

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS International General Certificate of Secondary Education

Original Com

*	
_	
_	
∞	
W	
ū	
9	
_	
W	
0	
_	

CANDIDATE NAME					
CENTRE NUMBER			CANDIDATE NUMBER		

MATHEMATICS 0581/43

Paper 4 (Extended) May/June 2012

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.

s.	N. Palle	Cant	For iner's
		[1]	9
	km/h	[2]	

1	Α	train	travels	from	Paris	to	Milan.
	Δ	паш	uaveis	пош	1 alls	w	willall.

- (a) The train departs from Paris at 2028 and the journey takes 9 hours 10 minutes.
 - (i) Find the time the train arrives in Milan.

 $Answer(a)(i) \qquad [1]$

(ii) The distance between Paris and Milan is 850 km.

Calculate the average speed of the train.

Answer(a)(ii) km/h [2]

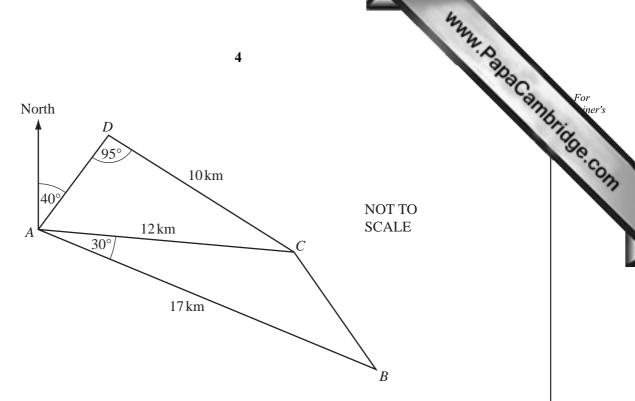
- **(b)** The total number of passengers on the train is 640.
 - (i) 160 passengers have tickets which cost \$255 each.
 - 330 passengers have tickets which cost \$190 each.
 - 150 passengers have tickets which cost \$180 each.

Calculate the mean cost of a ticket.

Answer(b)(i) [3]

		42		
		3 3 A.P.	Pacambridge.	
	(ii)	There are men, women and children on the train in the ratio	For	
		men:women:children = 4:3:1.	My India	er's
		Show that the number of women on the train is 240.	Too	1
		A		On
		Answer(b)(ii)		
			F03	
			[2]	
	(iii)	240 is an increase of 60% on the number of women on the train the previous day.		
		Calculate the number of women on the train the previous day.		
		Answer(b)(iii)	[3]	
(a)	The	e length of the train is 210 m.		
(c)		asses through a station of length 340 m, at a speed of 180 km/h.		
	Cal	culate the number of seconds the train takes to pass completely through the station.		
		Answer(c)	s [3]	

2



The diagram shows straight roads connecting the towns A, B, C and D.

 $AB = 17 \,\text{km}$, $AC = 12 \,\text{km}$ and $CD = 10 \,\text{km}$.

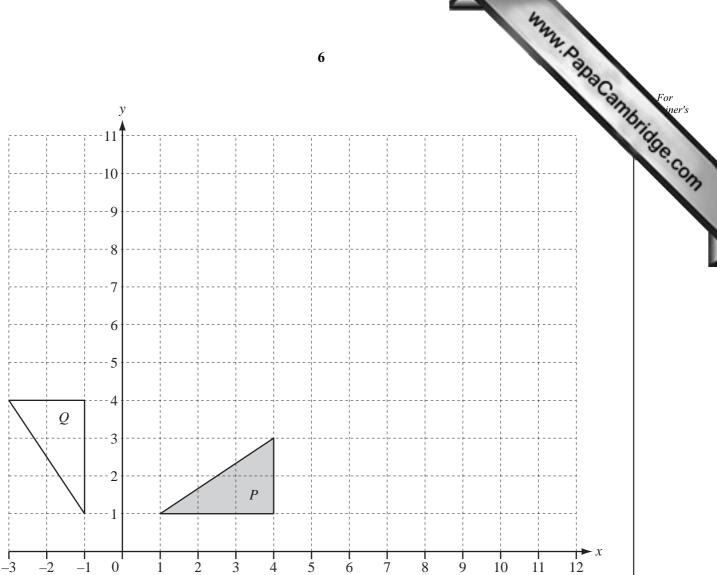
Angle $BAC = 30^{\circ}$ and angle $ADC = 95^{\circ}$.

(a) Calculate angle *CAD*.

$$Answer(a) \text{ Angle } CAD =$$
 [3]

(b) Calculate the distance *BC*.

