Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	

CENTRE NUMBER		CANDIDATE NUMBER	

3014020988

MATHEMATICS **0580/22**

Paper 2 (Extended) **October/November 2014**

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.

This document consists of **12** printed pages.

IB14 11_0580_22/RP

1 Insert **one pair** of brackets only to make the following statement correct.

$$6 + 5 \times (10 - 8) = 16$$

[1]

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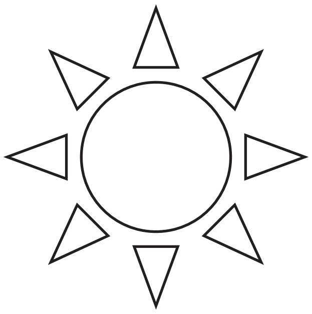
2 Calculate $\dfrac{8.24 + 2.56}{1.26 - 0.72}$.

Answer ....20....... [1]

3



Write down the order of rotational symmetry of this shape.

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

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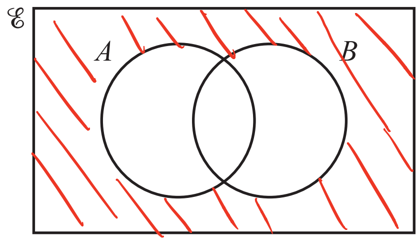
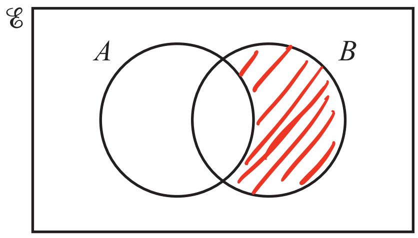
4 Shade the region required in each Venn diagram.



$(A \cup B)'$



$A' \cap B$

[2]

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5 Make r the subject of this formula.

$$v = \sqrt[3]{p+r}$$

$V^3 = p + r$

$V^3 - p = r$

Answer r = $V^3 - p$ [2]

---

6 The length, l metres, of a football pitch is 96 m, correct to the nearest metre. → 1 → $\frac{1}{2} = 0.5$

Complete the statement about the length of this football pitch.

LB 96 UB

−0.5 +0.5

95.5 96.5

Answer 95.5 $\leqslant l <$ 96.5 [2]

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7 For her holiday, Alyssa changed 2800 Malaysian Ringgits (MYR) to US dollars ($) when the exchange rate was 1 MYR = $0.325 .

×

At the end of her holiday she had $210 left.

(a) How many dollars did she spend?

$2800 \times 0.325 = 910$

$910 - 210 = 700$

Answer(a) $ 700 [2]

(b) She changed the $210 for 750 MYR.

What was the exchange rate in dollars for 1 MYR?

Answer(b) 1 MYR = $ 0.28 [1]

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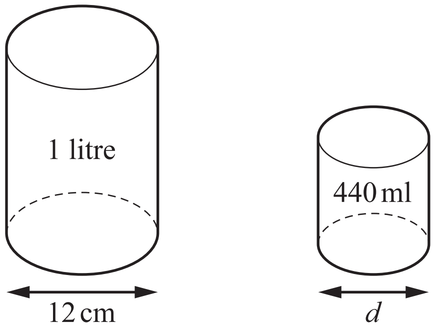
8 **Without using a calculator**, work out $1\frac{1}{6} \div \frac{7}{8}$.

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

$$\frac{7}{6} \div \frac{7}{8} = \frac{\cancel{7}}{6} \times \frac{8}{\cancel{7}} = \frac{8}{6} = \frac{4}{3}$$

Answer $1\frac{1}{3}$ [3]

9



NOT TO SCALE

$1L = 1000ml$

Two cylindrical cans are mathematically similar.
The larger can has a capacity of 1 litre and the smaller can has a capacity of 440 ml.

Calculate the diameter, d, of the 440 ml can.

$\frac{1000}{440} = \frac{25}{11}$ = Volume Scale Factor

$12 \div \sqrt[3]{\frac{25}{11}} = 9.127085906$

Answer d = 9.13 cm [3]

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10 The cost of a circular patio, \$ C, varies as the square of the radius, r metres.
$C = 202.80$ when $r = 2.6$.

Calculate the cost of a circular patio with $r = 1.8$.

