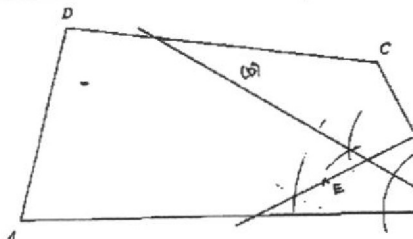
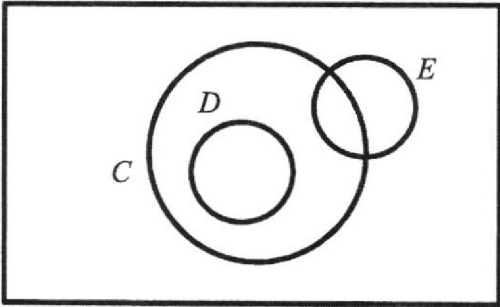
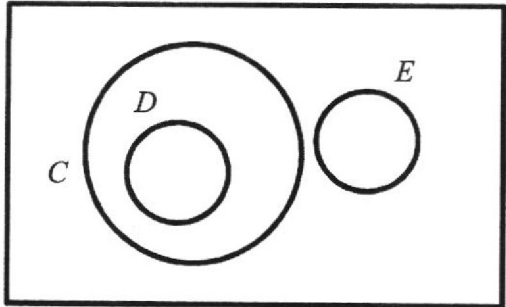


AMKSS 2021 Prelim 4E5N EM P1 Answer Scheme

	Answer	Marks
1 (a)	$\left(\frac{3}{x}\right)^{-2} = \frac{x^2}{9}$	B1
1(b)	$3^y \times 4^y = 12^{5-y}$ $12^y = 12^{5-y}$ $y = 5 - y$ $2y = 5$ $y = 2.5$	M1 (change to same base) A1
2	$2x - 3 < \frac{2}{3}(9x - 6)$ $2x - 3 < 6x - 4$ $-4x < -1$ $x > \frac{1}{4}$ Smallest possible value of $x = 2$.	M1 A1 B1 (no mark if inequality is wrong)
3(a)	$AB = \sqrt{(5-7)^2 + (-3-2)^2}$ $= 5.385164807$ $= 5.39$ units (3sf)	M1 A1
3(b)	Gradient of AB $\frac{2-(-3)}{7-5} = \frac{5}{2}$ $2y = hx - k$ $y = \frac{h}{2}x - \frac{k}{2}$ $h = 5$ $k = 5(3) - 2(8) = -1$	M1 A1 A1
4	$2 - \frac{3a-b}{a+b}$ $= \frac{2(a+b) - (3a-b)}{a+b}$ $= \frac{2a+2b-3a+b}{a+b}$ $= \frac{-a+3b}{a+b}$	M1 (combine into single fraction) A1
5	Maximum increase $= 531499 - 279350$ $= 252149$	M1 (for either 531 499 or 279 350) A1

	Answer	Marks
6	$x - 4y = 17 \dots (1)$ $2x + 3y = 1 \dots (2)$ From (1): $x = 4y + 17 \dots (3)$ Subs. (3) into (2): $2(4y + 17) + 3y = 1$ $8y + 34 + 3y = 1$ $11y = -33$ $y = -3$ $x = 4(-3) + 17 = 5$	M1 (substitution or elimination) A1 A1
7	No because the scale for the vertical axis is inconsistent. It gives the impression that there is comparable growth in sales of the 2 gaming consoles.	B1
8(a)	Emily calculated the probability without replacement . It should be $\frac{8}{11} \times \frac{8}{11} = \frac{64}{121}$.	B1 (need to mention without replacement or explain Emily should not reduce 1 from the total since there is replacement)
8(b)	P(at least 1 yellow) $= 1 - \left(\frac{3}{11} \times \frac{3}{11} \right)$ accept $2 \left(\frac{3}{11} \times \frac{8}{11} \right) + \frac{8}{11} \times \frac{8}{11}$ $= \frac{112}{121}$	M1 A1
9	$x = \frac{k}{\sqrt[3]{y}}$ When $x = 6$, $y = a$ $6 = \frac{k}{\sqrt[3]{a}}$ $k = 6\sqrt[3]{a}$ When $y = \frac{12.5}{100}a = \frac{1}{8}a$ $x = \frac{6\sqrt[3]{a}}{\sqrt[3]{\frac{1}{8}a}}$ $= \frac{6\sqrt[3]{a}}{\frac{1}{2}\sqrt[3]{a}}$ $= 12$	M1 A1
10	$x\% \rightarrow \$y$ $1\% \rightarrow \$\frac{y}{x}$ $100\% \rightarrow \$\frac{100y}{x}$	M1 A1 (or B2)

