

NEW MILFORD PUBLIC SCHOOLS
New Milford, Connecticut



Practical Math – Applications of Probability
JUNE 2016

Approved by BOE November 2016

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New Milford's Mission Statement

The mission of the New Milford Public Schools, a collaborative partnership of students, educators, family and community, is to prepare each and every student to compete and excel in an ever-changing world, embrace challenges with vigor, respect and appreciate the worth of every human being, and contribute to society by providing effective instruction and dynamic curriculum, offering a wide range of valuable experiences, and inspiring students to pursue their dreams and aspirations.

Practical Math – Applications of Probability

The goal of this a ½ year course is to provide a fundamental understanding of probability.

Topics include: Basic probability, compound probabilities, combinations and permutations, geometric probabilities and probabilities associated with graphs/charts and 2-way frequency tables. Also included are applications associated with these topics, as well as the use of the graphing calculator and computer.

Pacing Guide

Unit Title	# of Weeks
1. Basic Probability – including charts and graphs	2
2. Applications of Odds	2
3. Applications of the Addition Rule	2
4. Applications of the Multiplication Rule	3
5. Applications of the Counting Principle	2
6. Applications of Combinations and Permutations	4
7. Applications of Geometric Probabilities	3
8. Review and Final assessment	2

Committee Member(s): Deborah Murnan
Unit Title: Unit 1 - Basic probability
including reading graphs and charts

Course/Subject: Practical Math Probability
Grade Level: 12th grade
of Weeks: 2

Identify Desired Results

Common Core Standards

- CCSS.MATH.CONTENT.HSS.CP.A.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").
- CCSS.MATH.CONTENT.HSS.CP.A.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.
- CCSS.MATH.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.
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.
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?
- CCSS.MATH.7.SP.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.
- CCSS.MATH.7.SP.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.

Enduring Understandings Generalizations of desired understanding via essential questions (Students will understand that ...)		Essential Questions Inquiry used to explore generalizations
<ul style="list-style-type: none"> • Probability describes the likelihood an event will occur. • The complement of event A consists of all outcomes in which event A does not occur. • A probability is a number between and including 0 and 1 • The probability of an event's occurrence can be predicted with varying degrees of confidence. • Data are collected for a purpose and have meaning in a context 	<ul style="list-style-type: none"> • How is probability used in everyday life? • How do you conduct a probability experiment? • What is the difference between theoretical and experimental probabilities? • How do the rules of probability play into the statistics field 	
Expected Performances What students should know and be able to do		
<p>Students will know the following:</p> <ul style="list-style-type: none"> • The basic definition and rules of probability • The probability of an event must have a value between 0 and 1, inclusively • How to use the Complement Rule to make calculating probabilities simpler • Probabilities have a direct relationship to the gaming and sports industries • Probabilities are used to influence actions in various other industries <p>Students will be able to do the following:</p> <ul style="list-style-type: none"> • Calculate simple probabilities, including complements of events • Apply probability calculations to real-world situations 		
Character Attributes		
<ul style="list-style-type: none"> • Perseverance • Integrity • Responsibility • Honesty • Cooperation • Respect 		
Technology Competencies		
<ul style="list-style-type: none"> • Students use technology tools (i.e., calculators, smart boards, data collection probes, videos, educational software, their own personal devices) for problem solving, self directed learning, and extended learning activities 		
Develop Teaching and Learning Plan		
<p>Teaching Strategies:</p> <ul style="list-style-type: none"> • Teacher will explain simple probability including outcomes, unions, intersections, complements and correct notation 	<p>Learning Activities:</p> <ul style="list-style-type: none"> • Students should find probabilities for given problem sets • Students should work in small groups 	