$C = Kr^2$

$202.80 = K(2.6^2)$

$K = \frac{202.80}{2.6^2} = 30$

$C = 30(1.8^2) = 97.2$

Answer \$ 97.20 [3]

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11 $\mathbf{A} = \begin{pmatrix} 3 & -2 \\ 1 & 4 \end{pmatrix}$ $\mathbf{B} = \begin{pmatrix} 2 & 0 \\ -5 & 7 \end{pmatrix}$

(a) Calculate **BA**.

$\begin{pmatrix} 2 & 0 \\ -5 & 7 \end{pmatrix}\begin{pmatrix} 3 & -2 \\ 1 & 4 \end{pmatrix} = \begin{pmatrix} (2\times3) & (2\times-2) \\ (-5\times3)+(1\times7) & (-5\times-2)+(7\times4) \end{pmatrix}$

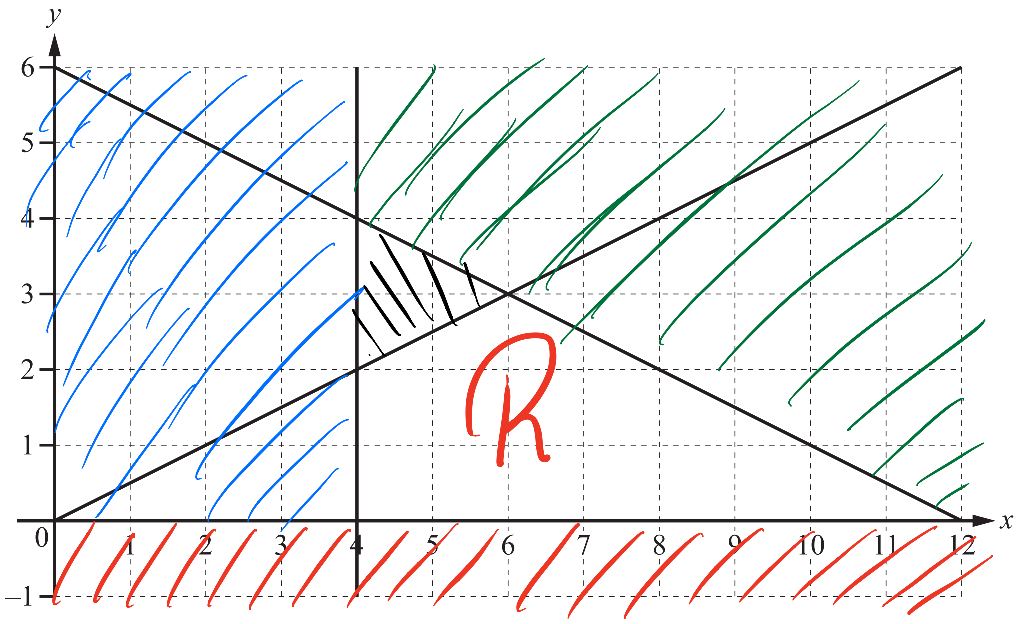
Answer(a) **BA** = $\begin{pmatrix} 6 & -4 \\ -8 & 38 \end{pmatrix}$ [2]

(b) Find the determinant of **A**.

$|A| = (3\times4)-(-2\times1)$

Answer(b) 14 [1]

12

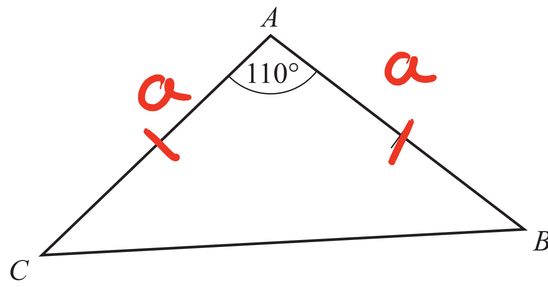


By shading the **unwanted** regions of the grid, find and label the region R which satisfies the following four inequalities.

$y \geqslant 0 \qquad x \geqslant 4 \qquad 2y \leqslant x \qquad 2y + x \leqslant 12$

[3]

13



NOT TO SCALE

Sides are the same

Triangle ABC is isosceles with $AB = AC$.
Angle $BAC = 110°$ and the area of the triangle is $85\,\text{cm}^2$.

