Jared Barber

Dr. Davis

STA 3032

24 January 2022

PROJECT 2.1

2.38

Four married couples have bought 8 seats in the same row for a concert. In how many different ways can they be seated

a) with no restrictions?

If there are no restrictions, then any one of the 8 people can sit in the first seat. Then, because one person is already seated, any one of the 7 remaining people can sit in the next seat, and so on. This is an application of the multiplication rule.

8*7*6*5*4*3*2*1 = **40320**

b) if each couple is to sit together?

If each couple is to sit together, consider each couple 1 item. Then, because there are 2 ways for each couple to be seated, there are $2^4(4!)$ = **384** different ways to be seated.

2.66

Shift	Unsafe Conditions	Human Error
Day	5%	32%
Evening	6%	25%
Graveyard	2%	30%

a) What is the probability that the accident occurred on the graveyard shift?
   2+30= **32%**
b) What is the probability the accident occurred due to human error?
   32+25+30= **87%**
c) What is the probability the accident occurred due to unsafe conditions?
   5+6+2 = **13%**
d) What is the probability the accident occurred on either the evening or the graveyard shift?
   6+25+2+32 = **63%**

2.78

a) What is the probability that a batch of serum survives the first departmental inspection but is rejected by the second?

(1- 0.10) * 0.08 = 0.9 * 0.08 = **0.072**

b) What is the probability that a batch of serum is rejected by the third department?

(1- 0.10) * (1- 0.08) * 0.12 = 0.9 * 0.92 * 0.12 = **0.9936**

2.80

Let P(L) denote the probability that the automobile needs an oil change, P(F) denote the probability that it needs a new oil filter, and P (F ∩ L) denote the probability that it needs both an oil change and a new oil filter.

a) If the oil has to be changed, what is the probability that a new oil filter is needed?
   P(F|L) = P (F ∩ L) / P (L) = 0.14/0.25 = **0.56**
b) If a new oil filter is needed, what is the probability the oil has to be changed?
   P(L|F) = P (F ∩ L) / P (F) = 0.14/0.40 = **0.35**

2.90

a) Find P (A∩B∩C)
   P(A∩B∩C) = P(C|A∩B)*P(A∩B)
   = P(C|A∩B)*P(B|A)*P(A)
   = (0.20)(0.75)(0.30) = **0.045**
b) Find P (B' ∩ C)
   P (B' ∩ C) = P(A∩B'∩C) + P(A'∩B'∩C)
   = P(C|A∩B')*P(B'|A)*P(A)+P(C|A'∩B')*P(B'|A')*P(A')
   = (0.80)(1-0.75)(0.3)+(0.90)(1-0.20)(1-0.3)
   = **0.564**
c) Find P (C)
   P(C)= P(A∩B∩C)+P(A∩B'∩C)+P(A'∩B∩C)+P(A'∩B'∩C)
   = 0.045 + 0.060 + 0.021 + 0.504 = **0.630**
d) Find the probability that the river is polluted, given that fishing is permitted ad the sample tested did not detect pollution.
   Find P(A|B'∩C) = P(A∩B'∩C)/P(B'∩C) = 0.06/0.564= **0.1064**

2.96

P(Speeding Ticket) = (0.4)(0.2) + (0.3)(0.1) + (0.2)(0.5) + (0.3)(0.2) = **0.27**

2.98

P(L_2|Speeding Ticket) = 0.03/0.27 = **0.1111**