Name:	Index Number:	Class:

HUA YI SECONDARY SCHOOL

4E Preliminary Examination 2022 **4E**

MATHEMATICS **4048/1**

Paper 1

2022
2 h

Candidates answer on the Answer Space provided.

Mark Scheme

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1.

$2^{1000}(1+2^3)$ -----M1 factorise
$= 2^{1000} \times 3^2$

m = 1000, n = 2----A2

2.

(a)

6----B1

(b)

30-3n-------B1

(c)

No as -31 is not a divisible by 3, or we will get n = 20.3, but n must be a whole number. ----------B1

3.

(a)

$AB = DC$ (Given) (S)

$AC = DB$ (Given) (S)

BC = CB (S) common side M1
Hence ΔABC is congruent to ΔDCB. (SSS) A1

(b) Since ΔABC is congruent to ΔDCB, $\angle DBC = \angle ACB$ $\angle DBC = \angle ACB$.
Hence triangle TBC is an isosceles triangle. ----B1

4.

(a) $450 = 2 \times 3^2 \times 5^2$-----B1

(b)

45 ----B1

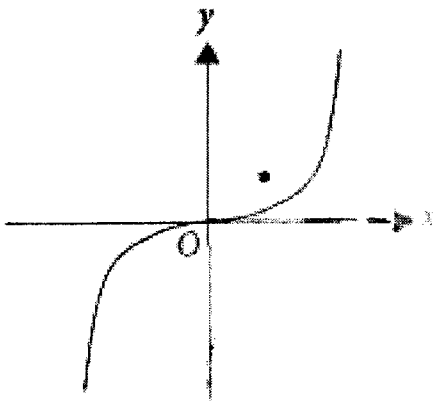
(c)

147 ---B1

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5.

B1 – curve A1 below the point (If curve is wrong then 0)



6.

$-3y = 3/5$ ---M1 (convert 1/7 to 7^{-1})

$y = -1/5$ ----A1

7.

$$\frac{25q^2}{4p^6} \div \frac{4}{p^{-2}q} \text{----} M1$$

$$= \frac{25q}{p^{-1}}$$

$$= 25pq \text{----} A1$$

8.

$$-0.6 \le x < 0.8 \text{------} B1$$

9.

$4x + 3 \ge -10$---M1

$x \ge -3.25$---A1

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10.

(a)

$v = \frac{4}{3}$ ---B1

(b)

$9v^2 = 25 - x^2$ ----$M1$

$x^2 = 25 - 9v^2$ ----$M1$

$x = \pm\sqrt{25 - 9v^2}$ ------$A1$($A0$ if no $\pm$)

11.

$9n^2 + 6n + 1 + 2$ ----$M1$

$3(3n^2 + 2n + 1)$ ----$A1$

12.

(a)

$\frac{3}{5} \times \frac{1}{3} \times \frac{1}{4} = \frac{1}{20}$ ---$B1$

(b)

$1 - \frac{2}{5} \times \frac{1}{3} \times \frac{1}{4}$ ---$M1$

$= \frac{29}{30}$ ---$A1$

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13.

(a)

Ans:

$\angle BAC = \angle ADB$(A)(Given)
$\angle ABC = \angle ABD$(A)(common) --------M1

Hence
triangle ABC is similar to triangle DBA. (AA) -----A1

(b)

$$\frac{7}{5+CD} = \frac{5}{7} ---M1$$
$$CD = 4.8 ----A1$$

14. a.

$$\frac{V_{small}}{V_{big}} = \frac{1}{8}$$
$$\frac{H_{small}}{H_{big}} = \frac{1}{2} ----M1$$
$$H_{big} = 10 ------A1$$

b.

$$\frac{A_{small}}{A_{big}} = \frac{1}{4}$$
$$A_{small} = \frac{1}{4} \times 26 = 6.5 ------A1$$

c. Disagree – because the mass of the cups is equal to mass of the paper. Thus the ratio of their mass should be equal to the ratio of their areas. Mass of big cup should be 4 times that of mass of small cup.

