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CLASS:	
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SUBJECT TEACHER: _____



YISHUN TOWN SECONDARY SCHOOL

G3

PRELIMINARY EXAMINATION 2026

SECONDARY 4/5

MATHEMATICS G3

PAPER 2 (4052/02)

DATE : 13 August 2026

DAY : Thursday

DURATION: 2 h 15 min

MARKS: 90

READ THESE INSTRUCTIONS FIRST

Do not turn over the cover page until you are told to do so.

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

Write in dark blue or black pen.

You may use a pencil for any diagrams or graphs.

Do not use staples, paper clips, highlighters, 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 of the marks for this paper is 90.

	MARKS	
	OBTAINED	FULL
1		12
2		6
3		6
4		8
5		7
6		8
7		10
8		12
9		11
10		10
TOTAL		90

This question paper consists of **24** printed pages and **2** blank pages.

Mathematical Formulae*Compound Interest*

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

Mensuration

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

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

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

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

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

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

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

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 (a) Solve the equation $\frac{x+7}{x^2-9} = -2 + \frac{1}{3-x}$.

Give your solutions correct to 2 decimal places.

Answer $x = \dots\dots\dots$ or $\dots\dots\dots$ [5]

(b) Solve the inequalities $\frac{2}{3} + y \leq 9 + \frac{4}{9}y < 4 + y$.

Answer [3]

(c) Given that $\frac{1}{2}b = \sqrt{\frac{4-z}{z}} + 3$,

(i) Find b when $z = 2$,

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

(ii) Rearrange the formula to make z the subject.

Answer $z = \dots\dots\dots$ [3]

- 2 YTSS is testing two AI systems, System A and System B, tracking their response times (in seconds) to student queries.

The response times for System A are shown below:

System A

Stem	Leaf			
3	8	9		
4	1	2	5	7
5	0	3	6	
6	2	4		

Key: 4 2 represents 42 seconds

- (a) (i) Find the median response time for System A.

Answer seconds [1]

- (ii) Find the standard deviation of the response times for System A.

Answer seconds [1]

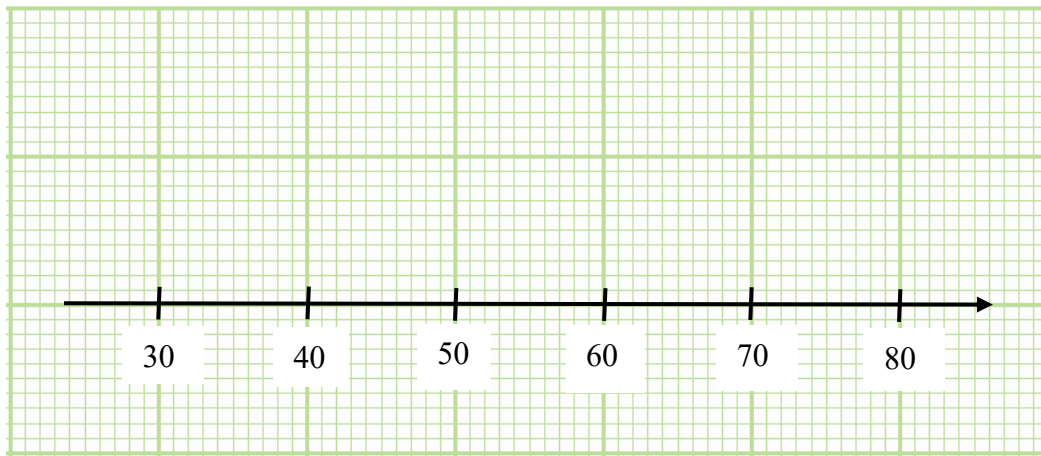
The following information is shown for System B:

System B

- Minimum = 35
- Lower Quartile = 40
- Median = 48
- Upper Quartile = 55
- Maximum = 70

(b) Construct a box-and-whisker plot for System B using the data provided.

[1]



(c) One student claims:

“System A is more consistent, but System B is faster.”

