Name:_____ ( )	Class:_____

70

GREENDALE SECONDARY SCHOOL
Preliminary Examination 2023

MATHEMATICS SYLLABUS A **4045/01**

Paper 1 **14 August 2023**

Secondary 4 Normal Academic **2 hours**

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your index number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a soft pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** the questions.
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 may 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 π, use either your calculator value or 3.142.

Question	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10a	Q10b	Q11	Q12	Q13
Strand														
Marks														

Question	Q14	Q15	Q16a	Q16b	Q17	Q18	Q19	Q20	Q21	Q22	Q23
Strand											
Marks											

This document consists of 19 printed pages.

For Examiner's Use Only

Mathematical Formulae

Compound interest

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

Mensuration

Curve surface area of a cone = πrl

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

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

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

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

Arc length = $r\theta$, where θ 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

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

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

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Answer **all** the questions.

1 Solve $\frac{3}{5}(x+2) = -(x-1)$.

Answer x = …….. [2]

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2 A 12 m string is cut in the ratio of $4:3:5$.
The shortest length is x cm.

Calculate x.

Answer x = …….. [2]

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3 Find the least prime value of y which satisfies $1-y<-10$.

Answer y = …….. [2]

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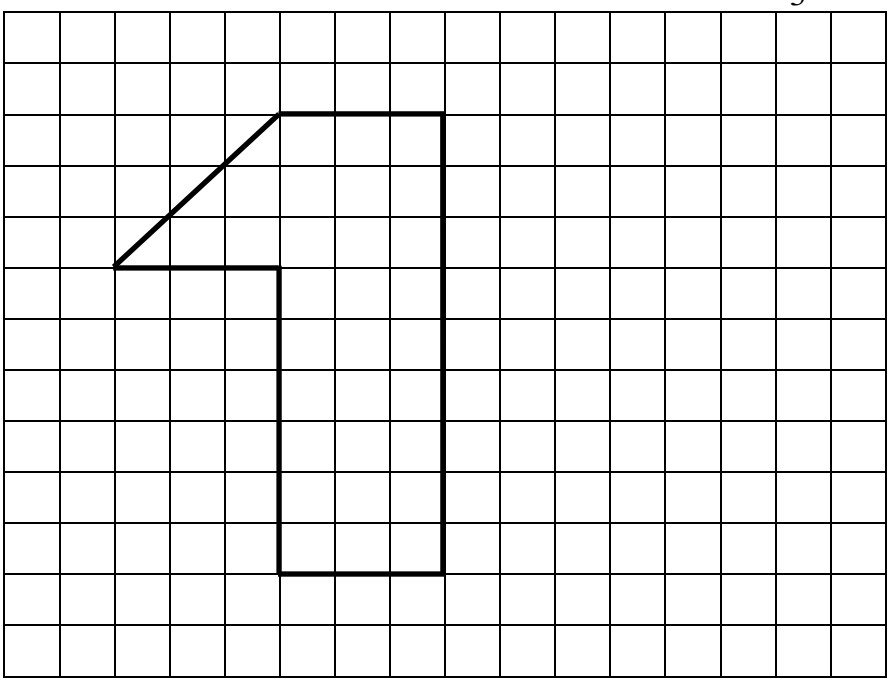
4 A red box contains three cards bearing the numbers 1, 2 and 3.
A blue box contains four cards bearing numbers *A, B, C* and *D*.
A card is chosen at random from each box.

Complete the table to show all possible outcomes. You may not need to use all the rows in the table.
Answer

Red box	Blue box
1	*A*
1	*B*

[1]

5 Draw a reduction of the figure below using the scale factor of $\frac{1}{3}$.



[2]

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6 Sandy can type 15 characters every 5 seconds using her mobile phone.
How many characters can Sandy type every minute?

