



MINISTRY OF EDUCATION, SINGAPORE
in collaboration with
CAMBRIDGE ASSESSMENT INTERNATIONAL EDUCATION
General Certificate of Education Normal (Academic) Level

CANDIDATE
NAME

--

CENTRE
NUMBER

S				
---	--	--	--	--

INDEX
NUMBER

--	--	--	--

MATHEMATICS (SYLLABUS A)

4045/02

Paper 2

For examination from 2023

SPECIMEN PAPER

2 hours

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, index number and name 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.
DO **NOT** WRITE ON ANY BARCODES.

Section A

Answer **all** questions.

Section B

Answer **one** question.

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 number of marks for this paper is 70.

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.

This document consists of **17** printed pages and **1** blank page.



Singapore Examinations and Assessment Board



Cambridge Assessment
International Education

*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

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

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

Section A (62 marks)
Answer **all** the questions in this section.

1 (a) Work out

(i) $\frac{53.2}{0.0692 \times 17.4}$,

Answer [1]

(ii) $\sqrt{(-5)^2 - 4(3)(-7)}$.

Answer [1]

(b) (i) Write 0.00706498 correct to 3 significant figures.

Answer [1]

(ii) Write 5.678 million to the nearest ten thousand.

Answer [1]

2 (a) $25 \times 5^5 = 5^n$

Find the value of n .

Answer $n =$ [2]

(b) Simplify $\left(\frac{a^3}{27}\right)^{\frac{2}{3}}$.

Answer [2]

- 3** Lee downloads music.
He records the number of his downloads each day for a period of 60 days.
The results are shown in the table.

Number of downloads	0	1	2	3	4	5	6
Frequency	3	5	p	17	14	q	2

- (a)** The probability of the number of downloads being greater than 3 is 0.4.

Find the value of q .

Answer [2]

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

Answer [1]

- (c)** Find the mean.

Answer [2]

- 4 (a) Divide \$66 in the ratio 8:3

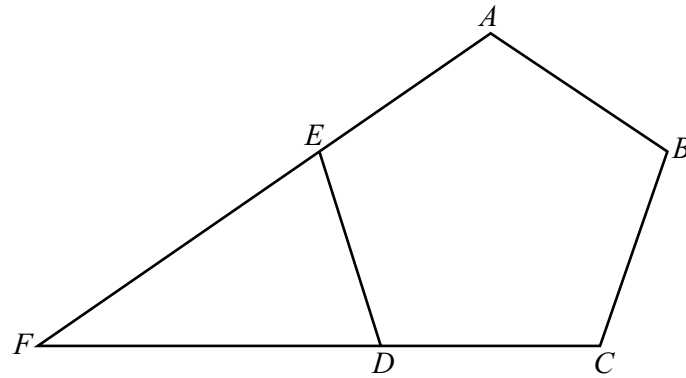
Answer \$..... : \$..... [2]

- (b) A map is drawn to a scale of 1 : 50 000.
A park has an area of 8 km².

Find the area of the park on the map.
Give your answer in square centimetres.

Answer cm² [3]

5 (a)

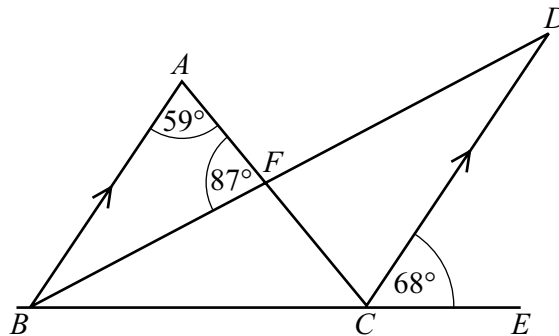


$ABCDE$ is a regular pentagon.
 FEA and FDC are straight lines.

Find angle EFD .

Answer [2]

(b)

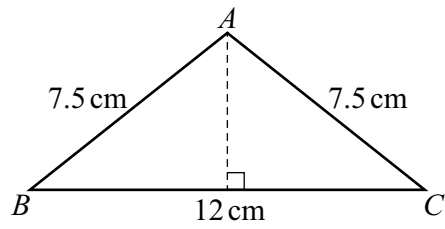


ABC is a triangle.
 BA is parallel to CD .
 BCE and BFD are straight lines.
 Angle $DCE = 68^\circ$, angle $BAF = 59^\circ$ and angle $BFA = 87^\circ$.

