

NORTHBROOKS SECONDARY SCHOOL
Preliminary Examination 2026
Secondary 4 and 5



CANDIDATE NAME					
CLASS		REGISTER NUMBER	<table border="1"><tr><td></td><td></td></tr></table>		

MATHEMATICS

4052/01

Paper 1

17 August 2026

2 hours 15 minutes

Candidates answer on the Question Paper.

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 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												
Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13
Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	

90

DO NOT TURN THE PAGE UNTIL YOU ARE TOLD TO DO SO.

This document consists of 22 printed pages.

[Turn Over

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

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

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

Answer **all** the questions.

- 1 There are 1000 people in an auditorium, correct to the nearest hundred.

State the minimum number of people that could be in the auditorium at this time.

Answer [1]

- 2 Miss Wong invests \$55000 at rate of 1.8% per annum compounded half yearly.
She leaves the money in the account for 2 years.

Calculate the value of her investment at the end of 2 years.

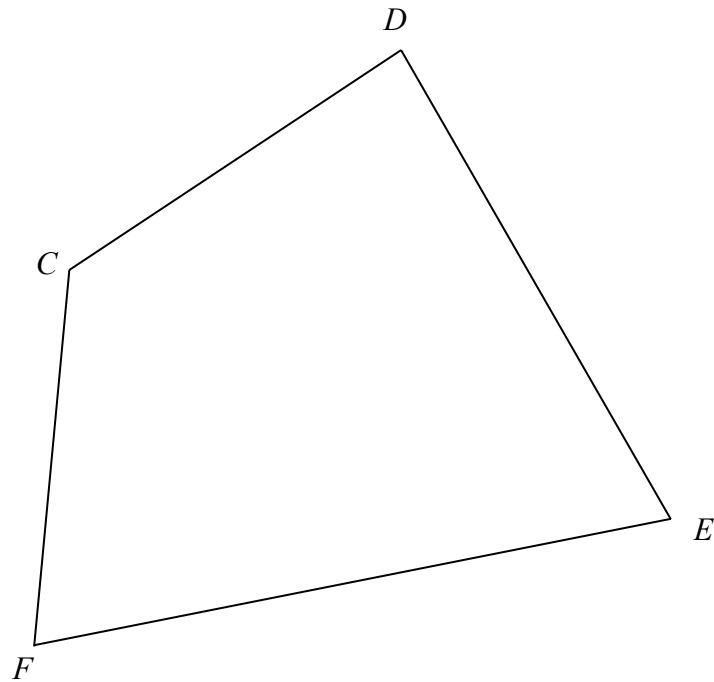
Answer \$ [2]

- 3 A cuboid has a volume of 1008 cm^3 .
The area of the **largest** face is 144 cm^2 .
The dimensions of the cuboid have integer values.

Find a possible set of dimensions of the cuboid.

Answer cm by cm by cm [2]

- 4 The diagram shows a quadrilateral $CDEF$.



- (a) Construct the perpendicular bisector of EF . [1]
- (b) Construct the bisector of angle CDE . [1]
- (c) A point P is inside the quadrilateral.
It is nearer to F than E and is nearer to CD than DE .
Shade the region where P could be. [1]
-

5 Six workers take two days to complete building a structure.

Assuming all the workers work at the same efficiency, find

(a) the number of workers needed to complete building the structure in 3 days,

Answer [1]

(b) the number of structures that can be completed by 36 men in 5 days.

Answer [2]

6 From 2022 to 2025, the mean Singapore's Certificate of Entitlement (COE) price for small cars (≤ 1600 cc) increased by 35.2%.

