SECONDARY 4 NORMAL (ACADEMIC) MARKING SCHEME
PRELIMINARY EXAMINATION 2024
ELEMENTARY MATHEMATICS

PAPER 2

SECTION A

Question	Answer	Marks	Guidance
1(a)(i)	42.1 million = 4 21 000 00 = 42 100 thousand	B1	
1(a)(ii)	0.005 187 62 $\approx$ 0.0052 (4 decimal places)	B1	
1(b)	$\frac{6.582\times0.891^2}{\sqrt{435.18}}$ $\approx\frac{7\times1^2}{\sqrt{400}}$ $=0.35$	M1 A1	
	Total	**4**	

Question	Answer	Marks	Guidance
2(a)	$7^a\times49=7^5$ $7^a\times7^2=7^5$ $\therefore a+2=5$ $a=3$	M1 A1	
2(b)	$\left(\frac{16}{x^4}\right)^{-\frac{3}{4}}$ $=\left(\frac{x^4}{16}\right)^{\frac{3}{4}}$ $=\left(\frac{x^4}{2^4}\right)^{\frac{3}{4}}$ $=\frac{x^3}{8}$	M1 A1	
	Total	**4**	

Question	Answer	Marks	Guidance
3(a)	$p = 40 - (3 + 7 + 12 + 8 + 5)$ $p = 5$	B1	
3(b)	p(more than 2) = $\frac{12+8+5}{40}$ = $\frac{25}{40}$ = 0.625	M1 A1	
3(c)	mean = $\frac{(0\times3)+(1\times7)+(2\times5)+(3\times12)+(4\times8)+(5\times5)}{40}$ = $\frac{110}{40}$ = 2.75	M1 A1	
	Total	**5**	

Question	Answer	Marks	Guidance
4(a)	15 units --- 180° 1 unit --- $\frac{180°}{15}$ = 12° 2 units (exterior angle) ---- $12°\times2$ = 24° $\therefore n = \frac{360°}{24°}$ = 15	M1 A1	

4(b)	angle $CDE = \frac{180^\circ - 50^\circ}{2}$ $= 65^\circ$ (isosceles triangle) angle $BAC = 360^\circ - 230^\circ$ $= 130^\circ$ (angles at a point) angle $ABC = 180^\circ - 130^\circ - 20^\circ$ $= 30^\circ$ (angles in sum of triangle) $\therefore$ angle $ABD = 35^\circ + 30^\circ$ $= 65^\circ$ Conclusion: Since angle $ABD = 65^\circ$ and angle $CDE = 65^\circ$, by corresponding angles, line AB is parallel to line CD.	M1 M1 M1 M1 A1	
	Total	**6**	

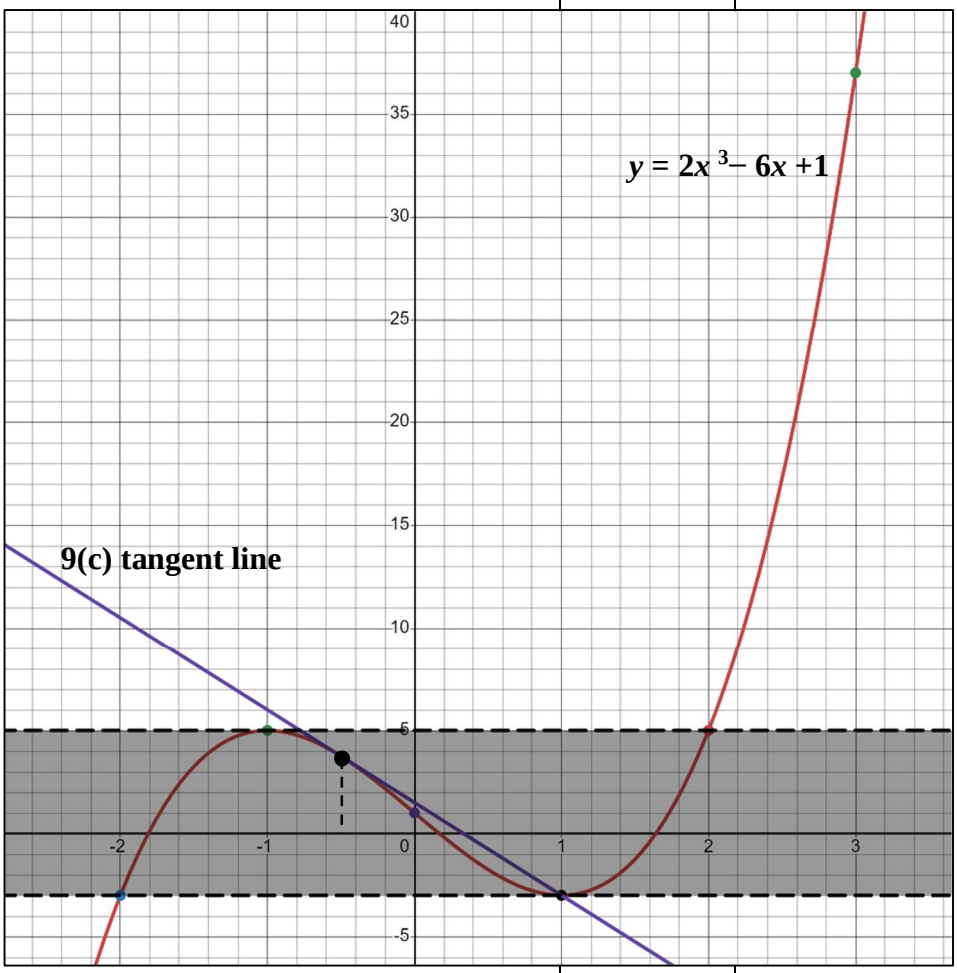
Question	Answer	Marks	Guidance
5(a)	For the first part of the journey, remaining distance = 300 - 180 = 120 km Time taken for remaining journey = $\frac{D}{s}$ $= \frac{120}{75}$ $= 1.6$ h Average speed for entire journey = $\frac{\text{Total Distance}}{\text{Total Time}}$ $= \frac{300}{1.8 + 1.6}$ $\approx$ 88. 23529412 $\approx$ 88.2 km/h (3 sig fig)	M1 M1 A1	Accept answer in fraction: $88\frac{4}{17}$ km/h

