Homework #2

Due 11:59pm (Section 2/Section 3) Feb. 8, 2019

You are encouraged to read Chapter 2 of your textbook to complete the homework.

Please follow the name convention to name your **folders and files**: *CC_<lastName>_HW<#>.pdf*. **Your HW will not be graded if you do not follow this name convention. And** electronically submit your HW to cv094021@gmail.com

Pages 61:
10

(a) False

(b) True

(c) True. This is the definition of probability.

14

(a) Since 562 stones were neither cracked nor discolored, 38 stones were cracked, discolored, or both. The probability is therefore $38/600 = 0.0633$.

(b) Let A be the event that the stone is cracked and let B be the event that the stone is discolored. We need to find $P(A \cap B)$. We know that $P(A) = 15/600 = 0.025$ and $P(B) = 27/600 = 0.045$. From part (a) we know that $P(A \cup B) = 38/600$.
Now $P(A \cup B) = P(A) + P(B) - P(A \cap B)$. Substituting, we find that $38/600 = 15/600 + 27/600 - P(A \cap B)$. It follows that $P(A \cap B) = 4/600 = 0.0067$.

(c) We need to find $P(A \cap B^c)$. Now $P(A) = P(A \cap B) + P(A \cap B^c)$ (this can be seen from a Venn diagram). We know that $P(A) = 15/600$ and $P(A \cap B) = 4/600$. Therefore $P(A \cap B^c) = 11/600 = 0.0183$.

Pages 68: 8

(a) $(26^3)(10^3) = 17,576,000$

(b) $(26)(25)(24)(10)(9)(8) = 11,232,000$

(c) $\frac{11,232,000}{17,576,000} = 0.6391$

Pages 85-86

10

Let A denote the event that the allocation sector is damaged, and let N denote the event that a non-allocation sector is damaged. Then $P(A \cap N^c) = 0.20$, $P(A^c \cap N) = 0.7$, and $P(A \cap N) = 0.10$.

(a) $P(A) = P(A \cap N^c) + P(A \cap N) = 0.3$

(b) $P(N) = P(A^c \cap N) + P(A \cap N) = 0.8$

$$\text{(c) } P(N|A) = \frac{P(A \cap N)}{P(A)} = \frac{P(A \cap N)}{P(A \cap N) + P(A \cap N^c)} = \frac{0.10}{0.10 + 0.20} = 1/3$$

$$\text{(d) } P(A|N) = \frac{P(A \cap N)}{P(N)} = \frac{P(A \cap N)}{P(A \cap N) + P(A^c \cap N)} = \frac{0.10}{0.10 + 0.70} = 1/8$$

$$\text{(e) } P(N^c|A) = \frac{P(A \cap N^c)}{P(A)} = \frac{P(A \cap N^c)}{P(A \cap N^c) + P(A \cap N)} = \frac{0.20}{0.20 + 0.10} = 2/3$$

Equivalently, one can compute $P(N^c|A) = 1 - P(N|A) = 1 - 1/3 = 2/3$

$$\text{(f) } P(A^c|N) = \frac{P(A^c \cap N)}{P(N)} = \frac{P(A^c \cap N)}{P(A^c \cap N) + P(A \cap N)} = \frac{0.70}{0.70 + 0.10} = 7/8$$

Equivalently, one can compute $P(A^c|N) = 1 - P(A|N) = 1 - 1/8 = 7/8$

18

(a) $\frac{71}{102+71+33+134} = \frac{71}{340}$

(b) $\frac{86}{102+86+26} = \frac{43}{107}$

(c) $\frac{22}{26+32+22+40} = \frac{11}{60}$

(d) $\frac{22}{33+36+22} = \frac{22}{91}$

(e) $\frac{86+63+36+26+32+22}{86+63+36+105+26+32+22+40} = \frac{53}{82}$

A chain of stores sells three different cell phones. Of its sales, 50% are brand 1, 30% are brand 2, 20% are brand 3. Each manufacturer offers a 1-year warranty on parts and labor. It is known that 25% of brand 1's cell phones require warranty repair work, whereas the corresponding percentages for brands 2 and 3 are 20% and 10%, respectively.

1. What is the probability that a randomly selected purchaser has brought Brand 1's cell phones that will need repair under warranty?
2. What is the probability that a randomly selected purchaser that will need repair under warranty
3. If a customer returns to the store with a cell phone that needs warranty repair work, what is the probability that it is a brand 1 cell phones? A brand 2 cell phones? A brand 3 cell phones?

[Solution]:

P(A1)=P(purchased Brand1 cell)=0.5
P(A2)=P(purchased Brand2 cell) =0.3
P(A3)= P(purchased Brand3 cell) =0.2

Event B=phone needs repair
P(B|A1)=0.25; P(B|A2)=0.2; P(B|A3)=0.1

(1) $P(A1 \cap B)=P(B|A1)P(A1)=0.25*0.5=0.125$

(2) P(B)

=P[(brand 1 and need repair) or (brand 2 and need repair) or (brand 3 and need repair)] = $P(A1\cap B)+ P(A2\cap B)+ P(A3\cap B)=0.205$

(3) $P(A1|B)= P(A1\cap B)/P(B)=0.125/0.205=0.609$

$P(A2|B)= P(A2\cap B)/P(B)=0.06/0.205=0.293$

$P(A3|B)= P(A3\cap B)/P(B)=0.02/0.205=0.098$