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Homework -1

1.1 ∵ $P(J) = 20\% = 0.2$
$P(S) = 30\% = 0.3$
$P(J \cap S) = 8\% = 0.08$

a: ∴ $P(J/S) = \frac{P(J \cap S)}{P(S)} = \frac{0.08}{0.3} = 26.66\%$

b: ∴ $P(J/\bar{S}) = \frac{P(J \cap \bar{S})}{P(\bar{S})} = \frac{P(J) - P(J \cap S)}{P(\bar{S})}$
$= \frac{0.2 - 0.08}{0.7}$
$= 17.14\%$

c: $P(J/S) = \frac{P(J \cap S)}{P(J \cup S)} = \frac{P(J \cap S)}{P(J) + P(S) - P(J \cap S)}$
$= \frac{0.08}{0.2 + 0.3 - 0.08} = 19\%$

1.2 ∵ $P(H) = 0.8$, $P(S) = 0.9$, $P(H \cup S) = 0.91$
∴ $P(H \cap S) = P(H) + P(S) - P(H \cup S) = 0.79$

a: $P(H/\bar{S}) = P(H) - P(H \cap S)$
$P(H \cap S) = P(H) + P(S) - P(H \cup S) = 0.8 + 0.9 - 0.91$
$P(H/\bar{S}) = 0.8 - 0.79 = 0.01 = 1\%$

b: $P(S/\bar{H}) = P(S) - P(H \cap S) = 0.9 - 0.79 = 0.11$
$= 11\%$

c: ~~P(H)~~ ~~to~~: $1 - P(H \cup S) = 1 - 0.91 = 9\%$

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1.3. If the event are independent, both of Jerry and Susan go to bank individually will be the same.

In that case: $P(J|S) = P(J) * P(S)$

$= 0.2 \cdot 0.3$

$= 0.6 = 60\%$

∴ Two events are not independent.

1.4.a. If the events are independent,

getting sum = 6 { 1;5, 2;4, 3;3, 4;2, 1;5 } 5 in total

$\therefore P = \frac{5}{6 \times 6} = \frac{5}{36}$

$P(\text{2nd dice} = 5) : \frac{6}{6} \times \frac{1}{6} = \frac{6}{36} = \frac{1}{6}$

$\therefore P(\text{sum} = 6 \cap \text{2nd dice} = 5) = \frac{1}{36}$

$P(\text{sum} = 6) * P(\text{2nd dice} = 5) = \frac{5}{36} * \frac{1}{6} = \frac{5}{216}$

∴ they are not independant

b: getting sum = 7 { 1;6, 2;5, 3;4, 4;3, 5;2, 6;1

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$P(1st \cap dice = 5) = \frac{1}{6}$

$P(sum=7 \cap 1st\ dice=5) = P(sum=7) * P(1st\ dice=5) = \frac{1}{36}$

$P(sum=7) * P(1st\ dice=5) = \frac{1}{36} * \frac{6}{36} = \frac{1}{36}$

$\therefore \frac{1}{36} = \frac{1}{36} \Rightarrow$ They are independent.

1.5.

a. $P(TX) = 0.6$ $P(\text{oil in } TX) = 0.3$

$P(NJ) = 0.1$ $P(\text{oil in } NJ) = 0.1$

$P(AK) = 0.3$ $P(\text{oil in } AK) = 0.2$

$P(\text{find oil}) = P(TX) \cdot P(\text{find in } TX) + P(NJ) \cdot P(\text{find in } NJ) + P(AK) \cdot P(\text{find in } AK)$

$= 0.6 \cdot 0.3 + 0.1 \cdot 0.1 + 0.3 \cdot 0.2$

$= 0.25 = 25\%$

b. $P(\text{find in } TX) = \frac{P(\text{oil in } TX)}{P(\text{find oil})} = \frac{0.3 \cdot 0.6}{0.25} = \frac{18}{25} = 0.72 = 72\%$

1.6 a. $P(\text{passenger did not survive}) = \frac{ST}{GT} = \frac{1490}{2201} = 0.677 = 67.7\%$

b. $P(\text{staying first class}) = \frac{325}{2201} = 14.8\%$

c. $P(\text{staying first class} / \text{survived}) = \frac{203}{711} = 28.5\%$

d. $P(\text{survived}) = 1 - P(\text{did not survive}) = 1 - 0.677 = 32.3\%$

$P(\text{first class}) = 14.8\%$

$P(\text{survived}) * P(\text{first class}) = 4.78\%$

$P(\text{first class} \cap \text{survived}) = \frac{203}{2201} = 9.22\%$

$\therefore$ They're not independent.

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e. $P(\text{was a child} \mid \text{survived}) = \frac{P(\text{first class} \cap \text{child} \cap \text{survived})}{P(\text{survived})}$

$= 6/711 \approx 0.84\%$

f. $P(\text{adult} \mid \text{surivied}) = \frac{P(\text{adult} \cap \text{surivied})}{P(\text{surived})}$

$= \frac{654}{711} = 91.98\%$

g. $P(\text{adult} \cap \text{Grand Total}) = \frac{197}{2201} = 0.089$

$P(\text{child} \cap \text{Grand Total}) = \frac{6}{2201} = 0.0027$

$P(\text{child}) = 57/2201$

$P(\text{adult}) = 659/2201$

$P(\text{first class}) = 203/2201$

$P(\text{child}) * P(\text{first class}) = 57 * 203/2201^2 = 0.023$

$P(\text{adult}) * P(\text{first class}) = 197 * 203/2201^2 = 0.008$

$\therefore P(\text{adult} \cap \text{first class}) \neq P(\text{adult}) P(\text{first class})$

$P(\text{child} \cap \text{first class}) \neq P(\text{child}) P(\text{first class})$

$\therefore$ adult passenger and first class are not independent that survived

child passenger and first class are not independent that survived.

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