DRAFT

CURRICULUM MANAGEMENT SYSTEM

MONROE TOWNSHIP SCHOOLS

Course Name: PROJECT-BASED LEARNING (PBL)
Grade: 6

For adoption by all regular education programs as specified and for adoption or adaptation by all Special Education Programs in accordance with Board of Education Policy # 2220.

Board Approved: Month, 2011

TABLE OF CONTENTS

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ACKNOWLEDGEMENTS

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VISION, MISSION, AND GOALS

Vision Statement

The Monroe Township Board of Education commits itself to all children by preparing them to reach their full potential and to function in a global society through a preeminent education.

Mission Statement

The Monroe Public Schools in collaboration with the members of the community shall ensure that all children receive an exemplary education by well-trained committed staff in a safe and orderly environment.

Goals

Raise achievement for all students paying particular attention to disparities between subgroups.

Systematically collect, analyze, and evaluate available data to inform all decisions.

Improve business efficiencies where possible to reduce overall operating costs.

Provide support programs for students across the continuum of academic achievement with an emphasis on those who are in the middle.

Provide early interventions for all students who are at risk of not reaching their full potential.

PHILOSOPHY

Monroe Township Schools are committed to providing all students with a quality education resulting in life-long learners who can succeed in a global society. The mathematics program, grades K - 12, is predicated on that belief and is guided by the following six principles as stated by the National Council of Teachers of Mathematics (NCTM) in the *Principles and Standards for School Mathematics, 2000.* First, a mathematics education requires equity. All students will be given worthwhile opportunities and strong support to meet high mathematical expectations. Second, a coherent mathematics curriculum will effectively organize, integrate, and articulate important mathematical ideas across the grades. Third, effective mathematics teaching requires the following: a) knowing and understanding mathematics, students as learners, and pedagogical strategies b) having a challenging and supportive classroom environment and c) continually reflecting on and refining instructional practice. Fourth, students must learn mathematics with understanding. A student's prior experiences and knowledge will actively build new knowledge. Fifth, assessment should support the learning of important mathematics and provide useful information to both teachers and students. Lastly, technology enhances mathematics learning, supports effective mathematics teaching, and influences what mathematics is taught.

As students begin their mathematics education in Monroe Township, classroom instruction will reflect the best thinking of the day. Children will engage in a wide variety of learning activities designed to develop their ability to reason and solve complex problems. Calculators, computers, manipulatives, technology, and the Internet will be used as tools to enhance learning and assist in problem solving. Group work, projects, literature, and interdisciplinary activities will make mathematics more meaningful and aid understanding. Classroom instruction will be designed to meet the learning needs of all children and will reflect a variety of learning styles.

In this changing world those who have a good understanding of mathematics will have many opportunities and doors open to them throughout their lives. Mathematics is not for the select few but rather is for everyone. Monroe Township Schools are committed to providing all students with the opportunity and the support necessary to learn significant mathematics with depth and understanding.

EDUCATIONAL GOALS

Having evolved from medical and engineering school models, "Project-Based Learning" is an inquiry-based, hands-on curriculum through which "students design and construct simple and/or complex investigations which require them to gather, analyze, and interpret data to report their findings" (NMSA 2008). Endorsed and supported by the National Middle School Association, Project-Based Learning facilitates student autonomy, engages active learning with 21st Century Skills, and connects to the appropriate grade-level *Common Core State Standards* in mathematics encompassing The Number System, Ratio and Proportional Relationships, Geometry, Statistics and Probability, and Expressions and Equations.

NJDOE: CORE CURRICULUM CONTENT STANDARDS

A note about Common Core State Standards for Mathematics

The *Common Core State Standards* for Mathematics were adopted by the state of New Jersey in 2010. The standards referenced in this curriculum guide refer to these new standards and may be found in the Curriculum folder on the district servers. A complete copy of the new Common Core State Standards for Mathematics and the end of year algebra 1 test content standards may also be found at:

i.e. http://www.corestandards.org/the-standards
i.e. http://www.achieve.org/AlgebraITestOverview

SCOPE AND SEQUENCE:

Quarter I – Project 1: EXPLORING THE MOON!

