Class Examples 9/25/18

Example 1: A probability experiment consists of rolling a single fair die.

a. Identify the outcomes of the probability experiment.
b. Determine the sample space
c. Define the event E = "roll and even number"

a. e_1 = rolling a one = $\{1\}$
e_2 = " a two = $\{2\}$
.
.
e_6 = " a six = $\{6\}$

b = S S = {6} = $\{\{1\}, \{2\}, \{3\}, \{4\}, \{5\}, \{6\}\}$

c. E = {roll and even no} = $\{\{4\},\{4\},\{6\}\}$

Example 2: Determine if the table below is a probability model.

Color	Probability
Brown	0.13
Yellow	0.14
Red	0.13
Blue	0.24
Orange	0.20
Green	0.16

The notation $P(E)$ means "The probability that event E occurs"

Rules of probabilities: The probability of any event E, $P(E)$, must be greater than or equal to zero and less than or equal to one. $0 \le P(E) \le 1$

② The sum of all probabilities of all outcomes must equal 1 if $S = \{e_1, e_2, \ldots, e_n\}$ then

$p(e_1) + p(e_2) + \cdots + p(e_n) = 1$

A. probability model lists the possible outcomes of a probability experiment and each outcomes probability. A probability model must statisfy rules 1 and 2 of the rules of probability.

Example 3: A pair of fair dice is rolled. Fair die are die where each outcome is equally likely.

a. Compute the probability of rolling a seven. $\{(5,2), (2,5), (6,1), (1,6), (3,4), (4,3)\} = \frac{6}{36}$

b. Compute the probability of rolling "snake eyes"; that is, compute the probability of rolling a two. $\{(1,1)\} = \frac{1}{36} \approx 0.0278$

c. Comment on the likelihood of rolling a seven versus rolling a two. we are more likely to roll a seven than we are to roll a two.

$P(E) = 0$ (impossible event)

$P(E) = 1$ (certain event)

An unusual event is an event that has a low probability Chance of occurring

Typically we consider an event with probability less than 0.05 (5%) to be unusual.

Reasearchers also use 0.01 (1%) and 0.10 (10%) as other cutoff points for unusual events.

Empirical Method: $P(E) \approx$ relative frequency of $E = \frac{\text{frequency of } E}{\text{Total No. of trials}}$

Classical method: $P(E) = \frac{\text{No. of ways that } E \text{ can occur}}{\text{No. of possible outcomes}} = \frac{m}{n}$

$$P(E) = \frac{N(E)}{N(S)}$$

The sample spaces S, of a probability experiment is the collection of all possible outcoms.

An event is any collection of outcomes from a probability experiment

Example 4: Sophia has three tickets to a concert, but Yolanda, Michael, Kevin, and Marissa all want to go to the concert with her. To be fair, Sophia randomly selects the two people who can go with her.

a: $S = \{(Y,M), (Y,K), \{Y, Ma\}, \{K, Ma\}, \{M, Ma\}, \{M,K\}\}$

a. Determine the sample space of the experiment. In other words, list all possible simple random samples of size n = 2.
b. Compute the probability of the event "Michael and Kevin attend the concert". $\{M,K\} = \frac{1}{6}$
c. Compute the probability of the event "Marissa attends the concert". $\frac{3}{6}$
d. Interpret the probability in part c.

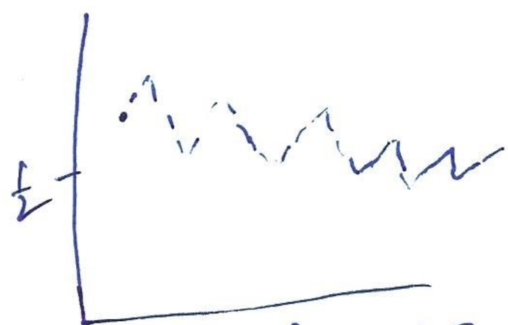
An event that consists of one outcome is called a simple event, denoted e_i

In general events are denoted by Capital letters, such as, E

Example 5: Suppose that a survey asked 500 families with three children to disclose the gender of their children and found that 180 of the families had two boys and one girl.

a. Estimate the probability of having two boys and one girl in a three-child family using the empirical method.
b. Compute and interpret the probability of having two boys and one girl in a three-child family using the classical method, assuming boys and girls are equally likely.

probability:



$0/1 = 0$, $\frac{2}{3} = 0.667$

$\frac{1}{2} = 0.5$

law of large nos- As the number of repetitions increases, the proportion with which a certain outcome is observed gets closer to the probability of the out come.

An experiment is any process with uncertain results that can be repeated