



Grade 7 Pre-Algebra - Unit H - Probability and Sampling

Unit Focus

In this unit, students design and use simulations to estimate probabilities of outcomes of chance experiments and understand the probability of an outcome as its long-run relative frequency.

They represent sample spaces in tables and tree diagrams and as lists. They calculate the number of outcomes in a given sample space to find the probability of a given event. They consider the strengths and weaknesses of different methods for obtaining a representative sample from a given population. They generate samples from a given population and examine the distributions of the samples, comparing these to the distribution of the population. They compare two populations by comparing samples from each population.

The PBA, Kitten Simulation, offers students a chance to develop their own model for a simulation. They will run their simulation and then compare their results with that of their classmates.

Stage 1: Desired Results - Key Understandings

Standard(s)	Transfer	
Common Core Mathematics: 7 - Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences. (CCSS.MATH.CONTENT.7.SP.A.1) - Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be. (CCSS.MATH.CONTENT.7.SP.A.2) - Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability. For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable. (CCSS.MATH.CONTENT. 7.SP.B.3) - Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. For example, decide whether the words in a chapter of a seventh-grade science book	<i>Students will be able to independently use their learning to...</i> T1 Initiate a plan using a variety of methods/strategies appropriately, execute it, and evaluate the reasonableness and accuracy of the solution. T2 Apply models to solve problems. T3 Identify and generalize patterns and structure in numbers, expressions, data and objects.	
	Meaning	
	Understanding(s)	Essential Question(s)
	<i>Students will understand that...</i> U1 Mathematicians work to make sense of the problem before trying to solve it. U2 Mathematicians make sense of quantities to represent situations mathematically. U3 Mathematicians create or use models to generalize, represent, and solve problems.	<i>Students will keep considering...</i> Q1 What do the quantities mean? Q2 What model best represents this problem?
	Acquisition of Knowledge and Skill	
Knowledge	Skill(s)	
<i>Students will know...</i> K1 Vocabulary: event, chance experiment, outcome, probability, likely, certain, impossible, unlikely, tree diagram, random,	<i>Students will be skilled at...</i> S1 finding the probability of simple or compound events using favorable	

Stage 1: Desired Results - Key Understandings

are generally longer than the words in a chapter of a fourth-grade science book. (CCSS.MATH.CONTENT.7.SP.B.4) • Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event. (CCSS.MATH.CONTENT.7.SP.C.5) • Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability. For example, when rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times. (CCSS.MATH.CONTENT.7.SP.C.6) • Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. For example, if a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected. (CCSS.MATH.CONTENT.7.SP.C.7A) • Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. For example, find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies? (CCSS.MATH.CONTENT.7.SP.C.7B) • Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs. (CCSS.MATH.CONTENT.7.SP.C.8A) • Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., rolling double sixes), identify the outcomes in the sample space which compose the event. (CCSS.MATH.CONTENT.7.SP.C.8B) • Design and use a simulation to generate frequencies for compound events. For example, use random digits as a simulation tool to approximate the answer to the question: If 40% of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood? (CCSS.MATH.CONTENT.7.SP.C.8C) • Model with mathematics. (CCSS.MATH.MP.4) • Look for and make use of structure. (CCSS.MATH.MP.7) • Look for and express regularity in repeated reasoning. (CCSS.MATH.MP.8) Madison Public Schools Profile of a Graduate • Analyzing: Examining information/data/ evidence from multiple sources to identify possible underlying assumptions, patterns, and relationships in order to make inferences. (POG.1.2)	sample space, simulation, mean absolute deviation (MAD), mean, median, population, sample, representative sample, interquartile range (IQR), range, simple event, compound event K2 a probability can be given as a decimal, fraction or percent. K3 an outcome has an expected outcome and an experimental outcome.	outcome(area) divided by total outcomes (area). S2 creating a sample space for two or more events using a tree diagram, chart or organized list. S3 identifying (and creating) simulations to model situations in order to determine a probability of an event. S4 finding the expected number of events that will occur when the probability of that event and number of trials is known. S5 using statistics (mean, median, mode, range, box plots) to compare and contrast the center two populations. S6 using statistics (mean, median, mode, range, box plots) to compare and contrast the variability two populations.
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