CHUNG CHENG HIGH SCHOOL (YISHUN)

NA

2023 Preliminary Examination
Secondary Four Normal Academic

CANDIDATE NAME

CLASS

INDEX NUMBER

MATHEMATICS SYLLABUS A

4045/02

Paper 2

31 July 2023

2 hours

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number on 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 paper clips, glue or correction fluid.

Section A
Answer **all** questions.

Section B
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 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.

You are reminded of the need for clear presentation in your answers.
Up to 2 marks may be deducted for improper presentation.

Question Number	Marks	Marks Obtained
1	3	
2	4	
3	5	
4	6	
5	7	
6	7	
7	6	
8	7	
9	9	
10	8	
11	8	
12	8	
TOTAL	70	

Mathematical Formulae

Compound Interest

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

Measurement

$$\text{Curved surface area of a cone} = \pi rl$$

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

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

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

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

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

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

Trigonometry

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

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

Statistics

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

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

Section A (62 marks)

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

1 **(a)** Evaluate $\dfrac{1.8056}{8.1349+13.8321}$. Write down all the figures shown on your calculator as the answer.

(b) Give your answer to **part (a)** correct to

(i) 3 significant figures,

(ii) 2 decimal places.

Answer (a) ..... [1]

(b)(i) ..... [1]

(b)(ii) ..... [1]

2 As of 31 May 2023, the number of COVID-19 cases reported in Singapore and Bhutan are 2 459 457 and 62 671 respectively.

Source : WHO Coronavirus (COVID-19) Dashboard | WHO Coronavirus (COVID-19) Dashboard With Vaccination Data

(a) Find the difference in the number of cases reported between Singapore and Bhutan. Give your answer in standard form correct to 3 significant figures.

Answer ..... [2]

(b) Find the number of times the number of cases reported in Singapore as compared to Bhutan. Give your answer correct to the nearest 10.

Answer ..... [2]

3 **(a)** The coordinates of P and Q are $(-4, 3)$ and $(2, 15)$ respectively.

Find the equation of the line PQ.

Answer …… [3]

(b) The line CD is parallel to the line PQ. $R(7, 11)$ is a point on the line CD.

Work out the equation of the line CD.

Answer …… [2]

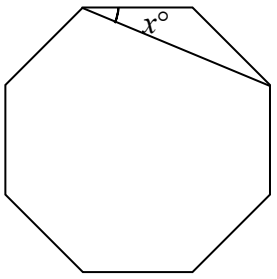
4 **(a)** Solve the simultaneous equations.

$$3x + y = 12$$
$$x - 2y = 11$$

Answer $x =$ ……

$y =$ …… [3]

(b) The diagram shows a regular octagon. Find the value of x.



Answer …… [3]

5 **(a)** Factorise $12m - 3m^3$ completely.

Answer ..... [2]

(b) Solve the equation $3^{x+6} = 27^x$.

Answer $x =$ ..... [2]

(c) Solve the equation $3x^2 + 4x - 9 = 0$.
Give your answers correct to 2 decimal places.

Answer $x =$ ..... or $x =$ ..... [3]

6 **(a)** y is directly proportional to the positive square root of x. When $x = 9$, $y = 54$.

(i) Find an equation connecting x and y.

Answer $y =$ ..... [2]

(ii) Find the value of x when $y = 72$.

Answer $x =$ ..... [2]

(b) Observe the following pattern.

first pattern	: 1×3	$= 2^2 - 1$
second pattern	: 3×5	$= 4^2 - 1$
third pattern	: 5×7	$= 6^2 - 1$

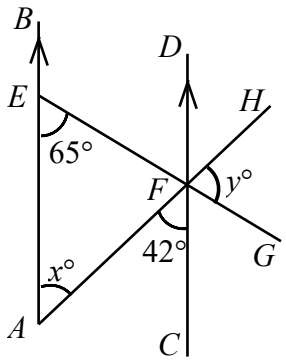
(i) Write down the fourth pattern.

Answer ..... [1]

(ii) Hence, write down an expression for the nth pattern.

Answer ..... [2]

7 **(a)** In the diagram, AB is parallel to CD. AEB, AFH and EFG are straight lines.
Find the value of x and of y.



Answer $x =$ ..... [1]

$y =$ ..... [2]

(b) The value of a car decreases over time. Its value decreases by 10% every year. The original price of the car is \$168 000. Work out the total percentage decrease at the end of the 2nd year.

