Name:	Index Number:	Class:

HUA YI SECONDARY SCHOOL

4NA **Preliminary Examination** **4NA**

MATHEMATICS **4045/2**

PAPER 2

6 Aug 2020

Candidates answer on the Question Paper. 2 h

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.

Section A
Answer **all** questions.

Section B
Answer **one** question.

Write your answers on separate answer paper provided. Omission of essential working will result in loss of marks.
The use of a scientific calculator is expected, where appropriate. For π, use either your calculator value or 3.142.
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.
At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use
60

The total number of marks for this paper is **60**.

[Turn Over

Mathematical Formulae

Compound Interest

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

Mensuration

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

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

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

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

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

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

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

Trigonometry

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

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

Statistics

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

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

Section A (52 marks)

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

1 **(a)** **(i)** Write 0.000 00265 in standard form.

Answer _____ [1]

(ii) The population of India in 2013 was 1.25×10^9.
The area of India is 3.3×10^6 square kilometres.
Calculate the number of people per square kilometre in India.
Give your answer in standard form.

Answer _____ [2]

(b) By writing each value correct to 1 significant figure, estimate the value of $\dfrac{\sqrt{8.8+41.2}}{9.07-2.3}$.

Answer _____ [2]

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2 **(a)** Simplify $\dfrac{a^2}{ab^3}\times\dfrac{(2a)^2}{b}$.

Answer _____ [2]

(b) Write $\sqrt{c^3}\times c$ as a single power of c.

Answer _____ [1]

(c) Solve $2^{x-1}=1$.

Answer _____ [1]

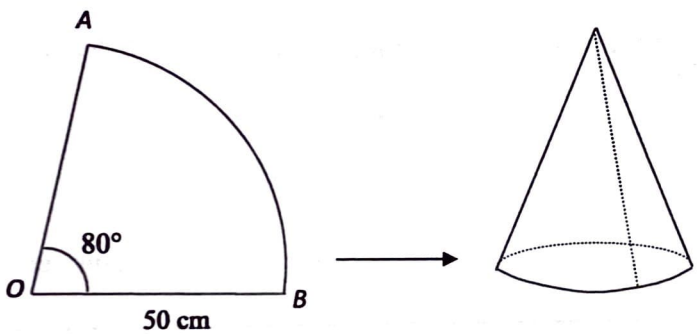
3 **(a)** Express $x^2+6x-27$ in the form $(x+h)^2+k$.

Answer _____ [1]

(b) Hence or otherwise, solve $x^2+6x-27=0$.

Answer $x=$ _____ or _____ [2]

4



The diagram shows a sector OAB of a circle centre O, radius 50 cm and angle $AOB=80°$.
The sector is folded, joining the edges OA and OB resulting in the cone as shown above.
Find

(a) the length of arc AB,

Answer _____ *cm* [2]

(b) the radius of the circular base of the cone,

Answer _____ *cm* [2]

(c) the vertical height of the cone.

Answer _____ *cm* [2]

5 The diagram below shows the first four figures of a sequence.

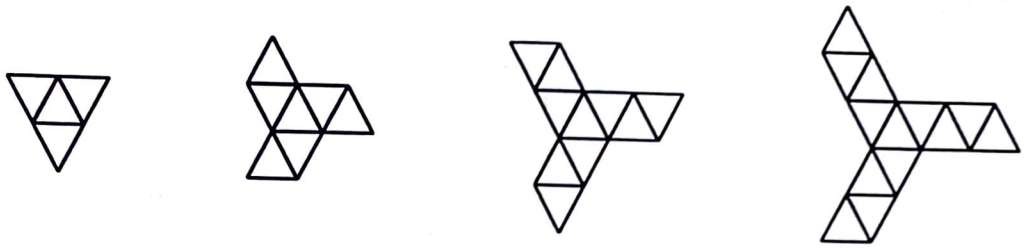


Fig. 1 Fig.2 Fig. 3 Fig. 4

(a) Complete the table.

Fig. Number, n	Number of small triangles, t
1	4
2	7
3	10
4	13
5	

[1]

(b) Find an expression, in terms of n, for the number of small triangles in Fig. n.

Answer _____ [1]

(c) Find the total number of small triangles in Fig. 50.

Answer _____ [1]

(d) Amy said a figure in this sequence can be formed using 64 small triangles. Do you agree with her? Show your working to support your answer.

.....

..... [1]

6 The distance between two towns, P and Q, is 205 km. For the first 120 km, Andrew drove at an average speed of x km/h. For the remaining 85 km, he increased his speed by 12 km/h and maintained this speed for the rest of the journey.

