

MINISTRY OF EDUCATION, SINGAPORE in collaboration with UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE General Certificate of Education Ordinary Level

CANDIDATE
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## **MATHEMATICS**

4048/02

THE PERSON NAMED IN

Paper 2

October/November 2019 2 hours 30 minutes

Candidates answer on the Question Paper.

## **READ THESE INSTRUCTIONS FIRST**

Write in dark blue or black pop

Write in dark blue or black pen.

You may use an HB pencil for any diagrams or graphs.

Do not use staples, paper clips, glue or correction fluid.

DO NOT WRITE IN ANY BARCODES.

Answer all questions.

If working is needed for any question it must be shown with the answer.

Omission of essential working will result in loss of marks.

The use of an approved scientific calculator is expected, where appropriate.

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.

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For  $\pi$ , use either your calculator value or 3.142, unless the question requires the answer in terms of  $\pi$ .

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 100.

This document consists of 23 printed pages and 1 blank page.



Singapore Examinations and Assessment Board

CAMBRIDGE International Examinations

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1. WILLIAM

[Turn over



1 (a) Simplify  $\frac{4p^2r}{3} \div \frac{2r^3}{p}$ .

Answer		[1]
Answer	***************************************	

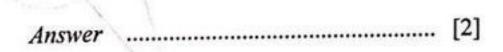
**(b)** 
$$a = \frac{3b + 4c}{5 - b}$$

(i) Evaluate a when b = 6 and c = -2.

[furn over for Chastins 1]

(ii) Express b in terms of a and c.

(c) (i) Express  $9-7x+x^2$  in the form  $p+(q+x)^2$ .



(ii) Write down the coordinates of the minimum point of the graph of  $9-7x+x^2$ .

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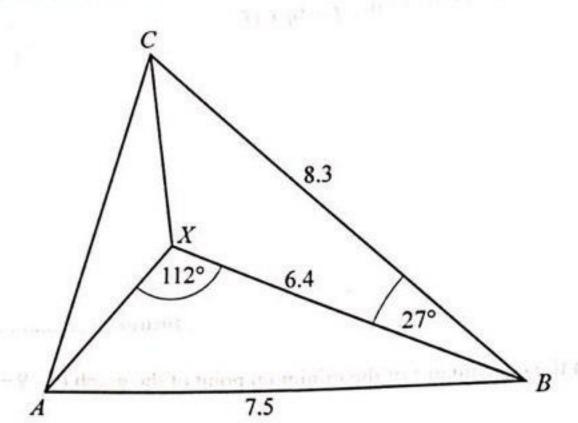
(a) Calcarate Cat

(d) Solve  $\frac{1}{x-3} + \frac{6}{x-1} = 2$ .

(b) Celeulate angle XIA.



Ш



X is a point inside triangle ABC. AB = 7.5 cm, BC = 8.3 cm and BX = 6.4 cm. Angle  $AXB = 112^{\circ}$  and angle  $XBC = 27^{\circ}$ .

(a) Calculate CX.

Answer ..... cm [3]

(b) Calculate angle XAB.



(c) Calculate the area of triangle ABC.

The sale price of the topics is \$ 750.

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3 (a) The price of a smartphone is \$620 in Singapore.

The price of the same smartphone in the UK is £389.

The exchange rate between Singapore dollars (\$) and UK pounds (£) is \$1 = £0.58.

Calculate how much cheaper the smartphone is in Singapore than in the UK.

Answer ......[2]

(b) The price of a tablet is reduced by 6% in a sale. The sale price of the tablet is \$785.

Calculate the price of the tablet before the sale. Give your answer correct to the nearest dollar.

Answer \$ ..... [2]

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(c) The table shows information about telecommunications in Singapore.

Year	2010	2015
Mobile phone subscriptions	$7.29 \times 10^{6}$	8.21 × 10 <sup>6</sup>
SMS messages sent	$2.77 \times 10^{10}$	$1.14 \times 10^{10}$
Broadband subscriptions	$7.85 \times 10^{6}$	$1.20 \times 10^{7}$

(i)	Calculate how many more mobile phone subscriptions there were in 2015 than in 2010.
***	Give your answer in standard form.

	F17
Answer	 [1]

(ii) Calculate the percentage increase in the number of broadband subscriptions from 2010 to 2015.