Answer ..... % [3]

8 **(a)** The scale of a map is 1 : 25 000. The area of a park is 10 cm^2 on the map.
Find the actual area in square kilometres.

Answer …… km^2 [3]

(b) An empty fuel tank is filled using a cylindrical pipe with diameter 8 cm.
Fuel flows along this pipe at a rate of 2 metres per second.
It takes 24 minutes to fill the tank. Calculate the capacity of the tank.
Give your answer to the nearest litres.

Answer …… litres [4]

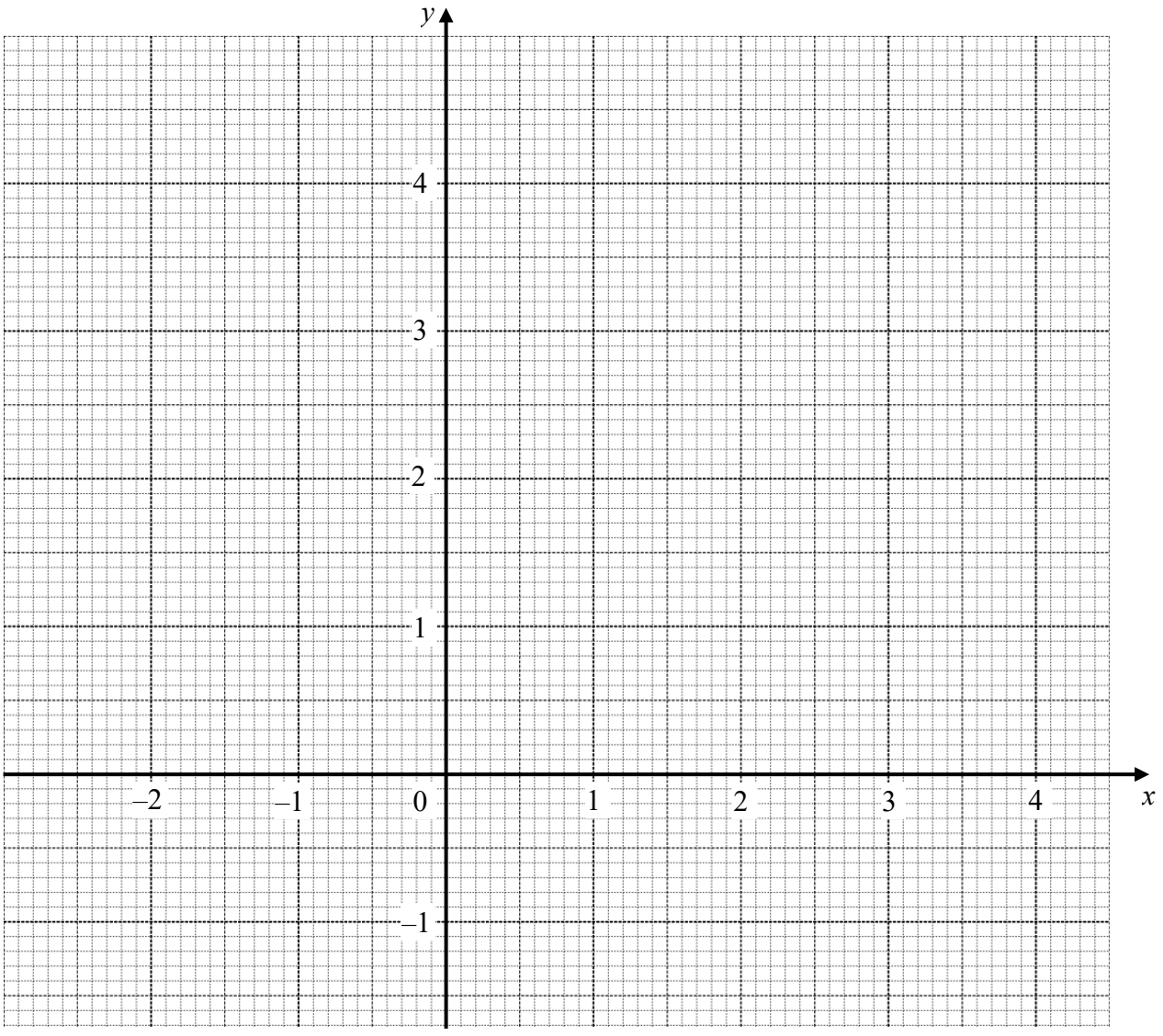
9 **(a)** Complete the table of values for $y = \frac{1}{3}x^3 - \frac{1}{2}x^2 - x + 2$.