Big Idea: Modeling
Domains: Ratio & Proportional Relationships, Geometry, Statistics, and Expressions & Equations

I. HISTORY OF NASA & LUNAR SCIENCE

II. RATIO CONCEPTS & PROPORTIONAL REASONING (6.RP.1, 6.RP.2, 6.RP.3)

a. Solve real world and mathematical problems
   i. Distance to the Moon
   ii. Diameter of the Moon
   iii. Reaping Rocks

b. Use ratio language to describe a relationship between two quantities; ratio a:b with b≠0

c. Understand unit rate and use rate language to describe a ratio relationship

III. DESCRIPTIVE STATISTICS (6.SP.3, 6.SP.4, 6.SP.5)

a. Relate the choice of measure to the shape of the data and the context
   i. Regolith Formation
   ii. Impact Craters
   iii. Moon Anomalies

b. Display numerical data in a variety of ways

c. Summarize numerical data
   i. Report number of observations
   ii. Describe nature of attributes
   iii. Measures of center: mean, median, mode
   iv. Measures of variability: interquartile range and/or mean absolute deviation
   v. Describe overall patterns or striking deviation

**For Accelerated Program Students (8th Grade 8.SP.1, 8.SP, 2, 8.SP.3)

d. Investigate patterns of association in bivariate data
   i. Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association
   ii. Know that straight lines are widely used to model relationships
   iii. Use the equation of a linear model to solve problems in the context, interpreting the slope and intercept.

SCOPE AND SEQUENCE:

Quarter I – Project 1: EXPLORING THE MOON!

IV. GEOMETRY: AREA, SURFACE AREA, AND VOLUME (6.G.1, 6.G.2, 6.G.3, 6.G.4)

a. Model real world problems with 2-D and 3-D geometry
    i. Apollo Landing Sites
    ii. Lava Flows
    iii. Lava Layering
    iv. Biosphere constructions
b. Draw polygons in the coordinate plane
c. Find surface area of three dimensional figures

V. ARITHMETIC TO ALGEBRAIC EXPRESSIONS (6.EE.1, 6.EE.2)

a. Write and evaluate numerical expressions
b. Write, read, and evaluate expressions using letters for numbers
c. *Accelerated Program Students: analyze the relationship using graphs and tables (8.EE.1 , 8.EE.3, 8.EE.4, 8.EE.5)
    i. Know and apply the properties of integer exponents
    ii. Estimate very large or very small quantities with scientific notation
    iii. Perform operations with numbers expressed in scientific notation,
    iv. Graph proportional relationships, interpreting the unit rate as the slope of the graph.

SCOPE AND SEQUENCE:

Quarter II – Project 2: CHARITY EVENT!

Big Idea: Representation
Domains: The Number System, Statistics, and Probability

I. WHOLE NUMBER OPERATIONS (6.NS.2, 6.NS.4)
- a. Greatest Common Factor (GCF) & Least Common Multiple (LCM)

II. FRACTION OPERATIONS (6.NS.1) ***Pizza Problems***
- a. Multiply and Divide
  - i. Interpretation
  - ii. Computation
  - iii. Modeling
  - iv. Story Problems: Pizza Problem(s)

III. RATIONAL NUMBERS REPRESENTATIONS & COMPARISONS (6.NS5, 6.NS.6, 6.NS.7, 6.NS.8)

VI. RATIO CONCEPTS & REASONING (6.RP.1, 6.RP.2, 6.RP.3) - ***Event/Budget Planning Problems***
- a. Use ratio language to describe a relationship between two quantities; ratio a:b with b≠0
- b. Understand unit rate and use rate language to describe a ratio relationship
- c. Solve real world and mathematical problems
  - i. Make tables of equivalent ratios, find missing values, and plot pairs on a coordinate plane
  - ii. Solve unit rate problems
  - iv. Find percent of a quantity as a rate per hundred
  - v. Use ratio reasoning to convert measurements

V. PROBABILITY (7.SP.5-8) ***Carnival Games***
- a. Event chance between 0 and 1 (7.SP.5)
- b. Theoretical and Experimental probability (7.SP.6)
- c. Compound probability (7.SP.7, 7.SP.8)
- d. Develop probability model using frequencies (7.SP.7)
- e. Organize compound probability (7.SP.8): Area Models, Tables, Lists, Tree Diagrams, Simulations
- f. Design and apply a simulation to generate frequencies for compound events. (7.SP.7, 7.SP.8.c)

SCOPE AND SEQUENCE:

Essential Questions for Mathematics
❖ Does this make sense? ❖ Why is mathematics important?
Enduring Understandings for Mathematics
❖ A mathematician is someone who reasons, perseveres, argues, convinces, and collaborates. ❖ Mathematics is a specialized language that allows us to communicate our intentions clearly and efficiently.
Common Core Mathematical Practices
1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

BIG IDEA I:

PROJECT I: EXPLORING THE MOON!
Domain(s): Ratio and Proportional Relationships, Geometry, Statistics, Expressions & Equations
Curriculum Management System
COURSE NAME: Project-Based Learning (PBL)

ESSENTIAL QUESTIONS

- How do we "model" with mathematics?
- How do we use tools appropriately and with precision?
- What problems can moon exploration help us with now and in the future?

