

Unit 5 Statistics and Probability

Content Area: **Mathematics**
Course(s): **Math - Grade 7**
Time Period: **May**
Length: **6 Weeks**
Status: **Published**

Unit Overview

Use random sampling to draw inferences about a population.

Draw informal comparative inferences about two populations.

Investigate chance processes and develop, use, and evaluate probability models.

End of Year benchmark can be given at the end of this unit.

By the end of the year, administer the Link It! NJSL Form C.

Transfer

Students will be able to independently use their learning to solve real world problems involving...

statistics to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population.

random sampling to produce representative samples and support valid inferences.

two data distributions compared using visual and numerical representations based upon measures of center and measures of variability to draw conclusions.

The probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring.

The probability of a chance event is approximated by collecting data on the chance process that produces it, observing its long-run relative frequency, and predicting the approximate relative frequency given the probability.

A probability model, which may or may not be uniform, is used to find probabilities of events.

Various tools are used to find probabilities of compound events. (Including organized lists, tables, tree diagrams, and simulations.)

For more information, read the following article by Grant Wiggins.

http://www.authenticeducation.org/ae_bigideas/article.lasso?artid=60

Meaning

Understandings

Students will understand that...

- Experimental results tend to approach theoretical probabilities after a large number of trials.
- Grouping by attributes (classification) can be used to answer mathematical questions.
- Algorithms can effectively and efficiently be used to quantify and interpret discrete information
- Optimization is finding the best solution within given constraints.
- Algorithms can effectively and efficiently be used to quantify and interpret discrete information

Essential Questions

Students will keep considering...

- Unit 5: Why is learning mathematics important?
- Chapter 7: How can you predict the outcome of future events?
- Chapter 8: How do you know which type of graph to use when displaying data?

Application of Knowledge and Skill

LGBTQ Inclusive Curriculum:

1) Use random sampling to draw inferences about a population. Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.

2) Use GLSEN's 2011 National School Climate Survey in a minilecture to demonstrate population samples as they relate to the experiences of LGBT students.

Students will know...

Students will know...

how to develop understanding of statistical variability. (6.SP.1-3)

how to summarize and describe distributions. (6.SP.4-5)

statistical variability (6.SP.2)

how to display data in various ways (6.SP.4)

how to interpret and summarize data as a numerical set in relation to its context.

Students will be skilled at...

Students will be skilled at...

...Recognizing and identifying that different sampling techniques must be used in real life situations, because it is very difficult to survey an entire population. (7.SP.1)

...Selecting appropriate sample sizes based on a population in real-life situations and explaining why generalizations about a population from a sample are valid only if the sample is random and representative of that population. (7.SP.1)

...Collecting data from a sample population in order to predict information about a population. (7.SP.1)

- Interpreting data from a random sample to draw inferences about a population with an unknown characteristic of interest. (7.SP.2)

...Generating multiple samples (or simulated samples) of the same size to determine the variation in estimates or predictions by comparing the samples. (7.SP.2)

- Identifying the degree of overlap between two numerical sets of data. (7.SP.3)

- Visually compare two numerical data distributions with like ranges. (7.SP.3)

...Measuring the difference between the centers of two different data distributions and express this difference as a multiple of a measure of variability. (7.SP.3)

- Using measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations

...Represent the probability of a chance event as a number between 0 and 1. (7.SP.5)

- Using the terms “likely”, “unlikely,” to describe the probability represented by the fractions used. (7.SP.5)

- Approximating the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency. (7.SP.6)

- Predicting the approximate relative frequency of a chance event given the probability. (7.SP.6)

- Developing a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. (7.SP.7)

- Developing a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. (7.SP.7)

- Comparing probabilities from a model to observed frequencies. (7.SP.7)
- If the agreement between a model and observed frequencies is not good, explaining possible sources of the discrepancy. (7.SP.7)
- Finding probabilities of compound events using organized lists, tables, tree diagrams, and simulation. (7.SP.8)
- Representing the probability of a compound event as the fraction of outcomes in the sample space for which the compound event occurs. (7.SP.8)
- Representing sample spaces for compound events using methods such as organized lists, tables and tree diagrams. (7.SP.8)
- For an event described in everyday language (e.g., “rolling double sixes”), identifying the outcome in the sample space which compose the event.

