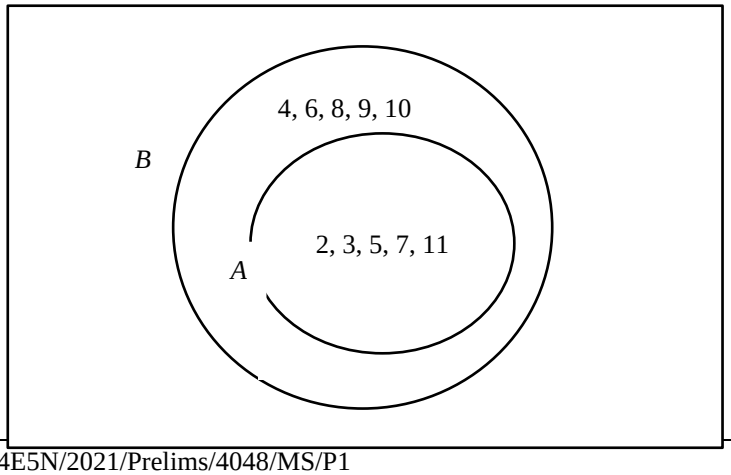
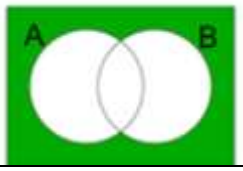
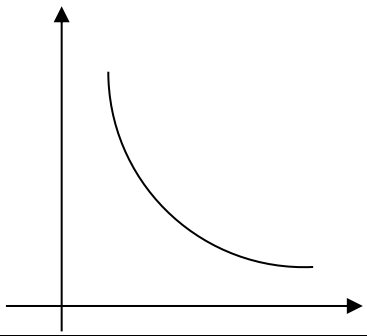
Serangoon Garden Secondary School
2021 Sec 4E/5NA Prelims P1 Suggested Mark Scheme

Qn	Solution	Mark Scheme
1(a)	$\frac{1.98^2 \times \sqrt[3]{31.2}}{3.41-2.2} = 10.199$	**B1**
(b)	10.199 = 10.2 (3 s.f)	**B1**
	Total for Q1	**2 m**
2	US\$5.40 = S\$ 5.40×1.33	
	US\$5.40 = S\$7.182	
	Cost of 1 litre of petrol in Los Angeles in terms of S\$ = S\$ $\frac{7.182}{3.79}$	
	= S\$ $\frac{7.182}{3.79}$	
	= S\$ 1.894	
	= S\$1.89 <S\$1.98	**M1**
	Hence, petrol in Los Angeles is cheaper than Singapore.	**A1**
	Total for Q2	**2 m**
3(a)	$\sin \angle ABY = \frac{4}{5}$	**B1**
		B1
(b)	$\cos \angle XAB = -\frac{4}{5}$	
	Total for Q3	**2 m**
4	Amount of energy produced in 2020 = $0.85 \times 510 \times 10^9$ watts	**M1**
	$= 433.5 \times 10^9$ watts	
	$= 4.335 \times 10^2 \times 10^9$ watts	
	$= 4.335 \times 10^{11}$ watts (exact answer and should not be rounded off)	**A1**
	Total for Q4	**2 m**
5	$\angle OAP = \angle OPA$ (ΔOAP is an isosceles triangle as *OA* = *OP*)	**M1**
	$\angle OAP = \angle BAP$ ($\angle OAB$ is bisected)	
	Hence, $\angle OPA = \angle BAP$.	
	Since $\angle OPA = \angle BAP$, *OP* is parallel to *AB.*	**A1**
	Total for Q5	**2 m**
6	Let the largest angle be $\angle p$.	

	$\cos \angle p = \frac{1^2 + 2.5^2 - 3^2}{2(1)(2.5)}$	**M2**
	$\angle p = \cos^{-1}(-0.35)$	
	$\angle p = 110.48^\circ$	
	$\angle p = 110.5^\circ$	**A1**
	Total for Q6	**3 m**
7(a)	1: 50 000.	
	1 cm: 50 000 cm	
	1 cm: 0.5 km	
	12 cm: 6 km	
	The actual distance between the two towns is 6 km.	**B1**
(b)	1 cm: 0.5 km	
	$1\text{ cm}^2 : 0.25\text{ km}^2$	**M1**
	$72\text{ cm}^2 : 18\text{ km}^2$	
	The area of the theme park on the map is 72 cm^2.	**A1**
	Total for Q7	**3 m**
8(a)	$240 - (-380) = 620$ m	**B1**
(b)	Distance the diver is below the sea level = $\frac{-380 + 240}{2} = -70$	
	Distance the diver is from the sea bed = $565 - 70 = 495$	**B1**
	Total for Q8	**2 m**
9(a)	$p = 2 \times 7 = 14$	**B1**
(b)(i)	LCM = $2^4 \times 3 \times 5^2 \times 7^{4k}$	**B1**
(ii)	y is a perfect square as the **power of each of its factor is even** for all	**B1**
	values of k.	
	Total for Q9	**3 m**
10(a)	$11 - 6x + x^2 = x^2 - 6x + \left(\frac{-6}{2}\right)^2 + 11 - \left(\frac{-6}{2}\right)^2$	**M1**
	$= (x-3)^2 + 2$	**A1**
(b)	The minimum point is $(3, 2)$	**B1**