<ul style="list-style-type: none"> Teacher will provide applications of simple probabilities 	to find probabilities using manipulatives, games and real data
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Assessments	
Performance Task(s)	Other Evidence
Authentic application to evaluate student achievement of desired results designed according to GRASPS (one per marking period)	Application that is functional in a classroom context to evaluate student achievement of desired results
<p>Goal: to successfully answer probability questions as they relate to several real situations</p> <p>Role: student</p> <p>Audience: teacher</p> <p>Situation: complete a series of tasks related to probability through the use of games, manipulatives and real data.</p> <p>Product or Performance: completion of the activities at all stations</p> <p>Standards for Success: Accurate results for the majority of the activities</p>	<ul style="list-style-type: none"> Monitoring class work through board work, group work, questioning, walk-throughs Check for understanding via going over homework using white boards or the Smartboard. Quizzes Test (may include 10-20 multiple choice, 15-30 regular answer) Participation in class discussion, group work, and responses.

Suggested Resources
<ul style="list-style-type: none"> Bureau of Labor statistics website: http://bls.com online Triola, Mario. <i>Elementary Statistics</i>. Pearson/Addison Wesley, 2007. Print Bock, Velleman, De Veaux. <i>Stats Modeling the World</i>. Pearson/Addison Wesley, 2007. Print Supplemental worksheets Graphing Calculator Personal Device

Committee Member(s): Deborah Murnan Unit Title: Unit 2 – Applications of Odds	Course/Subject: Practical Math Probability Grade Level: 12 th grade # of Weeks: 2
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Identify Desired Results

Common Core Standards	
<ul style="list-style-type: none"> • CCSS.Math.Content.7.SP.C.5 Understand that the probability of a chance event is a number between 0 and 1, inclusively, that expresses the likelihood of the event occurring. Understand the odds of an event are not the same as the probability of an event. 	
Enduring Understandings Generalizations of desired understanding via essential questions (Students will understand that ...)	Essential Questions Inquiry used to explore generalizations
<ul style="list-style-type: none"> • The odds of an event are a comparison between the probability of the event and its complement. 	<ul style="list-style-type: none"> • What do the odds of an event tell us • How can predictions be made using the odds of the event happening
Expected Performances What students should know and be able to do	
<p>Students will know the following:</p> <ul style="list-style-type: none"> • The odds of an event occurring are not the same as the probability of the event • The odds of an event have a direct relationship to the gaming and sports industries • Probabilities/ odds are used to influence actions in various other industries <p>Students will be able to do the following:</p> <ul style="list-style-type: none"> • Calculate the odds in favor and against an event • Calculate the odds of an event given the probability of the event • Calculate the probability of an event given the odds of the event • Apply probability/odds calculations to real-world situations 	
Character Attributes	
<ul style="list-style-type: none"> • Perseverance • Integrity • Responsibility • Honesty • Cooperation • Respect 	
Technology Competencies	
<ul style="list-style-type: none"> • Students use technology tools (i.e., graphing calculators, smart boards, data collection probes, videos, educational software, their own personal devices) for problem solving, self-directed learning, and extended learning activities 	
Develop Teaching and Learning Plan	
<p>Teaching Strategies:</p> <ul style="list-style-type: none"> • Teacher will introduce the concept of odds in favor and against an event and how they relate to the probability of the event • Teacher will provide applications of 	<p>Learning Activities:</p> <ul style="list-style-type: none"> • Students should transform odds in favor of an event to odds against the event and the probability of the event to better understand the relationship between the three measures

