Name: _____ ( ) Class: _____

華僑中學
HWA CHONG INSTITUTION
PAPER F

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 a in loss of marks.

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

1 Simplify

(a) $2(2a-3b)-3(b-2a)$, [2]

(b) $\frac{2y+1}{2}+\frac{6y-4}{3}$. [3]

2 **(a)** Given that the equation $ax-2=x$ has solution $x=\frac{1}{2}$, find the value of a. [3]

(b) If $ax-b=bx$,

(i) make x the subject of the formula, [3]

(ii) find the value of x, given that $b=1$ and $a=3$. [2]

3 Jack invested \$1000 at 3.5% simple interest for 15 years. Morgen invested \$910 at 3.5% interest compounded annually for 15 years. Who had more money at the end of 15 years? Justify your answer clearly. [3]

4 **(a)** Solve the inequality $2x+5>8-x$, illustrating your answer on a number line. [3]

(b) Express $1.\dot{3}\dot{6}$ as a fraction. [2]

(c) Without the use of the calculator, **estimate** the value of $\frac{(20.01)^3-\sqrt{144.28}}{\sqrt[3]{78.0388-13.996}}$

to two significant figures, showing your working clearly**.** [2]

5 Factorise the following expressions completely.

(a) $8ab-12b$ [1]

(b) $9(3x+2)+6x^2+4x$ [2]

6 Two points, P and Q, are 400 m apart. M is a point between P and Q. An object moves from P to M in 10 seconds and then from M to Q at a speed of 16 m/s. Let the speed between P and M be x m/s.

(i) Write down an expression in terms of x to represent the distance between P and M in metres. [1]

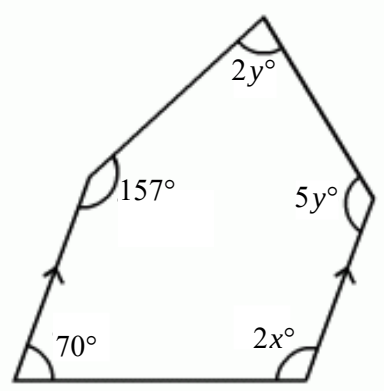
(ii) Show that the time taken, in seconds, to travel from M to Q is $\frac{200-5x}{8}$. Hence, write down the total time taken for the entire journey in terms of x. [3]

(iii) Given that the average speed for the entire journey is 20 m/s, form an equation in x and solve for x. [3]

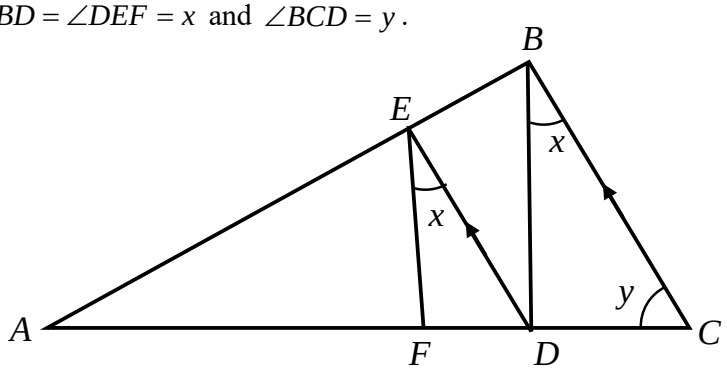
7 The diagram shows a pentagon. Find, stating your reasons,

(i) the value of x, [2]

(ii) the value of y. [2]



8 The figure shows a triangle ABC. Points D and E are points on AC and AB respectively such that ED is parallel to BC. F is another point on AC such that $\angle DEF = \angle CBD$. Let $\angle CBD = \angle DEF = x$ and $\angle BCD = y$.

