**Homework 1.18**

**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.**

P(Jerry) = 20%

P(Susan)= 30%

P(Jerry ∩ Susan) = 8%

P(Jerry - Susan) = 20% - 8% = 12%

P(Susan - Jerry) = 30% - 8% = 22%

P(Jerry ∪ Susan) = P(Jerry) + P(Susan) – P(Jerry ∩ Susan)

P(Jerry ∪ Susan) = 20% + 30% - 8%

P(Jerry ∪ Susan) = 42%

1. **Susan was at the bank last Monday. What’s the probability that Jerry was there too?**

Probability of Susan was at the Bank: P(Susan) = 30%

Probability that jerry was there too:

P(Jerry ∩ Susan)/ P(Susan)= 8% / 30% = **26.6667%**

1. **Last Friday, Susan wasn’t at the bank. What’s the probability that Jerry was there?**

Probability of Susan wasn’t at the bank:

100 – P(Susan) = 100% – 30% = 70%

Probability that Jerry was there:

P(Jerry - Susan)/70% = 12% / 70% = **17.1428%**

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

Probability that at least one of them was at the bank:

P(Jerry ∪ Susan) = 42%

Probability that both of them were there:

P(Jerry ∩ Susan)/ P(Jerry ∪ Susan) = 8% / 42% = **19.0476%**

**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(H) = 80%

P(S) = 90%

P(H ∪ S) = 91%

P(H ∪ S) = P(H) + P(S) – P(H ∩ S)

91% = 80% + 90% - P(H ∩ S)

P(H ∩ S) = 170% - 91% = 79%

P(H ∩ S) = 79%

1. **What is the probability that only Harold gets a “B”?**

**Probability that only Harold gets a “B”:**

P(H) – P(H ∩ S) = 80% - 79% = **1%**

1. **What is the probability that only Sharon gets a “B”?**

**Probability that only Sharon gets a “B”:**

P(S) – P(H ∩ S) = 90% - 79% = **11%**

1. **What is the probability that both won’t get a “B”?**

**Probability that both won’t get a “B”:**

100% - P(H ∪ S) = 100% - 91% = **9%**

**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(Jerry ∩ Susan) = **8%**

P(Jerry) = 20%

P(Susan)= 30%

Equation to figure out probability for independent events:  
 **P(Jerry ∩ Susan) =** P(Jerry) \* P(Susan)

P(Jerry **∩ Susan) = 20% \* 30\***

P(Jerry **∩ Susan) = 6%**

**As the above condition is a false,** the events “Jerry is at the bank” and

“Susan is at the bank” are **dependent event.**

**Homework 1.4**

**You roll 2 dice.**

1. **Are the events “the sum is 6” and “the second die shows 5” independent?**

P(A) = Event “the sum is 6”

P(B) = Event “the second die shows 5”

Probability that the events “the sum is 6” and “the second die shows 5”:

**P(A ∩ B) = 1/36**

[Comment: (1,5) is the only combination which satisfy the condition]

Probability of “the sum is 6” = P(A)= 1/5

[Comment: (1,5),(2,4),(3,3),(4,2),(5,1) are combination which satisfy the

condition]

Probability of “the second die shows 5”= P(B) = 1/6

[Comment: (1,5),(2,5),(3,5),(4,5),(5,5),(6,5) are combination which

satisfy the condition]

Equation to figure out probability for independent events:  
 **P(A ∩ B) =** P(A) \* P(B)

**P(A ∩ B) = (1/5) \* (1/6)**

**P(A ∩ B) = (1/30)**

**As the above condition is false,** “the sum is 6” and “the second die shows

5” **are dependent event.**

1. **Are the events “the sum is 7” and “the first die shows 5” independent?**

P(A) = Event “the sum is 7”

P(B) = Event “the first die shows 5”

Probability that the events “the sum is 7” and “the first die shows 5”:

**P(A ∩ B) = 1/36**

[Comment: (5,2) is the only combination which satisfy the condition]

