Name: ()

Class:

PRELIMINARY EXAMINATION GENERAL CERTIFICATE OF EDUCATION ORDINARY LEVEL

MATHEMATICS

4048/02

Paper 2

Friday 21 August 2020

2 hours 30 minutes

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your name, class, and index number on all the work you hand in. Write in dark blue or black pen on both sides of the paper.

You may use a pencil for any diagrams or graphs.

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

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.

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

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 number of marks for this paper is 100.

/ 80	Paper 1	 -	-	-		
/100	D	Q10		Q7	Q4	Q1
Paper 2 /100				Q8	Q5	Q2
				Q9	Q6	Q3
/ 100	Total					

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



Mathematical Formulae

Compound interest

Total amount =
$$P\left(1 + \frac{r}{100}\right)^n$$

Mensuration

Curved surface area of a cone
$$= \pi r l$$

Surface area of a sphere = $4\pi r^2$

Volume of a cone
$$=$$
 $\frac{1}{3}\pi r^2 h$

Volume of a sphere
$$=\frac{4}{3}\pi r^3$$

Area of a triangle
$$ABC = \frac{1}{2}ab \sin C$$

Arc length $= r \theta$, where θ is in radians

Sector area
$$=\frac{1}{2}r^2\theta$$
, where θ is in radians

Trigonometry

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^{2} = b^{2} + c^{2} - 2bc \cos A$$

Statistics

$$Mean = \frac{\sum f x}{\sum f}$$

Standard deviation =
$$\sqrt{\frac{\sum f x^2}{\sum f} - \left(\frac{\sum f x}{\sum f}\right)^2}$$

1 (a) Write as a single fraction in its simplest form $\frac{x-2}{x^2+7x+10} + \frac{x-5}{3x+6}$.

(b) Simplify
$$\frac{16x^2 - 9y^2}{12x^2 - 9xy}$$

(c) Solve the equation $\frac{1}{(x+1)(x-2)} = \frac{2}{8-x}$.

2 (a) (i) Paul sold a painting for \$15680.He made a profit of 12% in the sale.How much did he pay for the painting?

Answer \$ [1]

(ii) Paul saved \$15680 in a bank at 2.05% per year compound interest. What was the value of his savings after 3 years? Give your answer correct to the nearest dollar.

(iii) Which was greater, the profit he made on the painting or the interest he received in 3 years from the bank? Calculate the difference between the two.

(b) Paul bought an apartment at the end of 2006.

The price of the apartment at the end of 2006 was 9% higher than at the end of 2005. The price of the apartment at the end of 2007 was 6% higher than at the end of 2006.

(i) Express the price of the apartment at the end of 2007 as a percentage of the price at the end of 2005.

Answer% [1]

(ii) Given that the increase in the price from 2006 to 2007 was \$63000, calculate the increase in the price of the apartment from 2005 to 2006.Give your answer correct to the nearest hundred dollars.

Answer \$.....[3]

3 A Thai restaurant sells 3 different types of dinner sets. Each dinner set contains packets of 4 different types of food items: fried rice, stir fried vegetables, sambal toufu and mango sticky rice.

Matrix \mathbf{T} shows the breakdown of the number of packets of each type of food item within the 3 different sets.

Set	А	В	С	
	(2	4	7	Fried Rice
$\mathbf{T} = \begin{bmatrix} 1\\ 1\\ 2 \end{bmatrix}$	1	2	3	Stir Fried Vegetables
	1	1	2	Sambal Toufu
	2	3	4)	Mango Sticky Rice

(a) On average, the restaurant sells 5 Set A, 3 Set B and 6 Set C per day.

Represent this as a 3×1 column matrix **R**.

(b) Evaluate the matrix N = 7R.

(c) Evaluate $\mathbf{M} = \mathbf{T}\mathbf{N}$.

(d) State what each of the element(s) of M represent.

Answer[1]

(e) (i) If the restaurant sells Set A at \$24, Set B at \$43 and Set C at \$70, calculate the total sales from the dinner sets.

(ii) Instead of buying the dinner sets where the combination of food items is fixed, the food items can also be bought individually (this is known as à la carte).

For à la carte purchase, a packet of fried rice costs \$4, mixed vegetable \$6.50, sambal toufu \$5 and mango sticky rice \$5. In order to boost business, the restaurant also extends a discount of 10% for all à la carte purchases.

Calculate the percentage loss in sales when the restaurant sells dinner sets instead of à la carte.

Answer% [3]

- 4 (a) The *n*th term of a sequence is given by $T_n = \frac{n(n+3)}{2}$. (i) Use the formula to find T_{16} .

(ii) Which term in the sequence has a value of 54?

