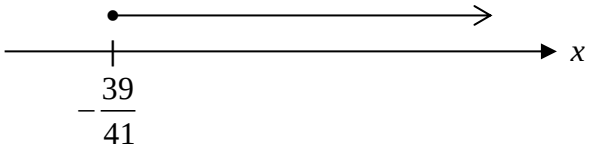
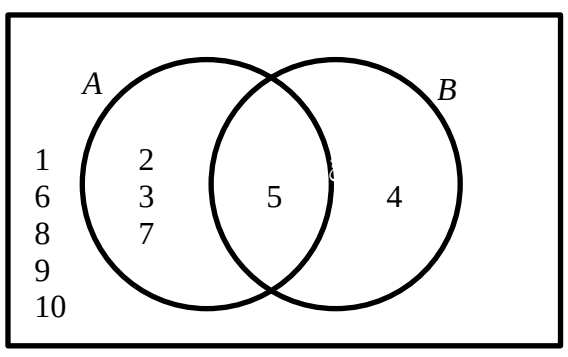
Tampines Secondary School

2023 Sec 4E/5N Mathematics 4052/02 Preliminary Examination Mark Scheme

[√ means follow through] **Total Marks : 90**

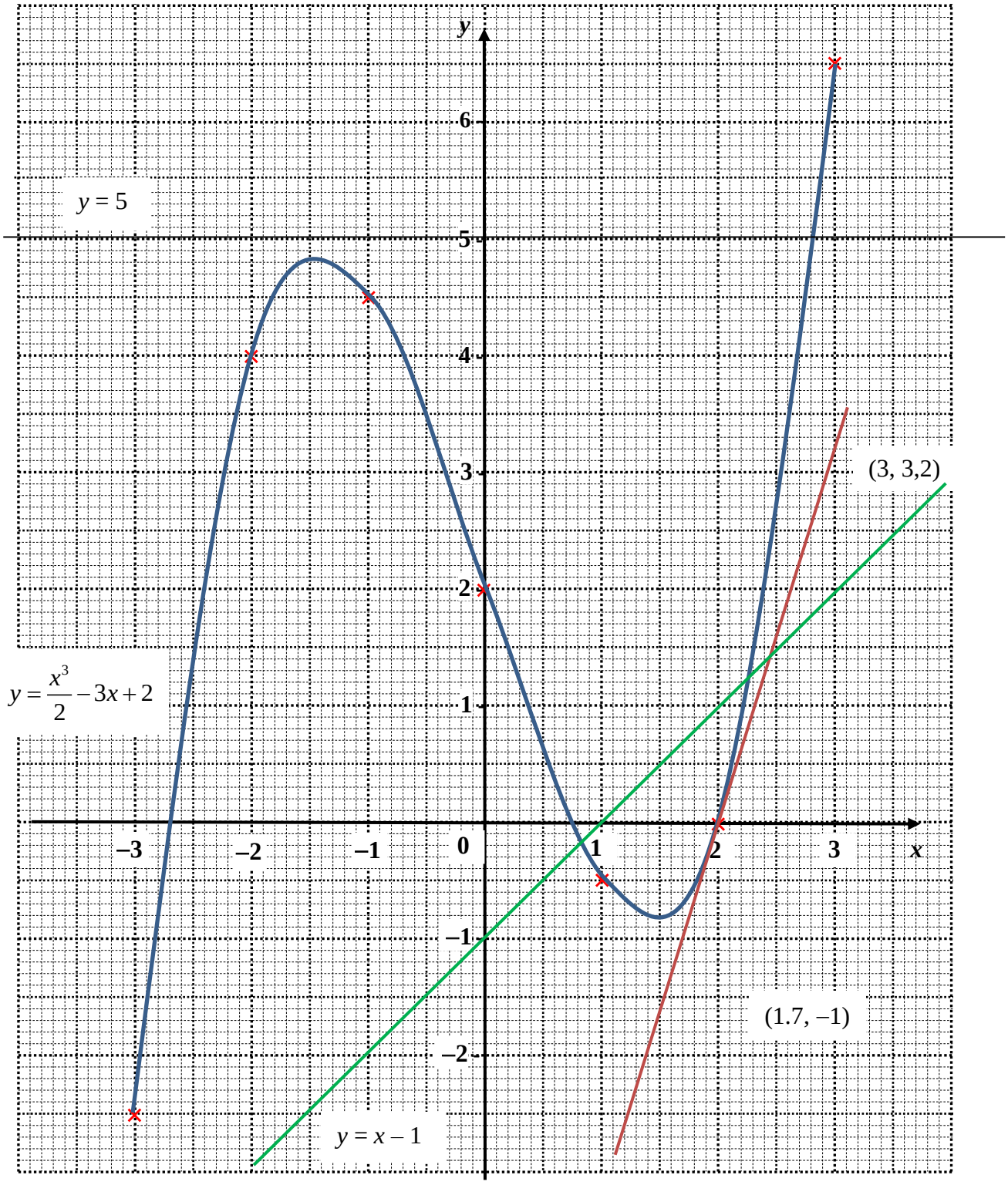
Qn	Solutions	Marks Allocation	
1a(i)	5	B1	
1a(ii)	$p=\sqrt{\frac{64-qr}{q}}$ $p^2=\frac{64-qr}{q}$ $p^2q=64-qr$ $q(p^2+r)=64$ $q=\frac{64}{p^2+r}$	M1: Sq both sides M1: Remove fraction A1	
1(b)	$\frac{5}{6-x}+\frac{4}{x-6}=2$ $\frac{5}{6-x}-\frac{4}{6-x}=2$ $\frac{1}{6-x}=2$ $1=12-2x$ $x=5.5$	M1: Combine fraction M1: Remove fraction A1	
1(c)	$3x-7\le\frac{50}{3}x+6$ $-\frac{41}{3}x\le 13$ $x\ge-\frac{39}{41}$	M1 A1	
1c(i)		B1	
1c(ii)	0	√B1	**11**
2a(i)		B1	