Calculate AC.

$\text{Area} = \frac{1}{2} \times a \times a \times \sin(110)$

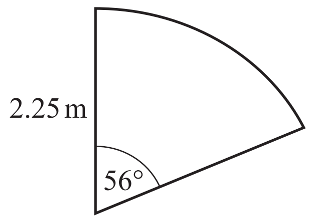
$= \frac{1}{2} \times a^2 \times \sin(110) = 85$

$a^2 = \frac{2 \times 85}{\sin(110)}$

Answer $AC =$ ......13.5...... cm [3]

$a = \sqrt{\frac{2 \times 85}{\sin(110)}}$

14



NOT TO SCALE

The diagram shows a sand pit in a child's play area.
The shape of the sand pit is a sector of a circle of radius 2.25 m and sector angle 56°.

(a) Calculate the area of the sand pit.

$$\frac{56}{360} \times \pi \times (2.25)^2 = \frac{63\pi}{80}$$

Answer(a) .... 2.47 .... m^2 [2]

(b) The sand pit is filled with sand to a depth of 0.3 m.

Calculate the volume of sand in the sand pit.

2.47×0.3

Answer(b) .... 0.742 .... m^3 [1]

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15 (a) Write 90 as a product of prime factors.

Answer(a) .... $2 \times 3^2 \times 5$ .... [2]

(b) Find the lowest common multiple of 90 and 105.

$90 = 2 \times 3^2 \times 5$

$105 = 3 \times 5 \times 7$

$LCM = 3^2 \times 2 \times 5 \times 7$

Answer(b) .... 630 .... [2]

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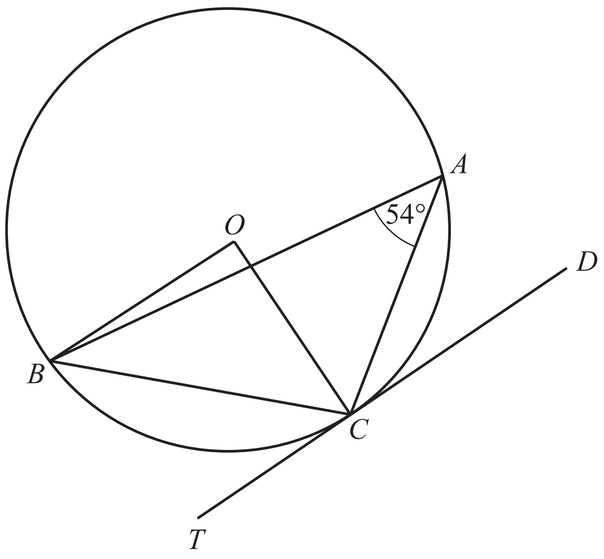
16 A, B and C are points on a circle, centre O.
TCD is a tangent to the circle.
Angle BAC = 54°.



NOT TO SCALE

(a) Find angle BOC, giving a reason for your answer.

Answer(a) Angle BOC = 108 because the angle at the center is double the angle at the circumference [2]

(b) When O is the origin, the position vector of point C is $\begin{pmatrix} 3 \\ -4 \end{pmatrix}$.

(i) Work out the gradient of the radius OC.

$M = \frac{\Delta y}{\Delta x} = \frac{-4}{3}$

Answer(b)(i) $-4/3$ [1]

(ii) D is the point (7, k).

Find the value of k.

As tangent, gradient $= \frac{-1}{m} = -\frac{1}{-4/3}$

$= 3/4$

$\frac{3}{4} = \frac{\Delta y}{\Delta x} = \frac{k - -4}{7-3} \rightarrow k = -1$

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

17 Alex invests \$200 for 2 years at a rate of 2% per year simple interest.
Chris invests \$200 for 2 years at a rate of 2% per year compound interest.

Calculate how much more interest Chris has than Alex.

