Plainfield Public Schools
Mathematics
Unit Planning Organizer

Grade/Course	Grade 7
Unit of Study	**Unit 3 Statistics & Probability**
Pacing	7 instructional weeks

Standards for Mathematical Practices
MP1. Make sense of problems and persevere in solving them. MP2. Reason abstractly and quantitatively. MP3. Construct viable arguments and critique the reasoning of others. MP4. Model with mathematics. MP5. Use appropriate tools strategically. MP6. Attend to precision. MP7. Look for and make use of structure. MP8. Look for and express regularity in repeated reasoning.

UNIT STANDARDS
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.
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. *For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be.*
7.SP.B.3. Informally assess the degree of visual overlap of two numerical data distributions with similar variability, measuring the difference between the centers by expressing it as a multiple of a measure of variability. *For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable.*
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. *For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.*
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.
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. *For example, when rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not*

exactly 200 times.

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.

a. Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. *For example, if a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected.*
b. Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. *For example, find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies?*

7.SP.C.8 Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.

a. **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.**
b. **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 events.**
c. **Design and use a simulation to generate frequencies for compound events. *For example, use random digits as a simulation tool to approximate the answer to the question: If 40 percent of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood.***

"Unwrapped" Skills (students need to be able to do)	"Unwrapped" Concepts (students need to know)	DOK Levels
FOCUS STANDARD: **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.**		
Understand Examine Generalize	statistics population	1 1 3

"Unwrapped" Skills (students need to be able to do)	"Unwrapped" Concepts (students need to know)	DOK Levels
FOCUS STANDARD: **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. *For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be.***		
Use Generate	Random sample	2 2

"Unwrapped" Skills (students need to be able to do)	"Unwrapped" Concepts (students need to know)	DOK Levels
FOCUS STANDARD: **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.**		
Understand	Probability	1

"Unwrapped" Skills (students need to be able to do)	"Unwrapped" Concepts (students need to know)	DOK Levels
FOCUS STANDARD: **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.** *For example, when rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times.*		
Approximate Predict	Probability Relative frequency	1 3

"Unwrapped" Skills (students need to be able to do)	"Unwrapped" Concepts (students need to know)	DOK Levels
FOCUS STANDARD: **7.SP.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.** **c. Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. *For example, if a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected.*** **d. Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. *For example, find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies.***		
Develop Compare Observe	Probability Probability frequencies	3 2 2

"Unwrapped" Skills (students need to be able to do)	"Unwrapped" Concepts (students need to know)	DOK Levels
FOCUS STANDARD: **7.SP.8 Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.** **a. 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.** **b. 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 events.** **c. Design and use a simulation to generate frequencies for compound events. *For example, use random digits as a simulation tool to approximate the answer to the question: If 40 percent of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood.*** Find Use Represent Design Use	Compound events Organized lists Tree diagrams Simulations Sample space Compound event Simulation	1 2 3 3 2

"Unwrapped" Skills (students need to be able to do)	"Unwrapped" Concepts (students need to know)	DOK Levels
SUPPORTING STANDARD: **7.SP.B.3. Informally assess the degree of visual overlap of two numerical data distributions with similar variability, measuring the difference between the centers by expressing it as a multiple of a measure of variability.** ***For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable.***		
Assess	Data distribution	3

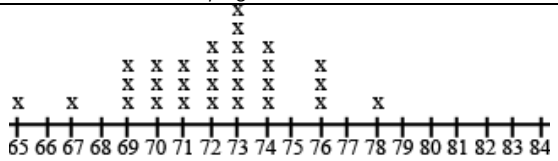
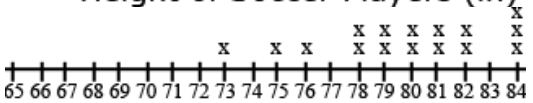
"Unwrapped" Skills (students need to be able to do)	"Unwrapped" Concepts (students need to know)	DOK Levels
SUPPORTING STANDARD: **7.SP.4. Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.** ***For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.***		
Use	Measures of central tendencies	2