15. Sum of the three equal interior angles = 375-----M1
One interior angle = 125------M1
x = 235----A1

16.

$$\angle ABC = 68 - 19(corresponding angles) --M1$$
$$= 49$$
$$\angle ACB = 49(isos.\Delta) ------M1$$
$$\angle CDA = 24.5(exterior angle, iso\Delta) --A1$$

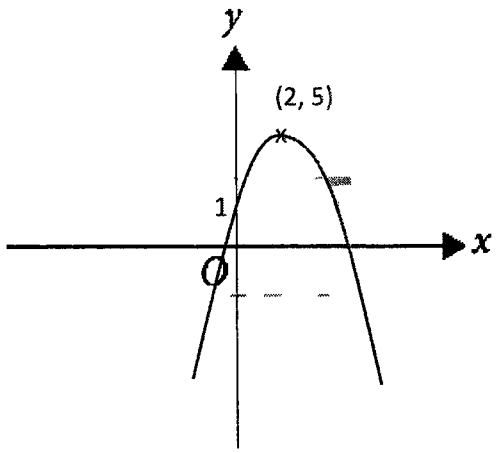
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17.

r = 0.4 , n = 5 -----B1 each

18. (a)

Symmetrical curve -----A1
Coordinates of turning point and y intercept ----A1



(b)

The maximum point is (2, 5). The maximum value of y is 5. Hence there will be no solution if y is more than 5. ----B1
or
y = 7 do not the intersect the graph.

[1]

19. (a)

$3\left(9x^2-4\right)---M1$

$3(3x-2)(3x+2)---A1$

Ans: _____ [2]

(b)

$$\frac{5}{3(3x-2)(3x+2)}-\frac{2}{(3x-2)}----M1$$

$$=\frac{5}{3(3x-2)(3x+2)}-\frac{2(3)(3x+2)}{3(3x-2)(3x+2)}----M1$$

$$=\frac{-7-18x}{3(3x-2)(3x+2)}---A1$$

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20. Let the fraction be $\frac{x}{x+3}$.

$\frac{x+1}{x+3+1}=\frac{7}{8}$ ----M1

$8x+8=7x+28$ -----M1

$x=20$

Ans : $\frac{20}{23}$ -----A1

21.

a)

$\overrightarrow{QR}=\overrightarrow{QP}+\overrightarrow{PR}=\begin{pmatrix}-2\\3\end{pmatrix}+\begin{pmatrix}-3\\9\end{pmatrix}=\begin{pmatrix}-5\\12\end{pmatrix}$ ---------M1

Length of QR = 13 units ----------A1

b) P (-2, 8) ------B1

22.

(a)

$\{7\}\in C$ $B\cup C=\{4\}$ $\{9\}\subset B$ $A\cap B=\{\phi\}$ $5\notin A'$ [2]

(b)

$\{4\}$ -----B1

(c)

The elements in set B are **perfect squares less than 10**. -----B1

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23. **(a)**

3, 6, 8, 9, 9,

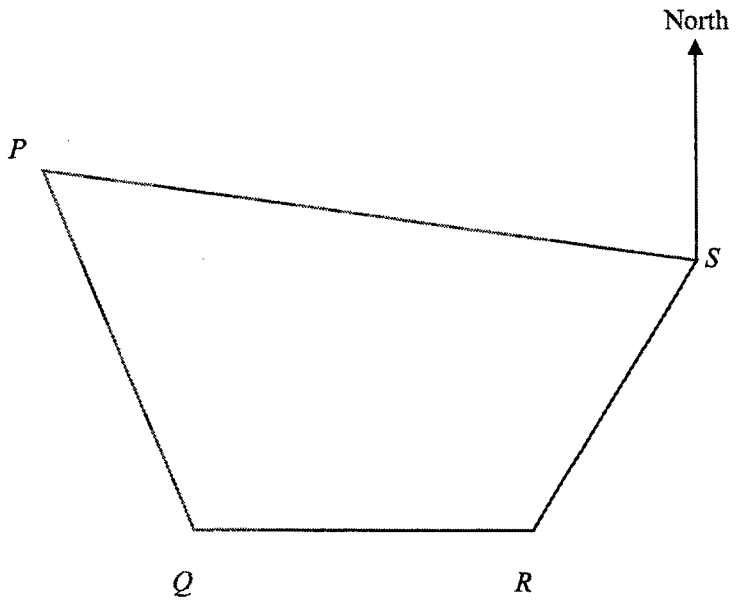
B1 for getting 3, 6, B1 for getting 8,9,9

(b)

He is wrong as there are different number of boys and girls. --------A1

$\frac{5(68)+8(55)}{13}=60$ -------A1

24.



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25.

(a)

$1200 \div 1.6 = 750$

(b)

On 23rd : \$1.5775 = 1 euro
1200 euro = \$1893 ------(Least)

On 10th / 12th , \$1.605 = 1 euro
1200 euro = \$1926 (greatest)

Difference = \$33 ------A1(Difference)

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HUA YI SECONDARY SCHOOL

4E Preliminary Examination 2022 **4E**

MATHEMATICS **4048/2**

Paper 2

2022
2 h 30 min

Candidates answer on the Answer Space provided.