Show that $BC = CD$.
 Give a reason for all your statements.

[4]

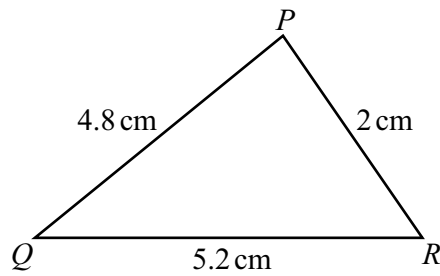
- 6 (a) The diagram shows an isosceles triangle ABC .



Calculate angle BAC .

Answer Angle BAC = [3]

- (b) The diagram shows triangle PQR .



Explain how you know that angle QPR is a right angle.
Show any calculations you make.

[3]

- 7 (a) In 2019 Lian earned \$850 per week.
In 2020 Lian received a 2.5% increase in pay.

(i) Calculate Lian's weekly pay in 2020.

Answer \$ [2]

- (ii) In 2019 Fahmida earned \$780 per week.
In 2020 Fahmida received a pay increase of $r\%$.
In 2020 both Fahmida and Lian earned the same amount per week.

Calculate r .

Answer $r =$ [2]

- (b) Lian's pay of \$850 per week in 2019 was 1.5% higher than in 2018.

Find Lian's weekly pay in 2018.
Give your answer to the nearest cent.

Answer \$ [2]

- 8 (a) Cai and Ju are playing a number game.
They both start with the same number x .

Cai adds 3 to the number and then doubles it.
Ju multiplies the number by 4 and then subtracts 1.
Ju's result is 5 more than Cai's result.

Write down an equation in x and solve it to find the original number.

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

- (b) Solve the simultaneous equations.

$$2x - 3y = 10$$

$$6x - 5y = 18$$

Answer $x = \dots\dots\dots$

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

- (c) Solve $3x^2 - 4x - 9 = 0$.
Give your answers correct to 2 decimal places.

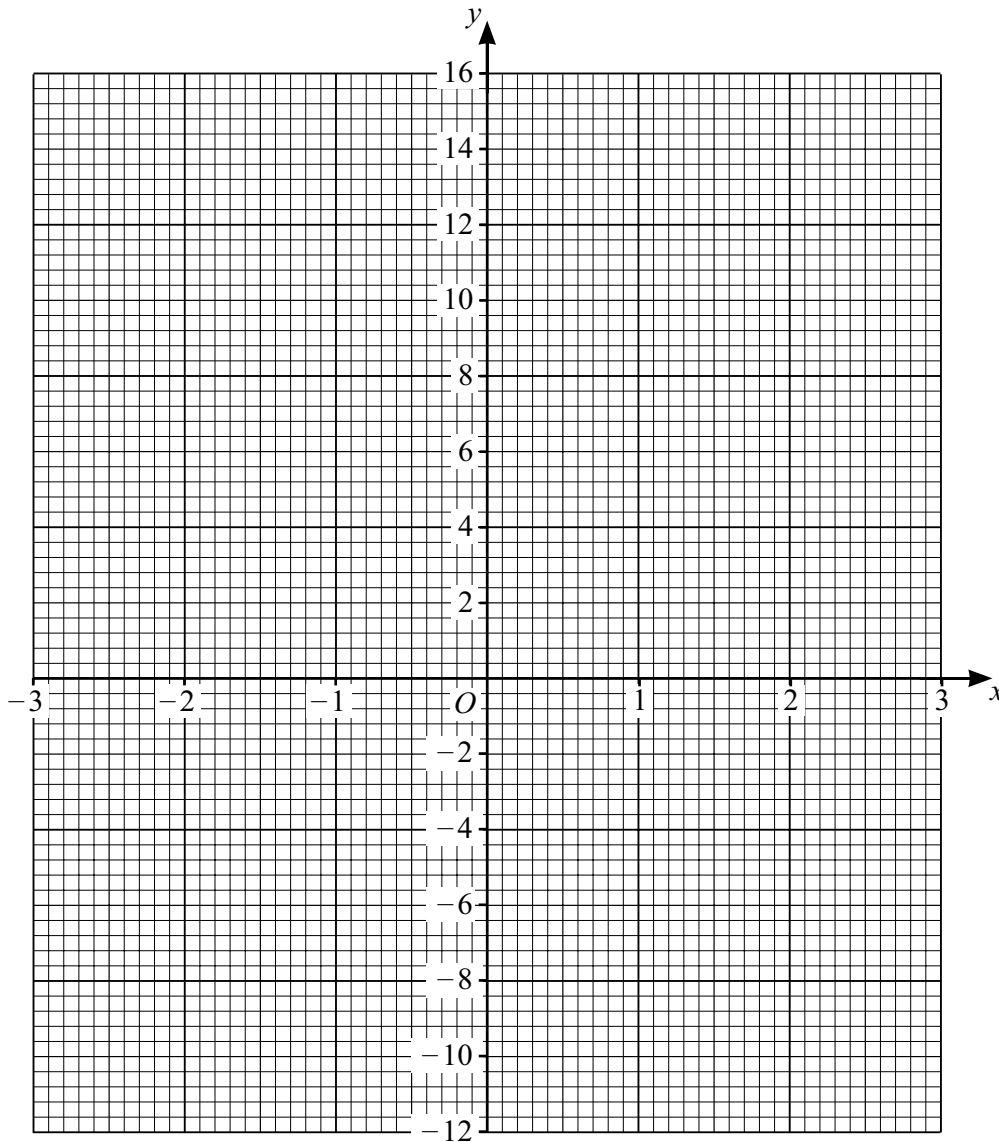
Answer $x = \dots\dots\dots$ or $x = \dots\dots\dots$ [3]

