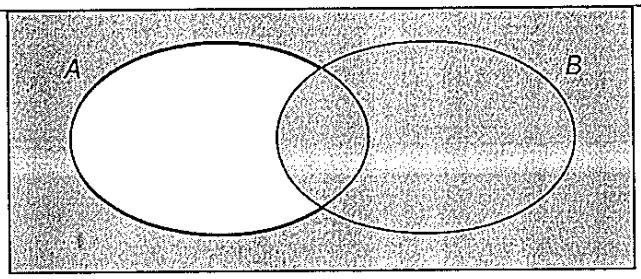
Marking Scheme for Sec 4E/5NA EMath P1

Qn	Solutions	Marks
1	$\frac{x}{4}+13=6$ $\frac{x}{4}=-7$ $x=-28$	B1
2	$25\text{ min}=\frac{25}{60}=\frac{5}{12}hrs$ $D=S\times T$ $D=60\times\frac{5}{12}=25km$	M1 A1
3	5, 5, 6, 9, 15	B1 (1st 3 numbers), B1 (last 2 numbers)
4	4047 m^2 = 1 Acre grows 20 000 sunflower plants $= 20000\times1500$ seeds $= 3\times10^7$ seeds $1\text{ m}^2=\frac{3\times10^7}{4047}$ seeds $1800/\text{m}^2=\frac{3\times10^7}{4047}\times1800$ seeds $=1.33\times10^7$	M1 A1
5	$\frac{3x}{5}-\frac{4(2-3x)}{7}=\frac{21x}{35}-\frac{20(2-3x)}{35}$ $=\frac{21x-20(2-3x)}{35}$ $=\frac{21x-40+60x}{35}$ $=\frac{81x-40}{35}$	M1 A1
6a	2	B1
6b		B1

7	$6ac+9ad-12bd-8bc$ $=3a(2c+3d)-4b(3d+2c)$ $=(3a-4b)(2c+3d)$	 M1 A1
8a	$\overrightarrow{OB}=\overrightarrow{OA}-\overrightarrow{BA}$ $\overrightarrow{OB}=\begin{pmatrix}-2\\5\end{pmatrix}-\begin{pmatrix}-4\\8\end{pmatrix}=\begin{pmatrix}2\\-3\end{pmatrix}$ $B=(2,\ -3)$	 B1
8b	$\left\|\overrightarrow{AB}\right\|=\sqrt{(-4)^2+(8)^2}=8.94$	B1
9	Mean = 10 720 g SD = 362.8 g	B1 B1
10	Cost of painting in 2017 $=\dfrac{73288.8}{1.2}=\$61074$ Cost of painting in 2016 $=\dfrac{61704}{1.08}=\$56550$ Percentage $=\dfrac{56550}{73288.8}\times100\%=77.2\%$	M1 M1 A1
11a	7 units represent 2.1*l* 1 units represent 0.3*l* 3 units represent 0.9*l*	 B1
11b	1 units represent 0.3*l* 12 units represent 3.6*l*	 B1
11c	Lemon : Simply Syrup : Coconut water $\frac{1}{2}$: $\frac{1}{3}$: 8 $\frac{1}{2}\times6$: $\frac{1}{3}\times6$ 1×2 : 8×2 3 : 2 : 16	 M1 A1
12	$x+(x-20)+3x=180$ $5x-20=180$ $5x=200$ $x=40°$ 40°, 20°, 120° or $(x+20)+x+3(x+20)=180$ $5x+80=180$ $5x=100$ $x=20°$ 40°, 20°, 120°	M1 M1 A1

13a	$y = kx$ or $x = ky$ $y = 5k$ ---------- (1) $y = 17k$ ---------- (2) (2) – (1); $17k - 5k = 54$ $12k = 54$ $k = 4.5$ $y = 4.5x$ or $5 = ky$ ---------- (1) $17 = ky$ ---------- (2) $\frac{17}{k} - \frac{5}{k} = 54$ $17 - 5 = 54k$ $k = \frac{2}{9}$ $x = \frac{2}{9}y$	M1 M1 A1
13b	$y = 4.5x$ $84 = 4.5x$ $x = 18\frac{2}{3}$	B1
14a	20	B1
14b	1210	B1
14c	924	B1
15a	$-15 \le 8 - 3x$ $3x \le 23$ $x \le \frac{23}{3}$ $2 < x \le \frac{23}{3}$ and $8 - 3x > 2$ $6 > 3x$ $2 < x$	M1 (Either 1) A1
15b	3, 4, 5, 6, 7	B1
16a	Sum of interior angles = $(6-2)\times 180 = 720°$	B1
16b	Sum of angles = 7 × angles at a point – [Sum of interior angle of hexagon + sum of interior angle of triangle] $= 7\times 360 - [720 + 180]$ $= 1620°$ Or $\angle a + \angle g + \angle f + \angle b = 4\times(360-120) = 960°$ $\angle d + \angle c + \angle e = (3\times 360) - 2(120) - 180 = 660°$ Sum of angles = $960° + 660° = 1620°$	M1 A1 M1 A1