5(b)	Total surface area = $2\pi(7.6)(2.5) + 2\pi(7.6)^2$ = 482.2973042 ≈ 482 cm^2 (3 sig. fig)	M1 A1	
	Total	**5**	
Question	**Answer**	**Marks**	**Guidance**
6(a)	70% × \$149 = \$104.30 60% × \$95 = \$57 Total = \$104.3 + \$57 = \$ 161.30	M1 M1 A1	
6(b)	Let x be the price of the 1st handbag paid after discount. $x + (x - \$25.80) = \$184.20$ $2x = \$210$ $x = \$105$ 70% --- \$105 $100\% = \frac{\$105}{70} \times 100$ = \$150	 M1 M1 A1	
	Total	**6**	

Question	**Answer**	**Marks**	**Guidance**
7(a)(i)	$h = \frac{16.2}{\frac{1}{2} \times 8.5}$ $h = 3.811764706$ ≈ 3.81 (3 sig.fig)	M1 A1	
7(a)(ii)	If angle Z is a right-angle, then by PT, $XZ = \sqrt{9.2^2 - 8.5^2}$ $= 3.519943181$ ≈ 3.52 (3 sig.fig) Since length of XZ is not equal to 3.81 (answer in a(i)), XZ is not the perpendicular height from X to YZ. Thus, triangle XYZ is not a right-angled triangle.	 M1 A1	

7(b)	$\tan 35^\circ = \dfrac{\text{height}}{80}$ $\therefore$ height = $\tan 35^\circ \times 80$ $= 56.01660306$ ≈ 56.0 (3 sig.fig)	M1 A1	
	Total	**6**	

Question	**Answer**	**Marks**	**Guidance**
8(a)	$5x^2 - 3x = 7$ $5x^2 - 3x - 7 = 0$ $x = \dfrac{-(-3) \pm \sqrt{(-3)^2 - 4(5)(-7)}}{2(5)}$ $x = \dfrac{3 \pm \sqrt{149}}{10}$ $x = 1.520655562$ or $x = -0.920655616$ $x = 1.52$ or $x = -0.92$	 M1 M1 A1	
8(b)	$2x - 6y = 31y$ $2(8 - 12y) - 6y = 31$ $16 - 24y - 6y = 31$ $-30y = 15$ $y = -0.5$ when $y = -0.5$, $x = 8 - 12(-0.5)$ $x = 14$	 M1 A1 A1	
8(c)	Amy : x years old Mr Pang: $3x$ years old <u>15 years time</u> Amy: $x + 15$ Mr Pang: $3x + 15$ $3x + 15 = 2(x + 15)$ $3x + 15 = 2x + 30$ $x = 15$	 M1 M1 A1	
	Total	**9**	

