GREENRIDGE SECONDARY SCHOOL
2024 PRELIMINARY EXAMINATION
SECONDARY 4 EXPRESS / 5 NORMAL (ACADEMIC)

CANDIDATE NAME					
CLASS		-		INDEX NUMBER	

MATHEMATICS **4052/01**

Paper 1 22 August 2024

Setter: Mr Chin Zhi Hao 2 hours 15 minutes

Candidates answer on the Question Paper.

Additional Materials: Nil

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** 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.

The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 90.

For Examiner's Use	
Total	90

This paper consists of **22** printed pages, including this cover page.

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Mathematical Formulae

Compound interest

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

Mensuration

Curved surface area of a cone = πrl

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 θ is in radians

Sector area = $\frac{1}{2}r^2\theta$, where θ 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

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

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

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Answer **all** the questions.

1 **(a)** Calculate $\dfrac{\sqrt[3]{123^2}}{\dfrac{3}{5.01}+2}$.

Answer …… [1]

(b) An item costs \$24 when rounded off to the nearest dollar.
What is the maximum possible price of the item?

Answer \$……...…… [1]

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2 **(a)** Given that $9^{12} = 27^x$, find x.

Answer x = …… [2]

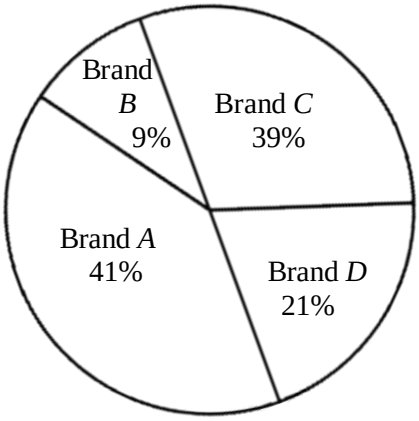
(b) The number of people owning cars in a country increased by p% every year, from 5000 in the year 2020, to 6500 in the year 2024.

Find the value of p.

Answer p = …… [2]

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3 School students were surveyed on their favourite brand of drink.
The results are represented in the pie chart below.



(a) State one error in the pie chart above.

Answer ……

……

…… [1]

(b) State one way to correct the error stated in part (**a**).

Answer ……

……

…… [1]

---

4 Factorise $6x^2 - x - 2$.

Answer ……... [2]

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5 Write $\frac{2}{x-2}-\frac{3}{2x+1}$ as a single fraction in its simplest form.

Answer ……... [2]

---

6 Six positive integers have a mean of 15, a median of 15 and a mode of 16.
The range of these numbers is 7. Find the six numbers.

Answer …..… …..… …..… …..… …..… …..… [2]

---

7 Solve the inequality $\frac{2x-3}{4} \leq \frac{5-x}{5}$.

Answer ……... [2]

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8 **(a)** Convert 40^o into radians. Leave your answers in terms of π.

Answer …… radians [1]

(b) Convert 23 km/h into m/s.

Answer …….. m/s [1]

---

9 Calculate the total surface area of a solid hemisphere with radius 6 cm.

Answer …….. cm^2 [2]

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10 $2c + b = \dfrac{b - c}{a}$

Rearrange the formula to make b the subject.

Answer $b =$ …… [3]

---

11 Triangle ABC is such that $AB = 16$ cm, $BC = 63$ cm, $AC = 65$ cm.
Do points A, B and C lie on the circumference of a circle? Explain with working.

Answer ……

……

…… [3]

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12 **(a)** Factorise $a^2b^4 - ab^2$.

Answer …… [1]

(b) Expand and simplify $(3x + 2)^2 + 4x(2 - x)$.

Answer …… [3]

---

13 **(a)** Find the area of a regular hexagon with each side 7 cm.

Answer ……..…… cm^2 [2]

(b) Find the interior angle of a regular 15-sided polygon.

Answer ……..……... [1]

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14 **(a)** y is directly proportional to $\sqrt[3]{x}$.
Find the percentage increase of y when x increases by 700%.

Answer ……. % [2]

(b) 6 men took 50 hours to paint a mural wall.
How long does it take for 4 men to paint the same wall?

Answer ……. hours [2]

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15 A bag contains some green counters, some orange counters and some yellow counters.
The probability of picking a green counter at random is 0.2.
The probability of picking an orange counter at random is 0.1 more than the probability of choosing a yellow counter at random.

(a) Show that the probability of picking a yellow counter at random is 0.35.

Answer

[1]

(b) If there are 14 yellow counters, how many counters are there altogether?

