**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?

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

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

Answer:

P(Jerry) = 20%, P(Susan)=30%, P(Jerry **∩** Susan)= 8%

1. P(Jerry|Susan) = P(Jerry **∩** Susan)/ P(Susan) = 8% / 30% = 26.66%

Probability of Jerry was at bank on Monday is 26.66 %

1. Susan wasn’t at bank, so the probability is 70%(Susan’)

P(Jerry|Susan) = P(Jerry **∩** Susan’) / P(Susan’) = 12% / 70% = 17.14 %

Probability of Jerry was at bank last Friday is 17.14%

1. P(Jerry U Susan)={P(J)+P(S)-P(J **∩** S }

= {20%+30%-8%}

= 42%

P(Jerry|Susan) = P (Jerry **∩** Susan) / P (Jerry **U** Susan) = 8% / 42% = 19.02%

Probability of both were at bank is 19.02%

**Homework 1.2**

Harold and Mary are studying for a test. Harold’s chances of getting “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%.

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

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

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

Answer:

a. P(Harold) = P(Harold) − P(Harold ∩ Sharon) = 80% − 79% = 1%

b. P(Sharon) = 𝑃(Sharon) − P(Sharon ∩ Harold) = 90% − 79% = 11%

c. P(Harold’ U Sharon’ ) = 100% − P(Harold ∪ Sharon) = 100% − 1% = 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?

Answer:

According to Independent Probability

P(Jerry ∩ Susan) = P(Jerry) \* P(Susan)

= 20%\*30%

= 6%

It is given that P(Jerry ∩ Susan) = 8%

The event “Susan at bank ” and “Jerry at bank” are not independent because

P(A n B) != P(A)P(B).

**Homework 1.4**

You roll 2 dice.

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

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

a. P(sum=6) = 5/36

P(second\_die=5) = 6/36 = 1/6

P(sum=6 and second\_die=5) = 1/36 ≠ P(sum=6) \* P(second\_die=5)

Therefore, they are not independent events.

b. P(sum=7) = 6/36 = 1/6

P(first\_die=5) = 6/36 = 1/6 P(sum=7 and first\_die=5) = 1/36 = P(sum=7) \* P(first\_die=5)

Therefore, they are independent events.

**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 a 60 % chance the company will choose TX and 10% chance of NJ.

There is a 30 % chance of finding oil in TX, 20% in AK, and 10% in NJ.

a. What’s the probability of finding oil?

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

Answer:

P (Oil | TX) =P(Oil ∩ TX)/ P(TX)

P(Oil ∩ TX)= P (Oil | TX)\*P(TX)=30%\*60% =18%

Similarly for P(Oil|NJ)= 10%

P(Oil ∩ NJ) = P(Oil| NJ) ∗ P(NJ) = 10% ∗ 10% = 1%

Similarly for P(Oil|AK)= 100%-(60%+10%)=30%

P(Oil ∩ AK) = P(Oil| AK) ∗ P(AK) = 30% ∗ 20% = 6%

**a**. P(Oil)=18%+6%+1%=25%

**b.** P(TX| Oil) =P(TX ∩ Oil)/P(Oil) =18% / 25%=72%

**Homework 1.6**

* P (passenger didn’t survive) = 1490/2201 =67.69%
* P(passenger staying in first class) = 325/2201 =14.7%
* P (staying in first class/survived) = 203/711 =28.5%
* P (survival and staying in first class) = P (survival) + P (first class) – P (survival or first class)

= 0.323 + 0.1476 – 0.3784

= 0.0922

=P (survival) \* P (first class) = 0.3230 \* 0.1476

=0.0476

So, P (survival and staying in first class) ≠ P (survival) \* P (first class)

So, the probability of survival and staying in first class are dependent.

* P (passenger in first class & child/survived) = 6/711 =0.8%
* P (passenger was an adult/survived) = 654/711 =91.98%
* If the person is an adult:

For age (adult) and being in first class to be independent given the person survived:

P (adult and being in first class given the person survived)

= P (adult) \* P (being in first class)

P (adult and being in first class given the person survived) = 0.27

P (adult) \* P (being in first class) = 0.92 \* 0.28 = 0.26

P (adult and being in first class given the person survived) ≈ P (adult) \* P (being in first

class)

Therefore, in this case age and staying in first class are independent

If the person is a child:

For age (child) and being in first class to be independent given the person survived:

P (child and being in first class given the person survived) = P (child) \* P (being in

first class)

P (child and being in first class given the person survived) = 0.008

P (child) \* P (being in first class) = 0.08 \* 0.28 = 0.02

So,

P (child and being in first class given the person survived) ≠ P (child) \* P (being in first

class)

So, in this case age and being in first class are not independent.

**Homework 1.7**

Evens A and B are Independent when : P(A and B) = P(A)\*P(B)

All values are calculated using above formula

Total

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 1st | 2nd | 3rd | 4th | Grand Total |
| Adult | 309 | 271 | 671 | 841 | 2092 |
| Child | 16 | 14 | 35 | 44 | 109 |
| Grand Total | 325 | 285 | 706 | 885 | 2201 |

Survived

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 1st | 2nd | 3rd | 4th | Grand Total |
| Adult | 187 | 108 | 164 | 195 | 654 |
| Child | 16 | 10 | 14 | 17 | 57 |
| Grand Total | 203 | 118 | 178 | 212 | 711 |

Not Survived

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 1st | 2nd | 3rd | 4th | Grand Total |
| Adult | 118 | 161 | 510 | 649 | 1438 |
| Child | 4 | 6 | 18 | 24 | 52 |
| Grand Total | 122 | 167 | 528 | 673 | 1490 |