Mathematical Standards and Practice …. Explanation and Examples

Statistics and Probability (SP) **Use random sampling to draw inferences about a population.**		
Standards *Students are expected to:*	*Mathematical Practices*	*Explanations and Examples*
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.	*7. MP.3.* Construct viable arguments and critique the reasoning of others. *7. MP.6.* Attend to precision.	Example: ● The school food service wants to increase the number of students who eat hot lunch in the cafeteria. The student council has been asked to conduct a survey of the student body to determine the students' preferences for hot lunch. They have determined two ways to do the survey. The two methods are listed below. Identify the type of sampling used in each survey option. Which survey option should the student council use and why? o Write all of the students' names on cards and pull them out in a draw to determine who will complete the survey. o Survey the first 20 students that enter the lunch room.
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. *For example, estimate the mean word length in a book by randomly sampling*	*7. MP.1.* Make sense of problems and persevere in solving them. *7. MP.2.* Reason abstractly and quantitatively. *7. MP.3.* Construct viable arguments and critique the reasoning of others. *7. MP.5.* Use appropriate tools	Example: ● Below is the data collected from two random samples of 100 students regarding students' school lunch preferences Make at least two inferences based on the results.

words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be.	strategically. *7. MP.6.* Attend to precision. *7. MP.7.* Look for and make use of structure.	Lunch Preferences student sample / hamburgers / tacos / pizza / total #1: 12 / 14 / 74 / 100 #2: 12 / 11 / 77 / 100

Statistics and Probability (SP) **Draw informal comparative inferences about two populations.**		
Standards *Students are expected to:*	*Mathematical Practices*	*Explanations and Examples*
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. *For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable*	*7. MP.1.* Make sense of problems and persevere in solving them. *7. MP.2.* Reason abstractly and quantitatively. *7. MP.3.* Construct viable arguments and critique the reasoning of others. *7. MP.4.* Model with mathematics. *7. MP.5.* Use appropriate tools strategically. *7. MP.6.* Attend to precision. *7.MP.7.* Look for and make use of structure.	Students can readily find data as described in the example on sports team or college websites. Other sources for data include American Fact Finder (Census Bureau), Fed Stats, Ecology Explorers, USGS, or CIA World Factbook. Researching data sets provides opportunities to connect mathematics to their interests and other academic subjects. Students can utilize statistic functions in graphing calculators or spreadsheets for calculations with larger data sets or to check their computations. Students calculate mean absolute deviations in preparation for later work with standard deviations. Example: ● Jason wanted to compare the mean height of the players on his favorite basketball and soccer teams. He thinks the mean height of the players on the basketball team will be greater but doesn't know how much greater. He also wonders if the variability of heights of the athletes is related to the sport they play. He thinks that there will be a greater variability in the heights of soccer players as compared to basketball players. He used the rosters and player statistics from the team websites to generate the following lists. Basketball Team – Height of Players in inches for 2010-2011 Season 75, 73, 76, 78, 79, 78, 79, 81, 80, 82, 81, 84, 82, 84, 80, 84 Soccer Team – Height of Players in inches for 2010 73, 73, 73, 72, 69, 76, 72, 73, 74, 70, 65, 71, 74, 76, 70, 72, 71, 74, 71, 74, 73, 67, 70, 72, 69, 78, 73, 76, 69 To compare the data sets, Jason creates a two dot plots on the same scale. The shortest player is 65 inches and the tallest players are 84 inches.

		Continued on next page
7. SP.B.3. continued		 Height of Soccer Players (in)  Height of Basketball Players (in) In looking at the distribution of the data, Jason observes that there is some overlap between the two data sets. Some players on both teams have players between 73 and 78 inches tall. Jason decides to use the mean and mean absolute deviation to compare the data sets. Jason sets up a table for each data set to help him with the calculations. The mean height of the basketball players is 79.75 inches as compared to the mean height of the soccer players at 72.07 inches, a difference of 7.68 inches. The mean absolute deviation (MAD) is calculated by taking the mean of the absolute deviations for each data point. The difference between each data point and the mean is recorded in the second column of the table. Jason used rounded values (80 inches for the mean height of basketball players and 72 inches for the mean height of soccer players) to find the differences. The absolute deviation, absolute value of the deviation, is recorded in the third column. The absolute deviations are summed and divided by the number of data points in the set. The mean absolute deviation is 2.53 inches for the basketball players and 2.14 for the soccer players. These values indicate moderate variation in both data sets. There is slightly more variability in the height of the soccer players. The difference between the heights of

		the teams is approximately 3 times the variability of the data sets (7.68 ÷ 2.53 = 3.04).
7.SP.B.3. *continued*		

