

Name: Register no: Class:



NGEE ANN SECONDARY SCHOOL



PRELIMINARY EXAMINATION

MATHEMATICS

4052/01

Paper 1

25 August 2026

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**Compound interest*

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

Geometry and Measurement

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

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

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

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

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

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

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

Trigonometry

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

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

Statistics

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

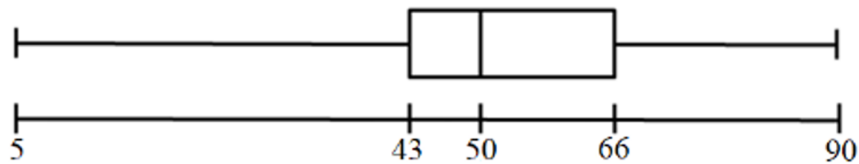
$$\text{Standard deviation} = \sqrt{\frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f} \right)^2}$$

Answer **all** the questions.

- 1 Expand and simplify $(3x - 2)(8x^2 - 5x + 1)$.

Answer [2]

- 2 The box-and-whisker plot shows the waiting times, in minutes, for 60 patients at a clinic.



- (a) Use the box-and-whisker plot to find the median waiting time.

Answermins [1]

- (b) Renee says, “There were almost twice as many patients who had waiting time less than 43 minutes as there were patients who had waiting time more than 66 minutes”.

Is she correct?

Give a reason for your answer.

.....

[1]

- 3 A number has exactly fifteen factors.
Two of the factors are 81 and 108.

Find this number.

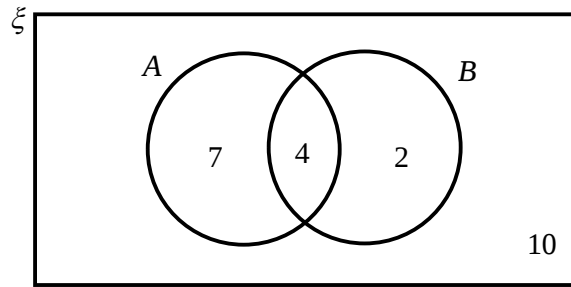
Answer [2]

- 4 The solution for the equation $\frac{3x}{4} = k - \frac{6x-5}{5}$ is twice the value of k and k is a constant.

Find the value of k .

Answer $k =$ [2]

- 5 The Venn diagram shows the universal set and the number of elements in each of its subsets.



Find the value of

(a) $n((A \cup B) \cap A')$

Answer [1]

(b) $n((A' \cap B) \cup (A \cap B'))$

Answer [1]

- 6 Factorise completely.

(a) $15\pi - 24\pi b + 3\pi^2$

Answer [1]

(b) $4x^2 + 9y^2 - 12xy - 64$

Answer [2]

- 7 Express as a single fraction in its simplest form $\frac{5x}{6} - \frac{3(x-1)}{4} + \frac{2x+7}{12}$.

Answer [2]

- 8 Six students took a Mathematics quiz and the marks were recorded.

9 11 10 14 11 10

- (a) Calculate the standard deviation.

Answer [1]

- (b) Two other students also took the quiz and their marks were recorded.
Both the mean mark and modal mark obtained by the eight students were 11.

Find the marks of these two students.

Answer and [2]

- 9** According to World Bank data, Singapore's population was 6.037 million in 2024. In the same year, its Gross Domestic Product (GDP) was US\$547.39 billion.

(a) Express 547.39 billion in standard form.

Answer [1]

(b) What is the GDP per person in Singapore?

Answer US\$..... [2]

- 10** Solve these simultaneous equations.

$$3x + 5y = 4$$

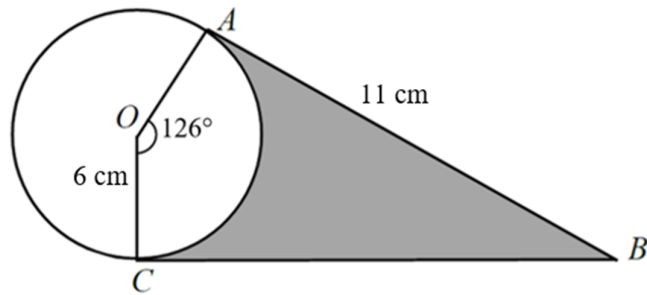
$$7x - 4y = -22$$

You must show your working.

Answer $x =$

$y =$ [3]

- 11 $OABC$ is a quadrilateral where AB and BC are tangents to a circle with centre O and radius of 6 cm.