odds and related probabilities	<ul style="list-style-type: none"> • Students should work in small groups to find probabilities using manipulatives, games and real data
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Assessments	
Performance Task(s)	Other Evidence
<p>Authentic application to evaluate student achievement of desired results designed according to GRASPS (one per marking period)</p>	<p>Application that is functional in a classroom context to evaluate student achievement of desired results</p>
<p>Goal: to successfully answer probability questions as they relate to various sporting events</p> <p>Role: student</p> <p>Audience: teacher</p> <p>Situation: complete a series of tasks related to probability through the use of real data.</p> <p>Product or Performance: completion of the activities</p> <p>Standards for Success: Accurate results for the majority of the activities</p>	<ul style="list-style-type: none"> • Monitoring class work through board work, group work, questioning, walk-throughs • Check for understanding via going over homework using white boards or the Smartboard. • Quizzes • Test (may include 10-20 multiple choice, 15-30 regular answer) • Participation in class discussion, group work, and responses.
Suggested Resources	
<ul style="list-style-type: none"> • Bureau of Labor statistics website: http://bls.com online • Triola, Mario. <i>Elementary Statistics</i>. Pearson/Addison Wesley, 2007. Print • Bock, Velleman, De Veaux. <i>Stats Modeling the World</i>. Pearson/Addison Wesley, 2007. Print • Supplemental worksheets • Graphing Calculator • Personal Device 	

Committee Member(s): Deborah Murnan Unit Title: Unit 3 –Applications of the Addition rule	Course/Subject: Practical Math Probability Grade Level: 12 th grade # of Weeks: 2
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Identify Desired Results

Common Core Standards

- CCSS.MATH.CONTENT.HSS.CP.A.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.
- 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.

Enduring Understandings

Generalizations of desired understanding via essential questions
(Students will understand that ...)

- Events A and B are mutually exclusive if they cannot occur simultaneously.
- The probability of two mutually exclusive events is the sum of the two events
- The probability of two overlapping events is the sum of the two events minus the probability both events happen simultaneously
- A two way frequency table can be used to interpret data when two categories are associated with each object being classified

Essential Questions

Inquiry used to explore generalizations

- What is meant by mutually exclusive?
- How does the probability of two mutually exclusive events differ from the probability of two non-mutually exclusive events
- How can you interpret data when two categories are associated with each object being classified

Expected Performances

What students should know and be able to do

Students will know the following:

- How and when to apply the Addition Rule
- How to determine if two events are mutually exclusive
- Probabilities have a direct relationship to the gaming and sports industries
- Probabilities are used to influence actions in various other industries
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Students will be able to do the following:

- Determine if two events are mutually exclusive or not
- Calculate the probability of two mutually exclusive events
- Calculate the probability of two non-mutually exclusive events
- Apply probability calculations to real-world situations

Character Attributes	
<ul style="list-style-type: none"> • Perseverance • Integrity • Responsibility • Honesty • Cooperation • Respect 	
Technology Competencies	
<ul style="list-style-type: none"> • Students use technology tools (i.e., graphing calculators, smart boards, data collection probes, videos, educational software, their own personal devices) for problem solving, self-directed learning, and extended learning activities 	
Develop Teaching and Learning Plan	
<p>Teaching Strategies:</p> <ul style="list-style-type: none"> • Teacher will introduce the addition rule for mutually exclusive and overlapping events • Teacher will use two-way frequency tables to practice the addition rule • Teacher will provide applications of mutually exclusive and overlapping events 	<p>Learning Activities:</p> <ul style="list-style-type: none"> • Students should practice determining if two events are mutually exclusive or overlapping • Students should practice calculating probability for mutually exclusive and overlapping events • Students should practice calculating these probabilities for data presented in a two-way frequency table • Students should work in small groups to find probabilities using manipulatives, games and real data

Assessments	
Performance Task(s)	Other Evidence
Authentic application to evaluate student achievement of desired results designed according to GRASPS (one per marking period)	Application that is functional in a classroom context to evaluate student achievement of desired results
<p>Goal: to successfully answer probability questions as they relate to several real situations</p> <p>Role: student</p> <p>Audience: teacher</p> <p>Situation: complete a series of tasks related to probability through the use of games, manipulatives and real data.</p>	<ul style="list-style-type: none"> • Monitoring class work through board work, group work, questioning, walk-throughs • Check for understanding via going over homework using white boards or the Smartboard. • Quizzes • Test (may include 10-20 multiple choice, 15-30 regular answer)

