

Mapping of the Tools to Sections of the Book

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This assignment is an attempt to complete deliverable 1b section I “Provide a mapping between the textbook section and the tool(s)”.

Mappings for “Mathematics Course 1”

Section 10-1

This section deals with Tree Diagrams, the Counting Principle and Permutations. Unfortunately no tools for any of these subjects have been found. However, motivating examples and lesson plans were created to compensate.

Section 10-2

This section deals with Theoretical Probability. No tools could be adapted to deal with just Theoretical Probability.

Section 10-3

Special Needs L1 p.488

Tools Suggested:

Coin Toss <http://www.shodor.org/interactivate/activities/Coin/>

Adjustable Spinner <http://www.shodor.org/interactivate/activities/AdjustableSpinner/>

Description

This exercise is tailored for students with learning deficiencies. Students are supposed to relate finding the experimental probability to conducting experiments. This should be accomplished by having them use spinners and coins. Nonetheless, this exercise has students simulate only a few hundred experiments, which is not enough to learn about the relation between experimental and theoretical probabilities. Two of the selected tools can help students understand experimental probability concepts in a better way, namely Coin Toss and Adjustable Spinner. Both tools allow the simulation of thousands of events. This makes the connections between experimental probability and the student’s predictions much more obvious than with just one hundred trials.

Fair Games p.489

Tools Suggested:

Adjustable [Spinner http://www.shodor.org/interactivate/activities/AdjustableSpinner/](http://www.shodor.org/interactivate/activities/AdjustableSpinner/)

Racing Game <http://www.shodor.org/interactivate/activities/RacingGameWithOneDie/>

Description

This exercise asks students to use probability to analyze a game played by rolling a weighted dice. For the first part of the exercise, students are shown data proving that the dice used to play the game favors certain numbers. This exercise has many problems with the way it is written. First, it never defines what a fair game is. Second, the weighted dice is a hard concept to grasp. Thus, if the teachers help students understand how a spinner can relate to rolling a dice, this exercise can be enhanced by using the Adjustable Spinner tool. With the tool, students can actually simulate a weighted dice and see why some numbers appear more often than other. For the second part of the exercise, students are asked to play a game in pairs. Player 1 wins with a 1, 3 or 6, and Player 2 wins with 2, 4 or 5. The Racing game can simulate such a game, but providing a fun and engaging interface.

Advanced Learners L4 p.489

Tools Suggested

Experimental Probability <http://www.shodor.org/interactivate/activities/ExpProbability/>

Description

This exercise has students roll a pair of dices, record the results, find the experimental probability of each possible sum and finally make a plot of their findings. The Experimental Probability tool allow students to make as many dice rolls as the need, it automatically records the results of each roll. This allows students to focus on what matters most, analyzing the results of the experiment.

Data Collection(17-22) p.491

Tool Suggested:

Experimental Probability <http://www.shodor.org/interactivate/activities/ExpProbability/>

Description

This exercise requires students to roll a pair of dices 50 times, record the results and then answer some questions. The Experimental Probability tool allows students to make the rolls in a fast and error-free way. Thus, allowing them to focus on the actual analysis.

Experimental and Theoretical Probabilities p.492

Tools Suggested:

Coin Toss <http://www.shodor.org/interactivate/activities/Coin/>

Description

This exercise is about making connections between theoretical and experimental probabilities. Students are asked to use coin tosses to simulate the different gender outcomes of a family having two children, then compare the results of the experiment with the theoretical probability. Students are asked to toss two coins 20 times, which may not be enough to fully understand the connections between the two probabilities. The Coin Toss tool can simulate up to a thousand tosses and they are interpreted in pairs for a total of 500, which is better when trying to tie the two probabilities together.

Section 10-4

Application: Quality Control p.495

Tools Suggested:

Adjustable Spinner <http://www.shodor.org/interactivate/activities/AdjustableSpinner/>

Description

This exercise asks students to make predictions about faulty robots using odds and samples. This exercise does not have a direct mapping with the tools. However, if the odds of a robot being faulty are translated into a percentage, the adjustable spinner can be used to simulate the production line, thus, allowing students to see how their predictions compare to the actual simulation. As a special note, this exercise never explains what it is meant by “close enough” and it never tells students that “close enough” may vary from situation to situation.