Probability of “the sum is 7” = P(A)= 1/6

[Comment: (1,6),(2,5),(3,4),(4,3),(5,2),(6,1) are combination which

satisfy the condition]

Probability of “the first die shows 5”= P(B) = 1/6

[Comment: (5,1),(5,2),(5,3),(5,4),(5,5),(5,6) are combination which

satisfy the condition]

Equation to figure out probability for independent events:  
 **P(A ∩ B) =** P(A) \* P(B)

**P(A ∩ B) = (1/6) \* (1/6)**

**P(A ∩ B) = (1/36)**

**As the above condition is True, the events** “the sum is 7” and “the first die

shows 5” are **Independent event.**

**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.**

1. **What’s the probability of finding oil?**

Probability of chance that company will choose TX= P(TX) = 60%

Probability of chance that company will choose AK= P(AK) = 30%

Probability of chance that company will choose NJ= P(NJ) = 10%

Probability of chance of finding oil in TX= P(oil/TX) = 30%

Probability of chance of finding oil in TX= P(oil/AK) = 20%

Probability of chance of finding oil in TX= P(oil/NJ) = 10%

P(oil **∩ TX) = P(oil/TX) \* P(TX) = 30% \* 60% = 18%**

P(oil **∩ AK) = P(oil/AK) \* P(TX) = 20% \* 30% = 6%**

P(oil **∩ NJ) = P(oil/NJ) \* P(TX) = 10% \* 10% = 1%**

P(oil) = P(oil **∩ TX) +** P(oil **∩ AK) +** P(oil **∩ NJ)**

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

**P(oil) = 25%**

**Probability of finding oil : P(oil) = 25%**

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

Probability that they drilled in TX :

P(TX)/P(oil) = P(oil **∩ TX) / P(oil)**

P(TX)/P(oil) = 18% / 25%

**P(TX)/P(oil) = 72%**

**Probability that they drilled in TX : 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**

1. **What is the probability that a passenger did not survive?**

Probability that a passenger did not survive:

P(Not survived/Total) = P(Not survived)/ P(Total)

P(Not survived/Total) = 1490/2201

P(Not survived/Total) = **0.676965**

1. **What is the probability that a passenger was staying in the first class?**

Probability that a passenger was staying in the first class:

P(First Class/Total) = P(First Class)/P(Total)

P(First Class/Total) = 325 / 2201

P(First Class/Total) = **0.14766**

1. **Given that a passenger survived, what is the probability that the passenger was staying in the first class?**

Probability that the passenger survived and passenger was staying in the first class:

P(First Class **/Survived) =** P(First Class **∩ Survived)/** P(Survived)

P(First Class **/Survived) = 203/ 711**

P(First Class **/Survived) = 0.28551**

1. **Are survival and staying in the first class independent?**

P(Survived **∩ First Class) = 203 / 711= 0.28**

P(Survived) = 711/ 2201

P(First Class) = 325/ 2201

P(Survived **∩ First Class) =** P(Survived) \* P(First Class)

P(Survived **∩ First Class) = (**711/ 2201) \* (325/ 2201)

P(Survived **∩ First Class) = 0.0476**

**As the above condition is false, the events** survival and staying in the first class are **dependent event.**

1. **Given that a passenger survived, what is the probability that the passenger was staying in the first class and the passenger was a child?**

Probability that passenger survived and the passenger was staying in the first class and the passenger was a child:

P(Child in First class/ survived) = P(Child **∩ First class)/** P(Survived)

P(Child in First class/ survived) = 6 / 711

P(Child in First class/ survived) = 0.0084

1. **Given that a passenger survived, what is the probability that the passenger was an adult?**

Probability that passenger survived and the passenger was an adult:

P(Adult / survived) = P(Adult **∩Survived)/** P(Survived)

P(Adult/ survived) = 654 / 711

P(Adult/ survived) = **0.9198**

1. **Given that a passenger survived, are age and staying in the first class independent?**