# ICMA151 Statistics for Science I

Name: _Vikan Node Vidy_　　ID: _608105U_

**Quiz 2 (5%) 70 points (10 points each)**

**Problem**

1. Three randomly chosen fourteen-year-old junior high students who had not yet taken driver's education classes were given the written part of the Michigan Driver's Exam. Each student was graded as passing (P) or failing (F) the written exam.

   a. Describe the sample space; that is, list all possible combinations of the three students' grades.

   $(P, F, F), (P, P, F), (P, P, P), (F, P, P), (F, F, P), (F, F, F)$

   $(F, P, F), (P, F, P)$

   b. Assuming each combination in part (a) is equally likely, what is the probability all three students fail?

   $$\frac{1}{2^3} = \frac{1}{8}$$

   c. Assuming each combination in part (a) is equally likely, what is the probability at least one student passes the written test?

   $$\frac{7}{8}$$

   d. Assuming each combination in part (a) is equally likely, and if you knew at least one student passed the test, what is the probability all three students passed the test?

   $$\frac{1}{7}$$

2. A sample space $S$ consists of five simple events with these probabilities:

$P(E_1) = P(E_2) = 0.20$, $P(E_3) = 0.45$, and $P(E_4) = 2P(E_5)$

a. Find the probability for outcomes in $E_4$.

0.2, 0.2, 0.45, 2x, x

1 - 0.85 = 0.15

0.2, 0.2, 0.45, 0.10, 0.5

_____0.1_____

b. Find the probabilities for these two events: (A): $E_1$, $E_3$, $E_4$

_____0.75_____

c. B: $E_2$, $E_4$

_____0.30_____

d. List the outcomes that are either in event A or event B or both:

$E_1, E_2, E_3, E_4$

e. List the simple events that are in both event A and event B:

$E_4$

3. An Italian restaurant in Grand Rapids, Michigan, offers a special summer menu in which, for a fixed dinner cost, you can choose from one of two salads, one of three entrees, and one of four deserts. How many different dinners are available?

_____$4! = 24$_____

4. Research studies suggest that the likelihood a drug offender will be convicted of a drug offense within two years after treatment for drug abuse may depend on the person's educational level. The proportion of the total number of cases that fall into four education/conviction categories are shown in the table below:

| Education | Convicted | Not Convicted | Total |
|---|---|---|---|
| 10 or more years of education | 0.10 | 0.30 | 0.40 |
| Less than 10 years of education | 0.25 | 0.35 | 0.60 |
| Total | 0.35 | 0.65 | 1.00 |

Suppose a single offender is selected from the treatment program. Here are two events of interest:

A: The offender has 10 or more years of education

B: The offender is convicted within two years after completion of treatment

a. Find P(A)

   0.4

b. Find P(B)

   0.35

c. Find $P(A \cap B)$

   0.1

d. Find $P(A \cup B)$

   0.65

e. Find $P(A^c)$

   0.6

f. Find $P(A \cup B)^c$

3

0.35

g. Find $P(A \cap B)^C$

0.9

h. Find A given that B has occurred

$$\frac{P(A \cap B)}{P(B)} = \frac{0.1}{0.35} = 0.2857$$

i. Find B given that A has occurred

$$\frac{P(B \cap A)}{P(A)} = \frac{0.1}{0.4} = 0.25$$

j. Are events A and B independent?

No

5. Lily frequents one of two fast food restaurants, choosing McDonald 25% of the time and Burger King 75% of the time. Regardless of where she goes, she buys French Fries on 60% of her visits.

   a. The next time Lily goes into a fast food restaurant, what is the probability that she goes to McDonald and orders a French Fries?

   $0.25 \times 0.6 = 0.15$

   b. Are the two events in the previous question independent? Explain.

   Independent

   c. Explain.

   Given where ever she goes she will have 60% to get French fries

   d. If Lily goes to a fast food restaurant and orders French Fries, what is the probability that she is at Burger King?

   $0.75 \cdot 0.6 = 0.45$

   e. What is the probability that Lily goes to McDonald, or orders French Fries, or both?

   0.25, 0.6, 0.15

6. Steve takes either a bus or the subway to go to work with probabilities 0.25 and 0.75, respectively. When he takes the bus, he is late 40% of the days. When he takes the subway, he is late 30% of the days. If Steve is late for work on a particular day, what is the probability that he took the bus?

   $\dfrac{0.1}{0.1 + 0.225} = 0.3077$

   0.25 $\langle$ 0.6 AL, 0.4 L→0.1

   0.75 $\langle$ 0.7 NL, 0.3 L→0.225

5
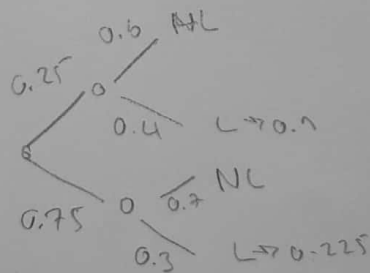
7. The probability distribution of your winnings at a casino's card game is shown below.

| x | p(x) |
|-----|------|
| $0 | 0.1 |
| $1 | 0.4 |
| $2 | 0.2 |
| $5 | 0.3 |

0
0.4 ⎫
0.4 ⎬
1.5 ⎭

a. What is the chance you win more than $1 if you play just once?

$\underline{\quad 0.9 \quad}$

b. How much should you expect to win if you play the game once?

$\underline{\quad \$\,2.3 \quad}$

c. After breaking the bank at the casino playing this card game, you decide to open your own casino where the customers can play your favorite card game. How much should you charge the players if you want to have an average profit of $1 per play?

$\underline{\qquad\qquad}$

| x | P(x) |
|-----|------|
| $0 | 0.8 |
| $5 | 0.2 |

Cost $2 per play.

6