Number Sense p.496

Tools Suggested:

Adjustable Spinner <http://www.shodor.org/interactivate/activities/AdjustableSpinner/>

Description

This exercise asks students to compare two samples of different sizes and then decide which one is better. The main goal of this exercise is that students realize that bigger sample produce more accurate predictions. Therefore, the Adjustable Spinner tool can provide a way for students to simulate the samples described in the exercise, as well as bigger or smaller samples. Thus, giving them a wide variety of samples to analyze and ultimately improving their understanding.

Simulations p.498

Tools suggested :

Adjustable Spinner <http://www.shodor.org/interactivate/activities/AdjustableSpinner/>

Random Number Generator <http://www.random.org/integers/>

Description

This exercise teaches students how to use a graphing calculator to generate random numbers and to use those numbers as a simulation. The Adjustable Spinner can provide an easier and more engaging way to do a simulation. The parameters of the simulation are easier to set up in the tool. Thus, it makes it easier and more entertaining for students to do the simulations. However, if one of the goals of the exercise is to have students learn about random numbers, the Random Number Generator generates any number of random numbers using the range entered by the user.

Section 10-5

Special Needs L1 and Below Level L2 p.500

Tools Suggested:

Box Model http://nlvm.usu.edu/en/nav/frames_asid_146_g_3_t_5.html

Description

Both of these exercises require a bag full of marbles or numbers, so that students can draw from them. The Box Model tool allows the simulation of a bag full of numbered marbles. So, it works well for both exercises, allowing students to simulate any type of bag they need. The tool allows the simulation of up to 10,000 draws, and it provides a graphical way to see the results of the experiment, as well as a way to compare the theoretical and experimental probabilities of the given exercise.

Mapping for “Mathematics Course 2”

Section 12-1

Special Needs L1 p.580

Tools Suggested

Racing Game <http://www.shodor.org/interactivate/activities/RacingGameWithOneDie/>

Description

This exercise has students roll a dice, record the number they get and think about why they are getting those numbers. This exercise is directed towards students with special needs. So, in order to motivate them, the Racing Game tool can be used in this exercise. Instead of just rolling a dice, the students can play the Racing Game, which provides a dice, and analyze why a certain car is moving.

Section 12-2

Exploring Probability p.585

Tools Suggested

Coin Toss <http://www.shodor.org/interactivate/activities/Coin/>

Description

This exercise has students analyze the different outcomes of tossing two coins instead of just one. Then they are asked to play a game based on tossing two coins and gaining points depending on the different outcomes. Students are required to toss two coins 100 times. The Coin Toss tool can be used to simulate the tosses faster. It only requires one minor modification instead of taking the outcomes of the tool and interpreting them one by one, the students should interpret the results in pairs.

Special Need L1 p.586

Tools Suggested

Coin Toss <http://www.shodor.org/interactivate/activities/Coin/>

Description

This exercise asks students to simulate a basketball player trying to score free throws. The students are supposed to use coin tosses to simulate each of the 20 free throws and make note of the results. The Coin Toss tool can be useful providing a way to simulate the 20 tosses at once, giving students more time to interpret the results.

Exercise 3 p.587

Tools Suggested

Coin Toss <http://www.shodor.org/interactivate/activities/Coin/>

Description

Students are asked to find the experimental probability that 2 out of 3 children in a family are girls. Assuming the boys and girls are equally likely. Students then throw 3 coins simultaneously 20 times. The Coin Toss tool can simulate 60 individual throws that can be later interpreted as 20 groups of three throws, as required by the exercise.

Baseball (9-12) p.588

Tools Suggested

Coin Toss <http://www.shodor.org/interactivate/activities/Coin/>

Adjustable Spinner <http://www.shodor.org/interactivate/activities/AdjustableSpinner/>

Description

Students are asked to simulate baseball games and then answer some questions. Assuming both teams have equal probabilities of winning, the Coin Toss tools can be used to simulate each game. The Adjustable Spinner provides a way to make a more complex simulation. This tool can simulate games where one team is better than the other, a situation closer to real life.

Random Numbers p.589

Tools Suggested

Adjustable Spinner <http://www.shodor.org/interactivate/activities/AdjustableSpinner/>

Random Number Generator <http://www.random.org/integers/>

Description

This exercise has students use a graphing calculator to produce random number in order to make a simulation. The Adjustable Spinner provides an easier way to make the simulations. However, if one of the goal of the exercise is to have students learn about random numbers. The Random Number Generator generates any number of random numbers using the range entered by the user.

Section 12-3

This section deals with sample spaces and tree diagrams. No tools have been found for this topic. However, motivating examples have been created.

Section 12-4

This section deals with Compound events. Even though, some of the tools can be used in conjunction to simulate compound events. It would be counterproductive, as it may be harder to students.