(a) Write down an expression, in terms of x, for

(i) the number of hours taken to travel the first 120 km,

Answer _____ h [1]

(ii) the number of hours taken to travel the rest of the journey.

Answer _____ h [1]

(b) The first part of the journey took 30 minutes more than the second part of the journey. Write down an equation in x, and show that it reduces to $x^2 - 58x - 2880 = 0$.

Answer

[3]

(c) Solve the equation $x^2 - 58x - 2880 = 0$.

Answer $x =$ _____ or _____ [2]

(d) Calculate, in terms of minutes, the time he took to travel for the first 120 km.

Answer _____ *min* [1]

7 **(a)** Write 4 km/h as a speed in m/s.

Answer _____ *m/s* [1]

(b) Mr Tan received a prize of $50 000. He used some of the money to pay for a holiday in Japan, which cost ¥380 000. The exchange rate was S$1 = ¥76.9.

(i) Calculate the amount of Mr Tan had left after paying for the holiday. Give your answer in dollars, correct to the nearest dollar.

Answer $ _____ [2]

(ii) He has plans to purchase a laptop for his son. In a recent electronics sale, there is a 20% discount off the laptops. If Mr Tan pays $850 for the laptop, what is its original price?

Answer $ _____ [2]

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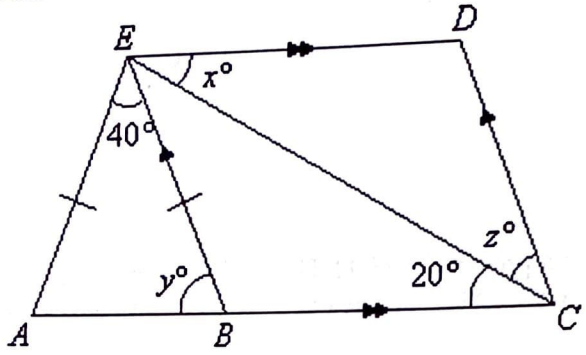
8 In 1 hour, 3 chefs in a restaurant prepared 16 meals. Assuming all the chefs work at the same rate, calculate the number of chefs needed to prepare 112 meals in 3 hours.

Answer _____ [2]

9 In the diagram, ABC is a straight line, $EA = EB$, and $BCDE$ is a parallelogram. $\angle AEB = 40°$ and $\angle BCE = 20°$.



(a) What is the mathematical name of quadrilateral $EDCA$?

Answer _____ [1]

(b) Find the values of x, y and z, stating your reasons clearly.

Answer $x =$ _____

$y =$ _____

$z =$ _____ [3]

(c) Jennie claims that ΔEBC is an isosceles triangle. Do you agree? Explain your answer clearly.

.....

..... [1]

