

Name: _____ () Class: _____



華僑中學

HWA CHONG INSTITUTION
PAPER E

MATHEMATICS

Level : Secondary One

Duration : 2 hours

Do not open this booklet until you are told to do so.

INSTRUCTIONS TO CANDIDATES

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

Answer **all** questions.

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, unless the question requires the answer in terms of π .

INFORMATION FOR CANDIDATES

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 80.

You are expected to use an electronic calculator to evaluate explicit numerical expressions. **The use of a graphing calculator is not permitted.**

You are reminded of the need for clear presentation in your answers. Omission of essential working will result in loss of marks.

This question paper consists 7 printed pages, including this page.

- 1 (i) Express the numbers as a product of its prime factors.
 (a) 28 (b) 63 [2]
- (ii) Using the results from (i), explain why 28×63 is a perfect square. [1]
- (iii) The number $28k$ is a perfect cube. Find the smallest positive integer value of k . [1]
- 2 (a) $1, \pi, \sqrt{4}, \sqrt[3]{-64}, 5.\dot{2}, \frac{1}{\sqrt{2}}, \frac{10}{2}, 13$
- From the given numbers above, state
- (i) the prime numbers, [1]
- (ii) the irrational numbers. [1]
- (b) While climbing a mountain, Joel discovers that the temperature decreases by 2°C for every 300 m that he climbs upwards. The temperature at the foot of the mountain is 18°C .
- (i) Find the temperature after Joel has climbed a height of 3.75 km from the foot of the mountain. [2]
- (ii) Find the height, in km, that Joel has climbed from the foot of the mountain if the temperature is -13°C . [2]
- 3 (i) Estimate the value of $\frac{35.71 \times 14.63}{24.49}$, giving your answer correct to 1 significant figure. [2]
- (ii) Using the result from (i), estimate the value of $\frac{3571 \times 14.63}{0.2449}$. [2]
- 4 The area of a reservoir is $180\,000\text{ m}^2$. It is represented on a map by an area of 2 cm^2 .
- (i) Find the scale of the map in the form $1 : n$. [2]
- (ii) The shoreline of the reservoir is 5.4 km long. Find, in cm, the length of the shoreline on the map. [2]

5 Simplify

(a) $7x - 4[x - 3(5 - 2x)],$ [2]

(b) $\frac{5y+1}{4} - \frac{2y-7}{3}.$ [3]

6 Factorise completely

(a) $18ab - 24a^2,$ [1]

(b) $2p - 4q + 2qr - pr.$ [2]

7 Solve the equation

(a) $2(9 - 2x) = x\left(5 + \frac{3}{x}\right),$ [2]

(b) $\frac{z+4}{7} = 1 - \frac{2z-5}{3}.$ [3]

8 (a) Solve the inequalities $\frac{1}{3}(x+1) \leq x+2 < 5-2x$. Hence illustrate your solution on a number line. [4]

(b) Given that $a = \frac{2b-1}{3+b}$, express b in terms of a . [2]

9 A motorist took 1 hour and 45 minutes to travel from Town P to Town Q with an average speed of x km/h. On his return journey, he travelled faster by 15 km/h and his travelling time was shortened by 20%.

(i) Find the time taken, in hours, for his return journey. [1]

(ii) Form an equation in x and solve for x . Hence find the average speed for the return journey. [3]

[Turn Over

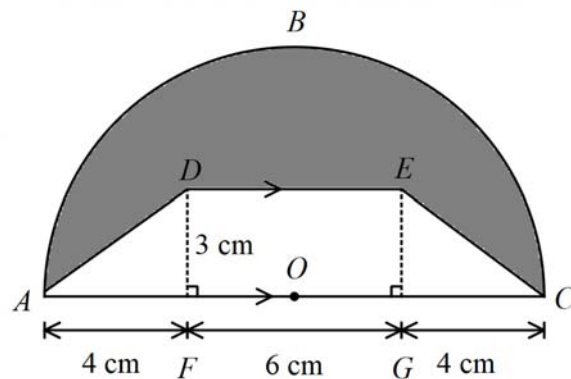
- 10** The first four terms of a sequence are given by 16, 25, 36, 49,
- (i) Write down the value of T_5 . [1]
- (ii) Find an expression for T_n , the n^{th} term of the sequence. [1]
- (iii) In a second sequence, the first four terms are 19, 28, 39, 52,
By comparing this sequence with the first, and using your answer in (ii),
write down an expression, in terms of n , for the n^{th} term of this sequence. [1]
- (iv) Explain why 125 is not a term of the sequence in (iii). [1]