Academic Vocabulary

Chapter 7

Complementary events, compound events, dependent events, experimental probability, fair, fundamental counting principle, independent events, outcome, permutation, probability, random, relative frequency, sample space, simple event, simulation, theoretical probability, tree diagram, uniform probability model, unfair

Chapter 8

Biased sample, convenience sample, double box plot, double dot plot, population, sample, simple random sample, statistics, survey, systematic random survey, unbiased sample, voluntary response sample

Learning Goal #1

Use random sampling to draw inferences about a population.

Develop a probability model and use it to find probabilities of events. (7.SP.C.7)

Compare probabilities from a model to observed frequency and reason about differences between the model and observed frequency. (7.SP.C.7)

Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.

Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about tow populations.

CRP.K-12.CRP2.1

Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.

CAEP.9.2.8.B.6

Demonstrate understanding of the necessary preparation and legal requirements to enter the workforce.

TECH.8.1.8

Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.

Target #5.8.1 -- (Level of Difficulty: Retrieval(executing), DOK: 2 - skill/concept)

SWBAT get an idea for the likelihood of an event by using results from previous experiments.

MA.7.SP.C.6

Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability.

MA.K-12.1

Make sense of problems and persevere in solving them.

MA.K-12.3

Construct viable arguments and critique the reasoning of others.

MA.K-12.4

Model with mathematics.

Target #5.8.2 --(Level of Difficulty: Comprehension, DOK: 3 - strategic thinking)

SWBAT describe the likelihood of events using the words impossible, unlikely, equally likely as not, likely, or certain.

SWBAT tell which event is more likely when the chances of different events are expressed as fractions, decimals, or percentages.

MA.7.SP.C.5

Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around $\frac{1}{2}$ indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.

MA.K-12.1

Make sense of problems and persevere in solving them.

MA.K-12.3

Construct viable arguments and critique the reasoning of others.

MA.K-12.4

Model with mathematics.

Target #5.8.3 --(Level of Difficulty: Comprehension, DOK: 2 - skill/concept)

SWBAT use the sample space to calculate the probability of an event when all outcomes are equally likely.

SWBAT write out the sample space for a simple chance experiment.

MA.7.SP.C

Investigate chance processes and develop, use, and evaluate probability models.

MA.7.SP.C.5

Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around $\frac{1}{2}$ indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.

MA.7.SP.C.6

Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability.

MA.7.SP.C.7a	Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events.
MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.

Target #5.8.4--(Level of Difficulty: Comprehension, DOK: 3 - strategic thinking)

SWBAT estimate the probability of an event based on the results from repeating an experiment.

SWBAT explain whether certain results from repeated experiments would be surprising or not.

MA.7.RP.A	Analyze proportional relationships and use them to solve real-world and mathematical problems.
MA.7.SP.C.5	Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.
MA.7.SP.C.6	Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability.
MA.7.SP.C.7	Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.
MA.7.SP.C.7b	Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process.
MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.

Target #5.8.5--(Level of Difficulty: Comprehension, DOK: 3 - strategic thinking)

SWBAT calculate the probability of an event when the outcomes in the sample space are not equally likely.

SWBAT explain why results from repeating an experiment may not exactly match the expected probability for an event.

MA.7.SP.C.5	Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.
MA.7.SP.C.6	Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability.
MA.7.SP.C.7	Develop a probability model and use it to find probabilities of events. Compare

	probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.
MA.7.SP.C.7b	Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process.
MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.

