## Name

BROADRICK SECONDARY SCHOOL **SECONDARY 4 NORMAL (ACADEMIC) PRELIMINARY EXAMINATION 2023** 4045/02

Class

# MATHEMATICS

Paper 2

ROADRICK

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.

You may use an HB pencil for any diagrams or graphs. Do not use staples, paper clips, glue or correction fluid. Write the question number attempted in the left column in the box provided.

#### Section A Section B Answer **all** the questions. Answer one question.

The number of marks is given in brackets [ ] at the end of each question or part question.

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 total of the marks for this paper is 70.

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  $\pi$ , use either your calculator value or 3.142.

For Examiner's Use				
Error in	Question Number	Marks Deducted		
Rounding-off				
Reasoning				
Presentation				

This document consists of 19 printed pages.

Setter(s) : Ms Yeo Li Shan

For Candidate's Use	For Examiner's Use
Question Number	Marks Obtained
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11 or 12	
Total Marks	/ 70

Index Number

August 2023

2 hours

### Mathematical Formulae

Compound interest

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

Mensuration

Curved Surface area of a cone =  $\pi rl$ 

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

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

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

Trigonometry

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$
$$a^{2} = b^{2} + c^{2} - 2bc \cos A$$

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**Statistics** 

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

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

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### Section A (62 marks)

Answer **all** the questions in this section.

**1** (a) Work out  $\sqrt{5.2^2 - (-2) \times 3}$ .

(b) Write 87.1 million in standard form.

(c) Write 0.054321 correct to 3 significant figures.

(d) Express  $\frac{4x-1}{3} - \frac{3+x}{6}$  as a single fraction. [1]

2 (a)  $49 \div 7^{n} = 7^{5}$ Find the value of *n*.

**(b)** Simplify 
$$\left(\frac{8}{x^3}\right)^{\frac{-1}{3}}$$
.

Answer  $n = \dots$ [2]



4 An advertisement on the sale of a particular type of Headphones is shown below.



(a) Calculate the percentage discount of the Headphones during the sale.

Answer ......% [2]

(b) Mr Kay intends to buy the Headphones on hire-purchase during the sale. He pays a deposit of 10% of the discounted price and then 12 monthly instalments at 5% simple interest per annum. Calculate the **extra** amount he pays as a percentage of the discounted price.

Answer ......% [3]

- 5 (a) Factorise
  - (i)  $25x^2 1$ ,

(ii) 4ax - 10x + 6ay - 15y.

**(b)** Solve  $\frac{1}{x+1} + \frac{1}{3-x} = 1$ .

Answer  $x = \dots$  [4]



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(a) Determine if triangle *XYZ* is a right-angled triangle.

Answer

(**b**) Calculate angle *XZY*.

[2]

*Answer* .....° [3]



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(c) Using your graph, solve the equation  $2x + \frac{8}{x} = 11$ .

*Answer*  $x = \dots \text{ or } x = \dots \text{ [2]}$ 

(d) By drawing a suitable tangent, find the gradient of the graph when x = 1.

A paper weight is made by removing a hemisphere with diameter 10 cm from the bottom of a solid wooden cylinder with base diameter 10 cm and vertical height 8 cm.



- (a) For the paper weight, calculate its
  - (i) volume,

(ii) total surface area.

10

(b) A rectangular box measures 85 cm by 50 cm by 8 cm.Find the maximum number of such paper weights which can be placed in the box.

9 (a) Solve the simultaneous equations.

2x + 3y = 144x - y = 7

*Answer x* = .....

(b) ABCD is a square of side x cm.

*PQRS* is a rectangle with PQ = (3x+7) cm and QR = (x-2) cm.



Given that ABCD and PQRS have the same area,

(i) Write down an equation to represent the information and show that it simplifies to  $2x^2 + x - 14 = 0$ .

Answer

(ii) Solve  $2x^2 + x - 14 = 0$ .

*Answer*  $x = \dots \text{ or } x = \dots \text{ [3]}$ 

(iii) Explain why one of the answers in (b)(ii) needs to be rejected.Answer

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[3]

[1]

Breakdown of Charges	Rate (\$)	Usage (per month)	Total cost (\$ per month)
Electricity Services	0.2794 / kWh 793 kWh		221.5642
Gas Services	0.2166 / kWh	0.2166 / kWh 70 kWh	
Water Services	1.21 / m <sup>3</sup>	$26.5 \text{ m}^3$	
Waterborne Fee	0.92 / m <sup>3</sup>	50.5 III*	
Water Conservation Tax	50% of charges for water service.		
Refuse Removal Fee	9 / Qty	1 Qty	

10 (a) The table below shows the utilities bill of the Lim family for a particular month.

By completing the table above, calculate the total amount to be paid, after 8% GST, by the Lim family.

Answer \$.....[3]

(b) The table below shows the electricity plan by various retailers per month. The Lim family is looking at getting a no contract or 12 months plan, comparing between SPgroup, Sembcorp and Senoko.

<b>CHEAPEST ELECTRICITY RETAILERS</b> (Per Month)					
RETAILERS	RETAILERS NO CONTRACT 6 MONTHS				
SPgroup	29.62¢/kWh				
Geneco Powered by YTL PowerSeraya		29.30¢/kWh	28.98¢/kWh		
Keppel Electric			31.10¢/kWh		
PacificLight	30.56¢/kWh + 55¢ daily fee	_	30.86¢/kWh		
sembcorp		_	29.61¢/kWh		
Senoko	(	29.30¢/kWh	28.98¢/kWh		
SUNSEAP		42.12¢/kWh	_		
TUAS POWER		29.52¢/kW			

https://blog.seedly.sg/electricity-retailer-comparison-cheapest-in-singapore/

The table below also shows available deals for SPgroup, Sembcorp and Senoko.

Plan	No contract	12 months	Credit Card
Retailer			Deal
SPgroup			One time Cash
			Rebate of \$50
Sembcorp		22.5% off	
		<b>Additional</b> One-time \$50 bill rebate	One time Cash Rebate of \$50
Senoko		19% off	One time Cash Rebate of \$50

Assuming the monthly electricity services usage is the same as (a), determine which plan from which retailer would be the lowest cost for the Lim family if they use credit card to pay.

## Show all your calculations and explain your answer clearly.

Answer

[Continue your Answer for Q10(c) on this page]





Answer Angle  $ABQ = \dots^{\circ}$  [2]

(b) The diagram shows three points, *X*, *Y* and *Z* on horizontal ground. XY = 11.5 m, angle  $YXZ = 70^{\circ}$  and angle  $XZY = 83^{\circ}$ .





*Answer YZ* = ..... m [2]

(ii) A bird is hovering 8 m vertically above *Y*. Find the angle of elevation of the bird from *X*.

*Answer* .....° [2]

12 (a) The stem-and-leaf diagram shows the time taken to travel to school every week by each student in a class of 12 students.

2	4					
3	0	0	1	6	6	8
4	2	2	2	7		
5	0					

Key: 4 2 means 42 minutes

Find the

**(ii)** 

(i) median,

mean,

Answer ..... min [1]

Answer ..... min [1]

(iii) standard deviation.

Answer ..... min [1]

100 80 60 40 20 0 0 10 20 30 40 50 60 70 80 (i) Use the diagram to estimate the median. Answer .....h [1] Use the diagram to estimate the interquartile range. **(ii)** Answer .....h [2] (iii) Two students are selected at random. Find the probability that both students spent more than 55 hours watching Youtube. Give your answer as a fraction in simplest form.

(b) The cumulative frequency graph shows the number of hours a group of 100 students spent on watching Youtube in June.

End of Paper