

NAME _____ () CLASS: SEC 4A ()



HOUGANG SECONDARY SCHOOL

PRELIMINARY EXAMINATION 2 2020

MATHEMATICS SYLLABUS A (4045/02) PAPER 2

SECONDARY FOUR NORMAL ACADEMIC

Tuesday, 18 August 2020

2 hours

MAKE THE DIFFERENCE RESPECT OURSELVES RESPECT OTHERS MAKE THE DIFFERENCE RESPECT OURSELVES RESPECT OTHERS MAKE THE DIFFERENCE
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Instructions to pupils

- Write your name, register number, class and calculator model in the space provided on this page.
- Write in dark blue or black pen in the spaces provided on the question paper.
- You may use a pencil for any diagrams or graphs.
- Do not use staples, paper clips, highlighters, glue or correction fluid.
- 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 the calculator value or 3.142, unless the question requires the answer in terms of π .

Section A

Answer **ALL** questions

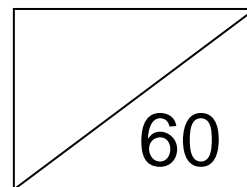
Section B

Answer only **ONE** question.

Information for pupils

- The number of marks is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is 60.

CALCULATOR MODEL: _____



This question paper consists of 17 printed pages (including this cover page).

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 (52 marks)

Answer **ALL** the questions in this section.

1 (a) Calculate $\sqrt[3]{72511.713} \div 5$.

Answer[1]

(b) In 2018, the number of people from Europe who visited Singapore was 1.62×10^6 .
In 2019, this number increased by 1.5%. Calculate the number of people from Europe that visited Singapore in 2019. Give your answer in standard form.

Answer[2]

(c) By rounding each number to 1 significant figure, estimate the value of

$$\frac{40.5 \div 7.81}{1.27 \times 0.489}$$

You must show your working.

Answer[2]

- 2 (a) It takes 5 workers to completely paint a house in 16 days. How many additional workers are needed to complete painting the house in 10 days?
(Assume that the workers are working at the same rate.)

Answerworkers [2]

- (b) In a sports CCA, three candidates namely Andy, Betty and Candy were nominated for the Captain position. The votes for Andy, Betty and Candy are in the ratio of 3 : 8 : 7 respectively. Candy has 12 votes more than Andy. Calculate the total number of votes Betty has.

Answervotes [2]

- 3 John cycles at 24 km/h for 1 hour 40 minutes from Town A to Town B.
He then cycles a further distance of 7 km in 20 minutes to Town C.
Calculate his average speed, in km/h, for the whole journey from Town A to Town C.

Answerkm/h [3]

4 When written as the product of their prime factors,

$$p = 2^3 \times 3 \times 5 \times 7$$

$$q = 2^2 \times 3^2 \times 7$$

$$r = 2^3 \times 3^3 \times 5^3$$

Find

(a) the value of cube root of r .

Answer[1]

(b) the lowest common multiple (LCM) of p and q , giving your answer as the product of its prime factors.

Answer[1]

(c) the smallest positive integer value of k such that $2^2 \times 3^2 \times 7 \times k$ is a perfect square.

Answer $k =$ [1]

- 5 (a) Mrs Koh invested a sum of money for 5 years and received interest compounded at the rate of 1.2% per year. At the end of 5 years, Mrs Koh's investment was worth \$4245.83. How much is the original sum of money she invested?

Answer[2]

- (b) Mdm Lee wishes to exchange 500 Singapore dollars (S\$) to United States dollar (US\$). She found two money changers that quoted her the exchange rates as shown below.

<p><u>Happy Money Changer</u></p> <p>S\$ 1 = US\$ 0.77</p>

<p><u>Cheerful Money Changer</u></p> <p>US\$ 1 = S\$ 1.28</p>

Which money changer should Mdm Lee choose? Explain your answer with workings. [2]

6 (a) Simplify $\frac{9x}{15x+12xy}$.

Answer[2]

(b) Factorise $2pm - 3m - 4pn + 6n$.