Soccer Players (n = 29)		
Height (in)	Deviation from Mean (in)	Absolute Deviation (in)
65	-7	7
67	-5	5
69	-3	3
69	-3	3
69	-3	3
70	-2	2
70	-2	2
70	-2	2
71	-1	1
71	-1	1
71	-1	1
72	0	0
72	0	0
72	0	0
72	0	0
73	+1	1
73	+1	1
73	+1	1
73	+1	1
73	+1	1
73	+1	1
74	+2	2
74	+2	2

Basketball Players (n = 16)		
Height (in)	Deviation from Mean (in)	Absolute Deviation (in)
73	-7	7
75	-5	5
76	-4	4
78	-2	2
78	-2	2
79	-1	1
79	-1	1
80	0	0
80	0	0
81	1	1
81	1	1
82	2	2
82	2	2
84	4	4
84	4	4
84	4	4

74	+2	2
74	+2	2
76	+4	4
76	+4	4
76	+4	4
78	+6	6
Σ = 2090		Σ = 62

Mean = 2090 ÷ 29 =72 inches

MAD = 62 ÷ 29 = 2.14 inches

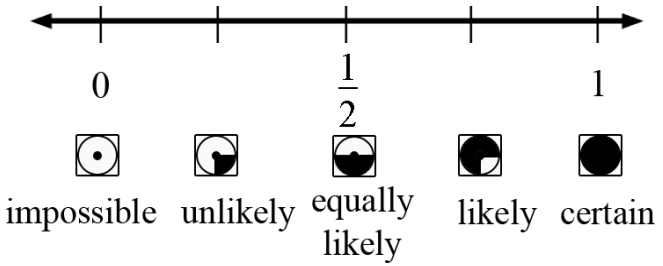
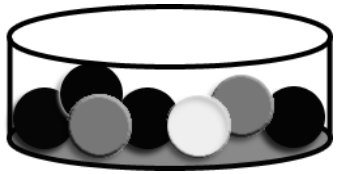
Σ = 1276		Σ = 40

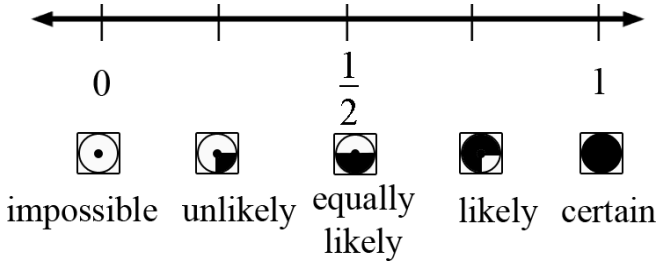
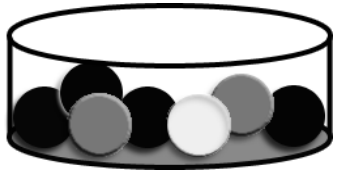
Mean = 1276 ÷ 16 =80 inches

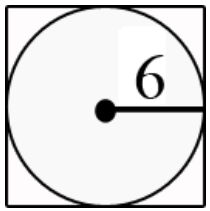
MAD = 40 ÷ 16 = 2.53 inches

7. SP.B.4. Use measures of center and measures of	*7. MP.1.* Make sense of problems and persevere in	Measures of center include mean, median, and mode. The measures of variability include

variability for numerical data from random samples to draw informal comparative inferences about two populations. *For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.*	solving them. *7. MP.2.* Reason abstractly and quantitatively. *7. MP.3.* Construct viable arguments and critique the reasoning of others. *7. MP.4.* Model with mathematics. *7. MP.5.* Use appropriate tools strategically. *7. MP.6.* Attend to precision. *7. MP.7.* Look for and make use of structure.	range, mean absolute deviation, and interquartile range. **Example**: ● The two data sets below depict random samples of the housing prices sold in the King River and Toby Ranch areas of Arizona. Based on the prices below, which measure of center will provide the most accurate estimation of housing prices in Arizona? Explain your reasoning. King River area {1.2 million, 242000, 265500, 140000, 281000, 265000, 211000} Toby Ranch homes {5 million, 154000, 250000, 250000, 200000, 160000, 190000}
Statistics and Probability (SP) **Investigate chance processes and develop, use, and evaluate probability models.**		
Standards *Students are expected to:*	*Mathematical Practices*	*Explanations and Examples*