State whether you agree with this claim. Justify your answer using statistical measures.

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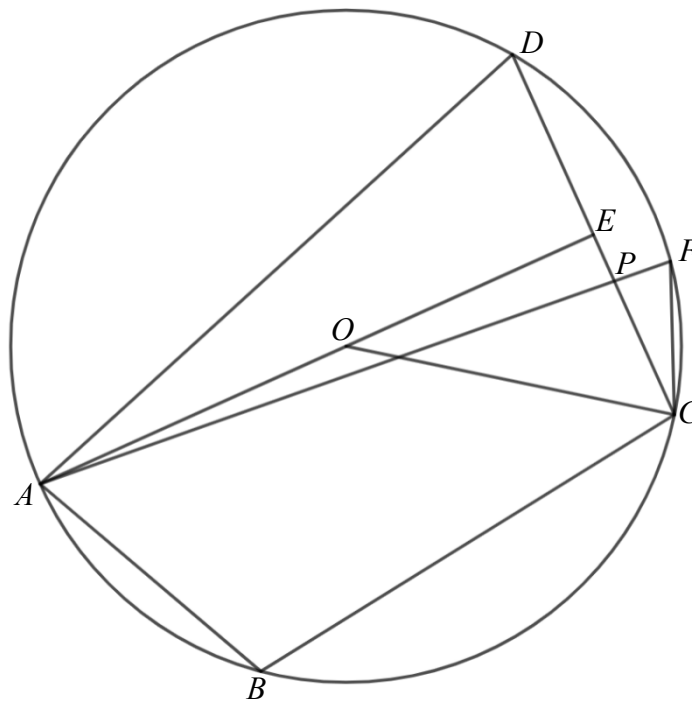
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[3]



A , B , C , D and F are points on a circle in the diagram above, O is the centre of the circle.

Line AE meets line OC at O .

The line AF cuts the line DC at P .

The ratio of angle AOC to angle ABC is $4 : 3$.

(a) Show that the angle AFC is 72° . Give a reason for each step of your working.

[2]

- (b) Find the perimeter of the major sector $ADFC$, given that the diameter of the circle with centre O is 11 cm.

Answer cm [2]

- (c) Another circle is drawn on the diagram such that line AD is its diameter. Determine whether point E lies on its circumference if $\angle DAO = 18^\circ$. Give reasons for each statement you make.

Answer

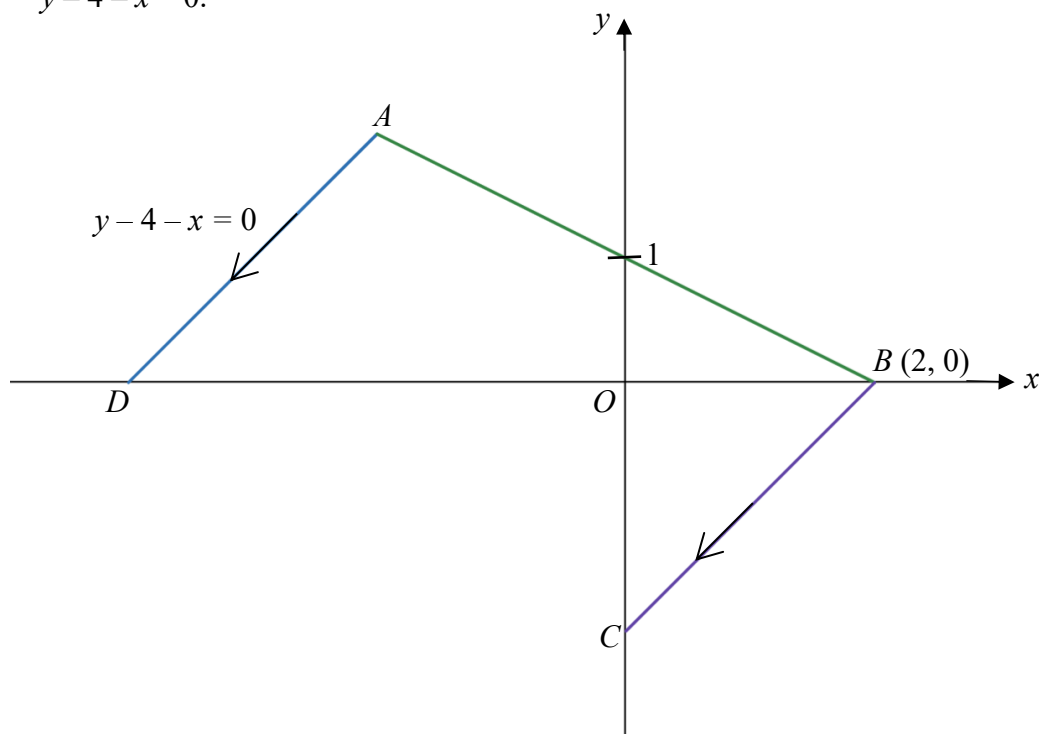
 [2]

