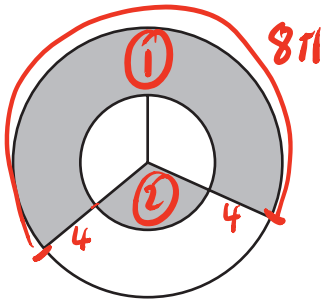
21



NOT TO SCALE

The diagram shows two concentric circles and three radii.
The diagram has rotational symmetry of order 3.

A club uses the diagram for its badge with some sections shaded.
The radius of the large circle is 6 cm and the radius of the small circle is 4 cm.



NOT TO SCALE

Calculate the total perimeter of the shaded area.

① $\frac{2}{3} \times 2 \times \pi \times 6 = 8\pi$

$(6-4) \times 2 = 4$

② $2 \times \pi \times 4 = 8\pi$

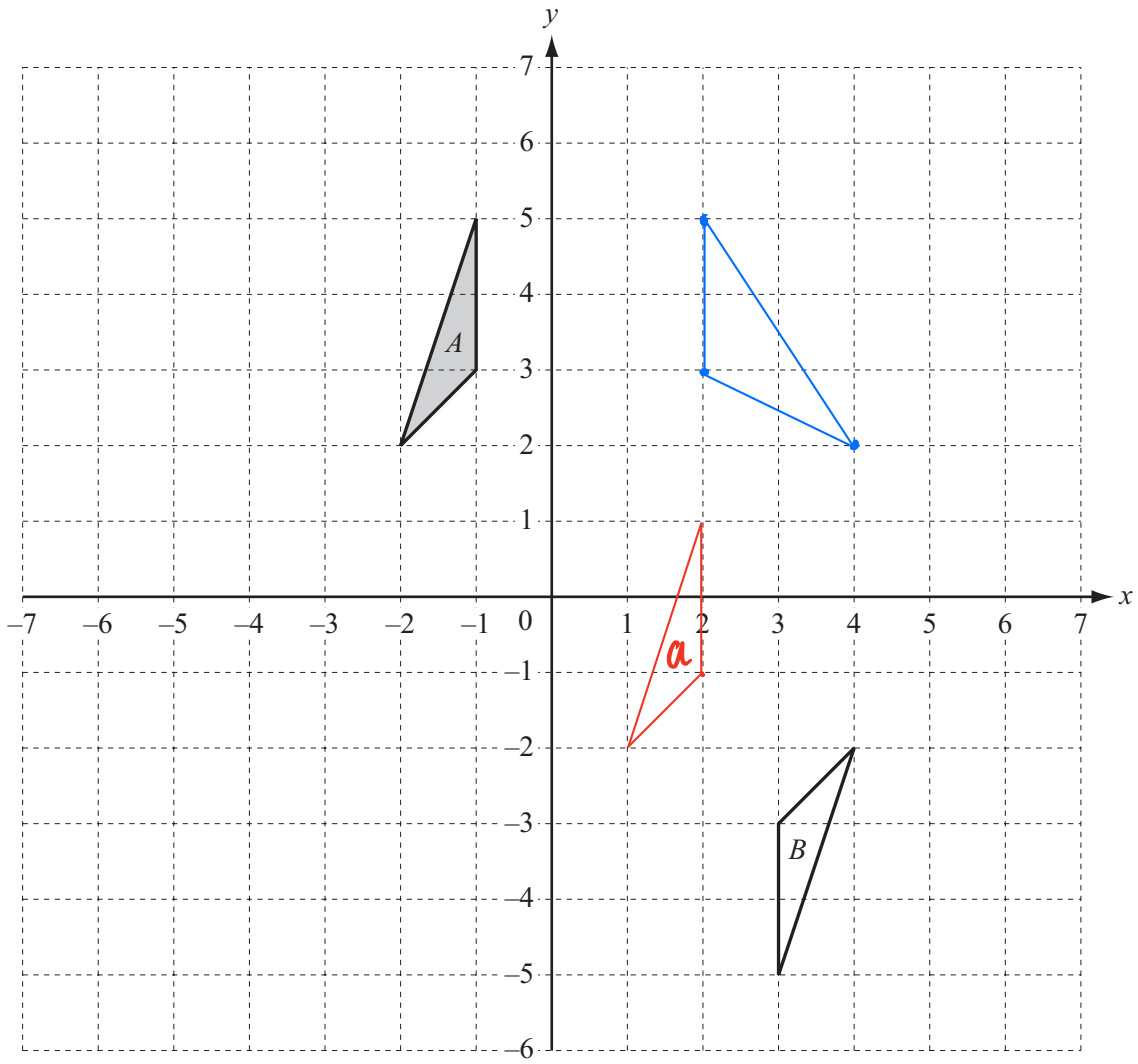
$8\pi + 4 + 4 = 8 + 8\pi$

$8\pi + 4 + 8 + 8\pi = 62.265548246$

Answer 62.3 cm [5]

Question 22 is printed on the next page.

22



(a) Draw the image of triangle A after a translation by the vector $\begin{pmatrix} 3 \\ -4 \end{pmatrix}$. [2]

(b) Describe fully the **single** transformation which maps triangle A onto triangle B.

Answer(b) Rotation at center (1,0) at 180°

..... [3]

(c) Draw the image of triangle A after the transformation represented by the matrix $\begin{pmatrix} -2 & 0 \\ 0 & 1 \end{pmatrix}$. [3]

$\begin{pmatrix} -2 & 0 \\ 0 & 1 \end{pmatrix}\left(\begin{array}{c|c|c} -1 & -1 & -2 \\ 3 & 5 & 2 \end{array}\right) = \left(\begin{array}{c|c|c} 2 & 2 & 4 \\ 3 & 5 & 2 \end{array}\right)$ = (2,3) (2,5) (4,2)

Triangle A