**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** |