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Answer .....% [2

of the operation of -9x-5 - p

(iii) The population of Singapore in 2015 was  $5.54 \times 10^6$ .

Calculate the mean number of SMS messages sent per person per day in 2015.

Answer



The variables x and y are connected by the equation  $y = \frac{x^3}{5} - 2x + 1$ .

Some corresponding values of x and y are given in the table below.

				1957	1		T .	2	3	4
1	x	-4	-3	-2	-1	0	1	1.4	0.4	5.8
Ī	v	D	1.6	3.4	2.8	1_	-0.8	-1.4	0.4	5.8

(a) Find the value of p. 0.100 pi mai d'apprende de la comprende de la comprende de la 2015 para ju 2010

Answer 
$$p = \dots [1]$$

on 3 backgate of toward test (300).

(b) On the grid opposite, draw the graph of 
$$y = \frac{x^3}{5} - 2x + 1$$
 for  $-4 \le x \le 4$ . [3]

(c) Use your graph to write down an inequality in x to describe the range of values where y > 4.

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(d) (i) On the same grid, draw the graph of 
$$5y+x=10$$
 for  $-4 \le x \le 4$ . [2]

(ii) Show that the points of intersection of the line and the curve give the solutions of the equation  $x^3 - 9x - 5 = 0$ .

Answer

The population of Sugamore in 2315 vas 5.54 = 100. Calculate the many purisher of SA(S musseress wat per present per day in 2013)

Use your graphs to solve the equation  $x^3 - 9x - 5 = 0$ .

[2]

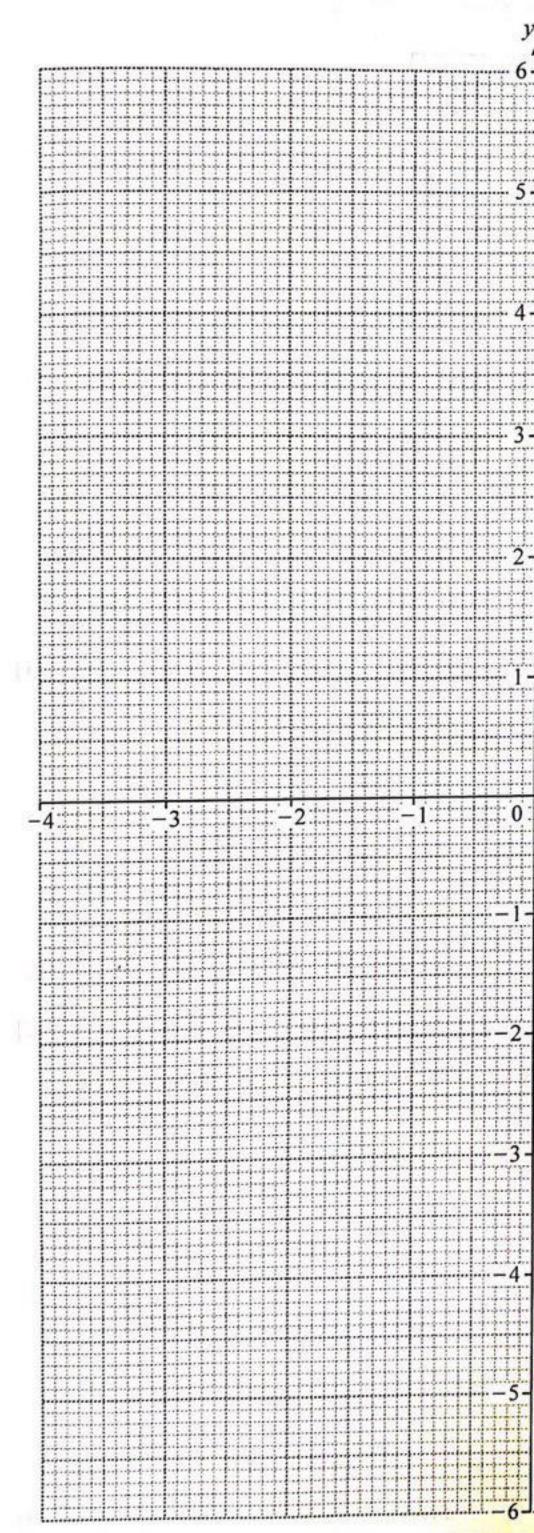
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5 (a) The diagram shows part of a number grid.