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Mathematical Formulae

Compound interest

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

Mensuration

Curved surface area of a cone = πrl

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

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

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

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

Arc length = $r\theta$, where θ is in radians

Sector area = $\frac{1}{2}r^2\theta$, where θ 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

Mean = $\frac{\Sigma fx}{\Sigma f}$

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

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Answer **all** the questions.

1.

(a)

$\frac{42}{x}$ ------B1

(b)

$\frac{42}{x+0.5}$ -----B1

(c)

(i)

$$\frac{42}{x}-\frac{42}{x+0.5}=\frac{1}{4}-----M1$$
$$84=x^2+0.5x-----M1$$
$$2x^2+x-168=0------A1$$

(ii)

$$x=\frac{-1\pm\sqrt{1^2-4(2)(-168)}}{2(2)}-----M1$$

$x=8.919=8.92(3sf)$------A1 *or* $-9.419=-9.42(3sf)------A1$

(iii) $\frac{42}{8.919+0.5}=4.459h=4.46h(3sf)-----M1$

$= 4$ h 28 min -------A1

2. (a)

(i)

1.25 ---------B1

(ii)

Find area of triangle AOC: 0.5 (12)(8)(sin 1.25) = 45.55 ----M1 ecf
Find area of sector AOB: 0.5 (12^2)(1.25) = 90 ------M1 ecf
Area of shaded region = 44.45 ----------A1

(iii)

Find AC using cosine rule = 12.14 ---------M1
Perimeter = 31.1 (3sf) --------A1

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(b)

(i)

32+38 = 70 (isosceles triangle AOD and AOB)

(ii)

140 (angle at center = twice angle at circumference)

(iii)

Find DCB using opposite angle of cyclic quad (M1 ecf)

Angle ODC = 180 – angle DCB (interior angles, // lines)
=180-110
=70-------A1

3.

(a) .

$AD^2 = 4^2 + 12^2$ --------M1
AD = 12.649 (shown) -----A1

(b)

Area of ABCD = 96 -------M1
Lateral area = (10+12+6+12.649) x 16 =650.384 --------M1

Surface area = 842.384
=842 (3sf) -----A1

(c)

Volume of prism = 96 (16) -----M1
= 1536 -----A1

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4.

(a)

$3\mathbf{c} - 3\mathbf{a}$ -----**B1**

(b)

$3\mathbf{a} - 1.5\mathbf{c}$ -----**B1**

(c)

$\overrightarrow{AK} = 1.5\mathbf{c} + \frac{1}{3}(3\mathbf{a} - 1.5\mathbf{c}) ----M1$

$= \mathbf{c} + \mathbf{a}$

$\overrightarrow{AK} = 2\overrightarrow{KP} -----M1$

This implies that AK// KP and they have a common point K. Hence A, K and P lies on a straight line. -----A1

(d)

1/ 2 ------B1

(e)

1/6 -----B1

5.

(a)

Form equation : Area of trapezium $0.5(20+55)v = 450$ ---------M1

Get $v = 12$ -----A1

(b)

Acceleration = 1.2 ------M1 or use similar triangle

Speed at t = 8 , 1.2(8)= 9.6 -----A1

(c)

[1]

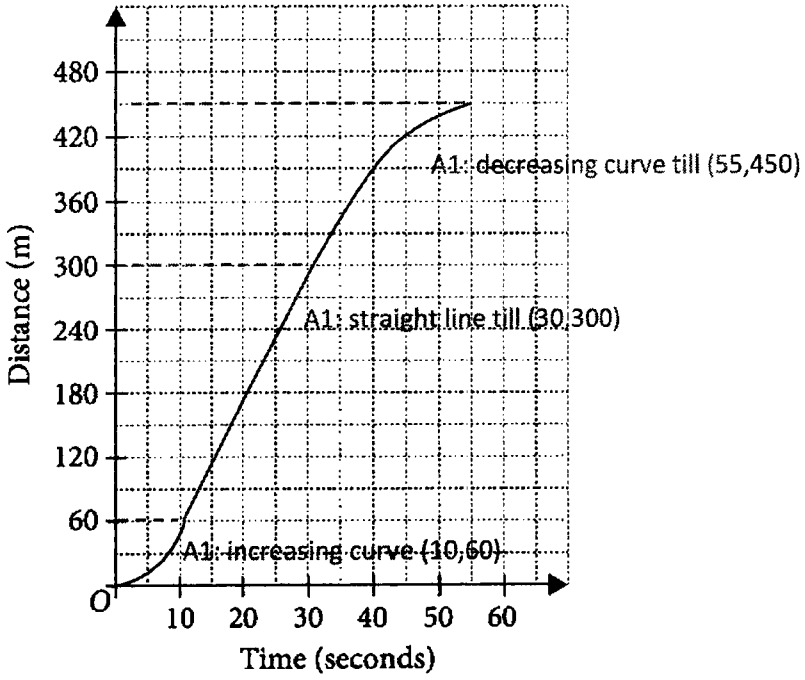
The motorcyclist is travelling at a constant speed . ------B1

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(d)

0.48 ------B1

(e)



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6.

