PRESBYTERIAN HIGH SCHOOL

MATHEMATICS PAPER 1

31 July 2023

PRESBYTERIAN HIGH SCHOOL PRESBYTERIAN HIGH SCHOOL

2023 SECONDARY FOUR NORMAL PRELIMINARY EXAMINATION

DO NOT OPEN THIS QUESTION PAPER UNTIL YOU ARE TOLD TO DO SO.

INSTRUCTIONS TO CANDIDATES:

Write your name, index number and class on the spaces provided above. 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, unless the question requires the answer in terms of π .

Note that all the diagrams in this paper are not drawn to scale.

For Examiner's Use								
Category	Accuracy	Symbols	Others	Marks Deducted				
Question No.								

Setter: Mrs Joyce Yeo Vetter: Mr Tan Chee Wee **TOTAL MARKS** /()

This paper consists of <u>17</u> printed pages (including this cover page) and <u>1</u> blank page.



Monday

2 hours

4045/01

Mathematical Formulae

Compound Interest

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

Mensuration

Curved surface area of a cone = πrl 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 = $\sqrt{\frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f}\right)^2}$

2 Find the smallest integer satisfying 4x > -75.

3 In a class of 40 pupils, 26 are boys. 10 of the boys wear spectacles and $\frac{3}{7}$ of the girls wear spectacles.

(a) Write the ratio boys : girls in its simplest form.

(b) Write the ratio boys who wear spectacles : girls who wear spectacles in its simplest form.

Answer[1]

3

S

4 The graph shows the number of points collected by a football team for the football league seasons in 2021 and 2022 respectively.



State one feature of the graph that may be misleading and explain why.

Answer

 	[2]

5 James bought 24 Snickers, 60 Mars and 72 M&M chocolates. If each type of chocolate is distributed equally into a number of party goodie bags, what is the greatest number of goodie bags that can be prepared?

Answerbags [2]



6 Draw an enlargement of the figure using a scale factor of $\frac{3}{2}$.







[2]

Figure *PQRS* is similar to figure *ABCD*. All the lengths are in centimetres.

Find the value of *x*.

8 Given that $\sin y^{\circ} = 0.65$, find the two possible values of y.

- **9** The first 5 terms of a sequence are 16, 13, 10, 7, 4.
 - (a) Write down the next two terms.

(b) Find an expression for the *n*th term of this sequence.

10 A group of students were asked to vote for their favourite T-shirt colour. The results are shown in the accurate pie chart below.



The number of students who chose blue is 12 more than the number of students who chose red.

Find the total number of students in the group.

Answer[3]

11 Mark's monthly salary is \$3100.

In a particular month, he spent $\frac{3}{10}$ of his salary on food, gave \$150 to his parents and saved 20% of his salary. He spent the rest of his salary on outings with his friends.

Mark told his friends that he spent more than 48% of his salary on outings with his friends. Is his statement correct? Justify your answer with working.

Answer

- **12** Given $Q = 4m^2 n$,
 - (a) find Q when m = 3 and n = -5,

(b) rearrange the formula to make *m* the subject.

8

13 A heptagon has 4 interior angles that are 80° each while the remaining interior angles are $(2x-5)^{\circ}$, $(x+30)^{\circ}$ and $(3x+60)^{\circ}$.

Find the value of *x*.

14 Ben invested \$5000 in an account earning compound interest of r% per year. At the end of 3 years, the total amount in the account is \$5329.48.

Calculate *r*.



M is the point of intersection of the bisector of angle BCA and the perpendicular bisector of AC.

(a) By using construction, find and label *M*. [2]

(**b**) Measure *AM*.

15

Answer cm [1]

16 (a) Factorise $4y^2 - 1$.

(**b**) Hence, or otherwise, express
$$\frac{1}{4y^2-1} + \frac{6}{2y+1}$$
 as a single fraction.

- 17 Mary travels from Singapore to Hong Kong. She exchanges S2500 into Hong Kong dollars (HK\$) when the exchange rate is S = HK5.85.
 - (a) While in Hong Kong, she spent HK\$13200.
 On her return, she exchanges the remaining Hong Kong dollars into Singapore dollars when the exchange rate is S\$1 = HK\$5.82.
 How many Singapore dollars does she receive?

 (b) Mary wants to buy a business bag. The business bag in Hong Kong costs HK\$699. The same bag sold in Singapore costs S\$139. Considering the same exchange rate of S\$1 = HK\$5.85, would Mary pay less for the bag in Hong Kong or Singapore? Justify your answer with calculations.

Answer

- 18 Two fair 4-sided dice, A and B are rolled once.Die A has the numbers 1, 2, 3, 4 and Die B has the numbers 2, 4, 5, 7.The product of the two numbers shown is recorded.The table shows some of the possible products.
 - (a) Complete the table to show all the possible outcomes.

	×	2	4	5	7		
Die A	1	2	4	5	7		
	2	4	8				
	3	6					
	4	8					

Die B

- (**b**) Find the probability that
 - (i) both dice show even numbers,

(ii) the product is a number less than 10,

(iii) the product is a factor of 16.

[2]

19 (a) Factorise completely 3ab-5bc+6a-10c.

(b)
$$x^{2} + 6x - 2 = (x + a)^{2} + b$$

(i) Find a and b.

Answer $a = \dots [2]$

(ii) Hence solve $x^2 + 6x - 2 = 0$, giving your answers correct to 2 decimal places.

Answer $x = \dots$ or \dots [2]

- 20 *P* is the point (-8, 0) and *Q* is the point (k, k+5) with k > 0. The length of *PQ* is 15 units.
 - (a) Form an equation in k and show that it simplifies to $k^2 + 13k 68 = 0$. Answer

[2]

(b) Using factorisation, solve $k^2 + 13k - 68 = 0$ and find the coordinates of Q.

Answer Q (.....) [3]

21 (a) The line 2x-5y+3=0 has gradient *m* and *y*-intercept (*a*, *b*). Find *m* and (*a*, *b*).

Answer $m = \dots$

$$(a, b) = (\dots, \dots, \dots) [2]$$

(b) The diagram shows the graph of y = x(x-4) and it passes through the x-axis at A(0, 0) and B(k, 0).



- (i) Show that the value of k is 4. [1] Answer
- (ii) Find the coordinates of the minimum point.

16

Answer (.....) [2]

22 An open container is made up of a hollow cylinder and a hollow conical base of radius 8 cm. The height of the cylinder is 5 cm and the vertical height of the conical base is 6 cm.



Calculate the

(a) total volume of the container,

Answer cm³ [3]

(b) total surface area of the container.

Answer cm² [3]

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