WHAT DO YOU EXPECT? Probability and Expected Value

Instructional Time and Investigations	26 days	• Inv. 1: A First Look at Chance (4 Problems) • Inv. 2: Experimental and Theoretical Probability (4 Problems) • Inv. 3: Making Decisions With Probability (4 Problems) • Inv. 4: Analyzing Compound Events Using an Area Model (4 Problems) • Inv. 5: Binomial Outcomes (3 Problems)
Goals	**Experimental and Theoretical Probabilities:** Understand experimental and theoretical probabilities. • The experimental probability of an event can be found by gathering data from experiments or observations, counting the number of times the specified outcome occurred, and comparing that to the number of trials. Long run relative frequencies collected from experiments make good approximations of theoretical probabilities. • Theoretical probability is determined by reasoning about the likelihood of a specific outcome based on all possible outcomes of an event. Lists, tree diagrams, or area models can show all of the possible outcomes and can be used to determine the theoretical probability of a compound event.	**Reasoning with Probability:** Explore and develop probability models by identifying possible outcomes, and analyze probabilities to solve problems • Probabilities are ratios. Probability can be used to predict outcomes in real-world events, to analyze games for fairness, and to determine the long-term average of a game of chance (expected value).
Common Core Standards	**Common Core Standards for Mathematical Practice** **MP.1:** Make sense of problems and persevere in solving them. **MP.2:** Reason abstractly and quantitatively. **MP.3:** Construct viable arguments and critique the reasoning of others. **MP.4:** Model with mathematics. **MP.5:** Use appropriate tools strategically. **MP.6:** Attend to precision. **MP.7:** Look for and make use of structure. **MP.8:** Look for and express regularity in repeated reasoning.	**Common Core Content Standards** **7.SP.C.5:** 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 $\frac{1}{2}$ indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event. **7.SP.C.6:** 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. **7.SP.C.7:** Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy. **7.SP.C.8:** Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation. **Also 7.RP.A.2, 7.RP.A.2a, 7.RP.A.3, 7.SP.C.7a–b, 7.SP.C.8a–b**

	WHAT DO YOU EXPECT? Probability and Expected Value	
	Content Connections to Other Units	
Goals of the Unit	**Prior Work**	**Future Work**
Experimental and Theoretical Probabilities: Understand experimental and theoretical probabilities.	• Gathering, analyzing, and displaying data to show trends (*Data About Us*) • Performing operations with whole numbers; finding factors and multiples (*Prime Time*) • Developing understanding of ratio in fraction, percent, and decimal form (*Comparing Bits and Pieces; Decimal Ops; Comparing and Scaling*) • Working with fractions and ratios (*Comparing Bits and Pieces; Decimal Ops; Accentuate the Negative; Comparing and Scaling*)	• Understanding and describing data distributions, sampling techniques, and using samples to predict population behaviors (*Samples and Populations*) • Using probabilities to make inferences and predictions about populations based on analysis of population samples (*Samples and Populations*) • Analyzing and comparing data (*Samples and Populations*)
Reasoning with Probability: Explore and develop probability models by identifying possible outcomes, and analyze probabilities to solve problems.	• Analyzing games or situations (*Prime Time*) • Looking for patterns (*Covering and Surrounding; Shapes and Designs*) • Working with ratio and proportion (*Comparing Bits and Pieces; Decimal Ops; Stretching and Shrinking; Comparing and Scaling*) • Using an area model for understanding addition and multiplication of fractions (*Let's Be Rational*) • Using area model to understand the Distributive Property (*Prime Time; Accentuate the Negative*) • Organizing data collected from experiments (*Variables and Patterns; Data About Us; Moving Straight Ahead*) • Using ratio and proportion (*Comparing Bits and Pieces; Decimal Ops; Stretching and Shrinking; Comparing and Scaling*)	• Developing strategies for analyzing complex situations to determine probabilities (*Samples and Populations*) • Designing simulation models using probability concepts to collect and organize data and make predictions about populations (*Samples and Populations*) • Using expected values of favorable and unfavorable outcomes to make inferences and predictions; using expected values to make recommendations or to develop solutions to real-world problems (*Samples and Populations*) • Analyzing data to show trends or the strength of the linear association of between two variables (*Thinking With Mathematical Models*)