- (a) Explain why angle OAB is 90° .

Answer

[1]

- (b) Calculate the shaded area.

Answercm² [2]

12 A map has a scale of 1: 6 000 000.

The distance between Malaysia and Indonesia shown on the map is 24 cm.

(a) Calculate the actual distance, in kilometres, between Malaysia and Indonesia.

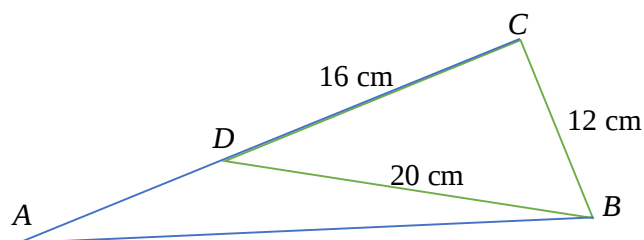
Answerkm [1]

(b) The difference in actual area between the two countries is 1 574 722 km².

Calculate the difference in area on the map.

Answercm² [2]

- 13 In triangle BCD , $BC = 12$ cm, $CD = 16$ cm and $DB = 20$ cm.
 ADC is a straight line.



- (a) Is BC perpendicular to CD ?
 Show your working clearly.

Answer

[1]

- (b) Angle $ADB = x^\circ$

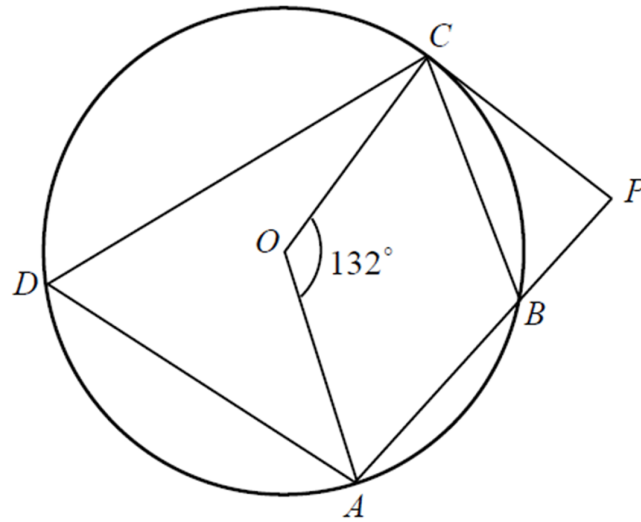
Find the exact value of $\cos x^\circ + \sin x^\circ$.

Answer [2]

14 Simplify $\frac{3x^2 + 7x - 40}{18x^3 - 128x}$.

Answer [3]

15

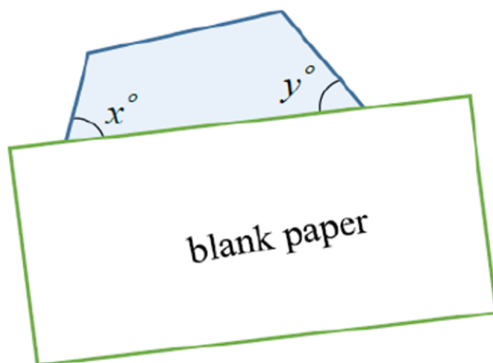


A, B, C and D are points on the circumference of a circle, centre O .
 PBA is a straight line.
 PC is a tangent to the circle and angle $COA = 132^\circ$.

Find angle CBP .
 Give reasons for each step of your working.

Answer Angle $CBP = \dots\dots\dots$ [3]

16



The diagram shows a regular polygon which is partially covered with a sheet of blank paper. The sum of the angles x° and y° is 60° .

Find the number of sides of the regular polygon.

Answer [3]

- 17** Mr Fok bought a vase for \$58900.
The value of the vase appreciates by 0.1% each month.

(a) Explain why the appreciation value of the first year is not 1.2% of \$58900.

.....

.....

[1]

(b) Calculate how much the vase is worth at the end of the third year.

Answer \$..... [2]

- 18** Tessa buys a sofa bed using hire purchase.
She pays a deposit of 25% of the cash price plus 26 equal monthly payment of \$88.
The outstanding amount is charged at a simple interest rate of 8% per annum.

Calculate the cash price of the sofa bed.

Answer \$..... [3]

- 19 (a) 8 men working 6 hours a day, can build a cupboard in 2 days.

Find the additional number of days required to build a cupboard by 3 men working 4 hours a day at the same rate.