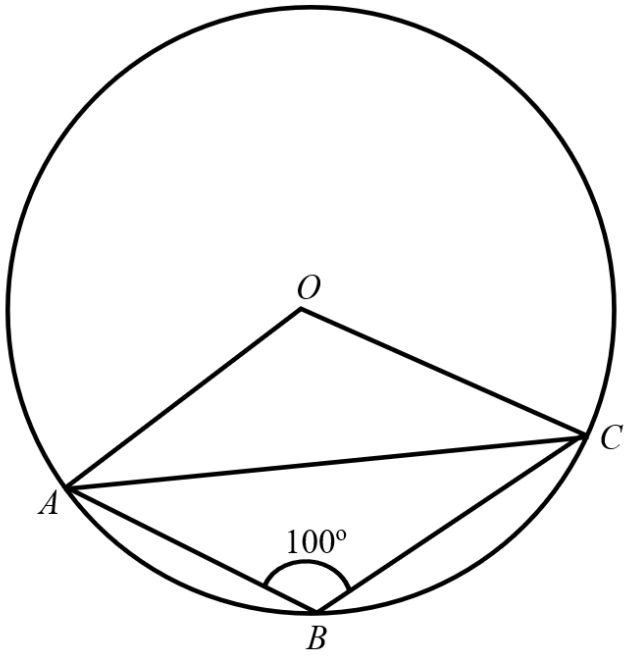
Answer …… counters [2]

(c) If 3 orange counters are removed, what is the new probability of picking a yellow counter at random?

Answer …… [1]

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16 The figure below shows a circle with centre O. Points A, B and C lie on the circle. Angle $ABC = 100^o$. Find angle OAC, giving reasons for each step of your working.



Answer Angle OAC = ……. [4]

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17 **(a)** These are the first four terms of a sequence.

2 6 10 14

Find an expression, in terms of n, for the nth term of the sequence.

Answer …….. [1]

(b) One term in the sequence is 82.
Find the value of n for this term.

Answer …… [1]

(c) Explain why 360 is not a term of this sequence.

Answer ……

……

…… [1]

(d) The **sum** of the first n terms of another sequence is $-4n^2 + 54n$.
Find the 8th term of this sequence.

Answer …….. [2]

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18 **(a)** $x^2 - 4x + 5 = (x - a)^2 + b$
Find the value of a and of b.

Answer a = ……

b = …… [2]

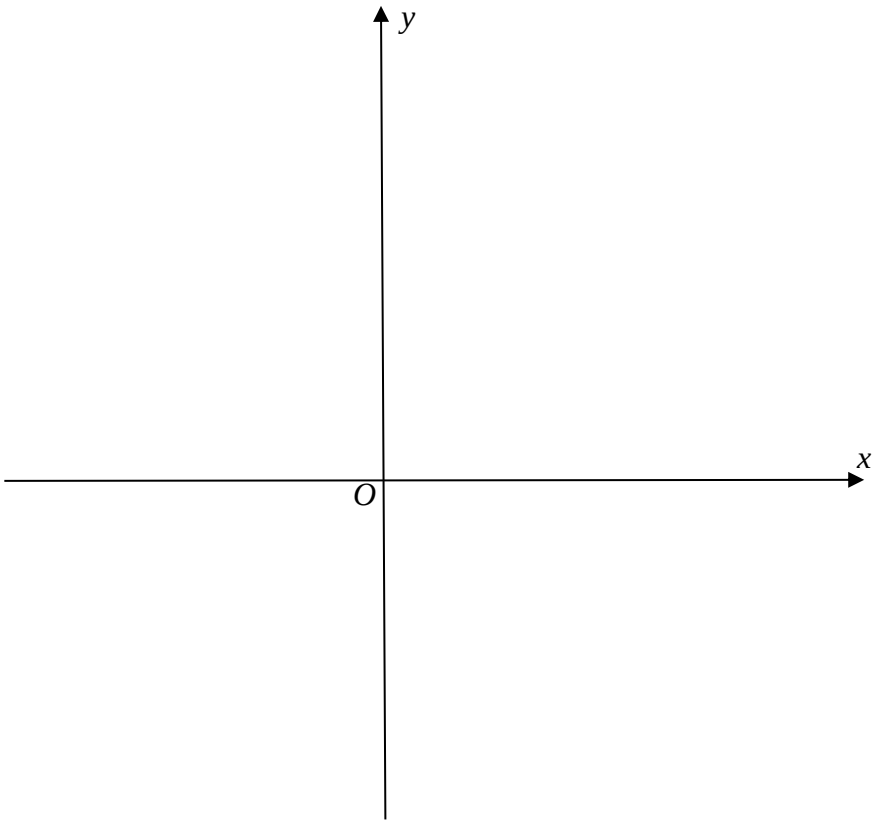
(b) The curve $y = x^2 - 4x + 5$ is drawn.

