

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS International General Certificate of Secondary Education

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CANDIDATE NAME					
CENTRE NUMBER			CANDIDATE NUMBER		

MATHEMATICS 0581/41

Paper 4 (Extended) May/June 2010

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator Geometrical instruments

Mathematical tables (optional)

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 130.

			42.	
	2		3.70	
A s	chool has 220 boys and 280 girls.		www. Pak	aCanny
(a)	Find the ratio of boys to girls, in its simplest form	ı .		origi
		Answer(a)	·	[1]
		11112 // 61 (69)		[-]
(b)	The ratio of students to teachers is 10 : 1. Find the number of teachers.			
		Answer(b)		[2]
(a)	There are 21 students on the school's committee.			
(c)	The ratio of boys to girls is 3:4. Find the number of girls on the committee.			
		Answer(c)		[2]
(d)	The committee organises a disco and sells tickets. 35% of the school's students each buy a ticket. E		ra \$1.60	
	Calculate the total amount received from selling the		.s \$1.00.	
		Answer(d) \$		[3]
(e)	The cost of running the disco is \$264.			
	This is an increase of 10% on the cost of running Calculate the cost of running last year's disco.	last year's disc	co.	
		Answer(e) \$		[2]

2 40 students are asked about the number of people in their families.

40 students are asked about the The table shows the results.	number of j	3 people in the	eir families.		m	M. PapaCo	For iner's
Number of people in family	2	3	4	5	6	7	OM
Frequency	1	1	17	12	6	3	

(9) Find		
(4	, i iiid		

Answer(a)(i)	 [1]

(ii) the median,

(i) the mode,

(iii) the mean.

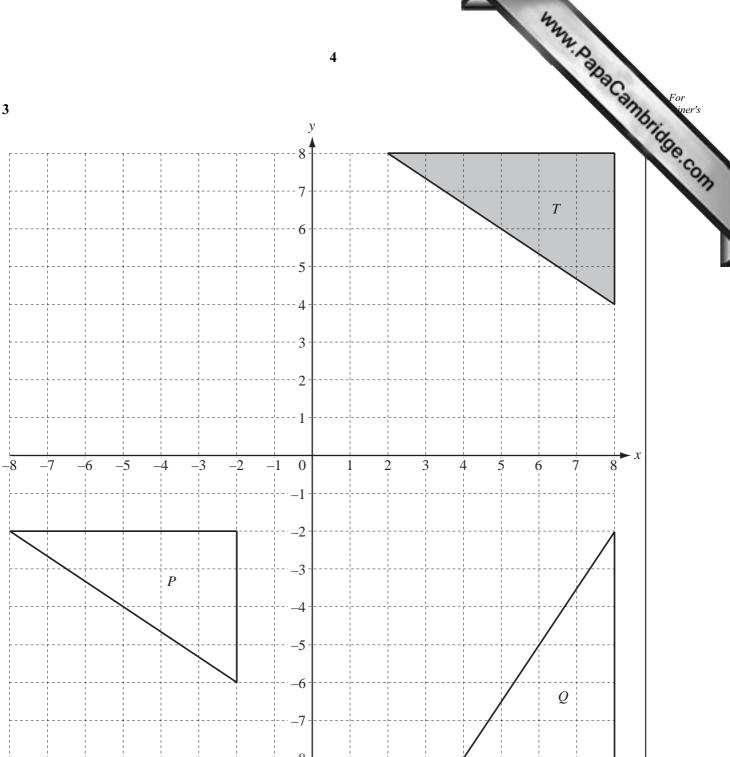
(b) Another n students are asked about the number of people in their families.

The mean for these n students is 3.

Find, in terms of n, an expression for the mean number for all (40 + n) students.

Answer(b) [2] 3





(a) On the grid, draw the enlargement of the triangle T, centre (0, 0), scale factor $\frac{1}{2}$. [2]

- **(b)** The matrix $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$ represents a transformation.
 - (i) Calculate the matrix product $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} 8 & 8 & 2 \\ 4 & 8 & 8 \end{pmatrix}$.

Answer(b)(i) [2]

- (ii) On the grid, draw the image of the triangle *T* under this transformation. [2]
- (iii) Describe fully this single transformation.

Answer(b)(iii) [2]

- (c) Describe fully the **single** transformation which maps
 - (i) triangle *T* onto triangle *P*,

Answer(c)(i) [2]

(ii) triangle T onto triangle Q.

