UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

0249795558

MATHEMATICS **0580/21**

Paper 2 (Extended) **October/November 2009**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Mathematical tables (optional)
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 a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.

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.

1

For the diagram above write down

(a) the order of rotational symmetry,

Answer(a) ..... [1]

(b) the number of lines of symmetry.

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

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2 Write down the next two prime numbers after 43.

Answer ..... and ..... [2]

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3 Use your calculator to find the value of $\dfrac{(\cos 30^{\circ})^2 - (\sin 30^{\circ})^2}{2(\sin 120^{\circ})(\cos 120^{\circ})}$.

Answer ..... [2]

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4 Simplify $\dfrac{5}{8}x^{\frac{3}{2}} \div \dfrac{1}{2}x^{-\frac{5}{2}}$.

Answer ..... [2]

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5 In 1970 the population of China was 8.2×10^8.
In 2007 the population of China was 1.322×10^9.
Calculate the population in 2007 as a percentage of the population in 1970.

Answer ..... % [2]

6

$$\mathbf{A} = \begin{pmatrix} 0 & 1 \\ -8 & -4 \end{pmatrix} \quad \mathbf{B} = \begin{pmatrix} 7 & 1 \\ 0 & -5 \end{pmatrix}$$

Calculate the value of $5\,|\mathbf{A}| + |\mathbf{B}|$, where $|\mathbf{A}|$ and $|\mathbf{B}|$ are the determinants of **A** and **B**.

Answer ..... [2]

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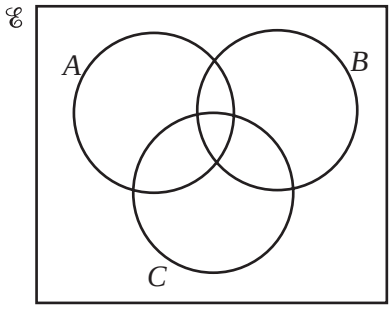
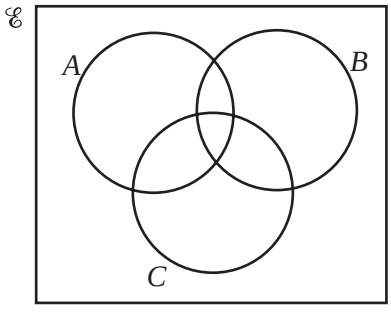
7 Shade the region required in each Venn Diagram.



$A' \cap (B \cap C)$



$A' \cap (B \cup C)$

[2]

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8 Find the length of the line joining the points $A(-4, 8)$ and $B(-1, 4)$.

Answer $AB =$ ..... [2]

---

9 Solve the simultaneous equations

$$6x + 18y = 57,$$
$$2x - 3y = -8.$$

Answer $x =$ .....

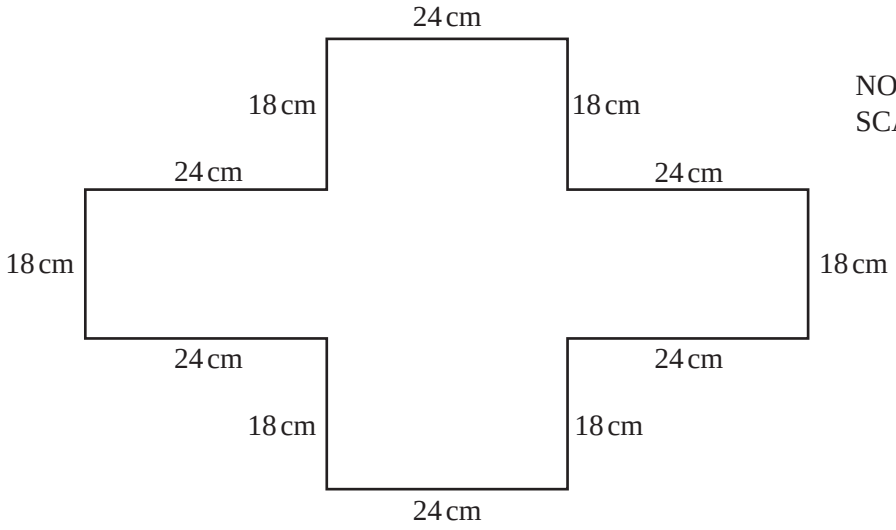
$y =$ ..... [3]

---

10 The braking distance, d, of a car is directly proportional to the square of its speed, v.
When $d = 5$, $v = 10$.
Find d when $v = 70$.

Answer $d =$ ..... [3]

11



NOT TO SCALE

Each of the lengths 24 cm and 18 cm is measured correct to the nearest centimetre.
Calculate the upper bound for the perimeter of the shape.