Target #5.8.6 --(Level of Difficulty: Comprehension, DOK: 2 - skill/concept)

SWBAT simulate a real-world situation using a simple experiment that reflects the probability of the actual event.

MA.7.SP.C	Investigate chance processes and develop, use, and evaluate probability models.
MA.7.SP.C.5	Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.
MA.7.SP.C.6	Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability.
MA.7.SP.C.7b	Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process.
MA.7.SP.C.8c	Design and use a simulation to generate frequencies for compound events.
MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.

Target #5.8.7 -- (Level of Difficulty: Retrieval(executing), DOK: 2-skill/concept)

SWBAT use a simulation to estimate the probability of a multi-step event.

MA.7.RP.A	Analyze proportional relationships and use them to solve real-world and mathematical problems.
MA.7.SP.C.8c	Design and use a simulation to generate frequencies for compound events.
MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.

Target #5.8.8 -- (Level of Difficulty: Retrieval(executing), DOK: 2 - skill/concept)

SWBAT write out the sample space for a multi-step experiment, using a list, table, or tree diagram.

MA.7.SP.C.8b	Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., “rolling double sixes”), identify the outcomes in the sample space which compose the event.
MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.

Target #5.8.9 --(Level of Difficulty: Comprehension, DOK: 2 - skill/concept)

SWBAT use the sample space to calculate the probability of an event in a multi-step experiment.

MA.7.SP.C.8a	Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs.
MA.7.SP.C.8b	Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., “rolling double sixes”), identify the outcomes in the sample space which compose the event.
MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.

Target #5.8.10--(Level of Difficulty: Comprehension, DOK: 4 - extended thinking)

SWBAT design a simulation to estimate the probability of a multi-step real-world situation.

MA.7.SP.C.8c	Design and use a simulation to generate frequencies for compound events.
MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.

Target #5.8.11--(Level of Difficulty: Comprehension, DOK: 3 - strategic thinking)

SWBAT calculate the difference between two means as a multiple of the mean absolute deviation.

SWBAT when looking at a pair of dot plots, determine whether the distributions are very different or have a lot of overlap.

MA.7.SP.B	Draw informal comparative inferences about two populations.
MA.7.SP.B.3	Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability.
MA.K-12.1	Make sense of problems and persevere in solving them.

MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.

Target #5.8.12 -- (Level of Difficulty: Analysis(specifying), DOK: 3 - strategic thinking)

SWBAT explain why it may be useful to gather data on a sample of a population.

SWBAT when they hear a statistical question, they can name the population of interest and give an example of a sample for that population.

MA.7.SP.A.1	Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.
MA.7.SP.B	Draw informal comparative inferences about two populations.
MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.

Target #5.8.13 -- (Level of Difficulty: Analysis(specifying), DOK: 3 - strategic thinking)

SWBAT determine whether a sample is representative of a population by considering the shape, center, and spread of each of them.

SWBAT know that some samples may represent the population better than others.

SWBAT remember that when a distribution is not symmetric, the median is a better estimate of a typical value than the mean.

MA.7.SP.A	Use random sampling to draw inferences about a population.
MA.7.SP.A.1	Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.
MA.7.SP.A.2	Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions.
MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.

Target #5.8.14 --(Level of Difficulty: Analysis(analyzing errors), DOK: 3 - strategic thinking)

SWBAT describe ways to get a random sample from a population.

SWBAT know that selecting a sample at random is usually a good way to get a representative sample.

MA.7.SP.A.1	Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.
MA.7.SP.A.2	Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions.
MA.7.SP.C.7	Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.
MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.

Target #5.8.15 --(Level of Difficulty: Comprehension, DOK: 2 - skill/concept)

SWBAT consider the variability of a sample to get an idea for how accurate my estimate is.

SWBAT estimate the mean or median of a population based on a sample of the population.

MA.7.SP.A.1	Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.
MA.7.SP.A.2	Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions.
MA.7.SP.B.4	Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.
MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.6	Attend to precision.

