UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

7755338632

MATHEMATICS **0580/21**

Paper 2 (Extended) **October/November 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.

For Examiner's Use

1 Use your calculator to find $\sqrt{\dfrac{45 \times 5.75}{3.1 + 1.5}}$.

Answer ..... [2]

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2 Work out $2(3 \times 10^8 - 4 \times 10^6)$, giving your answer in standard form.

Answer ..... [2]

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3 Write the following in order of size, **largest** first.

sin 158° cos 158° cos 38° sin 38°

Answer ..... > ..... > ..... > ..... [2]

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4 Write down all the working to show that $\dfrac{\frac{3}{5} + \frac{2}{3}}{\frac{3}{5} \times \frac{2}{3}} = 3\frac{1}{6}$.

Answer

[3]

For Examiner's Use

5 A circle has a radius of 50 cm.

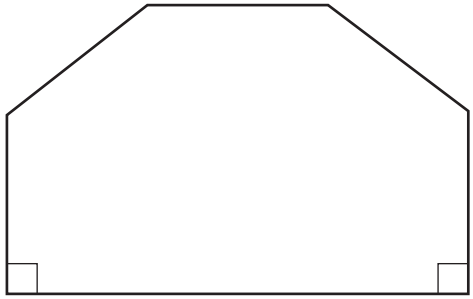
(a) Calculate the area of the circle in cm^2.

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

(b) Write your answer to **part (a)** in m^2.

Answer(b) ..... m^2 [1]

6



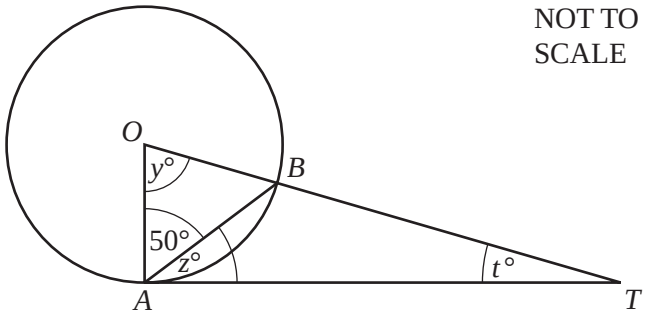
NOT TO SCALE

The front of a house is in the shape of a hexagon with two right angles.
The other four angles are all the same size.

Calculate the size of one of these angles.

Answer ..... [3]

7



TA is a tangent at *A* to the circle, centre *O*.
Angle *OAB* = 50°.

Find the value of

(a) *y*,

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

(b) *z*,

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

(c) *t*.

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

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8 Seismic shock waves travel at speed *v* through rock of density *d*.
v varies **inversely** as the **square root** of *d*.

v = 3 when *d* = 2.25.

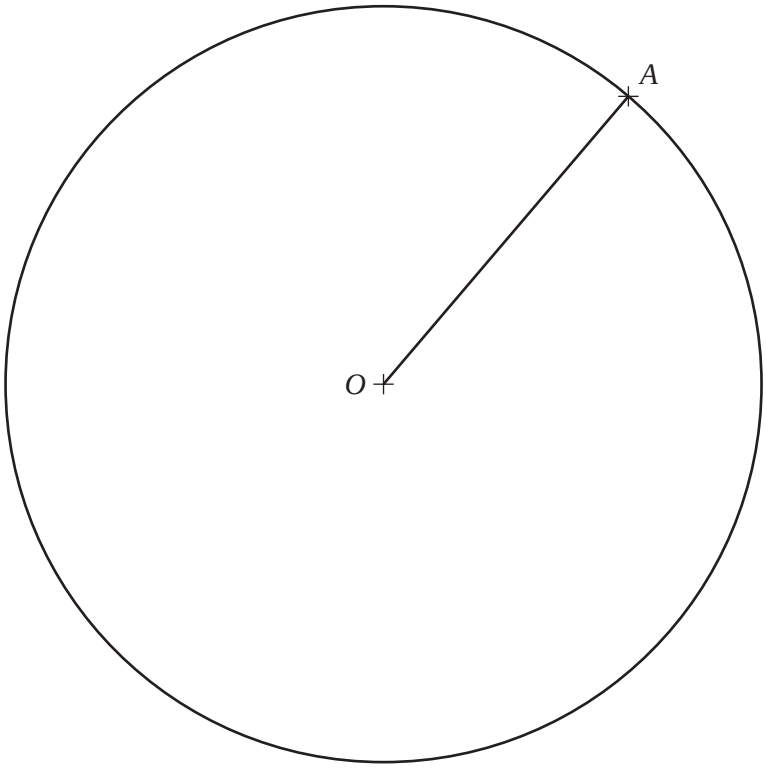
Find *v* when *d* = 2.56.