2a(ii)	1, 6, 8, 9, 10	√B1	
2a(iii)	**n(*A*) = 4**. If *C* is a proper subset of *A*, the number of **elements in *C* must be less than 4**. Hence Anthony's claim in **not valid**.	B1: soi n(*A*) = 4 B1: soi n(*C*) <4	
2b(i)	$a = 20$, $b = 26$	B2	
2b(ii)	$6n + 2$	B1	
2b(iii)	$6n + 2 = 2258$ $n = 376$ No. of squares = 1128	 M1 A1	**9**
3a(i)	5.985×10^6	B1	
3a(ii)	$\frac{5985000}{734.3} = 8150.6$ $= 8.2 \times 10^3$	M1 A1	
3(b)	Value in 2022 = $\frac{84}{100} \times 20\,000 = \$16800$ Value in 2021 = $\frac{16800}{120} \times 100\%$ = \$14 000	M1 M1 A1	
3(c)	<u>If exchange in Singapore</u> Amount of RM= 3350 <u>If exchange in Malaysia</u> Amount of RM = $\frac{1000}{33.5} \times 100$ = 2985.07 Since RM 3350 in Singapore > RM2985 in Malaysia, I do not agree with Mrs Raj.	A1 M1 A1	**9**
4a(i)	$\overrightarrow{PR} = \begin{pmatrix} 8 \\ 6 \end{pmatrix}$ $\left\lvert\overrightarrow{PR}\right\rvert$ = 10 units	M1 A1	
4a(ii)	$\overrightarrow{PQ} = \overrightarrow{PO} + \overrightarrow{OQ}$ $\begin{pmatrix} 11 \\ 2 \end{pmatrix} = \overrightarrow{PO} + \begin{pmatrix} 2 \\ 3 \end{pmatrix}$ $\overrightarrow{OP} = \begin{pmatrix} -9 \\ 1 \end{pmatrix}$	 M1 A1	
4b(i)	3 : 2	B1	
4b(ii)	$2\mathbf{a} + 4\mathbf{b}$	A1	
4b(iii)	$\overrightarrow{AE} = \overrightarrow{AB} + \overrightarrow{BE}$ $8\mathbf{a} + 4\mathbf{b} = 6\mathbf{a} + \overrightarrow{BE}$		