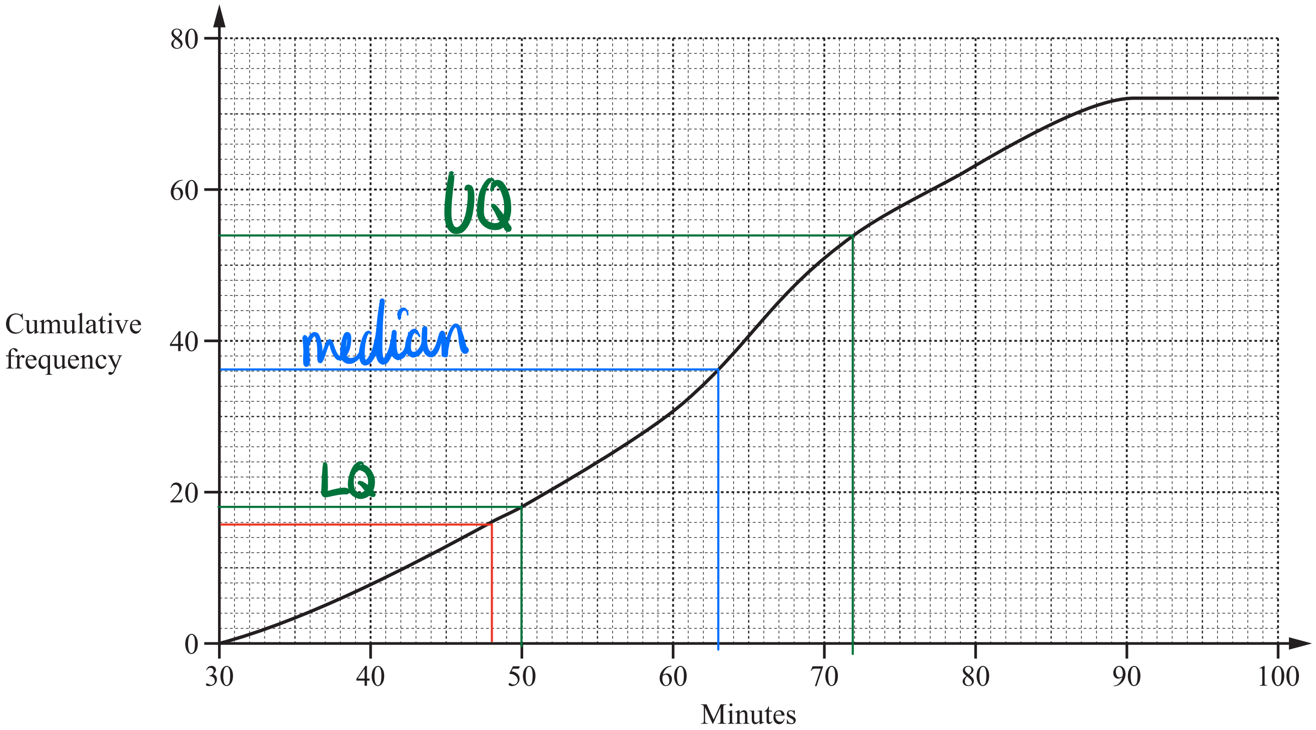
Simple Interest $= \dfrac{200 \times 2 \times 2}{100} = 8$

Compound Interest $= 200 \times (1.02)^2 = 208.08$

$= 208.08 - 200 = 8.08$

Answer \$ 0.08 [4]

18 72 students are given homework one evening.
They are told to spend no more than 100 minutes completing their homework.
The cumulative frequency diagram shows the number of minutes they spend.



(a) How many students spent more than 48 minutes completing their homework?

72 - 18

Answer(a) ....56........ [2]

(b) Find

(i) the median,

$\frac{72}{2} = 36$

Answer(b)(i) ....63........ [1]

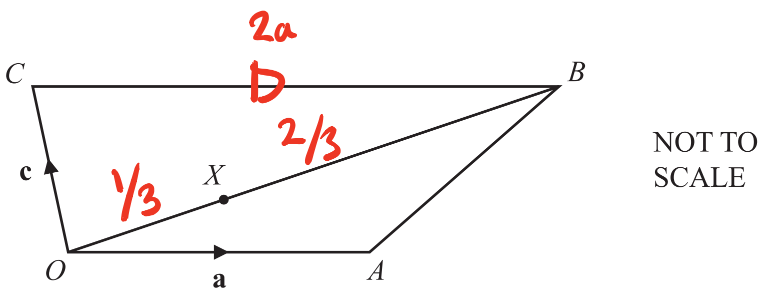
(ii) the inter-quartile range.