Answer days [2]

- (b) y^3 is inversely proportional to the square of x .
The difference between the values of y^3 when $x = 4$ and when $x = 8$ is 3.

Find the values of x when $y = 1$.

Answer $x =$ or [3]

20

$$\sqrt[3]{\frac{x^3 + 2y}{y}} = 2x$$

- (a) (i) Rearrange the formula to make y the subject.

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

- (ii) Find the value of y when x is -2 .

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

(b) $p = \frac{3}{q} + 2$

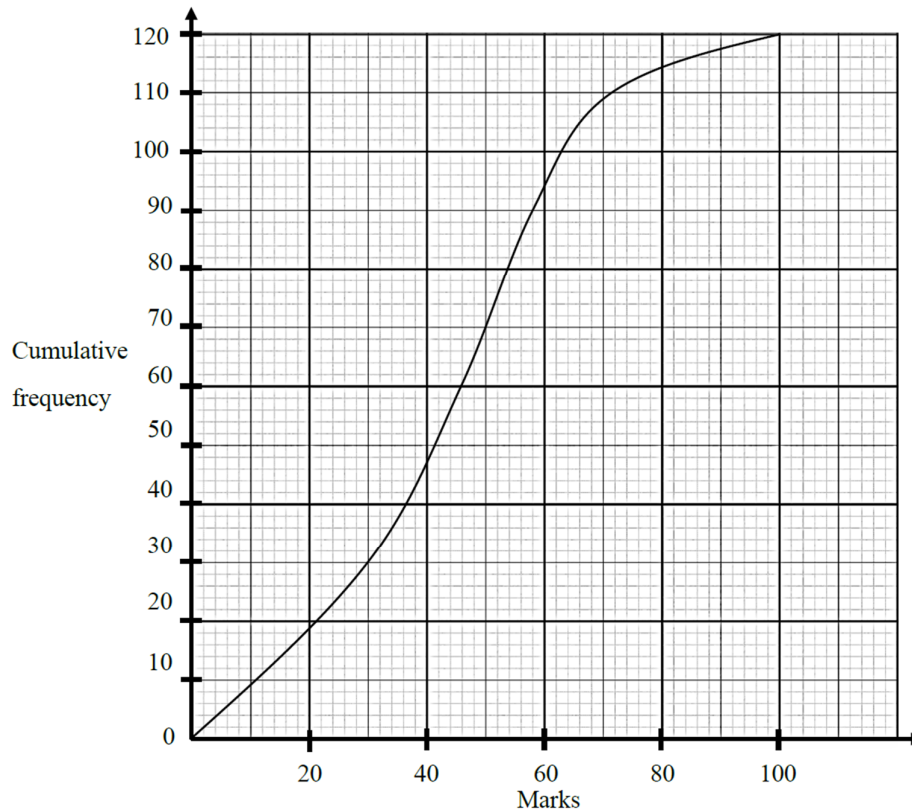
Sue claims that the value of q is undefined when $p = 3$.

Explain why she may be wrong.

.....

 [2]

- 21 The cumulative frequency diagram represents the marks scored by a group of 120 students for a Physics Weighted Assessment.



- (a) Use the diagram to find the interquartile range of the marks scored.

Answermarks [2]

- (b) One of these students is chosen at random.

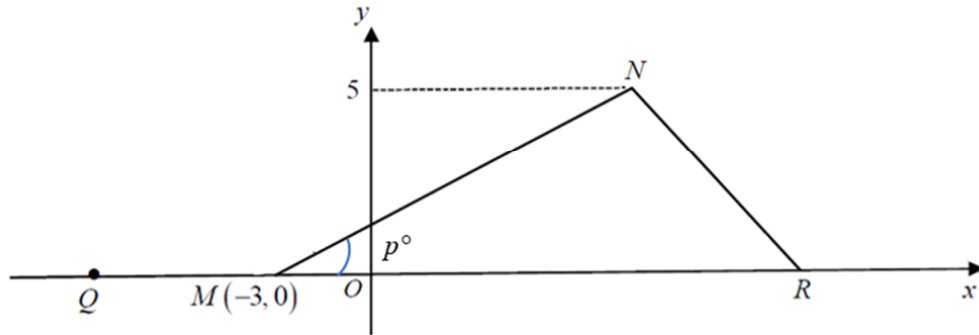
The probability that the student's mark is greater than t marks is $\frac{5}{12}$.

Find the value of t .

