1(a)	$4k + k + 4k + 9k = 1, k = \dfrac{1}{18}$
1(b)	$[E(X) = 28k =]\ \dfrac{14}{9}, 1.56$
1(c)	$P(X \neq 2 \mid X > 0) = \dfrac{\frac{10}{18}}{\frac{14}{18}}$
	$= \dfrac{5}{7}, 0.714$

Table in 1(a):

x	-2	1	2	3
$P(X = x)$	$\dfrac{4}{18}$	$\dfrac{1}{18}$	$\dfrac{4}{18}$	$\dfrac{9}{18}$

5(a)	**Method 1**
	[P(5, 6, 7) =] ${}^7C_5\,(0.6)^5(0.4)^2 + {}^7C_6\,(0.6)^6(0.4)^1 + (0.6)^7$ [= 0.261274 + 0.130637 + 0.027994]
	= 0.420
	Method 2
	[1-P(0,1,2,3,4) =] $1 - \{(0.4)^7 + {}^7C_1\,(0.6)\,(0.4)^6 + {}^7C_2\,(0.6)^2(0.4)^5 + {}^7C_3\,(0.6)^3(0.4)^4 + {}^7C_4\,(0.6)^4(0.4)^3\}$
	= 0.420

5(b)	[Mean = $0.1 \times 150 =$]15 [Variance = $0.1 \times 150 \times 0.9 =$]13.5
	$[\mathrm{P}(X < 22) = \mathrm{P}(Z <]\dfrac{21.5-15}{\sqrt{13.5}})$
	$[\mathrm{P}(Z < 1.769) = \Phi(1.769)]$ 0.962

1(a)	$[(0.6)^4(0.4)=]\ 0.05184,\ \dfrac{162}{3125}$
1(b)	$\left[1-\left(1-0.6^6\right)=\right]0.6^6$ Or $1-(0.4+0.4\times0.6+0.4\times0.6^2+0.4\times0.6^3+0.4\times0.6^4+$ $0.4\times0.6^5)$
	$=0.0467,\ \dfrac{729}{15625}$

2(a)

x	1	2	3	4	5
$P(X = x)$	$\frac{5}{15}$	$\frac{4}{15}$	$\frac{3}{15}$	$\frac{2}{15}$	$\frac{1}{15}$
	$\frac{40}{120}$	$\frac{32}{120}$	$\frac{24}{120}$	$\frac{16}{120}$	$\frac{8}{120}$
	$\frac{1}{3}$		$\frac{1}{5}$		
	0.3333	0.2667	0.2[000]	0.1333	0.06667

All decimals correct to at least 3SF

2(b)	[E(X) =] $1\times\frac{5}{15}+2\times\frac{4}{15}+3\times\frac{3}{15}+4\times\frac{2}{15}+5\times\frac{1}{15}$ $\left[\frac{5+8+9+8+5}{15}=\frac{35}{15},\ \frac{7}{3}\right]$
	[Var(X) =] $1^2\times\frac{5}{15}+2^2\times\frac{4}{15}+3^2\times\frac{3}{15}+4^2\times\frac{2}{15}+5^2\times\frac{1}{15}-\left(\textit{their}\,\frac{35}{15}\right)^2$ $\left[\frac{[1\times]5+4\times4+9\times3+16\times2+25[\times1]}{15}-\frac{49}{9}\right]$
	$=\ \frac{14}{9}$, 1.56

