# Unit 6 Probability

Content Area: **Mathematics**
Course(s): **Integrated Modern Algebra**
Time Period: **March**
Length: **6 weeks**
Status: **Published**

## Enduring Understandings

Either experimental or theoretical probability can be used to make predictions or decisions about future events.

All games are not created fair.

## Essential Questions

What real-world experience have you encountered that you could have used theoretical probability to compare the experimental probability?

How can collecting and analyzing data help you make decisions or predictions?

How can you make and interpret different representations of data?

When does order matter?

How can experimental and theoretical probabilities be used to make predictions or conclusions?

What makes a game fair?

How does the understanding of probability affect the choices you make in real life?

How can the analysis of information help us make reasonable predictions and informed decisions?

## Content

**Vocabulary**

event

combination

permutation

replacement

factorial

counting principle

Law of Large Numbers

dependent/independent events

complimentary events

compound events

mutually exclusive events

conditional probability

chances

odds

risk

## Skills

Apply and evaluation of combinations and permutations in order to solve problems with and without replacement.

Distinguish between theoretical probability and experimental probability.

Determine the probability that an event will occur based on simple experiments, counting principles, or data.

Apply the Law of Large numbers to make predictions.

Formulate predictions based on experimental and theoretical probabilities and comparing results.

Formulate multiple representations to analyze and summarize information concerning compound events.

## Resources

## Standards

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| CCSS.Math.Content.HSN-Q | Quantities |
| CCSS.Math.Content.HSN-Q.A | Reason quantitatively and use units to solve problems. |
| CCSS.Math.Content.HSN-Q.A.1 | Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. |
| CCSS.Math.Content.HSN-Q.A.2 | Define appropriate quantities for the purpose of descriptive modeling. |
| CCSS.Math.Content.HSS-CP | Conditional Probability and the Rules of Probability |
| CCSS.Math.Content.HSS-CP.A | Understand independence and conditional probability and use them to interpret data |
| CCSS.Math.Content.HSS-CP.A.2 | Understand that two events $A$ and $B$ are independent if the probability of $A$ and $B$ occurring together is the product of their probabilities, and use this characterization to determine if they are independent. |
| CCSS.Math.Content.HSS-CP.A.3 | Understand the conditional probability of $A$ given $B$ as $P(A \text{ and } B)/P(B)$, and interpret independence of $A$ and $B$ as saying that the conditional probability of $A$ given $B$ is the same as the probability of $A$, and the conditional probability of $B$ given $A$ is the same as the probability of $B$. |
| CCSS.Math.Content.HSS-CP.A.5 | Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. |
| CCSS.Math.Content.HSS-CP.B | Use the rules of probability to compute probabilities of compound events in a uniform probability model |
| CCSS.Math.Content.HSS-CP.B.6 | Find the conditional probability of $A$ given $B$ as the fraction of $B$'s outcomes that also belong to $A$, and interpret the answer in terms of the model. |
| CCSS.Math.Content.HSS-CP.B.7 | Apply the Addition Rule, $P(A \text{ or } B) = P(A) + P(B) – P(A \text{ and } B)$, and interpret the answer in terms of the model. |
| CCSS.Math.Practice.MP1 | Make sense of problems and persevere in solving them. |
| CCSS.Math.Practice.MP2 | Reason abstractly and quantitatively. |
| CCSS.Math.Practice.MP4 | Model with mathematics. |
| CCSS.Math.Practice.MP6 | Attend to precision. |

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize-to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents-and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.