- 9 (a) Complete the table of values for $y = 2 + 5x - x^3$.

x	-3	-2.5	-2	-1	0	1	2	2.5	3
y	14		0	-2	2	6	4	-1.1	

[2]

- (b) On the grid, plot the graph of $y = 2 + 5x - x^3$ for $-3 \leq x \leq 3$.



[3]

- (c) By drawing a suitable tangent, find the gradient of the curve when $x = 2$.

Answer [2]

- (d) The line $y = k$ meets the curve exactly twice.

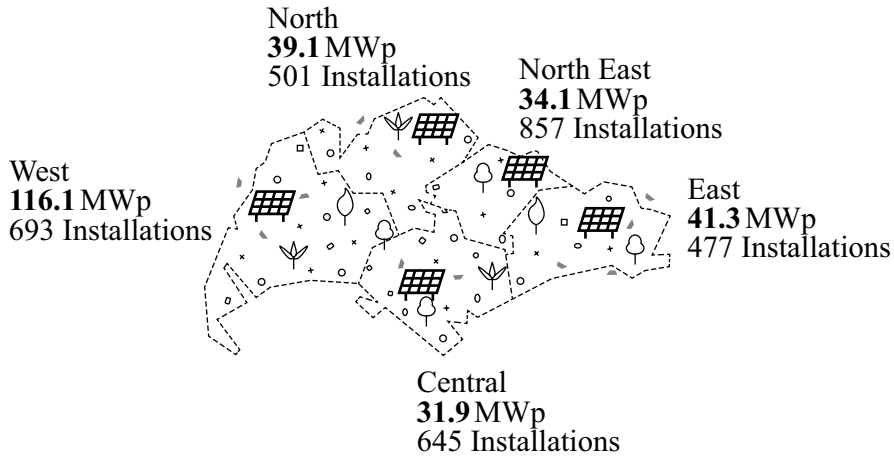
Write down the two possible values of k .

Answer $k = \dots\dots\dots$ or $k = \dots\dots\dots$ [2]

- 10 Singapore’s main source of renewable energy is solar power. This map shows information about the solar energy installations in Singapore. The figures are rounded correct to 1 decimal place. MWp stands for Megawatts peak.

Solar Landscape as at end Q2 2019

Total **262.4** MWp



- (a) Explain why the individual figures do not add up to exactly 262.4.

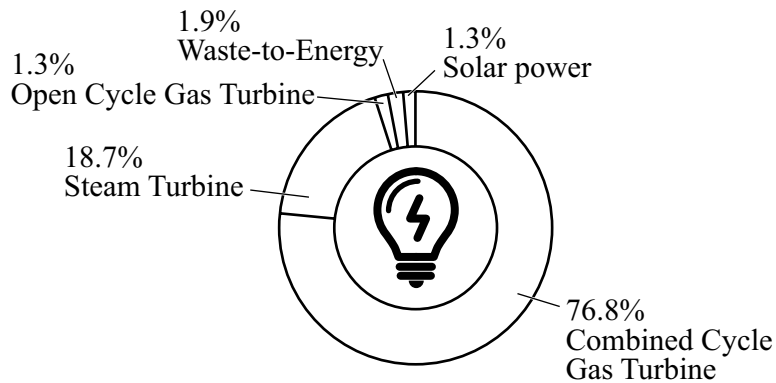
.....