Write down the equation of the line of symmetry of the curve.

Answer ……..…… [1]

(c) **Sketch** the curve $y = x^2 - 4x + 5$ on the axes below.
Indicate clearly the coordinates of the points where the graph crosses the axes and the minimum point on the curve.

Answer



[3]

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19 Siti has x number of \$5 notes. Aisha has y number of \$2 notes.
They have a total of 30 notes with total value \$111.
Form and solve two simultaneous equations to calculate the amount of money Siti has.

Answer \$.……... [4]

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20 The number of customers, c, served in a day at a counter for 40 days are given below.

Number of customers c	$0 < c \leq 5$	$5 < c \leq 10$	$10 < c \leq 15$	$15 < c \leq 20$
Frequency	11	18	9	2

(a) Calculate the mean number of customers served.

Answer …… customers [1]

(b) Calculate the standard deviation.

Answer …… customers [1]

(c) If 3 more customers were added to the counter each day, how would the mean and standard deviation be affected by this change?

Answer Mean ……

……

Standard deviation ……

…… [2]

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21 **(a)** Express 5500 as a product of its prime factors.

Answer ……... [1]

(b) The number $\frac{5500p}{q}$ is a perfect cube.

p and q are prime numbers.
Find the value of p and the value of q.

Answer p = …..……...

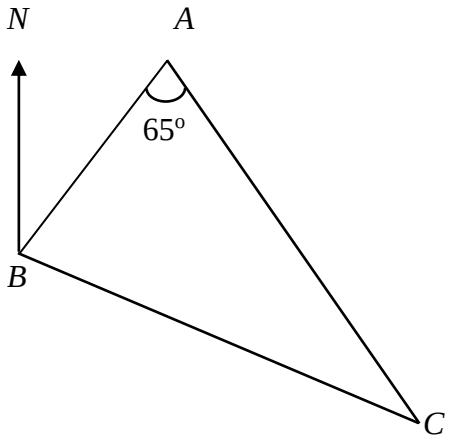
q = …...……... [2]

(c) Bus *A* takes 50 minutes to complete a route. Bus *B* takes 1 hour to complete the same route. Bus *C* takes 75 minutes to complete the same route. All 3 buses left the same bus stop at 6 am one morning. What time will all 3 buses meet again?

Answer ...…..……... [2]

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22 *A*, *B* and *C* are three points on horizontal ground.
The bearing of *A* from *B* is 040°.



(a) Find the bearing of *B* from *A*.

Answer ……... [2]

(b) Find the bearing of *C* from *A*.

Answer ……... [2]

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23 A concert offers three types of seating areas, *A*, *B* and *C*, for Saturday and Sunday. The numbers of tickets sold for each type of seating area on each of these days in a particular week are shown in the following table.

	A	***B***	***C***
Saturday	1100	1000	1200
Sunday	1400	1200	1300

(a) The information in the table can be represented by a 2×3 matrix **S**. Write down the matrix **S**.

Answer **S** = [1]

(b) Each ticket for type *A*, *B* and *C* seating area costs \$110, \$80 and \$$x$ respectively. Write down a 3×1 matrix **P** to represent this information.

Answer **P** = [1]

(c) Find, in terms of x, the matrix **T** = **SP**.

Answer **T** = [2]

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(d) Explain what is represented by the elements of matrix **T**.