Answer ..... cm [3]

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12 Simplify $16 - 4(3x - 2)^2$.

Answer ..... [3]

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13 Solve the inequality $6(2 - 3x) - 4(1 - 2x) \leqslant 0$.

Answer ..... [3]

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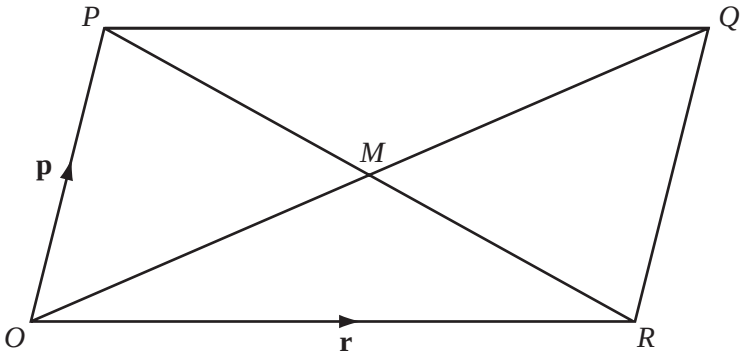
14 Zainab borrows \$198 from a bank to pay for a new bed.
The bank charges compound interest at 1.9% per month.
Calculate how much **interest** she owes at the end of 3 months.
Give your answer correct to 2 decimal places.

Answer \$ ..... [3]

15



O is the origin and *OPQR* is a parallelogram whose diagonals intersect at *M*.

The vector $\overrightarrow{OP}$ is represented by **p** and the vector $\overrightarrow{OR}$ is represented by **r**.

(a) Write down a single vector which is represented by

(i) $\mathbf{p} + \mathbf{r}$,

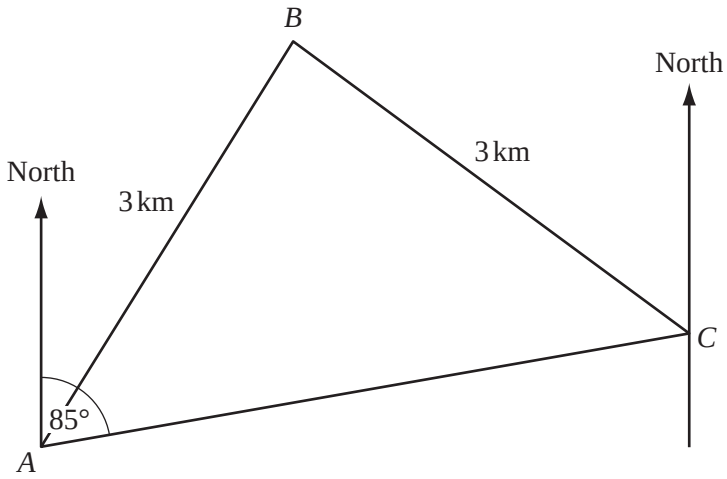
Answer(a)(i) ..... [1]

(ii) $\frac{1}{2}\mathbf{p} - \frac{1}{2}\mathbf{r}$.

Answer(a)(ii) ..... [1]

(b) On the diagram, mark with a cross (x) and label with the letter *S* the point with position vector $\frac{1}{2}\mathbf{p} + \frac{3}{4}\mathbf{r}$. [2]

16



A, *B* and *C* are three places in a desert. Tom leaves *A* at 06 40 and takes 30 minutes to walk directly to *B*, a distance of 3 kilometres. He then takes an hour to walk directly from *B* to *C*, also a distance of 3 kilometres.

(a) At what time did Tom arrive at *C*?

Answer (a) ..... [1]

(b) Calculate his average speed for the whole journey.

Answer (b) ..... km/h [2]

(c) The bearing of *C* from *A* is 085°.
Find the bearing of *A* from *C*.

Answer (c) ..... [1]

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17 **(a)** In 2007, a tourist changed 4000 Chinese Yuan into pounds (£) when the exchange rate was £1 = 15.2978 Chinese Yuan.
Calculate the amount he received, giving your answer correct to 2 decimal places.

