

Name: Register no: Class:



NGEE ANN SECONDARY SCHOOL

G3

SECONDARY TWO END-OF-YEAR EXAMINATION

MATHEMATICS

**24 September 2025
2 hours 15 minutes**

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your name, register number and class at the top of this page.

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** 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 will result in loss of marks.

The total of the marks for this paper is 90.

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

Total	/90
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Checked by student:

Date:

Mathematical Formulae

Geometry and Measurement

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

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

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

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

Answer **all** the questions.

- 1** Expand and simplify $3(2x - y)^2 - 4(1 + 3x^2)$.

Answer [3]

- 2 (a)** Factorise $6x^2 + x - 15$.

Answer [1]

- (b)** Hence, simplify the algebraic expression $\frac{6x^2 + x - 15}{7(4x^2 - 9)}$.

Answer [2]

- 3** A bag contains 18 coloured balls, of which 6 are red, 4 are yellow and the rest are purple. A ball is chosen at random from the bag.

(a) Find the probability that either a red or yellow ball is chosen.

Answer [1]

(b) x red balls are added into the bag such that the probability of choosing a red ball becomes $\frac{2}{5}$.

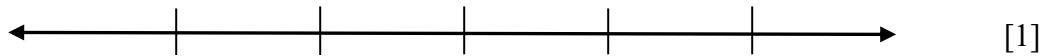
Find the value of x .

Answer $x =$ [3]

4 (a) Solve $x - 3 < \frac{5x}{2}$.

Answer [2]

(b) Represent the solution in **(a)** on the number line.



(c) Hence, state the smallest integer that satisfies the inequality

$$x - 3 < \frac{5x}{2}$$

Answer [1]

- 5 Rearrange the formula $\frac{2}{n} - 5 = \frac{4}{m}$ to make m the subject.

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

- 6 The time taken (T minutes) to fill up a swimming pool is inversely proportional to the number of water pipes (N) used.
6 water pipes take 25 minutes to fill up the swimming pool.

Find

- (a) an equation connecting N and T ,

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

- (b) the extra amount of time needed to fill the swimming pool if two pipes are faulty and not working.

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

- 7 The stem-and-leaf diagram shows the monthly savings of 20 students.

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

Key 1|1 means \$11

- (a) Find the median monthly savings.

Answer \$ [2]

- (b) One of the students claims that the only modal amount students saved was \$21.

Is the student correct?

Explain your answer.

Answer

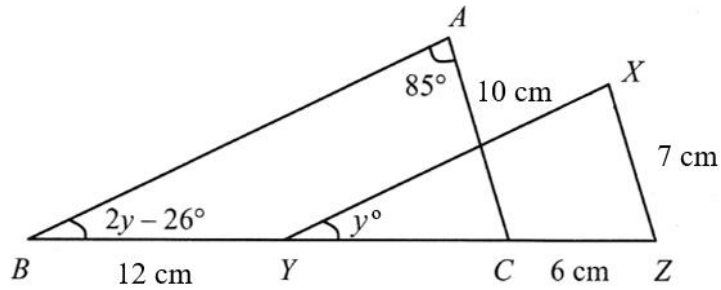
 [1]

8 $\frac{3}{4-x} - \frac{2}{x+1}$ can be written as a single fraction in the form $\frac{a(x+b)}{(4-x)(x+1)}$.

Find the value of a and of b .

Answer $a = \dots\dots\dots, b = \dots\dots\dots$ [3]

9



The diagram shows two similar triangles ABC and XYZ .
 Angle $BAC = 85^\circ$, angle $ABC = 2y - 26^\circ$ and angle $XYZ = y^\circ$.
 $AC = 10$ cm, $XZ = 7$ cm, $BY = 12$ cm and $CZ = 6$ cm.

Find

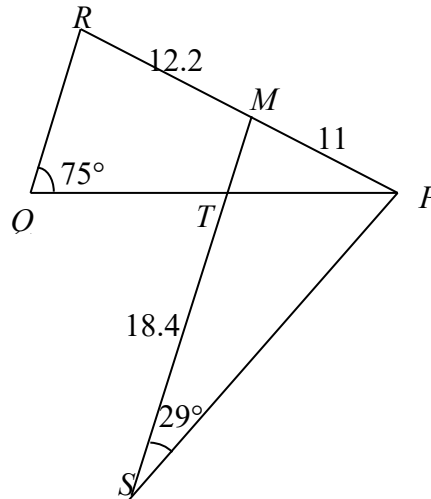
(a) the value of y ,

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

(b) the length of YC .