(iii) Find, in its simplest form, the expression for $T_{n+1} + T_n$, leaving your answer in terms of n.

(iv) Explain why the sum of two consecutive terms of this sequence will never be a perfect square.

- (b) The first four terms of a sequence are 6, 10, 14 and 18.
 - (i) Write down the 7^{th} term in this sequence.

Answer [1]

(ii) Find, an expression, in terms of *n*, for the *n*th term of this sequence.

- 5 A man was driving his truck from point A to point C in a remote part of a country. After he has travelled for 80 km, at a constant speed of x km/h, he reached point B, where his truck broke down.
 - (a) Write down an expression, in terms of *x*, for the time in hours, taken for him to drive from *A* to *B*.

Answer h [1]

He then walks the remaining 6 km from *B* to *C* at a constant speed of (x - 60) km/h.

(b) Write down an expression, in terms of *x*, for the time in hours, taken for him to walk from *B* to *C*.

Answer h [1]

(c) The man took 4 hours to travel from A to C. Write down an equation in x and show that it reduces to $2x^2 - 163x + 2400 = 0$.

(d) Solve the equation $2x^2 - 163x + 2400 = 0$.

Answer $x = \dots$ [3]

[3]

(e) Find how long it would have taken if the man was able to drive from A to C at the original constant speed.Give your answer in hours and minutes, correct to the nearest ten minutes.

Answer h min [2]



The diagram shows an ornament made up of a hemispherical block of wood of diameter 32 cm, that has a smaller hemispherical block of diameter 16 cm, carved out of it.

(i) Calculate the surface area of the ornament, leaving your answer in terms of π .

(ii) Calculate the volume of the ornament.

6 (a)



The figure shows a semicircle with centre O. *AB* is the diameter and point P is on the circumference of the circle.

Angle $OBP = 75^{\circ}$ and BP = 5 cm.

(i) Show that OA = 9.66 cm, correct to three significant figures.

(ii) Calculate the area of the shaded region.

[2]

7



The diagram shows a solid made up of a pyramid and a prism. The base of the prism is a right-angled triangle.

FC, AD and EB are vertically above the base.

FC = 18 cm, AD = EB = 6 cm, AB = DE = 3.6 cm, BC = 4.8 cm and AC = 6 cm.

(a) Show that $FD^2 = 180$.

(**b**) Show that triangle *FED* is a right-angled triangle.

[2]

(c) Calculate the total surface area of the solid.

(d) Find the ratio volume of the prism : volume of the pyramid.

Answer [2]

8 X is the point (1, 4) and Y is the point (6, 9).

Find

(a) the length of the line *XY*,

Answer units [2]

(**b**) the equation of the line XY,

Answer[3]

(c) the equation of the line *l*, which is parallel to *XY* and passes through the point *A* which has coordinates (2, 0),

(d) the coordinates of the point Z that lies on XY such that XY = 4 XZ.

Answer Z(.....)[2]

- **9** Nadirah observes that the queue at one of the school's canteen stall, Stall E, is always long. She decides to do a project to improve the situation.
 - (a) She finds information about the times, in seconds, spent by 100 students in the queue for Stall E. The cumulative frequency curve shows the distribution of the queuing times.



(i) Copy and complete the grouped frequency table for the queuing times for Stall E.

Time (<i>t</i> seconds)	$0 \le t < 40$	$40 \le t < 80$	$80 \le t < 120$	$120 \le t < 160$	$160 \le t < 200$	$200 \le t < 240$
Frequency	10	35	20			10

[1]

(ii) Calculate an estimate of the mean queuing time of the 100 students.

Answer s [1]

(iii) Calculate an estimate of the standard deviation.

Answer s [1]

(iv) A student claims that 75% of students queuing at Stall E had to wait at least 144 seconds. Is this claim true? Explain your answer.

A few weeks later, Nadirah recorded the queuing time of another 100 students. She observes that the longest queuing time is now 200 seconds and the median queuing time is smaller.

(v) State two possible ways the cumulative frequency curve for this set of data differs from the given curve.

1.	 	 	•••••
2.	 	 	[2]

(b) The table shows the number of students queuing at Stall F during recess on a particular day. Each student queues only once.

	Sec 3	Sec 4	Sec 5
Boy	18	7	6
Girl	10	16	8

(i) One student in the queue is selected at random.Find, as a fraction in its lowest term, the probability that the student is from Sec 4.

(ii) Two students in the queue are selected at random. Find the probability that

(a) one of them is a boy and the other is a girl,

(b) both students are girls and one of them is from Sec 3.

10 Mr Samad owns a bakery that specialises in pineapple tarts. Each pineapple tart is in the shape of a sphere of radius 15 mm with its bottom part removed as shown below.