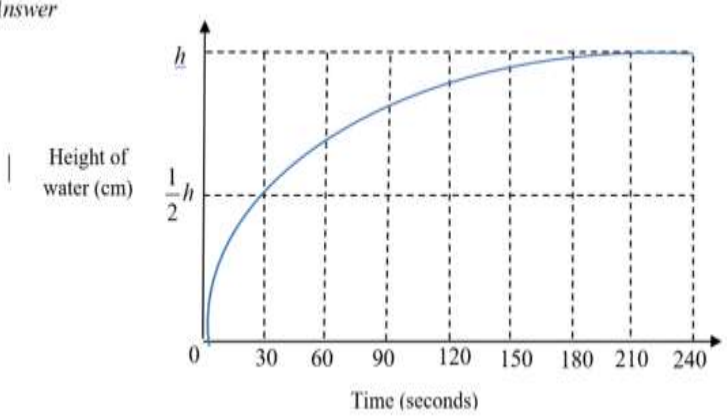
(c)	The graph will not cut the x-axis as the minimum point is above	
	the x-axis.	**B1**
	Total for Q10	**4 m**
11(a)	Initial amount of water = 9 litres	**B1**
(b)	Gradient = $\frac{24-9}{50-0}=0.3$ or $\frac{3}{10}$	**M1**
	Equation is $V=9+0.3t$	**A1**
	Total for Q11	**3 m**
12(a)	Let the original price of the washing machine be \$$x$	
	$0.7\times0.7\times x=\$1274$	**M1**
	$x=\frac{1274}{0.7\times0.7}$	
	$x=2600$	
	The original price of the washing machine is \$2600.	**A1**
(b)	Discount (%) = $\frac{2600-1274}{2600}\times100\%$	**M1**
	$=\frac{1326}{2600}\times100\%$	
	$=51\%$	
	Hence, Jamie is incorrect as he is given only 51% discount and not 60% discount.	**A1**
	Total for Q12	**4 m**
13(a)(i)	$\mathscr{E}$ = {0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11}	
	$A=\{2,3,5,7,11\}$	
	B = {integers x: $2x+3>5$}	
	$B=\{x>1\}=$ {2, 3, 4, 5, 6, 7, 8, 9, 10, 11}	
	$\mathscr{E}$ 	**B1 – Set B proper subset of set A** **B1 – Correct placement of**

	0, 1	**the members of each set**
(a)(ii)	n ($A' \cap B$) = 5	**B1**
(b)		**B1**
	Total for Q13	**4 m**
14(a)	$4a(3-2b)+5ba+a=12a-8ab+5ba+a$	**M1**
	$=13a-3ab$ or $13a-3ba$	**A1**
(b)	$4fx-4gy+gx-16fy=4fx-16fy+gx-4gy$	
	$=4f(x-4y)+g(x-4y)$	**M1**
	$=(x-4y)(4f+g)$	**A1**
	OR	
	$4fx-4gy+gx-16fy=4fx-16fy-4gy+gx$	
	$=4f(x-4y)-g(4y-x)$	***[M1]***
	$=4f(x-4y)+g(x-4y)$	
	$=(x-4y)(4f+g)$	***[A1]***
	Total for Q14	**4 m**
15(a)	$(x+3)(3x+2)-(x+3)^2=0$	
	$(x+3)[(3x+2)-(x+3)]=0$	**M1**

	$(x+3)(2x-1)=0$	
	$x=-3$ or $x=\frac{1}{2}$	**A1**
	OR $(x+3)(3x+2)-(x+3)^2=0$	
	$3x^2+11x+6-(x^2+6x+9)=0$	
	$2x^2+5x-3=0$	***[M1]***
	$(x+3)(2x-1)=0$	
	$x=-3$ or $x=\frac{1}{2}$	***[A1]***
(b)	$2-\frac{3}{x}=6$	
	$\frac{3}{x}=-4$ **OR** $-\frac{3}{x}=4$	**M1**
	$-4x=3$	
	$x=-\frac{3}{4}$	**A1**
	Total for Q15	**4 m**
16(a)		**B1**
(b)(i)	$1.5y$	**B1**
(ii)	$P=\frac{k}{r^2}$	
	$P_1=\frac{k}{r_1^2}$	
	$54=\frac{k}{y^2}$	