(c)	c) The bearing of D from A is 040° .	100	Can
	Find the bearing of		13
	(i) $B \text{ from } A$,		•
	Answer(c)(i)		[1]
	Answer(c)(ii)		[1]
(d)	d) Angle <i>ACB</i> is obtuse.		
	Calculate angle <i>BCD</i> .		
	Answer(d) Angle BCD =		[4]



- (a) Draw the translation of triangle P by $\binom{5}{3}$. [2]
- **(b)** Draw the reflection of triangle P in the line x = 6. [2]
- (c) (i) Describe fully the **single** transformation that maps triangle P onto triangle Q. Answer(c)(i)[3]
 - (ii) Find the 2 by 2 matrix which represents the transformation in part(c)(i).

- (d) (i) Draw the stretch of triangle P with scale factor 3 and the x-axis as the invariant line. [2]
 - (ii) Find the 2 by 2 matrix which represents a stretch, scale factor 3 and x-axis invariant.

$$Answer(d)$$
(ii) [2]

(a)	In a football le	ague a team is given 3 po	ints for a wir	n, 1 point for	a draw and 0	points for For
	The table show	vs the 20 results for Athle	tico Cambrid	lge.		TOTIGE SELS
		Points	3	1	0	36.69

Points	3	1	0
Frequency	10	3	7

	(i)	i) Find	the me	edian ar	nd the	mode
--	------------	---------	--------	----------	--------	------

Answer(a)(i) Median =	
Mode =	[3]

(ii) Thomas wants to draw a pie chart using the information in the table.

Calculate the angle of the sector which shows the number of times Athletico Cambridge were given 1 point.

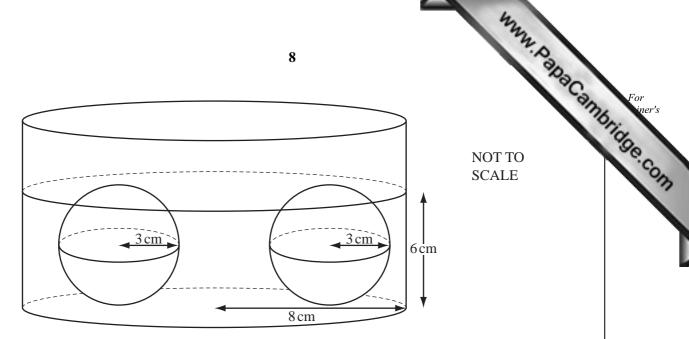
(b) Athletico Cambridge has 20 players.

The table shows information about the heights (*h* centimetres) of the players.

Height (h cm)	$170 < h \le 180$	$180 < h \le 190$	$190 < h \le 200$
Frequency	5	12	3

Calculate an estimate of the mean height of the players.

Answer(b)	cm	[4]
\ /		L .



The diagram shows two solid spheres of radius 3 cm lying on the base of a cylinder of radius 8 cm. Liquid is poured into the cylinder until the spheres are just covered.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3} \pi r^3$.]

- (a) Calculate the volume of liquid in the cylinder in
 - (i) cm^3 ,

Answer(a)(i)

(ii) litres.

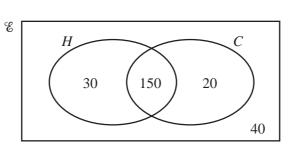
Answer(a)(ii) litres [1]

	One cubic centimetre of the liquid has a mass of 1.22 grams. Calculate the mass of the liquid in the cylinder. Give your answer in kilograms.
	9
(b)	One cubic centimetre of the liquid has a mass of 1.22 grams.
	Calculate the mass of the liquid in the cylinder.
	Give your answer in kilograms.
	Answer(b) kg [2]
(c)	The spheres are removed from the cylinder.
	Calculate the new height of the liquid in the cylinder.
	Answer(c) cm [2]

www.PapaCambridge.com

[1]

[1]



Answer(c)(i)

.....

Answer(c)(ii)

Write down the probability that this passenger

(ii) is on holiday and hires a car.

(i) hires a car,

(d)	Giv	e your answers to this part correct to 4 deci	mal places.		aCanne
	Two	of the 240 passengers are chosen at random.		·	1
	Find	I the probability that			
	(i)	they are both on holiday,			
			Answer(d)(i)		[2]
	(ii)	exactly one of the two passengers is on holida	NV.		
	(11)	exactly one of the two passengers is on nonda	ıy.		
			Answer(d)(ii)		[3]
			(1)		L- J
(e)	Giv	e your answer to this part correct to 4 decin	nal places.		
	Two	passengers are chosen at random from those	on holiday.		
	Find	I the probability that they both hire a car.			