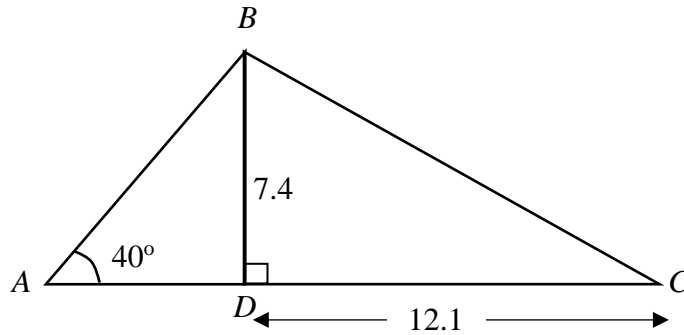
Answer[2]

(c) Make r the subject of the formula $s = \frac{t-r}{r}$.

Answer $r =$ [3]

(d) Solve $4x^2 - 5x + 1 = 2$, giving your answers to 2 decimal places.

Answer $x =$ or[3]



In triangle ABC , BD is perpendicular to AC .

Angle $BAD = 40^\circ$, $BD = 7.4$ cm and $DC = 12.1$ cm.

Calculate

(a) the length of BC ,

Answercm [2]

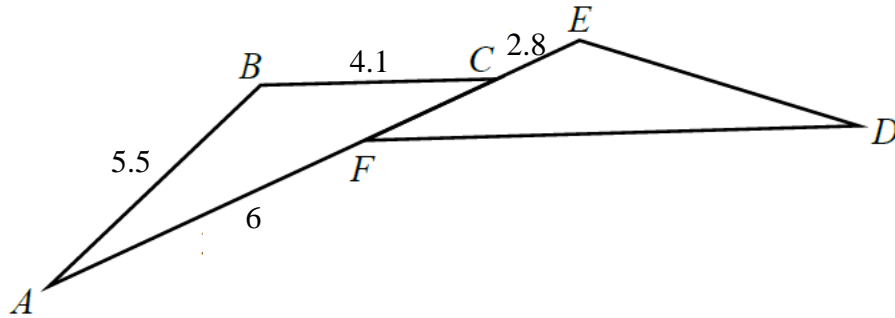
(b) the length of AB ,

Answercm [2]

(c) the area of triangle ABD .

Answercm² [2]

- 8 In the diagram, triangle ABC is congruent to triangle DEF . $AFCE$ is a straight line.
 $AB = 5.5$ cm, $BC = 4.1$ cm, $AF = 6$ cm and $CE = 2.8$ cm.
 Find the perimeter of the figure $ABCEDFA$.



Answercm [3]

- 9 The table below shows the annual food waste and recycling statistics from the National Environment Agency in Singapore from 2016 to 2018. The total population of Singapore was 5.64 million in 2018.

Year	Non-recyclable Food Waste (tonnes)	Recyclable Food Waste (tonnes)	Total Food Waste Generated (tonnes)
2016	679 900	111 100	791 000
2017	676 800	133 000	809 800
2018	636 900	126 200	763 100

Note: 1 tonne = 1000 kg

- (a) Calculate the percentage decrease of Recyclable Food Waste from 2017 to 2018.

Answer[2]

- (b) Find the average of the total food waste (in kg) generated from 2016 to 2018.
Express your answer in standard form, correct to 3 significant figures.

Answerkg [2]

- (c) It was estimated that the density of non-recyclable food waste is 535 kg/m^3 and the volume of an Olympic-sized swimming pool is 2500 m^3 .

John claimed that “*The non-recyclable food waste generated in 2018 can fill up more than 500 Olympic-sized swimming pools.*”

Do you agree with him? Explain clearly with calculations.

[4]

10 The size of the population, y of a certain bacteria after x hours, is given by $y = 2^x + 5x$.

The table shows the corresponding x and y values for $y = 2^x + 5x$.

x	0	1	2	3	4	5
y	1	7	p	23	36	57

(a) Calculate the value of p .

