Test 2 Q&A

True or False :

Q1) The probab ility which comes from the fact that you believe that you have a 1/2 chance of drawing a red card from a standard deck of cards is empirical probab ility. FALSE

Q) The events "not shitting off the water in the kitchen sink" and " rec eiving a high water bill" are not indepe ndent. TRUE

Q)The vents " cho osing a student who is male or a finance major from a nearby university to partic - ipate in a research study", are mutually exclusive. FALSE

Q)8!= 20160. False

Q2)Suppose the local shop makes dining room tables in three shapes and in three different finishes. Their production of the last six months is summarized in the following table:

Suppose one table is selected at random, Find the following:

A) P(the table is oval) = 177/400 **B) P(the table is pine or rectan gular) =** 101+47 +26/400 = 177/400 **C) P(the table is round and mahogany) =** 43/400 **D) P(the table is oak | it is round) =** 52/129 **E)P(the table is oval | it is mahogany) =** 62/152.

Q3)A coordi nator will select 7 songs from a list of 13 songs to compose an event's musical entert - ainment lineup. How many different lineups are possible?A: 13vPv7 = 8648640

Q6) A box contains 16 white marbles and 12 green marbles. If two are drawn without replac ement, what is the probab ility that they are both green? - 12/28 * 11/27 = 132/756.

Q7) The local restaurant is offering a dinner special that includes an appetizer, an entree, and a dessert. If there are 5 different appetizers to choose from, 11 different entrees, and 4 different desserts, how many different specials are possible? - 5*11*4 = 220

info

info (cont)

The median is the 50th percen tile; the point in data where 50% of the data falls below that point and 50% fall above it.Steps to calculate the K percentile **1)** Order all the values in the data set from smallest to largest. **2)** Multiply K% by the total number of values, n(index). **3)** IF the index or n is not a whole number, round up to the nearest whole number. Count the values in your data set from left to right(sma llest -> largest) until you reach the index. The corres ponding value is your K %ile. **4)**Count the values in your data set from the left until you reach the index. The K &ile is the average of that corres ponding value in your data set & the value that directly follows it.

IE: 25 test scores in order {43,54 ,56 ,61 ,62 ,66 ,68 ,69 ,69 ,70 ,71 ,72 ,77 ,78 ,79 ,85 ,87 ,88 ,89 ,93 ,95 ,96 ,98 ,99,99}

To find the 90th %ile **1)** Multiply 0.90 *25(amount of data) = 22.5(i ndex).* ***2)****Rounding up to you get 23, so counting from L->R go until you reach the 23rd value (98) that is the 90th %ile of this data set. OR if you wanted the 20th %ile* ***1)*** *0.20*25 = 5(index). **2)**5th+6th value (62+66)/2 = 64 is the 20th %ile. The median is the 13th score (77).

BASIC PROBAB ILITY

Probab ility Experiment -Any process with a result determined by chance.

Sample Space - Each individual result that's possible for a prob experi ment.

Event -A subset of outcomes from the sample space.

IE: Consider the experiment of rolling a dice. There are 6 possible **outcomes,**namely the number 1-6. The **sample space** is the set of all outcomes which in this case is simply {1,2,3 ,4, 5,6}. The **event** " rolling an even number " is the subset of outcomes {2,4,6}. On the other hand, the event " - rolling a number less than 10" is the set {1,2,3 ,4, 5,6}.

Subjective Probab ility -The least precise type of probab ility.