Answer …….. [2]

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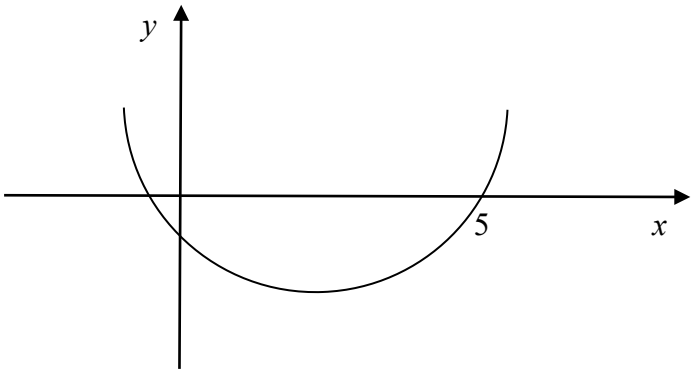
7 The diagram below shows the graph of $y = x^2 + bx + c$, where b and c are constants.

$x = 2$ is the line of symmetry and the curve passes through the point (5, 0).



Find the values of b and c.

Answer b = …… , c = …… [2]

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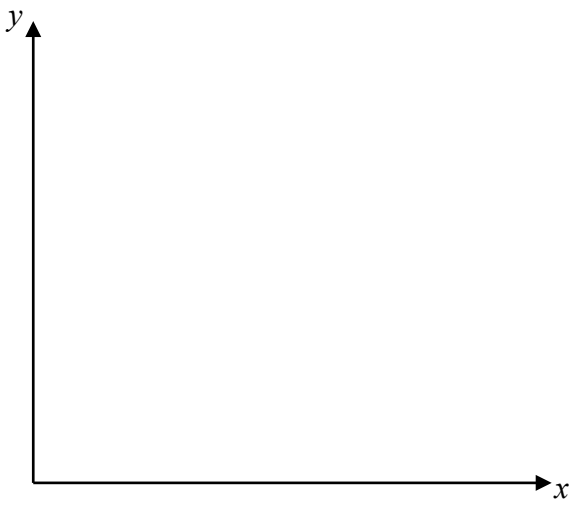
8 The height, h cm of a solid is inversely proportional to the square of its base radius, r cm.

(a) Given that $h = 8$ when $r = 10$, find h when $r = 4$.

Answer $h =$ …….. [2]

(b) Complete the graph below given that y is directly proportional to x.

Answer [1]



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9 $P = 2\times5^3\times7$ and $Q = 2\times5^a\times7^2$ where a is an integer greater than 1.

(a) Find the value of a if the lowest common multiple (LCM) of P and Q is $2\times5^4\times7^2$.

Answer $a =$ …….. [1]

(b) Find the largest perfect cube that is a factor of both P and Q.

Answer …….. [1]

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10 **(a)** $x^2 + 4x - 9 = (x+h)^2 + k$.
Find the values of h and k.

Answer $h =$ …….. , $k =$ ……..… [2]

(b) State the y-coordinate of the minimum point of the curve $y = x^2 + 4x - 9$.

Answer $y =$ …….. [1]

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11 **(a)** $x^{-2} \times x^{\frac{1}{3}} = x^n$

Find the value of n.

Answer $n =$ ..... [1]

(b) Simplify $\sqrt{\frac{y^8}{y^2}}$.

Answer ..... [2]

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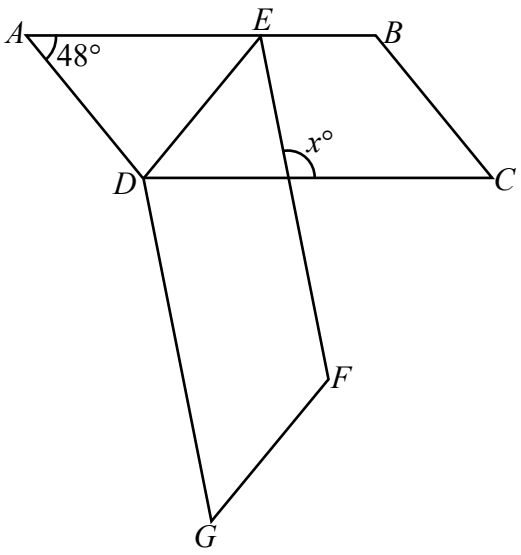
12 *ABCD* and *EFGD* are congruent parallelograms, where *E* is a point on *AB*.