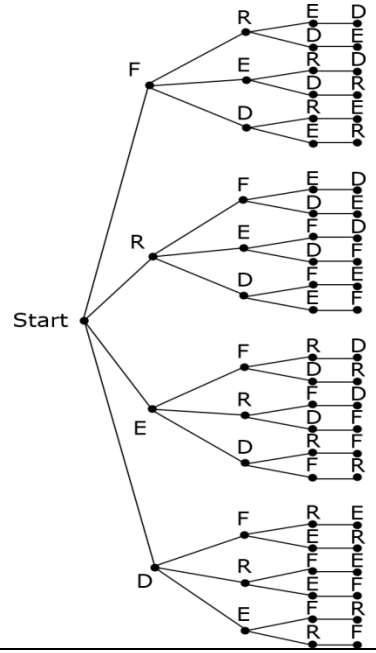
7. SP.C.5. Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around ½ indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.	*7.MP.4.* Model with mathematics. *7. MP.5.* Use appropriate tools strategically. *7. MP.6.* Attend to precision. *7. MP.7.* Look for and make use of structure.	Probability can be expressed in terms such as impossible, unlikely, likely, or certain or as a number between 0 and 1 as illustrated on the number line. Students can use simulations such as Marble Mania on AAAS or the Random Drawing Tool on NCTM's Illuminations to generate data and examine patterns. Marble Mania - *http://www.sciencenetlinks.com/interactives/marble/marblemania.html* *Random Drawing Tool* - *http://illuminations.nctm.org/activitydetail.aspx?id=67*  **Example**: ● The container below contains 2 gray, 1 white, and 4 black marbles. Without looking, if you choose a marble from the container, will the probability be closer to 0 or to 1 that you will select a white marble? A gray marble? A black marble? Justify each of your predictions. 

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 ½ indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.	*7. MP.4.* Model with mathematics. *7. MP.5.* Use appropriate tools strategically. *7. MP.6.* Attend to precision. *7. MP.7.* Look for and make use of structure.	Probability can be expressed in terms such as impossible, unlikely, likely, or certain or as a number between 0 and 1 as illustrated on the number line. Students can use simulations such as Marble Mania on AAAS or the Random Drawing Tool on NCTM's Illuminations to generate data and examine patterns. Marble Mania - http://www.sciencenetlinks.com/interactives/marble/marblemania.html Random Drawing Tool - http://illuminations.nctm.org/activitydetail.aspx?id=67  **Example**: • The container below contains 2 gray, 1 white, and 4 black marbles. Without looking, if you choose a marble from the container, will the probability be closer to 0 or to 1 that you will select a white marble? A gray marble? A black marble? Justify each of your predictions. 

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. *For example, when rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times.*	*7. MP.1.* Make sense of problems and persevere in solving them. *7. MP.2.* Reason abstractly and quantitatively. *7. MP.3.* Construct viable arguments and critique the reasoning of others. *7. MP.4.* Model with mathematics. *7. MP.5.* Use appropriate tools strategically.	**Students can collect data using physical objects or graphing calculator or web-based simulations. Students can perform experiments multiple times, pool data with other groups, or increase the number of trials in a simulation to look at the long-run relative frequencies.** **Example**: ● Each group receives a bag that contains 4 green marbles, 6 red marbles, and 10 blue marbles. Each group performs 50 pulls, recording the color of marble drawn and replacing the marble into the bag before the next draw. Students compile their data as a group and then as a class. They summarize their data as experimental probabilities and make conjectures about theoretical probabilities (How many green draws would you expect if you were to conduct 1000 pulls? 10,000 pulls?). Students create another scenario with a different ratio of marbles in the bag and make a conjecture about the outcome of 50 marble pulls with replacement. (An example would be 3 green marbles, 6 blue marbles, 3 blue marbles.) Students try the experiment and compare their predictions to the experimental outcomes to continue to explore and refine conjectures about theoretical probability.
7.SP.C.7. *continued* a. Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. *For example, if a student is selected at random from a class, find the probability that Jane will be selected and the probability*	*7. MP.3.* Construct viable arguments and critique the reasoning of others. *7. MP.4.* Model with mathematics. *7. MP.5.* Use appropriate tools strategically. *7. MP.6.* Attend to precision. *7. MP.7.* Look for and make use	**Example**: ● If you choose a point in the square, what is the probability that it is not in the circle? 

that a girl will be selected. b. Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. *For example, find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies?*	of structure. *7. MP.8.* Look for and express regularity in repeated reasoning.	

