

Visit
FREETESTPAPER.com
for more papers



Website: freetestpaper.com



[Facebook.com/freetestpaper](https://www.facebook.com/freetestpaper)



[Twitter.com/freetestpaper](https://www.twitter.com/freetestpaper)



HUA YI SECONDARY SCHOOL

PRELIMINARY EXAM 2024

4-G2

NAME

CLASS

--	--

INDEX
NUMBER

--	--

MATHEMATICS

PAPER 1

4045/01

31 July 2024

2 hours

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your Name, Class and Index Number in the spaces provided 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** 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 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 your answers in degrees to one decimal place.

For π , use either your calculator value, or 3.142.

For Examiner's
Use

70

This document consists of **13** printed pages and **1** blank page.

© HYSS 2024

No part of this document may be reproduced in any form or transmitted in any form or by any means without the prior permission of Hua Yi Secondary School.

Setter: Ms Shirlynn Khoo

[Turn Over

Mathematical Formulae*Compound interest*

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

Mensuration

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

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

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

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

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

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

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

Trigonometry

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

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

Statistics

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

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

1 Solve $5(x + 2) = 8 - x$.

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

2 $\frac{\pi}{5}$ 0.6 $\frac{5}{8}$ $0.\dot{6}\dot{0}$

Write these numbers in order of size, starting with the smallest.

Answer $\dots\dots\dots, \dots\dots\dots, \dots\dots\dots, \dots\dots\dots$ [1]
smallest

3 (a) Write 0.000845 in standard form.

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

(b) $(2.5 \times 10^m) \times (4.9 \times 10^n) = a \times 10^b$ where $1 \leq a < 10$.

(i) Find the value of a .

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

(ii) Write an expression for b in terms of m and n .

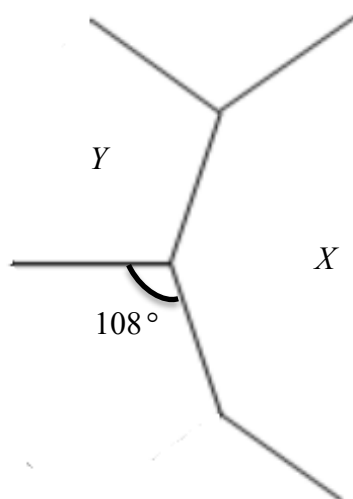
Answer $b = \dots\dots\dots$ [1]

- 4 By writing each number correct to 1 significant figure, estimate the value of

$$\sqrt{\frac{5.9 \times 24.2}{0.333}}.$$

Answer [2]

- 5 The diagram below shows an incomplete figure made up of a regular pentagon Y and another regular polygon X of n sides.



- (a) Complete pentagon Y .

Answer shown in diagram above

[2]

- (b) Find the value of n . Show your working clearly.

Answer [4]

- 6 (a) Write $\frac{1}{x-5} + \frac{1}{x^2-25}$ as a single fraction in its simplest form.

Answer [2]

- (b) Rearrange this formula to make h the subject.

$$a = \frac{1}{3}(h+k)b$$

Answer [2]

- 7 Mary scored 65 marks in her English test, 60 marks in her Science test and x marks in her Mathematics test, where x is an integer. The full mark for each test is 100 and she only takes these three subjects. Mary claims that her mean test score can be at least 80 marks.

- (a) Form an inequality involving x and that represents Mary's claim.

Answer [1]

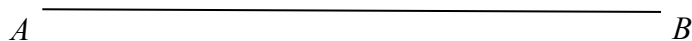
- (b) Determine whether Mary is correct in her claim. Show your working.

Answer

[1]

- 8 (a) ABC is a triangle with $BC = 7$ cm and $\angle CAB = 50^\circ$.
Construct triangle ABC .
 AB has been drawn for you.

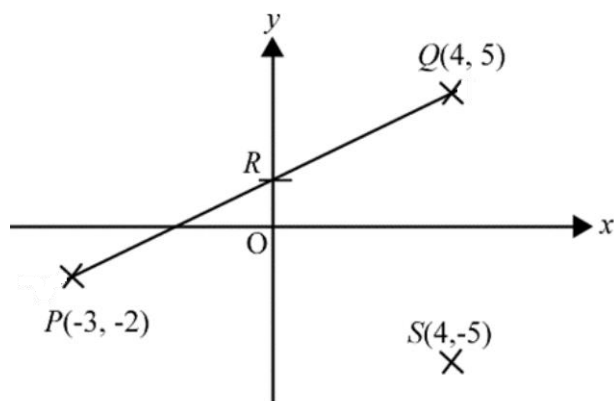
[2]



- (b) Construct the angle bisector of $\angle CAB$. [1]
(c) Construct the perpendicular bisector of AB . [1]
(d) X is the point where the angle bisector of $\angle CAB$ meets the perpendicular bisector of AB . Measure CX .

Answer cm [1]

9



The graph below shows a line segment PQ which cuts the y -axis at R .

(a) Find the gradient of PQ .

Answer [2]

(b) Hence find the equation of the line PQ .

Answer [2]

(c) Write down the coordinates of R .

Answer (..... ,) [1]

(d) A line, l , is parallel to PQ and passes through the point $S(4, -5)$.
Find the equation of l .

Answer [2]

10 Simplify the following expressions.

(a) $\frac{x}{4} - \frac{2(x-3)}{5},$

Answer [2]

(b) $\frac{10x^2y}{3y} \div \frac{8x}{15}.$

Answer [2]

11 A building can be completed in 120 days with 50 workers. Assuming that all the workers work at the same rate, find

(a) the number of days it takes to complete the building with 20 workers,

Answer days [1]

(b) how many more workers are required to complete the building in 100 days.

Answer [2]

- 12 (a) An expression for the n th term of a sequence is $10 - 3n$.
Find the 20th term of the sequence.

Answer [1]

- (b) The first four terms of a sequence are
-1, 3, 7, 11.

- (i) Find an expression for the n th term in this sequence.

Answer [1]

- (ii) Is 121 a term in this sequence? Explain your answer. [2]

Answer

-
- 13 Ten years ago, item A cost \$8. It was then increased by 200% from its original price. Two months ago, there was a discount of 8% for item A. Today there is a further reduction of price by 2%. How much does item A cost today?

Answer \$ [3]

- 14 There are two numbers, x and y . When the second number is subtracted from twice the first number, the result is 18. When 9 is added to the first number, the result is equal to twice the second number.

(a) Write down a pair of simultaneous equations to represent the information above.