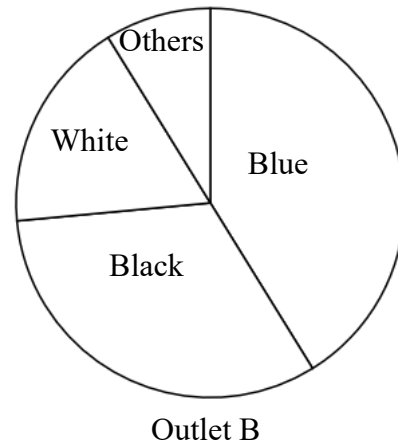
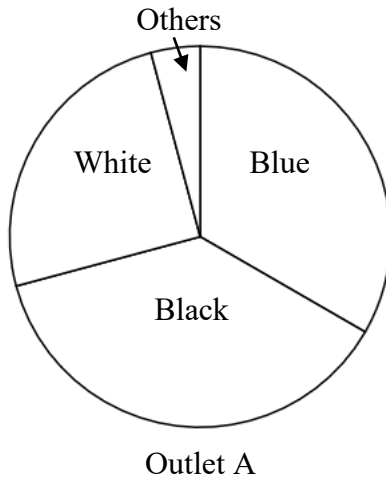
From 2022 to 2023, the mean COE price increased by 25.4%.

From 2023 to 2024, the mean COE prices decreased by 5.05%.

Calculate the percentage increase in the mean COE price from 2024 to 2025.

Answer % [3]

- 7 The **accurate** pie charts show the sales of shirt design by colours in Outlet A and Outlet B in a particular month.



- (a) “The number of blue shirts sold in Outlet A is less than the number of blue shirts sold in Outlet B.”

Explain why this statement might be false.

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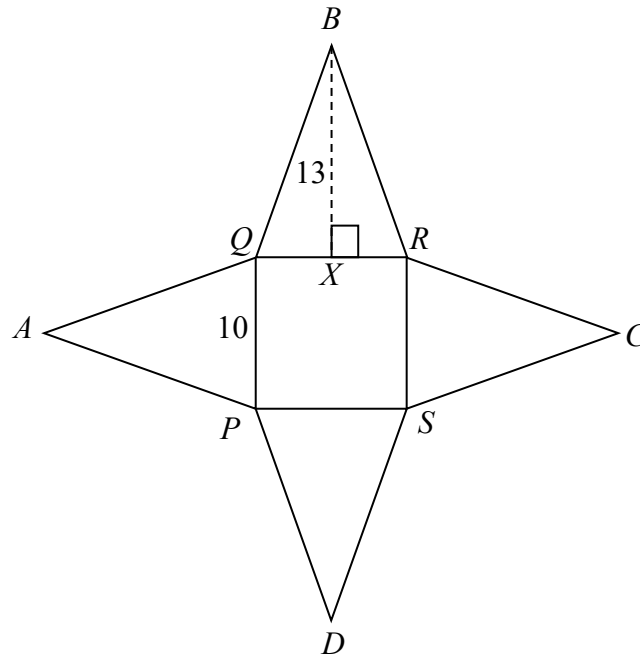
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[1]

- (b) Find the percentage of the black shirts sold in Outlet A.

Answer % [2]



The diagram shows a card which consists of a square $PQRS$ of sides 10 cm and four identical isosceles triangles.

In triangle BQR , BX is perpendicular to QR and $BX = 13$ cm.

The card is folded to form a right pyramid with $PQRS$ as base and A, B, C and D meeting at the vertex.

Calculate

(a) the height of the pyramid,

Answer cm [2]

(b) the volume of the pyramid.

Answer cm^3 [2]

9 (a) Simplify $\frac{p^4q}{28x} \div \frac{5q^3}{21px}$.

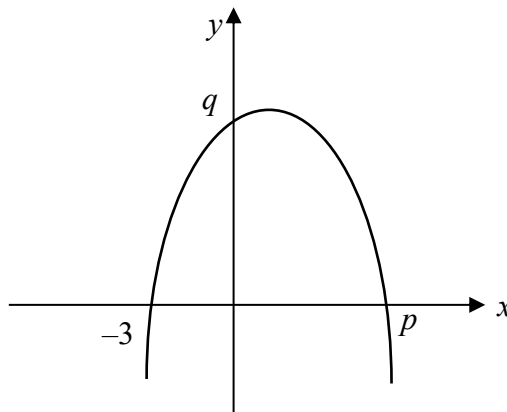
Answer [2]

(b) Factorise completely $15ab - 3ac - 5b + c$.

