

聖嬰中學

HOLY INNOCENTS' HIGH SCHOOL

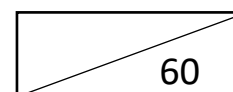


Candidate Name

Class

Index Number

END OF YEAR EXAMINATION 2023
SECONDARY 2
MATHEMATICS PAPER 1



4052/01

Date: 10 Oct 2023

Duration: 1 h 30 min

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

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number 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 paper clips, glue or correction tape/fluid.

Answer **ALL** 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 will result in loss of marks.

The total of the marks for this paper is **60**.

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.

For Examiner's use

You need to improve on your:

• **PRESENTATION**

• **ACCURACY**

Marks (max 5%)

Set by: Mr Lin WeiDing

Vetted by: Mr Ian Sim

Mathematical Formulae*Mensuration*

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

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

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

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

Answer **all** the questions

- 1 By rounding off each number to the nearest whole number, estimate the value of

$$\frac{649.823}{\sqrt{21.33 - 4.7} - 0.32}.$$

Show your working.

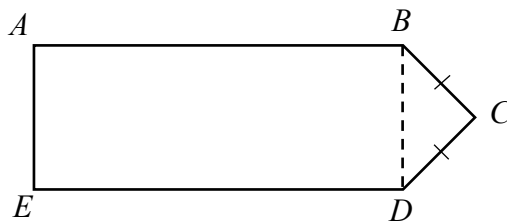
Answer [2]

- 2 Factorise $9mn + 12np - 3mq - 4pq$.

Answer [2]

- 3 The figure below is made up of a rectangle $ABDE$ and isosceles triangle BCD .

Answer (a)



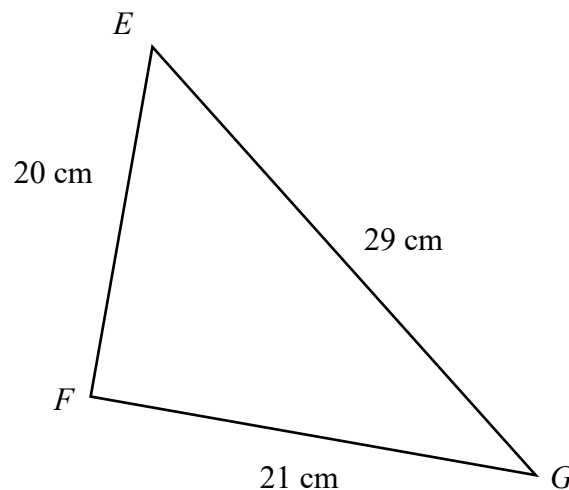
- (a) Draw the line(s) of symmetry on the figure. [1]
- (b) State the order of rotational symmetry of the figure.

Answer [1]

- 4 Liquid fertilisers costs m cents per litre.
 Ellie buys some fertilisers and it costs her n dollars.
 She was given a 50% discount.
 Find an expression, in terms of m and n , for the number of litres that Ellie buys.

Answer litres [2]

- 5 In the diagram, $EF = 20$ cm, $FG = 21$ cm, and $EG = 29$ cm.

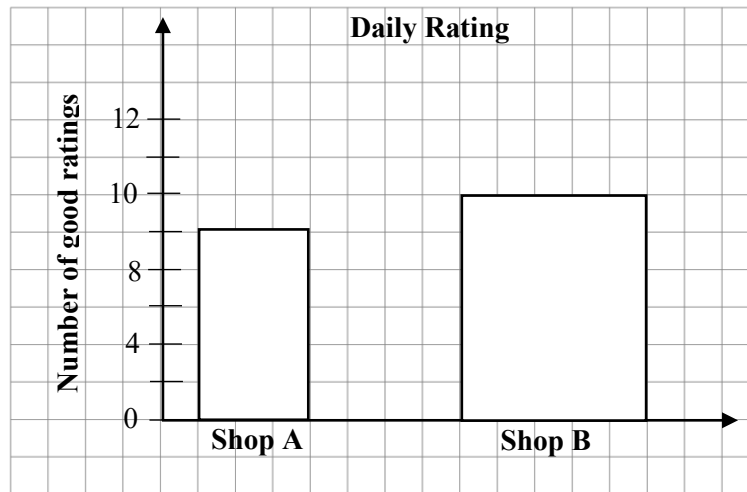


Is triangle EFG a right-angled triangle? Show your working.