17a	$\frac{A_A}{A_{A+B}} = (\frac{l_A}{l_{A+B}})^2$ $= (\frac{h}{2h})^2$ $= (\frac{1}{4})$	B1
17b	$\frac{200}{200+B} = (\frac{1}{4})$ $B = 600$	B1
17c	$\frac{V_A}{V_{A+B+C}} = (\frac{l_A}{l_{A+B+C}})^3$ $= (\frac{h}{3h})^3$ $= (\frac{1}{27})$ $\frac{V_A}{V_{A+B}} = (\frac{l_A}{l_{A+B}})^3$ $= (\frac{h}{2h})^3$ $= (\frac{1}{8})$ Vol of B : Vol of C = 7 : 19	M1 M1 A1
18	$\angle POR = 235 - 205 = 30°$ $PR^2 = 35^2 + 45^2 - 2(35)(45)\cos 30°$ $= 522.0199781$ $PR = \sqrt{522.0199781}$ $= 22.8$ km	M1 M1 A1

19	$\angle DOE = 180-35-35 = 110°$	M1
	Area of segment = area of sector DOC – area of triangle DOC $= \frac{110}{360} \times \pi \times (7)^2 - \frac{1}{2}(7)(7)\sin 110°$ $= 24.01415413$	M1, M1
	Area of section of circle = area of circle – 2 x area of segment $= \pi(7)^2 - 2(24.01415413)$ $= 106cm^2$	M1 A1
	OR	
	$\angle DOE = 180-35-35 = 110°$	M1
	2 x (Area of sector BOD + Area of triangle DOE) $= 2 \text{ x } (\frac{180-110}{360} \times \pi \times (7)^2 + \frac{1}{2}(7)(7)\sin 110°)$ $= 2 (29.932396 + 23.224692)$ $= 106cm^2$	M1 M1,M1 A1
20a	Line L_1: $2y = 3x - 5$	
	Gradient = 1.5	B1
	Line L_2: $y = 1.5x + 5.5$ or $2y = 3x + 11$	B1
20b	$area = \frac{5}{3} \times 8 = 13\frac{1}{3}$ units^2	B1
20c	$\tan \angle ABO = \frac{\frac{5}{2}}{\frac{5}{3}} = 1.5$	B1
21a	$T = 2\pi\sqrt{\frac{l}{g}}$ $\frac{T}{2\pi} = \sqrt{\frac{l}{g}}$ $\left(\frac{T}{2\pi}\right)^2 = \frac{l}{g}$	M1
	$l = \frac{T^2 g}{4\pi^2}$	A1

21b	$l=\sqrt{5^2+2.5^2}=5.59016994$ Total surface area = curved SA of cone + curved surface area of cylinder + base area $=\pi(2.5)(\sqrt{31.25})+2\pi(2.5)(5)+\pi(2.5)^2$ $=142\ \text{cm}^2$ (3sf)	M1, M1 (any 2) A1
22a	$R=\begin{pmatrix}6&5&3\\9&7&4\\10&8&2\end{pmatrix}\begin{pmatrix}7.20\\10.80\\32\end{pmatrix}$ $=\begin{pmatrix}193.20\\268.40\\222.40\end{pmatrix}$	M1 A1
22b	R represent the cost of each hamper	B1
22c	$T=(20\quad 25\quad 30)$	B1
22d	$(20\quad 25\quad 30)\begin{pmatrix}193.20\\268.40\\222.40\end{pmatrix}$ $=\$17\,246$	M1 A1
23a	$\frac{60}{360}\times 100\%=16.7\%$	B1
23b	30% rep 108° represent 36 boys 1° represent $\frac{36}{108}$ boys 360° represent $\frac{36}{108}\times 360=120$ boys	M1 A1
23c	No of boys in group E = Total boys − boys in $(A+B+C+D)$ $=120-30-36-18-20$ $=16$ boys	M1 A1
24a	$\frac{20-n}{20}$	B1
24b	$\frac{20-n}{20}\times\frac{19-n}{19}$ $=\frac{(20-n)(19-n)}{380}$ or $=\frac{380-39n+n^2}{380}$	B1

24c	$\frac{(20-n)(19-n)}{380}=\frac{39}{95}$ $(20-n)(19-n)=156$ $380-20n-19n+n^2=156$ $n^2-39n+224=0$ (Shown)	M1 A1
24d	$n^2-39n+224=0$ $(n-32)(n-7)=0$ Either $n=32$ or $n=7$ No of yellow marbles = 20 – 7 = 13	M1 M1 A1