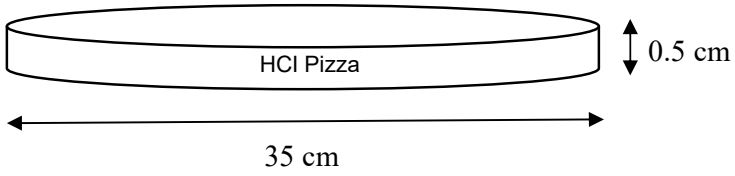


(i) Express $\angle BDC$ in terms of x and y and state the reason. [2]

(ii) Given that $x = 30°$ and $y = 50°$, find $\angle EFD$. [2]

(iii) Hence find another pair of parallel lines other than ED and BC. State the reason. [2]

9 HCI Student Entrepreneurial Club decided to raise fund for the school's centennial celebrations. The club created its very own HCI pizza. The pan that was used to cook the pizza is in the shape of a cylinder. The pan has diameter of 35cm and height of 0.5cm.



[Volume of sphere = $\frac{4}{3}\pi r^3$, Volume of cylinder = $\pi r^2 h$, where r is the radius and h is the height]

(i) Calculate the volume of the pan in cm^3, rounding your answer to the nearest integer. [2]

(ii) The dough to fill the pan completely is in the shape of a sphere. Find the radius of the sphere in cm, correct to one decimal place. [2]

(iii) Calculate the curved surface area of the pan, correct to 3 significant figures. [2]

(iv) The club decided to sell the pizza at \$10.50 each, which is at a profit of 25%. Find the cost price of a pizza. [2]

~~10~~ (Not examinable in 2020)

A group of students were surveyed for their music preferences in J-pop (*J*), E-pop (*E*) or K-pop (*K*). The following results were obtained:

100 students preferred E-pop;
95 students preferred K-pop;
68 students preferred K-pop and E-pop;
52 students preferred J-pop and E-pop;
50 students preferred K-pop and J-pop;
40 students preferred all three types of music;
8 students preferred J-pop only;
25 students preferred none of the three types of music.

(i) Illustrate the above information on a Venn diagram. [4]

(ii) Calculate the number of students who were surveyed. [2]

(iii) On your Venn diagram, shade the set $(K \cup E) \cap J'$. [1]

~~11~~ (Not examinable in 2020)

The age of 16 players in a soccer team are shown in the table below.

20	21	15	30	19	18	20	28
15	24	23	24	17	24	16	24

The stem and leaf diagram below illustrate the age of the 16 players.

Stem	Leaf								
1	***h***	5	6	7	8	9			
2	0	0	1	2	3	4	4	4	***k***
3	0								

Legend:

2 | 0 represents 20

(i) State the value of ***h*** and of ***k***. [2]

(ii) Find the mean, median and mode of the age of 16 players. [4]

If 4 new players with mean age of 21 join the soccer team with two of them being 22 and 23 years old,

(iii) find the mean age of the 20 players. [2]

(iv) find the sum of age of the other 2 new players. [1]

(v) is it possible that the median age of the 20 players is the same as the median age of the original 16 players? Explain your answer. [2]

12 Observe the following number pattern.

X	**Y**	**N**
$1^3 - 1$	0	$0 \times 1 \times 2$
$2^3 - 2$	6	$1 \times 2 \times 3$
$3^3 - 3$	24	$2 \times 3 \times 4$