Answer ……

……

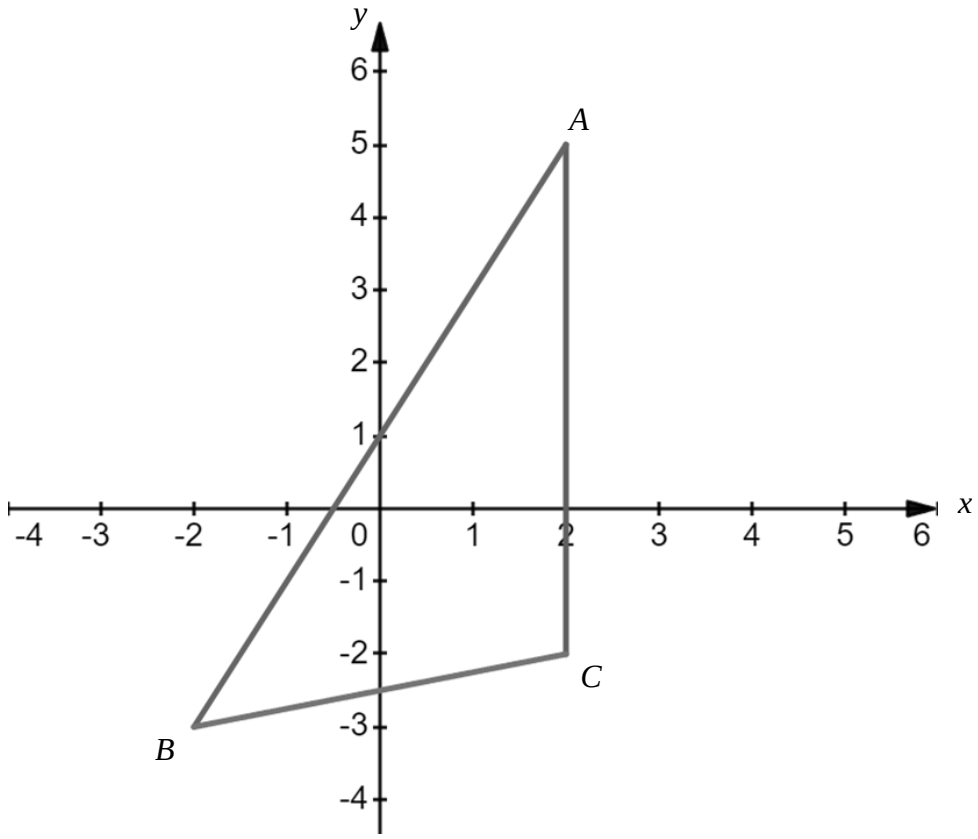
…… [1]

(e) The company collected \$688 500 from the sale of tickets for the weekend.
Find the value of x.

Answer $x =$…… [2]

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24 The triangle with vertices A (2, 5), B (–2, –3) and C (2, –2) is shown in the diagram below.



Find

(a) the area of triangle ABC,

Answer …… unit^2 [1]

(b) the coordinates of point D such that $ABCD$ is a parallelogram,

Answer (…… , ……) [1]

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(c) the area of parallelogram *ABCD*,

Answer …… unit^2 [1]

(d) angle *BAC*,

Answer Angle *BAC* = …… [1]

(e) the gradient of line *AC*,

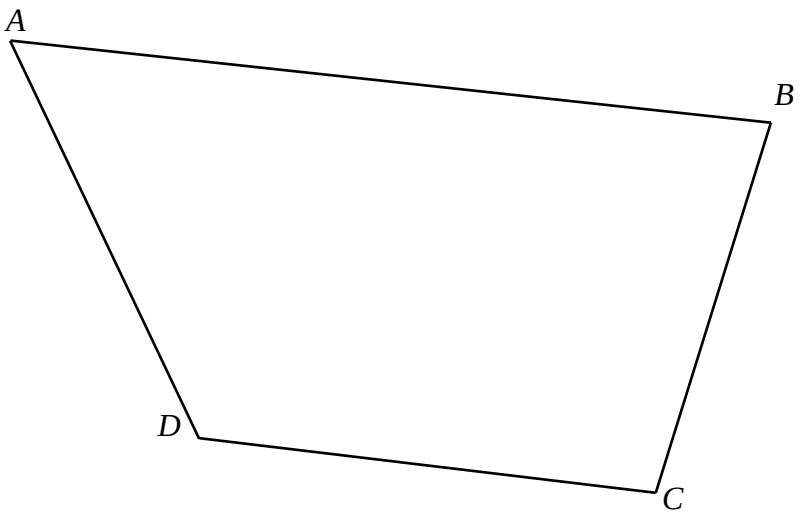
Answer …… [1]

(f) the cosine value of angle *BCA* in terms of *p*, where $p = BC$.

Answer …… [1]

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25 The diagram shows the map of a park in the shape of a quadrilateral *ABCD*.
The scale of the map is 1 cm to 10 m.



(a) Construct the bisector of angle *ABC*. [1]

(b) Construct the perpendicular bisector of *AB*. [1]

(c) Shade the region inside *ABCD* that is closer to *AB* than to *BC* and closer to *B* than to *A*. [1]

(d) A tree *T* is located inside the park *ABCD* such that it is 30 m from *D* and equidistant from *A* and *B*. Mark and label the exact position of *T*. [1]

END OF PAPER

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