Answer

 [2]

- 6 A graph showing the daily ratings for two shops is shown below.



State one feature of the graph that may be misleading and explain why.

Answer

.....

.....

.....

..... [2]

- 7 p is directly proportional to q^2 .
 It is known that $p = 125$ for a particular value of q .
 Find the value of p when this value of q is increased by 200%.

Answer [2]

- 8 It is given $\frac{2p+b^2}{a} = 3M$.
Express b in terms of M , a and p .

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

- 9 (a) Solve the inequality $\frac{8d+10}{10} > \frac{3d-18}{15}$.

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

- (b) Hence write down the smallest prime number that satisfies the inequality in part (a).

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

- 10 (a)** The first four terms of a sequence are $1^3 - 2$, $2^3 - 4$, $3^3 - 6$, $4^3 - 8$.

Find an expression T_n , in terms of n , for the n^{th} term in this sequence.

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

- (b)** The n^{th} term in a different sequence is given by $12n - 5$.

Explain if 235 is a term in this sequence.

Show all your working.

Answer

 [2]

- 11 (a) Factorise $x^2 - 25y^2$.

Answer [1]

- (b) It is given that $a^2 + b^2 = 16$ and $a = -\frac{9}{b}$.
Find the value of $(a - b)^2$.

Answer [2]

-
- 12 (a) Simplify $\frac{3x^2y^2}{p-4} \div \frac{xy^3}{2p-8}$.

Answer [2]

- (b) Write $\frac{7}{2m-1} - \frac{1}{m+2}$ as a single fraction in its simplest form.

Answer [2]

13 Solve these simultaneous equations.

$$3x - 5y = 7$$

$$2x - 3y = 4$$

Answer $x = \dots\dots\dots$

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

- 14** A map is drawn to a scale of 1 : 30 000.
The distance on the map between two buildings is 5.6 cm.

(a) Calculate the actual distance, in kilometres, between the two buildings.

Answer km [2]

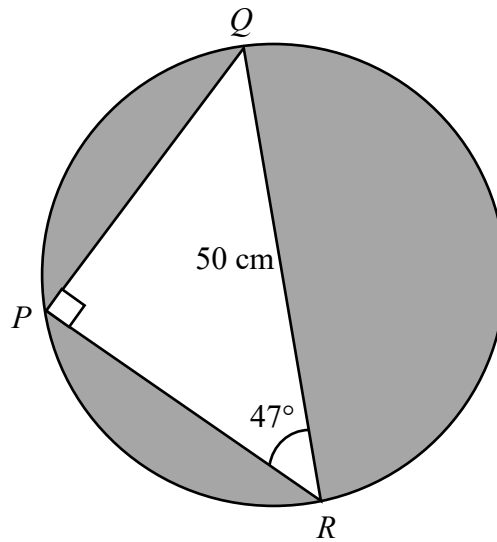
One of the building covers an area of 0.63 km^2 .

(b) Find the area, in square centimetres, covered by the building on the map.

Answer cm^2 [2]

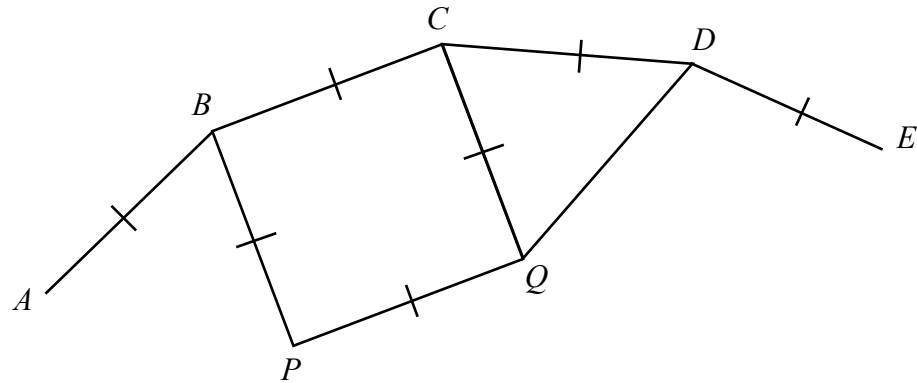
- 15** The diagram shows a right-angled triangle PQR enclosed by a circle. The diameter of the circle QR is 50cm. Angle $PRQ = 47^\circ$.