	Answer	Marks
11	$\frac{BD}{7.5} = \frac{4}{5}$ $BD = 6 \text{ cm}$ $ED = \sqrt{7.5^2 - 6^2} = 4.5 \text{ cm}$	M1 A1
12	Before: $18 : 7 = 54 : 21$ After: $17 : 3 = 119 : 21$ 65 units \rightarrow 1.3 litres 21 litres $\rightarrow \frac{1.3}{65} \times 21 = 0.42 \text{ litres}$	M1 (change to equivalent ratios) M1 A1
13(a)	$2^2 \times 3^2 \times 5$	B1
13(b)	Smallest perfect square $= 2^4 \times 3^4 \times 5^2$ $pq = 2^2 \times 3^2 \times 5$ $= (2^2 \times 3) \times (3 \times 5)$ $= 12 \times 15$ $p = 12$ $q = 15$	 B1 B1
14(a)		B1
14(b)		B1
14(c)		B1
15(a)	bearing of Q from B $= 180^\circ + 50^\circ$ (alternate \angle s) $= 230^\circ$	B1
15(b)	$\angle ACE = 180^\circ - 137^\circ = 43^\circ$ (adj \angle s on str. line) $\angle DEA = 360^\circ - (180^\circ - 50^\circ - 43^\circ)$ $= 273^\circ$ (\angle s at a point)	M1 A1
16(a)	$6 = -(0-3)(2(0)+b)$ $6 = 3b$ $b = 2$	B1
16(b)	(3, 0)	B1
16(c)	$-(x-3)(2x+2) = 0$ $x = 3$ or $x = -1$ Line of symmetry is $x = \frac{3+(-1)}{2} = 1$ $y = -(1-3)(2(1)+2) = 8$	M1 A1

	Answer	Marks
17(a)	$Q = \begin{pmatrix} 2 \\ x \\ 8 \end{pmatrix}$	B1
17(b)	$R = \begin{pmatrix} 85 & 42 & 16 \\ 90 & 65 & 28 \end{pmatrix} \begin{pmatrix} 2 \\ x \\ 8 \end{pmatrix}$ $= \begin{pmatrix} 298 + 42x \\ 404 + 65x \end{pmatrix}$	B2 (or M1, A1)
17(c)	$298 + 42x + 232.50 = 404 + 65x$ $23x = 126.50$ $x = 5.50$	B1
18(a)	60 min	B1
18(b)	53 min	B1
18(c)	43	B1
18(d)	Mean remains the same / No change to the mean	B1
19(a)	1112	B1
19(b)	0800 to 1900	B1
19(c)	$= (10 - 2.6) \times 2000000$ $= 14800000 \text{ mg}$ $= 14.8 \text{ kg}$	M1 A1
20	Sum of interior angles of hexagon $(6 - 2) \times 180 = 720^\circ$ $2x + 4y = 720^\circ$ $x + 2y = 360^\circ$ Yes, it is possible to put 3 sides adjacent to one another.	M1 (correct sum of int. angles of hexagon) A1
21(a)(i)	{1, 3, 5, 7, 11, 13, 15}	B1
21(a)(ii)	0	B1
21(b)	<p>ε</p>  <p>OR</p> <p>ε</p> 	B1 (for $D \subset C$) B1 (for correct E) No mark if not labelled.

	Answer	Marks
22(a)	Let h be height of the upper tier. $\frac{h}{10.5} = \frac{2x}{3x}$ $h = 7$ Total height = $7 + 10.5 = 17.5$ cm.	M1 A1
22(b)	$\left(\frac{2}{3}\right)^3 = \frac{8}{27}$ 35 units \rightarrow 1.4 kg 27 units $\rightarrow \frac{27}{35} \times 1.4 = 1.08$ kg	M1 (find ratio of volume) A1
23(a)	GFA of 1 level = $(3 \times 15) \times (8 \times 15) = 5400 \text{ m}^2$ Total GFA = $5400 \times 6 = 32400 \text{ m}^2$ OR GFA of 1 level = $(3 \times 15) \times (8.1 \times 15) = 5467.5 \text{ m}^2$ Total GFA = $5467.5 \times 6 = 32805 \text{ m}^2$	M1 A1
23(b)	Decrease in number = $\frac{32400}{10} - \frac{32400}{16}$ = 1215 OR Decrease in number = $\frac{32805}{10} - \frac{32805}{16}$ = 1230.1875 (accept 1230 or 1231)	M1 A1
24(a)	$12xy - 5 + 20x - 3y$ $= 12xy + 20x - 3y - 5$ $= 4x(3y + 5) - (3y + 5)$ $= (3y + 5)(4x - 1)$	M1 A1
24(b)(i)	Area of each side of cube $= \frac{6a^2 - 48ab + 96b^2}{6}$ $= a^2 - 8ab + 16b^2$ $= (a - 4b)^2$ Length of each side = $(a - 4b)$ cm.	M1 A1
24(b)(ii)	$(a - 4b)^3 = ((7) - 4(1))^3$ $= 27 \text{ cm}^3$	B1 (must use (i))
25(a)	$\frac{AB}{BD} = \frac{6.75}{9} = \frac{3}{4}$ $\frac{BD}{DC} = \frac{9}{12} = \frac{3}{4}$ $\frac{AB}{BD} = \frac{BD}{DC}$ $\angle ABD = \angle BDC \text{ (alternate angles)}$ Triangle ABD is similar to Triangle BDC (Ratios of 2 pairs of corresponding side and included angle equal)	M1 (show equal ratio) M1 (for angle) A1

	Answer	Marks
25(b)	$\frac{BC}{AD} = \frac{4}{3}$ $\frac{BC}{13.5} = \frac{4}{3}$ $BC = 18 \text{ cm}$ Perimeter = $6.75 + 18 + 12 + 13.5 = 50.25 \text{ cm}$	M1 (correct length of BC) A1