4 Solutions to this question by accurate drawing will not be accepted.

The diagram below shows 4 points, A , B , C and D .

Points B and D lie on the x -axis and point C lies on the y -axis.
 B is the point $(2, 0)$ and AB intersects the y -axis at 1 .

It is given further that BC is parallel to AD and the equation of the line AD is $y - 4 - x = 0$.



- (a)** Find the equation of the line AB .

Answer

[2]

- (b) Show that the coordinates of A are $(-2, 2)$.

[2]

- (c) (i) Find distance AC .

Answer units [2]

- (ii) Find the shortest distance from B to AC given that the area of ABC is 6 units².

Answer units [2]

5 (a) The first four terms in a sequence are 5, 8, 11 and 14.

(i) Find the fifth term of the sequence.

Answer [1]

(ii) T_n is the n th term of the sequence.

Find an expression, in terms of n , for T_n .

Answer $T_n =$ [1]

(iii) $T_{n^2} - T_n$ is a positive integer.

Show that $T_{n^2} - T_n$ is a multiple of 3 for $n \geq a$. Hence, state the value of a .

Answer $a =$ [2]

- (b) (i) The first four terms in a different sequence are

$$\frac{5}{1}, \frac{8}{4}, \frac{11}{9}, \frac{14}{16}$$

Find P_n , the n th term of this sequence.

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

- (ii) Jenna states that $\frac{110}{289}$ is a term in the above sequence.

Do you agree with her? Show your working clearly.

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[1]

- (iii) Explain why $P_n \leq 5$ for all values of n .

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[1]

- 6** The cost, y dollars, of printing each T-shirt when x T-shirts are printed is modelled by the equation $y = 8 + \frac{400}{x}$, for $10 \leq x \leq 160$.

Some corresponding values of x and y are given in the table below.

x	10	20	50	80	125	160
y	48	28	16	13	11.2	p

- (a)** Find the value of p in the table above.

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

- (b)** On the grid opposite, draw the graph of $y = 8 + \frac{400}{x}$ for $10 \leq x \leq 160$. [2]

- (c)** Use your graph to estimate the number of T-shirts that is printed if the cost of printing each T-shirt is \$20.

Answer $\dots\dots\dots$ T-shirts [1]

- (d)** By drawing a tangent, find the gradient of the curve at (40, 18).