Answer v = ... [3]

For Examiner's Use

9

For Examiner's Use



The point A lies on the circle centre O, radius 5 cm.

(a) **Using a straight edge and compasses only,** construct the perpendicular bisector of the line OA. [2]

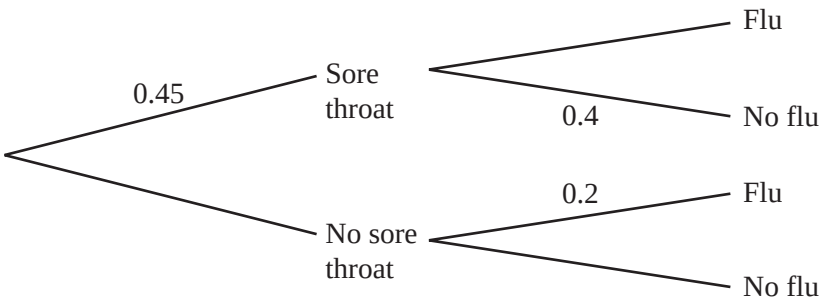
(b) The perpendicular bisector meets the circle at the points C and D.

Measure and write down the size of the angle AOD.

Answer(b) Angle AOD = ... [1]

For Examiner's Use

10 In a flu epidemic 45% of people have a sore throat.
If a person has a sore throat the probability of **not** having flu is 0.4.
If a person does not have a sore throat the probability of having flu is 0.2.



Calculate the probability that a person chosen at random has flu.

Answer ..... [4]

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11 Work out.

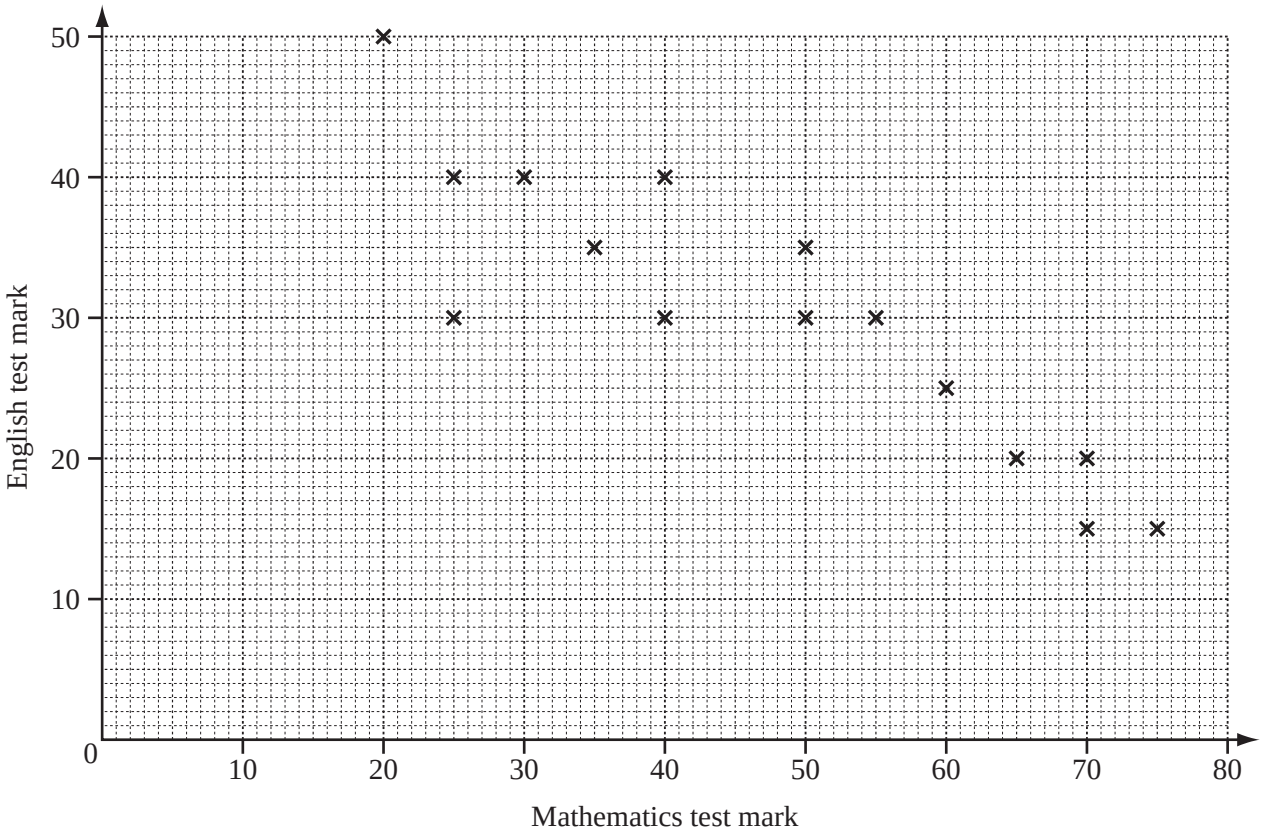
(a) $\begin{pmatrix} 2 & 1 \\ 4 & 3 \end{pmatrix}^2$

Answer(a) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

(b) $\begin{pmatrix} 2 & 1 \\ 4 & 3 \end{pmatrix}^{-1}$

Answer(b) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

12



The scatter diagram shows the marks obtained in a Mathematics test and the marks obtained in an English test by 15 students.

