HW 01 Probability Assignment

Homework 1.1

Jerry and Susan have a joint bank account. Jerry goes to the bank 20% of the days. Susan goes there 30% of the days. Together they are at the bank 8% of the days

a. Susan was at the bank last Monday. What's the probability that Jerry was there too?

8/30 = 26.67%

b. Last Friday, Susan wasn't at the bank. What's the probability that Jerry was there?

12/70 = 17.14%

c. Last Wednesday at least one of them was at the bank. What is the probability that both of them were there?

8/(100-58) = 19.05%

Homework 1.2

Harold and Sharon are studying for a test. Harold's chances of getting a "B" are 80%. Sharon's chances of getting a "B" are 90%. The probability of at least one of them getting a "B" is 91%

P(S) = 0.9

P(H U S)=0.91

P(H or S)= P(H) + P(S) – P(H and S)

0.91 = 0.8 + 0.9 - P(H and S)

P(H and S) = 1.7 – 0.91 = 0.79 = 79%

a. What is the probability that only Harold gets a "B"?

P(H) = 0.91 – 0.90 = 0.01 = 1%

b. What is the probability that only Sharon gets a "B"?

P(S) = 0.91 - 0.80 = 0.11 = 11%

c. What is the probability that both won't get a "B"?

1 - P(H and S) = 1 – 0.79 = 0.21 = 21%

Homework 1.3

Jerry and Susan have a joint bank account. Jerry goes to the bank 20% of the days. Susan goes there 30% of the days. Together they are at the bank 8% of the days.

Are the events "Jerry is at the bank" and "Susan is at the bank" independent?

P(J) = 0.2

P(S) = 0.3

P(J) * P(S) = 0.2 * 0.3 = 0.6

P(J and S) = 0.2 + 0.3 – 0.08 = 0.42

Events are independent if P(J and S) = P(J) * P(S)

Here events "Jerry is at the bank" and "Susan is at the bank" are not independent.

Homework 1.4

You roll 2 dice.

a. Are the events "the sum is 6" and "the second die shows 5" independent?

P(A) = 5/36

P(B) = 1/6

P(A and B) = 1/36

Events are independent if P(A and B) = P(A) * P(B)

Here events "the sum is 6" and "the second die shows 5" are not independent.

b. Are the events "the sum is 7" and "the first die shows 5" independent?

P(A) = 6/36 = 1/6

P(B) = 1/6

P(A and B) = 1/36

Events are independent if P(A and B) = P(A) * P(B)

Here events "the sum is 7" and "the first die shows 5" are independent.

Homework 1.5

An oil company is considering drilling in either TX, AK and NJ. The company may operate in only one state. There is 60% chance the company will choose TX and 10% chance –NJ. There is 30% chance of finding oil in TX, 20% -in AK, and 10% -in NJ.

	TX	AK	NJ
drill	60%	30%	10%
oil	30%	20%	10%
drill & oil	18%	6%	1%

1.What's the probability of finding oil?

P(oil) = P(oil and TX) + P(oil and AK) + P(oil and NJ)

P(oil) = 18 + 6 + 1 = 25%

2.The company decided to drill and found oil. What is the probability that they drilled in TX?

P(drill and oil TX) = 18 / 25 = 0.72 = 72%

Homework 1.6

The following slide shows the survival status of individual passengers on the Titanic. Use this information to answer the following questions

- **What is the probability that a passenger did not survive?**
  1490/2201 = 67.70%
- **What is the probability that a passenger was staying in the first class?**
  325/2201 = 14.77%
- **Given that a passenger survived, what is the probability that the passenger was staying in the first class?**
  203/711 = 28.55%
- **Are survival and staying in the first class independent?**
  P(survival) = 711/2201 = 32.30 %
  P(first class) = 325/2201 = 14.77%
  P(first class & survived) = 203/325 = 62.46%
  Events are independent if P(A and B) = P(A) * P(B)
  Here events survival and staying in the first class are not independent.
- **Given that a passenger survived, what is the probability that the passenger was staying in the first class and the passenger was a child?**
  6/711 = 0.0084 = 0.84%

- **Given that a passenger survived, what is the probability that the passenger was an adult?**
  654/711 = 0.9198 = 91.98%
- **Given that a passenger survived, are age and staying in the first class independent?**
  P(survived | Adult in first class) = 197/203 =97.04%
  P(survived | Child in first class) = 6/203 = 2.96%

  Events are independent if P(A and B) = P(A) * P(B)
  P(A) * P(B) = 0.2873
  P(A and B) = 0.2855

  Events A and B are independent.

Homework 1.7

Replace the missing values below (?), assuming independence between age and cabin class

Total

	1st	2nd	3rd	Crew	GrandTotal
Adult	278	248	681	885	2,092
Child	47	37	25	-	109
GrandTotal	**325**	**285**	**706**	**885**	**2,201**

Replace the missing values below (?), assuming independence between age and cabin class given survival status (conditional independence)

Survived

	1st	2nd	3rd	Crew	GrandTotal
Adult	198	98	146	212	654
Child	5	20	32		57
GrandTotal	**203**	**118**	**178**	**212**	**711**

Not Survived

	1st	2nd	3rd	Crew	GrandTotal
Adult	122	167	476	673	1,438
Child			52		52
GrandTotal	**122**	**167**	**528**	**673**	**1,490**