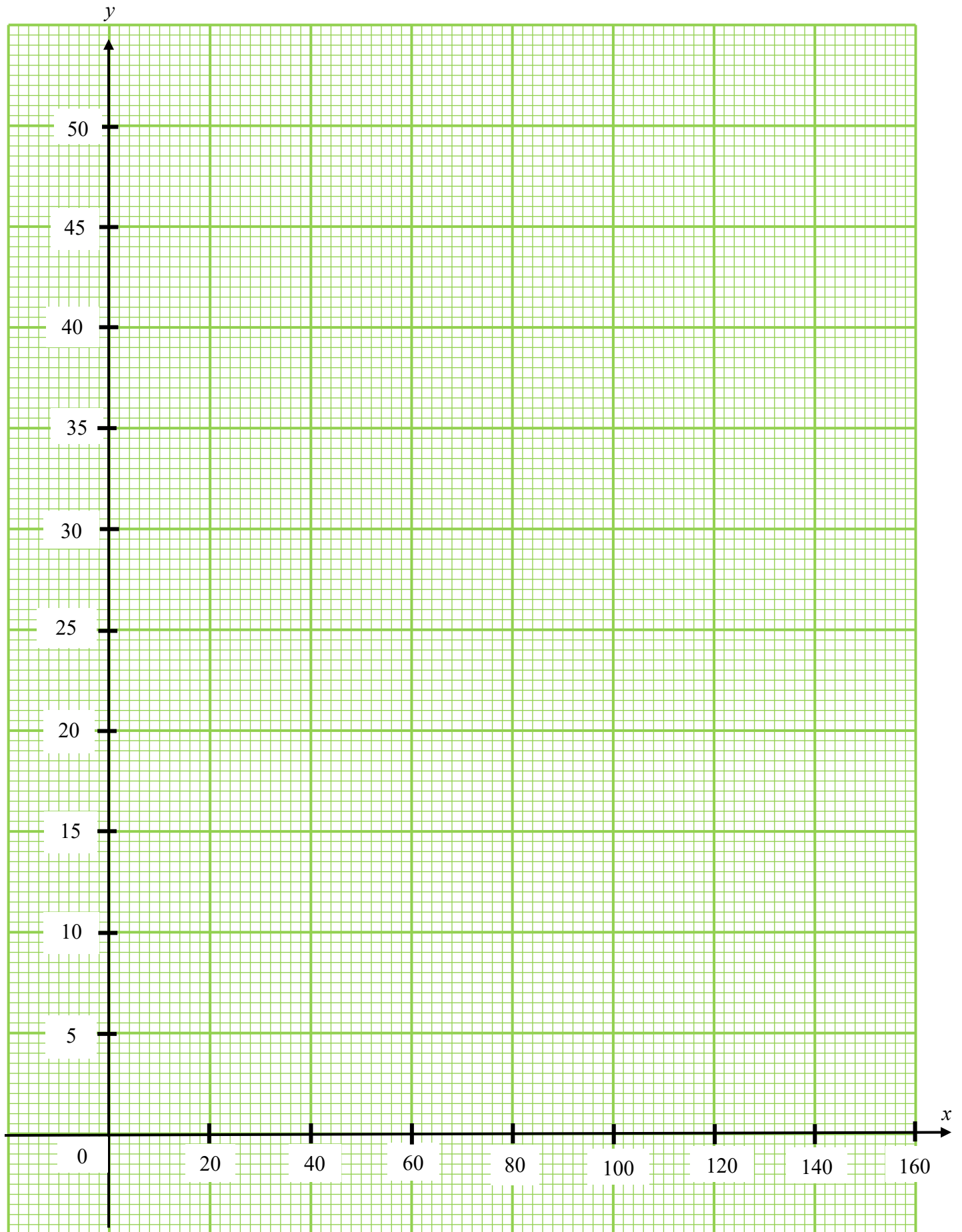
Answer $\dots\dots\dots$ [2]

- (e)** John suggests that the selling price of each T-shirt, in dollars, is modelled by $y = 30 - \frac{3}{16}x$.

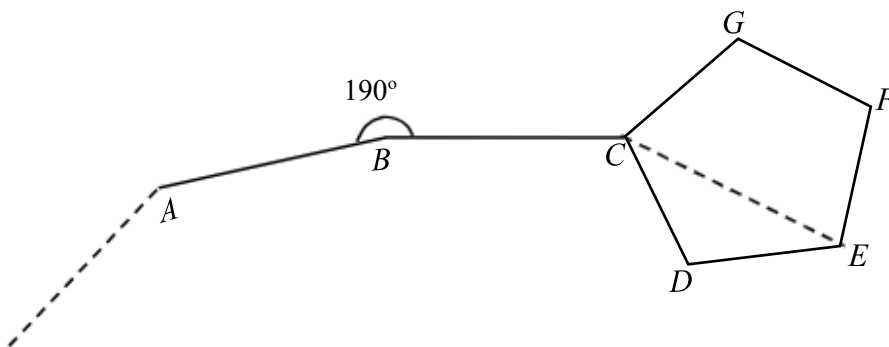
- (i)** On the same grid, draw the graph of $y = 30 - \frac{3}{16}x$ for $0 \leq x \leq 160$. [1]