Give your answers correct to 1 decimal place.

x	–2	–1.5	–1	–0.5	0	0.5	1	1.5	2	2.5	3
y	–0.7	1.3	2.2		2		0.8	0.5	0.7	1.6	3.5

[2]

(b) On the grid, plot the graph of $y = \frac{1}{3}x^3 - \frac{1}{2}x^2 - x + 2$ for $-2 \leq x \leq 3$.



[3]

(c) By drawing a suitable tangent, find the gradient of the curve when $x = 2.5$.

Answer …… [2]

(d) Use your graph to determine the number of solution(s) to the equation $2x^3 + 12 = 3x^2 + 6x$. Explain briefly.

Answer ……..

…….....

…… [2]

10 Amy plans to further her studies at a polytechnic after her GCE O-Level examination.

The tables below give information that Amy can use to work out the amount of money she might earn by taking on some temporary job offer before her course starts in April 2024.

ABC Singapore Pte Ltd Tele-marketing cum Administrative Assistant ✓ 5-day week, 8 a.m. – 5p.m. ✓ 3 or 4 months contract ✓ No experience needed, training provided	$1600 monthly

Appetit Singapore Pte Ltd Casual Kitchen Assistant ✓ work on weekends ✓ 10 a.m. – 6 p.m. ✓ lunch & dinner provided ✓ lunch, 30 min (flexi arrangement from 11 a.m. – 1 p.m.) ✓ dinner, 30 min (flexi arrangement from 4 p.m. – 6 p.m.)	$11 hourly

Amy intends to work for 4 full months from Dec 2023 to Mar 2024.

For weekdays, she would work for ABC Singapore Pte Ltd and work on weekends at Appetit Singapore Pte Ltd.

(a) (i) Assume there are 4 weeks in a month, show that Amy's monthly salary is $616 working with Appetit Singapore Pte Ltd.
You must show clearly your working steps. [2]

Answer

(ii) Every Singaporean and Singapore Permanent Resident (SPR) employee below the age of 55 years old must contribute 20% of their salaries to the Central Provident Fund (CPF) Board. Calculate Amy's monthly CPF contribution, from working in ABC Singapore and Appetit Singapore, rounded to the nearest dollars.

Answer $ ..... [2]

(b) Amy did a quick calculation using the information provided in the following tables based on current year information. She claimed that she would be able to pay for her first year course fees with the money earned from working from Dec 2023 to Mar 2024 after deducting her CPF contributions and monthly expenses.
Do you agree with her? Justify your decision with calculations.

Course Fees (With MOE Tuition Grant) - Admission Year 2023

Type of Fee	**Singapore Citizens (S$)**
Subsidised Tuition Fee Payable	3,000.00
Supplementary Fee (inclusive of GST)	86.50
Course Fees Per Academic Year	3086.50

Source : https://www.rp.edu.sg/financial-matters

Monthly Expenses ($)

hybrid concession pass, ($)	54
mobile phone subscription	10
expenditure	400

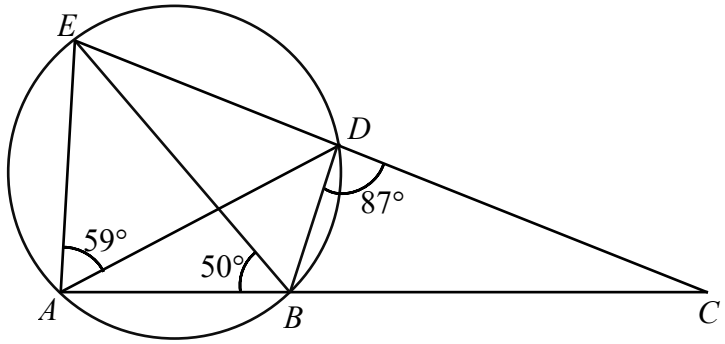
Answer Yes / No because .....

..... [4]

Section B (8 marks)

Answer **one** question from this section. Each question carries 8 marks.

11 **(a)** A, B, D, E are points on the circumference of a circle.
ABC and EDC are straight lines.
Angle $DAE = 59°$, angle $ABE = 50°$ and angle $BDC = 87°$.
State clearly the reasons in your working steps, find



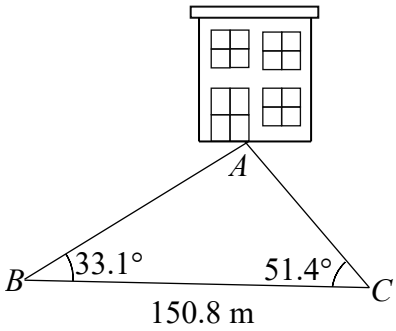
(i) angle AED,

Answer angle AED = …… [2]

(ii) angle BCD.