$\frac{72}{4} = 18 = LQ$ $\frac{72}{4} \times 3 = 54 = UQ$ 72 - 50

22

Answer(b)(ii) ....22........ [2]

19



The diagram shows a quadrilateral *OABC*.
$\overrightarrow{OA} = \mathbf{a}$, $\overrightarrow{OC} = \mathbf{c}$ and $\overrightarrow{CB} = 2\mathbf{a}$.
X is a point on *OB* such that $OX : XB = 1 : 2$.

(a) Find, in terms of **a** and **c**, in its simplest form

(i) $\overrightarrow{AC}$,

Answer(a)(i) $\overrightarrow{AC} =$ $-a + c$ [1]

(ii) $\overrightarrow{AX}$.

$\overrightarrow{OB} = c + 2a$

$\overrightarrow{AX} = \overrightarrow{AO} + \frac{1}{3}\overrightarrow{OB}$

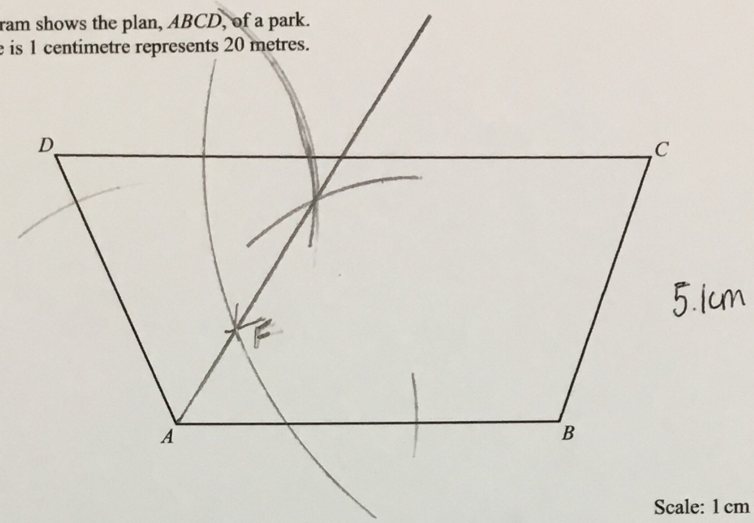
$-a + \frac{1}{3}(c + 2a) = -a + \frac{1c}{3} + \frac{2a}{3}$

Answer(a)(ii) $\overrightarrow{AX} =$ $\frac{1}{3}c - \frac{1}{3}a$ [3]

(b) Explain why the vectors $\overrightarrow{AC}$ and $\overrightarrow{AX}$ show that *C*, *X* and *A* lie on a straight line.

Answer(b) $\overrightarrow{AC} = \frac{1}{3}\overrightarrow{AX}$, hence they are parallel. As they both start from A, they lie on a straight line. [2]

20 The diagram shows the plan, *ABCD*, of a park.
The scale is 1 centimetre represents 20 metres.



Scale: 1 cm to 20 m

(102 to 106)

(a) Find the actual distance *BC*.

5.1cm × 20 = 102m

Answer(a) ......102...... m [2]

(b) A fountain, *F*, is to be placed

- 160 m from *C*

and

- equidistant from *AB* and *AD*.

On the diagram, **using a ruler and compasses only**, construct and mark the position of *F*.
Leave in all your construction lines. [5]

Question 21 is printed on the next page.

21 **(a)** Write as a single fraction in its simplest form.

$$\frac{3}{2x-1} - \frac{1}{x+2}$$

$$\frac{3(x+2) - (2x-1)}{(2x-1)(x+2)} = \frac{3x+6-2x+1}{(2x-1)(x+2)}$$

Answer(a) $\frac{x+7}{(2x-1)(x+2)}$ [3]

(b) Simplify.

$$\frac{4x^2 - 16x}{2x^2 + 6x - 56}$$

$$\frac{4x(x-4)}{2(x^2+3x-28)}$$

$x^2+3x-28$

Product $= -28$ } 7 and -4
Sum $= +3$

$= (x-4)(x+7)$

$$\frac{4x\cancel{(x-4)}}{2(x+7)\cancel{(x-4)}}$$

$$= \frac{4x}{2(x+7)} = \frac{2x}{x+7}$$

Answer(b) $\frac{2x}{x+7}$ [4]