Math 5710 Opportunity #3 ♬ W/07/15/20 – H/07/16/20

1. Please print your name legibly. Brock Francom, A02052161

2. Examine each of the following propositions, determine whether or not it is true, display your choice by circling either "T" or "F"; for each either prove that your decisions is correct or write at least one paragraph that explains why you decided that the proposition is true or why you decided that the proposition is false:

A. $\varnothing \in [\,0, \infty\,)$

T F

From our glossary, $A = \emptyset \Leftrightarrow \not\exists x \ni x \in A$. We can deduce that the set of elements in $[0, \infty) = \{0, \ldots, \infty\}$, such that each element is in $\mathbb{R}$. Therefore, no element in $[0,\infty)$ is the empty set, because any element you pick from $[0,\infty)$ fails to satisfy $A = \emptyset \Leftrightarrow \not\exists x \ni x \in A$.

B. $(\,V$ is the universe $\wedge A \in \{\text{ sets }\} \wedge A^c = A\,) \Rightarrow V = \varnothing$

T F. From the glossary, $A^c = V - A$. Now if $V = \emptyset$, The only option for $A = \emptyset$, since $V = \{\}$. Now $A^c = \emptyset - \emptyset = \{\} = \emptyset$.

Now we have $A^c = \emptyset = A$.

C. $s, t \in \{\text{ sequences }\} \Rightarrow |\,s\,| = |\,t\,|$

T F From the glossary a sequence is:
Given $A \in \{sets\}$, (s is a sequence $\Leftrightarrow s : \mathbb{N} \to A$)
Therefore both s and t will have the same cardinality as $\mathbb{N}$.
Therefore $|S| = |t|$.

D. (Ω is a sample space $\wedge A$ is an event of $\Omega \wedge p$ is a probability distribution on Ω }) $\Rightarrow$ (x is an outcome of $\Omega \Rightarrow x$ is a set)

T F An outcome is an element of the set of all outcomes, not a set itself. Therefore, x cannot be a set if it is an outcome.

E. (Ω is a sample space $\wedge A$ is an event of Ω $\wedge$ p is a probability distribution on Ω }) $\Rightarrow A$ is a set

T F

when we talked about Sybil in class we wrote down the event where the sum of 2 dice is 2.

$X_2 = \{(1,1)\}$.

This shows that an event of Ω is a set. An event is a subset of Ω.

F. (Ω is a sample space $\wedge A$ is an event of Ω $\wedge$ p is a probability distribution on Ω }) $\Rightarrow p$ is a set

T F

P maps an event A to a number in the range $[0,1]$. The set p could look like the following:

$p = \{(\text{event}, \text{probability}), \ldots\}$.

$P = \{(\text{get a 2 on a dice}, \frac{1}{6}), \ldots\}$.

G. (Ω is a sample space $\wedge A$ is an event of Ω $\wedge$ p is a probability distribution on Ω }) $\Rightarrow p(A)$ is a set

T F

P(A) is an number between $[0,1]$, not a set. The function p maps event A from Ω to a number between $[0,1]$. Therefore, P(A) is not a set.

H. (Ω is a sample space $\wedge$ A is an event of Ω $\wedge$ p is a probability distribution on Ω }) $\Rightarrow$ A is the domain of p

T F The domain of P is actually the set of all events of Ω, not just an event A. A is a part of the domain of p, but not the whole thing. P maps each event in Ω to a number between [0,1].

I. Results from an interval measurement can tenably interpreted as if they were ratio.

T F
Results from an interval measurment can tenably interpreted as if they were nominal. Nominal measurment is measured in Categories and So is interval measurment. Interval has a Specific spacing between values, but if you don't care about that Spacing, You can interperet the measurment as ratio.

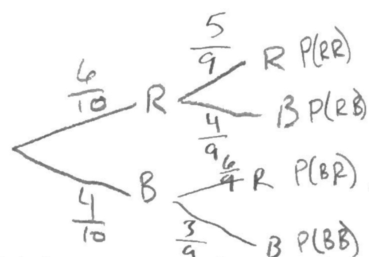
J. Measurement relevance is a sufficient condition for measurement reliability.

T F
Validity is a sufficent condition for measurment reliability. The more valid the data is, the more reliable it can be. A neccessesary condition for measurment reliability is Internal Consistency, and Validity is a sufficent Condition.

