

GREENRIDGE SECONDARY SCHOOL **2024 PRELIMINARY EXAMINATION** SECONDARY 4 NORMAL (ACADEMIC)

CANDIDATE NAME		
CLASS	- INDEX NUMBER	

MATHEMATICS SYLLABUS A

Paper 2

Setter: Mrs Goh-Kok Mei Leng

Candidates answer on the Question Paper.

Additional Materials: Nil

READ THESE INSTRUCTIONS FIRST

Write your class, index number and name 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.

Answer **all** the questions.

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 π , use either your calculator value or 3.142.

> For Examiner's Use Total 70

[Turn over

This paper consists of **19** printed pages, including this cover page.

6 August 2024

2 hours

4045/02

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 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

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

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

Answer **all** the questions.

1 (a) Express
$$7\frac{1}{5}$$
 as a percentage.

(b) Express 40.4% as a fraction in its simplest form.

Answer [1]

(c) Simplify
$$\frac{32x^3y^2}{8} \times \frac{5x^3}{20y^6}$$
.

(d) Simplify
$$\frac{25x^2-4}{6+15x}$$
.

2 (a) Write as a single fraction in its simplest form $\frac{5x}{6} - \frac{1-x}{4}$.

(b) Solve the equation
$$\frac{6}{2-5x} = \frac{1}{3}$$
.

(c) It is given that
$$x = \frac{a^2 - 5}{b}$$
.

(i) Find the value of x when a = 5 and b = 2.

Answer $x = \dots$ [2]

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

3 A circle with centre *O* has a radius of 4 cm. *A* and *B* are points on the circumference of the circle. Given that $\angle AOB = 95^\circ$, calculate



(a) the circumference of the circle,

(b) the perimeter of the sector *AOB*,

(c) the area of the minor sector *AOB*.

4 In the diagram, XYZ is a straight line, WX = 25 cm, WY = 17 cm and WZ = 15 cm. It is given that angle $XZW = 90^\circ$. Calculate



(a) the length of XY,

(b) angle ZWY,

Answer Angle $ZWY = \dots$ [1]

(c) angle YWX,

Answer Angle $YWX = \dots$ [2]

(d) the area of triangle *WXY*.

5 Kevin recorded the colour of cars that entered a carpark in an hour. The pie chart shows his results.



(a) There were twice as many blue cars as red cars. Find the angle representing blue cars.

(b) Given that there were 66 white cars, find the total number of cars in the survey.

6 The graph shows the parking fees charged by a shopping mall.



Find

(a) the maximum number of minutes that the shopping mall offered free parking,

Answer minutes [1]

(b) the duration a car is in the carpark if the parking cost is \$6,

Answer hours [1]

(c) the cost of parking if a person parks his car for 4.5 hours,

Answer \$ [1]

(d) the least number of hours he has parked if the person has paid \$9.00 for the parking.

- 7 (a) The scale of a map is 1 : 40 000.
 - (i) The distance between two railway stations is 8 cm on a map. Find, in kilometres, the actual distance between the stations.

Answer km [2]

(ii) A field has an area of 90 km².
Find the area of the field on the map in square centimetres.



- (b) The point X is the point of intersection of the bisector of angle CAB and the perpendicular bisector of AC.
 - (i) Measure angle *ABC*.

	Answer Angle $ABC = \dots$	[2]
(ii)	Construct the bisector of angle CAB and the perpendicular bisector of AC . Hence, label the point X .	[3]
(iii)	Measure and write down the length of <i>AX</i> .	

Answer $AX = \dots$ [1]

- 8 Mr Lim bought *x* shirts, each at the same price, for a total cost of \$168.
 - (a) Write down an expression for the cost of each shirt in terms of x.

Answer \$ [1]

Mr Lim bought (x+5) pairs of slacks, each at the same price, for a total cost of \$450.

(b) Write down an expression for the cost of each pair of slacks in terms of x.

Answer \$ [1]

(c) If 2 shirts and a pair of slacks cost \$134 altogether, form an equation in x and show that it reduces to $67x^2 - 58x - 840 = 0$.