Answer [2]

-
- 10 The diagram shows a sketch of a quadratic curve.
The line of symmetry is $x = 1$.

Find the value of p and the value of q .



Answer $p = \dots\dots\dots$, $q = \dots\dots\dots$ [2]

11 $5a = \frac{3c}{1-2c} + 1$

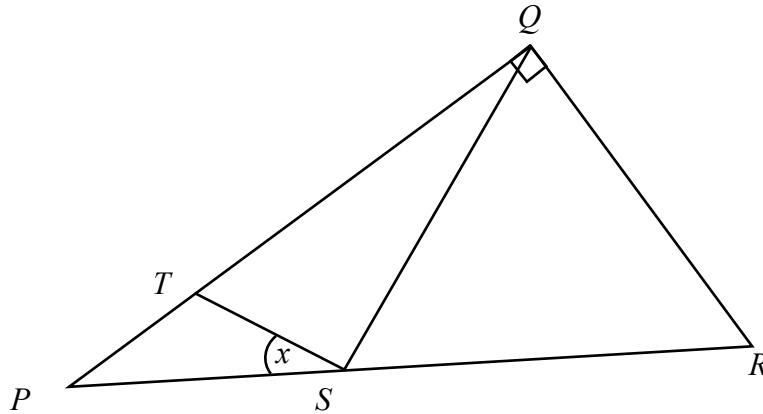
(a) Find a when $c = -7$.

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

(b) Rearrange the formula to make c the subject.

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

12



Triangle PQR is a right-angled triangle.

S is a point on PR such that $QS = QR$.

T is a point on PQ such that $PT = ST$.

Angle $PST = x$.

Show that angle $RQS = 2x$.

Give a reason for each step of your working.

Answer

13 P is the point $(-1, 5)$ and Q is the point $(3, -4)$.

(a) Write down the column vector $\overrightarrow{PQ}$.

Answer $\begin{pmatrix} \\ \end{pmatrix}$ [1]

(b) R has coordinates $(3, h)$ and $\overrightarrow{PR} = k\overrightarrow{PQ}$.

Find the value of h and the value of k .

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

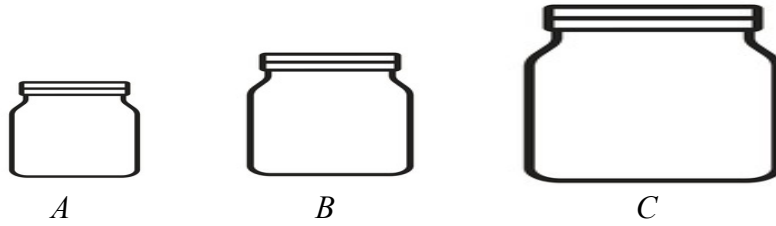
14 **(a)** Solve the inequalities $2x - 7 < 25 \leq 3x - 2$.

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

(b) Hence write down all the prime numbers that satisfy the inequality in **(a)**.

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

15



A, *B* and *C* are geometrically similar jars with circular base.

The ratio volume of jar *A* : volume of jar *B* : volume of jar *C* = 1 : 9 : 64.

(a) Find the ratio diameter of base of jar *A* : diameter of base of jar *C*.

Answer : [1]

(b) The surface area of jar *C* is 900 cm².

Find the surface area of jar *B*.

Answer cm² [2]

- 16** n is a positive integer.

Explain why $(2n - 1)(2n + 3)$ is an odd number for all n .

Answer

.....

 [2]

- 17** Cheng Li has five \$1 coins and seven 50 cents coins in her purse.

- (a)** She takes two coins out of her purse, at random, one after the other, without replacement.

Find the probability that the two coins are of different value.

Answer [2]

- (b)** She takes three coins out of her purse, at random, one after the other, without replacement.

Find the probability that the total sum of the three coins taken out is \$2.

Answer [2]

- 18** (a) Express $y = x^2 - 10x + 29$ in the form $y = (x + a)^2 + b$.

Answer [2]

- (b) Explain why the graph of $y = x^2 - 10x + 29$ will not pass through the x -axis.

