

Name _____

Investigation 11: Independent or Not Independent Events?

Worksheet 11.1 Independent or Not Independent Events

Scenario

Games can involve chance, skill, strategy or some mixture of them. This Investigation is interested in games of chance such as *Candy Land*, *Chutes and Ladders*, and the card game *War*.

1. Identify a game that determines a win or a loss by chance alone. Explain how chance is involved and how skill or strategy or not involved.
2. Identify a game in which a win or a loss is primarily determined by the skill of a player or players. Explain.
3. Identify a game in which a win or loss involves both chance and skill or strategies.

Game: Over or Under

The computer science students at Rufus King High School designed a game to be played on a computer that they called Over or Under. The directions were provided in the opening screen.

Each one of the numbers 0, 1, 2, 3, 4, and 5 is behind the following cards labeled A, B, C, D, E, and F. They are in random order. Each number is used with no repeats. Click on any three cards. If the sum of the numbers behind the cards is 6 or less, then you win the game. If the sum of the numbers is greater than 6 then you lose. Hit the Start icon to begin the game. Have fun!

Start

Justin played the game. The following opening screen starts the game.

Card A	Card B	Card C	Card D	Card E	Card F
?	?	?	?	?	?

Justin clicked on cards A, C, and D. The next screen indicated the following:

Card A		Card C		Card D	
3	+	0	+	2	= 5

You WIN!

If the sum were greater than 6, then Justin would have lost the game.

The computer science students decided to test out their game to determine if it would interest the students in their school. They were given permission to randomly select 100 students from their school and ask them several questions including if they would play their game, what year they were in (1st, 2nd, 3rd, or 4th), and whether or not the game was interesting. Each of 100

chosen students agreed to play the game once and to record whether they won or lost. The selected students agreed to play the game once and to record whether they won or lost.

Exactly 100 students played the game once. The following table summarizes the results:

	Number of students who won the game	Number of students who lost the game	Total number of students who played the game
1 st or 2 nd year student	11	29	40
3 rd or 4 th year student	19	41	60
Total	30	70	100

Students in the computer science class wanted to investigate if winning the game was connected to grade level. Are 3rd or 4th year students better at playing games of chance than 1st or 2nd year students?

- Complete the following conditional relative frequency table of winning or losing the game categories based on year of student.

	Conditional relative frequencies for wins based on year	Conditional relative frequencies for losses based on year	Totals
1 st or 2 nd year student			40/40 = 1.00 or 100%
3 rd or 4 th year student			60/60 = 1.00 or 100%
Totals	30/100=0.30 or 30%	70/100 = 0.70 or 70%	100/100 = 1.00

- Use the conditional relative frequencies as estimates of conditional probabilities and complete the following conditional probability table of events.

	Conditional probability of winning based on year	Conditional probability of losing based on year	Totals
1 st or 2 nd year student			40/40 = 1.00 or 100%
3 rd or 4 th year student			60/60 = 1.00 or 100%
Totals	30/100=0.30 or 30%	70/100 = 0.70 or 70%	100/100 = 1.00

Interpret the table of conditional probabilities.

6. If winning this game is totally based on chance and not connected to the year a student is in school, what is the probability that a randomly selected student wins the game?
7. If winning this game is totally based on chance what is the conditional probability that a 1st or 2nd year student would win the game?
8. If winning the game is totally based on chance what is the conditional probability that a 3rd or 4th year student would win the game?

Definition: Two events are **independent** when knowing that one event has occurred does not change the likelihood that the second event ~~has~~ will occur.

9. If event A is “winning the game” and event B is “1st or 2nd year student” are A and B independent events?

If the results from the 100 students who played the game were as follows:

	Number of students who won the game	Number of students who lost the game	Total number of students who played the game
1 st or 2 nd year student	12	28	40
3 rd or 4 th year student	18	42	60
Total	30	70	100

10. Using the hypothetical results, complete the following row conditional probability of events based on year in school:

Answer:

	Conditional probability of winning	Conditional probability of losing	Totals
1 st or 2 nd year student			40/40 = 1.00 or 100%
3 rd or 4 th year student			60/60 = 1.00 or 100%
Totals	30/100=0.30 or 30%	70/100 = 0.70 or 70%	100/100 = 1.00

11. Using the hypothetical results, if event A is “winning the game” and event B is “1st or 2nd year student” are events A and B independent events?