(a) Describe the correlation.

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

(b) The mean for the Mathematics test is 47.3 .
The mean for the English test is 30.3 .

Plot the mean point (47.3, 30.3) on the scatter diagram above. [1]

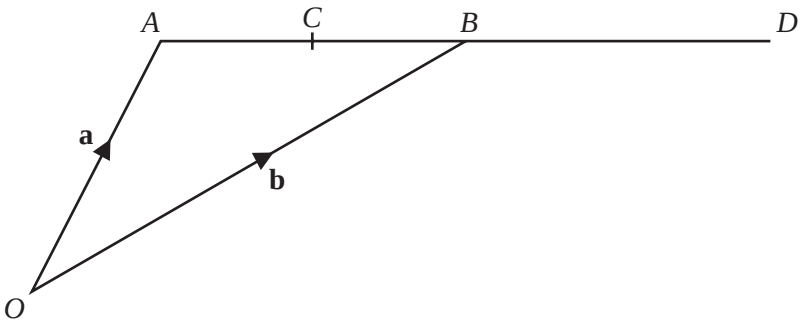
(c) **(i)** Draw the line of best fit on the diagram above. [1]

(ii) One student missed the English test.
She received 45 marks in the Mathematics test.

Use your line to estimate the mark she might have gained in the English test.

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

13



A and B have position vectors **a** and **b** relative to the origin O.
C is the midpoint of AB and B is the midpoint of AD.

Find, in terms of **a** and **b**, in their simplest form

(a) the position vector of C,

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

(b) the vector $\overrightarrow{CD}$.

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

14

$$T = 2\pi\sqrt{\frac{\ell}{g}}$$

(a) Find T when $g = 9.8$ and $\ell = 2$.

Answer(a) $T =$ ..... [2]

(b) Make g the subject of the formula.

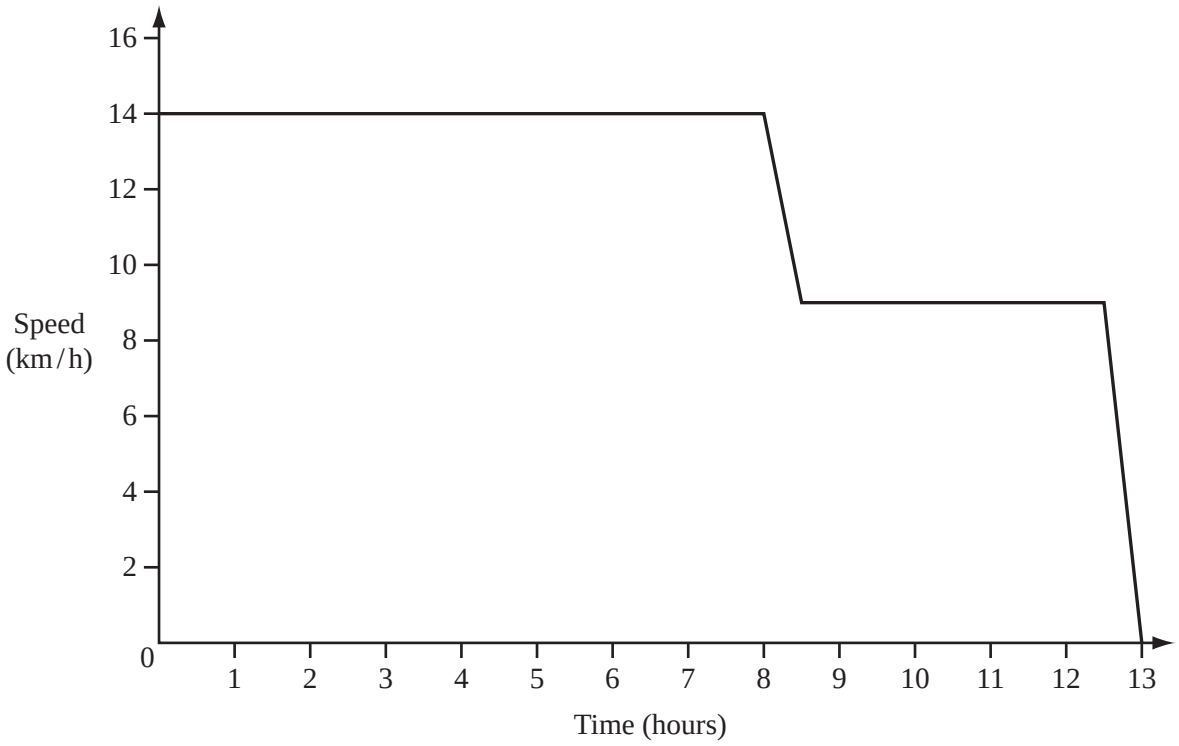
Answer(b) $g =$ ..... [3]

