1.

	1	2	3	
1	c	$2c$	$3c$	$2/5$
2	$2c$	$4c$	0	$2/5$
3	$3c$	0	0	$1/5$
	$2/5$	$2/5$	$1/5$	

a. $c = \dfrac{1}{15}$. No, since $\Pr(X = 3 \cap Y = 3) \neq \frac{1}{5} \cdot \frac{1}{5}$.

b.

$$\begin{aligned} M_x(t) &= \frac{2e^t + 2e^{2t} + e^{3t}}{5} \\ M_u(t) &= \frac{2e^{3t} + 2e^{6t} + e^{9t}}{5} \cdot e^{-5t} = \frac{2e^{-2t} + 2e^t + e^{4t}}{5} \end{aligned}$$

c.

$$\tfrac{1+4+9+4+16+9}{15} - \left(\tfrac{2+4+3}{5}\right)^2 = -\tfrac{28}{75}$$

d.

$$1 \cdot \frac{1}{6} + \frac{1}{2} \cdot \frac{2}{6} + \frac{1}{3} \cdot \frac{3}{6} = \frac{1}{2}$$

2. Visualize this as a probability tree:

1d 0s	$\frac{1}{2} \cdot \frac{3}{4} = \frac{3}{8}$	0
1d 1s	$\frac{1}{2} \cdot \frac{1}{4} = \frac{1}{8}$	1
2d 0s	$\frac{1}{3} \cdot \frac{\binom{39}{2}}{\binom{52}{2}} = \frac{19}{102}$	0
2d 1s	$\frac{1}{3} \cdot \frac{39 \times 13}{\binom{52}{2}} = \frac{13}{102}$	1
2d 2s	$\frac{1}{3} \cdot \frac{\binom{13}{2}}{\binom{52}{2}} = \frac{1}{51}$	2
3d 0s	$\frac{1}{6} \cdot \frac{\binom{39}{3}}{\binom{52}{3}} = \frac{703}{10\,200}$	0
3d 1s	$\frac{1}{6} \cdot \frac{\binom{39}{2} \times 13}{\binom{52}{3}} = \frac{247}{3400}$	1
3d 2s	$\frac{1}{6} \cdot \frac{39 \times \binom{13}{2}}{\binom{52}{3}} = \frac{39}{1700}$	2
3d 3s	$\frac{1}{6} \cdot \frac{\binom{13}{3}}{\binom{52}{3}} = \frac{11}{5100}$	3

a.

$X =$	0	1	2	3
Pr	$\frac{3}{8} + \frac{19}{102} + \frac{703}{10200} = \frac{1607}{2550}$	$\frac{1}{8} + \frac{13}{102} + \frac{247}{3400} = \frac{829}{2550}$	$\frac{1}{51} + \frac{39}{1700} = \frac{217}{5100}$	$\frac{11}{5100}$

b.

$$\frac{\frac{1}{8}}{\frac{1}{8}+\frac{13}{102}+\frac{247}{3400}} = 38.45\%$$

3. __

a.

$$\begin{aligned} 3\cdot\left(-\tfrac{3}{2}+\tfrac{8}{6}\right) &= -\tfrac{1}{2} \\ \sqrt{3\left(\tfrac{9}{2}+\tfrac{64}{6}-(-\tfrac{1}{6})^2\right)} &= 6.739 \end{aligned}$$

b.

$$(\tfrac{1}{6})^3 + 3\cdot\tfrac{1}{3}\cdot(\tfrac{1}{6})^2 = 3.241\%$$

c.

$$(\tfrac{1}{2})^{20}\cdot\sum_{i=11}^{20}\binom{20}{i} = 41.19\%$$

4. __

a.

$$\begin{aligned} \lambda &= \tfrac{147}{12} \\ e^{-\lambda}\sum_{i=0}^{6}\tfrac{\lambda^i}{i!} &= 3.984\% \end{aligned}$$

b.

$$1-\sum_{i=0}^{2}\binom{19}{i}(\tfrac{1}{6})^i(\tfrac{5}{6})^{19-i} = 63.57\%$$

c. By expanding

$$P(z) = e^{\lambda(z-1)}\cdot\left(\tfrac{z}{6-5z}\right)^3$$

and adding coefficients from z^3 to z^{27}, we get 44.88%.

5. ___

a.

$$\frac{\binom{2}{1}\cdot\binom{12}{3}\cdot\binom{37}{2}+\binom{1}{1}\cdot\binom{12}{2}\cdot\binom{37}{3}}{\binom{51}{6}} = 4.475\%$$

b.

$$6\cdot\tfrac{3}{51}\cdot 20 + 6\cdot\tfrac{13}{51}\cdot 5 - 10 = \$4.706$$

and

$$\sqrt{6\cdot\left(\tfrac{3}{51}\cdot\tfrac{48}{51}\cdot 20^2+\tfrac{13}{51}\cdot\tfrac{38}{51}\cdot 5^2 - 2\cdot 20\cdot 5\cdot(\tfrac{3}{51}\cdot\tfrac{13}{51}-\tfrac{1}{51})\right)\cdot\tfrac{45}{50}} = \$12.256$$