.....

 [1]

- 19** (a) Simplify $\left(\frac{16n^4}{m^{12}}\right)^{-\frac{3}{4}}$.

Answer [2]

- (b) Solve $343^x \times 3^{3x} = 21$.

Answer $x =$ [2]

- 20 (a) (i) Write 360 as a product of its prime factors.

Answer [1]

- (ii) The highest common factor (HCF) of two numbers is 18.
The lowest common multiple (LCM) of the two numbers is 360.
Both numbers are greater than 20.

Find the two numbers.

Answer and [2]

- (b) Written as a product of prime factors, $4704 = 2^5 \times 3 \times 7^2$.
The number $4704k$ is a perfect cube.

Find the smallest positive integer value of k .

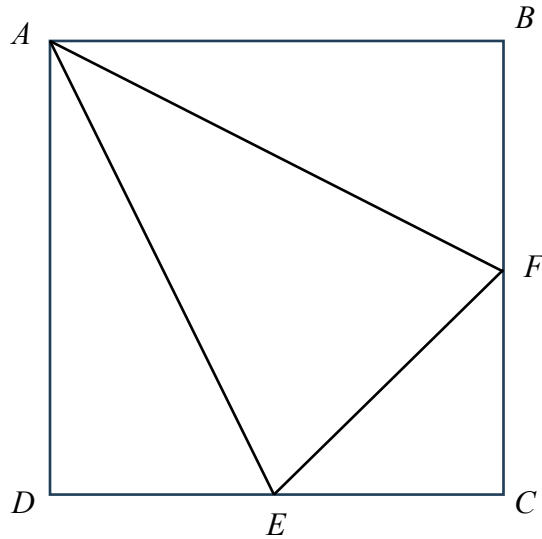
Answer $k =$ [1]

21 Solve $\frac{2}{2x-3} + \frac{5x}{x-5} = \frac{1}{2}$.

Give your solutions correct to two decimal places.

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

22



$ABCD$ is a square.

E and F are midpoints of BC and CD respectively.

- (a) Prove that triangle ADE is congruent to triangle ABF .

Answer

[3]

- (b) Hence, find angle EAF .

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

[Turn Over

- 23 (a)** The monthly electricity bills (to the nearest dollar) for 24 households in an HDB estate are shown in the stem-and-leaf diagram below.

6		2	5	8				
7		0	0	3	4	6	9	
8		1	1	2	2	5	7	8
9		0	3	4	5	7		
10		2	5	8				

Key: 7 | 3 represent \$73

- (i)** Write down the median electricity bill.

Answer \$ [1]

- (ii)** When the bill for a 25th household is added to the data, the range increases to \$52.

Find the two possible values for this 25th household's bill.

Answer \$ and \$ [1]

- (b)** This table represents the monthly household income distribution for a sample of 200 Singaporean households.

Monthly Income, \$ x	Frequency (f)
$\$0 < x \leq \4000	30
$\$4000 < x \leq \8000	38
$\$8000 < x \leq \$12\ 000$	40
$\$12\ 000 < x \leq \$16\ 000$	35
$\$16\ 000 < x \leq \$20\ 000$	25
$\$20\ 000 < x \leq \$30\ 000$	22
$x > \$30\ 000$	10

- (i)** The maximum household income in this sample is \$50 000.

- (a)** Show that the estimated mean monthly household income for this group is \$12 890.

Answer

- (b) Hence, estimate the standard deviation of the household income.
Give your answer correct to the nearest dollar.

Answer \$ [1]

- (ii) In the 2025 SingStat report, the median is often cited as a more "representative" figure than the mean for income. Based on the data given, explain why the mean might be higher than the median in this context.

