

NAME: _____ ()

CLASS: 4 ()



**ANGLICAN HIGH SCHOOL
SECONDARY FOUR
PRELIMINARY EXAMINATION 2022**

S4

MATHEMATICS**4048/01****Paper 1****25 August 2022**

Candidates answer on the Question Paper.

2 hours**READ THESE INSTRUCTIONS FIRST**

Write your name, index number and class in the space at the top of this page.

Write in dark blue or black pen.

You may use a HB pencil for any diagrams or graphs.

Do not use staples, paper clips, highlighters and 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 .

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 80.

For Examiners' Use

Question	1	2	3	4	5	6	7	8	9
Marks									
Question	10	11	12	13	14	15	16	17	18
Marks									
Question	19	20	21	22	23	24	25		
Marks									
Table of Penalties	Units					80			
	Clarity/ Logic								
	Accuracy/ Precision								
Parent's Name and Signature:									
Date:									

This document consists of **16** printed pages.

Mathematical Formulae*Compound Interest*

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

Mensuration

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

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

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

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

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

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

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

Trigonometry

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

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

Statistics

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

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

- 1 Calculate $\frac{-12.2^2}{3.15 - \sqrt{17}}$ and correct your answer to 4 significant figures.

Answer [1]

- 2 Rearrange the formula $y = \frac{x^2 - 2}{(x - 2)(x + 2)}$ to make x the subject.

Answer [3]

- 3 Solve the equation $3 - \frac{2x - 3}{5} = \frac{2x + 15}{7}$.

Answer $x =$ [3]

- 4 The area of triangle ABC is 36.7 cm^2 . The length of AB is 14.2 cm and BC is 6.1 cm . Find the possible values of angle ABC .

Answer Angle $ABC = \dots\dots\dots^\circ$ or $\dots\dots\dots^\circ$ [2]

- 5 Simplify $\left(\frac{8p^6}{27m^3}\right)^{-\frac{1}{3}}$, leaving your answer in positive index form.

Answer $\dots\dots\dots$ [2]

- 6 (a) Express 1134 as a product of its prime factors.

Answer $\dots\dots\dots$ [1]

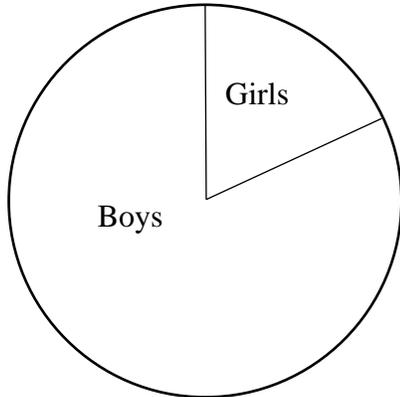
- (b) Find the smallest integer value of k such that $\frac{1134}{k}$ is a perfect cube.

Answer $k = \dots\dots\dots$ [1]

- (c) A perfect square number less than 150 has exactly 7 factors. List all the factors.

Answer [2]

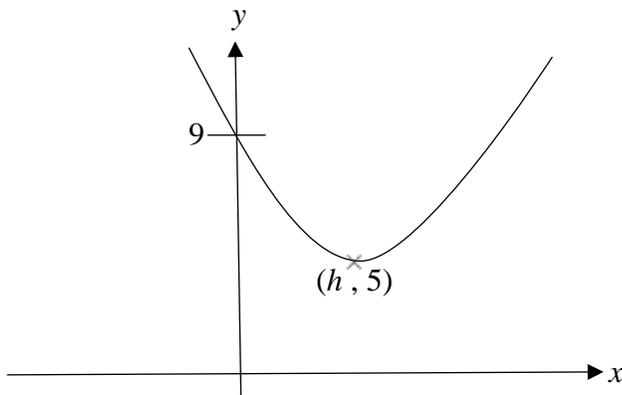
- 7 Based on the pie chart drawn, Audrey concluded that boys did better than the girls in the Mathematics Common Test. Do you agree? Justify your answer.