..... [1]

These are some statistics for energy generation in Singapore.

Energy flows for Electricity Generation

9.6 Mtoe Total Energy Inputs into Generation Companies	4.5 Mtoe (52,905 GWh) Total Gross Electricity Generated by the Generation Companies
---	--



Mtoe stands for million tonnes of oil equivalent.
 1Mtoe = 1.187×10^{16} joules

- (b) Calculate the total gross electricity generated from solar power in 2019.
Give your answer in joules in standard form.

Answer joules [2]

- (c) The efficiency of electricity generation is the total gross energy generated as a percentage of total energy input.

Calculate the efficiency of the electricity generation companies.

Answer% [2]

- (d) In October 2019 The Singapore Government announced that it was on schedule to generate 350 Megawatts peak (3.5×10^8 watts peak) of solar power by 2020.
The aim is to produce 2 Gigawatts peak (2×10^9 watts peak) of solar power by 2030.

Assuming that the annual rate of increase is a constant $r\%$ this means that

$$\text{Power in 2030} = (\text{Power in 2020}) \times \left(1 + \frac{r}{100}\right)^{10}$$

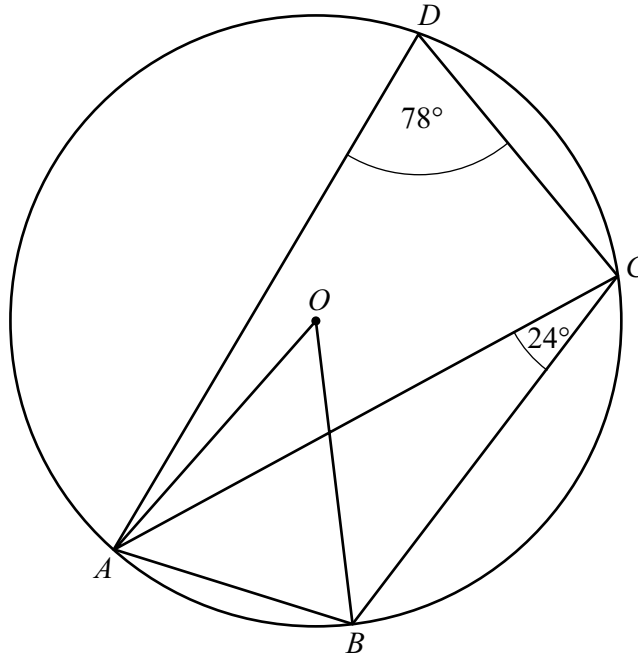
Find the value of r .

Answer $r =$ [3]

Section B (8 marks)

Answer **one** question from this section. Each question carries 8 marks.

11 (a)



A , B , C and D are points on a circle, centre O .
Angle $ADC = 78^\circ$ and angle $ACB = 24^\circ$.

Find

(i) angle ABC ,

Answer Angle $ABC = \dots\dots\dots$ [1]

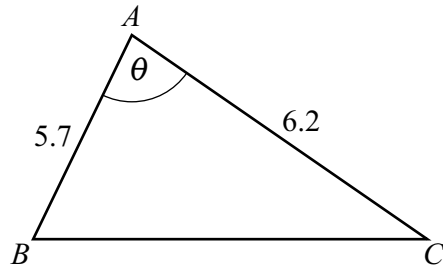
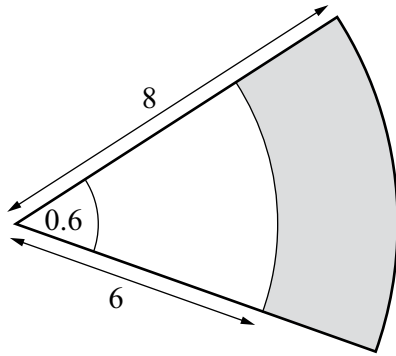
(ii) angle AOB ,

Answer Angle $AOB = \dots\dots\dots$ [1]

(iii) angle OAC .

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

(b)



The diagram shows two sectors, both with the same centre, and a triangle.
 The radius of the larger sector is 8 cm and the radius of the smaller sector is 6 cm.
 The sectors each have an angle of 0.6 radians.