Answer(e)

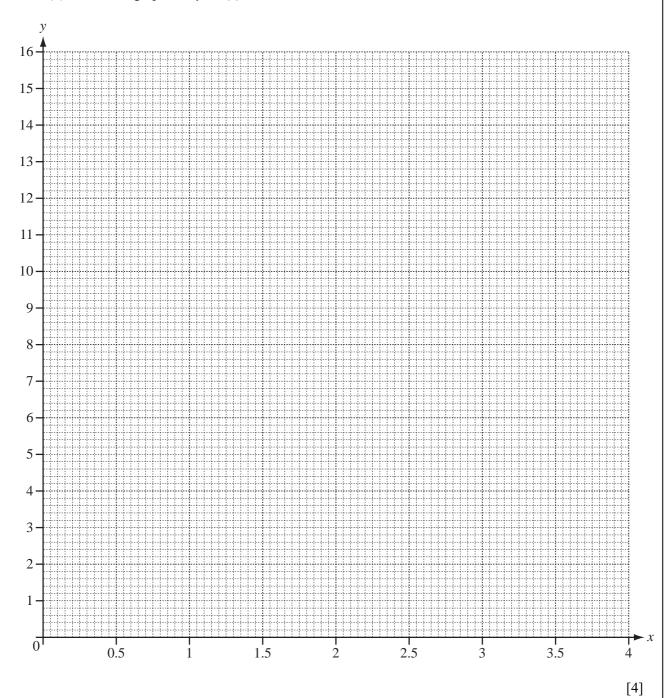
[3]

(a) Complete the table.

				1	2			4	W. Pab	For iner's
f(x)	$0 = 2^x$ te the tabl	e.							10	For iner's
x	0	0.5	1	1.5	2	2.5	3	3.5	4	Se.COM
f(x)		1.4	2	2.8	4	5.7	8			

[3]

(b) Draw the graph of y = f(x) for $0 \le x \le 4$.



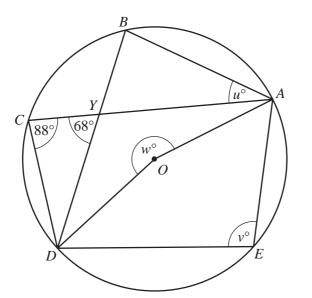
(c)	Use your graph to solve the equation $2^x = 5$.			
		Answer(c)	<i>x</i> =	
(d)	Draw a suitable straight line and use it to solve the	equation	$2^{x} =$	3 <i>x</i> .
	Answer(d) x =			or x

wer(c) x = [1]

Answer(d) x =	 or $x =$	 [3]

(e)	Draw a suitable tangent and use it to find the co-ordinates of the point on the graph of	y = f(x)
	where the gradient of the graph is 3.	

Answer(e) () [31
111131101 (0)	 ,	 <i>,</i> ,	~]



NOT TO SCALE www.PapaCambridge.com

A, B, C, D and E lie on the circle, centre O.

CA and BD intersect at Y.

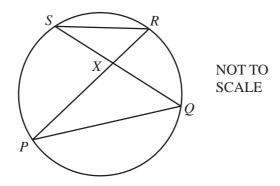
Angle $DCA = 88^{\circ}$ and angle $CYD = 68^{\circ}$.

Angle $BAC = u^{\circ}$, angle $AED = v^{\circ}$ and reflex angle $AOD = w^{\circ}$.

Calculate the values of u, v and w.

Answer(a) u =	
<i>v</i> =	
w =	[4]

(b)

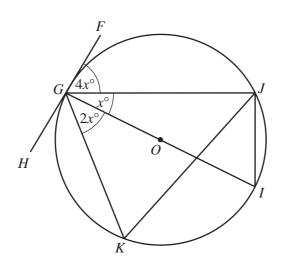


P, Q, R and S lie on the circle. PR and QS intersect at X. The area of triangle $RSX = 1.2 \text{ cm}^2$ and PX = 3 SX.

Calculate the area of triangle *PQX*.

Answer(b)	 cm^2	[2]
answer(b)	 CIII	[4]

(c)



NOT TO SCALE www.PapaCambridge.com

GI is a diameter of the circle. FGH is a tangent to the circle at G. J and K also lie on the circle. Angle $JGI = x^{\circ}$, angle $FGJ = 4x^{\circ}$ and angle $KGI = 2x^{\circ}$.

