Class Full Name

Index Number



## MATHEMATICS SYLLABUS A

# Secondary 4 Normal Academic/ 4 Normal Technical (OOS) 3 August 2023

2 hours

Candidates answer on the Question Paper. Additional Materials: Writing papers upon request

## 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.

### Section A

Answer **all** the 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 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  $\pi$ , use either your calculator value or 3.142.

## DO NOT OPEN THIS PAPER UNTIL YOU ARE TOLD TO DO SO

For Examine	er's Use
	70

This document consists of 18 printed pages, including this cover page.

## 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  $\theta$  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 = 
$$\frac{\Sigma f x}{\Sigma f}$$

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

## Section A (62 marks) Answer **all** the questions in this section.

1	(a)	Evalua	the $\frac{5.48 \times \sqrt[3]{98}}{(0.15)^2}$ .
		(i)	Write down your answer correct to 2 significant figures.
			Answer [1]
		( <b>ii</b> )	Write down your answer as a whole number.
			Answer [1]
	(b)	The po (i)	opulation of Asia is approximately 4 758 460 732. Write the value correct to the nearest million.
		(**)	Answer
		(11)	Calculate the number of people per square kilometre in Asia.

Answer ..... [2]

2 (a) Simplify 
$$8(y^{\frac{1}{2}}z)^3 \div \sqrt{4y^3}$$
.

(**b**) Given  $3^m \times 3^4 = 9$ , find *m*.



Two lines intersects at point R. Find the coordinates of point R.

3

Answer  $R = \dots$  [3]

4 A reservoir has an area of  $1250 \text{ m}^2$ . It is represented on the map by an area of  $50 \text{ cm}^2$ . Find the scale of the map in the form of 1 : n.

5 The number of hours spent on online activities by students in a particular week are recorded. The results are shown in the table below.

Number of hours	$0 < x \le 2$	$2 < x \leq 4$	$4 < x \le 6$	$6 < x \le 8$	$8 < x \le 10$
Frequency	р	9	10	25	16

(a) The modal online hours spent by students in a week is  $6 < x \le 8$ . Find the largest possible value of *p*.

Answer  $p = \dots$ [1]

(b) The estimated mean online hours spent by students in a week is 6.25.Find the value of *p*.

Answer  $p = \dots$  [3]



*ABCDE* is a pentagon. *AB* is parallel to *DC*, angle  $ABC = 75^{\circ}$  and angle  $BAE = 105^{\circ}$ . Find the value of angle  $x^{\circ}$ , stating all reasons clearly.



*ABCDEF* is a regular hexagon. The length of each side is 10cm. Calculate the area of the hexagon.



*ABCE* is a parallelogram. *AED* is a straight line. Given that EC = 5cm, AD = 11cm and perimeter of parallelogram = 26cm.

(a) Show that AE = 8cm.

Answer

[1]

(b) If CD = 4cm, explain how you know that angle CDE is a right angle. Show any calculations you make.

 Answer
 [2]

 (c)
 Find angle CED.

 8 (a) Alan, Benny and Charles ran for the President of the student council. Alan won 42%, Ben won 38% and Charles won 52 votes. Find the total number of votes cast.

Answer ...... votes [2]

(b) The usual price of a calculator is \$38. It was sold at a promotion price of \$32. Find the percentage decrease.

(a) The total participants registered for a marathon run was 224. The ratio of male runners to female runners was 3:4. On the actual day of the marathon run, a few more female runners who did not register joined in and the ratio of male runners to female runners became 8:11. Find the total number of female runners for the marathon run on the actual day.

9 (a) Benny travelled  $\frac{2}{5}$  of his journey by train,  $\frac{1}{4}$  by bus,  $\frac{1}{3}$  by car and the remaining 3km on foot. Find the total length of the journey.

(b) A train travelled 240km at speed x km/h. When the engine was replaced by an improved model, the speed of the train increased by 20 km/h and the travel time was reduced by an hour. Form an equation and show that it reduces to  $x^2 + 20x - 4800 = 0$ . Hence, find the value of x.

*Answer*  $x = \dots km/h$  [4]



Answer ......[1]

(ii) Find the length of *PT*.

(b) The two triangles in the diagram are similar. AE = 6 cm, AB = 3.5 cm and BC = 10 cm.



(i) Write down the pair of similar triangles.

(ii) Find the length of DE

Complete the table of values for  $y = x^3 - 2x^2 + 1$ . 11 **(a)** 

x	-1	-0.5	0	0.5	1	1.5	2	2.5
у	-2		1	0.6	0	-0.1	1	4.1

On the grid, plot the graph of  $y = x^3 - 2x^2 + 1$  for  $-1 \le x \le 2.5$ . **(b**)



(c) Use your graph to find the solutions to the equation  $x^3 - 2x^2 + 1 = 3$ .

Answer  $x = \dots$  [1]

(d) Draw a straight line y = -2x. Write down the coordinates of the intersection point.

(e) By drawing a tangent, find the gradient of the curve  $y = x^3 - 2x^2 + 1$  when x = 2.

12 The wooden table in a cafe is as seen in diagram.



It consists of two solid parts : a circular table top with thickness 2.5cm and diameter 90cm and a cylindrical bottom with height 40cm and diameter 35cm.



The table shows the cost required to paint the wooden tables in the café.

Paint type	Area Coverage (cm <sup>2</sup> per litre)	Cost (\$ per litre)	Labour Cost (\$ per table)
Primer Single Coat	5000	12	4
Double Coat Paint	3000	28	8

(a) Show that the total surface area of a wooden table to be painted is approximately 16900 cm<sup>2</sup>.
 Answer

[3]

- (b) Benny has set aside a budget of \$3000 for the paint job.
  - Assuming primer single coat paint is used for the cylindrical bottom and double coat paint is used for the circular top, what is the maximum number of tables that can be painted in the cafe?

#### Section B (8 marks)

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

13 (a) *A*, *B*, *C* and *D* are points on the circumference of a circle with centre *O*. *EF* is a tangent to the circle at *A*. Angle  $EAD = 57^{\circ}$ , angle  $CDA = 82^{\circ}$  and angle  $DBC = 41^{\circ}$ .



Find

(i) obtuse angle *AOC*,

Answer .....° [1]

(ii) angle *ABD*,

*Answer* .....° [1]

(iii) angle ODA.

*Answer* .....° [2]



*OAB* is a sector with radius 7cm and *AB* is 12.5cm. Find the perimeter of the segment.

Answer Perimeter = ..... cm [4]



The speeds in km/h of 260 cars travelling along a road were measured. The cumulative frequency curve summarises the results.



(ii) Find the speed limit if 10% of the cars were found speeding.

(b) Benny watches television or reads a book for an hour every night. He either falls asleep or stays awake.



(i) Find the value of *p*.

*Answer* p = ..... [1]

(ii) Given that the probability of Benny falling asleep when watching television is  $\frac{5}{39}$ , find the value of q.

Answer  $q = \dots$  [1]

(iii) Find the probability that Benny stays awake on a particular night.