

# Algebra 2

[Implement Start Year (2013-2014)]

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## Unit #1, Probability and Statistics

### Stage 1 – Desired Results

#### Established Goals

**2009 NJCCC Standard(s), Strand(s)/CPI #**  
(<http://www.nj.gov/education/cccs/2009/final.htm>)

**Common Core Curriculum Standards for Math and English**  
(<http://www.corestandards.org/>)

#### **Interpreting Categorical and Quantitative Data S-ID: 4**

- Summarize, represent, and interpret data on a single count or measurement variable.

#### **Making Inferences and Justifying Conclusions S-IC: 1, 2, 3, 4, 5, 6**

- Understand and evaluate random processes underlying statistical experiments.
- Make inferences and justify conclusions from sample surveys, experiments, and observational studies.

#### **Conditional Probability and the Rules of Probability S-CP:1, 2, 3, 6, 7, 9**

- Understand independence and conditional probability and use them to interpret data.
- Use the rules of probability to compute probabilities of compound events in a uniform probability model.

#### 21<sup>st</sup> Century Themes

( [www.21stcenturyskills.org](http://www.21stcenturyskills.org) )

- Global Awareness
- Financial, Economic, Business and Entrepreneurial Literacy
- Civic Literacy
- Health Literacy
- Environmental Literacy

#### 21<sup>st</sup> Century Skills

##### *Learning and Innovation Skills:*

- Creativity and Innovation
- Critical Thinking and Problem Solving
- Communication and Collaboration

##### *Information, Media and Technology Skills:*

- Information Literacy
- Media Literacy
- ICT (Information, Communications and Technology) Literacy

##### *Life and Career Skills:*

- Flexibility and Adaptability
- Initiative and Self-Direction
- Social and Cross-Cultural Skills
- Productivity and Accountability
- Leadership and Responsibility

<p><b>Enduring Understandings:</b> <i>Students will understand that . . .</i></p> <p>EU 1</p> <ul style="list-style-type: none"> <li>probability is used to predict the expected value of a situation</li> </ul> <p>EU 2</p> <ul style="list-style-type: none"> <li>critical vocabulary is necessary to communicate and understand mathematics in the real world</li> </ul>	<p><b>Essential Questions:</b></p> <p>EU 1</p> <ul style="list-style-type: none"> <li>How well can we predict the outcomes of future events?</li> <li>What are possible outcomes of situations?</li> </ul> <p>EU 2</p> <ul style="list-style-type: none"> <li>How can critical vocabulary be used to better enhance the communication and understanding of mathematics?</li> </ul>
<p><b>Knowledge:</b> <i>Students will know . . .</i></p> <p>EU 1</p> <ul style="list-style-type: none"> <li>how to apply the counting principle, a tree diagram, a permutation and a combination to determine the outcomes of an event .</li> <li>the definition of probability.</li> <li>the difference between theoretical and experimental probability and when to apply one or the other.</li> <li>how to calculate a compound event.</li> <li>outcomes of the occurrence of one event may or may not have an effect on the occurrence of another event.</li> </ul> <p>EU 2</p> <ul style="list-style-type: none"> <li>critical vocabulary is necessary to communicate and understand mathematics in the real world.</li> </ul>	<p><b>Skills:</b> <i>Students will be able to . . .</i></p> <p>EU 1</p> <ul style="list-style-type: none"> <li>apply the counting principle.</li> <li>demonstrate a tree diagram.</li> <li>distinguish between a permutation or combination and apply the correct formula.</li> <li>calculate the likelihood that an event will occur when outcomes are equally likely or an experiment is performed.</li> <li>determine the union and intersection of two events.</li> <li>determine if an event is independent or dependent based on given information.</li> </ul> <p>EU 2</p> <ul style="list-style-type: none"> <li>demonstrate the correct usage and application of critical vocabulary.</li> </ul>

## Stage 2 – Assessment Evidence

Recommended Performance Tasks: EU1, EU2

### Performance Task: Carnival Games

#### **Engaging Scenario:**

The advertisement in the local newspaper reads “Game Competition”. The Mount Laurel carnival is coming soon and this is the first time in the carnival’s history to have games available to play. However, they are looking for new or redesigned games that are exciting to play. As a game designer, this is a chance of a lifetime.

#### **Carnival Games Task 1**

Develop an idea for a game. Examine the possible outcomes of winning the game.

#### **Step 1:**

Coming up with a game. Think of any types of games that have been played: board games, amusement park games, card games of chance, etc. Make this game and play it in order to obtain data for the project. Make sure to include:

- Name of game
- Rules for game (Include all necessary pieces to play.)

#### **Step 2:**

Create a **tree diagram** that demonstrates the possible outcomes of a participant playing the game. Also, decide whether or not the **fundamental counting principle** can be applied to the game. If so, how? If not explain why in complete sentences. Provide an example and explanation.

#### **Step 3:**

Determine if the game utilizes the concepts of **permutations** or **combinations**. Explain your reasons using complete sentences.

#### **Step 4: (Optional)**

Determine the **theoretical probability** of the game.