					_
1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
21	20	33			21

A rectangular column outlining four numbers, as shown, can be placed anywhere on the grid.

(i) If t represents the number in the top of the rectangle, find an expression, in terms of t, for the product of the top number and the bottom number in the column.

	Answer	[1]
(ii)	Explain why the difference between the product of the middle two numbers and the product of the top and bottom numbers is always 72.	
	Answer	
		••••
		•••••
		[2]
(::::)	The master and an action of the first of the	

Find the value of the largest number in the column.

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- In a sequence, S, the difference between consecutive terms is constant. The third term of this sequence is 36.

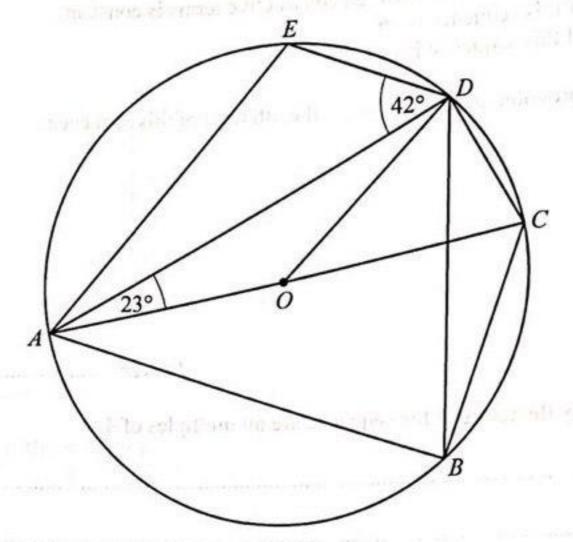
  The sixth term of this sequence is 60.
  - Find an expression, in terms of n, for the nth term of this sequence.

	Answer[2]
ii)	Explain why the terms of the sequence are all multiples of 4.
	Answer
	As gaines into he with the continuous and the first Co. 20 in-
	Significant with a process of the contract of

land, grang rensons for each answer,



6 (a)



A, B, C, D and E are points on the circle, centre O. AC is a diameter of the circle. Angle  $OAD = 23^{\circ}$  and angle  $ADE = 42^{\circ}$ .

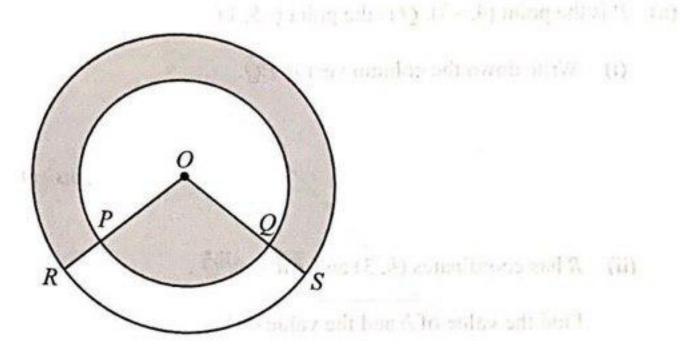
Find, giving reasons for each answer,

(i) angle ABD,

Answer ......[3]

(ii) angle EAD.





P and Q are points on the circle centre O with radius 4 cm.
R and S are points on the circle centre O with radius 6 cm.
OPR and OQS are straight lines.
The perimeter of the minor sector OPQ is 15.2 cm.

(i) Calculate angle POQ in radians.

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Answer	radians	[2]

(ii) Calculate the total shaded area.

Answer ......cm<sup>2</sup> [3]

I developed the second second



- 7 (a) P is the point (4, -3), Q is the point (-5, 1).
  - (i) Write down the column vector  $\overrightarrow{PQ}$ .

Answer 
$$\overrightarrow{PQ} = \left( \right)$$
 [1]

(ii) R has coordinates (h, 3) and  $\overrightarrow{PR} = k\overrightarrow{PQ}$ .

Find the value of h and the value of k.