<p>Product or Performance: completion of the activities at all stations</p> <p>Standards for Success: Accurate results for the majority of the activities</p>	<ul style="list-style-type: none"> • Participation in class discussion, group work, and responses.
Suggested Resources	
<ul style="list-style-type: none"> • Bureau of Labor statistics website: http://bls.com online • Triola, Mario. <i>Elementary Statistics</i>. Pearson/Addison Wesley, 2007. Print • Bock, Velleman, De Veaux. <i>Stats Modeling the World</i>. Pearson/Addison Wesley, 2007. Print • Supplemental worksheets • Graphing Calculator • Personal Device 	

<p>Committee Member(s): Deborah Murnan</p> <p>Unit Title: Unit 4 – Applications of the</p>	<p>Course/Subject: Practical Math Probability</p> <p>Grade Level: 12th grade</p>
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Multiplication rule

of Weeks: 3

Identify Desired Results

Common Core Standards

- CCSS.MATH.CONTENT.HSS.CP.B.8
- (+) Apply the general Multiplication Rule in a uniform probability model, $P(A \text{ and } B) = P(A)P(B|A) = P(B)P(A|B)$, and interpret the answer in terms of the model
- 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.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.
- CCSS.MATH.CONTENT.HSS.CP.A.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.
Use the rules of probability to compute probabilities of compound events.
- 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
- 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

Enduring Understandings Generalizations of desired understanding via essential questions (Students will understand that ...)	Essential Questions Inquiry used to explore generalizations
<ul style="list-style-type: none"> • Two events, A and B, are independent if the occurrence of one does not affect the probability of the occurrence of the other. • If A and B are not independent, then they are said to be dependent • The probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs. • The probability of two independent events is the product of their individual probabilities • The probability of two dependent events is the probability of the first event multiplied by the probability of the second event happening given the first even happened. 	<ul style="list-style-type: none"> • What is meant by independent/dependent outcomes? • How are events defined and what are examples of each? • What is conditional probability? • How do the probabilities of independent and dependent differ?
Expected Performances What students should know and be able to do	
<p>Students will know the following:</p> <ul style="list-style-type: none"> • How and when to apply the Multiplication Rule • How to determine if two events are dependent or independent • Probabilities have a direct relationship to the gaming and sports industries • Probabilities are used to influence actions in various other industries <p>Students will be able to do the following:</p> <ul style="list-style-type: none"> • Determine if two events are dependent or independent • Calculate the probability of two dependent events • Calculate the probability of two independent events • Apply probability calculations to real-world situations 	
Character Attributes	
<ul style="list-style-type: none"> • Perseverance • Integrity • Responsibility • Honesty • Cooperation • Respect 	
Technology Competencies	
<ul style="list-style-type: none"> • Students use technology tools (i.e., graphing calculators, smart boards, data collection probes, videos, educational software, their own personal devices) for 	

problem solving, self-directed learning, and extended learning activities	
Develop Teaching and Learning Plan	
<p>Teaching Strategies:</p> <ul style="list-style-type: none"> • Teacher will explain the difference between dependent and independent events • Teacher will introduce the multiplication rule for independent and dependent events • Teacher will provide applications of independent and dependent events 	<p>Learning Activities:</p> <ul style="list-style-type: none"> • Students should practice determining if two events are independent or dependent • Students should practice calculating probabilities for dependent and independent events • Students should work in small groups to find probabilities using manipulatives, games and real data