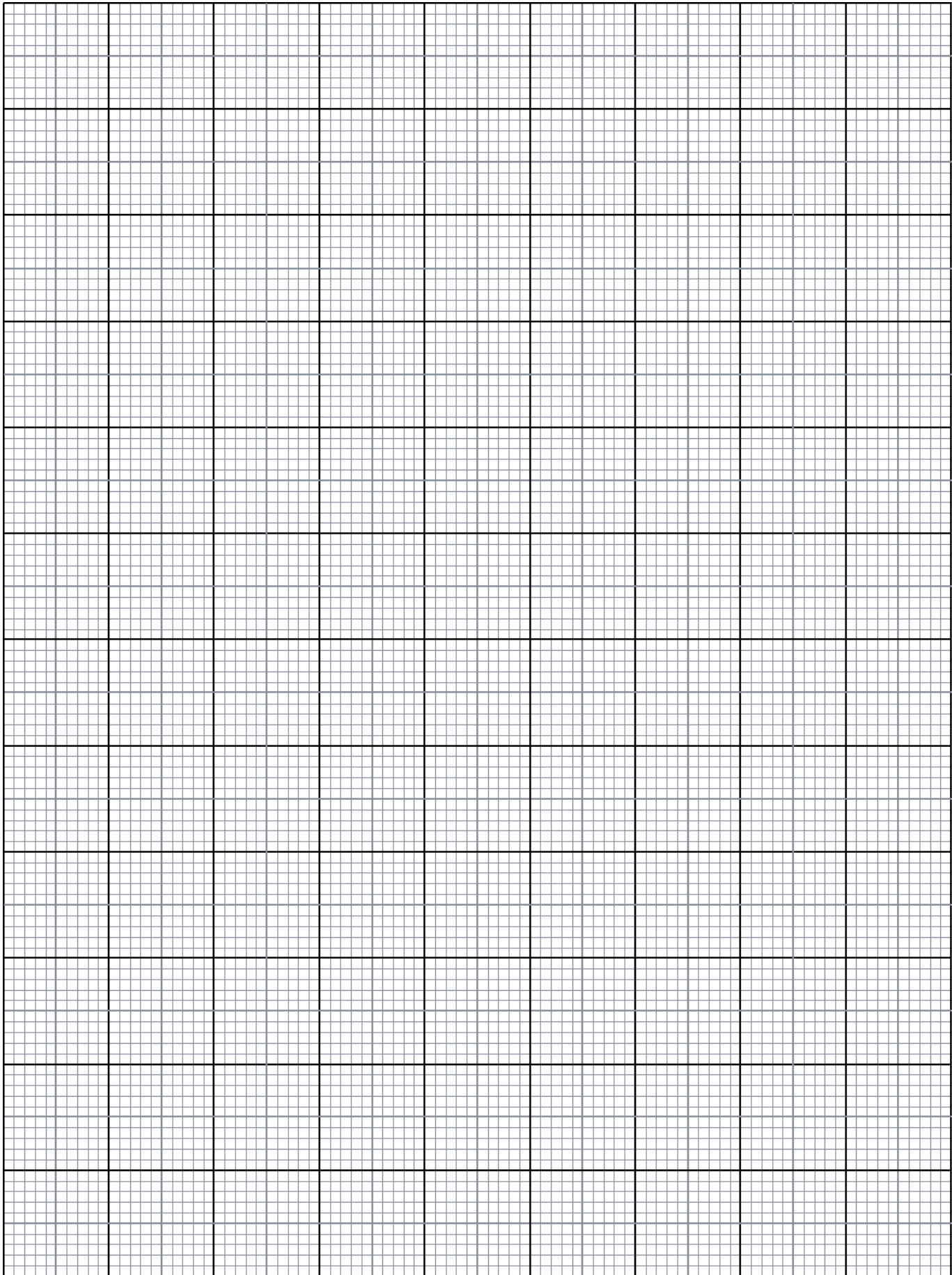
Answer[1]

(b) Using the graph paper on next page, draw the graph of $y = 2^x + 5x$ for $0 \leq x \leq 5$.

