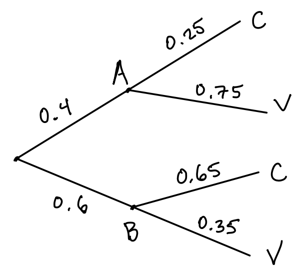
Copy A

1. (a) By the Law of Total Probability,



$$P(V) = P(V \text{ and } A) + P(V \text{ and } B)$$
$$= P(A)\,P(V \mid A) + P(B)\,P(V \mid B)$$
$$= (0.4)(0.75) + (0.6)(0.35)$$
$$= 0.51$$

(b) We seek $P(A \mid V)$ which, by Bayes' Rule, is

$$P(A \mid V) = \frac{P(V \mid A)\,P(A)}{P(V)} = \frac{(0.75)(0.4)}{0.51} = \underline{0.588}$$

2. (a) Geom (b) Unif (c) Pois (d) Norm

3. (a) $P(X \geq 5) = P(X=5) + P(X=7) = 0.2 + 0.3 = \underline{0.5}$

(b) $P(X=2) = 1 - (0.15 + 0.2 + 0.3) = \underline{0.35}$

(c) $E(X^2) = \sum_x x^2 P(X=x) = (2)^2(0.35) + (3)^2(0.15) + (5)^2(0.2) + (7)^2(0.3)$

$= \underline{22.45}$

4. (a) nrow(faculty)

(b) names(faculty)

(c) These variables are categorical: highestDegree, dept, rank, eligibleToRetire

(d) yearsEmployed is the most obviously discrete.

(e) mean(~ salary, data = faculty)

5. (a) $A = \{2, 4, 6, 8, 10, 12, 14, 16, 18, 20\}$

$B = \{1, 2, 3, 4, 5\}$

$C = \{10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20\}$

$D = \{3, 6, 9, 12, 15, 18\}$

$$\boxed{P(A) = \frac{10}{20} \quad P(C) = \frac{11}{20} \quad P(B) = \frac{5}{20} \quad P(D) = \frac{6}{20}}$$

(b) $A \text{ and } C = A \cap C = \{10, 12, 14, 16, 18, 20\}$, so $P(A \cap C) = \frac{6}{20}$

(c) $B \text{ or } D = B \cup D = \{1, 2, 3, 4, 5, 6, 9, 12, 15, 18\}$, so $P(B \cup D) = \frac{10}{20}$

(d) Since $B \cap C = \{\}$, B, C are disjoint events

(e) $P(A \mid D) = \dfrac{P(A \text{ and } D)}{P(D)} = \dfrac{3/20}{6/20} = \dfrac{1}{2}$

(f) A, D are independent, since $P(A) = \frac{1}{2} = P(A \mid D)$.

6. (a) When $X \sim \text{Exp}(\lambda)$, $\mu_X = \frac{1}{\lambda}$. So, $\lambda = \frac{1}{120}$

(b) $P(X \geq 3000) = 1 - P(X < 3000) = \boxed{1 - \text{pexp}(3000,\ 1/120)}$

Or, $P(X \geq 3000) = \displaystyle\int_{3000}^{\infty} f(x)\,dx = \int_{3000}^{\infty} \frac{1}{120} e^{-x/120}\,dx$

(c) qexp(0.75, 1/120)

7. (a) $a = 2$, $b = 10$ and

$E(X) = \frac{1}{2}(a+b) = 6$

$\text{Var}(X) = \frac{1}{12}(b-a)^2 = \frac{64}{12} = \frac{16}{3}$.

(b) 68% is the number for the blank.

"within 1 sd of the mean" corresponds to the interval

$6 \pm \sqrt{16/3}$, or $(3.691,\ 8.309)$

So, punif(8.309, 2, 10) − punif(3.691, 2, 10)

or $\displaystyle\int_{3.691}^{8.309} \frac{1}{8}\,dx = \frac{1}{8}x \Big|_{3.691}^{8.309} = \underline{0.577}$

8. $E(R+G) = E(R) + E(G) = 171 + 163 = \underline{334}$

$\text{Var}(R+G) = \text{Var}(R) + \text{Var}(G) = \sigma_R^2 + \sigma_G^2 = (9.7)^2 + (13.2)^2 = 268.33$

$\Rightarrow \quad SD(R+G) = \sqrt{268.33} = \underline{16.381}$