Performance Test Scoring Guide for Carnival Games-Task 1

**Proficient:**

- Name of game, rules listed and all necessary pieces are included.
- Constructed tree diagram
- Accurately explained with complete sentences if fundamental counting principle can be used
- Accurately explained with complete sentences if the game utilizes the concepts of permutations or combinations

**Exemplary:**

- Used the tree diagram to determine the probability of someone winning the game.
- Used complete sentences to describe if the game is fair and how to make it more difficult or if not, more fair.

**Carnival Games Task 2**

Create and play the game then determine the experimental probability of winning it.

**Step 1:**

Determine the **independent** and **dependent** variables in the game. Make sure this matches what you have done previously and makes sense.

**Step 2:**

Create the game!! This is the fun part. Create the game out of basic materials and it must work. Play the game numerous times to collect the required data.

**Step 3:**

Collect data. Test the game by playing it 5 times, 10 times, 20 times, and 30 times. Determine the **experimental probability**.

outcome	5	10	20	30
win				
loss				

**Step 4 (optional):**

Compare **theoretical** and **experimental probabilities**.

### **Performance Test Scoring Guide for Carnival Games-Task 2**

#### **Proficient:**

- Used complete sentences to accurately identify the **independent** and **dependent** variables in the game
- The game is functional
- Created and used a chart to accurately collect data after playing 5, 10 , 20 , and 30 times
- Used complete sentences to accurately determine experimental probability

#### **Exemplary:**

- Used complete sentences to compare theoretical and experimental probabilities

### **Carnival Games Task 3**

Represent the data graphically and write a report of the findings.

#### **Step 1:**

Create a bar graph using the data from task 2.

#### **Step 2:**

Write an individual report. This report must include the following:

- what you learned from **each** task of this project with detailed description of how you contributed (one paragraph per task)
- Reflection upon how this helped increase or hinder your understanding of the concepts being used
- Reflection upon what you liked and disliked about the project and offer suggestions on how to improve it.

#### **Step 3 (optional):**

Create a poster board that includes data collected from each task of the project. Present what was learned from this project.

### **Performance Test Scoring Guide for Carnival Games -Task 3**

#### **Proficient:**

- Created a bar graph that accurately displayed the data collected. Must include title and labels.
- Used complete sentences to write a minimum of 4 paragraphs-one paragraph for each task and a reflection paragraph.

#### **Exemplary:**

- Created a poster that included data collected from each task. Presented a short presentation (no longer than 5 minutes) to the class.

**Other Recommended Evidence:**

- Fundamental Counting Principle/Tree Diagram, Permutation and Combination Assessment
- Theoretical/Experimental Probability and Geometric Probability Assessment
- Cumulative Probability Unit Assessment
- Other teacher-graded evaluations

**Stage 3 – Learning Plan**

**Suggested Learning Activities to Include Differentiated Instruction and Interdisciplinary Connections:** *Consider the WHERETO elements. Each learning activity listed must be accompanied by a learning goal of A= Acquiring basic knowledge and skills, M= Making meaning and/or a T= Transfer.*

- Activity #1 – Tree Diagram – Counting Principle (A)
- Activity #2 – TI-nspire: Permutations: <http://education.ti.com/calculators/timathnspired/US/Activities/Detail?sa=1010&t=9124&id=8432> (M)
- Activity #3 – TI-nspire: Permutations and Combinations: <http://education.ti.com/calculators/timathnspired/US/Activities/Detail?sa=1010&t=9124&id=12602> (M)
- Activity #4 – “Clue” (T)
- Activity #5 – “Coin Toss” (M)
- Activity #6 - Students play matchups and rounds of "rock-paper-scissors" (RPS) in a best-of-five game series organized in a tournament bracket format. They note wins, losses, and ties in order to compare experimental probability to theoretical probability, and then solve probability problems. (M)
- Activity #7 – Powerpoint: Independent and Dependent Events (A)
- Activity #8 - Probability Review Game: <http://www.crctlessons.com/probability-game.html> (A)

The following is the suggested sequence of learning activities and number of days for the Algebra 2 L2 class. Adjustments should be made accordingly for other levels.

**Approximately 13 days for completion of unit**

- HOOK – Discussion on different types of games found at a carnival. An introduction to the performance task (A)

YWBAT apply the counting principle and demonstrate a tree diagram. (A)(M)

- Activity #1 – Tree diagram – Counting Principle(A)

YWBAT define and apply a permutation.(A)(M)

- Activity #2 – TI-nspire (M)

YWBAT define and apply a combination.(A)(M)

- Activity #3 – TI-nspire (M)
- Activity #4 – Clue (T)

YWBAT compare and contrast theoretical probability and experimental probability.(A)

- Activity #5 – “Coin Toss” (M)
- Activity #6 – “Rock, Paper, Scissors” (M)

YWBAT apply formulas to determine geometric probability.(A)

YWBAT determine the probability of compound events.(A)

YWBAT determine the probability of independent/dependent events.(A)

- Activity #7 – PowerPoint(A)
- Activity #8 – Review game (A)

**Critical Vocabulary:**

Combination  
Conditional probability  
Event  
Independent event  
Probability  
Tree diagram

Complement  
Counting principle  
Experimental probability  
Intersection  
Sample space  
Union

Compound event  
Dependent event  
Geometric probability  
Odds  
Theoretical probability