TEMASEK JC INTEGRATED PROGRAMME
YEAR ONE
2020 END-OF-YEAR EXAMINATION

FUNDAMENTAL MATHEMATICS

Date: 7 October 2020

Duration: 2 hours

Name: _____

Class: _____

Additional materials required: Graph Paper

READ THESE INSTRUCTIONS FIRST.

_____

Parent's Signature

Write in dark blue or black pen in the spaces provided in the paper.
You may use a soft pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** the 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 calculator value for should be used unless the question requires the answer in terms of π.
The use of an approved scientific calculator is expected, where appropriate.

You are reminded of the need for clear presentation in your answers. Marks will be deducted for poor or unclear presentation.

The number of marks is given in brackets [ ] at the end of each question or part question.

The total score for this paper is 80 marks.

This paper consists of **22** printed pages and **0** blank pages.

Question	Marks
1	
2	
3	
4	
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6	
7	
8	
9	
10	
11	
12	
13	
Presentation Deduction	−1
Total	

Answer all questions in the spaces provided. Show all working clearly.

1 Jack and Jill went to fetch a pail of water each from a well. The ratio of the amount of water that Jack fetched to Jill's amount is 5 : 2. After pouring 0.3 litres of water from Jack's pail to Jill's pail, the ratio of the amount of water is now 11 : 5. Find

(i) the total amount of water that the both of them had fetched, [3]

(ii) the percentage change in the amount of water in Jack's pail after pouring the water into Jill's pail. [2]

2 **(a)** The numbers 3 888 000 000, 138 240 000 and 7 290 000 000 written as a product of their prime factors, are

$3\,888\,000\,000 = 2^{10} \times 3^5 \times 5^6$,

$138\,240\,000 = 2^{13} \times 3^3 \times 5^4$,

$7\,290\,000\,000 = 2^7 \times 3^6 \times 5^7$.

Find

(i) the greatest whole number that divides 3 888 000 000, 138 240 000 and 7 290 000 000, leaving your answers in index form, [1]

(ii) the lowest common multiple of 3 888 000 000, 138 240 000 and 7 290 000 000, leaving your answers in index form, [1]

(iii) the smallest positive integer n such that the product of n and the lowest common multiple of 3 888 000 000, 138 240 000 and 7 290 000 000 is a perfect cube. [1]

(b) Ruhua has between 200 to 400 sweets. If he divides his sweets into groups of 11, he will have 10 sweets left. If he divides his sweets into groups of 13, he will have 12 sweets left. Find the number of sweets left if he divides his sweets into groups of 17. [3]

3 **Without the use of a calculator**, evaluate $3-\left[2\frac{4}{5}\times\left(-1\frac{3}{7}\right)^2-\left(\frac{\sqrt[3]{64}}{3}\right)\div\left(-1\frac{2}{5}\right)\right]$,

showing your working clearly. [5]

4 **(a)** **Without the use of a calculator**, estimate $\dfrac{\sqrt[3]{65.125}+(10.92)^2}{9.81}$, giving your answer correct to 2 significant figures. [4]

(b) Meiling has \$27. She wants to buy 5 pens at \$2.95 each, 2 notebooks at \$4.10 each and 3 highlighters at \$2.05 each.

Without the use of a calculator, estimate the total amount that Meiling has to pay for these stationeries and determine if she has enough money. [3]

5 **(a)** Factorise the expression $-6b^2c-18b^2c^2-12b^3c$. [2]

(b) Simplify the expression $\dfrac{3-2x}{15}-\left(-\dfrac{2x+5}{5}+\dfrac{x-4}{10}\right)$. [4]

6 **(i)** Solve the equation $\dfrac{2x-7}{2}+\dfrac{10-x}{3}=5-\dfrac{4x-1}{6}$. [3]

(ii) Hence, or otherwise, solve the equation $\dfrac{4y-7}{2}+\dfrac{10-2y}{3}=5-\dfrac{8y-1}{6}$. [2]

7 **(i)** A wire is bent into the shape of a rectangle. Its length is 4 cm less than 3 times its breadth. Given that the breadth of the rectangle is x cm, find an expression, in terms of x, for

(a) the length of the rectangle, [1]

(b) the perimeter of the rectangle. [1]

When the same wire is bent to form a square, the area of the square is 100 cm^2.