- 11** Three petrol stations, Vibe, Enoc, Topz, were having a price war.
- (a) Andrew pumped petrol at Vibe which offered a 15% discount.
The price of the petrol was \$2.28 per litre before discount.
He paid \$75.52 for his petrol. How many litres of petrol did he pump? [2]

To reward loyal customers, Enoc and Topz introduced privilege cards which comes with the following benefits:

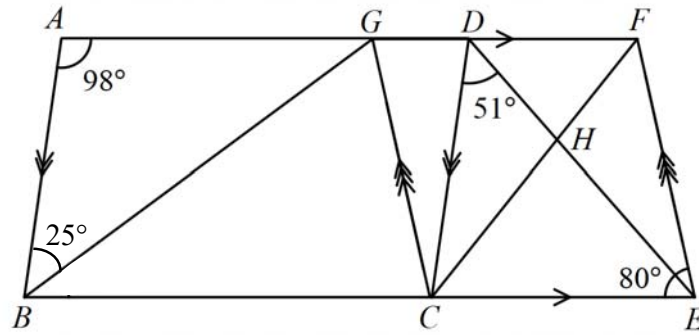
Enoc	12% off all petrol plus \$1 off for every \$20 on final bill
Topz	10% off all petrol plus 3% off the final bill

- (b) Bryan holds privilege cards from these two stations. He was deciding which petrol station to go, in order to save more money. He needed to pump 44.5 litres of petrol. Given that the price before discount is \$2.24 per litre, which petrol station should he go to? [3]
- 12** In the diagram, trapezium $ADEC$ is inscribed inside a semicircle $OABC$, centre O .



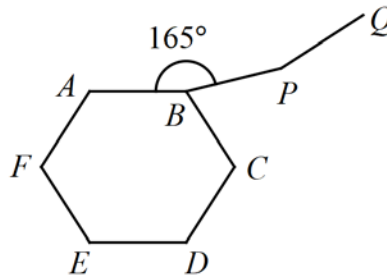
Find the area of the shaded region. [3]

- 13 (a) In the diagram, $ABCD$ is a parallelogram and $CEFG$ is a rhombus.
 $\angle BAG = 98^\circ$, $\angle ABG = 25^\circ$, $\angle CDH = 51^\circ$ and $\angle CEF = 80^\circ$.



Find, giving reasons for each answer,

- (i) $\angle GBC$, [1]
 - (ii) $\angle BGC$, [2]
 - (iii) $\angle GCD$, [1]
 - (iv) $\angle DFC$. [2]
- (b) In the diagram, $ABCDEF$ is a regular hexagon.



- (i) $ABPQ$ is part of another regular polygon where its interior angle is 165° . How many sides does this polygon have? [2]
- (ii) Calculate $\angle PBC$. [2]

[Turn Over

14 (Not examinable in 2020)

A class of 30 students was randomly divided into two equal groups, A and B. Their marks in a common test are shown in the stem-and-leaf diagram below.

Leaves for Group A				Stem	Leaves for Group B			
			8	2				7
6	0	0		3	2		8	
		2		4	5		6	
		5	1	5	5		9	
9	9	9	3	6	0	1		6
		0		7	2	7		8
		9		8	0		1	
	9	6		9				

Key: 2 | 7 means 27 marks

- (i) Find the modal mark of Group A. [1]
- (ii) Find the median mark of Group B. [1]
- (iii) John said that 'Group A performed better in the common test'. Do you agree? Justify your answer. [2]