Assessments	
Performance Task(s)	Other Evidence
<p>Authentic application to evaluate student achievement of desired results designed according to GRASPS (one per marking period)</p> <p>Goal: to successfully answer probability questions as they relate to several real situations</p> <p>Role: student</p> <p>Audience: teacher</p> <p>Situation: complete a series of tasks related to probability through the use of games, manipulatives and real data.</p> <p>Product or Performance: completion of the activities at all stations</p> <p>Standards for Success: Accurate results for the majority of the activities</p>	<p>Application that is functional in a classroom context to evaluate student achievement of desired results</p> <ul style="list-style-type: none"> • Monitoring class work through board work, group work, questioning, walk-throughs • Check for understanding via going over homework using white boards or the Smartboard. • Quizzes • Test (may include 10-20 multiple choice, 15-30 regular answer) • Participation in class discussion, group work, and responses.
Suggested Resources	
<ul style="list-style-type: none"> • Bureau of Labor statistics website: http://bls.com online • Triola, Mario. <i>Elementary Statistics</i>. Pearson/Addison Wesley, 2007. Print • Bock, Velleman, De Veaux. <i>Stats Modeling the World</i>. Pearson/Addison Wesley, 2007. Print • Supplemental worksheets • Graphing Calculator 	

- Personal Device

Committee Member(s): Deborah Murnan Unit Title: Unit 5 – Applications of the Counting principle	Course/Subject: Practical Math Probability Grade Level: 12 th grade # of Weeks: 2
Identify Desired Results	
Common Core Standards	
<ul style="list-style-type: none"> • <u>CCSS.MATH.CONTENT.HSS.CP.B.9</u> (+) Use permutations and combinations to compute probabilities of compound events and solve problems. 	
Enduring Understandings Generalizations of desired understanding via essential questions (Students will understand that ...)	Essential Questions Inquiry used to explore generalizations
<ul style="list-style-type: none"> • Counting techniques can be used to find all of the possible ways to complete different tasks or choose items from a list. • The counting principle can be an alternative for some combination and permutation questions 	<ul style="list-style-type: none"> • Can the fundamental counting principle and rules for combinations and permutations help us calculate statistical probabilities? • How does the counting principle compare to combination and permutation calculations?
Expected Performances	
What students should know and be able to do	
<p>Students will know the following:</p> <ul style="list-style-type: none"> • How and when to apply the counting principle • How the counting principle compares to combination and permutation calculations • How the counting principle can be used in probability calculations • Probabilities have a direct relationship to the gaming and sports industries • Probabilities are used to influence actions in various other industries <p>Students will be able to do the following:</p> <ul style="list-style-type: none"> • Calculate the possible ways to complete different tasks or choosing items from a list using the counting principle • Apply the results of a counting principle question to a probability situation • Apply probability calculations to real-world situations 	
Character Attributes	
<ul style="list-style-type: none"> • Perseverance • Integrity • Responsibility • Honesty • Cooperation 	

<ul style="list-style-type: none"> Respect 	
Technology Competencies	
<ul style="list-style-type: none"> Students use technology tools (i.e., graphing calculators, smart boards, data collection probes, videos, educational software, their own personal devices) for problem solving, self-directed learning, and extended learning activities Students specifically learn to find factorials, combinations and permutations on the TI-83/84 plus graphing calculators 	
Develop Teaching and Learning Plan	
Teaching Strategies: <ul style="list-style-type: none"> Teacher will explain the difference between combinations and permutations and how they relate to the counting principle Teacher will introduce applications of the counting principle 	Learning Activities: <ul style="list-style-type: none"> Students should work on problems using the formulas and then rework them using technology in order to see the benefits of using technology with respect to time spent doing calculations and how it relates to productivity Students should work in small groups to find probabilities using manipulatives, games and real data