Answer

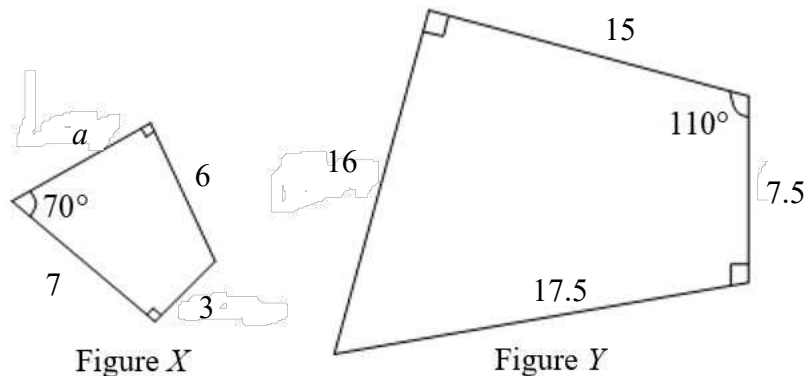
..... [2]

(b) Solve the simultaneous equations in (a). Find x and y .

Answer $x = \dots\dots\dots$

$y = \dots\dots\dots$ [2]

15



Figures X and Y are similar, with all the lengths given in centimetres.

(a) Figure Y is an enlargement of Figure X . Find the scale factor.

Answer

[1]

(b) Find the value of a .

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

- 16 (a) Given that $x^2 - 6x - 20 = (x + a)^2 + b$, find the value of a and of b .

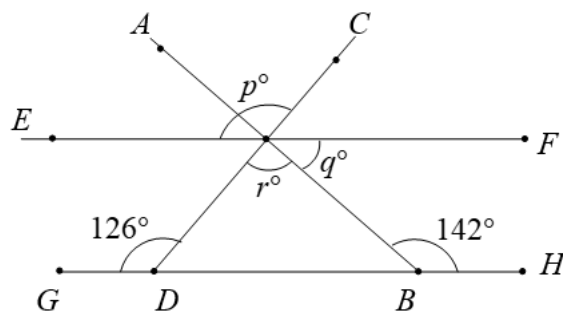
Answer $a = \dots\dots\dots$

$b = \dots\dots\dots$ [2]

- (b) Hence solve $x^2 - 6x - 20 = 0$, giving your answer to 2 decimal places.

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

17



The diagram shows a pair of parallel lines, EF and GH . AB and CD are straight lines. Stating your reasons clearly, find

- (a) p ,

$p = \dots\dots\dots$ Reason $\dots\dots\dots$ [1]

- (b) q ,

$q = \dots\dots\dots$ Reason $\dots\dots\dots$ [1]

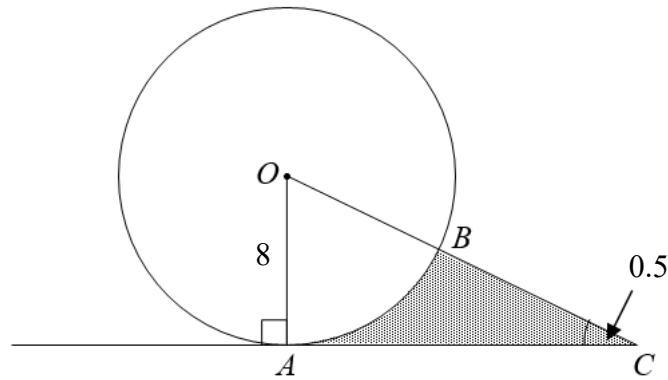
- (c) r .

$r = \dots\dots\dots$ Reason $\dots\dots\dots$ [1]

- 18 (a) Given that x is an obtuse angle, solve $\sin x = 0.75$.

Answer $x = \dots\dots\dots^\circ$ [1]

(b)



The diagram shows a circle, centre O , of radius 8cm. The line AC is perpendicular to the radius OA , and the line OC intersects the circle at B . Given that $\angle OCA = 0.5$ radians, calculate the area of the shaded region.

Answer $\dots\dots\dots \text{cm}^2$ [5]

- 19 A die was thrown x times. The frequency of the results were recorded.

Score on die	1	2	3	4	5	6
Frequency	a	3	2	4	6	6

- (a) Write down the smallest possible value of a given that the mode is 1.

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

- (b) Write down the smallest possible value of a given that the median is 4.

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

- (c) Calculate the value of a given that the mean is 3.92.

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

- (d) Calculate the standard deviation if $a = 2$.

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

End of Paper

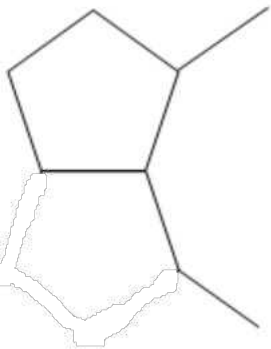
BLANK PAGE

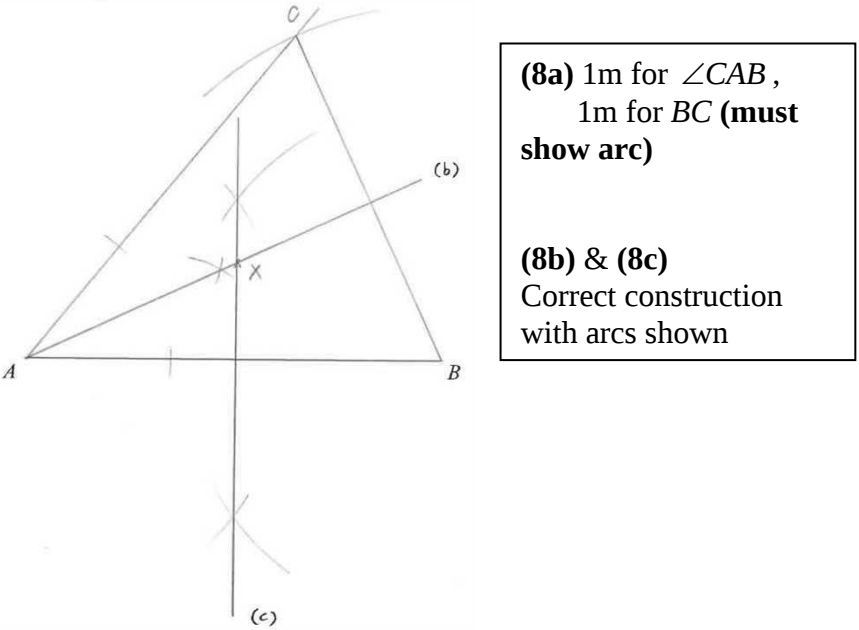
Name:	Index Number:	Class:
-------	---------------	--------

HUA YI SECONDARY SCHOOL		
4G2	Preliminary Examination 2024	4G2
MATHEMATICS		
Paper 1		

MARK SCHEME <table border="1"><tr><td>For Examiner's Use</td></tr><tr><td></td></tr></table>	For Examiner's Use	
For Examiner's Use		

This document consists of 6 printed pages. © HYSS 2024 No part of this document may be reproduced in any form or transmitted in any means without the prior permission of Hua Yi Secondary School. [Turn Over