Answer angle BCD = …… [2]

(b) In the diagram, BC represents a straight road at the same level as the foot A of a vertical building. A surveyor found that $BC = 150.8$ m, angle $ABC = 33.1°$ and angle $ACB = 51.4°$.



(i) Find the distance AB.

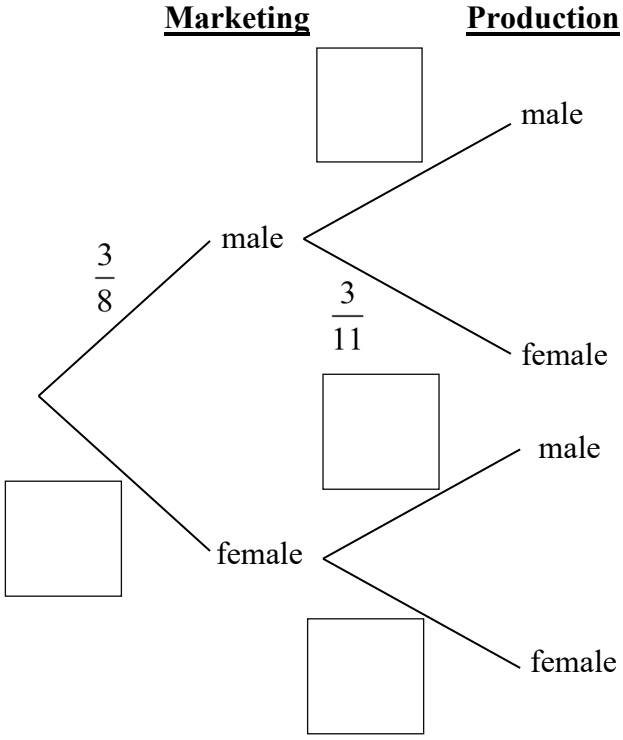
Answer $AB =$ …… m [2]

(ii) The angle of elevation of the top of the building from B is 25°. Calculate the height of the building to the nearest metres.

Answer …… m [2]

12 **(a)** In a company, the marketing department has 3 male staff and 5 female staff. The production department has 8 male staff and 3 female staff. A member from each department is selected at random to form a project team.

(i) Complete the tree diagram below.

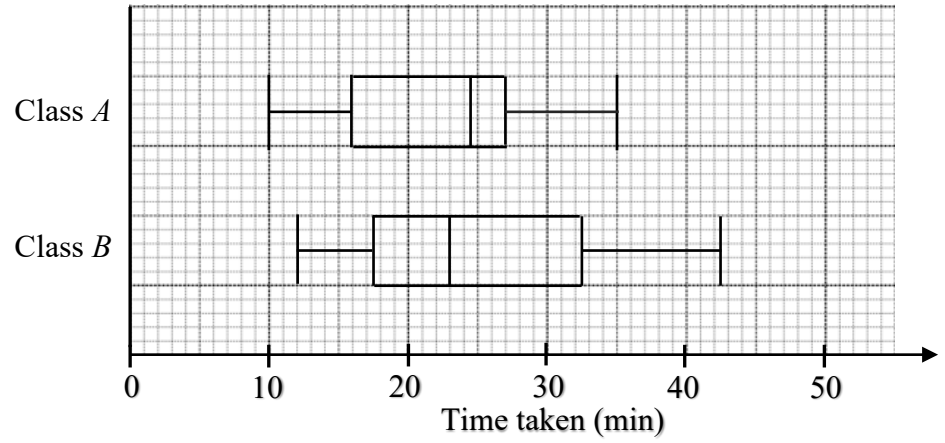


[2]

(ii) Find the probability that the team members are of the same gender.

Answer ..... [2]

(b) The box-and-whisker plots represent the distributions of the time taken by two classes of students, *A* and *B*, to solve a challenging Mathematics problem.



(i) Write down the median time for each class.

Answer median time of class *A* = …… minutes

median time of class *B* = …… minutes [2]

(ii) Make two comparisons between the time taken by the students of class *A* and class *B*.

Answer

1 ……

……

……

2 ……

……

……

[2]

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