

# YUAN CHING SECONDARY SCHOOL

Secondary Four Normal (Academic) Course Preliminary Examination 2024

CLASS			
MATHEMATI	CS	NUMBER	4045/02

Paper 2

Candidates answer on the question paper.

# 1 August 2024

2 hours

## 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 staple, paper clips, highlighters, 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. The total number of 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.

	MARKS
Total	/ 70

This paper consists of <u>18</u> printed pages.

[Turn Over

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 a 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

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

**Statistics** 

Mean = 
$$\frac{\sum fx}{\sum f}$$
  
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) Work out 
$$\frac{45.3}{0.0568 \times 16.5}$$
.

(b) y is directly proportional to the square of x. Given that y = 10 when x = 2, find y when x = 6.

2 (a) Write 0.006 013 74 in standard form, correct to 3 significant figures.

**(b)** Simplify 
$$\left(\frac{x^6}{64}\right)^{-\frac{2}{3}}$$
.

3 (a) The interior angle of a regular polygon is 165°.Find the number of sides of the polygon.





Answer

.....[2]

- Mr Wong travels from Singapore to Japan. He exchanges Singapore dollars (\$) \$1500 into Japanese Yen (¥) when the exchange rate is \$1 = ¥115.98.
  - (a) How much Japanese Yen (JPY) does he have?

**Answer** JPY ¥..... [1]

 (b) In Japan, Mr Wong spends ¥23 370.
 On his return, he exchanges the remaining Japanese Yen (¥) into Singapore dollars (\$) when the exchange rate is \$1 = ¥116.25. How many Singapore dollars does he receive?

**Answer** SGD \$ ..... [2]

5 (a) Solve the simultaneous equations.

$$6x + 2y = -2$$
$$4x - 3y = 29$$

**Answer** *x* = .....

(b) Two car rental companies charge the following values of y for x km driven.

Company A: y = 3x + 150Company B: y = 4x + 100

(i) Which rental company has a higher initial fee?

(ii) Calculate the driven distance for the cost of the two companies to be the same.

(c) A water balloon is launched into the air so that the height, *h* metres, after *t* seconds is  $h = -4t^2 + 27t + 2$ . Calculate the time taken for the water balloon to burst as it hits the ground.

**Answer** ...... s [3]

6 The table gives information about the time spent, in minutes, by 50 students revising Mathematics on Sunday.

Time spent ( <i>x</i> minutes)	Frequency
$0 < x \le 15$	12
$15 < x \le 30$	25
$30 < x \le 45$	8
$45 < x \le 60$	5

(a) On the grid, draw a histogram to represent this information.



Time (seconds)

(b) State the modal time interval.

Calculate an estimate of the

(c) (i) mean time,

**Answer** ..... min [2]

(ii) standard deviation time.

**Answer** ...... min [1]

(d) Find the percentage of students who spent more than 30 minutes revising Mathematics on Sunday.

**Answer** ......% [1]

7 This table of values is for  $y = x^3 - 6x + 1$ .

x	-3	-2	-1	0	1	2	3
у	-8	а	6	1	-4	b	10

(a) Calculate the value of *a* and the value of *b*.



(c) Use your graph to find the largest value of x when y = 2.5.

(d) By drawing a tangent, estimate the gradient of the graph of  $y = x^3 - 6x + 1$ when x = 2.

8 (a) Expand and simplify  $(3x-2)^2$ .

**(b)** Factorise completely  $8x^2 - 18y^2$ .



A circle has centre O and radius 5 cm. Minor sector AOB has an angle of  $120^{\circ}$ .

(a) Find the perimeter of major sector *AOB*. Give your answer in the form  $p\pi + q$ .

(b) Find the area of the shaded segment.



10

Mr Tan walks 190 m on a bearing of  $040^{\circ}$  from his office building at point *A* to the hawker centre at point *B* for lunch.

He then walks on a bearing of  $115^{\circ}$  from the hawker centre to a café at point *C* for a cup of coffee.

(a) Mr Tan looks up to his office from the café, which is 313 m away, at an angle of elevation of 23°.
 Calculate the vertical height of his office building.

(b) Calculate the bearing of A from C.

