



Université d'Ottawa • University of Ottawa

Faculté des sciences Faculty of Science
Mathématiques et de statistique Mathematics and Statistics

Solution to Assignment 1, Fall 2014 Probability and Statistics for Engineers.

585, av. King-Edward 585 King Edward Avenue
Ottawa (Ontario) K1N 6N5 Canada Ottawa, Ontario K1N 6N5 Canada
(613) 562-5864 • Téléc./Fax (613) 562-5776
Courriel/Email: uomaths@science.uottawa.ca

1.11

(a)

$$A \cup C = \{0, 2, 3, 4, 5, 6, 8\}.$$

(b)

$$A \cap B = \{\} = \emptyset.$$

(c)

$$C' = \{0, 1, 6, 7, 8, 9\}.$$

(d)

$$(C' \cap D) \cup B = \{1, 3, 5, 6, 7, 9\}.$$

(e)

$$(S \cap C)' = C' = \{0, 1, 6, 7, 8, 9\}.$$

(f)

$$A \cap C \cap D' = \{2, 4\} \cap D' = \{2, 4\}.$$

1.25.

$$9 \times 8 = 72.$$

1.30.

(a) Any of the 6 nonzero digits can be chosen for the hundreds position, and of the remaining 6 digits for the tens position, leaving 5 digits for the units position. So, there are

$$6 \times 6 \times 5 = 180.$$

three digit numbers.

(b) The units position can be filled using any of the 3 odd digits. Any of the remaining 5 nonzero digits can be chosen for the hundreds position, leaving a choice of 5 digits for the tens position. By Theorem 2.2, there are $(3)(5)(5) = 75$ three digit odd numbers.

(c) If a 4, 5, or 6 is used in the hundreds position there remain 6 and 5 choices, respectively, for the tens and units positions. This gives $(3)(6)(5) = 90$ three digit numbers beginning with a 4, 5, or 6. If a 3 is used in the hundreds position, then a 4, 5, or 6 must be used in the tens position leaving 5 choices for the units position. In this case, there are $(1)(3)(5) = 15$ three digit number begin with a 3. So, the total number of three digit numbers that are greater than 330 is $90 + 15 = 105$.

1.47.

(a)

$$0.03 + 0.15 + 0.14 = 0.32$$

(b)

$$1 - 0.32 = 0.68.$$

(c) The most likelihood location is in the office or den (with the probability of 0.4).

1.66.

For $i = 1, 2, 3, 4$ let $A_i = i^{th}$ test is failed and $B_i = i^{th}$ test is passed. Note that for $i = 1, 2, 3, 4$.

$$A'_i = B_i$$

For part (a) :

$$P(A_1 \cup A_2 \cup A_3 \cup A_4) = 1 - P(B_1 \cap B_2 \cap B_3 \cap B_4) = 1 - (0.99)(0.97)(0.98)(0.99) = 0.07.$$

(b)

$$P(A_2 \cup A_3) = 1 - P(B_2 \cap B_3) = 1 - (0.97)(0.98) = 0.0494.$$

(c)

$$100(0.07) = 7.$$

(d) 0.25.

1.69 This is a parallel system of two series subsystems.

(a)

$$\begin{aligned} P((A \cap B) \cup (C \cap D \cap E)) &= P(A \cap B) + P(C \cap D \cap E) - P(A \cap B \cap C \cap D \cap E) \\ &= (0.7)(0.7) + (0.8)(0.8)(0.8) - (0.7)(0.7)(0.8)(0.8)(0.8) = 0.49 + 0.512 - 0.25088 = 0.75112. \end{aligned}$$

(b)

$$\begin{aligned} P(A' | (A \cap B) \cup (C \cap D \cap E)) &= \frac{P(A' \cap ((A \cap B) \cup (C \cap D \cap E)))}{0.75112} = \frac{P(A' \cap C \cap D \cap E)}{0.75112} \\ &= \frac{(1 - 0.7)(0.8)(0.8)(0.8)}{0.75112} = 0.2044946. \end{aligned}$$

1.84 Let R , S , and L represent the events that a client is assigned a room at the Ramada Inn, Sheraton, and Lakeview Motor Lodge, respectively, and let F represents the event that the plumbing is faulty.

(a)

$$\begin{aligned} P(F) &= P(F|R)P(R) + P(F|S)P(S) + P(F|L)P(L) = (0.05)(0.2) + (0.04)(0.4) + (0.08)(0.3) \\ &= 0.054. \end{aligned}$$

(b)

$$P(L|F) = \frac{(0.08)(0.3)}{0.054} = \frac{4}{9}.$$

1.97

(a)

$$P(\text{Union member}|\text{New company (same field)}) = \frac{13}{13 + 10} = 0.5652.$$

(b)

$$P(\text{Unemployed}|\text{Union member}) = \frac{2}{40 + 13 + 4 + 2} = 0.034.$$