Answer

(d) Solve the equation $67x^2 - 58x - 840 = 0$.

[Turn over

[3]

9 A ball was thrown from the top of a vertical tower. The height, *h* metres, of the ball **above the top of the tower** at a time *t* seconds after it was thrown is given by the equation $h = 22t - 5t^2$.

This is a table of values for $h = 22t - 5t^2$.

t	0	1	2	3	4	5	6
h	0	17	24	21	8	р	-48

(a) Calculate the value of *p*.

Answer $p = \dots$ [1]



Answer m [1]

(ii) the time when the ball was 13 metres above the top of the tower.

Answer s [1]

(d) By drawing a tangent, estimate the gradient of the graph of $h = 22t - 5t^2$ when t = 3.5.

Peter stays in Punggol and goes to school in Bukit Timah.He has to take the train every morning at Punggol MRT station to Tan Kah Kee MRT station.

15

He wants to find the fastest route from home to school. Tables 1 and 2 are two possible routes that he can take.

<u>Table 1</u>

Route 1			
	MRT Stations	Time taken	Distance between the stations (km)
		(11111)	the stations (kin)
North East Line	Punggol \rightarrow Serangoon	11	7.6
Circle Line	Serangoon \rightarrow Botanic Gardens	14	9.3
East West Line	Botanic Gardens \rightarrow Tan Kah Kee	2	1.1

Table 2

Route 2			
	MRT Stations	Time taken	Distance between
		(min)	the stations (km)
		21	12.2
North East Line	Punggol \rightarrow Little India	21	13.2
East West Line	Little India → Tan Kah Kee	10	5.4

(a) Find the average speed, in km/h, of

(i) Route 1,

Answer km/h [1]

(**ii**) Route 2.

Answer km/h [1]

(b) Which route should Peter choose? Explain your answer.

Answer

(c)

Train Service Frequen	cies (in minutes)
	Monday – Friday
Peak	3
(6.30 a.m. to 9 a.m. & 5 p.m. to 7.30 p.m.)	
Off-peak	5

Given that the first train arrival at Punggol MRT station is 05 42.

Using your answer in part (**b**), calculate the latest train time that Peter needs to take to arrive in school by 07 15.

Answer

[2]

Section B (8 marks) Answer one question from this section.

11 (a) The cumulative frequency graph shows the distribution of completed passes data taken from 80 different players in one of the World Cup Football Competition matches.



Mark (<i>x</i>)	Frequency
$0 < x \le 20$	4
$20 < x \le 40$	16
$40 < x \le 60$	45
$60 < x \le 80$	30
$80 < x \le 100$	15

11 (b) The table below shows the marks obtained by 110 students from Alton Secondary School in the recent Science examinations.

(i) Calculate an estimation of the mean mark.

(ii) Calculate the standard deviation.

(iii) For Hilton Secondary, the mean mark was 53 and the standard deviation was 19.Which school's students performed more consistently for the examinations? Give a reason for your answer.

Answer

12 (a) In the diagram, A is the foot of a cliff and B and C are boats in the sea. A is due east of B and the bearing of C from A is 214° . AB = 24 m and AC = 22 m.



(i) The angle of elevation of the top of the cliff, T, from B is 22.3°. Find the height of the cliff, TA.

Answer m [1]

(ii) Calculate angle *BAC*.

Answer Angle $BAC = \dots$ [1]

(iii) Find the distance *BC*.

Answer $BC = \dots m$ [2]

12 (b) In the diagram P, Q, R and S are four points on the circle centre, O. Given that angle $POS = 120^{\circ}$ and angle $QRS = 118^{\circ}$.



Find these angles, giving a reason for each.

