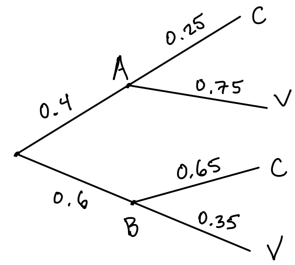
Copy A

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



$$P(V) = P(V \text{ and } A) + P(V \text{ and } B)$$

$$= P(A)\,P(V\,|\,A) + P(B)\,P(V\,|\,B)$$

$$= (0.4)(0.75) + (0.6)(0.35)$$

$$= 0.51$$

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

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

2\. (ii), (iii) and (iv) are resistant to outliers

3\. (a) has a categorical explanatory variable and a quantitative response: II

(b) both variables are quantitative: III

(c) both variables are categorical: I

4\. (a) <u>None</u>. Only in setting (b), where both variables are quantitative, is correlation meaningful. But given the nature of the variables, one would expect a negative correlation.

(b) Setting (b) is the easiest to make into an experiment, as exercise regimen is something one can impose on participants.

Setting (a) is plausible, but more difficult to impose explanatory values.

Setting (c) cannot be implemented as an experiment.

5\. (a) iii (b) ii (c) iv (d) i

6\. (a) It is unimodal and right-skewed

(b) mean is larger

(c) range (approx.): $22.5 - 5 = 17.5$

5-number summary (approx.): 5, 8, 13, 19, 22.5

IQR (approx): $19 - 8 = 11$

7\. Options (ii), (iii) and (v) are true

8. (a) nrow(faculty)

(b) names(faculty)

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

(d) tally(~ dept, data = faculty)

(e) Generally, it means when you know the value of one variable, you can make refined estimates/guesses about the other.

9. (a) dbinom(10, 25, 1/4)

(b) 1 - pbinom(9, 25, 1/3)

10. (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) $$P(A \mid D) = \frac{P(A \text{ and } D)}{P(D)} = \frac{3/20}{6/20} = \frac{1}{2}$$

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

11. (a) $P(X \geq 5) = P(X = 5) + P(X = 7) = 0.2 + 0.3 = 0.5$

(b) $P(X = 2) = 1 - (0.3 + 0.15 + 0.2) = 0.35$

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

$= \underline{22.45}$