SUGGESTED DAYS FOR INSTRUCTION: 45 (1 QUARTER)

PROJECT CALENDAR (1 Quarter = 9 weeks = 45 days)

Introduction to PBL! Expectations & Procedures	Expectations & Procedures (continued) *Administer PBL Pre-Assess.	History of NASA and Lunar Science – pre-assessment	1. Distance to the Moon – scale model	2. Diameter of the Moon – scale model
Skills – Ratio and Proportion	3. Reaping Rocks – describe, classify, and predict	4. The Lunar Disk – describe, compare, and classify	5. Apollo Landing Sites – locate with coordinate system	6. Regolith Formation – model comparison
Skills –Coordinate Plane, Measures of Center	7. Lunar Surface – scale model	Lunar Surface (cont.) – compare models with class	8. Differentiation	9. Impact Craters – data collection
Impact Craters (cont.) – data analysis and sharing results	Skills – Geometry (Circumference & Area) & Algebra (linear model)	10. Lava Flows – data collection	Lava Flows – data analysis and sharing results	11. Lava Layering
Mid-Quarter Portfolio organization & check	12. Lunar Landing Site – team duties & background	Lunar Landing Site – spacecraft design and planning	Lunar Landing Site – spacecraft design and planning	Lunar Landing Site – class presentations
Skills – similarity and scale, geometric area formulas	13. Lunar Roving Vehicle	14. Moon Anomalies – team "dilemmas"	Moon Anomalies – team "dilemmas" (cont.)	Moon Anomalies – team "dilemmas" - presentations
15. Lunar Land Use – Socratic Seminar	Lunar Land use (cont.)	Lunar Land Use – (cont.)	Lunar Land Use – council presentations	Lunar Land Use – council presentations
Skills – 3-D geometry	16. Settlement choices (Air, Elect., Comm. Food, etc.)	Settlement Committee work	Settlement Committee Work	17. Lunar Biosphere Mobiles
Lunar Biosphere Mobiles	Lunar Biosphere Mobiles	Presentations	Portfolio Reflections and PBL Post-Assessment	Final Quarter Portfolio

BIG IDEA I:

KNOW	UNDERSTAND	DO
Students will know that:	***Students will understand that:***	***Students will be able to:***
VOCABULARY*: scale, diameter, ratio, proportion, geologist, mineral, rock, igneous, sedimentary, metamorphic, anorthosite, basalt, soil, breccia, latitude, longitude, coordinates, Descartes, regolith, weathering, erosion, crater, rille, mare, ray, terrain, differentiation, density, magma, impact, ejecta, angle, levee, pressure, stratigraphy, earthquake, moonquake, Richter Scale, magnitude, biosphere*	**Modeling** links classroom mathematics and statistics to everyday life, work, and decision-making. Modeling is the process of choosing and using appropriate mathematics and statistics to analyze empirical situations, to understand them better, and to improve decisions. Quantities and their relationships in physical, economic, public policy, social, and everyday situations can be modeled using mathematical and statistical methods. When making mathematical models, technology is valuable for varying assumptions, exploring consequences, and comparing predictions with data. **Sample Conceptual Understandings** Source: "Impact Craters" Exploring the Moon -- A Teacher's Guide with Activities, NASA, p. 70 The size of a crater made during an impact depends not only on the mass and velocity of the impactor, but also on the amount of kinetic energy possessed by the impacting object. Kinetic energy, energy in motion, is described as: $KE = 1/2(mv^2)$ where, m = mass and v = velocity. During impact, the kinetic energy of an asteroid is transferred to the target surface, breaking up rock and moving the particles around. How does the kinetic energy of an impacting object relate to crater diameter?	Calculate the distance between scale models of the Earth and moon Calculate the diameter of the Moon using proportions
		Make predictions about the origin of lunar rocks by first collecting, describing, and classifying neighborhood rocks
		Carefully look at, describe, and learn about the origins of the six lunar samples contained in the disk.
Scale models help us understand physical relationships and make predictions; scale factor is used to dilate figures		Learn about the locations and geology of the six Apollo landing sites
Ratio and proportional reasoning can be used to solve real world problems		Compare the process of regolith formation of Earth and on the Moon
A set of data has a distribution that can be described by its center, spread, and overall shape		Make a model of the Moon's surface and to consider the geologic processes and rocks of each area
Numerical data can be plotted in a variety of ways, including number line, dot plots, histograms, and box plots; *bivariate data can be plotted and analyzed using scatterplots *accelerated		See how minerals separate from each other in a magma ocean

