



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS International General Certificate of Secondary Education

CANDIDATE NAME					
CENTRE NUMBER			CANDIDATE NUMBER		

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.



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

Answer	Г21
Answei	 [4]

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

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

 $\sin 158^{\circ}$ $\cos 158^{\circ}$ $\cos 38^{\circ}$

sin 38°

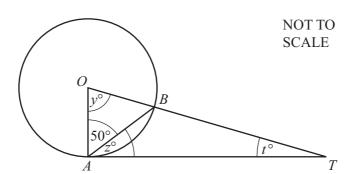
Write down all the working to show that $\frac{\frac{3}{5} + \frac{2}{3}}{\frac{3}{5} \times \frac{2}{3}} = 3\frac{1}{6}$

Answer

[3]

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5	A circle has a radius of 50 cm.			
	(a) Calculate the area of the circle in cm ² .			
	(b) Write your answer to part (a) in m ² .	Answer(a)	cm ² [2	2]
		Answer(b)	m ² [3	1]
6			NOT TO SCALE	
	The front of a house is in the shape of a hexagon wit The other four angles are all the same size.	h two right ar	ngles.	
	Calculate the size of one of these angles.			
		Ans	wer [2	3]



For Examiner's Use

TA is a tangent at A to the circle, centre O. Angle $OAB = 50^{\circ}$.

Find the value of

(a) y,

Answer(a) v =	Г17
Answer(a) v –	1

(b) z,

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

(c) t.

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

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

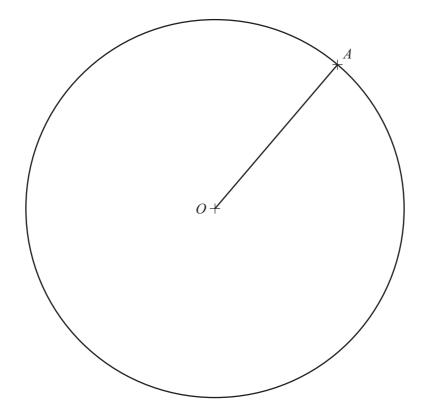
v = 3 when d = 2.25.

Find v when d = 2.56.

$$Answer v = [3]$$

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For Examiner's Use



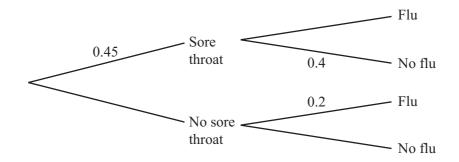
The point A lies on the circle centre O, radius 5 cm.

- (a) Using a straight edge and compasses only, construct the perpendicular bisector of the line OA.
- (b) The perpendicular bisector meets the circle at the points C and D.

Measure and write down the size of the angle *AOD*.

$$Answer(b) \text{ Angle } AOD =$$
 [1]

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.



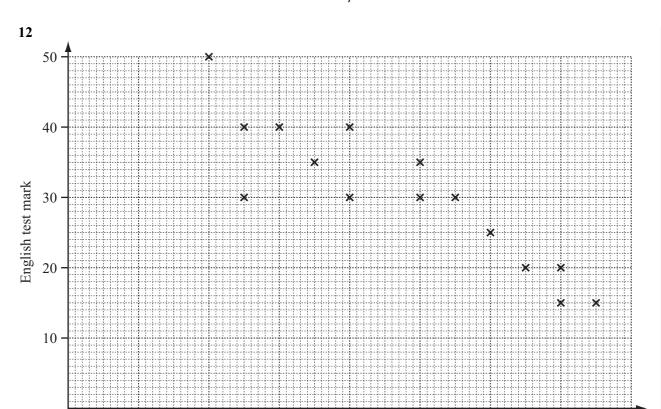
Calculate the probability that a person chosen at random has flu.

Answer	[4]

11 Work out.

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

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



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

40

Mathematics test mark

50

(a) Describe the correlation

10

Answer(a) [1]

60

70

(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.

20

30

[1]

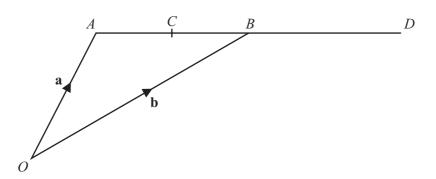
80

(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]

Examiner's Use



A and B have position vectors \mathbf{a} and \mathbf{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.

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

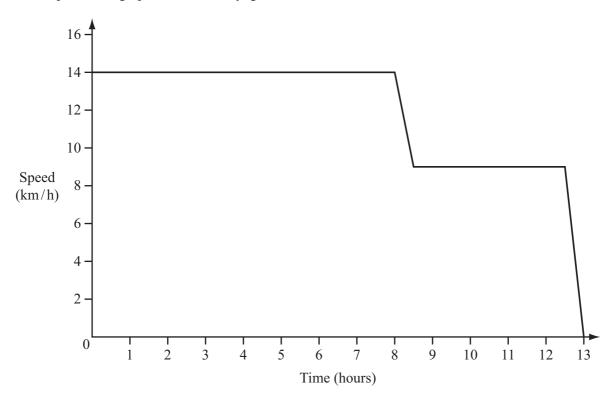
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15 A container ship travelled at 14 km/h for 8 hours and then slowed down to 9 km/h over a period of 30 minutes.

For Examiner's Use

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.



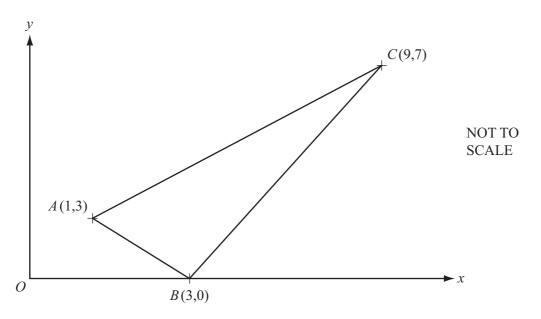
(a) Calculate the total distance travelled by the ship.

Answer(a) km [4]

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

Answer(b) _____ km/h [1]





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.

 $Answer(b) \qquad [3]$

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

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

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

(a) Work out fg(1).

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

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

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

Question 18 is printed on the next page.

18	The firs	t four	terms	of a	sequence	e are
10	1110 1110	t IOui	CCITIO	OI u	bequeite	Juic

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

(a) The *n*th 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.

$$U_1 = T_2 - T_1$$
 $U_2 = T_3 - T_2$ $U_3 = T_4 - T_3$

(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 *n*th term, U_n .

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

(c) The first four terms of another sequence are

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

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

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

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