Students who scored Distinction in Mathematics Common Test

Answer [2]

- 8 The diagram below shows the graph of $y = (x - h)^2 + k$. The graph cuts the y-axis at the point (0, 9) and has a minimum point at (h, 5).



- (a) State the value of k .

Answer $k =$ [1]

(b) Find the value of h .

Answer $h = \dots\dots\dots$ [2]

(c) State the number of solutions when $y < 5$.

Answer $\dots\dots\dots$ [1]

9 Factorise the following completely.

(a) $2a^2 - 6b^2 + ab$.

Answer $\dots\dots\dots$ [1]

(b) $2 - 8x^2 + 4x^2y - y$.

Answer $\dots\dots\dots$ [3]

10 Express as a single fraction in the simplest form $\frac{2x}{(2x-1)^2} - \frac{2}{2x-1}$.

Answer $\dots\dots\dots$ [2]

- 11** A fruit seller purchased 100 mangoes at \$2 each. Four were spoilt. After selling all the remaining mangoes, his total profit was 20%. Calculate the selling price of each mango.

Answer \$..... [2]

- 12** (a) Given that T is directly proportional to \sqrt{x} , find the percentage increase in T when the value of x is increased by 8 times.

Answer % [2]

- (b) Jane can prepare 4 full cups of bubble tea in 3 minutes. Danny can prepare 9 full cups in 7 minutes. Find the total number of full cups prepared by them in 20 minutes.

Answercups [3]

13 Given

$$\xi = \{x : x \text{ is an integer and } 0 < x \leq 14\}.$$

$$A = \{x : x \text{ is a factor of } 12\}.$$

$$B = \{x : x \text{ is an integer such that } 4x \geq 23\}.$$

(a) List the elements in $A' \cap B'$.

Answer [1]

(b) Write down the number of elements in the set $A \cup B$.

Answer [1]

14 A map has a scale of 1: 4 000 000. The length of a river running through a national park is 1.4 cm.

(a) Calculate the length of the river in km.

Answerkm [2]

(b) The area of the park is 52 000 km². Calculate, the area of the park in the map.

Answer cm² [2]

15 $ABCD$ is a parallelogram. $\overrightarrow{AB} = \begin{pmatrix} -1 \\ -5 \end{pmatrix}$ and $\overrightarrow{BD} = \begin{pmatrix} 4 \\ 8 \end{pmatrix}$. The coordinates of D is $(6, 2)$. Find

(a) the coordinates of B ,

Answer (.....,) [1]

(b) \overrightarrow{BC} ,

Answer $\overrightarrow{BC} = \begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

(c) the magnitude of \overline{CD} .

Answerunits [2]

- 16 (a)** Find the interior angle of a regular 18-sided polygon.

Answer [1]

- (b)** An n -sided polygon has 3 exterior angles measuring 70° each and the remaining exterior angles measuring w° each. Find w in terms of n .

Answer $w =$ [2]

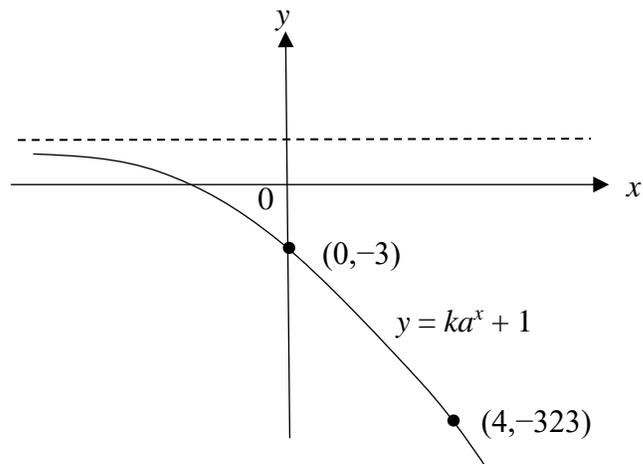
- 17 (a)** The thickness of Mary's hair is 0.036 mm. Express the thickness of the hair, in metres, in standard form.