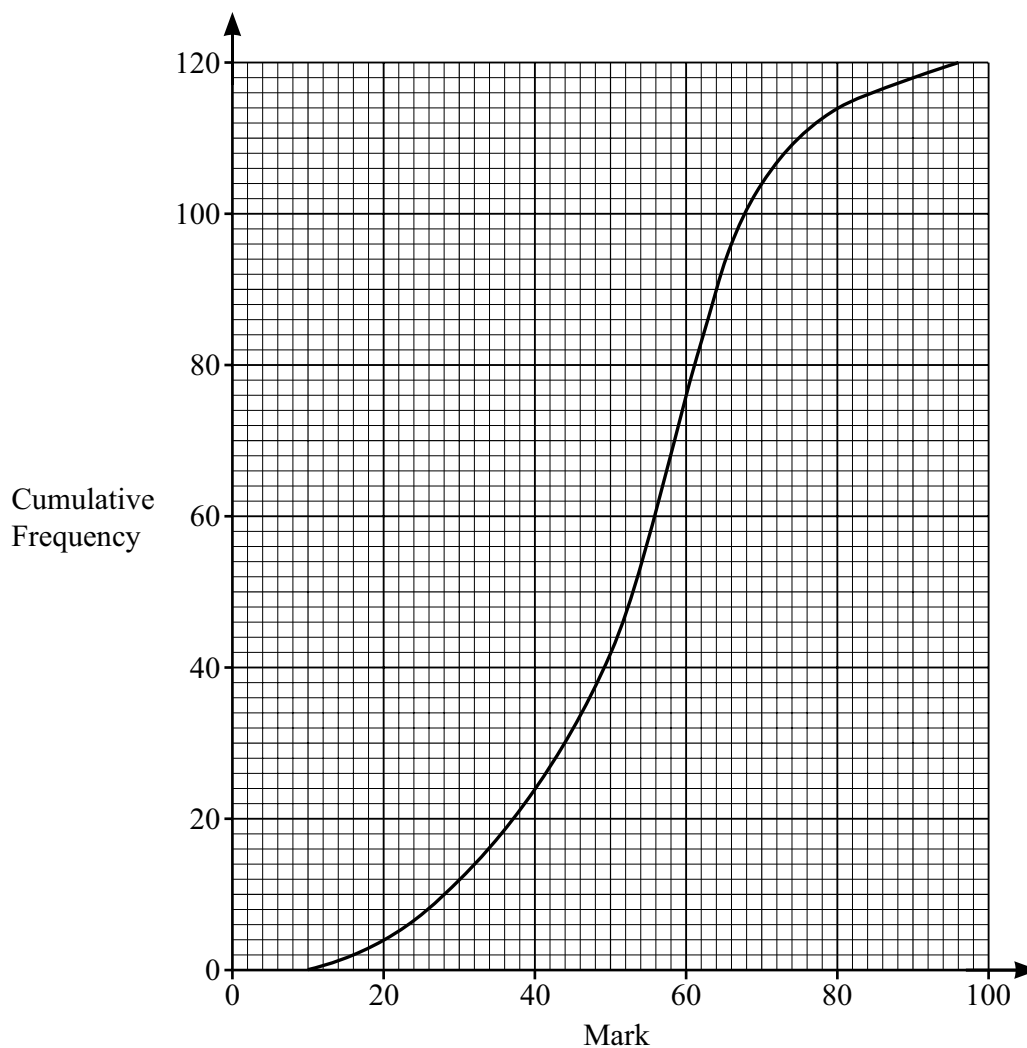
In triangle ABC , $AB = 5.7$ cm, $AC = 6.2$ cm and angle $BAC = \theta$ radians.

The shaded area and the area of the triangle are equal.

Calculate θ .

Answer $\theta = \dots\dots\dots$ radians [4]

- 12 (a) 120 students take a test and their marks are recorded.
The results are shown in the cumulative frequency diagram.



- (i) Use the diagram to estimate the median.

Answer marks [1]

- (ii) Use the diagram to estimate the inter-quartile range.

Answer marks [1]

- (iii) The 24 students scoring the highest marks are given a distinction.
Use the diagram to estimate the mark required to gain a distinction.

Answer marks [1]

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

Cambridge Assessment International Education is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which itself is a department of the University of Cambridge.