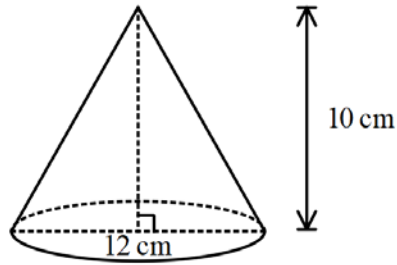


Diagram I

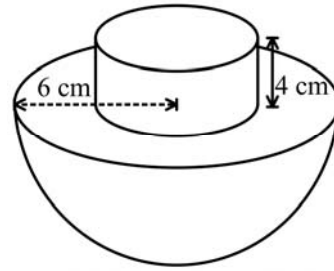


Diagram II

Shampoo *Herbal* comes in two types of bottles. Diagram I shows the first type of shampoo bottle in the shape of a cone. The diameter of the base of the cone is 12 cm and the height of the cone is 10 cm.

- (a) Calculate the volume of the cone. [2]

Diagram II shows the second type of shampoo bottle which is made up of a cylindrical neck and a hemispherical base. The height of the cylindrical part is 4 cm and the radius of the hemispherical part is 6 cm.

- (b) Calculate
- (i) the volume of the hemispherical base, [2]
 - (ii) the curved surface area of the hemispherical base. [2]
- (c) Find the radius of the cylindrical part, given that the volume of the cylindrical part is 150 cm^3 . [2]

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

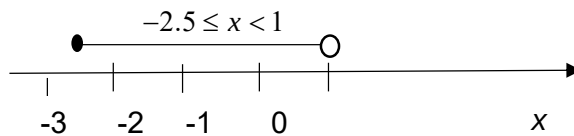
On a scale drawing, a park is in the form of a quadrilateral $ABCD$ with $AB = 9 \text{ cm}$, $\angle ABC = 70^\circ$, $BC = 3.3 \text{ cm}$, $AD = 7 \text{ cm}$ and diagonal $BD = 8.5 \text{ cm}$.

- (i) Construct the quadrilateral $ABCD$. [2]
- (ii) Construct the perpendicular bisector of AD . [1]
- (iii) Construct the bisector of $\angle BAD$. [1]
- (iv) A café is to be built in the park, nearer to A than to D and nearer to AD than to AB . Shade the region where the café is to be built. [1]

End of Paper

Short Answers:

- 1(i)(a) $28 = 2^2 \times 7$
 1(i)(b) $63 = 3^2 \times 7$
 1(iii) The smallest $k = 98$
 2(a)(i) $\sqrt{4}, \frac{10}{2}, 13$
 2(a)(ii) $\pi, \frac{1}{\sqrt{2}}$
 2(b)(i) -7°C
 2(b)(ii) 4.65 km
 3 (i) 20 (to 1 s.f.) (ii) 200 000 (to 1 s.f.)
 4 (i) 1:30 000 (ii) 18 cm
 5 (a) $60 - 21x$ (b) $\frac{7y+31}{12}$
 6 (a) $6a(3b-4a)$ (b) $(2-r)(p-2q)$
 7(a) $x = 1\frac{2}{3}$ or $\frac{5}{3}$
 7(b) $z = 2\frac{10}{17}$ or $\frac{44}{17}$
 8(a) $-2.5 \leq x < 1$



- 8(b) $b = \frac{-1-3a}{a-2}$ or $\frac{3a+1}{2-a}$
 9(i) $1.4h$
 9(ii) 75 km/h
 10(i) 64
 10(ii) $T_n = (n+3)^2$
 10(iii) $T_n = (n+3)^2 + 3$
 11(a) 39.0 l (to 3 s.f.)
 11(b) He should go to Enoc.
 12 47.0 cm^2 (to 3 s.f.)
 13(a)(i) 57°
 13(a)(ii) 43°
 13(a)(iii) $\angle GCD = 18^\circ$
 13(a)(iv) $\angle DFC = 50^\circ$
 13(b)(i) 24 sides
 13(b)(ii) 75°
 15(a) 377 cm^3 (to 3 s.f.)
 15(b)(i) 452 cm^3 (to 3 s.f.)
 15(b)(ii) 226 cm^2 (to 3 s.f.)
 15(c) 3.45 cm