BIG IDEA I:

KNOW		UNDERSTAND	DO
Students will know that:		***Students will understand that:***	***Students will be able to:***
	Area of triangles and polygons can be found by composing into rectangles or decomposing into triangles and other shapes; Areas of circles		Determine the factors affecting the appearance of impact craters and ejecta.
	The construction of a shape is dependent on the side and angle measurements.		Understand some of the geological processes and the structures that form as lava flows across planetary landscapes by using mud as an analog for lava
	Measurements require attendance to precision and use of appropriate tools		Learn about the stratigraphy of lava flows produced by multiple eruptions
	A variable can represent an unknown number or any number in a specified set; variables are used to represent numbers in expressions when solving a real-world or mathematical problem		Design a spacecraft for travel to and from the Moon and choose an interesting lunar landing site
	Real-world or mathematical problems can be solved by writing and solving equations		Investigate and try to explain various lunar anomalies using statistical analysis
	Properties of integer exponents. Scientific notation is an abbreviated form of expressing very large or very small numbers. *accelerated		Design a development on the Moon that is suitable, feasible, and beneficial
			Build a biosphere that is a balanced, self-enclosed living system able to run efficiently over a period of time

BIG IDEA I:

21st Century Skills		
Creativity and Innovation	***Critical Thinking and Problem Solving***	***Communication and Collaboration***
Information Literacy	***Media Literacy***	***ICT Literacy***
Life and Career Skills	***Technology Based Activities***	
http://www.p21.org/index.php?option=com_content&task=view&id=254&Itemid=119 http://www.iste.org/standards/nets-for-students.aspx		

Learning Activities	
Concept Activities: Please see resources in http://www.nasa.gov/pdf/58199main_Exploring.The.Moon.pdf	
Performance Assessment Task Sample	***Please see resources in http://www.nasa.gov/pdf/58199main_Exploring.The.Moon.pdf***

Assessment Models

- **NOTE: The assessment models provided in this document are suggestions for the teacher. If the teacher chooses to develop his/her own model, *it must be of equal or better quality and at the same or higher cognitive levels (as noted in parentheses*).**
- **Depending upon the needs of the class, the assessment questions may be answered in the form of essays, quizzes, mobiles, PowerPoint, oral reports, booklets, or other formats of measurement used by the teacher.**

Pre-Assessment/Diagnostic:

- Please distribute the "**PBL Pre- and Post-Affective Assessment**" both before and after each major project.
- Teachers can assign diagnostic measures (KWL, pre-test, do now) to assess student prior knowledge of lunar science, ratio and proportional reasoning, mathematical modeling, scale drawings, measures of central tendency and variability, graphing on the coordinate plane, 2-D area and perimeter calculations, and 3-D volume calculations

Open-Ended (Formative) Assessment:

- Group and individual work is assigned daily, from various sources *(Synthesis, Analysis, and Evaluation).*
- Introductory and Closing Activities will be done every day to pre-assess student knowledge and assess understanding of topics *(Synthesis, Analysis, and Evaluation).*

Summative Assessment:

- Assessment questions should be open-ended and should follow the general format illustrated in the Essential Questions/Sample Conceptual Understanding section. *(Synthesis, Analysis, Evaluation)*
- Students will be given quizzes that provide a brief review of the concepts and skills in the previous lessons.
- Students will be responsible for maintaining and providing evidence of understanding in their "project portfolios"

BIG IDEA I:

Additional Resources	**Teacher made Performance Assessment Tasks (PATs)** **Released PATs** **Online State resources** ***NASA "Exploring the Moon" Educator Resources*** **http://www.nasa.gov/audience/foreducators/topnav/materials/listbytype/Exploring.the.Moon.html**

PROJECT II: CHARITY EVENT!
Domain(s): The Number System, Probability, and Statistics
Curriculum Management System
COURSE NAME: Project-Based Learning (PBL)

ESSENTIAL QUESTIONS

- How do we "model" with mathematics?
- How do we use tools appropriately and with precision?
- How can mathematics be used to predict or draw conclusions within the real world?
- How do we judge if something is "fair"?