Question	Answer	Marks	Guidance
9(a)	$h = -3$ $k = 5$	B1 B1	
9(b)	Plotting all the points correctly. Smooth curve. 	B2 B1	Award B1 for only at most 1 incorrect plotted point.
9(c)	Drawing the correct tangent at $x = -0.5$. Gradient = –4.5 (±1)	M1 A1	 Award A1 based on finding the gradient correctly with their own tangent
9(d)	$-3 < m < 5$ (see the shaded region above, where the horizontal line will cut exactly at 3 points)	B1, B1	B1 for correct min value B1 for correct max value
	Total	**9**	

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>10(a)(i)</td><td>
<table>
<tr><td></td><td>Comfort</td><td>Strides</td></tr>
<tr><td>Flag down fare (Premium)</td><td>$4.10

(take the average between $3.9-$4.3)</td><td>$4.20

(take the average between $4.1 to $4.3)</td></tr>
<tr><td rowspan="2">Distance Rate fare</td><td colspan="2">12 km = 12 000m
12 000 /400 = 30</td></tr>
<tr><td>$0.35 ×30
= $10.50</td><td>$0.34 ×30
= $10.20</td></tr>
<tr><td>Metered Fare</td><td>$4.10 + $10.5
= <u>$14.60</u></td><td>$4.20 + $10.20
= <u>$14.40</u></td></tr>
</table>
Hence, Strides is a cheaper option as compared to ComfortDelGro by $0.20.</td><td>M1

M1

A1</td><td>Award M1 for taking the maximum value/minimum value as the flag-down fare (instead of taking average)

Award M1 for metered fare based on the chosen flag down fare

A1 for writing down the conclusion statement</td></tr>
<tr><td>10(a)(i)</td><td>
<table>
<tr><td>Booking Fee</td><td>$3.30</td></tr>
<tr><td>Timed Based Surcharge</td><td>25% × $14.40

= $3.60</td></tr>
<tr><td>Total metered fare (MF + BF + TBS)</td><td>$14.40 + $3.30 + $3.60

= $21.30</td></tr>
</table></td><td>M1

A1</td><td></td></tr>
<tr><td>10(b)</td><td>10% × $25.40
= $2.54

9% GST = 9% × ($25.40 + $2.54)
= $2.5146

Payment surcharges = $2.54 + $2.5146
= $5.0546

Total payment = $25.40 + $5.0546
= $30. 4546 (≈ $30.45)</td><td>M1

M1

A1</td><td></td></tr>
<tr><td colspan="2">Total</td><td>8</td><td></td></tr>
</table>

SECTION B

Question	Answer	Marks	Guidance
11(a)(i)	27 min	B1	
11(a)(ii)	LQ (200) = 14 min UQ (600) ≈ 25.5 min IQR = 25.5 – 14 = 11.5 min	 B1	 No marks for UQ to be exact at 25. Award B1 for their estimated UQ in the following range: $25 < \text{UQ} \leq 25.5$.
11(a)(iii)	800 – 240 = 560	 B1	
11(b)(i)	$\frac{15-x}{15}$	B1	
11(b)(ii)	$\frac{15-x}{15} \times \frac{x}{15-1}$ $= \frac{(15-x)(x)}{210}$ $= \frac{15x-x^2}{210}$	M1 A1	
11(b)(iii)	P(first ribbon gold) = $\frac{15-x}{15}$ P(second ribbon gold) = $\frac{15-x-1}{15-1}$ $= \frac{14-x}{14}$ $\therefore \frac{14-x}{14} = \frac{4}{7}$ $\Rightarrow 14-x=8$ $\Rightarrow x=6$		
	Total	**8**	

SECTION B

Question	Answer	Marks	Guidance
12(a)(i)	angle $BEC = \frac{70^\circ}{2}$ $= 35^\circ$ (angle at centre = $2 \times$ angle at circumference)	B1	
12(a)(ii)	angle $ACE = 31^\circ$ (angle in same segment)	B1	
12(a)(iii)	angle $BOA = 180^\circ - 70^\circ$ $= 110^\circ$ (adjacent angles on a straight line) $\therefore$ angle $AGB = 360^\circ - 110^\circ - 90^\circ - 90^\circ$ $= 70^\circ$ (2 external tangents from a point)	M1 A1	
12(b)i)	area of semi-circle = $\frac{1}{2}\pi(6)^2$ $= 18\pi$ cm^2 area sector = $\frac{18\pi}{3}$ $= 6\pi$ cm^2	M1 A1	
12(b)ii)	$\frac{1}{2}(12)^2\theta = 6\pi$ $72\theta = 6\pi$ $\theta \approx 0.2617993878$ ≈ 0.262 (3 sig.fig)	M1 A1	
	Total	**8**	