6(a)	$[\left(\frac{5}{7}\right)^{10}=]$ 0.0346, $\frac{9765625}{282475249}$

6(b)	**Method 1**
	[P(0, 1, 2) =] $^{10}C_2\left(\frac{6}{7}\right)^8\left(\frac{1}{7}\right)^2+{}^{10}C_1\left(\frac{6}{7}\right)^9\left(\frac{1}{7}\right)+\left(\frac{6}{7}\right)^{10}$ $\left[= 0.2675729 + 0.3567639 + 0.2140583 =\right]$
	0.838
	[P(0,1,2) =] $1-\{\left(\frac{1}{7}\right)^{10}+{}^{10}C_9\left(\frac{6}{7}\right)\left(\frac{1}{7}\right)^9+{}^{10}C_1\left(\frac{6}{7}\right)^2\left(\frac{1}{7}\right)^8+{}^{10}C_1$ $\left(\frac{6}{7}\right)^3\left(\frac{1}{7}\right)^7+{}^{10}C_1\left(\frac{6}{7}\right)^4\left(\frac{1}{7}\right)^6+{}^{10}C_1\left(\frac{6}{7}\right)^5\left(\frac{1}{7}\right)^5+{}^{10}C_1$ $\left(\frac{6}{7}\right)^4\left(\frac{1}{7}\right)^6+{}^{10}C_1\left(\frac{6}{7}\right)^3\left(\frac{1}{7}\right)^7\}$
	0.838

6(c)	[Mean = $392 \times \frac{1}{7} =$] 56 [Variance = $392 \times \frac{1}{7} \times \frac{6}{7} =$] 48
	[P($X > 65$) = P($Z >$] $\frac{65.5 - 56}{\sqrt{48}}$)
	[= 1 – $\Phi(1.3712)$] = 1 – 0.9149
	= 0.0851 final answer

4(a)	$P(\frac{-1.2}{2.5} < Z < \frac{1.2}{2.5})$
	$[= \Phi(0.48) + \Phi(-0.48) = 2\Phi(0.48) - 1\ ]$ $2 \times 0.6844 - 1$ *or* $2 \times (0.6844 - 0.5)$ *or* $0.6844 - 0.3156$
	0.3688
	Expected number = $0.3688 \times 600 = 221.28$ so 221 or 222

4(b)	**Method 1**
	[$P(2 \leqslant X < 8) = 1 - P(0, 1, 8, 9) =$] $1 - (0.4^9 + {}^9C_1\ 0.4^8\ 0.6 + {}^9C_8\ 0.4^1 0.6^8 + 0.6^9) =$ [$1 - 0.000262144 - 0.00353894 - 0.060466176 - 0.010077696 =$]
	0.926
	Method 2
	[$P(2 \leqslant X < 8) = P(2, 3, 4, 5, 6, 7) =$] ${}^9C_2\ 0.4^7\ 0.6^2 + {}^9C_3\ 0.4^6\ 0.6^3 + {}^9C_4\ 0.4^5\ 0.6^4 + {}^9C_5\ 0.4^4\ 0.6^5 + {}^9C_6\ 0.4^3\ 0.6^6 + {}^9C_7\ 0.4^2\ 0.6^7$
	0.926

4(c)	Mean $= 80 \times 0.6 = 48$ Variance $= 80 \times 0.6 \times 0.4 = 19.2$
	[P($X > 50$) =] $P\left(Z > \frac{50.5 - 48}{\sqrt{19.2}}\right)$
	[$P(Z > 0.571) = 1 - \Phi(0.571) =$] $1 - 0.7160 =$
	0.284

6(a)	**Method 1**
	$$P(X=2) = \frac{6}{10}\times\frac{5}{9}\times\frac{4}{8}\times\frac{3}{7}\times\frac{4!}{2!2!} = \frac{3}{7}$$
	Method 2
	$$\frac{{}^6C_2 \times {}^4C_2}{10C4} = \left[\frac{15\times 6}{210} = \right]\frac{3}{7}$$

6(b)	(table below)

x	0	1	2	3	4
$P(X = x)$	$\frac{1}{210}$, 0.00476	$\frac{4}{35}$, 0.114	$\frac{3}{7}$	$\frac{8}{21}$, 0.381	$\frac{1}{14}$, 0.0714

6(c)

[P(2B, 3B | 3B1R or 2B2R or 1B 3R) =] $\dfrac{\frac{3}{7}+\frac{8}{21}}{\frac{4}{35}+\frac{3}{7}+\frac{8}{21}}$

$= \left[\dfrac{\frac{17}{21}}{\frac{97}{105}}\right] = \dfrac{170}{194}, \dfrac{85}{97}$, 0.876