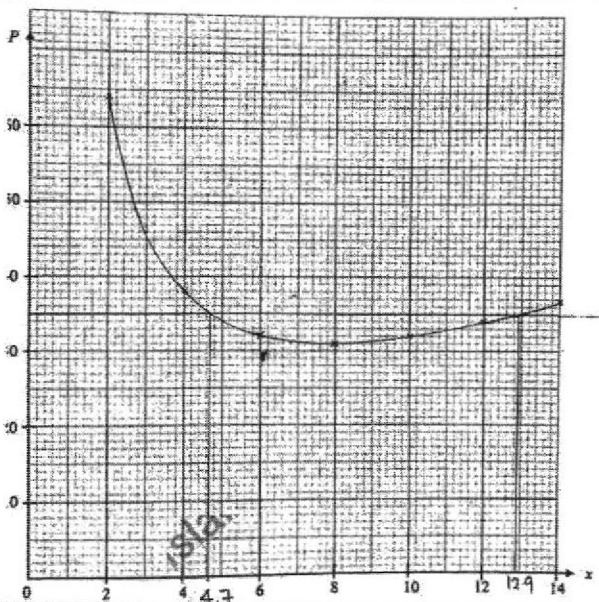| No.	Solution	Mark	Remarks
1ai	$\dfrac{w^2}{3}$	B1	
1aii	$\dfrac{3}{y-1} - \dfrac{5}{y+6}$ $= \dfrac{3y+18-5y+5}{(y-1)(y+6)}$ $= \dfrac{-2y+23}{(y-1)(y+6)}$	M1 A1	Combine fraction
1aiii	$\dfrac{2v^2-5v-12}{16-v^2}$ $= \dfrac{(2v+3)(v-4)}{(4+v)(4-v)}$ $= -\dfrac{2v+3}{v+4}$	M1 B1 A1	Factorise numerator $(4+v)(4-v)$ seen o.e
			Total: 6 marks
2a	$\begin{pmatrix} 50 & 40 \\ 0 & 20 \\ 20 & 30 \end{pmatrix}$	B1	cao
2b	$\begin{pmatrix} 111 & 140 \\ 8 & -1 \end{pmatrix}$	B1 B1	−1 for each error
2c	<u>Stall A</u> because <u>he would pay $8 more in stall B</u>	B1	
2d	$[(111+8) + (140-1)] \times 0.7$ $= 83.3 + 97.3$ $= \$180.60$	B1 M1 A1	119 or 139 seen $\times 0.7$ 2 d.p
			Total: 7 marks
3ai	$\text{Height} = \dfrac{52.6}{12.7}$ $\qquad\quad = 4.1417$ $\text{Sin } 50 = \dfrac{4.1417}{RS}$ $RS = 5.4066$ $\quad\ = 5.407 \text{ (shown)}$	B1 B1	Height = $QR\sin 130$ 5.4066
3aii	$QS^2 = 12.7^2 + 5.407^2 - 2(12.7)(5.407)\cos 130$ $QS = 16.7$	M1 A1	Apply Cosine rule, cos130
3bi	$\angle ABC = 180 - 118$ ($\angle$s in opposite segment) $\qquad\quad = 62$	B1	with reason
3bii	reflex $\angle AOC = 236$ ($\angle$ at centre $= 2\angle$ at circumfe $\angle BCO = 360 - 32 - 236 - 62$ $\qquad\quad = 30$	B1 B1	
			Total: 7 marks

No.	Solution	Mark	Remarks
4a	$OP = OQ$ (equal chords; $AB = BC$) $\angle OPA = \angle OQC = 90$ (perpendicular bisector of ch $AO = OC$ (radii of circle) Triangle $OAP \equiv$ triangle OCQ (RHS) **Alternatively,** $AP = CQ$ ($AB = BC$, $AP = \dfrac{1}{2} AB$, $CQ = \dfrac{1}{2} BC$) $OP = OQ$ (equal chords; $AB = BC$) $AO = OC$ (radii of circle) Triangle $OAP \equiv$ triangle OCQ (SSS)	B1 B1 B1 B1 B1 B1	-1 for test not stated
4b	Shaded area $= 2 \times$ $\left[\dfrac{1}{2}(6)^2 \left(\dfrac{11\pi}{18} \right) - \dfrac{1}{2}(6)^2 \sin \dfrac{11\pi}{18} \right]$ $= 35.3$ **Alternatively,** Shaded area $=$ $\pi (6)^2 - \left(2 \times \dfrac{1}{2}(6)^2 \sin \dfrac{11\pi}{18} \right) - \dfrac{1}{2}(6)^2 \dfrac{7\pi}{9}$	B1 M1 M1 A1	$\dfrac{11\pi}{18}$ seen Area of sector Area of triangle
			Total: 7 marks
5a	greatest possible area $= \dfrac{250.5}{8.35}$ $= 30$	B1 B1	250.5 seen cao
5bi	$\angle RAB = \angle QPB$ (corresponding $\angle$) $\angle ARB = \angle PQB$ (corresponding $\angle$) $\angle RCA$ is shared/common Triangles ABR and PBQ are similar (AA)	B1 B1	
5bii	Area PBQ : Area of Trapezium $= \quad 25 \quad : \quad 36 - 25$ $= \quad 25 \quad : \quad 11$	B1 AG	$36 - 25$ seen
5biii	Area of $ABR = \dfrac{22}{11} \times 36 = 72$ Area of $ABC = \dfrac{72}{3} \times 5$ $= 120$	B1 M1 A1	72 soi $\dfrac{\text{Their area } ABR}{3} \times 5$
			Total: 8 marks