Answer $t =$ [2]

22 In triangle MNR , point M is $(-3, 0)$ and angle $NMR = p^\circ$.

Q is a point on the negative x -axis and $\sin p^\circ = \frac{5}{13}$.



(a) Express as a fraction

(i) $\cos (180^\circ - p^\circ)$,

Answer [1]

(ii) $\tan p^\circ$.

Answer [1]

(b) The area of triangle MNR is 50 square units.

Find the coordinates of R .

Answer (.....,) [2]

23

$$y = k - (x - h)^2$$

- (a) Explain why y has its maximum value when $x = h$.

.....

 [1]

- (b) Solve the equation $41 - 12x - x^2 = 0$ by completing the square.
 Give your solution correct to 2 decimal places.

Answer $x = \dots\dots\dots$ or $\dots\dots\dots$ [3]

24 The first four terms in a sequence of numbers, $T_1, T_2, T_3, T_4, \dots$ are given as shown.

$$T_1 = 1 + 2 + 4 = 7$$

$$T_2 = 2 + 5 + 9 = 16$$

$$T_3 = 4 + 8 + 16 = 28$$

$$T_4 = 8 + 11 + 25 = 44$$

(a) Find an expression, in terms of n , for the n th term, T_n , of the sequence.

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

(b) Show that $T_n - T_{n-1} = 2^{n-2} + 2n + 4$.

Answer

[3]

- (c) Hence, explain why the difference between consecutive terms in the sequence is always an even number.

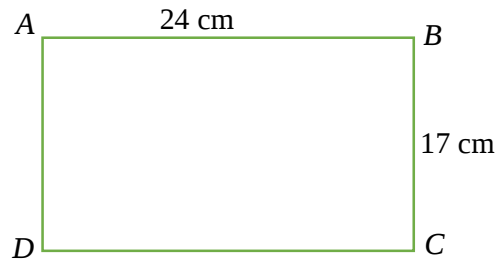
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[1]

25 (a)

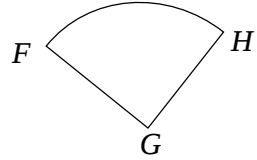


The diagram shows a sheet of rectangular paper $ABCD$ measured 24 cm by 17 cm. The sides AD and BC are joined together to form an open cylinder.

Find the volume of the cylinder, in terms of π .

Answercm³ [2]

(b)



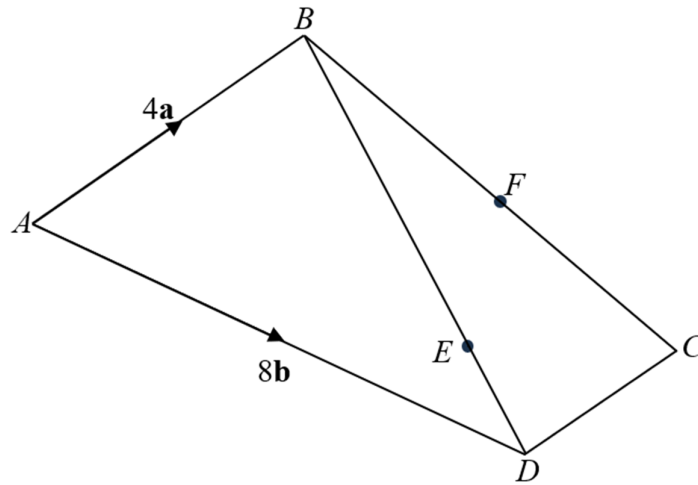
The diagram shows a piece of card in the shape of a quadrant with centre G . FG and GH are joined together to form a cone.

The curved surface area of the cone is $72\frac{1}{4}\pi \text{ cm}^2$.

Find the volume of the cone.

Answercm³ [4]

26



$ABCD$ is a quadrilateral.

E is the point on BD such that $BE : BD = 3 : 4$.

F is the midpoint of BC .

$\overrightarrow{AB} = 4\mathbf{a}$, $\overrightarrow{AD} = 8\mathbf{b}$ and $\overrightarrow{EF} = 2(\mathbf{a} - \mathbf{b})$.

- (a) Express $\overrightarrow{BE}$ in terms of $\mathbf{a}$ and $\mathbf{b}$, as simply as possible.

Answer [2]

- (b) Express $\overrightarrow{BC}$ in terms of $\mathbf{a}$ and $\mathbf{b}$, as simply as possible.

Answer [2]

- (c) What type of quadrilateral is $ABCD$?
Explain your answer using vectors.

$ABCD$ is a because

..... [3]

END OF PAPER

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