	$k = 54y^2$	**M1**
	$P = \frac{54y^2}{r^2}$	
	When $r_2 = 1.5y$, $P_2 = \frac{54y^2}{r_2^2}$	
	$P_2 = \frac{54y^2}{(1.5y)^2}$	
	$P_2 = 24$	
	The new pressure is 24 N/cm^2.	**A1**
	Total for Q16	**4 m**
17(a)	$x = 85 - 22 = 63$	
	$\therefore a - 3$	**B1**
	$74.5 = \frac{73 + y}{2}$	
	$y = 76$	
	$\therefore b - 6$	**B1**
(b)	$Q_3 = \frac{79 + 82}{2} = 80.5$	
	$Q_1 = \frac{68 + 69}{2} = 68.5$	
	Interquartile range = 80.5 - 68.5	
	= 12	**B1**
	Total for Q17	**3 m**
18(a)	Median speed = 62 km/h	**B1**
(b)	$\frac{16}{120} = \frac{2}{15}$	**B1**
(c)(i)	$g = 8$	**B1**
(ii)	Standard deviation = 15.216 = 15.2 km/h	**B1**
	Total for Q18	**4 m**
19(a)	Total amount to be received by Keith = \$ $8000\left(1 + \frac{2}{100}\right)^6$	**M1**
	Interest earned by Keith = **\$** $8000\left(1 + \frac{2}{100}\right)^6$ - \$8000	
	= \$1009.299	

	= \$1009.30 (correct to 2 d.p)	**A1**
19(b)(i)	**Method 1**	
	15% of annual pay = \$936 + 12% of annual pay	
	3% of annual pay = \$936	**M1**
	100% of annual pay = \$31200	
	Linda's monthly pay = $\frac{\$31200}{12}$ = \$2600	**A1**
	Method 2	
	Let x be Linda's current annual pay.	
	$\frac{15}{100} \times x = 936 + \left(\frac{12}{100} \times x\right)$	**[M1]**
	$0.15x = 936 + 0.12x$	
	$0.03x = 936$	
	$x = 31200$	
	Linda's monthly pay = $\frac{\$31200}{12}$ = \$2600	**[A1]**
(b)(ii)	Pamela's pay is > \$2600 whereas Hafiz's pay is < \$2600.	**B1**
	(**OR** Pamela's pay is greater than Linda's pay and Hafiz's pay is lesser than Linda's pay. / The \$936 for Hafiz is more than 3% of his salary, whereas for Pamela, the \$936 is less than 3% of her salary.)	**[B1]**
	Total for Q19	**5 m**
20(a)	$\angle AOB = \frac{2\pi}{5}$ or 0.4π radian	**B1**
(b)	**Method 1**	
	Area of ΔAOB = $\frac{1}{2}(6)(6)\sin\frac{2\pi}{5}$	**M1**
	Area of circle = πr^2 = $\pi(6)^2$	**M1**
	Area of shaded region = $\pi(6)^2 - 5 \times \frac{1}{2}(6)(6)\sin\frac{2\pi}{5}$	**M1**
	= 27.502 cm^2 = 27.5 cm^2	**A1**
	Method 2	

	Area of sector $AOB = \frac{1}{2}(6)(6)\frac{2\pi}{5}$	**[M1]**
	Area of $\Delta AOB = \frac{1}{2}(6)(6)\sin\frac{2\pi}{5}$	**[M1]**
	Area of shaded region $= 5\left[\frac{1}{2}(6)(6)\frac{2\pi}{5} - \frac{1}{2}(6)(6)\sin\frac{2\pi}{5}\right]$	**[M1]**
	$= 27.5\ \text{cm}^2$	**[A1]**
	Total for Q20	**5 m**
21(a)(i)	$\frac{Vol.\ of\ water}{Vol.\ of\ cup} = \left(\frac{1}{2}\right)^3 = \frac{1}{8}$	
	$8\ \text{units}^3$ – 240 seconds	
	$1\ \text{units}^3$ – 30 seconds	**B1**
(a)(ii)	*Answer*  **B1 for the correct shape of graph and passing through(0, 0), (30, 0.5h) and (240, h)**	
(b)	Let the slant height be l cm	
	$\sin 20° = \frac{6}{l}$, $l = \frac{6}{\sin 20°}$	**M1**
	Surface area in contact with water = πrl	
	$= \pi \times 6 \times \frac{6}{\sin 20°}$	**M1**
	$= 330.67\ \text{cm}^2 = 331\ \text{cm}^2$	**A1**
	Total for Q21	**5 m**
22(a)	$\angle TSU = \angle TPQ$ (corresponding angles)	**B2 (any of the three reasons)**
	$\angle TUS = \angle TQP$ (corresponding angles)	
	$\angle STU = \angle PTQ$ (common angle)	
	Hence, ΔSTU and ΔPTQ are similar. (AA Similarity Test)	

(b)	ΔUVR	**B1**
(c)(i)	area of ΔTSU : area of $\Delta TPQ = \left(\frac{2}{5}\right)^2 = \frac{4}{25} = 4 : 25$	**B1**
(ii)	area of ΔTSU : area of quad $SUQP$ = 4: 21	
	area of quadrilateral $SUQP = \frac{21}{4} \times 8$ =42 cm^2	**B1**
	Total for Q22	**5 m**