Find *x*.

Answer x = …….. [2]

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13 The first 4 terms of a sequence are

$$-17 \quad -11 \quad -5 \quad 1$$

(a) Write down, in terms of n, the n^{th} term of the sequence.

Answer …….. [1]

(b) Find the smallest k value such that the k^{th} term is greater than 50.

Answer k = …….. [1]

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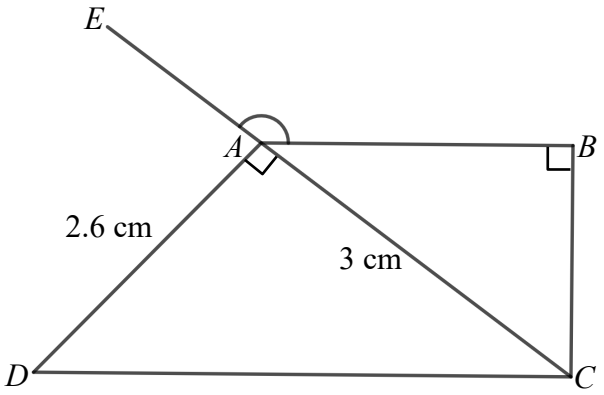
14 $ABCD$ is a trapezium.
E is produced from the line CA, where CA = 3 cm and DA = 2.6 cm.



Find obtuse angle EAB.

Answer …….. ° [3]

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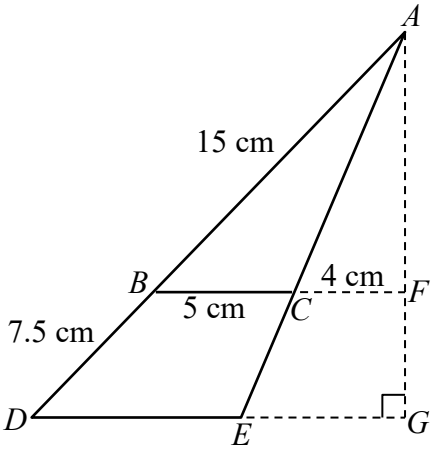
15 ABC and ADE are similar triangles.
$AB = 15$ cm, $BD = 7.5$ cm, $BC = 5$ cm and $CF = 4$ cm.



Find the area of triangle ADE.

Answer ..... cm^2 [4]

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16 **(a)** Expand $(2x-3)^2$.

Answer …….. [1]

(b) $1-\dfrac{2x}{2x-3}=\dfrac{ax+b}{(2x-3)^2}$.

Find the values of a and b.

Answer a = …….. , b = ……..… [2]

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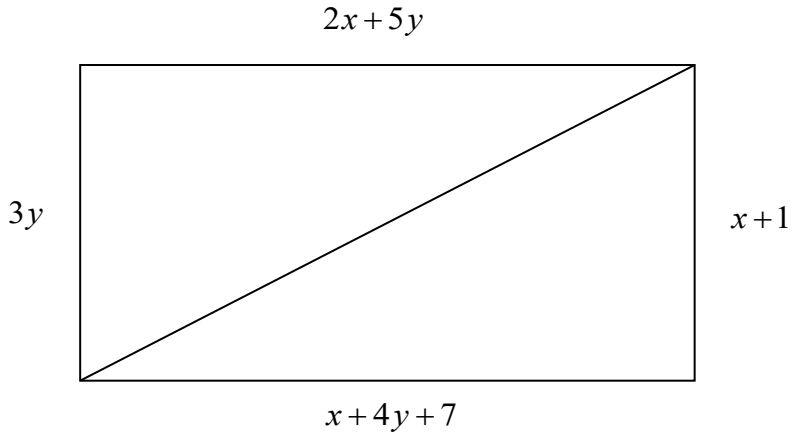
17 The diagram below shows a rectangle with the dimensions given in terms of x and y.



By first finding the values of x and y, find the length of the diagonal.

Answer …….. [5]

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18 The table below shows the amount of time spent studying by a group of students in one particular week.