Answer $YC = \dots\dots\dots$ cm [2]

10



In the figure below, triangle PQR is congruent to triangle SPM .

$PM = 11$ cm, $RM = 12.2$ cm and $ST = 18.4$ cm.

Angle $PQR = 75^\circ$ and angle $PSM = 29^\circ$.

Find

(a) the length of TM ,

Answer cm [2]

(b) angle PRQ ,

Answer Angle $PRQ =$ [1]

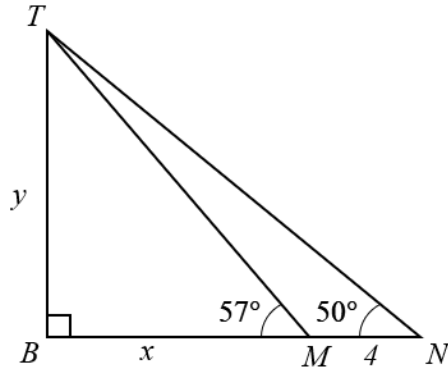
(c) angle QTS .

Answer Angle $QTS =$ [2]

(d) Is QR parallel to SM ?
Explain your answer.

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

11



The diagram shows 2 strings, TM and TN , attached to the top of a building at point T . TM and TN make angles of 57° and 50° with the horizontal ground respectively. The building is y m tall, and the foot of the building is x m from M .

- (a) Express $\tan 57^\circ$ in terms of x and y .

Answer $\tan 57^\circ = \dots\dots\dots$ [1]

- (b) Express $\tan 50^\circ$ in terms of x and y .

Answer $\tan 50^\circ = \dots\dots\dots$ [1]

- (c) Using the results in **parts (a) and (b)**, show that $x \tan 57^\circ = x \tan 50^\circ + 4 \tan 50^\circ$

Answer

[1]

- (d) Hence, find the height of the building.

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

- 12 The number of goals scored by a soccer team is recorded.

Goals scored	0	1	2	3	4	5
Frequency	2	5	x	12	4	2

- (a) If the mode is 3, find the largest possible value of x .

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

- (b) Find the value of x if the mean number of goals is 2.5.

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

- 13 y is directly proportional to the square of t .
When $t = 6$, $y = 4$.

- (a) Find an equation connecting y and t .

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

- (b) When $t = 12$, find

- (i) the value of y ,

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

- (ii) the percentage increase in y if this value of t is increased by 50%.

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

14 The distance between Singapore and Kuala Lumpur is 300 km.

- (a)** James drove from Singapore to Kuala Lumpur and it took him x hours.

Write down an expression, in terms of x , for James' average speed in km/h.

Answer km/h

[1]

- (b)** Ben took a train from Singapore to Kuala Lumpur.

Ben took 2 hours longer than James to cover the same distance.

Write down an expression, in terms of x , for Ben's average speed in km/h.

Answer km/h

[1]

- (c)** The train travelled at 40 km/h slower than James' car.

Form an equation in x and show that it reduces to $x^2 + 2x - 15 = 0$.

Answer

[3]

- (d)** Solve the equation $x^2 + 2x - 15 = 0$.

Answer $x =$ or $x =$

[1]

- (e)** Find the average speed, in km/h, of the train.

Answer km/h

[1]

- 15** A ball bearing is thrown upwards where h is the height of the ball above the ground in metres and t is the time of the flight in seconds.

The motion is given by $h = -t^2 + 6t + 6$.

Some corresponding values of t and h are given in the following table.

t	0	1	2	3	4	5	6
h	6	p	14	15	14	11	6

- (a)** Find the value of p .

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

- (b)** On the grid opposite, draw the graph of $h = -t^2 + 6t + 6$ for $0 \leq t \leq 6$. [2]

- (c)** Use the graph to find

- (i)** the maximum height of the ball bearing,

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

- (ii)** the possible times, in seconds, when the ball bearing is at 10m.