Assessments	
Performance Task(s)	Other Evidence
Authentic application to evaluate student achievement of desired results designed according to GRASPS (one per marking period)	Application that is functional in a classroom context to evaluate student achievement of desired results
Goal: to successfully answer probability questions as they relate to real situations Role: student Audience: teacher Situation: complete a series of tasks related to probability through the use of games, manipulatives and real data. Product or Performance: completion of the activities at all stations Standards for Success: Accurate results for the majority of the activities	<ul style="list-style-type: none"> Monitoring class work through board work, group work, questioning, walk-throughs Check for understanding via going over homework using white boards or the Smartboard. Quizzes Test (may include 10-20 multiple choice, 15-30 regular answer) Participation in class discussion, group work, and responses.
Suggested Resources	
<ul style="list-style-type: none"> Bureau of Labor statistics website: http://bls.com online Triola, Mario. <i>Elementary Statistics</i>. Pearson/Addison Wesley, 2007. Print Bock, Velleman, De Veaux. <i>Stats Modeling the World</i>. Pearson/Addison Wesley, 2007. Print 	

- Supplemental worksheets
- Graphing Calculator
- Personal Device

Committee Member(s): Deborah Murnan
 Unit Title: Unit 6 – Applications of
 Combinations and Permutations

Course/Subject: Practical Math Probability
 Grade Level: 12th grade
 # of Weeks: 4

Identify Desired Results

Common Core Standards

- CCSS.MATH.CONTENT.HSS.CP.B.9
 (+) Use permutations and combinations to compute probabilities of compound events and solve problem

Enduring Understandings

Generalizations of desired understanding via
 essential questions
 (Students will understand that ...)

- Counting techniques can be used to find all of the possible ways to complete different tasks or choose items from a list.
- The rules for combinations apply to situations in which the order of the events does not matter
- The rules for permutations apply to situations where the order of the events does matter

Essential Questions

Inquiry used to explore generalizations

- Can the fundamental counting principle and rules for combinations and permutations help us calculate statistical probabilities?
- How do the rules for combinations and permutations differ?

Expected Performances

What students should know and be able to do

Students will know the following:

- How and when to apply combination and permutation formulas
- How the counting principle compares to combination and permutation calculations
- How the results of combination/permutation problems can be used in probability calculations
- Probabilities have a direct relationship to the gaming and sports industries
- Probabilities are used to influence actions in various other industries

Students will be able to do the following:

- Calculate the total number of possibilities for situations involving multiple tasks or arrangements
- Determine when the counting principle is a more efficient method for finding the total number of possibilities as compared to the combination/permutation formulas in the graphing calculator
- Apply probability calculations to real-world situations

Character Attributes	
<ul style="list-style-type: none"> • Perseverance • Integrity • Responsibility • Honesty • Cooperation • Respect 	
Technology Competencies	
<ul style="list-style-type: none"> • Students use technology tools (i.e., graphing calculators, smart boards, data collection probes, videos, educational software, their own personal devices) for problem solving, self-directed learning, and extended learning activities • Students specifically learn to find factorials, combinations and permutations on the TI-83/84 plus graphing calculators 	
Develop Teaching and Learning Plan	
<p>Teaching Strategies:</p> <ul style="list-style-type: none"> • Teacher will explain the difference between combinations and permutations and how they relate to the counting principle • Teacher will introduce applications of combination and permutation formulas 	<p>Learning Activities:</p> <ul style="list-style-type: none"> • Students should work on problems using the formulas for combinations and permutations and then rework them using technology in order to see the benefits of using technology with respect to time spent doing calculations and how it relates to productivity • Students should work in small groups to find probabilities using manipulatives, games and real data

Assessments	
Performance Task(s)	Other Evidence
Authentic application to evaluate student achievement of desired results designed according to GRASPS (one per marking period)	Application that is functional in a classroom context to evaluate student achievement of desired results
<p>Goal: to successfully answer probability questions as they relate to several real situations</p> <p>Role: student</p> <p>Audience: teacher</p> <p>Situation: complete a series of tasks related to probability through the use of games, manipulatives and real data.</p>	<ul style="list-style-type: none"> • Monitoring class work through board work, group work, questioning, walk-throughs • Check for understanding via going over homework using white boards or the Smartboard. • Quizzes • Test (may include 10-20 multiple choice, 15-30 regular answer) • Participation in class discussion, group