Qn	Suggested Solution	Mark Allocation
1	$5(x+2) = 8 - x$ $5x + 10 = 8 - x$ $6x = -2$ $x = -\frac{1}{3}$	--- M1 (expansion) --- A1 (will not accept 3sf)
2	$0.6, 0.\dot{6}\dot{0}, \frac{5}{8}, \frac{\pi}{5}$	--- B1
3a	$0.000845 = 8.45 \times 10^{-4}$	--- B1
3bi	$(2.5 \times 10^m) \times (4.9 \times 10^n) = 12.25 \times 10^{m+n}$ $= 1.225 \times 10 \times 10^{m+n}$ $= 1.225 \times 10^{m+n+1}$ $a = 1.225$	--- B1
3bii	$b = m + n + 1$	--- B1
4	$\sqrt{\frac{5.9 \times 24.2}{0.333}} \approx \sqrt{\frac{6 \times 20}{0.3}}$ $= \sqrt{400}$ $= 20$	--- M1 (any 2 correct) --- A1
5a		--- B1 (5 sides drawn) --- B1 (correct interior angles)
5b	Interior angle of pentagon $= \frac{(5-2) \times 180^\circ}{5}$ $= 108^\circ$ Interior angle of polygon $= 360^\circ - 108^\circ - 108^\circ$ $= 144^\circ$ Exterior angle of polygon $= 180^\circ - 144^\circ$ $= 36^\circ$ $n = \frac{360^\circ}{36}$ $= 10$	--- M1 --- M1 (ecf)(if students measure the int. angle of polygon, can award them the mark) --- M1 (or if they use int. angle formula) --- A1

6a	$\frac{1}{x-5} + \frac{1}{x^2-25} = \frac{x+5}{(x-5)(x+5)} + \frac{1}{(x-5)(x+5)}$ $= \frac{x+6}{(x-5)(x+5)}$	--- M1 (same denominator) --- A1
6b	$a = \frac{1}{3}(h+k)b$ $3a = (h+k)b$ $\frac{3a}{b} = h+k$ $h = \frac{3a}{b} - k$	--- M1 --- A1
7a	$\frac{65+60+x}{3} \geq 80 \quad \text{Or} \quad 65+60+x \geq 240$ *Students don't have to simplify/solve. If they did and did it wrongly, they will still be awarded full marks if they had formed the inequality correctly.	--- B1
7b	$65+60+x \geq 240$ $x \geq 115$ Mary is wrong because the maximum mark is 100.	--- B1 (must have both answer and conclusion)
8a-c	 (8a) 1m for $\angle CAB$, 1m for BC (must show arc) (8b) & (8c) Correct construction with arcs shown	--- B1 --- B2
8d	4.6cm (± 0.1 cm)	--- B1
9a	$\frac{5-(-2)}{4-(-3)} = 1$	--- M1, A1
9b	$y = mx + c$ Substitute $x = 4, y = 5$, then $c = 1$. Equation of PQ : $y = x + 1$	--- M1 (ecf from (a)) --- A1
9c	$R(0, y)$ $\therefore R(0, 1)$	--- B1 (ecf)

9d	Since the line l is parallel to PQ, gradient of line $l = 1$ Sub $x = 4$, $y = -5$, $y = mx + c$ $-5 = 4 + c$ $c = -9$ Equation of line l: $y = x - 9$	--- M1 --- A1												
10a	$\frac{x}{4} - \frac{2(x-3)}{5} = \frac{5x}{20} - \frac{8(x-3)}{20}$ $= \frac{5x - 8x + 24}{20}$ $= \frac{-3x + 24}{20}$	--- M1 (<i>expansion</i>) --- A1												
10b	$\frac{10x^2y}{3y} \div \frac{8x}{15} = \frac{10x^2y}{3y} \times \frac{15}{8x}$ $= \frac{25x}{4}$	--- M1 --- A1												
11a	Since the no. of workers and the time taken for completing the building are inversely proportional, <table border="1"> <tr> <td>No. of days</td><td>workers</td><td>days</td></tr> <tr> <td>$= \frac{120 \times 50}{20}$</td><td>50</td><td>120</td></tr> <tr> <td>$= 300$ days</td><td>1</td><td>6000</td></tr> <tr> <td></td><td>20</td><td>300</td></tr> </table> Or	No. of days	workers	days	$= \frac{120 \times 50}{20}$	50	120	$= 300$ days	1	6000		20	300	--- B1
No. of days	workers	days												
$= \frac{120 \times 50}{20}$	50	120												
$= 300$ days	1	6000												
	20	300												
11b	No. of workers needed <table border="1"> <tr> <td>$= \frac{120 \times 50}{100}$</td><td>workers</td><td>days</td></tr> <tr> <td>$= 60$ workers</td><td>50</td><td>120</td></tr> <tr> <td></td><td>6000</td><td>1</td></tr> <tr> <td></td><td>60</td><td>100</td></tr> </table> Or Or use (a) to find the 60 workers No. of more workers required $= 60 - 50$ $= 10$ workers	$= \frac{120 \times 50}{100}$	workers	days	$= 60$ workers	50	120		6000	1		60	100	--- M1 --- A1
$= \frac{120 \times 50}{100}$	workers	days												
$= 60$ workers	50	120												
	6000	1												
	60	100												
12a	$10 - 3(20) = -50$	--- B1												
12bi	$4n - 5$	--- B1												
12bii	$4n - 5 = 121$ $4n = 126$ $n = 31.5$ 121 is not a term in this sequence because <u>n is not an integer</u> /whole number/is a decimal.	--- M1 --- A1												

13	$100\% - \$8$ $300\% - \$24$ $92\% \times \$24 = 22.08$ $98\% \times \$22.08 = \21.6384 $= \$21.64$	--- M1 --- M1 --- A1
14a	$2x - y = 18$ $x + 9 = 2y$	--- B1 --- B1
14b	$x + 9 = 2y$ $x = 2y - 9$ $\therefore 2(2y - 9) - y = 18$ $4y - 18 - y = 18$ $3y = 36$ $y = 12$ $x = 2(12) - 9$ $= 15$	--- M1 --- A1
15a	$\frac{17.5}{7} = 2.5$	--- B1
15b	$a = 16 \div 2.5$ $= 6.4$	--- B1
16a	$x^2 - 6x - 20 = (x - 3)^2 - 9 - 20$ $= (x - 3)^2 - 29$ $a = -3, \quad b = -29$	--- M1 --- A1 (ecf)
16b	$(x - 3)^2 - 29 = 0$ $(x - 3)^2 = 29$ $x - 3 = \pm\sqrt{29}$ $x = 8.39 \text{ or } -2.39(2dp)$	--- M1 (ecf) --- A1
17a	*For Qn 17, overall deduct one mark for wrong/missing reason $p = 126$ Reason: corresponding angles	 --- B1
17b	$q = 38$ Reason: interior angles	--- B1
17c	$r = 88$ Reason: vertically opp. angles/ alternate angles	--- B1