Experi mental Probab ility -specif ically it is calculated by dividing the number of times an event occurs by the total number of trials performed. **F:** If E is an event, the **P(E),** "the probab ility that E occurs is given by: **P(E) = f/n** F= the frequency of event E, N= the total number of times the experiment is performed.**IE:**A fisherman wants to know the prob that a fish he

Empirical Rule (68-95-99.7%) - Use the empirical rule to estimate the probability of a porcupine living between 20.5 & 27.4 years with an average lifespan of 22.8, the standard deviation is 2.3 years. Chart 1.0 **Step 1)** The average lifespan 22.8(mean).**2)** SD is 2.3 years so 1 SD below is 20.5 & 1 above is 25.1 yrs. **3)**Two SD's below the mean is 18.2, two above is 27.4. **4)**Three SDs below is 15.9yrs & above is 29.7yrs. **5)** Looking for prob of porcupine living between 20.5-27.4 years. **6)** Empirical Rule tells us 95% of the porcupines will have lifespans within 2 SD's of the avg. Also 68% will have lifespans within 1 SD of the mean. **7)** That leaves 95% - 68% = 27% of porcupines between 1&2 SD's or 13.5%(each side). **8)** The probability is 68% + 13.5% or 81.5%

STANDARD SCORE (Z-SCORE)

A z-score is defined as the number of standard deviations a specific point is away from the mean. Q) The grades on a physics midterm at Santa Rita are normally distri buted with M = 78 & O = 3.5. Ishaan scored 79% on the exam. Find the Z-Score Steps 1) Z = 79 - 78 / 2.5 ---> Z = 0.29. Ishaan's score was 0.29 SD's above the mean.

PERCENTILE

catches in his fav pond will be a catfish. HE records the numbers & types of fish he catches for one week. He catches 92 fish, 43 of which were catfish. He then calculates the prob as follows: --> P(catfish) = # of catfish caught /total # of fish caught --> 43/92 = 0.4674. **Law of Large Numbers -** The greater the number of trials, the closer the experi mental probab ility will be to the true prob.

CLASSICAL PROBAB ILTIY

The most precise type of probab ility. It is calculated by taking all possible outcomes into consid era tion. It states that if all outcomes are equally likely; the probab ility of an event is equal to the number of outcomes included in the event divided by the total number of outcomes in the sample space.

P(E) = n(E)/n(S) n(E) = the number of outcomes in the event **n(S)=** number of outcomes in the sample space.

IE:1 All fish from the pond recorded, total # of fish 1235, 541 are catfish. So:

P(catfish) = n(E)/n(S) --> 541/1235 = 0.4381

IE:2 Idea of rolling a 6 sided die and getting an even number. There are 3 possible outcomes a 2,4, or 6. So n(E) = 3 with 6 outcomes in the sample space thus n(S) = 6. **P(even) = 3/6 --> 1/2 = 0.5 prob**

Subjective Probab ility-An educated guess regarding the chance that an event will occur.

info (cont)

Experi mental Probab ility-Uses the outcomes obtained by repeatedly performing an experiment to calculate the probab ility.
Comple ment-For E denoted E ,consists of all the outcomes in the sample space that are not in E.
P(E) + P(E) = 1 OR **P(E) = 1 - P(E)**
IE: Roll a pair of dice, what is the probab ility that neither die is a 3? It is much easier to count the outcomes in the complement E . There are 11 possible outcomes where at least 1 of the dice is a 3 = {(3,1) ,(3 ,2) ,(3 ,4) ,(3 ,5) ,(3,6) (counted once per die) + {3,3}. **P(E)= n(E)/n(S) = 11/36** OR better written:
P(E) = 1 - P(E) = 1 - 11/36 = 25/36 = 0.6944