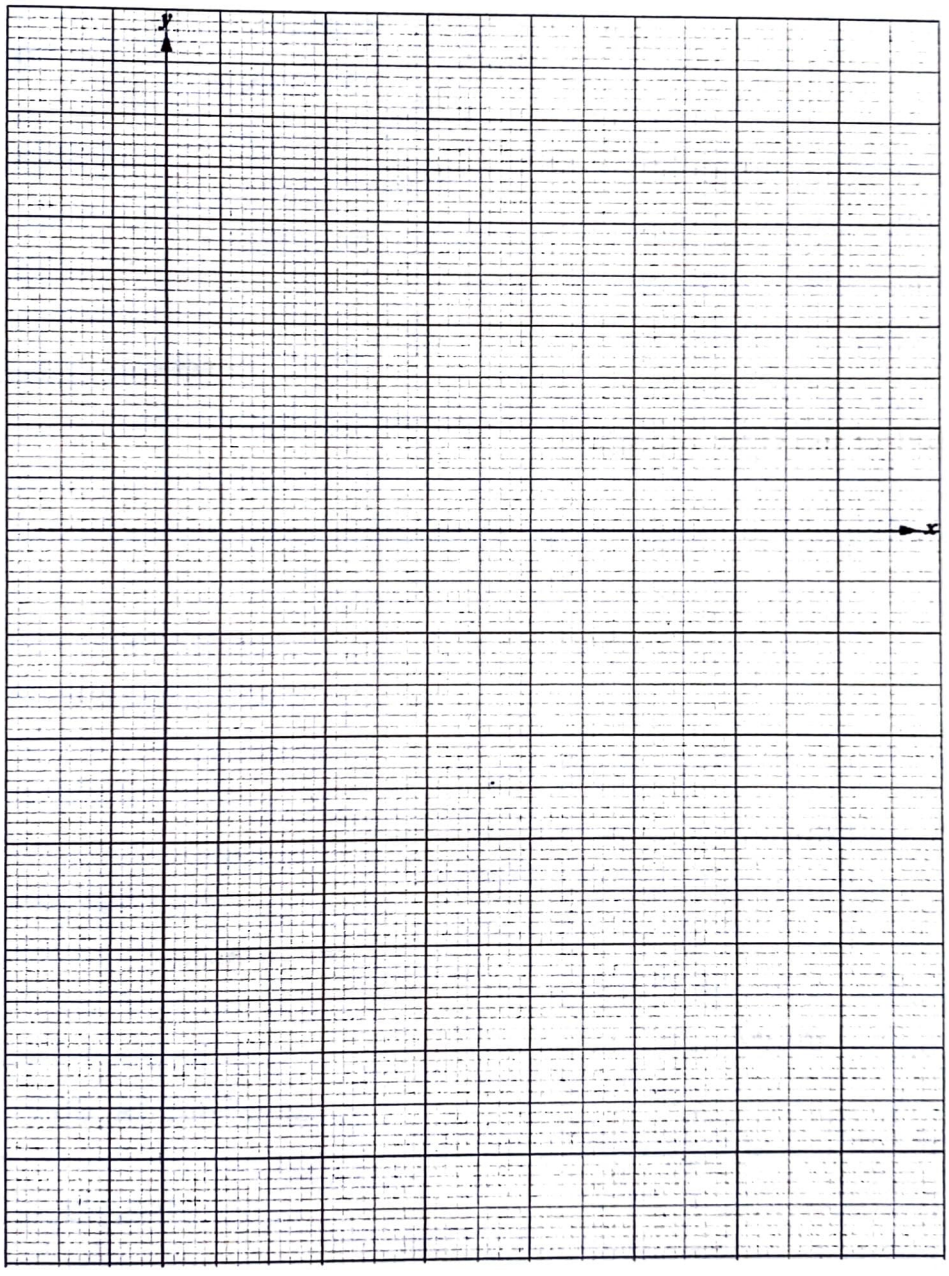
10 This table of values is for $y = x^2 - 34x$.

x	−5	0	5	10	15	20	25	30	35
$y = x^2 - 34x$	195	0	−145	−240	−285	p	−225	−120	35

(a) Find the value of p.

Answer $p =$ _____ [1]

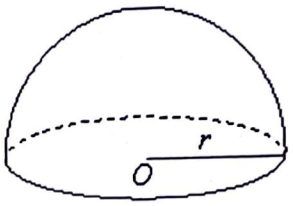
(b) Draw the graph of $y = x^2 - 34x$ for $-5 \leq x \leq 35$. [3]



(c) Use your graph to find the values of x when $y = -100$.

Answer $x =$ _____ or _____ [2]

11 The figure shows a closed hemisphere with centre O and volume of 134 cm^3.



Calculate
(a) the radius r of the hemisphere.

Answer _____ cm [2]

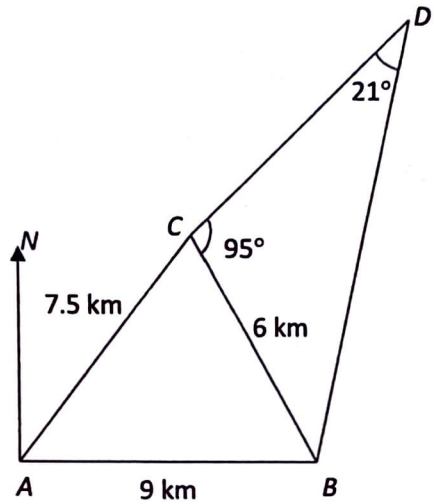
(b) the surface area of the hemisphere.

Answer _____ cm^2 [2]

Section B (8 marks)

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

12 In the diagram below, A, B, C and D are four points on level ground. Point B is due east of point A. $AB = 9$ km, $AC = 7.5$ km, $BC = 6$ km, $\angle BCD = 95°$ and $\angle CDB = 21°$.