18a	$\sin x = 0.75$ $x = 48.590$ Obtuse angle $x = 131.4^\circ$ (1dp)	--- B1
18b	$\tan 0.5 = \frac{8}{AC}$ $AC = 14.6439$ $\text{Area of } \triangle OAC = \frac{1}{2} \times 14.6439 \times 8$ $= 58.5756 \text{ cm}^2$ $\angle AOC = \pi - \frac{\pi}{2} - 0.5$ $= 1.07079 \text{ rad}$ $\text{Area of sector } AOB = \frac{1}{2} \times 8^2 \times 1.07079$ $= 34.2652 \text{ cm}^2$ $\text{Area of shaded region} = 58.5756 - 34.2652$ $= 24.3104$ $= 24.3 \text{ cm}^2$ (3sf)	--- M1 --- M1 --- M1 --- M1 --- A1
19a	7	--- B1
19b	4	--- B1
19c	$\frac{a + 2(3) + 3(2) + 4(4) + 5(6) + 6(6)}{a + 3 + 2 + 4 + 6 + 6} = 3.92$ $\frac{a + 94}{a + 21} = 3.92$ $a + 94 = 3.92a + 82.32$ $2.92a = 11.68$ $a = 4$	--- M1 --- A1
19d	1.63 (3sf)	--- B1



HUA YI SECONDARY SCHOOL

PRELIMINARY EXAM 2024

4-G2

NAME

--

CLASS

--	--

INDEX
NUMBER

--	--

MATHEMATICS

PAPER 2

4045/02

05 August 2024

2 hours

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your Name, Class and Index Number in the spaces provided 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.

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 of the 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 your answers in degrees to one decimal place.

For π , use either your calculator value, or 3.142.

For Examiner's Use
70

This document consists of **19** printed pages and **1** blank page.

© HYSS 2024

No part of this document may be reproduced in any form or transmitted in any form or by any means
without the prior permission of Hua Yi Secondary School.

Setter: Ms Shirlynn Khoo

[Turn Over

Mathematical Formulae*Compound interest*

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

Mensuration

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

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

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

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

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

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

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

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 Written as the product of its prime factors, $396 = 2^2 \times 3^2 \times 11$.

(a) (i) Explain why 396 is not a perfect square.

.....

..... [1]

(ii) Find the smallest positive integer value of k such that $396k$ is a perfect cube.

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

(b) (i) Express 2100 as the product of its prime factors.

Answer [2]

(ii) Hence find the highest common factor of 396 and 2100.

Answer [1]

- 2 A train travels with a speed of 70 km/h for 2.5 hours. It then travels for 2 hours at x km/h. Given that the average speed of the train for the whole journey is 80 km/h, find the value of x .

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

- 3 \$10 000 is placed in an account, earning compound interest of p % per annum. At the end of 2 years, the total amount in the account is \$10506.25. Calculate p .

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

4 Factorise the following expressions completely

(a) $2x^2 - 9x - 5$,

Answer [2]

(b) $2x^2 - 18y^2$.

Answer [2]

5 On a map, a length of 5 cm represents an actual distance of 1 km. Find

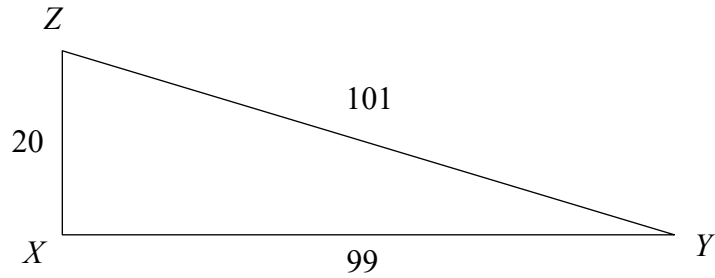
(a) the scale of the map, in the form of $1 : n$,

Answer [1]

(b) the area on the map, in cm^2 , which represents an actual area of 8 km^2 .

Answer cm^2 [2]

6



XYZ is a triangle where $XZ = 20\text{cm}$, $XY = 99\text{cm}$ and $YZ = 101\text{cm}$.

- (a) Is XYZ a right-angled triangle? Explain, showing your working clearly.

[2]

Answer

- (b) Find the shortest distance from X to YZ .

Answer cm [3]

7 Leticia throws a fair 6-sided die and a fair coin together.

(a) Draw a tree diagram in the space below to display all the possible outcomes. [2]

Answer

(b) Find the probability of obtaining

(i) a prime number and a tail,

Answer [1]

(ii) a '7' and a tail.

Answer [1]

- 8 The variables of x and y are connected by the equation $y = 2x^2 - 5x - 4$.
Some corresponding values of x and y are given in the following table.

x	-3	-2	-1	0	0.5	1	2	3	4	5
y	29	14	p	-4	-6	-7	-6	-1	8	21

- (a) Calculate the value of p .

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

- (b) Draw the graph of $y = 2x^2 - 5x - 4$ for $-3 \leq x \leq 5$ on the grid provided on the next page. [2]

- (c) Use your graph to find the values of x when $y = 15$.

Answer $x = \dots\dots\dots, \dots\dots\dots$ [2]

- (d) Explain why it is not possible to find a value of x when $y = -15$.