Answer(c)(ii) [3]

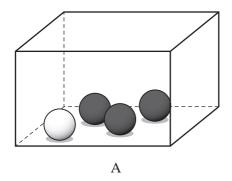
(d) Find the 2 by 2 matrix which represents the transformation in part (c)(ii).

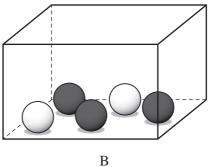
Answer(d)

[2]

HANNA, BARAC AIN For iner's

4





Box A contains 3 black balls and 1 white ball. Box B contains 3 black balls and 2 white balls.

Explain your answer.

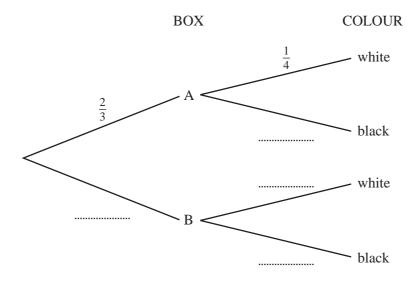
(a) A ball can be chosen at random from either box. Complete the following statement.

Amornian(a)	- Γ ⁴	1]
Answertai	- 1.7	l I

(b) Abdul chooses a box and then chooses a ball from this box at random.

The probability that he chooses box A is $\frac{2}{3}$.

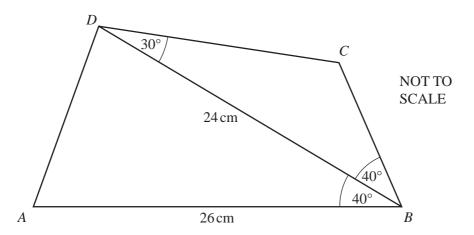
(i) Complete the tree diagram by writing the four probabilities in the empty spaces.



	For	
-	For	

	7	
	(ii) Find the probability that Abdul chooses box A and a black ball. Answer(b)(ii) [2]	For iner's
	Answer(b)(ii)	Se.com
	Answer(b)(iii) [2]	L
(c)	Tatiana chooses a box and then chooses two balls from this box at random (without replacement).	
	The probability that she chooses box A is $\frac{2}{3}$.	
	Find the probability that Tatiana chooses two white balls.	
	Answer(c)[2]	





ABCD is a quadrilateral and BD is a diagonal. AB = 26 cm, BD = 24 cm, angle $ABD = 40^{\circ}$, angle $CBD = 40^{\circ}$ and angle $CDB = 30^{\circ}$.

(a) Calculate the area of triangle ABD.

Answer(a)		cm ²	[2]
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(b) Calculate the length of *AD*.

(c) Calculate the length of BC.

Answer(c)
$$cm$$
 [4]

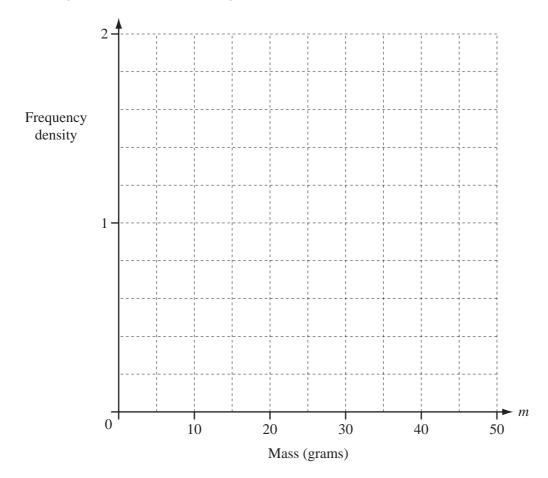
(d) Calculate the shortest distance from the point C to the line BD.

The masses of 60 potatoes are measured. 6 The table shows the results.

The masses of 60 pota The table shows the re		9		For iner's
Mass (<i>m</i> grams)	$10 < m \le 20$	$20 < m \le 40$	$40 < m \le 50$	O. COM
Frequency	10	30	20	

(a) Calculate an estimate of the mean.

(b) On the grid, draw an accurate histogram to show the information in the table.



[3]

7 (a) Calculate the volume of a cylinder of radius 31 centimetres and length 15 metres. Give your answer in cubic metres.

mm.	Dan		
metres and length 15 metres.		Canne	For iner's
Answer(a)	m^3	[3]	OH

(b) A tree trunk has a circular cross-section of radius 31 cm and length 15 m. One cubic metre of the wood has a mass of 800 kg. Calculate the mass of the tree trunk, giving your answer in tonnes.