(i)	Angle PQS	
	Angle <i>PQS</i> = Reason	
		[2]
(ii)	Angle QPS,	
	Angle <i>QPS</i> = Reason	
		[2]

End of Paper

5	(a)	(i)	(a)	question		
			(b)	question	Answer	[1]
					Answer	[1]
6	Show	v that	aaaaa	aaaaaa		
	Ans	wer				
						[2]
7	(a)	Show	w that	aaaaaaaa		
		Ans	wer			
						[2]
8	(a)	(i)	Show	v that aaaaaaaa		
			Ans	wer		
						[2]
9	(a)	(i)	(a)	Show that aaaaaaaaa		
				Answer		

[2]

1. (a) (i) $\frac{7.6+9.3+1.1}{27\div60} = \frac{18}{27\div60} = 40$ km/h	B1	
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(ii) $\frac{13.2+5.4}{31\div60} = \frac{18.6}{31\div60} = 36$ km/h	B1
(b) Route $1 = 27$ min.	B1
Route $2 = 31$ min.	B1
Peter should choose Route 1	
because the total time taken is shorter/ distance	ce is
shorter by 4 km / average speed is faster by 4	km/h
(c) Total time for Route $1 = 27$ min.	
$07\ 15 - 27\ \text{min.} = 06\ 48$ (Time Peter has to be	e on train)
First train = $05\ 42$ Considering 5 min off-peak (before 06 30): $05\ 42 + 50\ min = 06\ 32$	M1
Considering 3 min peak (after 06 30):	
$06\ 32 + 15\ \min = 06\ 47$	A1

2 The table shows the interest rate for investment offered by Bank A and Bank B

Bank A	Bank B
Simple interest of 2.8% per annum	Interest rate of 3% compounded annually

(a) Mr Tan intends to invest \$40 000 for 2 years in each of the two banks. Calculate the total interest earned from the two banks.

(b) Find the interest rate that Bank A should offer in order to match the same returns as Bank B over 2 years.

22

(a) question

(b) question

2 In the diagram, A is the foot of a cliff and B and C are yachts in the sea. A is due east of B and the bearing of C from A is 214° . AB = 24 m and AC = 22 m.



(a) question

Answer [1]

(b) question

			Answer	[1]
2	(a)	question		
	(b)	question	Answer	[1]
			Answer	[1]
2	(a)	question		
	(b)	question	Answer	[1]
			Answer	

(a) question

	(b) question
	Answer
10	Explain why aaaaaaaaaaa
	Answer
	[2]
11	(a) Explain why aaaaaaaaaaa
	Answer
	[2]
12	(a) (i) Explain why aaaaaaaa
	Answer
	[1]
13	(a) (i) (a) Explain why aaaaaaaaa
	Answer
	[1]
14	Write these numbers in order of size, starting from smallest. (NA & NT)

Answer [1]

15 Write these numbers in order of size, starting from largest. (NA & NT)

	Answer	largest smallest	[2]			
16	Write these numbers in order of size, start	ing from smallest. (2018 O Level)				
	Answer	,	[2]			
17	Write these numbers in order of size, starting from largest. (2018 O Level)					
	Answer	,	[2]			
18	Write these numbers in order of size, start	ting from smallest. (NA & NT)				
	Answer, smallest	largest	[2]			
19	Write these numbers in order of size, start	ting from largest. (NA & NT)				
	Answer, largest	smallest	[2]			
20	Write these numbers in order of size, start	ing from smallest. (2018 O Level)				
	Answer,	·····, ·····, ······, ······, ······, ······	[2]			
21	Write these numbers in order of size, start	ting from largest. (2018 O Level)				
	Answer,	·····, ·····, ······, ······, ·····, ·····	[2]			

6 In the diagram, which is not to scale, the equation of the straight line is given as 3y + 2x = 12.



(a) Find the co-ordinates of A and of B.

(b) Calculate the length of line segment *AB*.

3 (a) Tim scored 16 out of 20 marks in Test A and 49 out of 56 marks in Test B. In which test did Tim do better? Justify your answer.

(b) For a group of 338 students who are going for an excursion, the organizer charges \$29.95 per student. By approximating both the cost and number of students, estimate the cost of the excursion. Show your working clearly.

- 2 Detergent powder is being sold in packet of 2 different sizes. The small packet costs \$8.70 and weight 600 g. The larger packet costs \$19.50 and weighs 1.5 kg.
 - (a) Which packet gives a better value? Show your working clearly.

(b) The manufacturer decides to change the price of the small packet so that both packets cost the same unit price. Find the new price of the small packet.

END OF PAPER

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