7. SP.C.8. Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation. a. 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	*7. MP.1.* Make sense of problems and persevere in solving them. *7. MP.2.* Reason abstractly and quantitatively. *7. MP.4.* Model with mathematics.	**Examples**: ● Students conduct a bag pull experiment. A bag contains 5 marbles. There is one red marble, two blue marbles and two purple marbles. Students will draw one marble without replacement and then draw another. What is the sample space for this situation? Explain how you determined the sample space and how you will use it to find the probability of drawing one blue marble followed by another blue marble. ● Show all possible arrangements of the letters in the word FRED using a tree

compound event occurs. b. 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. *Continued on next page*	*7. MP.5.* Use appropriate tools strategically. *7. MP.7.* Look for and make use of structure. *7. MP.8.* Look for and express regularity in repeated reasoning.	diagram. If each of the letters is on a tile and drawn at random, what is the probability that you will draw the letters F-R-E-D in that order? What is the probability that your "word" will have an F as the first letter? 

7.SP.C.8. *continued* c. Design and use a simulation to generate frequencies for compound events. *For example, use random digits as a simulation tool to approximate the answer to the question: If 40% of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood?*		

III. Essential Questions ……..Corresponding Big Ideas

Essential Questions	Corresponding Big Ideas
How can data collection assist in making predictions about an event?	Using conjectures to formulate new questions and plan new studies to answer them.
How can you use simulations to generate samples?	Understanding and using appropriate terminology to describe complementary and mutually exclusive events.
How do you find the experimental probability that a particular result will occur? Why is it called the experimental probability?	Using proportionality and a basic understanding of probability to make and test conjectures about the results of experiments and simulations.
How you can find the theoretical probability of an outcome. Why is it called a theoretical probability?	Computing probabilities for simple compound events, using such methods as organized lists, tree diagrams, and area models.
Can the probabilities of the outcomes be determined both experimentally and theoretically?	Formulating questions, designing studies, and collecting data about a characteristic shared by two populations or different characteristics within one population.
As you increase the number of actions for a binomial situation, what happens to the total number of possible outcomes?	Using observations about differences between two or more samples to make conjectures about the populations from which samples were taken.
	Making conjectures about possible relationships between two characteristics of a sample on the basis of scatter plots of the data and approximate lines of fit.
	Graphs and tables are useful for displaying distributions of categorical data.

How do graphs of distributions help you compare data sets? How do measures of center help you compare data sets? How do measures of spread help you compare data sets How do different sampling plans influence the reliability of sample statistics and resulting conclusions and predictions? When does it make sense to compare groups using counts, or frequencies? When does it make sense to compare groups using percent, or relative frequencies? How can you use statistics to decide whether differences between samples are expected due to natural variability or reflect measurable differences in underlying populations?	Numerical summaries of quantitative data are useful for measuring the amount of variability within a distribution. Graphs and tables based on grouped data are useful for displaying distributions of quantitative data. The shape of a distribution influences which summary measure is most appropriate for describing the center of a distribution for quantitative data. Graphs and tables based on a division of the ordered data into equal sized groups are useful displaying distributions of quantitative data. Some numerical summaries of quantitative data are more resistant than others to extreme data values, called outliers. The focus of comparisons between two or more groups of data id on similarities and differences between the distributions. The amount of separation between two or more distributions is related to the amount of variability within them. *Source:* *Bright, G. W., Frierson, D., Tarr, J. E., & Thomas, C. (2003) Navigating through Probability in Grades 6-8. Reson, VA: The National Council of Teacher of Mathematics, Inc.* *Kader, Gary D (2010). Developing essential understanding of Statistics teaching mathematics in grades 6-8 . Reston, VA: The National Council of Teachers of Mathematics, Inc.*