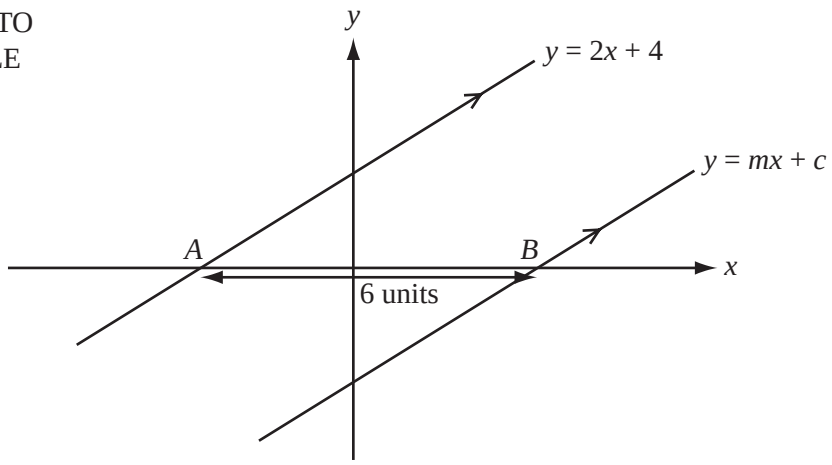
Answer(a) £ ..... [2]

(b) In 2006, the exchange rate was £1 = 15.9128 Chinese Yuan.
Calculate the percentage decrease in the number of Chinese Yuan for each £1 from 2006 to 2007.

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

18

NOT TO SCALE



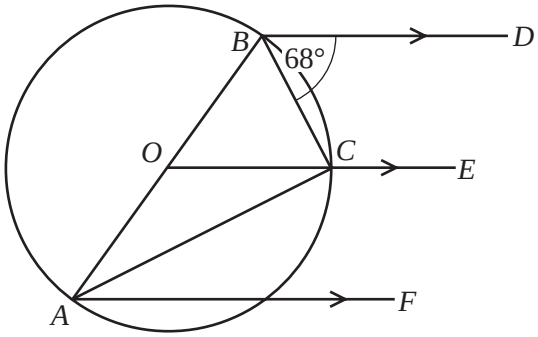
The line $y = mx + c$ is parallel to the line $y = 2x + 4$.
The distance AB is 6 units.

Find the value of m and the value of c.

Answer $m =$ ..... and $c =$ ..... [4]

19

NOT TO SCALE



Points A, B and C lie on a circle, centre O, with diameter AB.
BD, OCE and AF are parallel lines.
Angle $CBD = 68°$.

Calculate

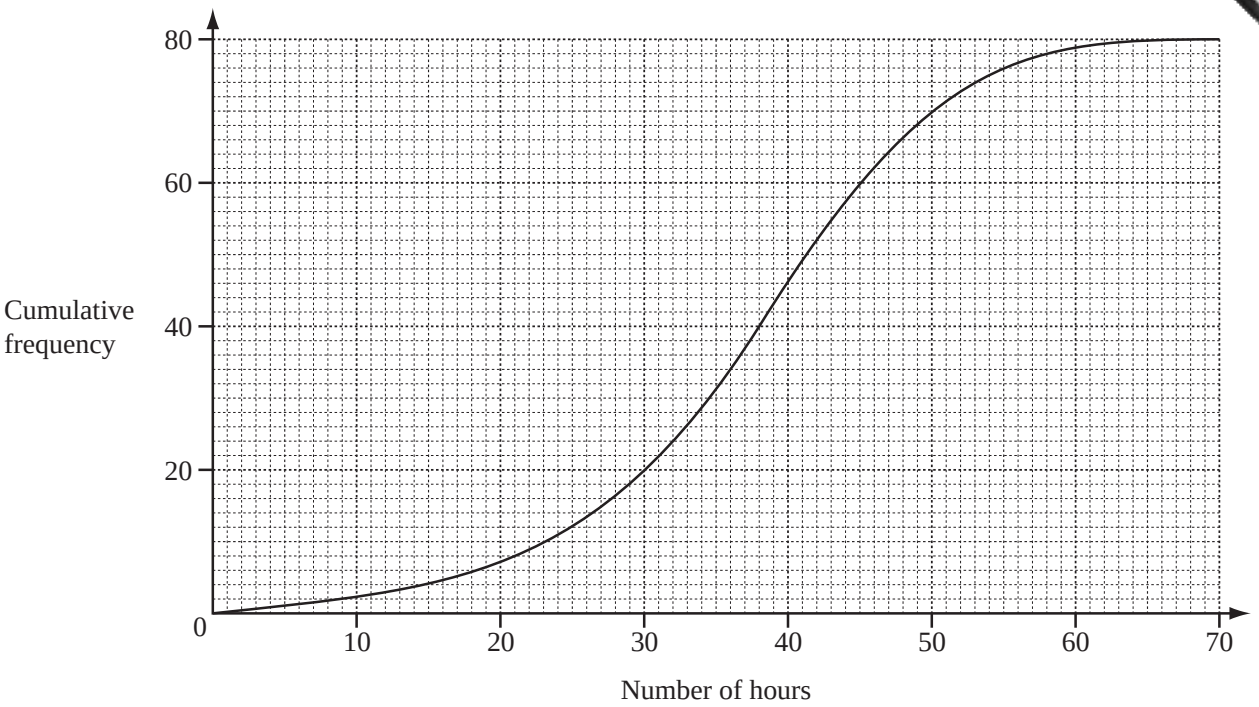
(a) angle BOC,

Answer(a) Angle BOC = ... [2]

(b) angle ACE.