Answerm [1]

- (b)** After a hair bonding treatment, Mary's hair length is 4 cm longer than Betty. Given that the rate of Mary's and Betty's hair growth is 1.2 cm and 1.6 cm per month respectively, calculate the time taken, in months, for their hair to be of the same length.

Answermonths [2]

- 18** The sketch shows the graph of $y = ka^x + 1$, where $a > 0$.
The points $(0, -3)$ and $(4, -323)$ lie on the graph.



Find the value of

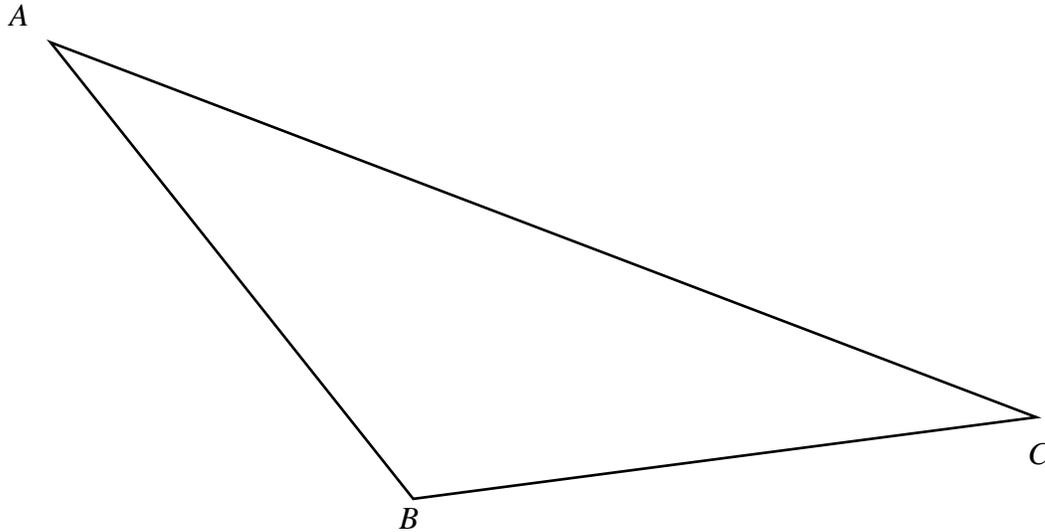
- (a)** k and

Answer $k = \dots\dots\dots [1]$

- (b)** a .

Answer $a = \dots\dots\dots [1]$

- 19** In the diagram below, construct
- (a) a perpendicular bisector of AB , [1]
 - (b) an angle bisector of angle ABC . [1]

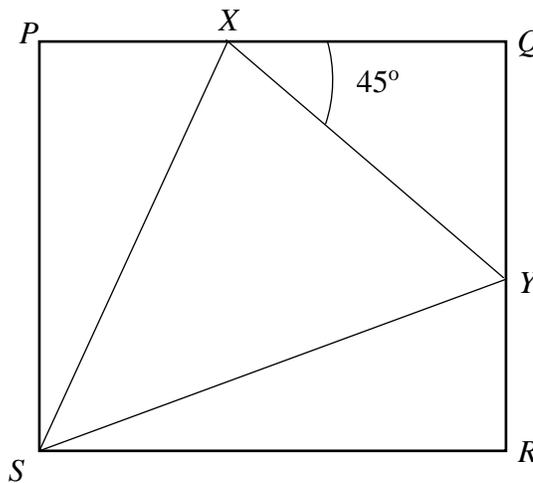


- (c) These 2 lines from (a) and (b) meet at point P . Complete the sentence below.

Answer The point P isfrom point A and point B .

It is also from the lines and [2]

- 20** In the diagram, $PQRS$ is a square and $\angle QXY = 45^\circ$. Giving reasons clearly, prove that triangle PXS is congruent to triangle RYS .