(a)

$p = 3.4$ -----B1

(b) See graph

(c) Draw any line that cuts y- axis at -2 and intersect the curve at 2 points for $-4 \le x \le 4$.

One possible line is the line that passes through (2,-1.4) and (0, -2)

$$m = \frac{-1.4-(-2)}{2-0} = 0.3 \text{-----} A1$$

$0.3 \le m \le 1.95$

(d)

Get y = 4 ----M1
The line y = 4 intersect the curve at 1 point, hence the equation only has one solution------A1

(e)

B1 for graph

(f)

Form $\frac{x^3}{5} - 2x + 1 = -\frac{x}{2} + 2$ ----M1

Balance equation -------M1
Get $2x^3 - 15x - 10 = 0$ ------A1

---

7. **(a)**

Time taken = 11/3 h or 1 h 20 min -----M1

Time expected to arrive at B = 0005 or 12:05am ----A1

(b)

Use cosine rule :
$PQ^2 = 300^2 + 120^2 - 2(300)(120)\cos 116$ -------M1

PQ = 368.73
=369 (3sf)

(c)

Form sine rule equation or cosine rule to find angle QPB-----M1
find angle QPB------M1 (ecf)

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bearing of Q from P = 064 - 017.00 =047.0----A1

8. (a)

(i)

11.625---B1

(ii)

It was because we do not have the actual timing for each customer. ---B1

(iii)

5.35 -----B1

(iv)

I would go to Shop B although the the mean is slightly higher than shop A. But the smaller SD suggest that the more consistency in the waiting time. ----B1

Or

I would go to Shop A as the mean is smaller, meaning on average I will have a shorter waiting time. ----B1

Any reasoning that is logicial.

(v)

The mean will remain the same and the SD will decrease. B1 each

(b)

(i)

52 ---B1

(ii)

66----B1

(iii)

44 -----B1

(iv)

180-75 -------M1 (Find 75)
=105 ------B1

9. (a)

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$\begin{pmatrix} 84 & 90 & 56 \\ 92 & 60 & 61 \end{pmatrix}$ ---B1

(b) $\begin{pmatrix} 1812 & 886 \\ 1673 & 853 \end{pmatrix}$ -----B1

(c) 48.9% -----B1

(d) (1742.5 869.5)--------A1

(e) The average sale for the 2 days is \$1742.50 and the average profit is \$ 869.50. ---B1

10. (a)

(i) Find gradient or y intercept correct ---M1

$$y = \frac{3}{8}x + 3\frac{1}{4} - - - A1$$

She is not correct as the y intercept should be 3.25.

(ii) Use Pythagoras' thm or formula ------M1
AB = 5 units

(iii) -4/5 -----B1

(iv) $x = -1$ or 5

(b) (i)

$$\frac{130000000}{55} - - - - M1$$
$$= 2.37 \times 10^6 - - - - - - - - - - A1$$

(ii)
$(1.3 \times 10^8) \div 70 \div 10 \div 150$----M1
$= 1238$ ---- A1

11 (a)

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$$\text{interest} = \frac{2}{100} \times 40000 \times \frac{30}{12} = 2000 - - - M1$$

monthly instalment = 42000 ÷ 30=1400---A1

(b)

$\frac{5100}{85} \times 15$ ----M1 (85% is \$5100, find 15%)

= 900------A1

(c) Teaching staff : 12 (2)(4)(\$70) + 14(2)(4)(\$90)= (\$6720 + \$10080) = \$16 800 M1

Total staff cost : 16 800 + 1800 + 45(5)(4)=\$19500

Rental and printing cost = 8400

Total operational cost per month = \$19500 + 8000+400 =27900 M1

Total fee collected (assuming each class has the minimum number of students)
= 12(5)(\$200) + 14(5)(\$300) ---M1
=\$33 000

(\$52800 if they find 8 students per class) Can find for other number as well but they have to state.

Min Profit per month = \$5100 ---M1

Her target of a minimum of \$5000 per month can be reached as her minimum profit per month is \$5100. –A1 justification

\$5100 x 6 months = \$30 600 < \$45 100 + 2000 interest ----M1

She might miss her target of recovering her start up cost within 6 months as the total profit for 6 months assuming she get the minimal number of students per class is less than the start up cost.--_A1

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