Pre-Calculus
Unit 8: Probability

References

Textbook Connection: Glencoe PreCalculus Text: Chapter 0 & 11

Every student will receive a text copy and access to the online textbook resource: **http://www.connected.mcgraw-hill.com**

Helpful Links:

GA Virtual: http://cms.gavirtualschool.org/Shared/Math/GSEPrecalculus/Probability/index.html

Multiplication Rule: https://www.youtube.com/watch?v=Q_7PR9kRXWs

Permutation & Combinations: http://www.mathsisfun.com/combinatorics/combinations-permutations.html

http://regentsprep.org/Regents/math/algtrig/ATS5/PCPrac.htm

Outcomes https://www.khanacademy.org/math/probability/random-variables-topic/expected-value/e/expected_value

http://www.mathsisfun.com/data/random-variables.html

https://www.khanacademy.org/math/probability/random-variables-

Dear Parents,

Students will extend their learning about conditional probabilities, set theory and independent variables, by exploring permutations, combinations, expected value and random variables.

Concepts Students will Use & Understand

- Calculate probabilities using the General Multiplication Rule and interpret the results in context
- Use permutations and combinations in conjunction with other probability methods to calculate probabilities of compound events and solve problems
- Define random variables, assign probabilities to its sample space, and graphically display the distribution of the random variable
- Calculate and interpret the expected value of random variables
- Develop the theoretical and empirical probability distribution and find expected values
- Set up a probability distribution for a random variable representing payoff values
- Make and explain in context decisions based on expected values.

Vocabulary

Conditional Probability. $P(A|B) = \frac{P(A \cap B)}{P(B)}$

Combinations. A combination is an arrangement of objects in which order does NOT matter. ${}_nC_r = \frac{n!}{r!(n-r)!}$

Odds. Typically expressed as a ratio of the likelihood that an event will happen to the likelihood that an event will not happen.

Permutations. An ordered arrangement of *n* objects. The order of the objects matters – a different order creates a different outcome. ${}_nP_r = \frac{n!}{(n-r)!}$

Sample Space. The set of all possible outcomes.

Expected Value: The mean of a random variable X is called the expected value of X. It can be found with the formula $\sum_{i=1}^{n} X_i P_i$ where P_i is the probability of the value of X_i.

Sample Practice Problems

1) How many ways could you select a chairman and a secretary for a committee of 10 people? $_{10}P_2 = \frac{10!}{(10-2)!} = \frac{10\cdot9\cdot8\cdot7\cdot6\cdot5\cdot4\cdot3\cdot2\cdot1}{8\cdot7\cdot6\cdot5\cdot4\cdot3\cdot2\cdot1} = \frac{10\cdot9}{1} = 90$

2) How many ways could you select a committee of 3 people out of a group of 10 people?

$_{10}C_3 = \frac{10!}{3!(10-3)!} = \frac{10\cdot9\cdot8\cdot7\cdot6\cdot5\cdot4\cdot3\cdot2\cdot1}{3\cdot2\cdot1\cdot7\cdot6\cdot5\cdot4\cdot3\cdot2\cdot1} = \frac{10\cdot9\cdot8}{3\cdot2\cdot1} = 120$

3) Paul is deciding whether or not to pay the parking meter when he is going to the movies. He knows that a parking ticket costs $30 and he estimates that there is a 40% chance that the traffic police spot his car and write him a ticket. If he chooses to pay the meter it will cost 4 dollars and he will have a 0% chance of getting a ticket. Is it cheaper to pay the meter or risk the fine?

Solution: Since there are two possible scenarios, calculate the expected cost in each case.

$Paying\ the\ meter: \$4 \cdot 100\% = \$4$

$Risking\ the\ fine: \$0 \cdot 60\% + \$30 \cdot 40\% = \$12$

Risking the fine has an expected cost three times that of paying the meter.

4) What is the probability that the sum of two die will be greater than 8, given that the first die is 6?

Answer: 2/3

5) Suppose there are 12 multiple choice questions in a Mathematics class quiz. Each question has 5 possible answers and only 1 of them is correct. Find the probability of having 4 or less correct answers if a student attempts to answer every question at random.

Answer: 0.927