Name:	Index Number:	Class:

HUA YI SECONDARY SCHOOL

4G2 **Preliminary Examination 2024** **4G2**

MATHEMATICS

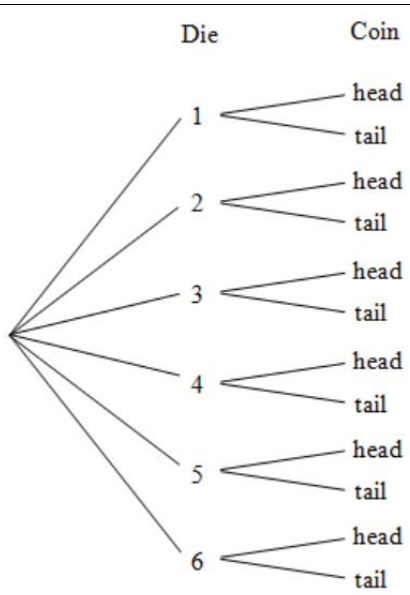
Paper 2

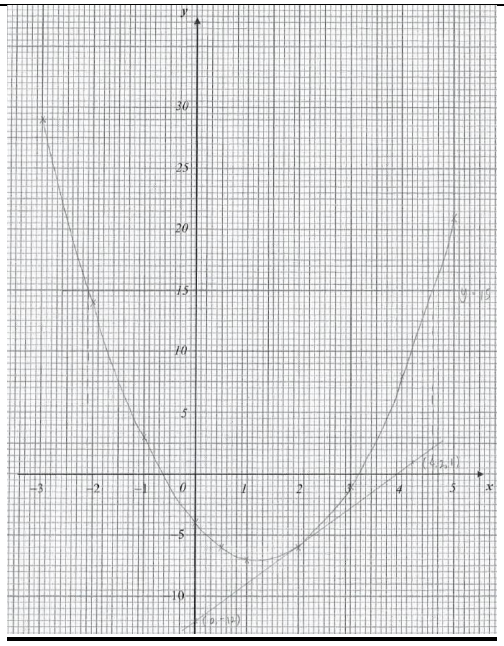
MARK SCHEME

For Examiner's Use

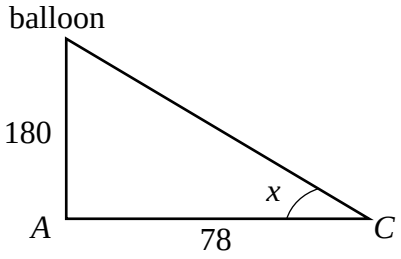
[Turn Over

Qn	*Suggested Solution*	*Mark Allocation*
1ai	Not all the **<u>powers</u>** of the prime factors are **<u>even numbers/multiples of 2</u>**.	--- B1
1aii	$k = 2\times 3\times 11^2$ $= 726$	--- B1
1bi	2 | 2100 2 | 1050 3 | 525 5 | 175 5 | 35 7 | 7 1 $2100 = 2^2\times 3\times 5^2\times 7$	--- M1 --- A1
1bii	$HCF = 2^2\times 3$ $= 12$	--- B1 *(ecf)*
2	$\frac{(70\times 2.5)+(2x)}{4.5} = 80$ $175+2x = 360$ $2x = 185$ $x = 92.5$	--- M1 ---M1 --- A1
3	$10506.25 = 10000\left(1+\frac{p}{100}\right)^2$ $1.050625 = \left(1+\frac{p}{100}\right)^2$ $1+\frac{p}{100} = 1.025$ $p = 2.5$	--- M1 --- M1 --- A1
4a	*M1 – multiplication frame $2x^2-9x-5 = (2x+1)(x-5)$	--- M1 --- A1
4b	$2x^2-18y^2 = 2(x^2-9y^2)$ $= 2\left[x^2-(3y)^2\right]$ $= 2(x+3y)(x-3y)$	---M1 ---A1

5a	$5cm:1km$ $5cm:100000cm$ $1:20000$	--- B1
5b	$5cm:1km$ $25cm^2:1km^2$ $200cm^2:8km^2$ Or $5cm:1km$ $1cm:0.2km$ $1cm^2:0.04km^2$ $200cm^2:8km^2$	--- M1 --- A1
6a	$XZ^2+XY^2=20^2+99^2=10201$ $YZ^2=101^2=10201$ Since $XZ^2+XY^2=YZ^2$, XYZ is a right-angled triangle.	--- B1
6b	$\cos\angle XYZ=\frac{99}{101}$ Or using area $\angle XYZ=11.4211$ Let the shortest distance from X to YZ be h. $\sin 11.4211=\frac{h}{99}$ $h=19.603$ $h=19.6\,m\,(3sf)$	--- M1 --- M1 --- A1
7a		--- A1 *(for the 6 outcomes for the die)* --- A1 *(for the outcomes for the coin)* ***wont penalise students if they write the probabilities/write the probabilities wrongly**
7bi	$\frac{3}{12}=\frac{1}{4}$	--- B1
7bii	0	--- B1
8a	3	--- B1