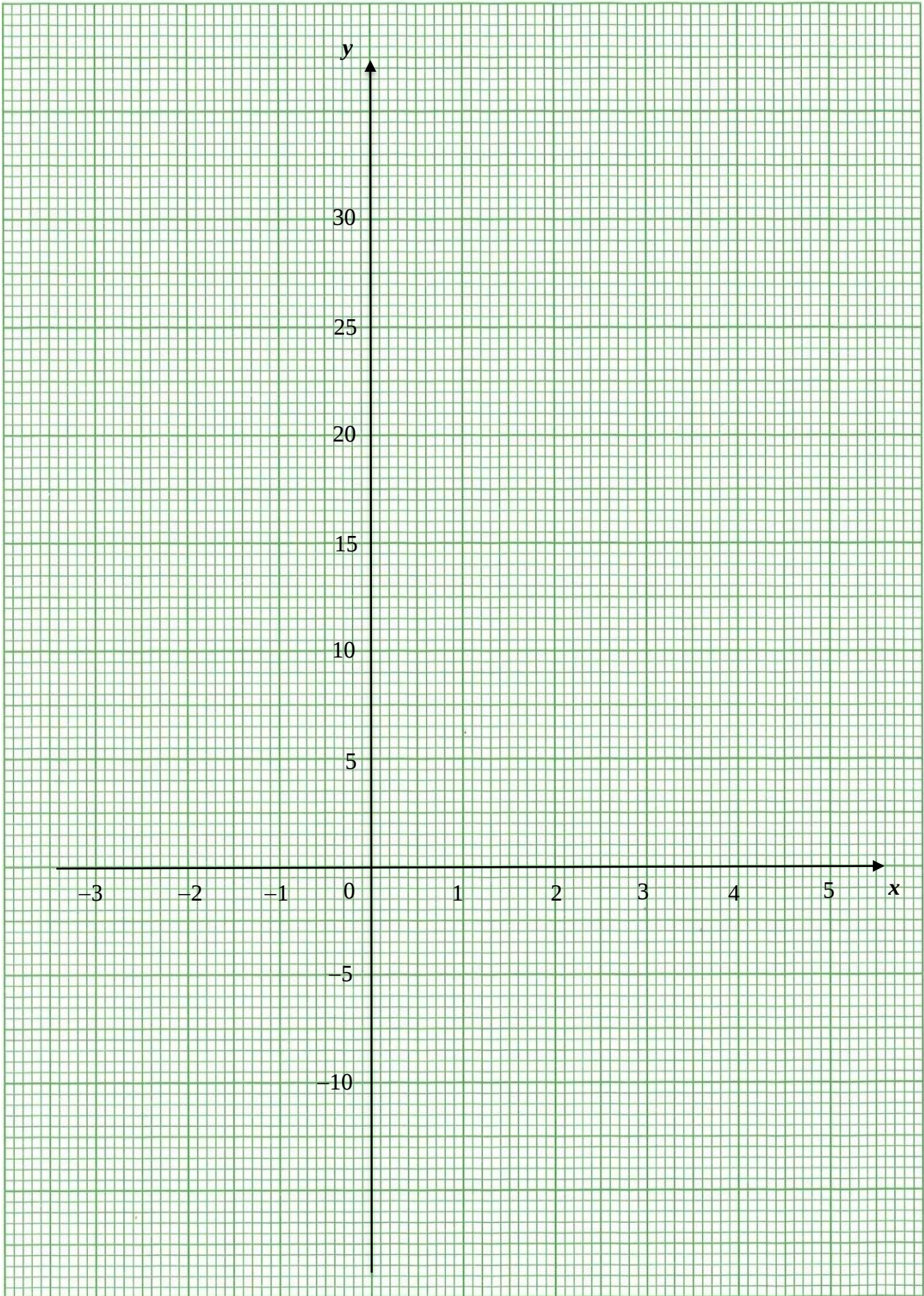
Answer

.....

..... [1]

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

Answer [2]



- 9 At the Great Singapore Sale, Caleb paid \$300 for x number of T-shirts. He plans to sell the T-shirts, at which he will make a profit of \$1.50 on each T-shirt.

(a) Write down, in terms of x , expressions for the

(i) amount of money that Caleb paid for each T-shirt,

Answer \$ [1]

(ii) price at which he plans to sell each T-shirt.

Answer \$ [1]

- (b) However, Caleb later discovered that 30 of the T-shirts either had holes or stains on them so he kept them for other use. He sold the remaining T-shirts. After selling all the T-shirts, he found that his sale amounted to \$360. Form an equation in x and simplify it to $x^2 - 70x - 6000 = 0$. [3]

Answer

- (c) Solve $x^2 - 70x - 6000 = 0$.

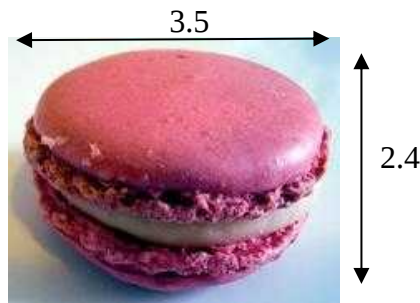
Answer $x = \dots, \dots$ [3]

- (d) Explain why one of the answers in (c) has to be rejected.

Answer

..... [1]

- 10 Janet has been a home-baker since the Covid-19 period. She bakes macarons, which take the estimated shape of a cylinder. The diameter of her macaron is 3.5 cm and its thickness is 2.4 cm.



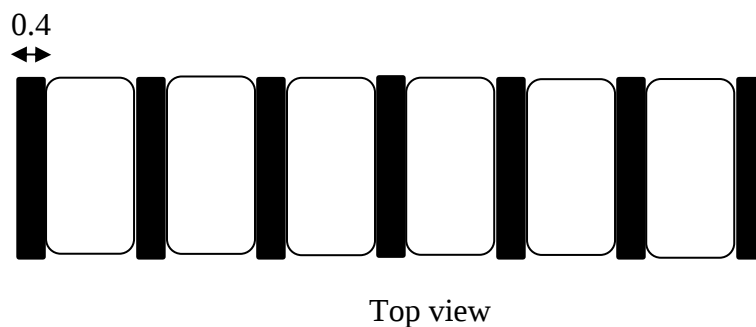
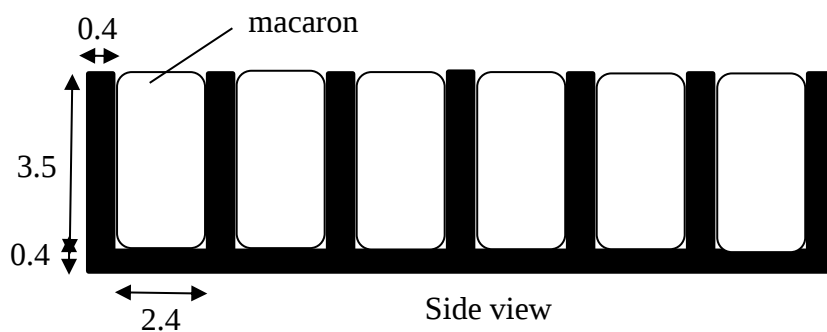
- (a) Calculate the estimated volume of each macaron.

Answer cm^3 [1]

Janet sells her macarons in boxes of 6.

Every 6 macarons are packed in an opened top six-pocketed thermoformed pockets, with a thickness of 0.4 cm to separate one macaron from another as shown in the diagram below.

Each of these pockets in the six-pocketed thermoformed pockets was created to fit in the macarons of dimensions stated above.



- (b) Find the volume occupied by air in each single row of 6 macarons packed in the six-pocketed thermoformed pockets.

Answer cm³ [2]

Janet also custom-makes boxes and paper bags to pack the macarons from the same supplier that creates the thermoformed pockets. The prices quoted by the supplier are as shown.

Items	Pricing
six-pocketed thermoformed pockets	\$2.80 each
box for 6 macarons	\$1.65 per box
paper bag	\$0.40 each

In her recipe, every 12 macarons require the following amount of ingredients.

Ingredients	Mass required (in grams)
almond flour	65
powdered sugar	65
castor sugar	45
egg whites	60

- Each egg is estimated to contain an average of 30 grams of egg white

The price list of a store she purchases her baking ingredients from is shown below.

Items	Pricing
1kg of almond flour	\$30
1kg of powdered sugar	\$2.50
800 g of castor sugar	\$2.60
a dozen of eggs	\$2.50

Janet provides delivery to her customers with the delivery costs shown below.