	$\overrightarrow{BE} = 2\mathbf{a} + 4\mathbf{b} = \overrightarrow{AD}$ Hence *ABED* forms a parallelogram.	A1	
4biv(a)	1 : 2	B1	
4biv(b)	3 : 2	B1	**9**
5a(i)	60 minutes	B1	
5a(ii)	72 minutes	B1	
5a(iii)	76 – 66 = 10 minutes	M1 A1	
5(b)	12.5% × 200 = 25 boys n = 80	M1 B1	
5(c)	The cumulative frequency would be shifted to the left by 5 minutes.	B1	
5(d)	Secondary 1 Girls Median = 62 minutes Interquartile range = 7 minutes 1. The **girls took a shorter time** to complete the task as compared to the boys because the **girls' median at 62 minutes is shorter** than then boys' median at 72 minutes. 2. The time taken by the **girls** to complete the task is **more consistent** because the interquartile ranges for the **girls at 7 minutes is shorter than the boys' at 10 minutes.**	B1 B1	**9**
6a(i)	Angle *STU* = 80° (Angles in the same segment) Angle *TUS* = 180° – 60° – 80° (Sum of angles in triangle) = 40°	B1 B1	
6a(ii)	35° (Angle at centre = 2 angle at circumference)	B1	
6a(iii)	55° (*OS* = *OR*, sum of angles in isos triangle)	B1	
6a(iv)	Angle *SRQ* = 180° – 80° (angles in opp segment) = 100° Angle *ORQ* = 100° – 55° = 45°	M1 A1	
6a(v)	Angle *OSR* = 55° Angle *SRQ* = 100° Since Angle *OSR* + Angle *SRQ* ≠ 180°, Angle *OSR* + Angle *SRQ* are **not interior angles of parallel lines** lines *OS* and *QR* are **not** parallel.	M1 A1	

6b(i)	$\frac{2n+3+4n-1}{2n+3+4n-1+18-2n}=\frac{19}{22}$ $\frac{6n+2}{20+4n}=\frac{19}{22}$ $132n+44=380+76n$ $56n=366$ $n=6\,(shown)$	M1 A1	
6b(ii)	$\frac{15}{44}\times\frac{14}{43}=\frac{105}{946}$	M1, A1	**12**
7(a)	24 cm	B1	
7(b)	$\frac{r}{10}=\frac{18}{24}$ $r=7\frac{1}{2}$ (shown)	M1 A1	
7(c)	Surface area = SA of hemisphere + SA of cone $= 2\pi(10)^2 + 26\pi(10) - \pi(7.5)\sqrt{18^2+7.5^2}$ = 986 cm^2	M1: $2\pi(10)^2$ M1: $\sqrt{18^2+7.5^2}$ A1	
7(d)	Volume = Vol of hemisphere + Volume of frustrum $=\frac{2}{3}\pi(10)^3+\frac{37}{64}\times\frac{1}{3}\pi(10)^2\times24$ = 3550 cm^3	M1: $\frac{2}{3}\pi(10)^3$ M1: $\frac{1}{3}\pi(10)^2\times24$ A1	**9**
8(a)	–2.5	B1	
8(b)	Smooth curve passing through all points 5 or less points marked correctly; All points marked correctly	G1 P1/2	
8(c)	$x > 2.8$ [±0.2]	B1	
8(d)	Gradient = $\frac{3.2-(-1)}{3-1.7}$ = 3.23	B1: Tangent on graph A1	
8e(i)	$y = x - 1$ drawn on grid	B1	
8e(ii)	$\frac{x^3}{2}-3x+2=x-1$ $\frac{x^3}{2}-4x+3=0$ $x^3-8x+6=0$ (*shown*)	M1 A1	
8e(iii)	0.8; 2.25 [±0.1]	B2	**12**

Question 8 Mark Scheme



Question 9 Mark Scheme

Qn	Solutions	Marks Allocation	
9a(i)	Correct construction	B1	

9a(ii)	21	√B1	
9a(iii)	Correct construction	B1	
9a(iv)	24 & 26	√B1	
9(b)	**Renting from GetCar** Car rental & mileage charges = ($7×4) + ($0.39×67) = $54.13 **Renting from FindCar** Car rental & mileage charges = ($3×1 + $5×3) + ($0.39×67) = $44.13 Amount of petrol needed = $\frac{67}{12.5}$ = 5.36 litres Fuel Charges = $2.20 × 5.36 = $11.792 Total charges = 44.13 + 11.792 = $55.92 > $54.13 Since it costs less to rent from GetCar, Sally should rent from Company GetCar.	M1: 7×4 M1: 0.39×67 M1: $3×1 + $5×3 M1 M1 A1	