UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

9520291400

MATHEMATICS **0581/22**

Paper 2 (Extended) **May/June 2011**

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

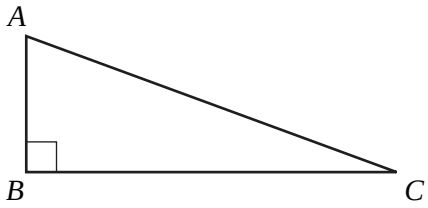
Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

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.

1 In the right-angled triangle ABC, $\cos C = \frac{4}{5}$. Find angle A.



NOT TO SCALE

Answer Angle A = ... [2]

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2 Which of the following numbers are irrational?

$\frac{2}{3}$ $\sqrt{36}$ $\sqrt{3} + \sqrt{6}$ π 0.75 48% $8^{\frac{1}{3}}$

Answer ..... [2]

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3 Show that $1\frac{5}{9} \div 1\frac{7}{9} = \frac{7}{8}$.

Write down all the steps in your working.

Answer

[2]

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4 $\frac{3}{5} < p < \frac{2}{3}$

Which of the following could be a value of p?

$\frac{16}{27}$ 0.67 60% $(0.8)^2$ $\sqrt{\frac{4}{9}}$

Answer ..... [2]

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5 A meal on a boat costs 6 euros (€) or 11.5 Brunei dollars ($).

In which currency does the meal cost less, on a day when the exchange rate is €1 = $1.9037?
Write down all the steps in your working.

Answer ..... [2]

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6 Use your calculator to find the value of $2^{\sqrt{3}}$.

Give your answer correct to 4 significant figures.

Answer ..... [2]

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7 Solve the equation $4x + 6 \times 10^3 = 8 \times 10^4$.

Give your answer in standard form.

Answer $x =$ ..... [3]

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8 p varies directly as the square root of q.
$p = 8$ when $q = 25$.

Find p when $q = 100$.

Answer $p =$ ..... [3]

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9 Ashraf takes 1500 steps to walk d **metres** from his home to the station.
Each step is 90 centimetres correct to the nearest 10 cm.

Find the lower bound and the upper bound for d.

Answer ..... $\leqslant d <$ ..... [3]

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10 The table shows the opening and closing times of a café.

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Opening time	0600	0600	0600	0600	0600	(a)	0800
Closing time	2200	2200	2200	2200	2200	2200	1300

(a) The café is open for a total of 100 hours each week.
Work out the opening time on Saturday.

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

(b) The owner decides to close the café at a later time on Sunday. This increases the **total** number of hours the café is open by 4%.
Work out the new closing time on Sunday.

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

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11 Rearrange the formula $c = \dfrac{4}{a-b}$ to make a the subject.

Answer $a =$ ..... [3]

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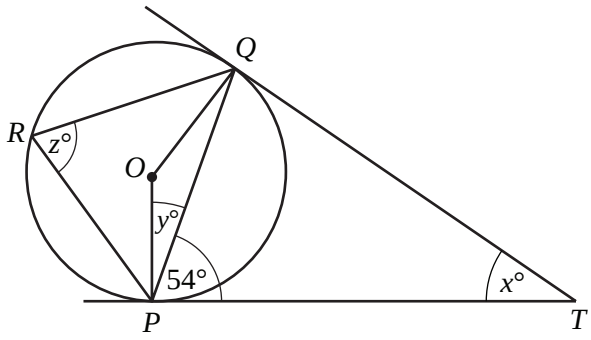
12 Solve the simultaneous equations.

$$x - 5y = 0$$
$$15x + 10y = 17$$

Answer $x =$ .....

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

13



NOT TO SCALE

The points P, Q and R lie on a circle, centre O.
TP and TQ are tangents to the circle.
Angle $TPQ = 54°$.

Calculate the value of

(a) x,

Answer(a) $x =$ ..... [1]

(b) y,

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

(c) z.

Answer(c) $z =$ ..... [2]

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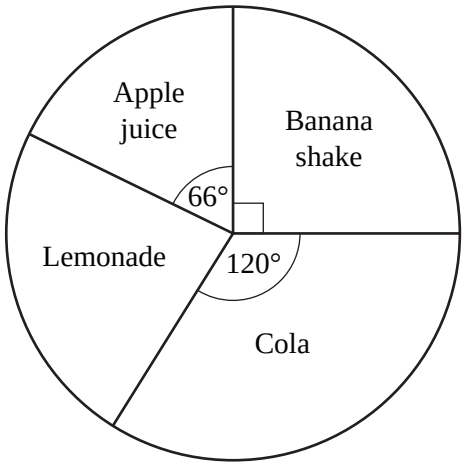
14 60 students recorded their favourite drink.
The results are shown in the pie chart.



NOT TO SCALE

(a) **Calculate** the angle for the sector labelled Lemonade.

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

(b) Calculate the number of students who chose Banana shake.

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

(c) The pie chart has a radius of 3 cm.
Calculate the arc length of the sector representing Cola.

