



華僑中學

Hwa Chong Institution
Secondary 1 PAPER i

CANDIDATE
NAME

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CLASS

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REGISTER
NUMBER

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Mathematics

2 hours

Additional materials:

Writing papers

Plain paper

READ THESE INSTRUCTIONS FIRST

Write your name, class and register number on all the work that you hand in.

Write in dark blue or black pen.

You may use an HB pencil for any diagrams or graphs.

Answer **all** questions.

Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place in the case of angles in degrees, unless a different level of accuracy is specified in the question.

The use of an approved scientific calculator is expected, where appropriate.

For π , use either your calculator value or 3.142, unless the question requires the answer in terms of π .

You are reminded of the need for clear presentation in your answers.

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.

The total of the marks for this paper is 80.

- 1 Consider the following numbers.

$$1, \sqrt[3]{27}, -\frac{5}{8}, 2\pi, 3.142, \sqrt{4}, \sqrt{5}$$

Write down

(a) the prime number(s), [1]

(b) the irrational number(s), [1]

- 2 Factorise completely $6ab^2c - 12a^3bc + 2abc^2$. [2]

- 3 A car travels at an average speed of 81.5 km/h for 4.25 hours.

(a) By rounding these numbers correct to 1 significant figure, find an estimate of the distance travelled by the car. Show your working clearly. [2]

(b) Without doing any further calculation, explain why the actual distance travelled by the car is greater than the answer to **part (a)**. [1]

- 4 Simplify the following algebraic expressions.

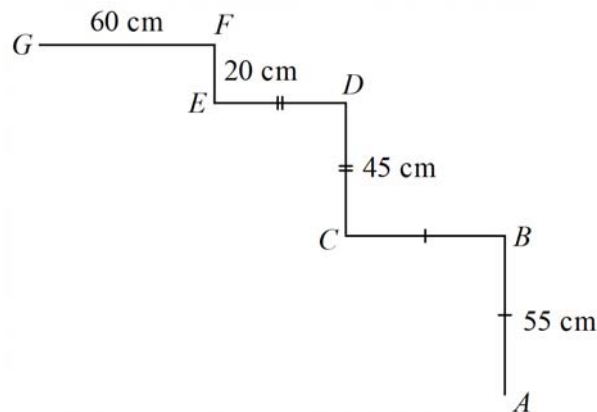
(a) $\frac{2(x-1)}{3} + \frac{3x-2}{4}$ [2]

(b) $\frac{6qr}{9p^3q} \div \frac{4pr}{3}$ [2]

- 5 Make x the subject of the formula $x = \frac{2x+1}{a}$. [3]

- 6 It is given that $0.4 \leq x \leq 0.8$ and $2 \leq y \leq 5$. If $z = \frac{y}{x}$, find the range of values of z , expressing your answer as an inequality. [3]

- 7 On a map, an area of 2 cm^2 represents an actual area of 18 km^2 .
- A town has an actual area of 31.5 km^2 .
Find the area, in square centimetres, of the town on the map. [2]
 - Express the scale of the map in the form $1 : n$. [2]
 - The distance between two fire stations on the map is 7.2 cm .
Find the actual distance, in kilometres, between the two fire stations. [2]
- 8
- Express 600 as a product of its prime factors. [1]
 - Given that $\frac{600}{m} = n^2$, where m and n are whole numbers and n is as large as possible, find the value of m and of n . [2]
 - The lowest common multiple of two numbers is 600.
The highest common factor of these two numbers is 15.
Both numbers are greater than their highest common factor.
Find the two numbers. [2]
- 9 The base and height of a triangle are $\frac{x}{2} \text{ cm}$ and $(2x + 3) \text{ cm}$ respectively.
- Find the area of the triangle in terms of x . [2]
 - The height is changed such that the area is now decreased by $\frac{x}{4} \text{ cm}^2$.
Find in terms of x , the new area and the corresponding new height. [4]
- 10 To get from Point A on the ground to Point G on the window, a flight of stairs was designed with $AB = BC = 55 \text{ cm}$, $CD = DE = 45 \text{ cm}$, $EF = 20 \text{ cm}$ and $FG = 60 \text{ cm}$. It was later replaced by a ladder with its top fixed at G and bottom secured at A. What is the length of this ladder? [2]



- 11 (a) A bank pays simple interest at the rate of 2.5% per year. How much must Vani have in the bank to earn an interest of \$240 in 6 years? [2]
- (b) Sally deposited \$20 000 in a bank that pays 0.8% per annum compound interest compounded half-yearly. Find the total amount of money she will receive at the end of 5 years, leaving your answer to the nearest cent. [2]

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

- 12 (a) James had \$8500 in a savings account. He withdrew 62% of the money. He spent $\frac{1}{4}$ of the money on a camera. Given that he bought the camera at a discount of 15%, find the marked price of the camera. [3]
- (b) In 2021, Weiming earned a gross annual income of \$93 000. Of this \$93 000, the amount that will not be subjected to income tax is shown in the following table:

Personal Relief	\$3000
Wife Relief	\$2000
Children Relief	\$4000
Life Insurance Premiums	\$5600
Donations	\$1300

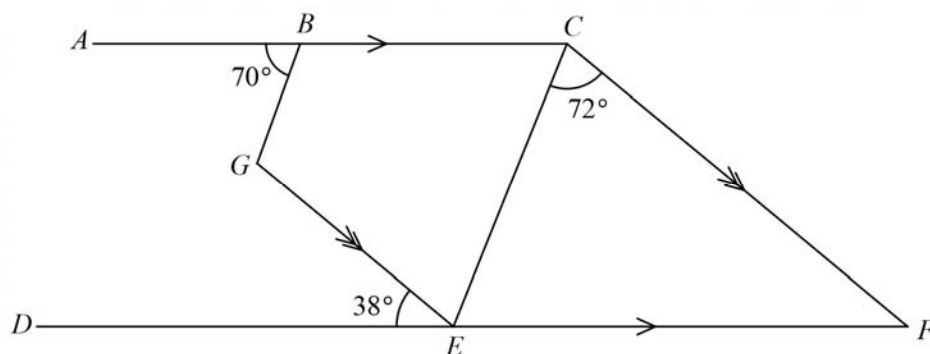
- (i) Calculate Weiming's chargeable income. [2]

The table below shows the tax rates for the year of assessment 2021.