Purchase Amount	Delivery cost
below \$50	\$15
above \$50	\$10
for bulk orders, above \$200	Free

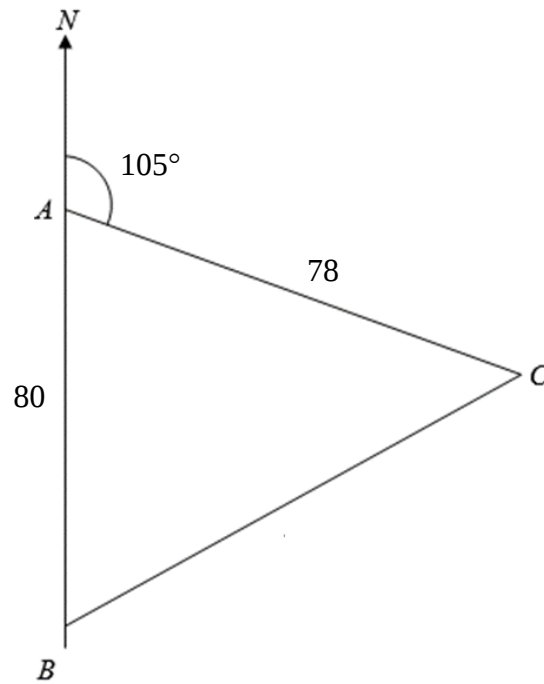
- (c) (i) What is Janet's cost price of making and packing one box of macarons?

Answer \$ [4]

- (ii) How much should Janet charge a customer who orders 72 macarons should she want to make a profit of 30%? Round off your answer to the nearest dollar.

Answer \$ [3]

- 11 Three points A , B and C are on level ground such that A is due north of B .
 $AB = 80\text{m}$, $AC = 78\text{m}$ and the bearing of C from A is 105° .



Find

- (a) the bearing of A from C ,

Answer $^\circ$ [1]

- (b) $\angle ACB$,

Answer $^\circ$ [3]

- (c) area of triangle ABC .

Answer m^2 [2]

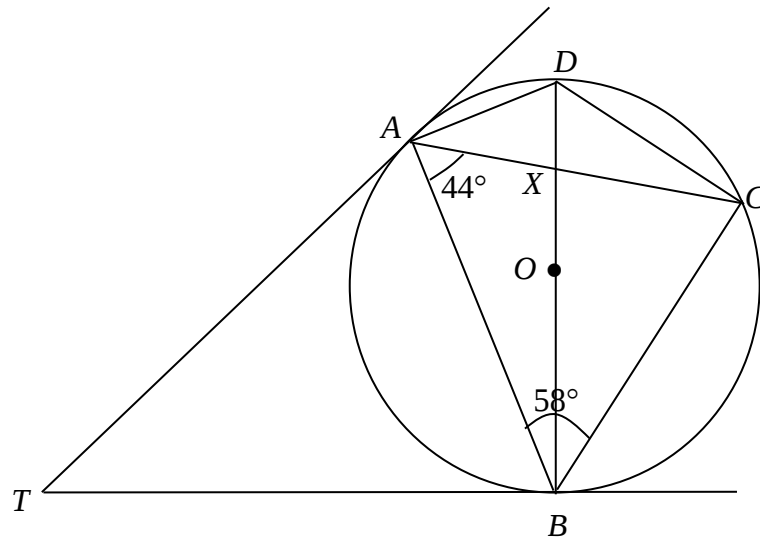
- (d) A hot air balloon hovers 180m vertically above A. Calculate the angle of elevation of the hot air balloon from C.

Answer $^\circ$ [2]

Section B (8 marks)

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

12



In the figure above, A , B , C and D lie on the circle. BD is a diameter. AT and BT are tangents to the circle. $\angle BAC = 44^\circ$ and $\angle ABC = 58^\circ$.

(a) Find these angles, giving a reason for each.

(i) $\angle BDC$,

Answer

$\angle BDC = \dots\dots\dots$ Reason $\dots\dots\dots$

$\dots\dots\dots$ [1]

(ii) $\angle ADC$.

Answer

$\angle ADC = \dots\dots\dots$ Reason $\dots\dots\dots$

$\dots\dots\dots$ [1]

(b) Find the following angles, stating your reasons clearly.

(i) $\angle ABD$,

Answer° [2]

(ii) $\angle ATB$.

Answer° [3]

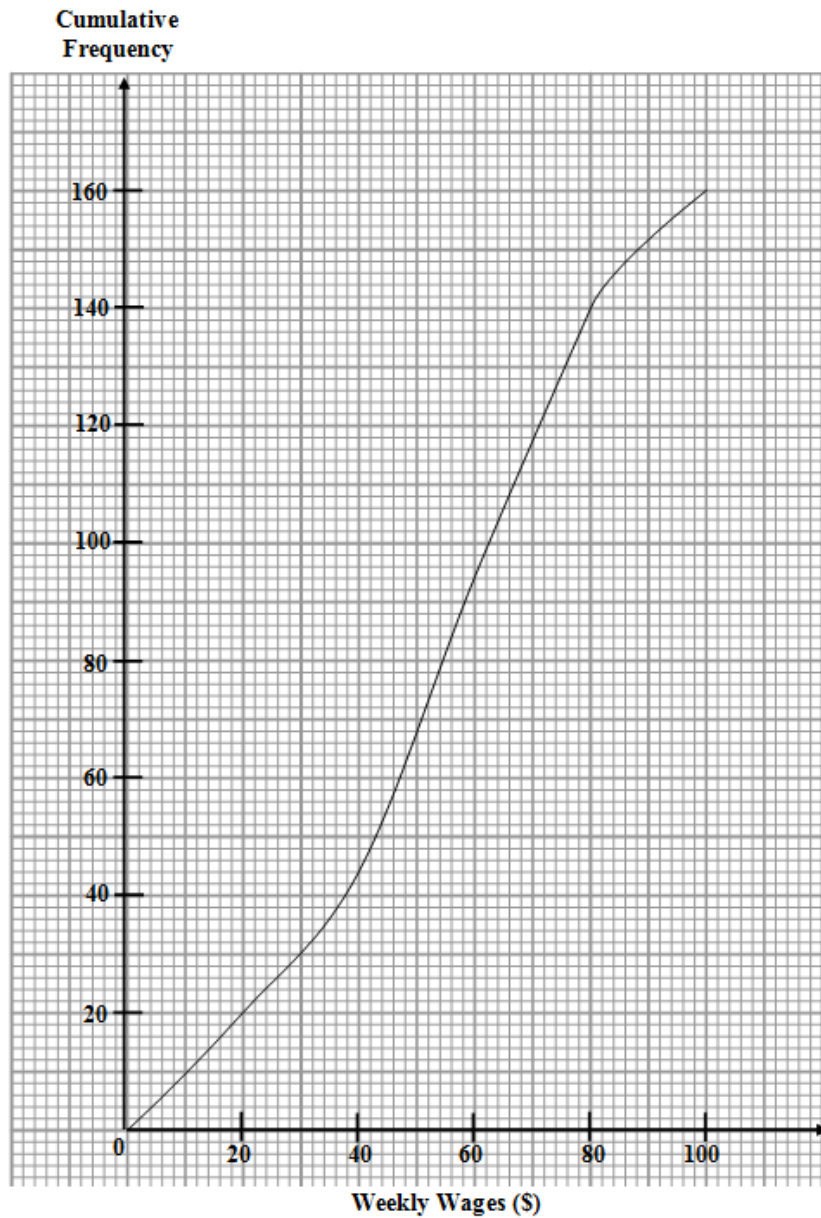
(c) Explain why $\angle OTB$ is equal to $\angle OTA$.

