Probability & Statistics

10.1/10.2 Explore and apply rules of conditional probability

CCSS	4 – Mastery	3 – Proficient	2 - Basic	1 – Below Basic	0 – No Evidence
Describe sample space (S.CP.1)	Can extend thinking beyond the standard, including tasks that may involve one of the following: • Designing • Connecting • Synthesizing • Applying • Justifying • Critiquing • Analyzing • Creating • Proving	Describe events within the sample space using characteristics **or as unions, intersections, or complements of other events (with and without notation)**	**Describe** events within the sample space using characteristics	**Identify** events in a sample space	Little evidence of reasoning or application to solve the problem Does not meet the criteria in a level 1
Independent and conditional probability (S.CP.2, S.CP.3, S.CP.5, S.CP.6, S.MD.6, S.MD.7)		Recognize, determine **and use** independent and conditional probability in contextual problems Apply probability concepts to **analyze and make fair decisions** related to real-world situations	Recognize and determine independent **and conditional probability** in contextual problems	Recognize and determine **independent probability** in contextual problems.	
Construct frequency tables (S.CP.4)		Construct a two-way frequency table for data, use the table to determine independence, **and** calculate conditional probabilities from the table	Construct a two-way frequency table for data **and use the table** to determine independence or calculate conditional probabilities from the table	**Construct a two-way frequency table** for data	
Apply rules of probability (S.CP.7, S.CP.8)		Apply the addition and multiplication rules in a probability model **and interpret the answer in context of the situation**	Apply the addition **and** multiplication rules in a probability model	Apply the addition **or** multiplication rules in a probability model	

S.CP.1 Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").

S.CP.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.

S.CP.3. Understand the conditional probability of *A* given *B* as *P*(*A* 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*.

S.CP.4. Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. *For example, collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results.*

S.CP.5. Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. *For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.*

S.CP.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.

S.CP.7. Apply the Addition Rule, P(A or B) = P(A) + P(B) – P(A and B), and interpret the answer in terms of the model.

S.CP.8. (+) Apply the general Multiplication Rule in a uniform probability model, P(A and B) = P(A)P(B|A) = P(B)P(A|B), and interpret the answer in terms of the model.

S.MD.6. (+) Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).

S.MD.7. (+) Analyze decisions and strategies using probability concepts (e.g.product testing, medical testing, pulling a hockey goalie at the end of a game).

Probability & Statistics

11.1/11.2 Analyze statistical data and explore normal distributions

CCSS	4 – Mastery	3 – Proficient	2 - Basic	1 – Below Basic	0 – No Evidence
Understand statistical data and models (S.IC.1, S.IC.2, S.IC.3)	Can extend thinking beyond the standard, including tasks that may involve one of the following: • Designing • Connecting • Synthesizing • Applying • Justifying • Critiquing • Analyzing • Creating • Proving	Use sample data to make inferences about a population **Explain** using randomization why a sample survey, experiment or observational study is most appropriate **Decide** if data models are consistent with the results	**Use** sample data to make inferences about a population **Determine** whether a sample survey, experiment or observational study is most appropriate Determine whether **experimental probabilities match given theoretical probabilities**	**Identify** when sample data can be used to make inferences about a population **Identify** whether a given scenario represents a sample survey, experiment or observational study **Identify** experimental and theoretical probabilities	Little evidence of reasoning or application to solve the problem Does not meet the criteria in a level 1
Use data (S.IC.4, S.IC.5, S.IC.6, S.ID.4)		Can do **all** of the following: • Use data from a sample survey to estimate a population mean or proportion • Develop a margin of error through the use of simulation models for random sampling. • Use data from a randomized experiment to compare two treatments • Use simulations to decide if differences between parameters are significant. • Evaluate reports based on data. • Uses the means and standard deviations of data sets to fit them to normal distributions • Fits functions to data in order to solve contextual problems	Can do **five** of the following: • Use data from a sample survey to estimate a population mean or proportion • Develop a margin of error through the use of simulation models for random sampling. • Use data from a randomized experiment to compare two treatments • Use simulations to decide if differences between parameters are significant. • Evaluate reports based on data. • Uses the means and standard deviations of data sets to fit them to normal distributions • Fits functions to data in order to solve contextual problems	Can do **four** of the following: • Use data from a sample survey to estimate a population mean or proportion • Develop a margin of error through the use of simulation models for random sampling. • Use data from a randomized experiment to compare two treatments • Use simulations to decide if differences between parameters are significant. • Evaluate reports based on data. • Uses the means and standard deviations of data sets to fit them to normal distributions • Fits functions to data in order to solve contextual problems	

S.IC.1 Understand statistics as a process for making inferences about population parameters based on a random sample from that population.
S.IC.2 Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation.
S.IC.3 Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.
S.IC.4 Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.
S.IC.5 Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.
S.IC.6 Evaluate reports based on data.
S.ID.4 Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.