Lesson Topic	**Hoop It Up! How the Law of Large Numbers Determines Insurance Premiums**
Concept Category	Insurance: • Risk Management • Determining insurance premiums
Applicable Classes	Business Law Introduction to Business Exploratory Business Personal Finance
Estimated Time Needed	1 – 2 hours
Intended Student Level	Secondary
NBEA Standards	*Personal Finance VIII: Protecting Against Risk* • Analyze choices available to consumers for protection against risk and financial loss
NE Frameworks Essential Learnings	*BE 12.5.1 Economics and Personal Finance* • Risk Management – summarize choices available to consumers for protection against risk and financial loss • Personal Decision Making/Resource Management – use a sound decision-making process as it applies to the roles of consumers, workers, and citizens *BE 12.2.1 Communication* • Discussion – participate in and lead group discussions • Presentations – research, compose and orally present information for a variety of situations utilizing appropriate technology *BE 12.10.1 Business and Consumer Law* • Purchasing power – define function of insurance
Links to Nebraska Standards	RSL 12.3.1 Participate in student directed discussions by eliciting questions and responses M 12.6.1 Graph and interpret algebraic relations and inequalities
Purpose/Description	This lesson introduces students to the insurance premium equation and its role in insurance. Students participate in group activity and graphing lesson to demonstrate the concepts of risk management by applying the 'law of large numbers' in estimating probability of loss. Students will conduct a basketball experiment to demonstrate how characteristics of groups affect the insurance equation. The "law of large numbers" will be applied to illustrate how insurance premiums are calculated.
Teaching Strategy	Brainstorming Demonstration and application, group experiment Graphing activity
Materials	• *Choice, Chance, Control* video kit and instructor resources (kit no longer available for distribution, but video and teacher resources can be downloaded free online at:

	website of the Insurance Education Foundation
	• Basketball
	• Sidewalk chalk (if court is outside) OR clipboard to tally shots
Classroom Activities:	• Students will participate in a basketball shooting experiment. They will estimate how many missed baskets will occur if students are given three shots.
	• Discuss the law of large numbers as it relates to their findings and determine measurable characteristics (height, gender, basketball experience) to be considered when predicting losses.
	• Using sidewalk chalk, three groups will be assigned to create three graphs that indicate probability of loss according to height, gender, and experience. *Note: Students could also create their graphs inside their classroom using Excel spreadsheet application software.*
	• Students will apply the insurance premium equation to calculate how much premium to charge each student 'policyholder' based on their height, gender, and experience.
Teacher Instructions:	*Insurance premium equation:*
	• **RATE OF LOSS = No. of X's lost per year ÷ No. of X's in existence** **OR** **RATE OF LOSS = No. of shots missed ÷ No. of shots taken**
	• Discuss the insurance premium equation and complete the sample problem using the *Choice, Chance, Control* directions given on Pg 24 of its teacher packet, OR use any sample of the insurance premium equation
	• After *rate of loss* is calculated, determine how much to charge each policyholder (premium) to cover that loss: **ANNUAL PREMIUM = Rate of Loss x Value of X (item to insure)**
	Playing "Hoop It Up" to demonstrate the 'law of large numbers'
	• Take students to basketball court
	• Before shooting, explain that each basket is an 'event' representing a loss. Each student writes down an estimate of how many missed baskets will occur if each student is given 3 shots from the free-throw line. (Students can use sidewalk chalk to record their estimates on the sidewalk court OR instructor uses clipboard to keep tally of shots, etc.)
	• Each student shoots 3 shots in a row and records losses with total tries, figuring relative frequency at these intervals: a) After the first student shoots 1 basket, discuss accuracy of predicting a loss after 1 event; b) After the 1st student completes all 3 shorts, discuss the accuracy according to 1 person; c) Refigure again after a quarter of the class shoots, after half the class shoots, and again after everyone shoots their three hoops. d) Students should be able to estimate losses (shots missed) more accurately as more students shoot hoops! This experiment seems to work best when class sizes are larger, or more shots

	are taken. Discuss with students how this represents the actuarial science of predicting probability of loss.
	• Using sidewalk chalk, students chart occurrences of losses
	• Discuss the 'law of large numbers' as it relates to their findings
	• Discuss characteristics that might be used in predicting losses (height, gender, experience, etc.)
	
	Graphing
	• Students form 3 groups to create 3 graphs on the sidewalk (or created in the classroom using Excel spreadsheet software) to exemplify risk classification:
	  a) Height : Losses
	  b) Gender: Losses
	  c) Experience: Losses
	• The X axis represents *losses*, each of the variable characteristics are represented on the Y axis
	• Height graphs: *Line* graph
	  Gender graphs: *Bar* graph, with one bar representing males, the other bar, females
	  Experience graphs: *Line* graph
	
	Determining Premiums
	• Using the *insurance premium equation,* students assign a cash value to the loss of a missed basket and calculate the premium they would charge each type of policyholder,
	• Students should then re-calculate premiums according to risk classification factors of height, gender, and basketball experience

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