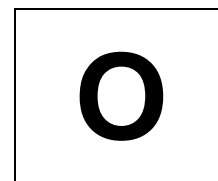




**SWISS COTTAGE SECONDARY SCHOOL**  
**SECONDARY FOUR**  
**WEIGHTED ASSESSMENT 2**



Name: \_\_\_\_\_ (      ) Class: \_\_\_\_\_

**MATHEMATICS**

**4052**

**Wednesday 10 May 2023**

**45 Minutes**

**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.

Answer **all** the questions.

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  $\pi$ , use either your calculator value or 3.142, unless the question requires the answer in terms of  $\pi$ .

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 30.

Qn	Mark	Concept	Application	Careless	Student Analysis/Remarks
1	6	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2	4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3	2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4	8	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
5	3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
6	7	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Total Mark	30	Parent's Signature			

This document consists of **9** printed pages.

**Setter:** Mr Ngoh Kia Joon, Ms Leung Yan Ru, Mr Ang Hanping

**[Turn over**

***Mathematical Formulae****Compound interest*

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

*Mensuration*

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

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

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

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

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

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

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

*Trigonometry*

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

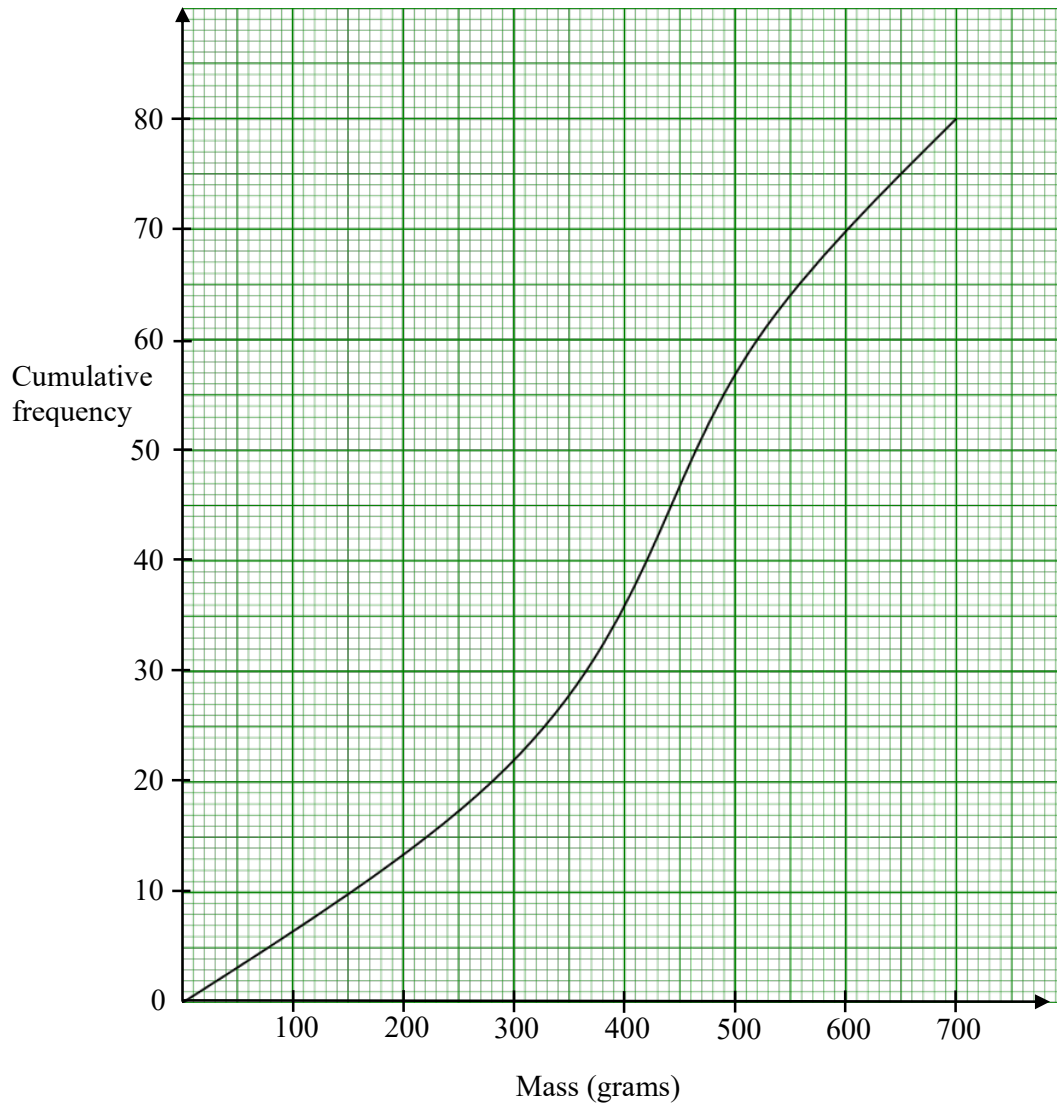
$$a^2 = b^2 + c^2 - 2bc \cos A$$

*Statistics*

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

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

- 1 A group of students participated in a competition to estimate the mass of a jar of marbles. The cumulative frequency diagram below shows the estimation by the students.



- (a) Use the graph to estimate

- (i) median,

Answer ..... g [1]

- (ii) interquartile range for the mass of the jar of marbles.