Target #5.8.16 -- (Level of Difficulty: Comprehension, DOK: 2 - skill/concept)

SWBAT estimate the proportion of population data that are in a certain category based on a sample.

MA.7.NS.A.2d	Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats.
MA.7.RP.A	Analyze proportional relationships and use them to solve real-world and mathematical problems.

MA.7.SP.A	Use random sampling to draw inferences about a population.
MA.7.SP.A.2	Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions.
MA.7.SP.B.4	Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.
MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.

Target #5.8.17 -- (Level of Difficulty: Analysis, DOK: 3 - strategic thinking)

SWBAT use the means from many samples to judge how accurate an estimate for the population mean is.

SWBAT know that as the sample size gets bigger, the sample mean is more likely to be close to the population mean.

MA.7.SP.A	Use random sampling to draw inferences about a population.
MA.7.SP.A.2	Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions.
MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.4	Model with mathematics.

Target #5.8.18 -- (Level of Difficulty: Analysis, DOK: 3 - strategic thinking)

SWBAT calculate the difference between two medians as a multiple of the interquartile range.

SWBAT determine whether there is a meaningful difference between two populations based on a sample from each population.

MA.7.SP.B.3	Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability.
MA.7.SP.B.4	Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.
MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.4	Model with mathematics.

Target # 5.8.19 -- (Level of Difficulty: Analysis, DOK: 3 - strategic thinking)

SWBAT decide what information I need to know to be able to compare two populations based on a sample from each.

MA.7.SP.B.4	Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.

Target #5.8.20 -- (Level of Difficulty: Analysis, DOK: 3 - strategic thinking)

SWBAT compare two groups by taking a random sample, calculating important measures, and determining whether the populations are meaningfully different.

MA.7.RP.A	Analyze proportional relationships and use them to solve real-world and mathematical problems.
MA.7.SP.A	Use random sampling to draw inferences about a population.
MA.7.SP.A.1	Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.
MA.7.SP.A.2	Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions.
MA.7.SP.B.4	Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.
MA.7.SP.C.7a	Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events.
MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.4	Model with mathematics.

Formative Assessment and Performance Opportunities

- ALEKS
- Exit Ticket
- Interactive Notes
- Kahoot
- Quizizz
- Quizzlet live
- Status Check (Thumbs up/down...)
- Student Presentations
- Student-Teacher Conference
- white boards

Summative Assessment

- ALEKS
- bench mark
- linikit
- Project
- Quiz
- Test

21st Century Life and Careers

CAEP.9.2.8.B.3	Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.
CAEP.9.2.8.B.4	Evaluate how traditional and nontraditional careers have evolved regionally, nationally, and globally.
CAEP.9.2.8.B.5	Analyze labor market trends using state and federal labor market information and other resources available online.

Accommodations/ Modifications

- calculators
- create a "math talk"
- lesson extensions
- leveled centers
- manipulatives
- modifications as per IEP/504
- provide notes
- review and practice
- RTI section of Glencoe
- small group instructions
- teacher conferences
- use blocks or marbles to find mean, median, mode, and range
- use cards to discuss probability
- use dice to describe probability
- use spinners, and blocks or marbles to find probability
- word bank

Unit Resources

- Aleks online learning

- CK12 online resources
- <http://achievethecore.org/page/1118/coherence-map>

Interdisciplinary Connections

- Geograph: 100 people:
https://www.100people.org/statistics_detailed_statistics.php?section=statistics

- Science: global sun temperature: <http://www.ciese.org/curriculum/tempproj/>

6-8.MS-ESS1-1 Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.

6-8.MS-ESS1-1.ESS1.A.1 Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models.

SOC.6.1.8.CS1 Three Worlds Meet: Indigenous societies in the Western Hemisphere migrated and changed in response to the physical environment and due to their interactions with Europeans. European exploration expanded global economic and cultural exchange into the Western Hemisphere.