- (ii)** Using your graphs, determine the range of values of x for which John will not make any loss, assuming that all of the t-shirts will be sold.

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



- 7 (a) A, B, C and E are four vertices of a n -sided polygon and reflex angle ABC is 190° . The remaining reflex angles of the n -sided polygon are each equal to 205° . A regular pentagon $CDEFG$ is placed such that one of its diagonal CE , is also one of the sides of the n -sided polygon.



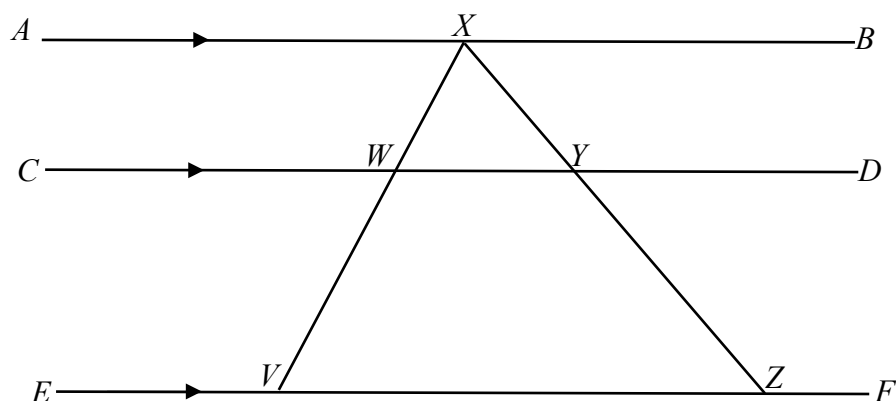
- (i) Find $\angle BCD$.

Answer $\angle BCD = \dots\dots\dots$ [3]

- (ii) Find the number of sides of the n -sided polygon.

Answer $n = \dots\dots\dots$ [3]

- (b) In the diagram below, AB , CD and EF are parallel lines. XWV and XYZ are straight lines. The line XZ bisects angle BXW and $\angle VWY = 106^\circ$.



- (i) Show that WXY is an isosceles triangle. Give reasons for your working.

[2]

- (ii) Which is the longest side of the triangle XVZ ? Show all your necessary workings.

Answer

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[2]

- 8 (a) The table shows the number of messages sent per month from June to September in 2023 in Singapore.

Month	June	July	Aug	Sep
Number of days	30	31	31	30
Number of messages sent	9.88×10^{12}	8.3×10^{11}	5.97×10^{11}	9.11×10^{12}

- (i) The population of Singapore in 2023 was 5.12×10^9 .
Calculate the mean number of messages sent per person per day from June to September in 2023.

Answer messages [2]

- (ii) Calculate the percentage decrease in the number of messages sent from July to August.

Answer% [2]

- (iii) The number of messages sent in 2025 from June to September was 12.2% more than the number of messages sent in 2023 from June to September.

Calculate the number of number of messages sent in 2025. Give your answer in standard form.

Answer messages [2]

- (b) In 2023, Singapore has a population of 5.64 million.
The land area of Singapore was 728.6 km^2 .
Find the population of Singapore per km^2 , leaving your answer as standard form.

Answer [2]

- (c) The area of the reserve on a map is 24 cm^2 , while its actual area is 6 km^2 .

- (i) Find the scale of the map in the form $1: n$.

Answer 1: [2]

- (ii) The scale of the map in (i) is reduced to $1: 25\,000$.

