



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
International General Certificate of Secondary Education

CANDIDATE  
NAME

CENTRE  
NUMBER

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**MATHEMATICS**

**0580/22**

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  $\pi$ , 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.

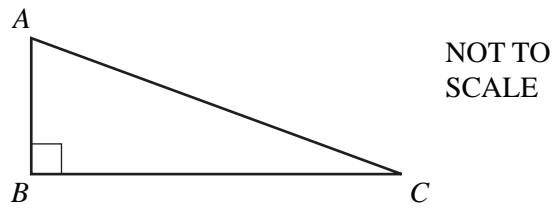
The total of the marks for this paper is 70.

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



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

For  
Examiner's  
Use



Answer Angle  $A =$  ..... [2]

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- 2 Which of the following numbers are irrational?

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

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]

---

4

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

Which of the following could be a value of  $p$ ?

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

*Answer* ..... [2]

---

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]

---

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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*For  
Examiner's  
Use*

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

Give your answer in standard form.

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

---

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

Find  $p$  when  $q = 100$ .

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

---

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* .....  $\leq d <$  ..... [3]

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*For  
Examiner's  
Use*

- 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]

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

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

12 Solve the simultaneous equations.

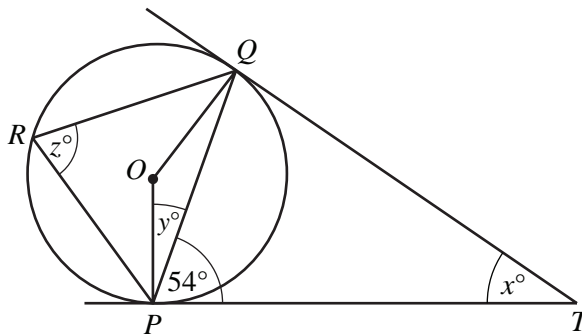
$$\begin{aligned}x - 5y &= 0 \\15x + 10y &= 17\end{aligned}$$

For  
Examiner's  
Use

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  $TPQ = 54^\circ$ .

Calculate the value of

(a)  $x$ ,

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

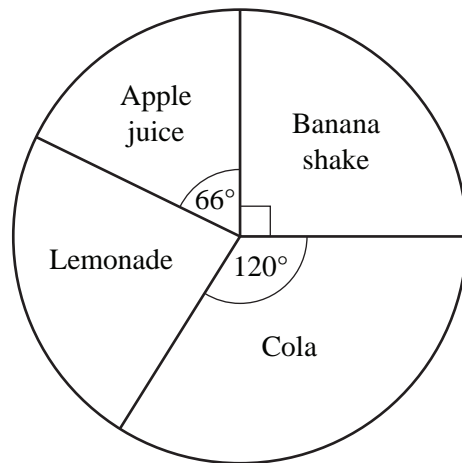
(b)  $y$ ,

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

(c)  $z$ .

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

- 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]

For  
Examiner's  
Use

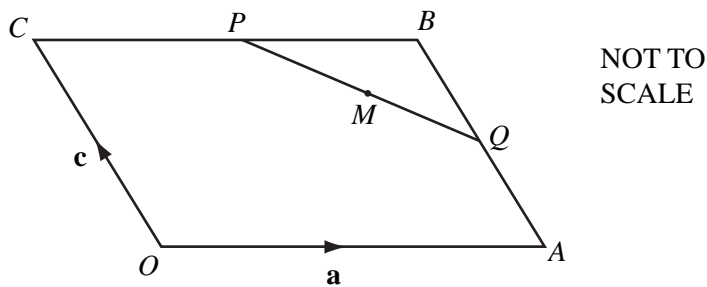
15 Write the following as a single fraction in its simplest form.

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

For  
Examiner's  
Use

Answer ..... [4]

16



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

$\vec{OA} = \mathbf{a}$  and  $\vec{OC} = \mathbf{c}$ .

Find in terms of  $\mathbf{a}$  and  $\mathbf{c}$ , in their simplest form,

(a)  $\vec{PQ}$ ,

Answer(a)  $\vec{PQ} = \dots\dots\dots$  [2]

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

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



17 Simplify

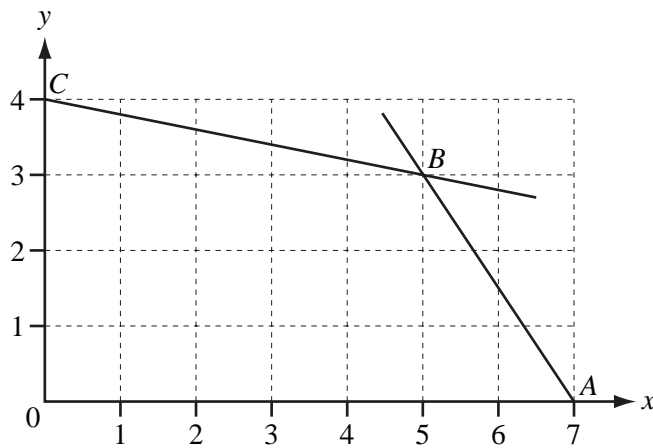
(a)  $32x^8 \div 8x^{32}$ ,

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]

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.

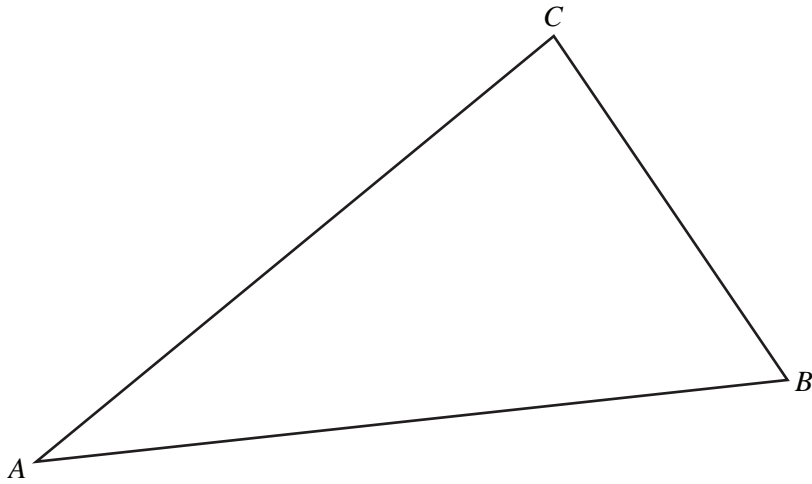
*Answer(b)* ..... [2]

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

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

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*For  
Examiner's  
Use*



- (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)

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

$$\mathbf{B} = \begin{pmatrix} 6 \\ -4 \end{pmatrix}$$

For  
Examiner's  
Use(i) Work out  $\mathbf{AB}$ .*Answer(a)(i)* [2](ii) Work out  $\mathbf{BA}$ .*Answer(a)(ii)* [2]

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

Find  $\mathbf{C}^{-1}$ , the inverse of  $\mathbf{C}$ .*Answer(b)* [2]

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