Answer(b)		tonnes	[2]
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(c) NOT TO plastic **SCALE** sheet

The diagram shows a pile of 10 tree trunks. Each tree trunk has a circular cross-section of radius 31 cm and length 15 m. A plastic sheet is wrapped around the pile.

C is the centre of one of the circles. CE and CD are perpendicular to the straight edges, as shown.

(i)	Show that angle $ECD = 120^{\circ}$. Answer(c)(i)	De	Can
(ii)	Calculate the length of the arc <i>DE</i> , giving your answer in metres.		[2]
(iii)	Answer(c)(ii)	m	[2]
(iv)	Answer(c) (iii) The plastic sheet does not cover the two ends of the pile. Calculate the area of the plastic sheet. $Answer(c) (iv)$	m	[3]

(a) $f(x) = 2^x$ 8

$f(x) = 2^x$			12				www.Po.	For iner's
Complete the tal	ble.							Tate
X	-2	-1	0	1	2	3	4	OM
y = f(x)		0.5	1	2	4			

[3]

(b)
$$g(x) = x(4-x)$$

Complete the table.

x	-1	0	1	2	3	4
y = g(x)		0	3		3	0

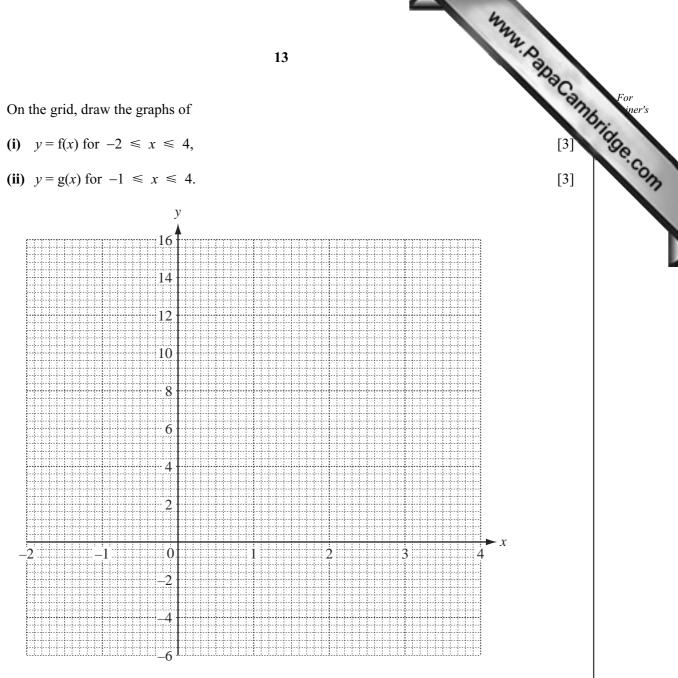
[2]

(c) On the grid, draw the graphs of

(i)
$$y = f(x)$$
 for $-2 \le x \le 4$,

(ii)
$$y = g(x)$$
 for $-1 \le x \le 4$.





(d) Use your graphs to solve the following equations.

(i)
$$f(x) = 10$$

$$Answer(d)(i) x = [1]$$

(ii)
$$f(x) = g(x)$$

Answer(d)(ii)
$$x =$$
 or $x =$ [2]

(iii)
$$f^{-1}(x) = 1.7$$

$$Answer(d)(iii) x = [1]$$

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iner	·′c
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(a) Solve the following equations.

(i)
$$\frac{5}{w} = \frac{3}{w+1}$$

Answer(a)(i)
$$w =$$
 [2]

(ii)
$$(y+1)^2 = 4$$

$$Answer(a)(ii) y = \underbrace{\qquad} or y = \underbrace{\qquad} [2]$$

(iii)
$$\frac{x+1}{3} - \frac{x-2}{5} = 2$$

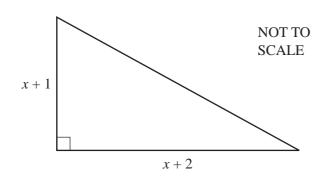
$$Answer(a)(iii) x =$$
 [3]

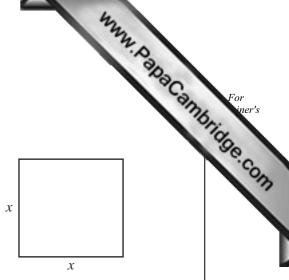
(b) (i) Factorise $u^2 - 9u - 10$.