Answer ..... g [2]

- (b) Estimate the number of students who answered that the mass of the jar of marbles is at least 500 g.

*Answer* ..... [2]

- (c) To increase the difficulty of the competition, the organiser announced that a jar with greater mass of marbles will be used next week.

Describe how the cumulative frequency curve for the estimation by students next week will differ from the current competition.

.....  
 .....[1]

- 2 The table below shows the distance, in km, ran by each of the members of a club, in a week.

Distance (km)	Number of members
$0 \leq x < 5$	2
$5 \leq x < 10$	4
$10 \leq x < 15$	11
$15 \leq x < 20$	$d$
$20 \leq x < 25$	4
$25 \leq x < 30$	3

- (a) (i) Complete the following cumulative frequency table for the data given. [1]

*Answer*

Distance (km)	Number of members
$x < 5$	2
$x < 10$	
$x < 15$	
$x < 20$	23
$x < 25$	
$x < 30$	

- (ii) Find the value of  $d$ .

*Answer*  $d =$ ..... [1]

**(b)** Find an estimate of the

**(i)** mean of the distance ran,

*Answer* .....km [1]

**(ii)** standard deviation of the distance ran.

*Answer* .....km [1]

**3**  $\mathbf{A} = \begin{pmatrix} 6 & 3.1 \\ 1 & \frac{5}{2} \end{pmatrix}$ ,  $\mathbf{B} = \begin{pmatrix} 2 & 3 \\ 4 & 1.8 \end{pmatrix}$  and  $\mathbf{C} = \begin{pmatrix} 2 & 3 \\ 4 & \frac{5y}{6} \end{pmatrix}$ .

**(a)** Evaluate  $\mathbf{A} + \mathbf{B}$ .

*Answer* ..... [1]

**(b)** It is given that  $\mathbf{B} = \mathbf{C}$ , find the value of  $y$ .

*Answer* ..... [1]

- 4 A dance school offers dance sessions for cultural and international dance students on weekdays and weekends.  
Each student has a 10-week block of lessons with one session per week.  
The matrix **D** shows the number of students attending the dance lessons each week in one 10-week block.

$$\mathbf{D} = \begin{array}{cc} & \begin{array}{cc} \text{Cultural} & \text{International} \end{array} \\ \begin{pmatrix} 3 & 10 \\ 5 & 8 \end{pmatrix} & \begin{array}{l} \text{Weekday} \\ \text{Weekend} \end{array} \end{array}$$

- (a) Evaluate the matrix  $\mathbf{L} = 10\mathbf{D}$ .

*Answer* ..... [1]

- (b) The dance school charges \$80 for each cultural dance session and \$90 for each international dance session.

Represent the session charges in a  $2 \times 1$  column matrix **C**.

*Answer* ..... [1]

- (c) Evaluate the matrix  $\mathbf{G} = \mathbf{LC}$ .

*Answer* ..... [1]

- (d) State what the elements of **G** represents.

*Answer* .....

.....

..... [1]

- (e) The dance school wants to attract more students, so in the next 10-week block, the dance school reduces the price for cultural and international dance session by 10%. For this block of sessions, on weekdays, there are 5 cultural dance students and 12 international dance students.  
On weekends, there are 8 cultural dance students and 15 international dance students.

By using matrix multiplication, calculate the total amount of money the dance school earns for this 10-week block of sessions.

*Answer* ..... [4]

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- 5 Given that  $P$  is the point  $(1, 1)$ ,  $\overrightarrow{PQ} = \begin{pmatrix} -3 \\ 1 \end{pmatrix}$  and  $\overrightarrow{PR} = \begin{pmatrix} 2 \\ -1 \end{pmatrix}$ , find

(a)  $\overrightarrow{QR}$  ,

*Answer* ..... [1]

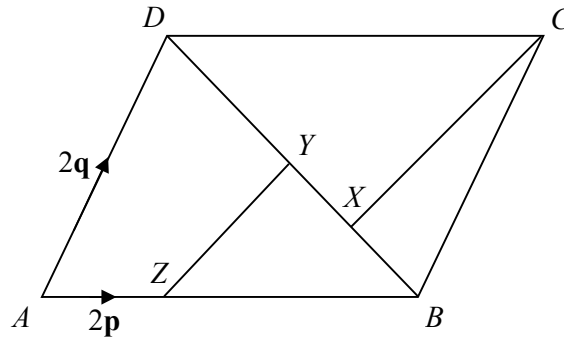
- (b) the coordinates of the point  $X$  such that  $PQXR$  is a parallelogram.

*Answer* ..... [2]

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6



In the diagram,  $ABCD$  is a parallelogram.  $Y$  is the midpoint of  $BD$ ,  $X$  is the midpoint of  $BY$  and  $Z$  is the point on  $AB$  such that  $AB = 3AZ$ .

(a) Given that  $\vec{AZ} = 2\mathbf{p}$  and  $\vec{AD} = 2\mathbf{q}$ , express as simply as possible, in terms of  $\mathbf{p}$  and/or  $\mathbf{q}$

(i)  $\vec{BD}$ ,

Answer ..... [1]

(ii)  $\vec{ZY}$ ,

Answer ..... [2]

(iii)  $\vec{XC}$ .

Answer ..... [2]

(b) Using your answers in (a)(ii) and (a)(iii), deduce two facts about  $XC$  and  $ZY$ .

Answer ..... [1]

Answer ..... [1]