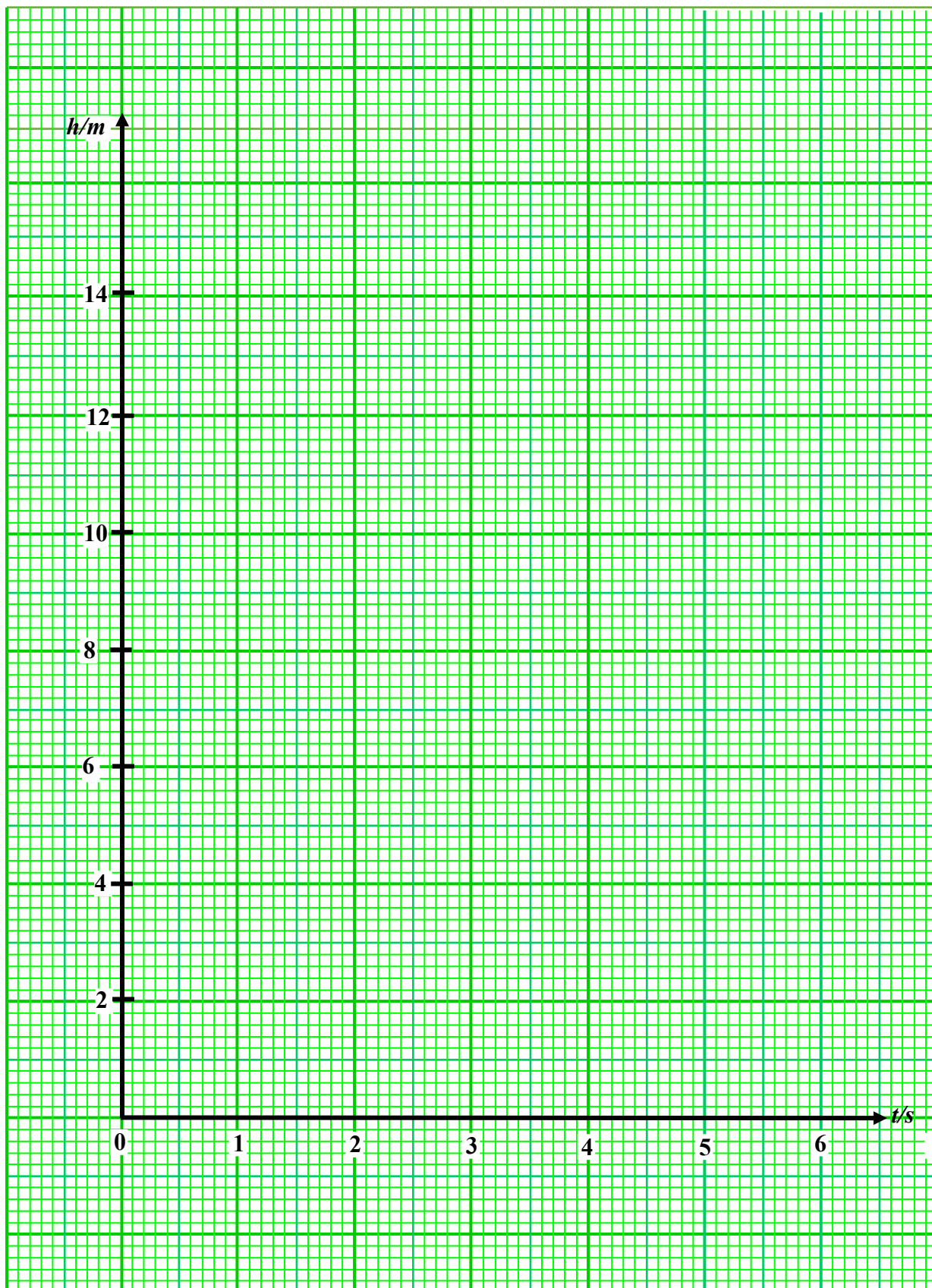
Answer $\dots\dots\dots s$ and $\dots\dots\dots s$ [1]

- (d)** Is the ball thrown from the ground level?
Explain your answer.