Answer

 [3]

21 Solve the equation $\frac{4m+7}{m^2+1} - \frac{5}{2m-1} = \frac{3}{m^2+1}$.

Answer $m = \dots\dots\dots$ or $\dots\dots\dots$ [4]

22 Given that $B = \{\text{black grapes}\}$, $G = \{\text{green grapes}\}$, $S = \{\text{sweet grapes}\}$ and $L = \{\text{seedless grapes}\}$.

(a) Use set notation to express each of the following statements:

(i) all seedless grapes are sweet but not all sweet grapes are seedless,

Answer $\dots\dots\dots$ [1]

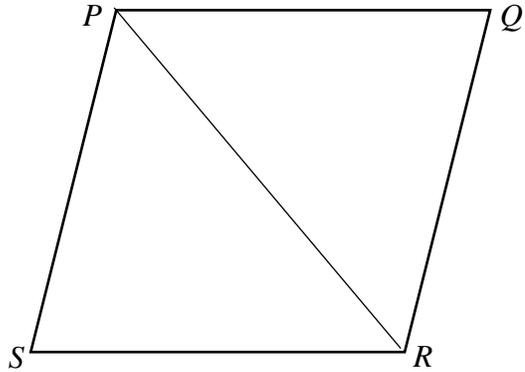
(ii) no green grapes are seedless.

Answer $\dots\dots\dots$ [1]

(b) Write a statement to explain what does $(G \cup B) \cap S \neq \emptyset$ means.

Answer $\dots\dots\dots$
 $\dots\dots\dots$ [1]

- 23 The figure below is made up of 2 equilateral triangles SPR and PQR . PQ is $(x + 2y)$ cm, QR is $(3x + y)$ cm and PS is $(2x + 4y - 3)$ cm.



- (a) Form, without simplifying, 2 simultaneous equations in terms of x and y .

Answer

.....

.....

..... [1]

- (b) Hence, find the value of x and of y .

Answer $x = \dots\dots\dots$

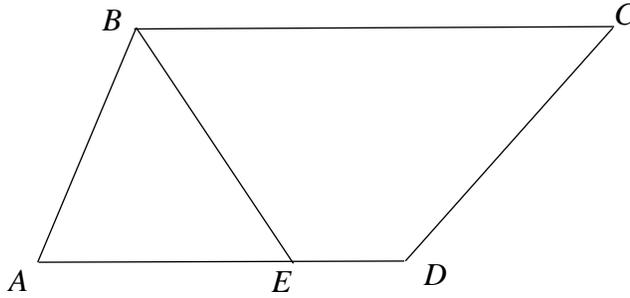
$y = \dots\dots\dots$ [3]

- (c) Find the area of the figure.

Answer

..... cm^2 [2]

- 24 In the diagram, angle $EBC = 58^\circ$, angle $BAE = 66^\circ$ and angle $EDC = 132^\circ$. The line BE bisects angle ABC .



- (a) State angle ABE .

Answer Angle $ABE = \dots\dots\dots^\circ$ [1]

- (b) Giving reasons clearly, find

- (i) angle AEB ,

Answer Angle $AEB = \dots\dots\dots^\circ$ [1]

- (ii) angle DCB .

Answer Angle $DCB = \dots\dots\dots^\circ$ [1]

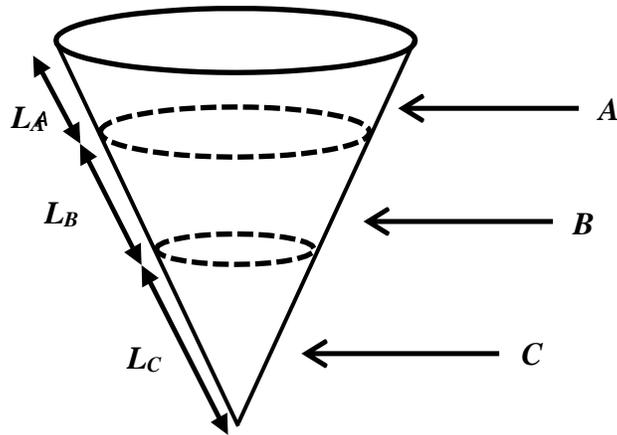
- (c) Show that BC is not parallel to AD .