Chargeable income	Income tax rate (%)	Gross tax payable (\$)
First \$20 000	0	0
Next \$10 000	3.5	350
First \$30 000	---	350
Next \$10 000	5.5	550
First \$40 000	---	900
Next \$40 000	8.5	3400
First \$80 000	---	4300
Next \$80 000	14	11 200

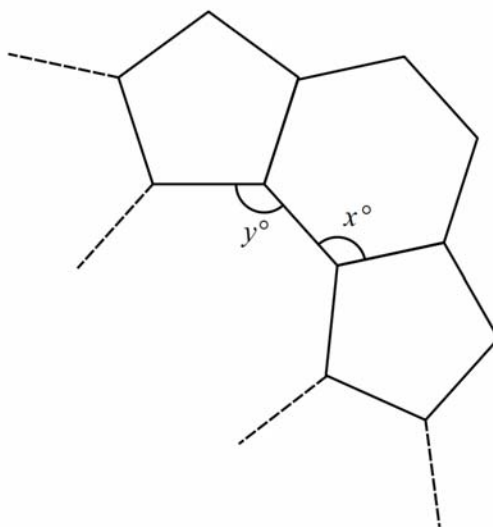
- (ii) Calculate the amount of income tax Weiming had to pay. [2]

- 13 In the diagram, AC is parallel to DF and GE is parallel to CF .
 $\angle ABG = 70^\circ$, $\angle DEG = 38^\circ$ and $\angle ECF = 72^\circ$.



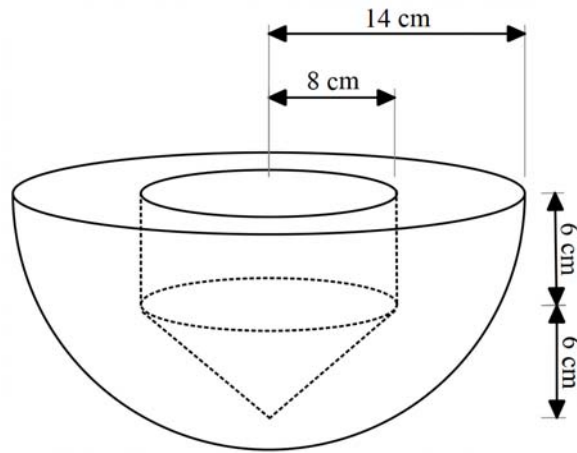
- (a) Find, giving reasons for each answer,
- (i) $\angle CFE$, [1]
 - (ii) $\angle BCE$, [2]
 - (iii) $\angle BGE$. [2]
- (b) State, showing your reasoning, whether BG is or is not parallel to CE . [2]

- 14 The diagram shows a sketch of two regular pentagons and one regular hexagon.



- (a) Find the value of x . [2]
- (b) Show that $y^\circ = 132^\circ$. [2]
- (c) By using interior and exterior angles of polygons, explain whether it is possible to repeat the pattern to form a closed figure surrounded by the pentagons and hexagons. You must show your working clearly. [3]

- 15** A metal cube of side x cm is melted to produce a hemispherical container of radius 14 cm. The container consists of a hollow cylindrical part and a hollow conical part, both of radius 8 cm and height 6 cm.



Calculate

(a) the volume of the container, leaving your answer in terms of π , [3]

(b) the value of x . [2]

$$\left[\text{Volume of cone} = \frac{1}{3}\pi r^2 h, \text{ Volume of sphere} = \frac{4}{3}\pi r^3. \right]$$

- 16 Part of a number pattern is shown in the table below.

Row 5	$\frac{2}{5 \times 6 \times 7} = \frac{1}{5} - \frac{2}{6} + \frac{1}{7}$
Row 6	$\frac{2}{6 \times 7 \times 8} = \frac{1}{6} - \frac{2}{7} + \frac{1}{8}$
Row 7	$\frac{2}{7 \times 8 \times 9} = \frac{1}{7} - \frac{2}{8} + \frac{1}{9}$
:	:
:	:

- (a) Write down the pattern for Row 19. [1]
- (b) Write down, in terms of n , the pattern for Row n . [1]
- (c) Given that $\frac{2}{9240} = \frac{1}{a} - \frac{2}{b} + \frac{1}{c}$, find the values of a , b and c . [3]
- (d) Find the value of $\frac{2}{5 \times 6 \times 7} + \frac{2}{6 \times 7 \times 8} + \frac{2}{7 \times 8 \times 9} + \dots + \frac{2}{18 \times 19 \times 20}$.
Show your working clearly. [3]

- 17 Answer the whole of this question on a sheet of plain paper.

- (a) Construct the quadrilateral $ABCD$ in which $AB = 8$ cm, $\angle BAD = 100^\circ$, $AD = 6.5$ cm, diagonal $AC = 11.5$ cm and $BC = 7.5$ cm. [2]
- (b) Measure and write down the length of CD . [1]
- (c) On the quadrilateral, construct
- (i) the perpendicular bisector of AB , [1]
- (ii) the bisector of angle BCD . [1]
- (d) Mark clearly a possible point which is inside the quadrilateral, equidistant from A and B , and is nearer to BC than DC . Label this point P . [1]

End of Paper