Answer 
$$h = \dots$$
 [2]

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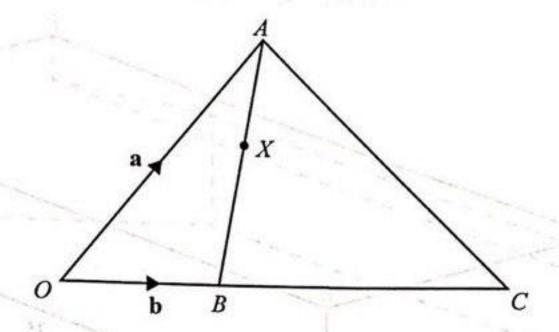
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(b)



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 $\overrightarrow{OAC}$  is a triangle and B is a point on OC.  $\overrightarrow{OA} = \mathbf{a}$ ,  $\overrightarrow{OB} = \mathbf{b}$  and OB:BC = 2:3.

X is the point on AB such that AX:XB = 1:2.

(i) Express  $\overrightarrow{AC}$  in terms of a and b, as simply as possible.

The term has one staping restaugular tentis. Let  $z : \partial L = 4 \text{ m}$ , Re = e m. (1) = 10 m. (2) = 3 m and Ri = 1.5 m. The barn is positioned on be available ground and the walls are vertical.

Calculate the commo of the huns.

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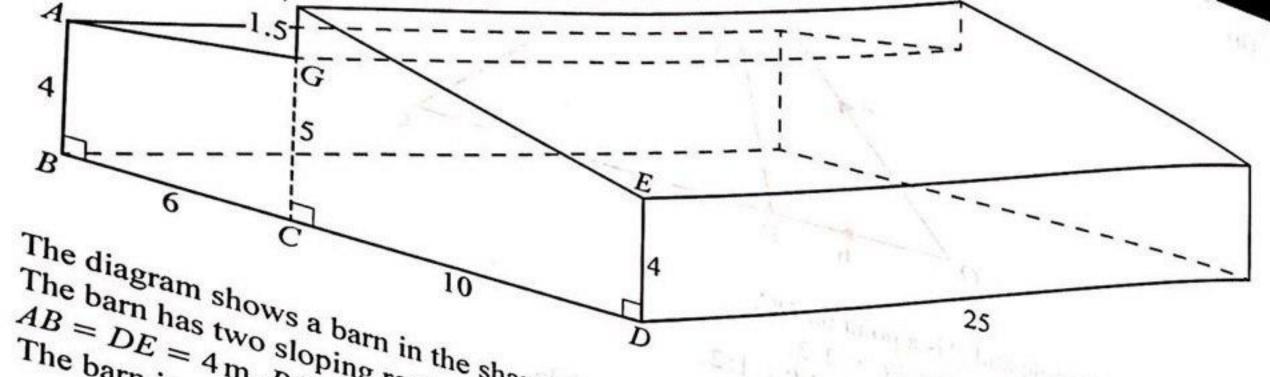
Answer ......[2

(ii) Express  $\overrightarrow{XB}$  in terms of a and b, as simply as possible.

Answer

.... [2]

(iii) Y is the point on OC such that AXYC is a trapezium. Find, in terms of a and b,  $\overrightarrow{XY}$ .



The diagram shows a barn in the shape of a prism of length 25 m with a rectangular base. The barn is positioned on horizontal ground and the walls are vertical.

Answer construction and the second second and and a second second

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till Express Ni in terms of a and b. as simply as possible.



(b) Calculate the total area of the two sloping roofs of the barn.

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(c) Calculate the angle of elevation of P from D.

And the state of t

(iii) Calculate the percentage of students in group A who sound more than '0'

Answer ......[4]



9 (a) Two groups of students entered a science competition. Their scores are shown in the stem-and-leaf diagram.