Answer(b) Angle ACE = ... [2]

20 The number of hours that a group of 80 students spent using a computer in a week was record
The results are shown by the cumulative frequency curve.



Use the cumulative frequency curve to find

(a) the median,

Answer(a) ..... h [1]

(b) the upper quartile,

Answer(b) ..... h [1]

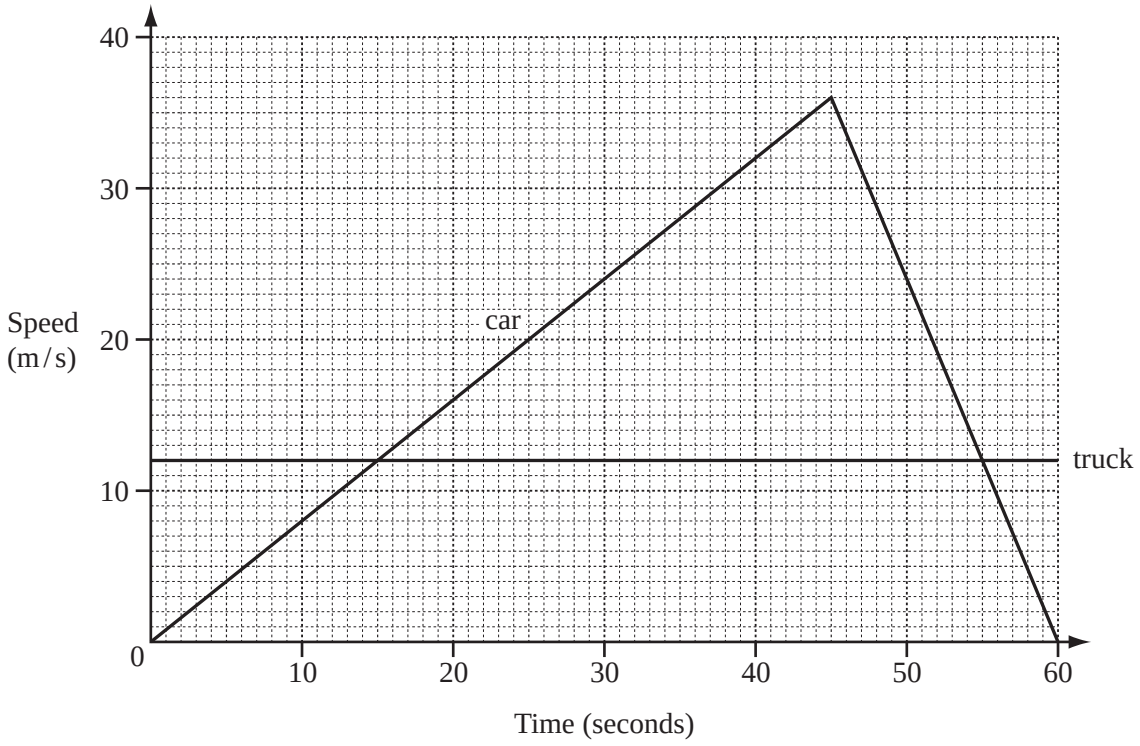
(c) the interquartile range,

Answer(c) ..... h [1]

(d) the number of students who spent more than 50 hours using a computer in a week.

Answer(d) ..... [2]

21



The graph shows the speed of a truck and a car over 60 seconds.

(a) Calculate the acceleration of the car over the first 45 seconds.

Answer(a) ..... m/s^2 [2]

(b) Calculate the distance travelled by the car while it was travelling faster than the truck.

Answer(b) ..... m [3]

Question 22 is printed on the next page.

22 $f(x) = 4x + 1$ $g(x) = x^3 + 1$ $h(x) = \frac{2x+1}{3}$

For iner's

(a) Find the value of gf(0).

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

(b) Find fg(x). Simplify your answer.

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

(c) Find $h^{-1}(x)$.

Answer(c) ..... [2]