IV. Student Learning Objectives

Student Learning Goals	***Concept/ Skills***	***PARCC Instructional Clarification for Mathematics Assessment Test Specifications***	**Mathematical practices**
Distinguish between representative and non-representative samples of a population (*e.g. if the class had 50% girls and the sample had 10% girls, then that sample was not representative of the population*).7.SP.1	**Concept(s)** • 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. • Random sampling tends to produce representative samples. **Students are able to**: • analyze and distinguish between representative and non-representative samples of a population.	.	MP.1 MP.2 MP.4 MP.5 MP.6
Use random sampling to produce a representative sample. Develop inferences about a	**Concept(s):** • Inferences can be drawn from random sampling. **Students are able to:**		MP.1 MP.2 MP.3 MP.4

population using data from a random sample and assess the variation in estimates after generating multiple samples of the same size.7.SP.2	• analyze data from a sample to draw inferences about the population. • generate multiple random samples of the same size. • analyze the variation in multiple random samples of the same size.		MP.5 MP.6
Visually compare the means of two distributions that have similar variability; express the difference between the centers as a multiple of a measure of variability. 7.SP.3	**Concept(s):** No new concepts introduced **Students are able to:** • locate, approximately, the measure of center (mean or median) of a distribution • visually assess, given a distribution, the measure of spread (mean absolute deviation or inter-quartile range). • visually compare two numerical data distributions and describe the degree of overlap. • measure or approximate the difference between the measures centers and express it as a multiple of a measure of variability.	Tasks may use mean absolute deviation, range, or interquartile range as a measure of variability.	MP.1 MP.2 MP.3 MP.4 MP.5 MP.6 MP.7
Draw informal comparative inferences about two populations using their measures of center and measures of variability.7.SP4	**Concept(s):** No new concept(s) introduced **Students are able to:** • using measures of center, draw informal inferences about two populations and compare the		MP.1 MP.2 MP.3 MP.4 MP.5 MP.6

	inferences. • using measures of variability, draw informal inferences about two populations and compare the inferences.		
Interpret and express the likelihood of a chance event as a number between 0 and 1, relating that the probability of an unlikely event happening is near 0, a likely event is near 1, and 1/2 is neither likely nor unlikely.7.SP.5	**Concept(s):** • Probability of a chance event is a number between 0 and 1. • Probability expresses the likelihood of the event occurring. • Larger probability indicates greater likelihood. **Students are able to:** • draw conclusions about the likelihood of events given their probability.	Tasks may involve probabilities that are certain (1) or impossible (0).	MP.4 MP.5 MP.6 MP.7
Approximate the probability of a chance event by collecting data and observing long-run relative frequency; predict the approximate relative frequency given the probability7.SP.6	**Concept(s):** • Relative frequency • Experimental probability • Theoretical probability **Students are able to:** • collect data on chance processes, noting the long-run relative frequency. • predict the approximate relative frequency given the theoretical	Tasks require the student to make a prediction based on long-run relative frequency in data from a chance process.	MP.1 MP.2 MP.3 MP.4 MP.5

	probability.		
Develop a uniform probability model by assigning equal probability to all outcomes; develop probability models by observing frequencies and use the models to determine probabilities of events; compare probabilities from a model to observed frequencies and explain sources of discrepancy when agreement is not good 7.SP.7	**Concept(s):** • Uniform (equally likely) and non-uniform probability models **Students are able to:** • develop a uniform probability model. • use a uniform probability model to determine the probabilities of events. • develop (non-uniform) probability models by observing frequencies in data that has been generated from a chance process.	Simple events only.	MP.1 MP.2 MP.4 MP.6
Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams, identifying the outcomes in the sample space which compose the event. Use the sample space to find the probability of a compound event. 7.SP.C.8.a, 7.SP.C.8b Design and use a simulation to generate frequencies for compound events. 7.SP.C.8.c	**Concept(s):** • Just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space. **Students are able to**: • use organized lists, tables, and tree diagrams to represent sample spaces. • given a description of an event using everyday language, identify the outcomes in a sample space that make up the described event. • design simulations.		MP.1 MP.2 MP.4 MP.5 MP.7 MP.8

	• use designed simulations to generate frequencies for compound events.		

V. Unit Vocabulary

Unit Vocabulary Terms	
Samples Biased sample Probability Favorable outcomes Possible outcomes Random sampling Sample population Simulation Tree diagram Simple event Data distribution Compound events Organized lists Sample space Compound event	Measures of central tendency Variability Stem and leaf plot Box and whisker plot Median Range Lower quartile Upper quartile Interquartile range

