Anoka-Hennepin Secondary Curriculum Unit Plan

Department:	Mathematics	Course:	Statistics and Probability	Unit 3 Title:	Simulations and Expected Value	Grade Level(s):	10-11
Assessed Trimester:	Trimester A	Pacing:	5-7 Days	Date Created:	1/29/2014	Last Revision Date:	1/29/2014

Course Understandings: *Student will understand that:*

B. The Law of Large Numbers expresses a relationship between theoretical probabilities and expected value and the probabilities and values obtained from experiments and simulations.

H. Technology can be used to assist with calculations, simulations, and data analysis.

DESIRED RESULTS (Stage 1) - WHAT WE WANT STUDENT TO KNOW AND BE ABLE TO DO?

Established Goals

Minnesota State/Local/Technology Standard(s) addressed (2007):

- **Standard (9.4.3.#):** Calculate probabilities and apply probability concepts to solve real-world and mathematical problems.
  Benchmark:
  9.4.3.1 Select and apply counting procedures, such as the multiplication and addition principles and tree diagrams, to determine the size of a sample space (the number of possible outcomes) and to calculate probabilities.
  9.4.3.2 Calculate experimental probabilities by performing simulations or experiments involving a probability model and using relative frequencies of outcomes.
  9.4.3.3 Understand that the Law of Large Numbers expresses a relationship between the probabilities in a probability model and the experimental probabilities found by performing simulations or experiments involving the model.
  9.4.3.4 Use random numbers generated by a calculator or a spreadsheet, or taken from a table, to perform probability simulations and to introduce fairness into decision making.
  9.4.3.8 Apply probability concepts to real-world situations to make informed decisions.

Transfer

Students will be able to independently use their learning to: (product, high order reasoning)

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Meaning

Unit Understanding(s):	Essential Question(s):
Students will understand that: • As a result of experiments we are able to estimate theoretical probabilities. • In order to calculate an experimental probability you need to simulate the situation many times. • To be able to calculate an expected value you must first build an accurate probability model. • In order to determine if a game is fair the expected value needs to be equal to the cost of the game.	**Students will keep considering:** • How do casinos determine how much they will charge you to play and how do they keep people coming? • When would it be best to simulate a situation versus trying to calculate a theoretical probability?

Acquisition

Knowledge - Students will:
- Know what a legitimate probability model is
- Understand what an experimental probability is
- Understand what a theoretical probability is
- Define the Law of Large Numbers
- Understand that each number that is generated from a random digit table represents a real-world outcome
- Define randomness
- Define fairness

Reasoning - Students will:
- Compare experimental probabilities to the theoretical probabilities
- Analyze how the Law of Large Numbers applies to the relationship between experimental and theoretical probabilities
- Determine how to assign digits according to the probability model
- Justify a decision using probability concepts

Skills - Students will:
- Use appropriate methods to calculate probabilities
- Carry out simulations or experiments to calculate an experimental probability
- Perform a simulation
- Use a random digit table, calculator or spreadsheet to generate random numbers
- Calculate probability
- Use probability concepts in real world situations

Common Misunderstandings
- Students choose incorrect operations.
- Students do not recognize implausible answers.
- Students do not remember that “0” is a digit that should/can be assigned
- Students do not know when to stop grouping numbers on the random digit table

Essential new vocabulary
- Expected value
- Experimental probability
- Fairness
- Law of large numbers
- Probability model
- Random digit table
- Randomness
- Simulation
- Theoretical probability