<p>Product or Performance: completion of the activities at all stations</p> <p>Standards for Success: Accurate results for the majority of the activities</p>	<p>work, and responses</p>
<p>Suggested Resources</p>	
<ul style="list-style-type: none"> • Bureau of Labor statistics website: http://bls.com online • Triola, Mario. <i>Elementary Statistics</i>. Pearson/Addison Wesley, 2007. Print • Bock, Velleman, De Veaux. <i>Stats Modeling the World</i>. Pearson/Addison Wesley, 2007. Print • Supplemental worksheets • Graphing Calculator • Personal Device 	

Committee Member(s): Deborah Murnan Unit Title: Unit 7 – Applications of geometric probabilities	Course/Subject: Practical Math Probability Grade Level: 12 th grade # of Weeks: 3
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Identify Desired Results

Common Core Standards

- CC.9-12.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").
- CCSS.MATH. 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
- CCSS.MATH. 7.G.6.
Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

Enduring Understandings Generalizations of desired understanding via essential questions (Students will understand that ...)	Essential Questions Inquiry used to explore generalizations
<ul style="list-style-type: none"> • Certain problems in probability can be solved by modeling the situation with geometric measures • Probability can be used to make fair decisions based on prior experience. 	<ul style="list-style-type: none"> • How can you model a geometric problem as a probability? • How can geometric probabilities be used to influence fair decisions?

Expected Performances

What students should know and be able to do

- Students will know the following:
- How to apply geometric calculations to probability applications
 - Probabilities have a direct relationship to the gaming and sports industries
 - Probabilities are used to influence actions in various other industries
- Students will be able to do the following:
- Calculate areas and volumes of 2 and 3 dimensional figures
 - Apply the area and volume calculations to probability applications

<ul style="list-style-type: none"> Apply probability calculations to real-world situations 	
Character Attributes	
<ul style="list-style-type: none"> Perseverance Integrity Responsibility Honesty Cooperation Respect 	
Technology Competencies	
<ul style="list-style-type: none"> Students use technology tools (i.e., graphing calculators, smart boards, data collection probes, videos, educational software, their own personal devices) for problem solving, self-directed learning, and extended learning activities 	
Develop Teaching and Learning Plan	
<p>Teaching Strategies:</p> <ul style="list-style-type: none"> Teacher will review area and volume calculations Teacher will explain how area and volumes can be used to calculate probabilities Teacher will introduce applications of geometric probability involving area and volume formulas 	<p>Learning Activities:</p> <ul style="list-style-type: none"> Students will calculate area and volumes of 2 and 3 dimensional figures Students should work on using area and volume calculations to calculate probabilities Students should work in small groups to find probabilities using manipulatives, games and real data

Assessments	
Performance Task(s)	Other Evidence
<p>Authentic application to evaluate student achievement of desired results designed according to GRASPS (one per marking period)</p>	<p>Application that is functional in a classroom context to evaluate student achievement of desired results</p>
<p>Goal: to successfully answer probability questions as they relate to real situations</p> <p>Role: student</p> <p>Audience: teacher</p> <p>Situation: complete a series of tasks related to probability through the use of games, manipulatives and real data.</p> <p>Product or Performance: completion of the activities at all stations</p> <p>Standards for Success: Accurate results for the majority of the activities</p>	<ul style="list-style-type: none"> Monitoring class work through board work, group work, questioning, walk-throughs Check for understanding via going over homework using white boards or the Smartboard. Quizzes Test (may include 10-20 multiple choice, 15-30 regular answer) Participation in class discussion, group work, and responses.
Suggested Resources	

- Bureau of Labor statistics website: <http://bls.com> online
- Triola, Mario. *Elementary Statistics*. Pearson/Addison Wesley, 2007. Print
- Bock, Velleman, De Veaux. *Stats Modeling the World*. Pearson/Addison Wesley, 2007. Print
- Supplemental worksheets
- Graphing Calculator
- Personal Device