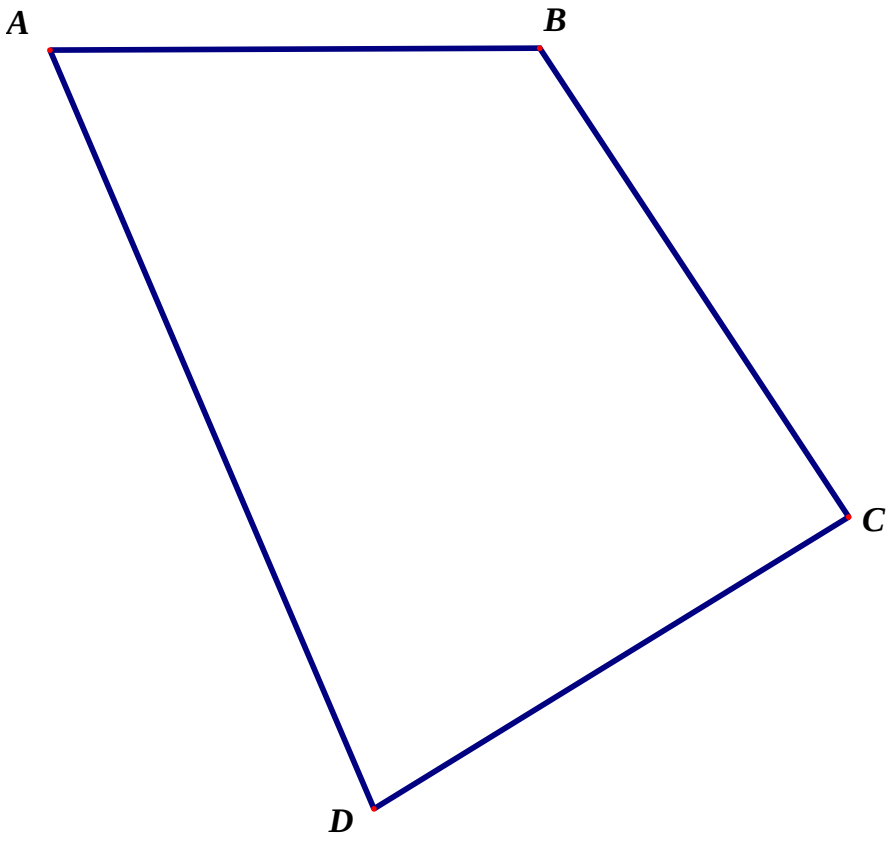
(i) Write down the HCF of the three numbers in the "**N**" column. [1]

(ii) If $X = m^3 - m$, where m is a whole number, express Y, in terms of m, as a product of 3 consecutive numbers. [2]

(iii) If $N = 2^4 \times 3^2 \times 5$ and $X = k^3 - k$, find the value of k. [2]

13. **Answer the whole of this question on this paper. Detach it from the question paper and staple it at the back of your answer sheets.**

To mark our school's 100th anniversary, the Secondary 1 cohort was given a small plot of land *ABCD*, within the school grounds, as show in the diagram below.



By measurement, length of DX = _____cm.

(i) Construct the perpendicular bisector of *AB*. [1]

(ii) Construct the bisector of angle *DCB*. [1]

(iii) Mark the intersection of the perpendicular bisector of *AB* and the bisector of angle *DCB* as *X*. Measure and write down the length of *DX*. [2]

(iv) HCI Orchids are to be planted in a region in ABCD which is nearer to *B* than to *A* and nearer to *DC* than to *BC*. Shade the region where the HCI orchids are to be planted. [2]

End of Paper

Short Answers:

Qn

1 (a) $10a - 9b$

1 (b) $\dfrac{18y - 5}{6}$

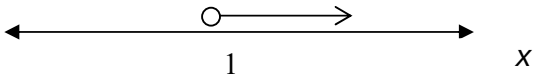
2 (a) $a = 5$

2(b) (i) $x = \dfrac{b}{a - b}$

2 (b) (ii) $x = \dfrac{1}{2}$

3 Jack had more money.

4a $x > 1$



4b $x = 1\dfrac{4}{11}$

4c 2000(to 2 sig figures)

5a $4b(2a - 3)$

5b $(3x + 2)(9 + 2x)$

6 (i) $10x$ m.

6 (ii) $\left(10 + \dfrac{200 - 5x}{8}\right)$

6 (iii) $x = 24$

7i $x = 55$

7ii $y = 29$

8 (i) $180° - x - y$

8 (ii) $100°$

9 (i) 481 cm^3

9 (ii) $r \approx 4.9 \text{ cm}$

9 (iii) Curved surface area of pan

55.0 cm^2

9 (iv) \$8.40

12 (i) 1

12 (ii) $\text{Y} = (m - 1) \times m \times (m + 1)$

12 (iii) $k = 9$

13 $DX = 5.9 \pm 0.1$