Use a scale of 2 cm to 1 unit on the x -axis and 2 cm to 10 units on the y -axis. [2]

(c) Use your graph to estimate the size of the population after 4.5 hours. [1]

(d) By drawing a tangent, find the rate of increase in the growth of population when $x = 3$. [2]



Section B (8 marks)

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

11 The mass of 50 durians from Store A was recorded in the table below.

Mass (grams)	$500 < x \leq 1000$	$1000 < x \leq 1500$	$1500 < x \leq 2000$	$2000 < x \leq 2500$
Number of durians	8	24	15	3

(a) Calculate an estimate of the mean and standard deviation of the mass of 50 durians in Store A.

Answer : Mean = g

SD =g [3]

(b) The mass of 50 durians from Store B was also recorded.

The mean mass was 1420 g and the standard deviation was 380 g.

Make two comparisons about the durians in Store A and B using their mean mass and standard deviation.

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..... [2]

(c) Two of the durians were chosen at random from Store A.

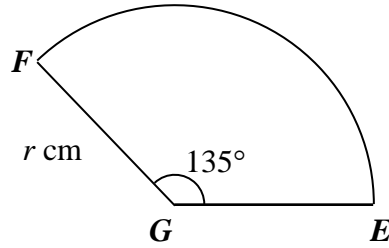
(i) Find the probability that both durians weigh at most 1 kg.

Answer[1]

(ii) Find the probability that at least one durian has a mass of more than 1.5 kg.

Answer[2]

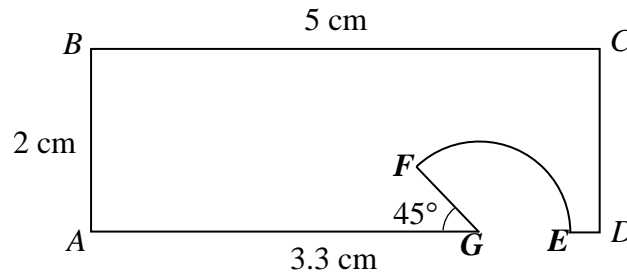
- 12 (a)(i) A sector EFG has an arc length of 2.83 cm with radius r subtending an angle of 135° at the centre G .



Show that $r = 1.20$ cm.

[2]

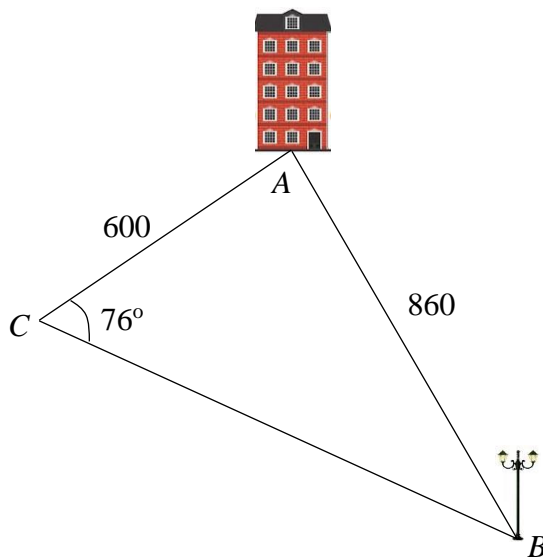
- (a)(ii) The diagram shows the side view of a pocket can opener $ABCDEFGA$. Its design comprises a rectangle $ABCD$ with dimensions 2 cm by 5 cm. A sector EFG with centre G in **part (a)** was cut out from its edge and $AG = 3.3$ cm.



Find the area of the can opener $ABCDEFGA$.

Answercm² [3]

- 12 (b) In the diagram, A , B and C are on the same ground level.
 A and B are at the foot of a building and a lamp post, respectively.
Angle $ACB = 76^\circ$, $AB = 860$ m and $AC = 600$ m.



Calculate $\angle CAB$.

Answer $^\circ$ [3]

End of Paper