Find

(i) the value of x,

$$Answer(c)(i) x =$$
 [2]

(ii) the size of angle JKG,

$$Answer(c)(ii) Angle JKG =$$
 [2]

(iii) the size of angle GJK.

$$Answer(c)(iii) Angle GJK =$$
 [1]

$$f(x) = 1 - 2x$$

$$f(x) = 1 - 2x$$
 $g(x) = \frac{1}{x}, x \neq 0$ $h(x) = x^3 + 1$

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



- (a) Find the value of
 - (i) gf(2),

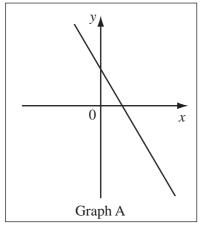
(ii) h(-2).

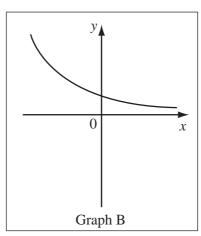
(b) Find fg(x). Write your answer as a single fraction.

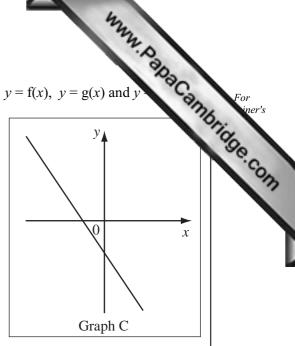
$$Answer(b) fg(x) =$$
 [2]

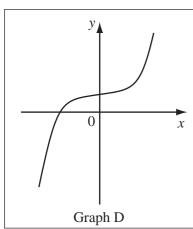
(c) Find $h^{-1}(x)$, the inverse of h(x).

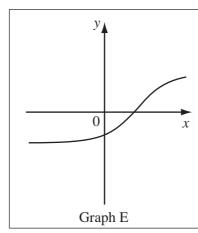
Answer(c)
$$h^{-1}(x) =$$
 [2]

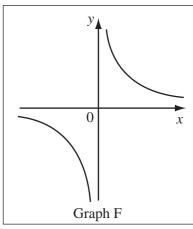












Answer(d) y = f(x) Graph

y = g(x) Graph

y = h(x) Graph [3]

(e)
$$k(x) = x^5 - 3$$

Solve the equation $k^{-1}(x) = 2$.

Answer(e) x =[2]

		10	8	
10	(a)		ag a	For
		Potatoes cost $\$(x+1)$ per kilogram.	7%	iner's
		The total cost of 12 kg of rice and 7 kg of potatoes is \$31.7	0.	6
		Find the cost of 1 kg of rice.		e.com
				Ì

(b) The cost of a small bottle of juice is y. The cost of a large bottle of juice is (y + 1). When Catriona spends \$36 on small bottles only, she receives 25 more bottles than when she spends \$36 on large bottles only.

(i) Show that
$$25y^2 + 25y - 36 = 0$$
.

Answer(b)(i)

(ii) Factorise $25y^2 + 25y - 36$.

Answer(a) \$

[3]

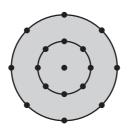
(iii) Solve the equation $25y^2 + 25y - 36 = 0$.

(iv) Find the total cost of 1 small bottle of juice and 1 large bottle of juice.



[4]





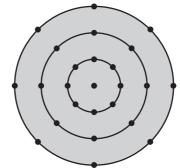


Diagram 1

Diagram 2

Diagram 3

The diagrams show a sequence of dots and circles.

Each diagram has one dot at the centre and 8 dots on each circle.

The radius of the first circle is 1 unit.

The radius of each new circle is 1 unit greater than the radius of the previous circle.

(a) Complete the table for diagrams 4 and 5.

Diagram	1	2	3	4	5
Number of dots	9	17	25		
Area of the largest circle	π	4π	9π		
Total length of the circumferences of the circles	2π	6π	12π		

((b)	(i)	Write down	. in terms	of n .	the number	of dots	in diagram r	1
١	v	, ,.,	11 11 10 GO 11 11	, 111 (011110	OI II,	the manifest	or acce	III diagiani /	ı

Answer(b)(i) _____ [2]

(ii) Find n, when the number of dots in diagram n is 1097.

$$Answer(b)(ii) n = [2]$$

- (c) Write down, in terms of n and π , the area of the largest circle in
 - (i) diagram n,

$$Answer(c)(i) \qquad [1]$$

(ii) diagram 3n.

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

(d) Find, in terms of n and π , the total length of the circumferences of the circles in diagram n.

$$Answer(d) \qquad [2]$$

20

BLANK PAGE

www.PapaCambridge.com

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.