Find the percentage of the circle that is unshaded.



Answer % [4]

- 16 In the diagram below, $ABCDE$ is part of a regular polygon with 12 sides.
 $BCQP$ is a square.
 Angle $BCQ = 90^\circ$.



- (a) Calculate angle BCD .

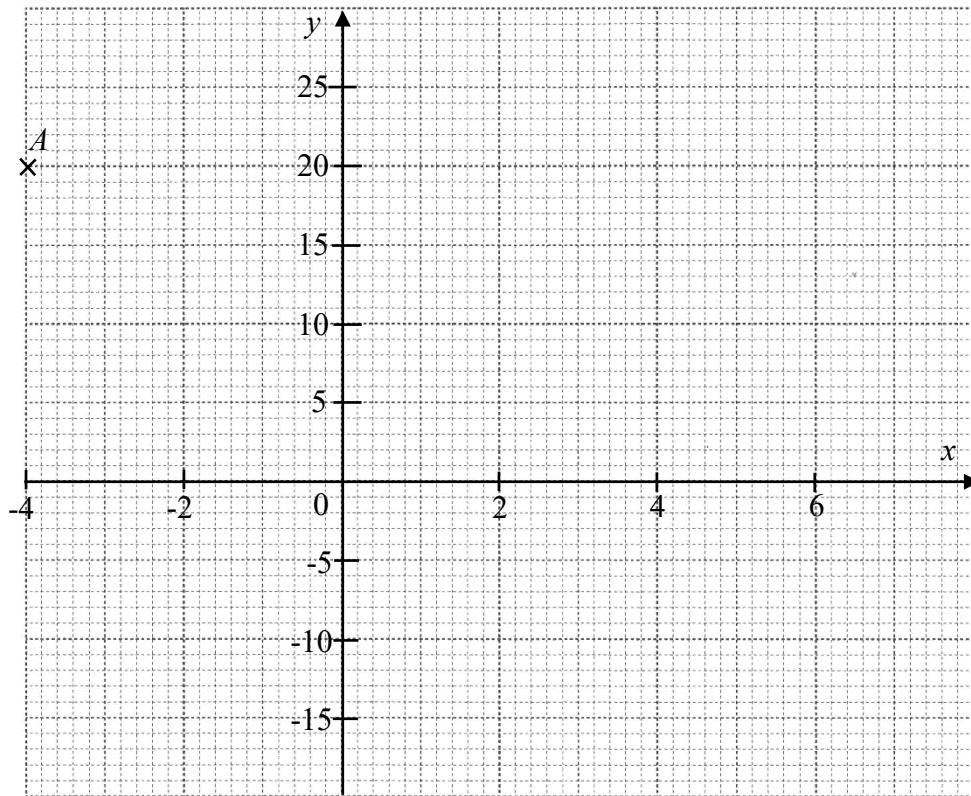
Answer $^\circ$ [2]

- (b) A student states that Triangle CDQ is not an equilateral triangle.
 Do you agree? Show your working.

Answer

 [2]

- 17 The point A is shown on the Cartesian plane below.



- (a) Write down the coordinates of point A .

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

- (b) B is the point $(4, -10)$.
Plot and label point B on the same Cartesian plane.

[1]

- (c) Find the equation of the line AB .

