

Homework

1.1) Jerry & 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

Solution :-

Probability of Jerry going to bank when Susan is also in the bank :-

$$P(\text{Jerry} | \text{Susan}) = \frac{P(\text{Jerry} \cap \text{Susan})}{P(\text{Susan})}$$

$$= 8/30 = \boxed{26.66\%} //$$

→  
ptd

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

Solution :-

Probability of Jerry going to the bank when Susan is not in the bank is :-

$$P(\text{Jerry} | \text{Susan}') = \frac{P(\text{Jerry} \cap \text{Susan}' )}{P(\text{Susan}' )}$$

$$= 12 / 70$$

$$= \boxed{17.14\%}$$

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

Solution :-

Probability that ~~both~~ Jerry or Susan either one of them was present the other one was present:-

$$P(\text{Jerry} | \text{Susan}) = \frac{P(\text{Jerry} \cap \text{Susan})}{P(\text{Jerry} \cup \text{Susan})}$$

$$= \frac{8}{42}$$

$$= \boxed{19.04\%}$$

— X — END OF 1.1 — X —

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"?

Solution :-

Probability that only Harold gets a "B":-

$$\begin{aligned} P(\text{only Harold}) &= P(\text{Harold}) - P(\text{Harold} \cap \text{Sharon}) \\ &= 80 - 19 \\ &= \boxed{11\%} // \end{aligned}$$

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

Solution :-

Probability that only Sharon gets "B" is

$$\begin{aligned} P(\text{only Sharon}) &= P(\text{Sharon}) - P(\text{Harold} \cap \text{Sharon}) \\ &= 90 - 19 \\ &= \boxed{11\%} // \end{aligned}$$

(c) What is the probability that both would get a "B"?

Solution :-

Probability that both would get "B"

$$P(\text{Harold} \cap \text{Sharon}) = 100 - P(\text{Harold} \cup \text{Sharon}) \\ = 100 - 79 = \boxed{21\%}$$

— X — END OF 1.2 — X —

1.3) Jerry & 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 87% of the days.  
~~Area~~

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

Solution :-

Both Jerry and Susan go to the bank 87% of the days.

If the events were independent the individual parameters of going together if calculated product would be similar. But,

$$20 \times 30 = 60\%$$

Hence events are not independent

→ — END of 1.3 — →

1.4) You Roll 2 dice

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

Solution :-

If these events are independent:-

$$P(\text{Second die} = 5 \text{ & sum} = 6) = P(\text{sum} = 6) + P(\text{Second die} = 5)$$

$$\frac{5}{36} + \frac{6}{36} = \frac{1}{36} \text{ which is not equal}$$

thus both events are not independent

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

Solution :-

If these events are independent

$$P(\text{first die} = 5 \text{ & sum} = 7) = P(\text{sum} = 7) + P(\text{first die} = 5)$$

$$\frac{1}{36} = \frac{6}{36} + \frac{6}{36}$$

As both events are equal, events are independent

— x END of 1.4 — x —

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

a) What's the probability of finding oil

Solution :-

Finding probability of finding oil in a state and probability of choosing that state

For TX,

$$P(\text{Oil} | \text{TX}) * P(\text{TX}) = 30\% * 60\% = 18\%$$

$$\text{For AK, } P(\text{Oil} | \text{AK}) * P(\text{AK}) = 20\% * 30\% = 6\%$$

$$\text{For NJ, } P(\text{Oil} | \text{NJ}) * P(\text{NJ}) = 10\% * 10\% = 1\%$$

Therefore, probability of finding oil = 18% + 6% + 1% = 25%

Probability of finding oil = 25%

b) The company decided to drill & found oil.  
What is the probability that they drilled +x.

Solution :-

Probability of drilling in +x and finding  
oil =

$$P(+x | \text{Oil}) = \frac{P(+x \cap \text{Oil})}{P(\text{Oil})} = \frac{18}{25} = 72\%$$

— x — END OF I.S. — x —

1.6) Answering questions based on titanic survivor data

a) What is the probability that a passenger did not survive?

Solution :-

$$P(\text{Not Survived}) = \frac{1490 - 613}{2201 - 885} = [62.08\%]$$

b) What is the probability that a passenger was staying in the first class.

Solution :-

$$P(F) = \frac{325}{1316} = [24.69\%]$$

c) Given that a passenger survived, what is the probability that a passenger was staying in first class.

Solution :-

$$P(S \cap F) = 203 / 1499 = [13.68\%]$$

d) Are survival & staying in the first class dependent?

Solution :-

If probability of staying in first class and surviving are equally by being mutually exclusive they are independent

$$\text{Probability of surviving} = 100 - P(\text{NS}) \\ = 100 - 62.08 \\ = 37.92\%.$$

Therefore,  $24.69 \times 37.92 = 9.36\%$ .

So survival and staying first class are not independent.

- e) Given that a passenger survived, what is the probability that the passenger was staying in the first class and was a child?

Solution :-

$$P(\text{passenger survived, staying in first class and is a child}) = 6/499 = 1.2\%.$$

- f) Given the passenger survived, what is the probability that the passenger was an adult?

Solution :-

$$P(\text{passenger survived & adult}) = 442/499 = 88.57\%.$$

g) Given that a passenger survived, are age and staying in the first class independent?

Solution:-

$$P(\text{age passenger survived}) = P(A|S) + P(C|S)$$
$$= 442/499 + 57/499 = 1.$$

$$P(\text{passenger survived \& staying in first class}) = 40.68\%$$

therefore probability of age \& staying in first class = 40.68%.

Since probability of age and first class is equal

Events are independent

→ END OF 1.6 →