XINMIN SECONDARY SCHOOL
新民中学
SEKOLAH MENENGAH XINMIN
Weighted Assessment 2 2023

CANDIDATE NAME	
CLASS	INDEX NUMBER

MATHEMATICS 4052

Secondary 4 Express
Setter: Mr Johnson Chua
Vetter: Ms Vanessa Chia

02 May 2023
45 minutes

Candidates answer on the Question Paper.
No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your name, register number and class in the spaces at the top of this page.
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 π, use either your calculator value or 3.142, unless the question requires the answer in terms of π.

At the end of the examination, fasten all your work securely together.
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**.

Errors	Qn No.	Errors	Qn No.
Accuracy		Simplification	
Brackets		Units	
Geometry		***Marks Awarded***	
Presentation		***Marks Penalised***	

For Examiner's Use
30

Parent's/Guardian's Signature:

Mathematical Formulae

Compound Interest

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

Mensuration

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

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

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

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

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

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

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

Trigonometry

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

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

Statistics

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

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

Answer **all** the questions.

1 Given that $3\begin{pmatrix} 1 & 2 \\ x & -2 \end{pmatrix} - 2\begin{pmatrix} 0 & y \\ -1 & -5 \end{pmatrix} = \begin{pmatrix} 3 & 0 \\ -13 & 4 \end{pmatrix}$, find the value of x and of y.

Answer x = ……

y = …… [2]

2 Mr Gan weighed 8 male students.
The median mass of the students was 63.5 kg.
The interquartile range of the masses of the students was 4.5 kg.
Mr Gan realised that the scale of the weighing machine was inaccurate.
The correct mass of each student was 1.5 kg less than what he had recorded.
Write down the correct values for the median mass and interquartile range.

Answer Median mass: ……kg

Interquartile range: ……kg [2]

3 27 female patients and 30 male patients living in Xin-town are found to be infected with the E-virus. The ages of the patients are shown in the stem-and-leaf diagram below.

Female Patients							**Male Patients**								
				7	3	2	4	5	5						
			3	2	0	3	1	6							
					1	4	2	2	3	5	7				
	6	6	4	4	2	5	*x*	7	8	8					
5	3	2	0	0	0	6	0	2	2	3	3	4	8	8	
	5	5	4	2	1	7	4	5	6	7					
	3	1	1	0	0	8	2	4	4	5					

Key (Female Patients)

2 | 7 means 72

Key (Male Patients)

2 | 4 means 24

(a) Write down the range of the ages of the female patients.

Answer …… [1]

(b) Find the median age of the male patients.

Answer …… [1]

(c) Find the interquartile range for the male patients.

Answer …… [2]

(d) Write down all possible values of x given that both the male and female groups have the same percentage of patients who are younger than 55 years old.

Answer x = …… [2]

4 At supermarket A, a bag of flour costs \$2.90, a tray of eggs costs \$4.40 and a sack of rice costs \$24.
The same items can be bought in supermarket B where the flour costs \$3.20, eggs cost \$$x$ and rice costs \$25.

This information can be represented by the matrix $\mathbf{C} = \begin{matrix} \\ \text{A} \\ \text{B} \end{matrix}\begin{matrix} \begin{matrix} \text{F} & \text{E} & \text{R} \end{matrix} \\ \begin{pmatrix} 2.9 & 4.4 & 24 \\ 3.2 & x & 25 \end{pmatrix} \end{matrix}$

(a) Ron buys 3 bags of flour, 4 trays of eggs and 2 sacks of rice.
Zoe buys 5 bags of rice, 3 trays of eggs and 3 sacks of rice.
Represent this information in a 3×2 matrix **D**.

Answer **D** = $\begin{pmatrix} & \\ & \\ & \end{pmatrix}$ [1]

(b) Find, in terms of x, the matrix **T** = **CD**.

Answer **T** = [2]

(c) Explain what the elements in the first row of matrix **T** represent.

Answer ……

……

……[1]

(d) Ron would save \$1.30 by buying his purchases from supermarket A.
Find the value of x.

Answer x = …… [2]

(e) On a particular week, supermarket A was offering a store-wide 20% discount promotion while supermarket B was offering a store-wide 10% discount promotion.

(i) Write down a matrix **P**, such that the product of **P** and **T** would give the discounted prices which Ron and Zoe each has to pay if they purchase the items from supermarkets A and B respectively.