(ii) Find the perimeter of the square. [1]

(iii) Using your results in **(i)(b)** and **(ii)**, form an equation in x and solve it. [2]

(iv) Hence, find the area of the original rectangle from **(i)**. [2]

[Turn over

8 The weekly wages of a senior waiter and a junior waiter at a restaurant are shown in the table below.

	Basic Weekly Wage	Additional amount earned per customer served
Senior Waiter	\$200	\$0.16
Junior Waiter	\$150	\$0.10

In a particular week, the junior waiter served x customers and the senior waiter served 50 customers more than the junior waiter.

(i) Express, in terms of x, the amount earned in that week by

(a) the senior waiter, [1]

(b) the junior waiter. [1]

(ii) Given that the senior waiter earned \$76 more than the junior waiter, calculate the number of customers served by the senior waiter. [4]

9 **(a)** The first four terms in a sequence are 3, 5, 7, 9. Find an expression, in terms of n, for the nth term of this sequence. [1]

(b) Consider the following number pattern:

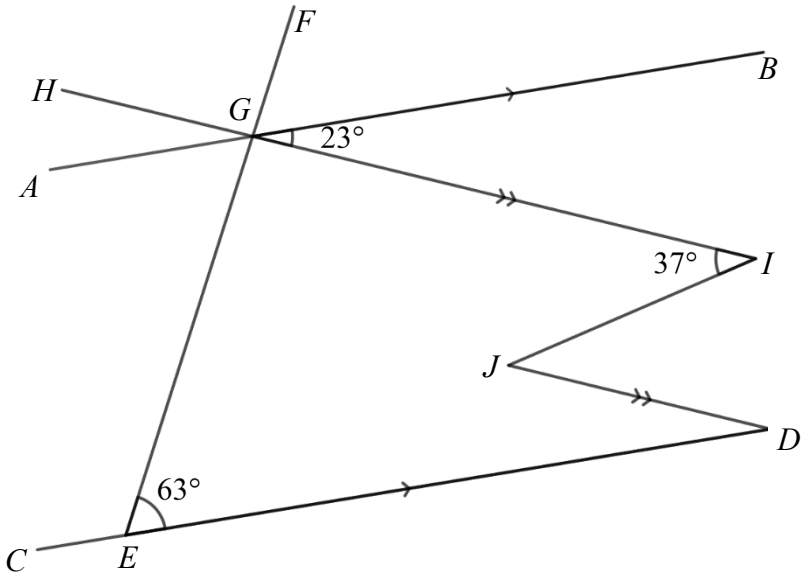
Row	**Sum**
1	$1^2+3=4=2^2$
2	$2^2+5=9=3^2$
3	$3^2+7=16=4^2$
4	$4^2+9=25=5^2$
⋮	⋮
10	
⋮	⋮
n	

(i) With reference to the table above, fill in the blanks in the table below. [3]

(ii) Explain whether 216 is a term in this sequence. [1]

(iii) Given that the difference between two consecutive terms in this sequence is 97, find these two consecutive terms. [2]

10 In the diagram below (not drawn to scale), the line segment AB is parallel to CD and HI is parallel JD. Point E is on the line segment CD. Point G is the intersection between the line segments AB, HI and FE. Given that $\angle BGI = 23°$, $\angle GIJ = 37°$ and $\angle GED = 63°$, find,



(i) $\angle HGA$, [1]

(ii) $\angle EGI$, [1]

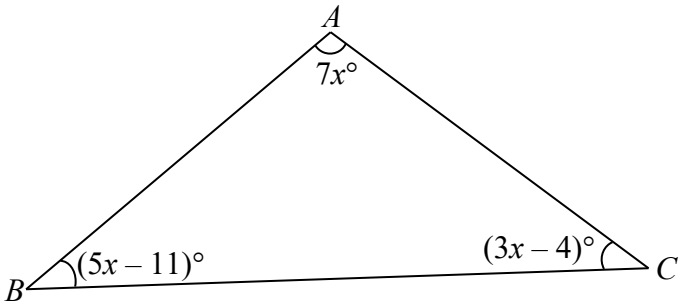
(iii) $\angle DJI$, [1]

(iv) reflex $\angle JDE$. [3]

[Turn over

11 **(a)** The figure below shows $\triangle ABC$.