Show your working clearly to determine whether the area of the reserve shown on the new map is doubled, quadrupled or remains unchanged.

Answer

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[2]

- 9 The diagram shows a metal buoy. It is made up of a cone and a hemisphere. The cone is mounted on the base of a hemisphere with a radius of 0.6 m.

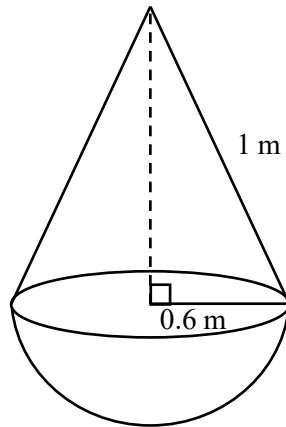


Figure 1

Given that the slant height of the cone is 1 m,

- (a) Show that the height of the buoy is 1.4 m.

[1]

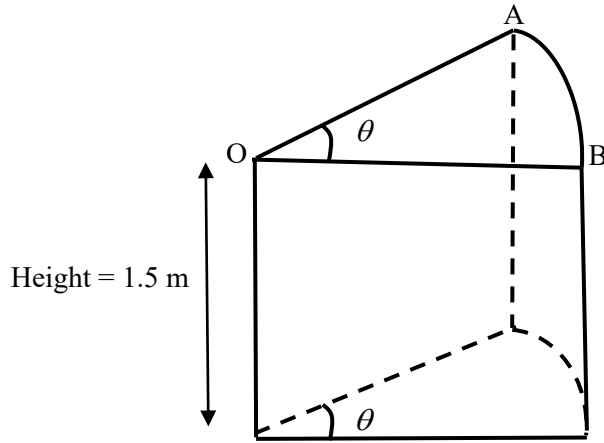
- (b) Calculate the total surface area of the buoy.

Answer m² [3]

- (c) Calculate the volume of the buoy, leaving your answer in terms of π .

Answer m³ [3]

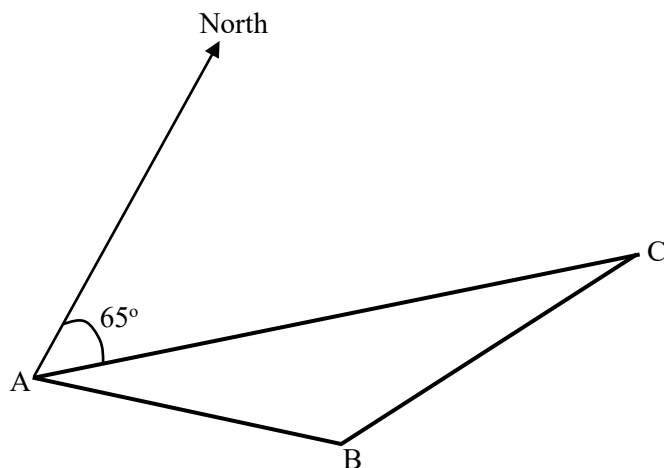
- (d) The buoy shown in Figure 1 is melted and recast into the prism shown below. The prism has height 1.5 m, and its cross-section is the sector OAB , where angle AOB is $\frac{11\pi}{30}$ radians. Assuming no material is lost during the recasting process, find the radius of the sector.



Answer m [4]

10. As a director of a medical logistics company, you are evaluating different methods of transporting emergency medical supplies from station A during adverse weather conditions. The emergency supplies must reach station C within 1 hour of dispatch.

Three stations A, B and C are located at sea. Station B is due east of station A. The bearing of C from A is 065° . The bearing of C from B is 020° . Distance between A and B is 17.6 km.



*The diagram is
not drawn to scale*

A drone travels directly from A to C. A speedboat travels from A to B, then from B to C.

A helicopter may also be used if weather conditions permit.

- (a) Calculate the direct distance AC travelled by the drone.
Give your answer correct to 5 significant figures.

Answer: km [3]

The company collected the following operational data during a trial run.