**Answer** ...... ° [5]

**11** PRWC Question (8 marks)

#### Section B (8 marks)

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

12 Ah Seng owns a farm that grows tomatoes.

This year, he separates his tomato plants into two groups, Group A and Group B.

Ah Seng gave fertiliser to the tomato plants in Group A and weighed the 60 tomatoes from Group A.

The cumulative frequency graph shows some information about the weights of the tomatoes.



Use the graph to estimate

(a) (i) the median weight,

**Answer** ...... g [1]

(ii) the interquartile range,

(iii) the number of tomatoes that are more than 182g.

Answer ...... tomatoes [1]

(b) Calculate the percentile of a tomato weighing 177g.

Answer ......% [2]

(c) Ah Seng did not give fertiliser to the tomatoes plants in Group B. He weighed the 60 tomatoes from Group B. The box-and-whiskers plot below shows the results collected.

Box-and-Whiskers plot for tomato weights in Group B



Compare the distribution of the weights of the tomatoes from Group A with the distribution of the weights of the tomatoes from Group B.

Answer	•••••
	•••••
	[2]



*A*, *B* and *C* are points on the circumference of a circle with centre *O*. *TA* and *TB* are tangents to the circle. *AC* is the diameter of the circle and angle  $OTA = 28^{\circ}$ .

#### Find, stating your reasons clearly,

(i) angle *AOB*,

13

**(a)** 

**Answer** ......° [2]

(ii) angle OBC.

**Answer** .....° [2]

(b) A bag contains 5 red marbles, 3 blue marbles and 2 green marbles. Jasmine takes one marble at random from the bag and puts it on the table. She then takes a second marble at random from the same bag.

Calculate the probability that the two marbles are

(i) the same colour,

(ii) of different colours.

----- END OF PAPER -----Efforts Today, Rewards Tomorrow

### 2024 4NA Math Prelim P2 PRWC solution

	Total distance			
	= 1.5 + 40 + 10			D1
_	= 51.5 KIII 125			Ы
	$135 \text{ min} = \frac{155}{60} \text{ h}$			
	= 2 h 15 min			
				D1
_	Silver award			BI
	$\frac{40}{10}$			M1
	22			1/11
	$=1\frac{9}{11}$ h			A1
_	<u>II</u> Shortast possible time if tr	ains intensaly for swimp	ning	
	15  40  10	and intensely for swifting	lillig	
	$=\frac{1.5}{5}+\frac{10}{22}+\frac{10}{8}$			M1
	- 81 -			
	$= 3\frac{1}{220}$ h			
	= 3 h 22 min (rounded off	to nearest minute)		
	Shortest possible time if tr	ains intensely for runnin	g	
	$=\frac{1.5}{2}+\frac{40}{22}+\frac{10}{110}$			
	3 22 11.9			M1
	$= 3\frac{415}{2618}$ h			
	-3 h 10 min (rounded off	to nearest minute)		
		to hearest minute)		
	Susan should train intensiv	vely for <b>running</b> as		A1
	3 h 10 min < 3 h 22 min			A1
		1.0.1		
	Susan should train intensi which is lesser than the ti	vely for <b>running</b> as the	e time needed is $3 \text{ h}$ 10 mins,	
	which is itsset than the th	The needed for swimmin	ig, which is 511 22 mins.	
	Alternative answer:			
	Alternative answer:			
	Alternative answer:	Swimming	Running	MI
	Alternative answer: No training	Swimming $1.5 \div 3 = 30 \text{ min}$	Running 10÷8=1h 15min (laset time)	M1 Swim
	Alternative answer: No training	Swimming $1.5 \div 3 = 30$ min (least time) $1.5 \div 5 = 18$ min	Running $10 \div 8 = 1 h \ 15 min$ (least time) $10 \div 110 = 50.4 min$	M1 Swim
	Alternative answer: No training With training	Swimming $1.5 \div 3 = 30 \text{ min}$ (least time) $1.5 \div 5 = 18 \text{ min}$ (least time)	Running $10 \div 8 = 1 h \ 15 min$ (least time) $10 \div 11.9 = 50.4 min$ (least time)	M1 Swim M1 – F