(a) Show that the height of a pineapple tart is 25 mm.

The pineapple tarts are arranged such that after each layer, a piece of baking paper, of negligible thickness, is placed to ensure the tarts stay in place. The side and top views of how the tarts are arranged are shown below.



Mr Samad sells his pineapple tarts in rectangular containers that measure 21 cm in length, 9 cm in width and 5 cm in height.

(b) Calculate the number of pineapple tarts in a rectangular container.

During festive seasons, the pineapple tarts are packed in cylindrical containers.

The top view of each layer of the pineapple tarts is shown below.



Top View of each Layer

(c) Calculate the diameter and the height of the cylindrical container such that it can fit the same number of pineapple tarts in (b).

Answer diameter = cm

height = cm [2]

During one of the festive seasons, Mr Samad received a bulk order of 250 containers of pineapple tarts.

He decided to use a courier service to deliver the pineapple tarts. He has a choice of 2 courier services: GoVan and Singapost. Both courier services offer no weight limit and charge based on the size of goods. The cylindrical containers are packed in cardboard boxes based on the courier service's requirement.

To prevent the pineapple tarts from breaking, Mr Samad packs each cylindrical container upright as shown below.



The rates of the two courier services are as follow.



(d) Given that the trip distance is 23.7 km, which courier service should Mr Samad use? Support your answer with clear workings.

$x^{2}+3x-31$		9aiv) The claim is false.		
$\frac{1a}{3(x+2)(x+5)}$		25% of students had to wait at least 144 seconds.		
4x+3y				
$\frac{10}{3x}$		144 seconds		
1c) $x = 2.71$ or -2.21				
2ai) \$14000		9v) The curve is less wide or narrower or		
2aii) \$16664		steeper.		
2aiii) Profit from sale	e is greater by \$696.	The median is shifted to the left.		
2bi) 115.54%				
2bii) \$86700		obi) 23		
(5) (3)	35) (448)	$\frac{901}{65}$		
3a 3 3b 2	21 203	9biia) $\frac{31}{65} \times \frac{34}{64} \times 2 = \frac{527}{1040}$		
	3c) 140			
	(301)			
3d) Each element of 1	M shows the total	9 (hijh) $\frac{24}{24} \times \frac{10}{10} \times 2 - \frac{3}{10}$		
number of packets of	of each of the 4 different	$\frac{1}{65} + \frac{1}{64} + \frac{1}{26} = \frac{1}{26}$		
types of food items t	that were sold in one			
week (or 7 days) res	pectively.			
3ei) \$4683 (weekly)	or \$669 (daily)	10b) 42		
3eii) 2.13%		10c) Diameter = 9 cm		
4a1) 152		Height = 15 cm		
4a11) 9 ⁴⁴ term		10d) <u>Govan</u>		
4a111) $n^2 + 4n + 2$	· .1 1	No. of containers per box		
4aiv) Since the expre	ssion cannot be expressed	$= (50 \div 9) \times (50 \div 9) \times (50 \div 15) \approx 5 \times 5 \times 3 = 75$		
as a perfect square, it	is not possible for the			
sum to be a perfect so	juare. (with workings)	1		
401_{50}		No. of boxes required = $250 \div 75 = 3 - \approx 4$		
4011)4n+2	6	-		
5a) $\frac{60}{r}$	5b) $\frac{0}{r-60}$	Cost = handling fee + base charge + charge per		
$\frac{x}{5d}$ r = 62 2 or 19 3	$\lambda = 00$	$km = (4 \times 5) + 25 + (0.8 \times 23.7) = 63.96		
5e) 1h 20min				
$\frac{500}{600} \frac{1112011111}{832\pi \text{ cm}^2}$		<u>Singapost</u>		
$6aii) 7510 \text{ cm}^3$		No. of containers per box		
6bii) 98.8 cm ²		I I I I I I I I I I I I I I I I I I I		
$7c) 183 cm^2$		$=(55\div9)\times(50\div9)\times(40\div15)\approx6\times5\times2=60$		
7d) 3 : 2				
8a) 7.07 units		No. of boxes required = $250 \div 60 = 4\frac{1}{2} \approx 5$		
8b) $y = x + 3$		6		
8c) $y = x - 2$		Cost = handling fee + hase charge + charge per		
8d) $(2\frac{1}{4}, 5\frac{1}{4})$		$km = (5 \times 3.5) + 30 + (0.5 \times 23.7) = 59.35		
9ai) 15, 10				
9aii) 104 s		Mr Samad should use Singapost as it is		
9aiii) 59.2 s		cheaper.		

2020 Y4 Math EOY Paper 2 Answer Key

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