BROADRICK SECONDARY SCHOOL SECONDARY 4 NORMAL (ACADEMIC) PRELIMINARY EXAMINATION 2023

Class

MATHEMATICS SYLLABUS A

Paper 1

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.

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				
Error in	Question Number	Marks Deducted		
Rounding-off				
Reasoning				
Presentation				



This document consists of 17 printed pages.

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4045/01

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2 hours

Index Number

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 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.

$$0.25 \quad \frac{3}{11} \quad 0.2 \quad \sqrt[3]{0.02}$$

Write these numbers in order of size, starting with the largest.

2 (a) A box contains red and black discs only. $\frac{2}{7}$ of the discs are red. Write the ratio red discs : black discs.

1

(b) Express 1.2 litres as a percentage of 150 ml.

Answer% [2]

3 Find the smallest prime number satisfying -2x < -8.

4 *P* is inversely proportional to x^2 . When x = 2.5, P = 20. Find the value of *P* when *x* is 5.

5 (a) $\sin x^\circ = 0.7$

Given that *x* is an obtuse angle, find *x*.

Answer $x = \dots$ [1]

(b) $\cos 123^\circ = -\cos y^\circ$

Given that *y* is an acute angle, find *y*.

Answer y = [1]

- **6** $m = 4a^2 5$
 - (a) Find *m* where a = -5.

Answer $m = \dots$ [1]

(b) Rearrange the formula to make *a* the subject.





Answer $y = \dots$ [2]

8 The graph shows the number of students who borrowed books from the school library.

Kerry claims that the number of students who borrowed books has been decreasing from January to September.





All the lengths are in centimetres.

Find the length of *PQ*.

9

Answer $PQ = \dots$ [2]

10 Solve x = 2(x + 3).

Answer $x = \dots$ [2]

11 \$1500 is placed in an account earning compound interest of r% per year. At the end of 5 years, the total amount in the account is \$1592.19. Calculate r.

Answer $r = \dots$ [3]

12 (a) It is given that $1575 = 3^2 \times 5^2 \times 7$.

Express 405 as a product of its prime factors. (i)

(ii) Find the highest common factor of 1575 and 405.

 Q^3 is equal to the square of $2^3 \times 5^{6n}$, where *n* is a positive integer. **(b)**

Write *Q*, in terms of *n*, as the product of its prime factors.

Answer $Q = \dots$ [2]

He spent:

 $\frac{9}{20}$ on flight tickets and accommodations, and

40% of the remainder on entertainment and transport.

The rest of the money was spent on food and shopping.

Find the percentage of the money he spent on food and shopping.

Answer% [3]

14 The following table shows the exchange rates of some currencies displayed in a bank against Singapore Dollars (SGD).

Code	Foreign Currency	Unit	Selling (SGD)	Buying (SGD)
CAD	Canadian Dollar	1	1.0278	1.0028
JPY	Japanese Yen	100	0.9447	0.9297

(a) Kate has 250 CAD.

By using the "Buying" rate, calculate the amount in SGD Kate will receive if she exchanges 250 CAD to SGD?

(**b**) Lim has 500 SGD.

By using the "Selling" rate, calculate the amount in JPY Lim will receive if he exchanges 500 SGD to JPY?

Give your answer correct to the nearest Yen.

15 The diagram shows some patterns made from two types of arrows.



(a) Complete the table.

Pattern number	Black arrows	White arrows	Total
1	4	2	6
2	7	4	11
3	10	6	16
4	13	8	21
5			

- (b) Find an expression in terms of *n*, for
 - (i) the number of white arrows in Pattern n,

(ii) the total number of arrows in Pattern n.

(c) Tina says that it is possible to have a total of 615 arrows in the pattern.

Is he correct? Explain your answer.

Answer

[1]

16 *P* is the point (k, -1) and *Q* is the point (3, k).

The gradient of the line PQ is 3.

(a) Form an equation in k and solve it to find the coordinates of P.

Answer P = (.....) [3]

(b) Another line *L* is parallel to *PQ* and passes through (5, -3). Find the equation of the line *L*.

17 Two six-sided dice are rolled and the product of the two numbers is recorded.The table shows some of the possible products.

×	1	2	3	4	5	6
1	1	2	3	4	5	6
2	2	4	6	8	10	12
3	3	6	9	12	15	18
4	4	8	12			
5	5	10	15			
6	6	12	18			

(a) Complete the table above to show all the possible outcomes.

- [2]
- (b) Find the probability that, when the two dice are rolled, the product is
 - (i) a prime number,

Answer		[1]
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(ii) at most 20,

- Answer [1]
- (iii) an irrational number.

18 $x^2 - 6x - 16 = (x+a)^2 + b$ (a) Find *a* and *b*.

Answer a =, b = [2]

(b) Hence, for the graph
$$y = x^2 - 6x - 16$$
,

(i) state the equation of the line of symmetry,

(ii) find the values of the *x*-intercepts of the graph.

Answer $x = \dots$ [2]

19 (a) The equation of the line AB is y = 2x - 8.

Seng says that the graph of the line *AB* is shown below.



Is he correct? Explain your answer.

(b) The sketch shows a quadratic curve with an equation y = -(x+4)(x-2).



Find the coordinates of the maximum point.

Answer (.....) [2]

- 20 A paper cone has a circular base of radius 5 cm and a perpendicular height of 18 cm.
 - (a) By finding the slant height, *L*, of the cone, calculate the curved surface area of the cone.



(b) The paper cone is cut along its slant height, *L*, to form a sector. Find θ , in degrees.



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

21 The diagram below shows a field *PQR*.



- (a) A point, *M*, is situated in the field.
 It lies on the perpendicular bisector of *PQ* and on the bisector of angle *RPQ*.
 Construct and label the position of *M*.
- (b) A fence is built around a garden in the field *PQR* such that is it 4 cm from *R* in the diagram above.Shade the garden area and determine whether *M* lies inside the garden.Circle the correct word(s) in the statement below.

Answer The point M (<u>does / does not</u>) lie inside the garden.

[2]

End of Paper