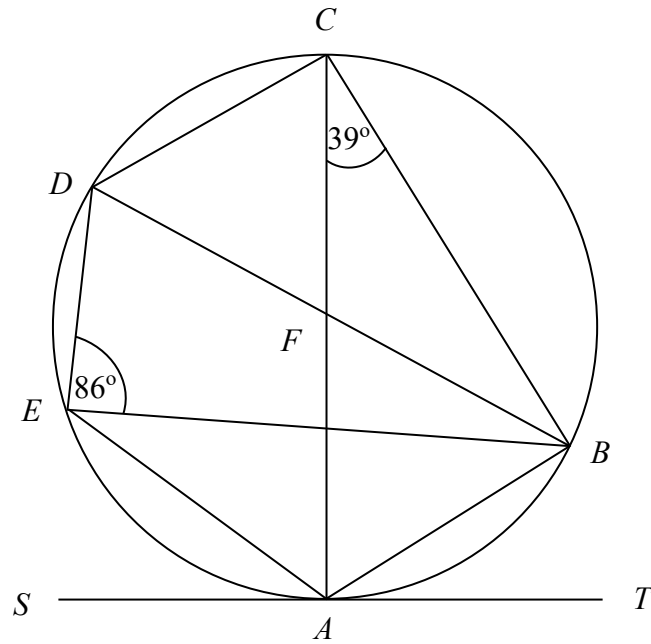
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 [1]

- (iii) Find the probability that a household, chosen at random, has monthly income more than \$20 000.

Answer [1]

24 (a)



In the diagram, ST is a tangent to the circle at A .

AC is the diameter of the circle.

Angle $ACB = 39^\circ$ and angle $BED = 86^\circ$.

- (i) Find angle ABD .
Give a reason for each step of your working.

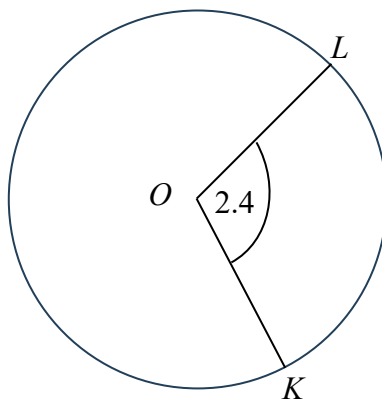
Answer Angle $ABD = \dots\dots\dots$ [2]

- (ii) Explain why triangle AFB is not isosceles.

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[2]

(b)

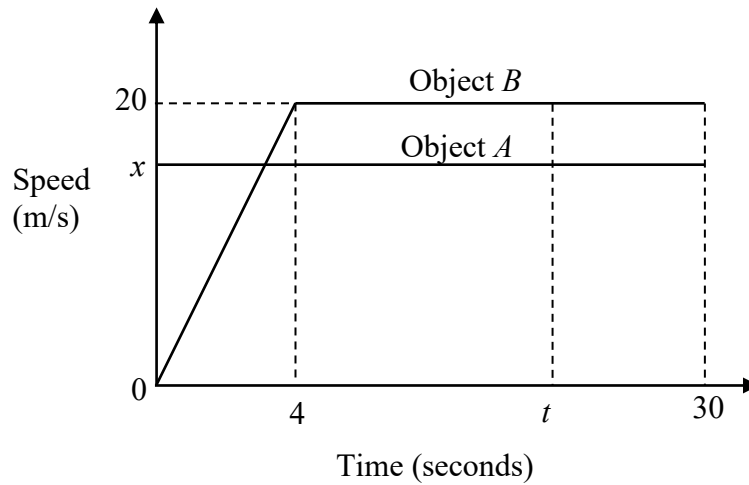


The diagram shows a circle, centre O , passing through K and L .
Angle $KOL = 2.4$ radians.

Find the radius of the circle if the area of the major sector OKL is 440 cm^2 .

Answer cm [3]

- 25** The diagram shows the speed-time graph for two objects, A and B , travelling along the same path in the same direction.



Object A travels at a constant speed of x m/s.

Object B accelerates for 4 seconds and then travels at a constant speed of 20 m/s.

- (a)** Calculate the acceleration of B for the first 4 seconds.

Answer m/s^2 [1]

- (b)** Object A and Object B are travelling at the same speed at 3.6 seconds.

Find the value of x .

Answer $x =$ [2]

- (c)** Object A and Object B have travelled the same distance after t seconds.

Find the value of t .

Answer $t =$ [2]