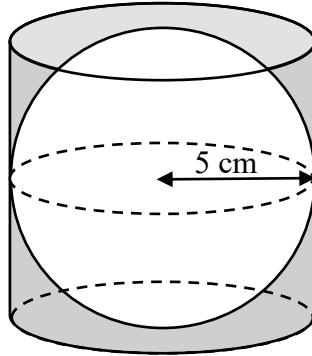
Answer [1]

- (d) C is the point $(k, -10)$ where $k > 0$.
Given that the area of triangle ABC is 30 units², find the value(s) of k .

Answer $k =$ [2]

- 18** A chocolate ball is modelled in the shape of a sphere. The ball has a radius of 5 cm and is placed in a closed cylindrical container. The ball fits perfectly into the cylindrical container.

Take $\pi = 3.142$.



- (a)** Calculate the volume of the empty space in the cylindrical container.

Answer cm^3 [3]

A layer of coating will be applied to each chocolate ball's surface. It costs $\$0.01/\text{cm}^2$ to coat each chocolate ball.

- (b)** Find the total cost to coat 30 of such chocolate balls.

Answer \$ [2]

- 19 The marks for a class of students are shown in the stem-and-leaf diagram.

Stem	Leaf					
1	0	7	8	8		
2	1	1	4	6	6	7
3	0	0	2	5	5	7
4	1	1	2	8		

Key
4 | 1 means 41 marks

(a) Find

(i) the number of students,

Answer students [1]

(ii) the difference between the lowest and highest mark.

Answer mark [1]

(b) Calculate the percentage of students who scored less than 25 marks.

Answer % [1]

(c) The same data is to be represented in a pie chart.

Calculate the angle representing the scores which are greater than 30 marks in the pie chart.

Answer ° [2]

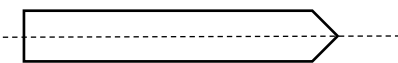
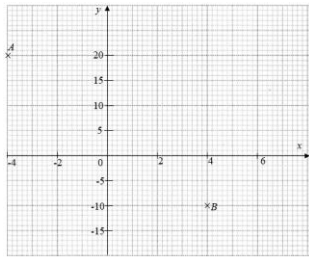
(d) Explain why a bar chart may not be suitable to represent the above data.

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

End of Paper

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ONE PAGE ANSWER (Sec 2E EOY EXAMINATIONS 2023)

1	162.5	15	31.8%
2	$(3n - q)(3m + 4p)$	16a	150°
3a		16b	Angle QCD = $150 - 90$ = 60°
3b	Order 1		Angle CQD = angle CDQ = $\frac{180 - 60}{2}$ = 60°
4	$\frac{200n}{m}$ litres		Therefore $CQ = CD = QD$
5	EG^2 = 29^2 = 841 $EF^2 + FG^2$ = $20^2 + 21^2$ = 841 $EF^2 + FG^2 = EG^2$ By converse of pythagoras' theorem, triangle EFG is a right-angled triangle and angle $EFG = 90^\circ$.		I do not agree. Triangle CDQ is equilateral as all angles and sides are equal.
6	The bar chart representing both shops are of different sizes. This might cause readers to think that the number of ratings for Shop B is a lot more/much greater compared to Shop A as the bar chart is bigger in size. <u>or</u> The vertical scale is not proportional. This might cause readers to obtain wrong number of ratings for Shop B and Shop A and making inaccurate comparisons.	17a 17b	Coordinates of $A = (-4, 20)$ 
7	1125	17c	$y = -\frac{15}{4}x + 5$
8	$b = \pm\sqrt{3aM - 2p}$	17d	$k = 2$ or 6
9a	$d > -3\frac{2}{3}$	18a 18b	262 cm^2 \$94.26
9b	2	19ai	20 students
10a	$T_n = n^3 - 2n$	19aai	38
10b	235 is a term as the pattern number n is a positive integer.	19b	35%
11a	$(x + 5y)(x - 5y)$	19c	144°
11b	34	19d	not suitable if there are too many classes of data as it will lead to a confusing/hard to visualise/massive bar chart.
12a	$\frac{6x}{y}$		
12b	$\frac{5m + 15}{(2m - 1)(m + 2)}$		
13	$x = -1$ and $y = -2$		
14a	1.68 km		
14b	7 cm^2		