Time (h hours)	**Frequency**
$0 < h \leq 2$	0
$2 < h \leq 4$	1
$4 < h \leq 6$	4
$6 < h \leq 8$	8
$8 < h \leq 10$	9
$10 < h \leq 12$	2
$12 < h \leq 14$	1

(a) Calculate an estimate of the mean time spent studying in that week.

Answer ……hours [3]

(b) Explain why this is only an estimate of the mean time that the students spent studying that week.

Answer

_____

_____ [1]

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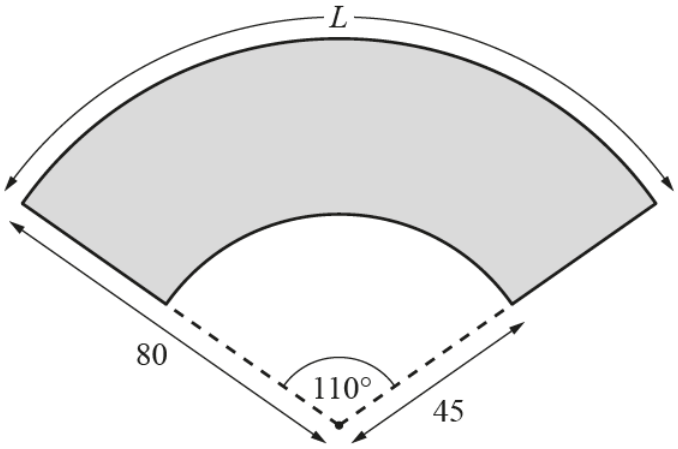

A display notice is made by removing a sector of a circle from a larger sector.
Both sectors have an angle of 110°.
The radii of the sectors are 80 cm and 45 cm.

(i) Calculate arc length L.

Answer L = ……cm [2]

(ii) Calculate the area of this display notice.

Answer ……cm^2 [3]

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20 Points $A(4, -5)$, $B(-m, 2m)$ and $C(-16, 5)$ lie on a straight line.
Find the value of m.

Answer m = …….. [3]

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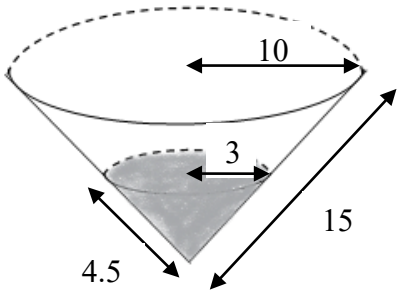
21 (a)



The diagram above shows an inverted cone, with radius 10 cm and slant length 15 cm. Water is poured into the cone such that the slant length is 4.5 cm and the radius of the top circular surface is 3 cm.

Find the curved surface area of the cone that does not touch the water.

Answer …… cm^2 [2]

(b) Another cone, with radius r cm and a vertical height h cm, has the same volume of a sphere with radius r cm. Find h in terms of r.

Answer h = …….. [2]

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22 ABC is a triangle with angle $CAB = 98°$ and $BC = 9.8$ cm.

(a) Construct triangle ABC.
AB had been drawn for you.

[2]

(b) Construct the bisector of angle CAB. [1]

(c) Shade the area within triangle ABC, 2 cm from A and nearer to AB than CA. [2]

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Ticket Type (Local Resident)	**Soft Opening (For visit from 8 – 26 May 2023)**	**For visit on/after 27 May 2023**
Adult	$34.20	$43.20
Child Ages 3 to 12	$20.70	$29.70
Senior Citizen Ages 60 and above	$20.00	$20.00

*Local Residents can enjoy 20% off total cost with WildPass.

The table shows the cost of tickets for the Mandai Bird Paradise.

(a) Mr and Mrs Tan buy 2 adults and 2 children tickets for the Mandai Bird Paradise on 20 May 2023.

Find the total cost of the 4 tickets.

Answer $ …….. [2]

(b) Mr Lim who is a WildPass holder decides to visit Mandai Bird Paradise with his 56 years old mother and 60 years old father on 1 June 2023.

Find the total cost Mr Lim pays for the tickets.

Answer $ …….. [3]

(c) Calculate the percentage increase on an adult ticket after the soft opening period.

Answer ……..% [1]

END OF PAPER