Answer $\dots\dots\dots$

$\dots\dots\dots$

$\dots\dots\dots$ [1]



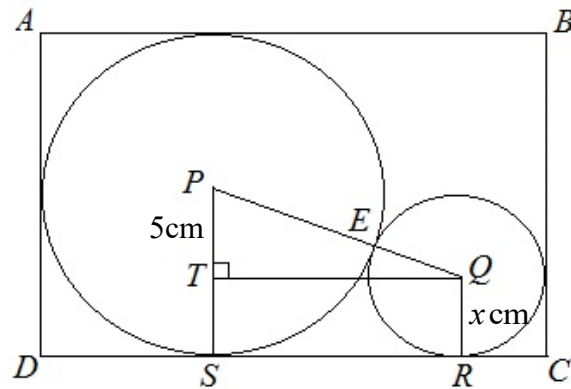
16 (a) Expand and simplify $\left(x^2 + \frac{1}{16}\right)\left(x + \frac{1}{4}\right)\left(x - \frac{1}{4}\right)$ completely.

Answer [2]

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

Answer $x =$ [3]

- 17 The diagram shows a rectangle $ABCD$.
 The large circle with centre P touches three sides of the rectangle.
 The small circle of radius x cm has a centre Q that touches two sides of the rectangle.
 It also touches the large circle at the point E .
 The length of PT is 5 cm and the area of triangle PTQ is 30 cm^2 .



- (a) Show the length of PQ is 13 cm.

Answer

[3]

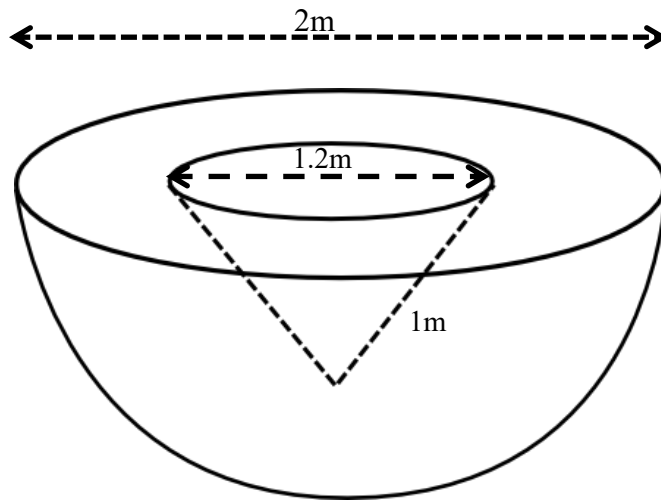
- (b) Find the value of x .

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

- (c) Find angle PQR .

Answer Angle $PQR = \dots\dots\dots$ [2]

- 18 The diagram shows a concrete sculpture formed by removing a cone, with a diameter of 1.2m and a slant height of 1m, from a solid hemisphere of diameter 2m.



- (a) Show that, correct to three significant figures, the volume of the sculpture is 1.79 m^3

Answer

- (b) The concrete is a mixture of cement, sand and stones in the ratio of 3 : 5 : 7 by volume.

Find the volume of sand needed to make the sculpture.

Answer m³ [2]

- (c) The mass of 1 cubic metre of sand is 1530 kg.

Calculate the mass of sand needed to make the sculpture.

Answer kg [1]

- (d) Sand is sold in bags, each of which contains 25 kg of sand.

Do you think that 36 bags are sufficient to make the sculpture?
Explain your answer.

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

- 19** Anna is a city planner working on a new guide for Singapore's MRT System. The details of some MRT lines on a particular map, Map *A*, are shown in the table.

MRT Line	Year of Completion	Actual Length (km)	Length on Map (cm)	Time taken (mins)
Circle Line	2009 - 2016	35.7	7.14	60
Downtown Line	2017	43.0	8.6	40 – 50
Northeast Line	2003	20.0	4.0	35

- (a)** Express the scale of the map in the form $1 : n$.

Answer : [1]

Anna now needs to create Map *B* on a poster at the station for tourists, which has a scale of $1 : 20\,000$.

- (b)** Find the length of the Downtown Line on Map *B*.

Answercm [2]

- (c) Kim Chuan Depot is a train depot that provides maintenance services for trains.

Feature	Specifications
Train Capacity	70 trains
Total Area	>100,000 m ²

While exploring the depot, Anna wondered about its real size and tried to compare it with something familiar, like a football field.

The depot has an area of 2.5 cm² on Map *B*.

One football field has an area of 0.007 km².

Is the depot able to fit 14 football fields?

Explain your answer.

Answer