info1

Addition Rule P(E or F) = P(E) + P(F) - P(E & F)
IE: What is the probab ility of drawing a heart or a queen from a deck of cards? There are 52 cards in a deck and 13 are hears. Probab ility of drawing a heart is 13/52, there are 4 queens in a deck so 4/52. Probab ility of drawing one or the other?
One problem - The queen of hearts is counted twice since it falls under both catego ries, so it must be subtracted as follows:
P(heart or queen) = P(heart) + P(queen) - P(heart & queen) = 13/52 + 4/52 - 1/52 = 16/52 = 0.3077.
Mutually Exclusive- Events that share no outcomes.
**Addition Rule for Probab ility of Mutually Exclusive Events
P(E or F) = P(E) + P(F)**
IE: Caleb is buying a new car, he's narrowed it down to 4 cars. Kevin is betting he will chose either toyota or jeep. Find the probab ility Devin is right.
Toyota: 0.40 | Honda: 0.10 | Ford: 0.10 | Jeep: 0.35 *His friends accurately determined his interest in each brand*
**P(Toyota or Jeep) = P(Toyota) + P(Jeep) = 0.40+0.35 = 0.75.
Multip lic ation Rules for Indepe ndent Events
P(E&F) = P(E)*P(F)
IE: Chose two cards from a deck, with replac - ement. What is the probab ility of choosing a king and then a queen?
P(king & queen, w/repl ace ment) = P(king)
***P(queen) = 4/52* 4/52**
= 1/13 *1/13 = 1/169 = 0.0059
Without Replac ement

info1 (cont)

= P(F) * P(E | F)
IE: What is the probab ility of choosing two face card in a row? Assume that the cards are chosen w/o replac ement. When the first card is picked, all 12 face cards are available out of 52 total cards. When the second card is drawn, there are only 11 left out of 51. **P(face card & face card)**
= P(face card) * P(face card | face card)
= 12/52 *11/51 = 1/13* 11/17 = 11/221 = 0.0498
When you need to count the number of ways objects can be chosen out of a group of distinct objects, without replac ement, then the problem you are dealing with involves combin ations & permut - ations.
Factorial- The product of all positive integers less than or equal to a given positive integer, n. Symbol ically written as n!.
IE: 0! = 1 , 4!/0! = 4 *321/1 = 24/1* , *95!/93! = 9594939291/939291* = 9594 = 8930.
Combin ation-A selection of objects from a group without regard to their arrang ement. C = n!/r!(- n-r)! **When order is not important**
Permut ation-A selection of objects from a group where the arrang ement is specific. P = n!/(n-r)!
When order is important
IE: Given a group of 3 friends, Bubba, Lyndsay, & Re. **QA)** How many ways can you arrange the way they stand in line for the movies? **order is important so permut ation, were arranging 3 object so r = 3, from a group of 3 objects so n = 3.** The number of permut ations of 3 things permuted 3 at a time is calcul ated: P = 3!/(3-3)! = 321/0! = 6/1 = 6
QB) How many ways can you choose two of them to ride in a car together? **order is not important, so combin ation, contro lling the number of combin - ations of 2 things from a group of 3 so** C = 3!/2! (3-2)! = 3!/2! 1! = *321/211* = 3/1.
Special Permut ations -Involve objects that are identical. The number of distin gui shable permut ations of n objects, of which K are all alike, k2 are all alike, & so on. n!/k1! - k2!....kp!
IE: How many different ways can you arrange the letters in the word TENNESSEE? **You can distin - guish between each E,N, or S, so group each letter together. T: 1, E: 4, N: 2, S: 2 9 total letter so --> 9!/1!4 !2!2!
= *987654321*/(1)*(4321)*(21)*(21)* = *9473*5* = 3780.

P(king) = 4/52 = 1/13 assume you draw a king what is the probab ility you draw a queen next? There are 4 queens left but only 51 cards remain.

P(queen, given king drawn first, w/o replac ement) = 4/51 So -->

P(king &q ueen, w/o replac ement) = P(king)*P - (queen, given king drawn first)

= 4/52 ***4/51 = 1/13*** **4/51 = 4/663 = 0.0060**

Condit ional Probab ility- Denoted P(F | E), it is the probab ility of event F occurring given that event E occurs first. **P(F | E) = P(E & F)/P(E)**

IE: One card has already been chosen, w/o replac - ement. What is the probab ility of now choosing a second card from the deck and it being red, given that the first card was a diamond? Given that the first card was a diamon d(red card) there is only 25 red cards left instead of 26, and only 51 total cards remaining. So **: P(red | diamond) = 25/51 = 0.4902**

Multip lic ation Rule for Probab ility of Dependent Events

P(E & F) = P(E) * P(F | E)