By forming an equation in x, find the value of x. [2]

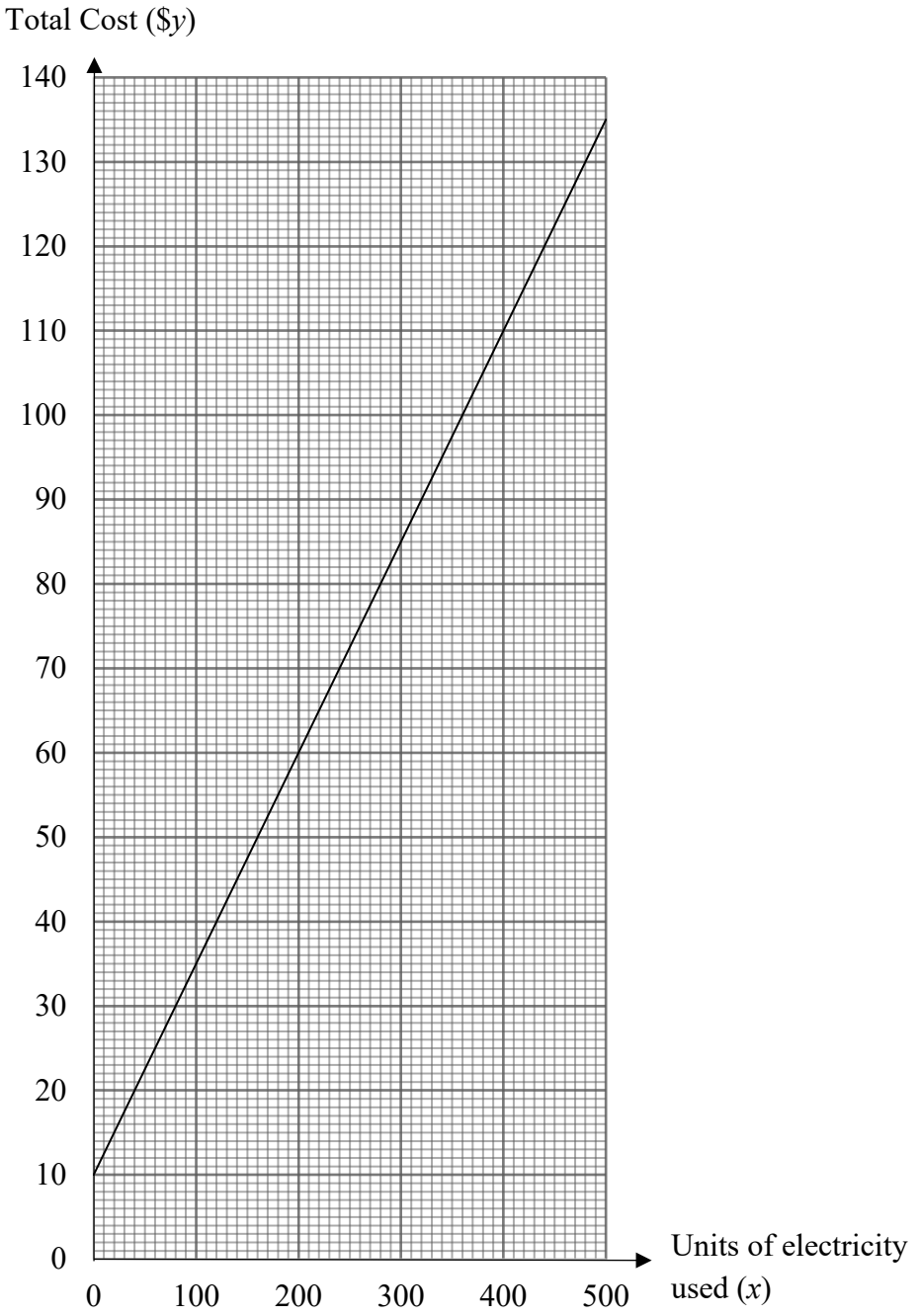


(b) **(i)** Find the sum of the interior angles of a heptagon. [1]

[A heptagon is a polygon with seven sides.]

(ii) 4 of the exterior angles of this heptagon are 50°, while the others are $(x + 7)°$, $(x + 9)°$ and $(2x + 12)°$. Find the largest interior angle of this heptagon. [3]

12 The graph below shows the relation between the number of units of electricity used, x, and the total cost, \$$y$, of the electricity bill.