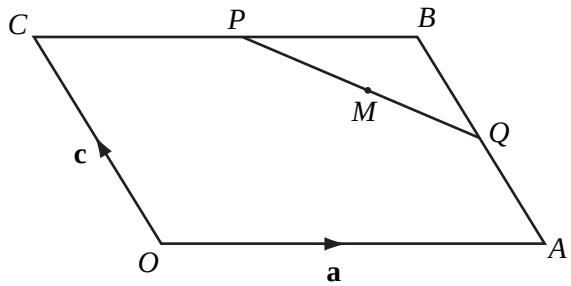
Answer(c) ..... cm [2]

15 Write the following as a single fraction in its simplest form.

$$\frac{x+1}{x+5} - \frac{x}{x+1}$$

Answer ..... [4]

16



NOT TO SCALE

O is the origin and $OABC$ is a parallelogram.
$CP = PB$ and $AQ = QB$.

$\overrightarrow{OA}$ = **a** and $\overrightarrow{OC}$ = **c** .
Find in terms of **a** and **c**, in their simplest form,

(a) $\overrightarrow{PQ}$,

Answer(a) $\overrightarrow{PQ}$ = ... [2]

(b) the position vector of M, where M is the midpoint of PQ.

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

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17 Simplify

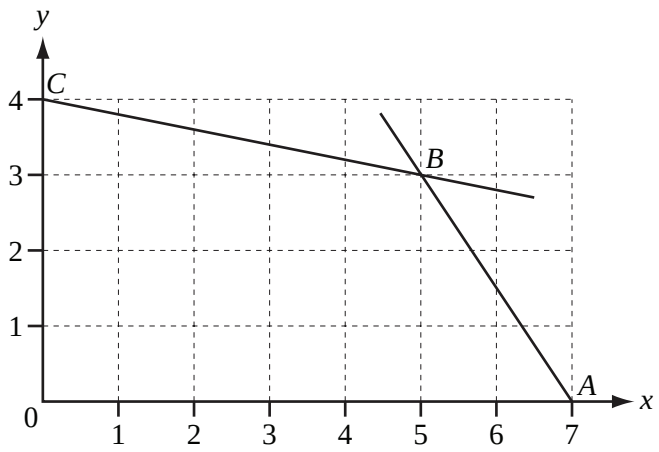
(a) $32x^8 \div 8x^{32}$,

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

(b) $\left(\frac{x^3}{64}\right)^{\frac{2}{3}}$.

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

18



The lines AB and CB intersect at B.

(a) Find the co-ordinates of the midpoint of AB.

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

(b) Find the equation of the line CB.

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

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19 $f(x) = x^2$ $g(x) = 2^x$ $h(x) = 2x - 3$

(a) Find g(3).

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

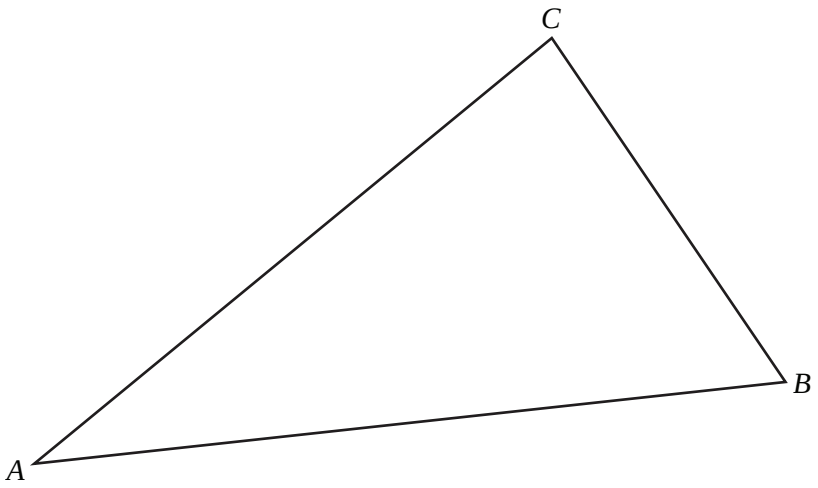
(b) Find hh(x) in its simplest form.

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

(c) Find fg($x + 1$) in its simplest form.

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

20



(a) On the diagram above, **using a straight edge and compasses only**, construct

(i) the bisector of angle ABC, [2]

(ii) the locus of points which are equidistant from A and from B. [2]

(b) Shade the region inside the triangle which is nearer to A than to B **and** nearer to AB than to BC. [1]

Question 21 is printed on the next page.

21 (a)

$$\mathbf{A} = \begin{pmatrix} 2 & 3 \end{pmatrix} \qquad \mathbf{B} = \begin{pmatrix} 6 \\ -4 \end{pmatrix}$$

(i) Work out **AB**.

Answer(a)(i) [2]

(ii) Work out **BA**.

Answer(a)(ii) [2]

(b) $\mathbf{C} = \begin{pmatrix} 3 & 1 \\ 1 & 1 \end{pmatrix}$

Find $\mathbf{C}^{-1}$, the inverse of **C**.

Answer(b) [2]