VI. Differentiations / Modifications Teaching Strategies

Research Based Effective Teaching Strategies	**Modifications (how do I differentiate instruction?)**	**Strategies for Special Needs Learners**	**Strategies for English Language Learners**
Task /Activities that solidifies mathematical concepts Use questioning techniques to facilitate learning Reinforcing Effort, Providing Recognition Practice, reinforce and connect to other ideas within mathematics Promotes linguistic and nonlinguistic representations Cooperative Learning Setting Objectives, Providing Feedback Varied opportunities for students to communicate mathematically	**Modifications** Before or after school tutorial program Leveled rubrics Increased intervention Small groups Change in pace Calculators Extended time Alternative assessments Tiered activities/products Color coded notes Use of movements Use any form of technology Extension *See Connected Math Program Classroom Differentiating for Gifted Students*	Change in pace Calculators Alternative assessments Accommodations as per IEP Modifications as per IEP Use graphic organizer to clarify mathematical functions for students with processing and organizing difficulties'. Constant review of math concepts to strengthen understanding of prior concepts for difficulties recalling facts. Use self-regulations strategies for student to monitor and assess their thinking and performance for difficultly attending to	*Whiteboards* *Small Group / Triads* *Word Walls* *Partially Completed Solution* *Gestures* *Native Language Supports* *Pictures / Photos* *Partner Work* *Work Banks* *Teacher Modeling* *Math Journals* *See Connected Math Program Classroom Differentiating for English Language Learners*

Use technological and /or physical tools		task. Cooperative learning (small group, teaming, peer assisted tutoring) to foster communication and strengthen confidence. Use technology and/or hands on devices to: clarify abstract concepts and process for: 1. Difficulty interpreting pictures and diagram. 2.difficulties with oral communications 3. Difficulty correctly identifying symbols of numeral 4.Difficulty maintaining attentions Simplify and reduces strategies / Goal structure to enhance motivation, foster independence and self-direction for: 1.Difficulty attending to task	

		2. Difficulty with following a sequence of steps to solution. 3.Difficulty processing and organizing Scaffolding math idea/concepts by guided practice and questioning strategies' to clarify and enhance understanding of math big ideas for: 1.Difficulty with process and organization 2.Difficulty with oral and written communication Teacher models strategies' and think out aloud strategies to specify step by step process for 1. Difficulties processing and organization 2. Difficulty attending to tasks. Use bold numbers and/or words to draw students' attention to important	

		information. Use highlighters to emphasize the position of the variable. Provide a chart for key words and phrases as they work through the unit. *See Connected Math Program Classroom Differentiating for Special Needs*	

VII. Instructional Resources

<table>
<tr><th colspan="3">Instructional Resources and Materials</th></tr>
<tr><th>Formative Assessment</th><th colspan="2">Print</th></tr>
<tr><td rowspan="2">Short constructed responses
Extended responses
Checks for Understanding
Exit tickets
Teacher observation
Timed Practice Test – Multiple Choice & Open-Ended Questions

Performance Tasks:

7.SP.B.3,4 College Athletes
7.SP.C.6 Heads or Tails

Additional performance tasks

7.SP.A.1 Mr. Briggs Class Likes Math
7.SP.A.2 Valentine Marbles
7.SP.B.3,4 Offensive Linemen
7.SP.C.7, 6 Rolling Dice
7.SP.C.7a How Many Buttons
7.SP.C.8 Tetrahedral Dice
7.SP.C.8 Waiting Times</td><td colspan="2">Connected Math Program Grade 7 Unit (s) : What Do You Expect
Samples and Populations
Scope and Sequence Connected Mathematics Program 3</td></tr>
<tr><td colspan="2">Additional Print and technology Resources</td></tr>
<tr><td>Resources for teachers
Connected Math Project (Michigan State University)
My Pearson Training : Connected Math Program
Annenberg Learning : Insight into Algebra 1
National Council of Teachers of Mathematics
Mathematics Assessment Projects
Achieve the Core
Illustrative Mathematics
Mathematics Assessment Projects
Get the Math
Webmath.com
sosmath.com
Mathplanet.com
Interactive Mathematics.com
Inside Mathmatics.org
Asia Pacific Economic Cooperation : :Lesson Study Videos</td><td>Resources for Students
My Math Universe.com
Math is Fun website
Khan Academy
Figure This.org website
Virtual Nerd website
Math Snacks websites

Internet 4 Classroom website
A Maths Dictionary for kids</td></tr>
</table>

Project (optional) *Teach 21 Problem Based Learning : Got Luck*	*Genderchip.org* *Interactive Geometry* *Mathematical Association of America* *learner.org* *Math Forum : Teacher Place* *Shmoop /common core math*	