(ii) Solve the equation $u^2 - 9u - 10 = 0$.

$$Answer(b)(ii) \ u = \underbrace{\qquad \qquad or \ u = }$$

(c)





The area of the triangle is equal to the area of the square. All lengths are in centimetres.

(i) Show that $x^2 - 3x - 2 = 0$.

Answer(c)(i)

[3]

(ii) Solve the equation $x^2 - 3x - 2 = 0$, giving your answers correct to 2 decimal places. Show all your working.

$$Answer(c)(ii) x = \qquad \text{or } x = \qquad [4]$$

(iii) Calculate the area of one of the shapes.

Answer(c)(iii) cm² [1]

For iner's

10 A company has a vehicle parking area of 1200 m² with space for x cars and y trucks.

Each car requires 20 m² of space and each truck requires 100 m² of space.

(a) Show that $x + 5y \le 60$.

Answer(a)

[1]

- **(b)** There must also be space for
 - (i) at least 40 vehicles,
 - (ii) at least 2 trucks.

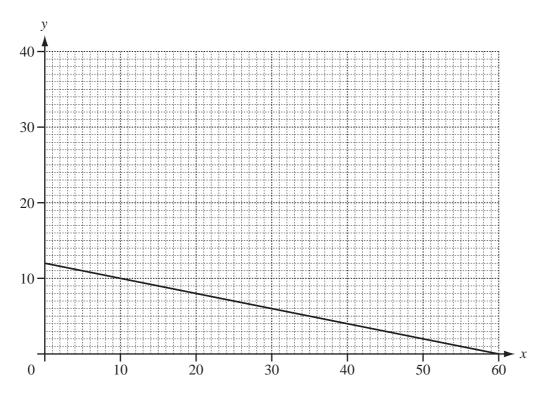
Write down two more inequalities to show this information.

Answer(b)(i)	 [1]
111151101 (0)(1)	 L+]

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

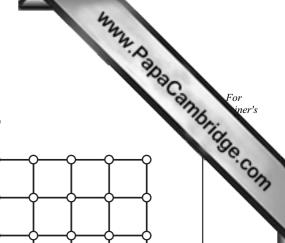
(c) One line has been drawn for you.

On the grid, show the three inequalities by drawing the other two lines and shading the **unwanted** regions.



[4]

	Use your graph to find the largest possible number of trucks. Answer(d) [1]	
(d)	Use your graph to find the largest possible number of trucks.	For iner's
	Answer(d) [1]	Se. COM
(e)	The company charges \$5 for parking each car and \$10 for parking each truck. Find the number of cars and the number of trucks which give the company the greatest possible income.	
	Calculate this income.	
	Answer(e) Number of cars =	
	Number of trucks =	
	Greatest possible income = \$[3]	

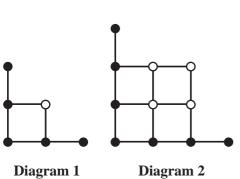


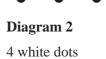


1 white dot

5 black dots

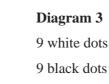
6 lines





7 black dots

14 lines





16 white dots 11 black dots

42 lines

The four diagrams above are the first four of a pattern.

(a) Diagram 5 has been started below. Complete this diagram and write down the information about the numbers of dots and lines.

26 lines

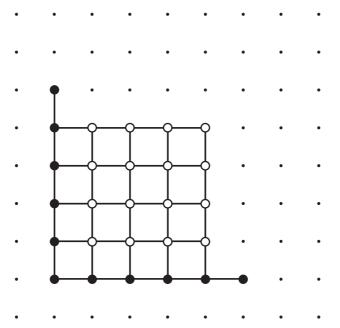


Diagram 5

..... white dots

..... black dots

..... lines

	19 May Pak	For iner's
(b)	Complete the information about the number of dots and lines in Diagram 8.	For iner's
	Answer(b) white dots	age Co.
	black dots	13
	lines	[3]
(c)	Complete the information about the number of dots in Diagram n . Give your answers in terms of n .	
	Answer(c) white dots	
	black dots	[2]
(d)	The number of lines in diagram n is $k(n^2 + n + 1)$.	
	Find	
	(i) the value of k ,	
	$Answer(d)(i) \ k =$ (ii) the number of lines in Diagram 100.	[1]

Answer(d)(ii)

[1]

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