Answer

.....

..... [1]

- 13 The weekly wages of 160 workers in company A are shown in the cumulative frequency curve below.



- (a) Use the graph to estimate the

(i) median wage,

Answer \$..... [1]

(ii) inter-quartile range,

Answer \$..... [2]

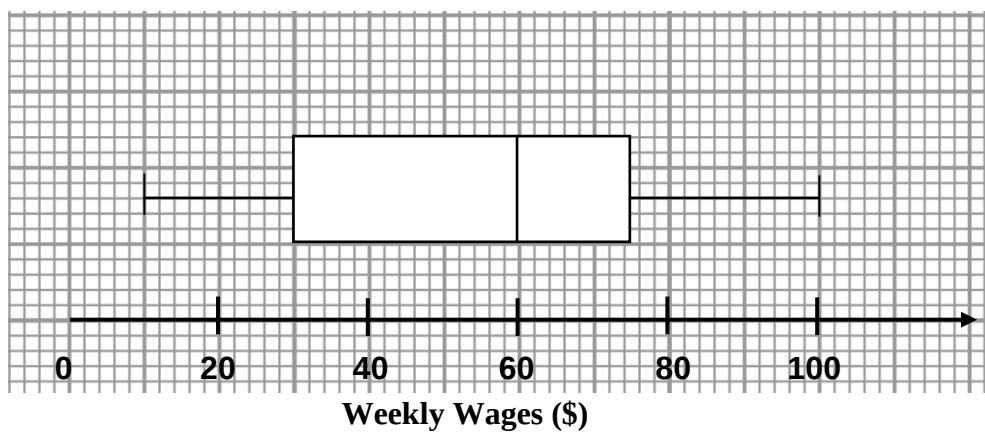
(iii) 70th percentile.

Answer \$..... [1]

- (b) A full-time worker is one who earns more than \$60 per week. Calculate the probability of selecting two such workers at random for a particular job.

Answer [2]

- (c) The weekly wages of another 160 workers working in company B is represented in the following box and whisker diagram.



- (i) Give one reason why you may choose to work in company A.

Answer

.....

..... [1]

- (ii) Give one reason why you may choose to work in company B.

Answer

.....

..... [1]

End of Paper

BLANK PAGE

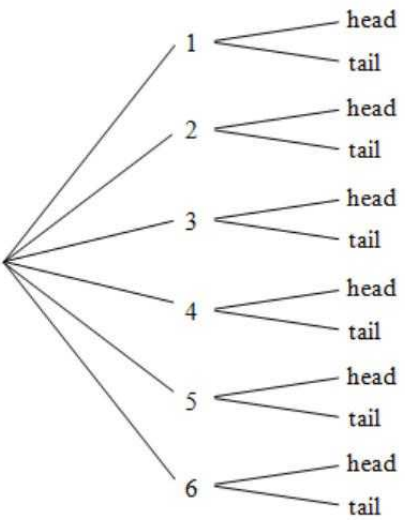
Name:	Index Number:	Class:
-------	---------------	--------

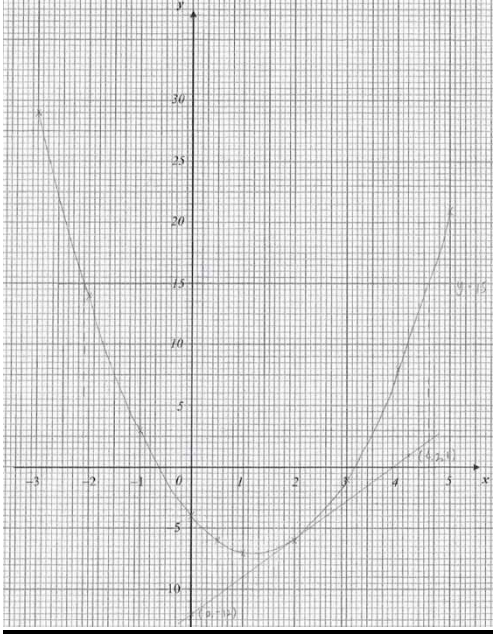
HUA YI SECONDARY SCHOOL		
4G2	Preliminary Examination 2024	4G2
MATHEMATICS		
Paper 2		

MARK SCHEME <table border="1"><tr><td>For Examiner's Use</td></tr><tr><td></td></tr></table>	For Examiner's Use	
For Examiner's Use		

This document consists of 7 printed pages including the cover page. © HYSS 2024 No part of this document may be reproduced in any form or transmitted in any means without the prior permission of Hua Yi Secondary School. [Turn Over
--

Qn	Suggested Solution	Mark Allocation														
1ai	Not all the powers of the prime factors are even numbers/multiples of 2 .	--- B1														
1aii	$k = 2 \times 3 \times 11^2$ $= 726$	--- B1														
1bi	<table><tr><td>2</td><td>2100</td></tr><tr><td>2</td><td>1050</td></tr><tr><td>3</td><td>525</td></tr><tr><td>5</td><td>175</td></tr><tr><td>5</td><td>35</td></tr><tr><td>7</td><td>7</td></tr><tr><td></td><td>1</td></tr></table> $2100 = 2^2 \times 3 \times 5^2 \times 7$	2	2100	2	1050	3	525	5	175	5	35	7	7		1	--- M1 --- A1
2	2100															
2	1050															
3	525															
5	175															
5	35															
7	7															
	1															
1bii	$HCF = 2^2 \times 3$ $= 12$	--- B1 (ecf)														
2	$\frac{(70 \times 2.5) + (2x)}{4.5} = 80$ $175 + 2x = 360$ $2x = 185$ $x = 92.5$	--- M1 ---M1 --- A1														
3	$10506.25 = 10000 \left(1 + \frac{p}{100} \right)^2$ $1.050625 = \left(1 + \frac{p}{100} \right)^2$ $1 + \frac{p}{100} = 1.025$ $p = 2.5$	--- M1 --- M1 --- A1														
4a	*M1 – multiplication frame $2x^2 - 9x - 5 = (2x + 1)(x - 5)$	--- M1 --- A1														
4b	$2x^2 - 18y^2 = 2(x^2 - 9y^2)$ $= 2 \left[x^2 - (3y)^2 \right]$ $= 2(x + 3y)(x - 3y)$	---M1 ---A1														

5a	$5\text{cm} : 1\text{km}$ $5\text{cm} : 100000\text{cm}$ $1 : 20000$	--- B1
5b	$5\text{cm} : 1\text{km}$ $25\text{cm}^2 : 1\text{km}^2$ $200\text{cm}^2 : 8\text{km}^2$ Or $5\text{cm} : 1\text{km}$ $1\text{cm} : 0.2\text{km}$ $1\text{cm}^2 : 0.04\text{km}^2$ $200\text{cm}^2 : 8\text{km}^2$	--- M1 --- A1
6a	$XZ^2 + XY^2 = 20^2 + 99^2 = 10201$ $YZ^2 = 101^2 = 10201$ Since $XZ^2 + XY^2 = YZ^2$, XYZ is a right-angled triangle.	--- B1
6b	$\cos \angle XYZ = \frac{99}{101}$ $\angle XYZ = 11.4211$ Let the shortest distance from X to YZ be h . $\sin 11.4211 = \frac{h}{99}$ $h = 19.603$ $h = 19.6\text{ m}(3\text{sf})$	Or using area --- M1 --- M1 --- A1
7a	Die Coin 	--- A1 (for the 6 outcomes for the die) --- A1 (for the outcomes for the coin) *wont penalise students if they write the probabilities/write the probabilities wrongly
7bi	$\frac{3}{12} = \frac{1}{4}$	--- B1
7bii	0	--- B1
8a	3	--- B1