(i) Use the graph to find the number of units of electricity used when the total bill costs \$110. [1]

(ii) Given that the equation of the graph can be written in the form $y = mx + c$,

(a) state the value of c and explain its significance. [2]

(b) calculate the value of m and explain its significance. [3]

[Turn over

13 **(i)** On a sheet of graph paper, using a scale of 4 cm to represent 1 unit on the x-axis and 1 cm to represent 1 unit on the y-axis, plot the graph of $y = 5x - 2$ for the values of x from −2 to 2. [3]

(ii) By drawing the line $y = 5.4$ on the same axes, state the coordinates of the point of intersection, A. [2]

(iii) On the same sheet of graph paper, plot the points $B(1, 1)$ and $C(2, 1)$. [2]

(iv) Find the area of triangle ABC. [1]

End of Paper

[Answers]

1 **(i)** $11.2l$ **(ii)** 3.75%

2 **(a)(i)** $2^7 \times 3^3 \times 5^4$ **(a)(ii)** $2^{13} \times 3^6 \times 5^7$

(a)(iii) 100 **(b)** 13

3 $-3\frac{2}{3}$

4 **(a)** 13 **(b)** Not enough.

5 **(a)** $-6b^2c(1+3c+2b)$ **(b)** $\frac{5x+48}{30}$

6 **(i)** 4 **(ii)** 2

7 **(i)(a)** $3x-4$ cm **(i)(b)** $8x-8$ cm

(ii) 40 cm **(iii)** 6

(iv) 84 cm^2

8 **(i)(a)** $\$(208+0.16x)$ **(i)(b)** $\$(150+0.1x)$

(ii) 350

9 **(a)** $2n + 1$

(b)(i) $T_{10} = 10^2 + 21 = 121 = 11^2$, $T_n = n^2 + 2n + 1 = (n+1)^2$

(b)(ii) 2 304, 2 401

10 **(i)** 23° **(ii)** 94°

(iii) 37° **(iv)** 337°

11 **(a)** 13

(b)(i) 900° **(b)(ii)** 140°

12 **(i)** 400 units **(ii)(a)** \$0.25 for each unit of electricity used

(ii)(b) basic/fixed cost incurred even if no electricity is used

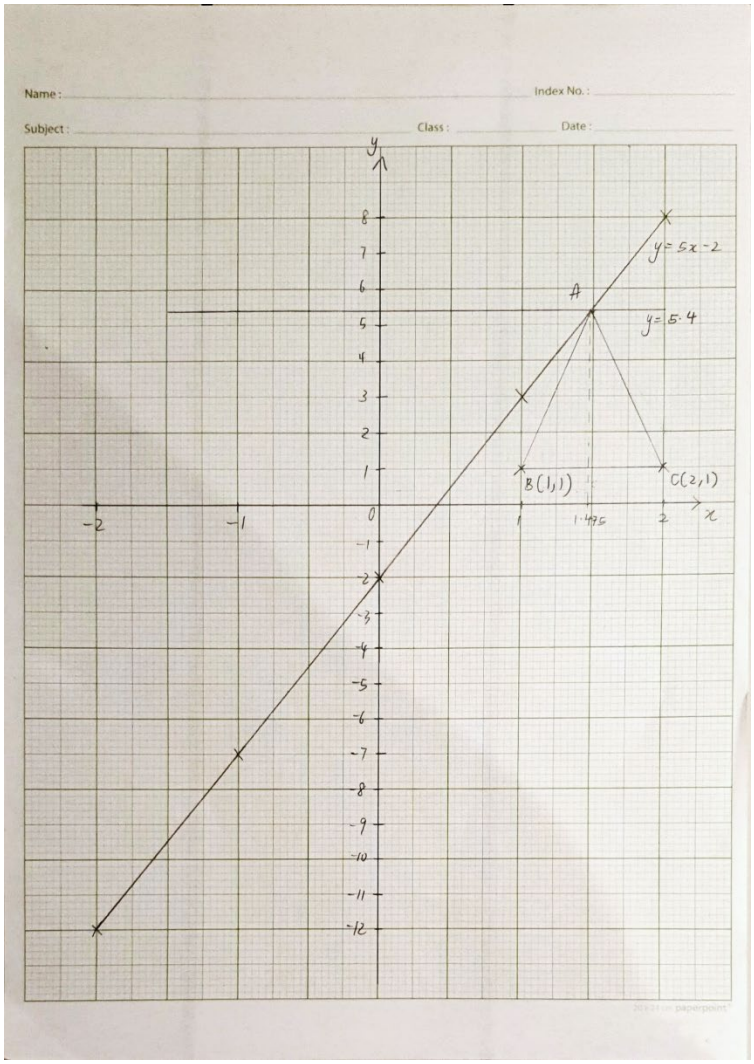
13 **(i)**

x	−2	−1	0	1	2
y	−12	−7	−2	3	8

Refer to graph

(ii) A (1.475, 5.4) or values obtained from the graph

(iii) Refer to graph



(iv) Area $= \frac{1}{2} \times 1 \times 4.4 = 2.2$ units^2

[Turn over