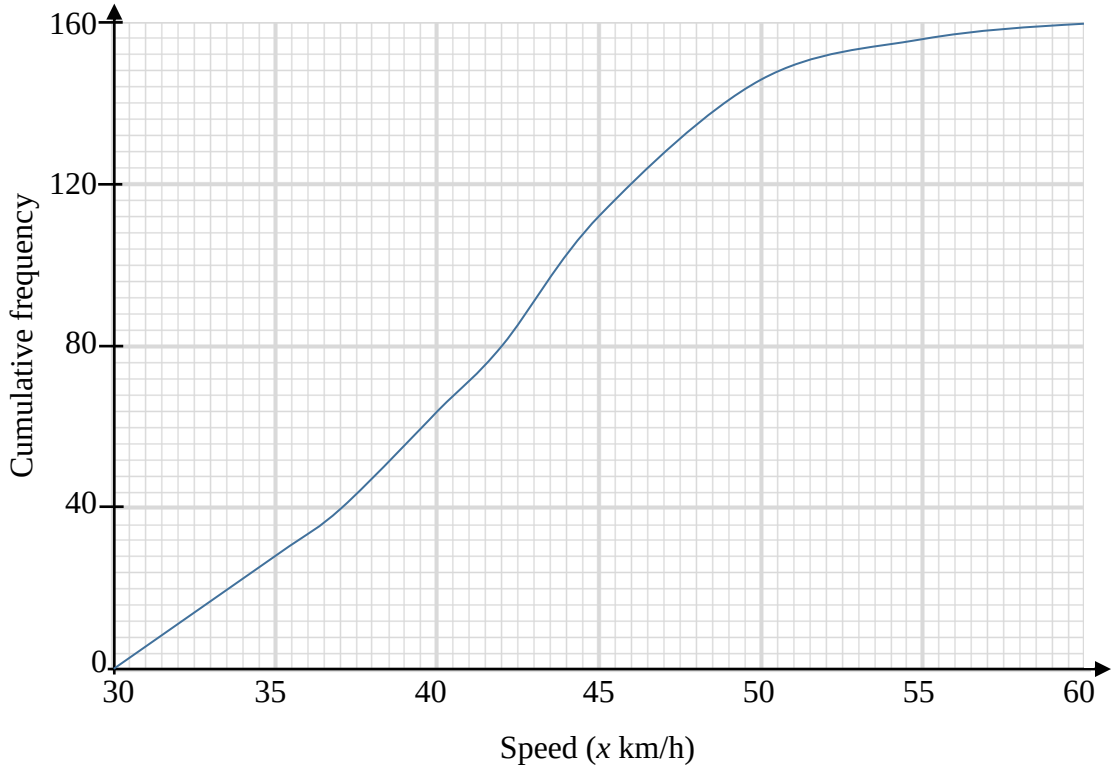
Answer **P** = [1]

(ii) Hence, using the value of x found in **(d)**, find the product of the matrices **P** and **T**.

Answer [1]

5 The speeds of 160 cars passing through a checkpoint one morning were recorded.

The cumulative frequency curve below shows the speed, x km/h, and the number of cars with speed less than or equals to x km/h.



(a) Use the curve to estimate

(i) the median speed,

Answer …… km/h [1]

(ii) the interquartile range of the speeds,

Answer …… km/h [2]

(iii) the 30th percentile.

Answer …… km/h [1]

(b) Explain why it is not possible to state the number of cars with speed less than 45 km/h.

Answer ……

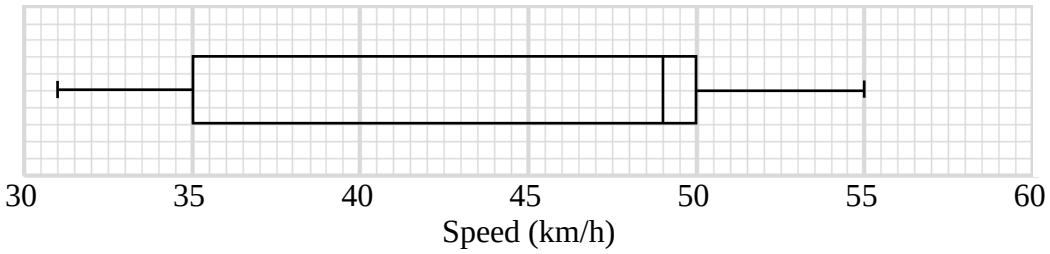
……[1]

(c) The speed limit on the road is v km/h.

Given that $\frac{1}{40}$ of the vehicles exceeded the speed limit, find the value of v.

Answer v = …… [1]

(d) The speeds of 160 cars passing through the same checkpoint in the evening were also recorded. The box-and-whisker plot below shows the distribution of the speeds.



Make two comments comparing the speed of the cars in the morning and in the evening.

Answer ……

……..

……[2]

(e) **(i)** Complete the grouped frequency table for the speeds of the cars passing through the checkpoint in the morning.

Speed (x km/h)	Frequency
$30 < x \leq 35$	28
$35 < x \leq 40$	36
$40 < x \leq 45$	
$45 < x \leq 50$	
$50 < x \leq 55$	
$55 < x \leq 60$	4

[1]

Calculate an estimate of the

(ii) mean speed,

Answer ……km/h [1]

(iii) standard deviation.

Answer ……km/h [1]

(f) Explain why the mean speed of the cars is only an estimate.

Answer ……

……[1]

--- End of paper---

Answer Key

1	$x = -5, y = 3$
2	Median Mass: 62; Interquartile Range: 4.5
3	(a) 60 (b) 61 (c) 31 (d) x = 5, 6, 7
4	(a) $\begin{pmatrix} 3 & 5 \\ 4 & 3 \\ 2 & 3 \end{pmatrix}$ (b) $\begin{pmatrix} 74.3 & 99.7 \\ 59.6+4x & 91+3x \end{pmatrix}$ (c) The elements represent the amount of money Ron and Zoe have to pay respectively for the items purchased from supermarket *A*. (d) x = 4 (e) (i) $\begin{pmatrix} 0.8 & 0 \\ 0 & 0.9 \end{pmatrix}$ (e)(ii) $\begin{pmatrix} 59.44 & 79.76 \\ 68.04 & 92.7 \end{pmatrix}$
5	(a)(i) 42 (a)(ii) 9 (a)(iii) 38 (b) Cumulative frequency curve is a "less than or equals to curve". Reading from graph at x = 45 will include cars travelling at 45 km/h. (c) v = 55 (d) Speed of cars in the evening is faster due to a higher median speed of 49km/h, as compared to speed of the cars in the afternoon, which has a median speed of 42 km/h; Cars in the evening were driving at a less consistent speed due to a higher IQR of 15, as compared to cars in the afternoon of lower IQR at 9. (e)(i) 48, 34, 10 (e)(ii) 41.7 km/h (e)(iii) 6.30 (f) We are not given the exact speed of every car **OR** mean speed is calculated by taking the mid value of each interval.