Vehicle	Maximum Speed	Actual Operating Speed	Further Information	Operating Cost
Drone	26 m/s	19 m/s due to strong wind	5 mins preparation time (loading and take-off) 42 mins maximum flying time 8 kg maximum carrying load	\$1380
Speedboat	45 km/h	40 km/h from A to B	11 mins for docking and refuelling time at B	\$860
		29 km/h from B to C due to rough sea conditions		
Helicopter	160 km/h	150 km/h	18 mins landing clearance and safety checks. - For safety reasons, helicopter operations are suspended if visibility falls below the minimum requirement of 1.8 km at any point during the journey.	\$2390

The following information is further provided:

- Current visibility fluctuates between 1.3 km and 2.0 km.
 - Medical supply is 7.2 kg.
 - The drone system will only be approved if **BOTH** conditions below are satisfied.
- Condition 1: The drone must reduce the total delivery time by at least 50% relative to the current speedboat operation.
- Condition 2: The operating cost of drone per minute should not exceed the operating cost of the speedboat per minute by \$50.

- (b) The company may choose either one of the 3 transportation methods. The company wants the fastest transportation method while keeping total operating cost to be below \$2400.

Determine which transportation method should be selected. You must show all relevant calculations and justify your conclusion clearly (other than the conditions stated above). State one assumption made in your working. [7]

Continuation of working space for question 10.

END OF PAPER

Answer Key for 2026 YTSS 4G3 Prelims Mathematics P2

1(a)	1.56, -2.56	6(c)	34
1(b)	$9 < y \leq 15$	6(d)	-0.25
1(c)(i)	4	6(e)(ii)\	$23 \leq x \leq 94$
1(c)(ii)	$z = \frac{16}{b^2 - 8}$	7(a)(i)	119°
2(a)(i)	47	7(a)(ii)	$n = 15$
2(a)(ii)	8.60	7(b)(i)	$\angle BXZ = \angle VXZ$ (line XZ bisects angle BXW) $\angle BXY = \angle XYW$ (alt. angles, AB // CD) Hence $\angle WXY = \angle XYW$ (base angle of isosceles triangle)
2(c)	IQR_A = $56 - 41 = 15$ IQR_B = $55 - 40 = 15$ I disagree. System A is faster as the median as the median response time of 47secs is lower than system B's median which is at 48 seconds. Both systems are consistent in their data as their IQR is the same.	7(b)(ii)	Angle XVZ = $180^\circ - 106^\circ = 74^\circ$. (int angle, CD//EF) Angle BXZ = Angle XZV = 53° . (alt angle, AB//EF) XZ is the largest side of the triangle as it is opposite the largest angle.
3(b)	31.7	8(a)(i)	32.7
3(c)	Point E lies on the circumference.	8(a)(ii)	28.1%
4(a)	$y = -\frac{1}{2}x + 1$	8(a)(iii)	2.29×10^{13}
4(c)(i)	4.47 units	8(b)	7.74×10^3
4(c)(ii)	2.68 units	8(c)(i)	1 : 50 000
5(a)(i)	17	8(c)(ii)	The area of the reserve shown on the new map is quadrupled.
5(a)(ii)	$3n+2$	9(a)	$Height = \sqrt{1^2 - 0.6^2} = 0.8$ $0.8 + 0.6 = 1.4$ (shown)
5(a)(iii)	$a=2$	9(b)	4.15
5(b)(i)	$\frac{3n+2}{n^2}$	9(c)	$\frac{6}{25}\pi$
5(b)(ii)	Value of $n = 17/2$ or $-34/55$ Since n is not a positive integer, $110/289$ is not a term in sequence	9(d)	$r=0.934$
5(b)(iii)	n^2 increases faster than $3n+2$, as n increases, P_n tends to 0. As $n \geq 1$, $P_n \leq \frac{3}{1} + \frac{2}{1^2} \leq 5$	10(a)	23.389 km
6(a)	10.5	10(b)	Drone should be chosen