For Examiner's Use

15 A container ship travelled at 14 km/h for 8 hours and then slowed down to 9 km/h over a period of 30 minutes.

It travelled at this speed for another 4 hours and then slowed to a stop over 30 minutes.

The speed-time graph shows this voyage.



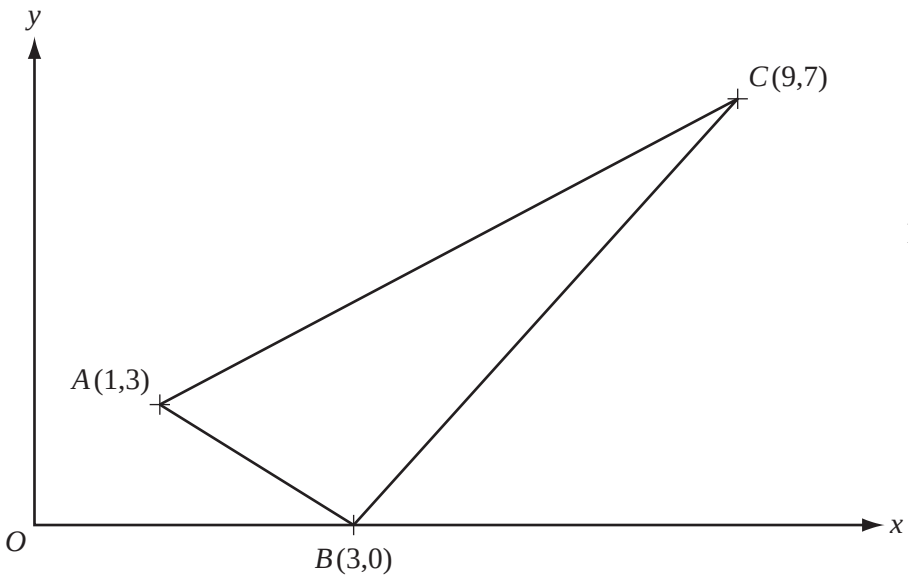
(a) Calculate the total distance travelled by the ship.

Answer(a) ..... km [4]

(b) Calculate the average speed of the ship for the whole voyage.

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

16



The co-ordinates of A, B and C are shown on the diagram, which is not to scale.

(a) Find the length of the line AB.

Answer(a) $AB =$ ..... [3]

(b) Find the equation of the line AC.

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

17 $f(x) = \dfrac{1}{x+4} \quad (x \neq -4)$

$g(x) = x^2 - 3x$

$h(x) = x^3 + 1$

(a) Work out fg(1).

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

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

Answer(b) $h^{-1}(x) =$ ..... [2]

(c) Solve the equation $g(x) = -2$.

Answer(c) $x =$ ..... or $x =$ ..... [3]

Question 18 is printed on the next page.

For Examiner's Use

18 The first four terms of a sequence are

$T_1 = 1^2 \quad T_2 = 1^2 + 2^2 \quad T_3 = 1^2 + 2^2 + 3^2 \quad T_4 = 1^2 + 2^2 + 3^2 + 4^2$.

(a) The nth term is given by $T_n = \frac{1}{6} n(n + 1)(2n + 1)$.

Work out the value of T_{23}.

Answer(a) T_{23} = ... [2]

(b) A new sequence is formed as follows.

$U_1 = T_2 - T_1 \quad U_2 = T_3 - T_2 \quad U_3 = T_4 - T_3$ .....

(i) Find the values of U_1 and U_2.

Answer(b)(i) U_1 = ... and U_2 = ... [2]

(ii) Write down a formula for the nth term, U_n .

Answer(b)(ii) U_n = ... [1]

(c) The first four terms of another sequence are

$V_1 = 2^2 \quad V_2 = 2^2 + 4^2 \quad V_3 = 2^2 + 4^2 + 6^2 \quad V_4 = 2^2 + 4^2 + 6^2 + 8^2$.

By comparing this sequence with the one in **part (a)**, find a formula for the nth term, V_n .

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