K. ($A, B \in$ { non-empty subsets of Ω $\wedge$ A and B are mutually-exclusive relative to one another) $\Rightarrow$ A and B are independent of one another.

T F

Consider picking 2 balls out of a bag. The bag contains 6 red and 4 blue balls.



As we can see, the outcomes are mutually exclusive, But The probabilities differ from the first tier to the second. Therefore, They are not independant events

L. ($D \in$ { finite sets } $\wedge$ $t \in$ { permutations of D }) $\Rightarrow$ $t \in$ { finite sets }

T F

Consider the following: $D = \{1,2\}$.

Permutations of $D = \{\{1,2\},\{2,1\}\}$.

$t = \{2,1\}$ or $t = \{1,2\}$.

Both are elements of {finite sets}.

M. $(n, r \in \omega \ni r \leq n) \Rightarrow \binom{n}{r} \in$ { finite sets }

T F

$\binom{n}{r}$ = an integer in $\mathbb{R}$

Because an integer is not a set, $\binom{n}{r} \notin$ {finite sets}. Therefore, The Statement cannot be correct because it implies that $\binom{n}{r}$ is a set.

3. Fawn teaches an ESOL (English for speakers of other languages) to 30 students. Five of the students only write in Portuguese, 10 only write in Korean, and 15 only write in Spanish. She finds a document belonging to one of the students but she doesn't know whom. The document is not related to the class, so she doesn't think she should read it but she readily sees that it is not written in Korean. Address the following question and display your computation: What is the probability that it is written in Portuguese?

$\frac{5}{30}$ → portuguese

$\frac{10}{30}$ → korean

$\frac{15}{30}$ → spanish

Given that the paper is not korean, our probabilites now change. Since 10 students use korean, we can eliminate them. Now $30 - 10 = 20$. our sample space is now 20. There fore the probability that the paper is written in Portuguese is $\frac{5}{20} = P(\text{Portuguese})$.

$$\boxed{P(\text{Portuguese}) = \frac{5}{20}}$$

4. Three experiments are conducted:

Experiment 1: One card is randomly drawn from a well-shuffled poker deck consisting of 52 cards – no jokers).

Experiment 2: A ball is randomly drawn from an urn that contains exactly 4 black balls, 3 green balls, 3 yellow balls, and 2 orange balls. $4+3+3+2=12$

$n=12$

Experiment 3: Experiments 1 and 2 are combined.

What is the probability that Experiment 3 results in the event that an ace is drawn and a black ball is drawn?

Please display the computation that led to your solution.

$P(\text{ace drawn} \cap \text{black ball}) = ?$

we know the probability of drawing an ace is $P(\text{ace drawn}) = \frac{4}{52}$

we know the probability of getting a black ball is $P(\text{black ball}) = \frac{4}{12}$

$$P(\text{ace drawn} \cap \text{black ball}) = P(\text{ace drawn}) \cdot P(\text{black ball})$$

$$= \frac{4}{52} \cdot \frac{4}{12}$$

$$\boxed{= .02564 = \frac{1}{39}}$$

5. When you completed our homework assignment for Meeting #1, you described an experiment in response to the following prompt:

E.* Design and describe an experiment that addresses a question about future events. The question should involve a prediction about some population – not about some unique individual member of that population. For example, rather than designing an experiment to help predict whether Jim becomes infected with COVID 19 before August 5, design an experiment to predict whether at least one member of our Math 5710 family will be infected with COVID 19 before August 5. Please post the resulting document (as a PDF file) on the indicated *Assignment* link of *Canvas*.

Although you've already posted your description on the Canvas Assignment link, please either paste it herein or attach it to this document; and then respond to the following prompt:

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Homework 1

My experiment will test how many families in the apartment complex next to my house will move out within the next year.

I would survey a random sample of married people at USU and ask them the amount of time lived in their last apartment. Then I would find the average amount of time a family lives in a college apartment. I would note how long each family has been living in the complex next to my house, and then use that data to predict how many people would move out in the last year.

Write a paragraph that explains how your experiences in Math 5710 up to this point in time have influenced how you would approach or modify your Homework #1-related experiment.

I would use more precise language. I notice several places were my wording could be improved and make my proposal more clear. I could also introduce some precise notation to clarify the sample space. I have learned that using the correct terms and notation makes probability easier than trying to do it more quickly and with notation mistakes.

6. Smile you finished taking advantage of Opportunity #3.