6ai	50 900		B1	50 893.8 50 900.4
6aii	$h = \dfrac{25893.8}{\pi(18)^2}$ $\dfrac{\text{their ans} - 25\,000}{\pi(18)^2}$ $= 25.4$		M1 A1	
6aiii	Number of cups $= \dfrac{25000}{\dfrac{2}{3}\pi(3.5)^3}$ $= 278$		M1 A1	Volume of hemp cao
6b	Surface area $= 6x(6x)\times 5 + \dfrac{1}{2}(5x)(6x)\times 4$ $= 240x^2$		M1 B1 M1 A1	$6x6x$ (area of sq) Slant $h = 5x$ $\dfrac{1}{2}$(Their slant height)$(6x)\times 4$ cao
				Total: 9 marks
7a	$P = 2x + \left(\dfrac{60}{x}\right)\times 2$ $= 2x + \dfrac{120}{x}$		B1	$\left(\dfrac{60}{x}\right)\times 2$ seen
7b	64		B1	
7c			P2 C1	−1 mark for every wrong point plotted
7d	$4.7 \leq x \leq 12.9$		B1 B1	4.6 to 4.8 and 12.8 to 13.0 $4.68 \leq x \leq 12.82$
7e	$p = 4x$		B1	
				Total: 8 marks

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8a	$p = 121876.00$ $q = 21818.00$	B1 B1	Accept $p = 121876$ $q = 21818$
8bi	$3350 + 0.115 (100058 - 80000)$ $= \$5656.67$ (shown)	B1 B1	3350 seen 20058 soi
8bii	Angie's income tax $= 0.55 \times 5656.67$ $\qquad\qquad\qquad = \$3111.1685$ Let x be the remaining income. $550 + x (7\%) = 3111.1685$ $x = \$36588.1214$ Angie's chargeable income $= 40\,000 + 36588.1214$ $= \$76588.12$ $\dfrac{76588.12}{100058} \times 100\% = 76.5\%$ Disagree as Angie's is 0.44 times Ahmad's chargeable income. **or** $100058 \times 55\% = \$55\,031.90$ Disagree as Angie's income is less than \$55 031.90.	M1 M1 B1 A1 A1 A1	Finding Angie's income tax Formulate 550 or 40000 seen \$76588.12 Express Angie's income as percentage Finding what 55% of Ahmad's income is
			Total: 9 marks

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9a	25	B1	
	21	B1	
9b	1025 isn't a perfect square	B1	oe
9c	$1584 = 561 + n^2 - 1$	M1	
	$n^2 = 1024$		
	$n = 32$	A1	
9di	$R = \dfrac{3}{2} n(n+1)$	B1	oe
9dii	408	B1	
9e	$D = \dfrac{1}{2}(n+1)(n+2)$	B1	oe
			Total: 8 marks
10a	121, 127.5, 132	B1	*LQ UQ*
		B1	Median
	120 and 131	B1	*LQ UQ*
10b	The median of the cumulative curve will be on the left.	B1	
10ci	<u>False</u> because <u>the median mass for apples is lower.</u>	B1	
10cii	<u>True</u> because <u>upper quartile for mass of oranges is higher</u>	B1	
10di	126.25 or $126\dfrac{1}{4}$	B1	Accept 3s.f and above (126, …)
10dii	8.57	B1	cao
10diii	$1 - \dfrac{15}{40} \times \dfrac{14}{39}$	M1	When all weight less than 125g
	$= \dfrac{45}{52}$	A1	
	Or $\dfrac{25}{40} \times \dfrac{24}{39} + \dfrac{25}{40} \times \dfrac{15}{39} \times 2$	M1	
	$= \dfrac{45}{52}$	A1	
			Total: 10 marks
11ai	$\dfrac{72}{x}$	B1	
11aii	$\dfrac{144}{x-2}$	B1	
11aiii	$\dfrac{72}{x} + \dfrac{144}{x-2} = 25$	B1	Their ai + aii = 25
	$72(x-2) + 144x = 25(x-2)$		
	$216x - 144 = 25x^2 - 50x$	B1	

	$25x^2 - 266x + 144 = 0$ (shown)		
11aiv	$x = \dfrac{22 \pm \sqrt{266^2 - 4(25)(144)}}{2(25)}$ $x = 10.068$ or 0.572	M1 A1A1	Ignore rejection
11b	Time $= \dfrac{4}{10.068 - 2}$ $= 29$ mins 45 secs	M1 A1	Replace 11aii by $x = 10.068$
			Total: 9 marks
12ai 12aii 12aiii		B1 B1 B1	
12b	D because the psf is the lowest **Or** D because price per metre square is the lowest.	B1	
12c	**John and Chieh** Purchase price $= 46\,500 - 80\,000 - 50\,000$ $\quad = 46\,500 - 130\,000$ $\quad = \$335\,000$ Interest $=$ (their purchase price) $\times 0.9 \times 2.6\% \times 15$ $\quad = \$117\,585$ **Janet** Purchase price $= 348\,338 - 50\,000 - 15\,000^*$ $\quad\quad = 283\,338$ (their purchase price) $\times 0.75 \times 1.8\% \times n <$ 117585 $\quad\quad\quad\quad\quad n < 30.7$ Janet should finish servicing her loan in 20 years to incur less interest. I took the average of the grant for PHG as I am unsure if she would receive the full grant or not.	 B1 M1 B1 M1 M1 M1 B1 B1	[choosing **C**] 46 500 seen Find purchase price − grant 130 000 seen Find Int. (HDB) *10000 − 20000 Find Int. (Bank) State the no of years. State assumption
			Total: 12 marks

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