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 of them were there?

Solution 1.1 :

	Jerry at Bank	**Jerry not at Bank**	
Susan at Bank	8%	22%	30%
Susan Not at Bank	12%	58%	70%
	20%	80%	100%

From above table,

a. 8/30 = 0.2667 = 26.67%
b. 12/70 = 0.1714 = 17.14%
c. 8/(100-58) = 8/42 = 0.1905 = 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%.

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"?

Solution 1.2 :

P(Harold chances of getting "B") = P(H) = 80%
P(Sharon chances of getting "B") = P(S) = 90%
P(At least one of Harold Sharon getting a "B") = $P(H \cup S)$ = 91%

Using formula, $P(H \cup S) = P(H) + P(S) - P(H \cap S)$

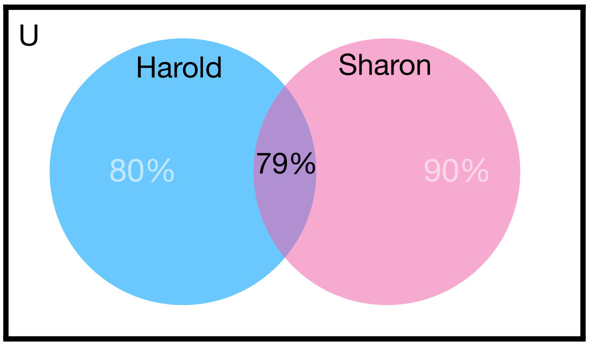
$P(H \cap S) = P(H) + P(S) - P(H \cup S)$

$P(H \cap S) = 80 + 90 - 91$

$P(H \cap S) = 79\%$

a. P(only Harold gets a "B") : $P(H) - P(H \cap S) = (80 - 79)\,\% = 1\%$

b. P(only Sharon gets a "B") : $P(S) - P(H \cap S) = (90-79)\% = 11\%$



c. P(both won't get a "B") : $(100 - P(H \cup S))\% = (100 - 91)\% = 9\%$

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?

Solution 1.3 :

Events are independent if two events say A and B where A here is “Jerry is at the bank” and B is “Susan is at the bank” :

$P(A \mid B) = P(A)$ or $P(A \cap B) = P(A)P(B)$

Here, $P(A) = 20\%$, $P(B) = 30\%$, $P(A \cap B) = 8\%$

$P(A) * P(B) = (20 * 30)\% = 6\ \%$ which is not equal to $P(A \cap B) = 8\%$

Hence, A and B 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?

b.

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

Solution 1.4 :

a. P(the sum is 6) = 6/36 and
P(the second die shows 5) = 5/36
Events are independent if P(A I B) = P(A) or P(A ∩ B) = P(A)P(B)

Let A = the sum is 6 and B = the second die shows 5

Here, P(A)P(B) = P(A)*P(B) = (6/36) * (5/36)
and P(A ∩ B) = 1/36. (Sum is 6 and second die shows 5)

P(A ∩ B) is not equal to P(A)P(B)
Hence, Events are not independent.

b. P(the sum is 7) = P(A) = 6/36 = 1/6
P(the first die shows 5) = 6/36 = 1/6

Events are independent if P(A I B) = P(A) or P(A ∩ B) = P(A)P(B)

Here, P(A)P(B) = P(A)*P(B) = (1/6) * (1/6) = 1/36
and P(A ∩ B) = 1/36. (Sum is 7 and first die shows 5)

P(A ∩ B) is equal to P(A)P(B)
Hence, Events 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.
1. What's the probability of finding oil?
2. The company decided to drill and found oil. What is the probability that they drilled in TX?

Solution 1.5 :

	TX	AK	NJ	
Oil	18%	6%	1%	25%
No Oil	42%	24%	9%	75%
	60%	30%	10%	100%

From the above table :
1. P(finding oil) = 25%
2. Company decided to drill and found oil. P(company people drilled in TX) = (18/25)% = 0.72 %

Homework 1.6

The following slide shows
the survival status of
individual
passengers
on the Titanic
. Use this information to answer the
following questions
a. What is
the probability
that a passenger did not survive?
b. What is the probability that a passenger was staying in the first class?
c. Given that a passenger survived, what
is the probability that the passenger was staying in the first class?
d. Are survival and staying in the first class independent?
e. Given that a passenger survived, what is the probability that the passenger was staying in the first class and the passenger was a child?
f. Given that a passenger survived, what is the probability that the passenger was an adult?
g. Given that a passenger survived, are age and staying in the first class independent?

Solution 1.6 :

a. P(Passenger did not survive) = Not survived/total = 1490/2201 = 0.677

b. P(Passenger staying in first class) = 325/2201 = 0.1477

c. Let A = Passenger Survived, B = Passenger staying in First class
$P(B|A) = P(B \cap A)/P(A)$ = P(Passenger survived in first class)/P(Passenger survived)
= (203/2201)/(711/2201) = 0.286

d. Let A = Survival, B = Staying in first in class
Events are independent if $P(A | B) = P(A)$ or $P(A \cap B) = P(A)P(B)$
$P(A)*P(B) = (711/2201)*(325/2201) = 0.323*0.148 = 0.048$
$P(A \cap B) = 203/2201 = 0.092$

Here, $P(A \cap B)$ is not equal $P(A)*P(B)$
Hence, Survival and Staying in first class are not independent.

e. P(Passenger survived) = P(A)
P(Passenger was staying in first class) = P(B)
P(Passenger was a child) = P(C)

$P(B \cap C | A) = P(B \cap C \cap A)/P(A) = (6/2201)/(711/2201) = 0.0084$

f. Let A = Passenger survived, B = Passenger was an adult
$P(B | A) = P(B \cap A)/P(A) = (654/2201)/(711/2201) = 0.919$

g. From the survived passenger, if (Adult and First Class) and (Child and First Class) are independent then (Age and First Class) are independent.

Let A = Passenger survived, B = Adult, C = Child D = First Class independent

P(B ∩ D) = 197/2201 = 0.0895
P(C ∩ D) = 6/2201 = 0.0027

P(B) = 654/2201 = 0.297
P(C) = 57/2201 = 0.026
P(D) = 203/2201 = 0.092

P(B)*P(D) = 0.027
P(C)*P(D) = 0.0024

Here, P(B ∩ D) is not equal P(B)*P(D) Hence Survived Adult and Child are independent
P(C ∩ D) is not equal P(C)*P(D) Hence, Survived Child and First Class they are independent

Therefore, Survived Age and First Class are independent.