Answer

.....

..... [1]

- 25 A right solid cone is made up of frustrum A , frustrum B and cone C .
The ratio of the slant height of A , B and C is given by $L_A:L_B:L_C=2:3:5$.



- (a) Find the ratio of volume of A : volume of whole cone.

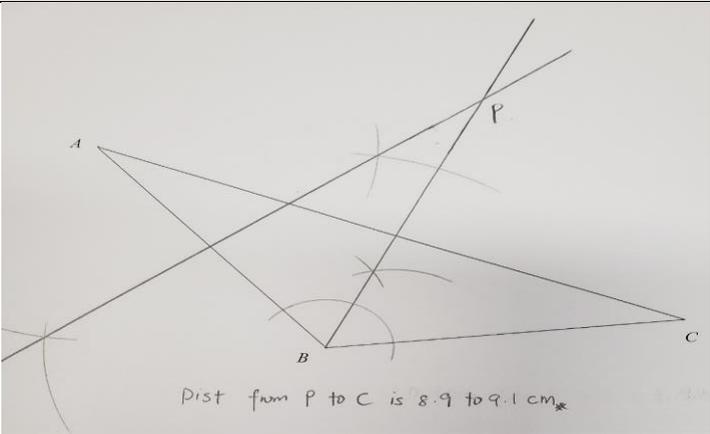
Answer : [2]

- (b) Given that the volume of A is 122 cm^3 , calculate the volume of B .

Answer cm^3 [2]

End of Paper

Answer Key

1	153.0	15a	$B(2, -6)$
2	$x = \pm \sqrt{\frac{2(2y-1)}{y-1}}$	15b	$\begin{pmatrix} 3 \\ 3 \end{pmatrix}$
3	$x = \frac{17}{8}$ or $2\frac{1}{8}$ or 2.125	15c	5.10
4	57.9° or 122.1°	16a	160°
5	$\frac{3m}{2p^2}$	16b	$w = \frac{150^\circ}{n-3}$
6a	$1134 = 2 \times 3^4 \times 7$	17a	3.6×10^{-5}
6b	42	17b	10 months
6c	1,2,4,8,16,32,64	18a	$k = -4$
		18b	$a = 3$
7	<p>I do not agree.</p> <p>1) Although the number of girls who scored distinction may be lower than the number of boys, the percentage of passing may be higher.</p> <p>2) There is no actual number of boys and girls given taking the test, hence it is not conclusive of the statement.</p> <p>3) This data does not show the central tendency of distribution (mean, mode, median)</p>	19a	
		19b	The point P is <u>equidistant</u> from point A and point B . It is also <u>equidistant</u> from lines AB and BC .
8a	$k = 5$	20	SAS test
8b	$h = 2$	21	1.19 or -2.52
8c	0	22ai	$L \subset S$. Accept $S \cap L = L$
9a	$(a+2b)(2a-3b)$	22aii	$G \cap L = \emptyset$ or $\{ \}$
9b	$(2-y)(1-2x)(1+2x)$	22b	<u>There are black or green grapes that are sweet.</u>
10	$\frac{2(1-x)}{(2x-1)^2}$	23a	$x+2y=3x+y$ -----(1) $x+2y=2x+4y-3$ -----(2)
11	\$2.50	23b	$x=0.6$ or $y=1.2$
12a	200%	23c	7.79 cm^2
12b	Accept both 51 and 52 cups	24a	58°
13a	$\{5\}$	24b	56°
13b	13	24c	46°
14a	56 km	25a	61 : 125
14b	32.5 cm^2	25b	96.75 cm^3