(a) Calculate

(i) the length of BD,

Answer _____ *km* [2]

(ii) $\angle ABC$,

Answer _____ [2]

(iii) the bearing of C from B,

Answer _____ [1]

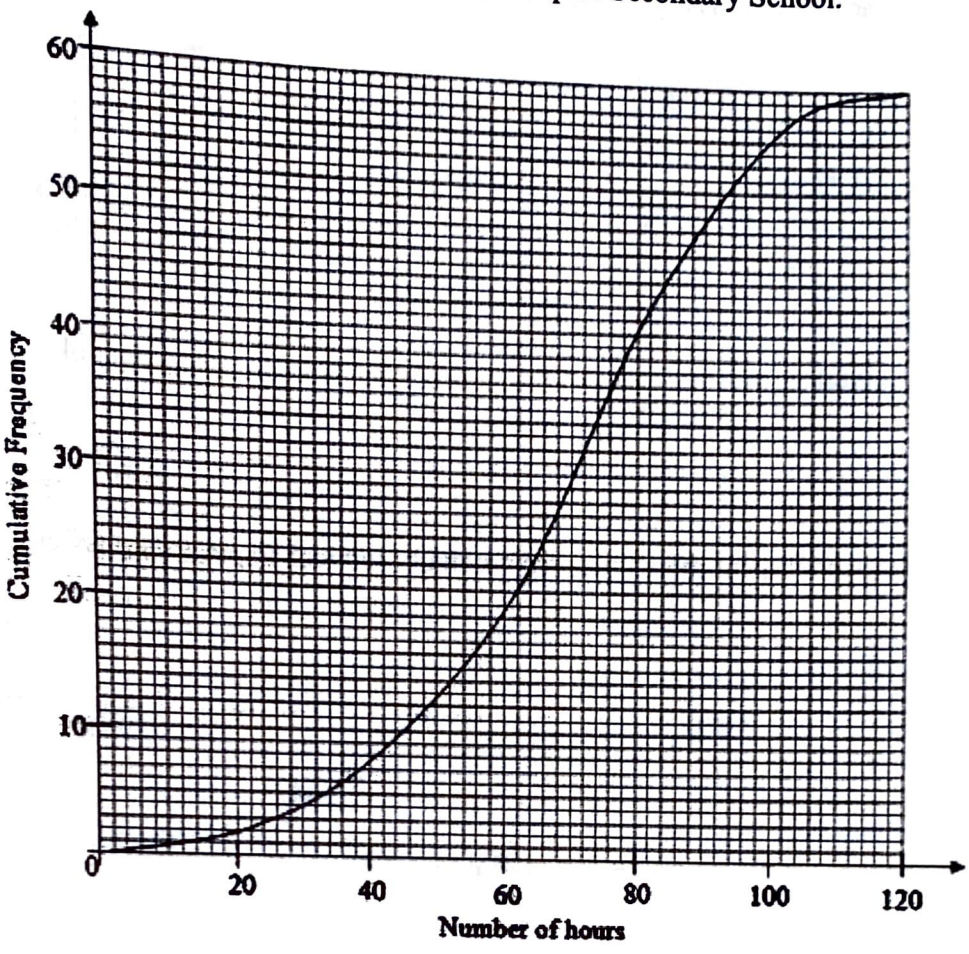
(iv) the area of triangle ABC.

Answer _____ km^2 [1]

(b) A vertical structure, whose top is T, is erected at A. Given that the angle of elevation of T from C is $3°$, calculate the height of the structure, giving your answer in metres.

Answer _____ m [2]

13 The cumulative frequency graph represents the number of hours of community work accumulated over four years by 60 students in Helpful Secondary School.



(a) Find the median hours.

Answer _____ [1]

(b) Find the interquartile range.

Answer _____ [2]

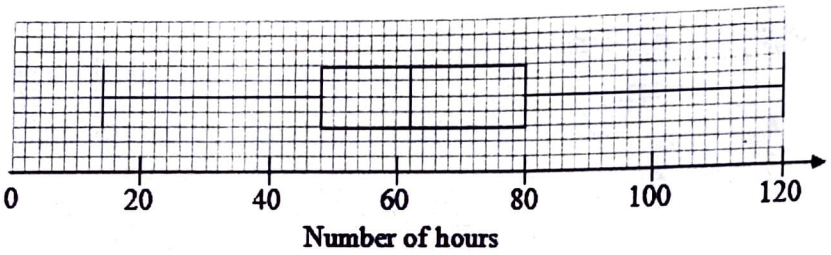
(c) Find the 80th percentile.

Answer _____ [1]

(d) Two students are picked at random. Calculate the probability that both students accumulated more than 80 hours.

Answer _____ [2]

The number of hours of community service accumulated by another 60 students in Caring Secondary School is represented in the following box-and-whisker plot.



(e) Write down the median hours of the students in Caring Secondary School.

Answer _____ [1]

(f) Which school spent more time on community service? Explain your answer.

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..... [1]

~ END OF PAPER ~