		Gro	up A								Gro	up B			
			-37-	9	8	3	5	0	1	5	7				
8	7	6	5	4	2	0	6	2	2	6				49	_
7	7	6	5	2		- 1	7	1	3	4	5	5	7	8	9
			8	8			8								
							9	1	3						
	8	8 7 7 7	8 7 6	8 7 6 5	7 7 6 5 2	9 8 8 7 6 5 4 2 7 7 6 5 2 1 8 8 7	9 8 3 8 7 6 5 4 2 0 7 7 6 5 2 1 1 8 8 7 2	9 8 3 5 8 7 6 5 4 2 0 6 7 7 6 5 2 1 1 7 8 8 7 2 8	9     8     3     5     0       8     7     6     5     4     2     0     6     2       7     7     6     5     2     1     1     7     1       8     8     7     2     8     0	9     8     3     5     0     1       8     7     6     5     4     2     0     6     2     2       7     7     6     5     2     1     1     7     1     3       8     8     7     2     8     0     6	9 8 3 5 0 1 5 8 7 6 5 4 2 0 6 2 2 6 7 7 6 5 2 1 1 7 1 3 4 8 8 7 2 8 0 6 7	9 8 3 5 0 1 5 7 8 7 6 5 4 2 0 6 2 2 6 7 7 6 5 2 1 1 7 1 3 4 5 8 8 7 2 8 0 6 7	9 8 3 5 0 1 5 7 8 7 6 5 4 2 0 6 2 2 6 7 7 6 5 2 1 1 7 1 3 4 5 5 8 8 7 2 8 0 6 7	9 8 3 5 0 1 5 7 8 7 6 5 4 2 0 6 2 2 6 7 7 6 5 2 1 1 7 1 3 4 5 5 7 8 8 7 2 8 0 6 7	9     8     3     5     0     1     5     7       8     7     6     5     4     2     0     6     2     2     6       7     7     6     5     2     1     1     7     1     3     4     5     5     7     8       8     8     7     2     8     0     6     7

Key: 3 | 5 | 0 means a score of 53 in group A and a score of 50 in group B

(i) Find the median score for group A.

Answer		[1]
MISHE	***************************************	F-1

(ii) Find the range of scores for group B.

Character to be a factor of the control of the cont

(iii) Calculate the percentage of students in group A who scored more than 70.

(iv) Students who scored more than 70 were awarded a merit. Students who scored more than 85 were awarded a distinction.

Use this information to make two comments comparing the performance of the students in the two groups.

	******
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(b) A bag contains 16 red counters and 9 blue counters.

Two counters are taken from the bag at random without replacement.

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	o counters are to	aren ireni are oug at random	without replacement.	For taking below given	
(i)	Shen says the	probability that both counter	s are blue is $\frac{81}{625}$ .	a distance and the second	
	Explain what I	he has done wrong.	493777		
	Answer	- Cr (52)			
	- F 12	Antistant Strain.	and demonstrated paid	alife and	
		8.4		200	
					[1]
(ii)	Draw a tree di	agram to show the probabilit	ies of the possible outcor	nes.	
	Answer				
	sul supe	many land	ericait	and.	
	70.52	an area of	dza200	268 3 11 2	
	11.52	charitanay'i		Cut of city	

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(2) Find, as a fraction in its simplest form, the probability that only one of the counters is red.

affirmation to the analysis of the analysis of

(iii) Find, as a fraction in its simplest form, the probability that only one of the counters is red

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Answer

. [2]

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10 Leila lives in Kuala Lumpur and drives a small family car.

The tables below give information that Leila can use to work out her driving costs.

Type of driving	A	mount of fuel	used (litres/100 k	m)
			e of car	
	Supermini	Small family	Large family	SUV
City	5.5	6.3	7.8	7.6
Out of city	3.9	4.2	4.6	5.0
Combined	4.5	5.0	5.8	6.0

Speed	limits
City roads	60 km/h
Out of city	
Federal roads	90 km/h
Expressway	110 km/h

Fuel pric	es per litre
Regular	\$2.07
Premium	\$2.11
Diesel	\$1.45
5% discount w	ith loyalty card

(a) One week, Leila drives a total distance of 92 km in the city. Leila estimates that she uses 5.8 litres of fuel.

Show that Leila is correct.

Answer

(b) Leila drives for 45 minutes on the expressway at an average speed of 85 km/h.

the state of the fire simulate form, the probability that only one of the content and

Calculate an estimate of the amount of fuel she uses.

[1]



(c) Leila and Hamid go on a journey together in Leila's car.
They drive from the city of Kuala Lumpur to a town outside of Kuala Lumpur.

23

Leila drives the first stage of the journey at an average speed of 60 km/h. The second stage of the journey is 25 km shorter than the first stage. Leila drives the second stage at an average speed of 75 km/h. The journey takes a total of 3 hours 15 minutes.

Hamid offers to pay half of the cost of the fuel used for the journey. Leila's car uses regular fuel and she has a loyalty card.

Suggest a suitable amount for Leila to ask Hamid to pay.

Justify the decision you make and show your calculations clearly.

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