Section 12-5

This section deals with permutations. No tools are available for dealing with permutations. However, motivating examples and case studies are available.

Section 12-6

This section deals with combinations. No tools are available for dealing with Combinations. However, motivating examples and case studies are available.

Mappings for “Mathematics Course 3”

Section 10-1

Special Needs L1 p.470

Tools Suggested:

Coin Toss <http://www.shodor.org/interactivate/activities/coin/>

Spinner <http://www.shodor.org/interactivate/activities/BasicSpinner/>

Description

This exercise is oriented towards students who have learning disabilities, and it suggests that the students should use spinners and toss coins and make predictions on the outcomes to learn concepts of experimental probability. Two of the Shodor tools could make the exercise much more engaging, namely the Spinner and Coin Toss. This section is all about making connections between the concepts of experimental and theoretical probability. The tools allow the simulation of thousands of events, making the process of connecting the two concepts much easier.

Advanced Learners L4 p.471

Tools Suggested:

Coin Toss <http://www.shodor.org/interactivate/activities/coin/>

Racing Game <http://www.shodor.org/interactivate/activities/RacingGameWithOneDie/>

Description

This exercise is about rolling a dice 50 times and calculating both the theoretical probability and the experimental probability of getting even numbers. Three of the selected tools can improve both the presentation of the exercise and the understanding of the concepts. The Crazy Choices Game tool allows the simulation of hundreds of thousands of dice rolls, making the difference between theoretical and experimental probability smaller than the one seen when rolling the dice 50 times. The Coin Toss tool is a much simpler and graphical tool that allows for a variation of the exercise using a much simpler event, namely a coin toss. Finally, the Racing Game tool gives a fun and graphical way to simulate 32 dice rolls.

Section 10-2

Fair Games p.474

Tools Suggested:

Crazy Choices Game <http://www.shodor.org/interactivate/activities/CrazyChoicesGame/>

Coin Toss <http://www.shodor.org/interactivate/activities/coin/>

Description

This exercise asks students to determine if a bet is good or bad for them by using coin tosses to simulate events. The Crazy Choices Game tool has the advantage of being capable of simulating thousand of multiple unrelated coin tosses at the same time. This tool can greatly help students make their decision making process much more accurate. The Coin Toss tool offers some of the same reliability as Crazy Choices Game with a simpler and more graphical approach. However, it can simulate fewer coin tosses and only one at a time.

Exercise A p.477

Tools Suggested:

Adjustable Spinner <http://www.shodor.org/interactivate/activities/AdjustableSpinner/>

Description

This exercise has a flaw in the way it is presented. Students are asked to make predictions about the outcomes of spinning a spinner. However, the number of events presented in the exercise is far too small to make accurate predictions. The Adjustable Spinner tool allows the students to simulate a spinner with the same description as the one in the exercise, but the tool provides a way to simulate thousands of spins, making the predictions of the students much more accurate.

Section 10-3

Exercises 1 and 2 p.484

Tools suggested:

Adjustable Spinner <http://www.shodor.org/interactivate/activities/AdjustableSpinner/>

Experimental Probability <http://www.shodor.org/interactivate/activities/ExpProbability/>

Random Number Generator <http://www.random.org/integers/>

Description

Both of these exercises ask the students to create random numbers using a graphing calculator, then use those numbers as data to make predictions and analyze certain types of events. If the random numbers generated by the calculator are replaced with spinners or die, both exercises can be more fun and engaging. The Adjustable Spinner tool allows students to modify the probabilities of the colors and then make the simulations asked in the exercises. The Experimental Probability tool and the Crazy Choices Game tool allow the use of die, and can be used in the same way. However, if one of the goal

of the exercise is to have students learn about random numbers, the Random Number Generator tool generates any number of random numbers using the range entered by the user.

Section 10-4

Comparing types of events p.485

Tools Suggested:

Box Model http://nlvm.usu.edu/en/nav/frames_asid_146_g_3_t_5.html

Description

This exercise is about finding the theoretical probability of drawing colored cubes from a bag. Even though this exercise focuses on theoretical probability, the Box Model tools can provide a way to simulate a bag full of colored cubes as described in the exercise and allow students to see that their predictions or calculations of the theoretical probability are accurate. By simulating thousands of draws, the students will see that the theoretical probability is not far from the experimental probability.

Sections 10-5 and 10-6

Unfortunately no tools for permutations, nor combinations were found up to this point. However, a few very good motivating examples and case studies are available.