8b		1m --- at least 8 points plotted correctly 1m --- smooth curve drawn
8c	$x = -2.1, 4.6 (\pm 0.1)$	--- B2
8d	The minimum/lowest point of the curve is at $y = -7$, so there will not be any point below $y = -7$.	--- B1
8e	Drawing of tangent correctly $gradient = \dfrac{1-(-12)}{4.2-0}$ $= 3.0952$ $= 3.10 (3sf)$	--- B1 --- B1
9ai	$\$\left(\dfrac{300}{x}\right)$	--- B1
9aii	$\$\left(\dfrac{300}{x}+1.5\right)$	--- B1
9b	$\left(\dfrac{300}{x}+1.5\right)(x-30)=360$ $300-\dfrac{9000}{x}+1.5x-45=360$ $-\dfrac{9000}{x}+1.5x-105=0$ $-9000+1.5x^2-105x=0$ $x^2-70x-6000=0$	--- M1 *(form eqn)* --- M1 *(expansion)* --- A1
9c	$x^2-70x-6000=0$ $(x-120)(x+50)=0$ $x=120 \quad or \quad x=-50$	--- M1 *(or any other method)* --- A1
9d	x represents the number of T-shirts and it cannot be a negative number.	--- B1 *(or any logical explanation)*

10a	$Volume = \pi(1.75)^2(2.4)$ $= 23.0907$ $= 23.1cm^3\ (3sf)$	 --- B1
10b	$Volume\ of\ 1\ pocket = 3.5 \times 2.4 \times 3.5$ $= 29.4cm^3$ $Volume\ of\ total\ air = 6(29.4 - 23.0907)$ $= 37.8558$ $= 37.9cm^3\ (3sf)$ **Alternative: can take the volume of whole box – volume of macarons**	--- M1 --- A1
10ci	For 12 macarons, $\text{cost of almond flour} = \frac{30}{1000} \times 65$ $= \$1.95$ $\text{cost of powdered sugar} = \frac{2.5}{1000} \times 65$ $= \$0.1625$ $\text{cost of castor sugar} = \frac{2.6}{800} \times 45$ $= \$0.14625$ $\text{cost of egg whites} = \frac{2.5}{12} \times 2$ $= \$0.4167$ $\text{total cost of ingredients} = \frac{1}{2}(1.95 + 0.1625 + 0.14625 + 0.4167)$ $= \$1.3377$ $\text{total cost price} = 1.3377 + 2.80 + 1.65 + 0.40$ $= \$6.1877$ $= \$6.19\ (\text{nearest cent})$	 --- M1 *(any 2 correct)* --- M1 *(finding total cost of 6 macarons, ecf)* --- M1 *(add packing, ecf)* --- A1
10cii	$\frac{72}{6} = 12\ boxes$ $\text{total cost price with delivery} = \$6.1877 \times 12 + \$10$ $= \$84.2524$ $\text{selling price} = \$84.2524 \times 130\%$ $= \$109.528$ $= \$110\ (\text{nearest dollar})$	 --- M1 *(ecf from (cii))* --- M1 *(ecf)* --- A1

11a	$Bearing\ of\ A\ from\ C = 360° - (180° - 105°)$ $= 285°$	--- B1
11b	$\angle BAC = 180° - 105°$ $= 75°$ $BC^2 = 78^2 + 80^2 - 2(78)(80)\cos 75°$ $BC^2 = 9253.938$ $BC = 96.197$ $\frac{\sin \angle ACB}{80} = \frac{\sin 75°}{96.1973}$ $\sin \angle ACB = 0.80328$ $\angle ACB = 53.445$ $= 53.4° (1dp)$	--- M1 *(ecf)* --- M1 *(ecf)* --- A1
11c	$Area\ of\ \Delta ABC = \frac{1}{2}(78)(80)\sin 75°$ $= 3013.688$ $= 3010 m^2 (3sf)$	--- M1 --- A1
11d	let the angle of elevation be x. $\tan x = \frac{180}{78}$ $x = 66.571$ $= 66.6° (1dp)$  	--- M1 --- A1
12ai	***For Qn 12, deduct one mark overall if reasons are missing or wrong** $\angle BDC = 44°$ Reason: angles in same segment	--- B1
12aii	$\angle ADC = 180° - 58° = 122°$ Reason: angles in opp segment	--- B1
12bi	$\angle ADB = 122° - 44°$ $= 78°$ $\angle BAD = 90°$ (angle in a semicircle) $\angle ABD = 180° - 90° - 78°$ $= 12° (\angle\ sum\ of\ \Delta)$	--- M1 *(either step)* --- A1

12bii	$\angle ACB = 180° - 44° - 58° (\angle \, sum \, of \, \Delta)$ $= 78°$ **Or** $\angle ACB = 78° (angles \, in \, same \, segment)$ $\angle AOB = 78° \times 2 (\angle \, at \, centre = 2 \angle \, at \, circumference)$ $= 156°$ $\angle ATB = 360° - 156° - 90° - 90° (\text{tan} \, gent \perp radius, \angle \, sum \, of \, quad)$ $= 24°$ Or any other method	--- M1 --- M1 --- A1
12c	ΔATO and ΔBTO are congruent triangles.	--- B1
13ai	\$55 or \$54	--- B1
13aii	$Q_1 = \$38$ $Q_3 = \$71$ $IQR = \$71 - \$38$ $= \$33$	 --- M1 --- A1
13aiii	$70\% \times 160 = 112$ 70^{th} percentile $= \$68$	 --- B1
13b	Number of workers who earn more than $\$60 = 160 - 94 = 66$ $\frac{66}{160} \times \frac{65}{159} = \frac{143}{848}$	--- M1 *(either finding 66 or multiplying the probability (ecf) correctly)* --- A1
13ci	The **inter-quartile range is lower** in company *A*, so the **wage is more consistent**/has a smaller spread.	--- B1
13cii	The **median wage** in company *B* is **higher** so I will **earn more**.	--- B1