Probability Mix - Probability - Pfeil - **Solutions** Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Date:\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Pd:\_\_\_\_\_\_\_\_\_



**\*Not sure where to start? Draw a picture (Venn diagram or tree diagram). At the very least it could provide you with some insight.**

**\*Don’t forget about complements. If P(A) + P(B) = 1, then P(B) = 1 - P(A) … P(B) = P(Ac)**

1) Explain why the following are neither mutually exclusive nor independent.

a) Event A: it’s raining outside Event B: going to a baseball game

Both raining and going to a baseball game can occur at the same time. If it is raining, that will change the probability that I still go to the game.

b) Event A: being a female Event B: being colorblind

Being a female and colorblind can occur at the same time. The majority of colorblind people are males.

2) In a survey, 510 adults were asked if they drive a *P*(Pickup) = 1/6

pickup truck and if they drive a Ford. The results *P*(Ford) = 3/10

showed that one in six adults surveyed drives a pickup *P*(Pickup|Ford) = 2/9

truck, and three in ten adults surveyed drives a Ford.

Of the adults surveyed that drive Fords, two in nine

drive a pickup truck.

a) Find the probability that a randomly selected adult drives a pickup truck given that he or she drives a Ford.

P(Pickup|Ford) = 2/9

b) Are the events of driving a Ford and driving a pickup truck independent or dependent? Show mathematically.

Dependent. If they were independent then *P*(Pickup) = *P*(Pickup|Ford). They are not equal.

 1/6 ≠ 2/9

c) Find the probability that a randomly selected adult drives a Ford and drives a pickup truck.

P(Ford and Pickup) = P(Ford)\*(Pickup|Ford) = (3/10)(2/9) = 6/90

3) A poker player holds a flush when all 5 cards in the hand belong to the same suit. We will find the probability of a flush when 5 cards are dealt.

a) We will concentrate on spades. What is the probability the first card dealt is a spade?

*P*(spade) = 13/52

b) What is the conditional probability that the second card is a spade, given that the first is a spade?

*P*(spade|spade) = 12/51

c) Continue in a similar manner to find the probability the third card is a spade, fourth and fifth.

*P*(3rd) = 11/50 *P*(4th) = 10/49 *P*(5th) = 09/48

d) So what is the probability of being dealt a flush of spades?

*P*(Flush of Spades) = (13/52)(12/51)(11/50)(10/49)(9/48) = 0.000495

e) What is the probability of being dealt a flush?

*P*(Flush) = 4(.000495) = 0.00198 or (52/52)(12/51)(11/50)(10/49)(9/48) = 0.00198

4) You’re taking a multiple choice exam and you don’t know the answers to two of the questions. Each question has four choices, so the probability of getting a question right by guessing is 0.25. Draw a tree diagram showing the probabilities of getting none, one, or both questions right by guessing.

 P(0) = (0.75)(0.75) = 0.5625

P(R) = 0.25

P(W) = 0.75

P(R) = 0.25

P(W) = 0.75

P(R) = 0.25

P(W) = 0.75

 P(1) = (0.25)(0.75) + (0.75)(0.25) = 0.375

 P(2) = (0.25)(0.25) = 0.0625

5) A sample of automobile dealerships found that 19% of automobiles sold are silver, 22% of automobiles sold are SUVs, and 16% of automobiles sold are silver SUVs. What is the probability that a randomly chosen sold automobile from the sample is silver or an SUV?

Silver (.03)

SUV (.06)

0.16

*P*(silver) = 0.19 *P*(SUV) = 0.22 *P*(silver and SUV) = 0.16

*P*(silver or SUV) = *P*(silver) + *P*(SUV) - *P*(silver and SUV)

(0.19) + (0.22) - (0.16) = .25

6) Musical styles other than rock and pop are becoming more popular. A survey of college students finds that 40% like country music, 30% like gospel music and 10% like both.

|  |  |
| --- | --- |
| a) What is the conditional probability that a student likes gospel music if we know that he or she likes country music? | b) What is the conditional probability that a student who does not like country music likes gospel music? |
| $$P(G|C) = \frac{P(G and C)}{P(C)}=\frac{0.10}{0.40}=0.25$$P(C)0.30P(G)0.200.10 | $$P(G|C^{c}) = \frac{P(G and C^{c})}{P(C^{c})}=\frac{0.20}{0.4+0.2}=0.33$$P(C)0.30P(G)0.200.100.4 |

7) There is a jar that has 5 blue marbles, 6 green marbles, and 3 purple marbles. You close your eyes, reach in the jar and randomly choose 2 marbles. Find the following probabilities:

a) Both are green. b) At least one is purple. c) 1 blue and 1 green.

(6/14)(5/13) = 0.165 1 - (11/14)(10/13) = 0.396 (5/14)(6/13) + (6/14)(5/13)= 0.33

 

8)

a) Find the probability of being “7-12“ years-old AND preferring “Chicken Nuggets”. (Dep. Events)

*P*(7-12 and CN) = *P*(7-12) ∗ *P*(CN|7-12) = 30/82 ∗ 13/30 = 13/82

b) Find the probability of being “13-15“ years-old OR preferring “Filet’o’fish”. (Not Mutually Exclusive)

*P*(13-15 or FF) = *P*(13-15) + *P*(FF) - *P*(13-15 and FF) = (35/82) + (15/82) - (8/82) = 0.51

c) Find the probability of preferring “Hamburger” given that the randomly selected child is “13-15” years-old.

*P*(H|13-15) 16/35 = 0.475 or *P*(H and 13-15)/P(13-15) = (16/82)/(35/82) = 16/35

d) Show, using probability, that preferring “Hamburger” and being “13-15” years-old are not independent events.

If ***P*(13-15|Hamburger) = P(13-15)** then the events are independent. *P*(13-15|Hamburger) = 16/34 and *P*(13-15) = 35/82. 16/34 does not equal 35/82 therefore the probabilities are not independent.