8b		1m --- at least 8 points plotted correctly 1m --- smooth curve drawn
8c	$x = -2.1, 4.6(\pm 0.1)$	--- B2
8d	The minimum/lowest point of the curve is at $y = -7$, so there will not be any point below $y = -7$.	--- B1
8e	Drawing of tangent correctly $\text{gradient} = \frac{1 - (-12)}{4.2 - 0}$ $= 3.0952$ $= 3.10(3sf)$	--- B1 --- B1
9ai	$\$ \left(\frac{300}{x} \right)$	--- B1
9aii	$\$ \left(\frac{300}{x} + 1.5 \right)$	--- B1
9b	$\left(\frac{300}{x} + 1.5 \right) (x - 30) = 360$ $300 - \frac{9000}{x} + 1.5x - 45 = 360$ $-\frac{9000}{x} + 1.5x - 105 = 0$ $-9000 + 1.5x^2 - 105x = 0$ $x^2 - 70x - 6000 = 0$	--- M1 (form eqn) --- M1 (expansion) --- A1
9c	$x^2 - 70x - 6000 = 0$ $(x - 120)(x + 50) = 0$ $x = 120 \quad \text{or} \quad x = -50$	--- M1 (or any other method) --- A1
9d	x represents the number of T-shirts and it cannot be a negative number.	--- B1 (or any logical explanation)

10a	$\text{Volume} = \pi(1.75)^2(2.4)$ $= 23.0907$ $= 23.1\text{cm}^3 \text{ (3sf)}$	--- B1
10b	$\text{Volume of 1 pocket} = 3.5 \times 2.4 \times 3.5$ $= 29.4\text{cm}^3$ $\text{Volume of total air} = 6(29.4 - 23.0907)$ $= 37.8558$ $= 37.9\text{cm}^3 \text{ (3sf)}$ Alternative: can take the volume of whole box – volume of macarons	--- M1 --- A1
10ci	For 12 macarons, $\text{cost of almond flour} = \frac{30}{1000} \times 65$ $= \\$1.95$ $\text{cost of powdered sugar} = \frac{2.5}{1000} \times 65$ $= \\$0.1625$ $\text{cost of castor sugar} = \frac{2.6}{800} \times 45$ $= \\$0.14625$ $\text{cost of egg whites} = \frac{2.5}{12} \times 2$ $= \\$0.4167$ } $\text{total cost of ingredients} = \frac{1}{2}(1.95 + 0.1625 + 0.14625 + 0.4167)$ $= \$1.3377$ $\text{total cost price} = 1.3377 + 2.80 + 1.65 + 0.40$ $= \$6.1877$ $= \$6.19 \text{ (nearest cent)}$	--- M1 (any 2 correct) --- M1 (finding total cost of 6 macarons, ecf) --- M1 (add packing, ecf) --- A1
10cii	$\frac{72}{6} = 12 \text{ boxes}$ $\text{total cost price with delivery} = \$6.1877 \times 12 + \$10$ $= \$84.2524$ $\text{selling price} = \$84.2524 \times 130\%$ $= \$109.528$ $= \$110 \text{ (nearest dollar)}$	--- M1 (ecf from (cii)) --- M1 (ecf) --- A1

11a	$\text{Bearing of A from C} = 360^\circ - (180^\circ - 105^\circ)$ $= 285^\circ$	--- B1
11b	$\angle BAC = 180^\circ - 105^\circ$ $= 75^\circ$ $BC^2 = 78^2 + 80^2 - 2(78)(80)\cos 75^\circ$ $BC^2 = 9253.938$ $BC = 96.197$ $\frac{\sin \angle ACB}{80} = \frac{\sin 75^\circ}{96.1973}$ $\sin \angle ACB = 0.80328$ $\angle ACB = 53.445$ $= 53.4^\circ (1dp)$	--- M1 (ecf) --- M1 (ecf) --- A1
11c	$\text{Area of } \triangle ABC = \frac{1}{2}(78)(80)\sin 75^\circ$ $= 3013.688$ $= 3010m^2 (3sf)$	--- M1 --- A1
11d	let the angle of elevation be x . $\tan x = \frac{180}{78}$ $x = 66.571$ $= 66.6^\circ (1dp)$ balloon	--- M1 --- A1
12ai	*For Qn 12, deduct one mark overall if reasons are missing or wrong $\angle BDC = 44^\circ$ Reason: angles in same segment	--- B1
12aii	$\angle ADC = 180^\circ - 58^\circ = 122^\circ$ Reason: angles in opp segment	--- B1
12bi	$\angle ADB = 122^\circ - 44^\circ$ $= 78^\circ$ $\angle BAD = 90^\circ \text{ (angle in a semicircle)}$ $\angle ABD = 180^\circ - 90^\circ - 78^\circ$ $= 12^\circ (\angle \text{sum of } \triangle)$	--- M1 (either step) --- A1

12bii	$\angle ACB = 180^\circ - 44^\circ - 58^\circ (\angle \text{sum of } \Delta)$ $= 78^\circ$ Or $\angle ACB = 78^\circ (\text{angles in same segment})$ $\angle AOB = 78^\circ \times 2 (\angle \text{at centre} = 2\angle \text{at circumference})$ $= 156^\circ$ $\angle ATB = 360^\circ - 156^\circ - 90^\circ - 90^\circ (\text{tan gent } \perp \text{ radius, } \angle \text{sum of quad})$ $= 24^\circ$ Or any other method	--- M1 --- M1 --- A1
12c	ΔATO and ΔBTO are congruent triangles.	--- B1
13ai	\$55 or \$54	--- B1
13aii	$Q_1 = \$38$ $Q_3 = \$71$ $IQR = \$71 - \38 $= \$33$	--- M1 --- A1
13aiii	$70\% \times 160 = 112$ 70^{th} percentile = \$68	--- B1
13b	Number of workers who earn more than \$60 = $160 - 94 = 66$ $\frac{66}{160} \times \frac{65}{159} = \frac{143}{848}$	--- M1 (either finding 66 or multiplying the probability (ecf) correctly) --- A1
13ci	The <u>inter-quartile range is lower</u> in company A, so the <u>wage is more consistent</u> /has a smaller spread.	--- B1
13cii	The <u>median wage</u> in company B is <u>higher</u> so I will <u>earn more</u> .	--- B1