SUGGESTED DAYS FOR INSTRUCTION: 45 (1 QUARTER)

PROJECT CALENDAR (1 Quarter = 9 weeks = 45 days)

Introduction to PBL! Expectations & Procedures	Expectations & Procedures (continued) *Administer PBL Pre-Assessment*	Charity Event Project Overview and Pre-assessment	1. Event Proposal Requirements Project Roles	Skills – Prime Factorization, GCF,LCM
2. GCF Problem – Concession Problems http://www.ixl.com/math/grade-6/greatest-common-factor-word-problems	3. LCM –Concession Problems http://www.ixl.com/math/grade-6/greatest-common-factor-word-problems	4. Pizza Problem Fractions	Pizza Problem Quiz LCM, GCF, Prime Factorization	Skills- Converting between fractions decimal s and percents
5. Event Budget Worksheet Quiz – fraction, decimal, percent	Skills –ratio, rate, unit price, proportion http://www.ixl.com/math/grade-6/unit-rates-and-equivalent-rates	6. Concession Menu/Prices	Concession Menu/prices Quiz – Ratio , Proportion	7. Powerpoint
Skills –combination http://www.ixl.com/math/grade-6/combinations	Skill - permutation http://www.ixl.com/math/grade-6/permutations	8. Event Map	Update Powerpoint	9. Play Carnival Game – experimental and theoretical probability
Mid-Quarter Portfolio organization & check	Skill- simple probability, sample space, experimental, theoretical, line plot, fair, unfair, certain, impossible	10. Design Carnival game – Supplies, rules, theoretical probabilities, charge to play and expected pay out	Create and test carnival game – Experimental probability	Design Carnival game – Supplies, rules, theoretical probabilities, charge to play and expected pay out
Create and test carnival game – Experimental probability	Design Carnival game – Supplies, rules, theoretical probabilities, charge to play and expected pay out	Create and test carnival game – Experimental probability	Design Carnival game – Supplies, rules, theoretical probabilities, charge to play	Create and test carnival game – Experimental probability

			and expected pay out	
Design Carnival game – Supplies, rules, theoretical probabilities, charge to play and expected pay out	Create and test carnival game – Experimental probability	Quiz – Probability Powerpoint	11. Overall Event Profit Projections	Overall Event Profit Projections
Portfolio Reflections and Self-Assessment	Preparation for Panel Presentation	Preparation for Panel Presentation	Preparation for Panel Presentation	Preparation for Panel Presentation
Preparation for Panel Presentation	Presentations	Presentations	Final Group Evaluation *PBL Post Assessment	Final Quarter Portfolio

KNOW	UNDERSTAND	DO
Students will know that:	***Students will understand that:***	***Students will be able to:***
VOCABULARY: *LCM, GCF, prime factorization, ratio, rate, unit rate, proportion, unit price, combination, permutation, experimental probability, theoretical probability, sample space, certain event, possible event, expected value, line plot*	**Modeling** links classroom mathematics and probability to everyday life, work, and decision-making. Modeling is the process of choosing and using appropriate mathematics to analyze empirical situations, to understand them better, and to improve decisions. Mathematics is a specialized language that we can use to communicate our ideas clearly and efficiently Numbers can be expressed in a variety of ways with equal values. Probability of a chance event is between 0 and 1 that expresses the likelihood of the event occurring. There are a variety of ways to calculate probability, both theoretical and experimental.	Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor. *For example, express 36 + 8 as 4 (9 + 2).* • The student will use greatest common factor to solve real world-world problems • The student will use least common multiple to solve real world-world problems. • Apply prime factorization to solve real world problems.
- The student will define greatest common factor.		The student will convert an improper fraction to a mixed number.

KNOW	UNDERSTAND	DO
Students will know that:	***Students will understand that:***	***Students will be able to:***
- The student will define least common multiple. - The student will define prime factorization. - The student will know that a number can be expressed in different forms.	A ratio is a multiplicative comparison of two quantities, or it is a joining of two quantities in a composed unit. In a proportion, the ratio of two quantities remains constant as the corresponding values of the quantities change.	The student will convert between fractions, decimals, and percents.
The student will understand the concept of ratio and be able to use ratio language to describe a quantitative relationship. The student will be able to understand, interpret, and apply the concept of unit rate. Ratio and proportional reasoning can help solve real-world and mathematical problems. A ratio is a comparison of two amounts and that a proportion expresses equivalent ratios	**SAMPLE CONCEPTUAL UNDERSTANDING** • Within their carnival game, there will be many opportunities for students to determine experimental probability. They will use the results to set the price to play and determine the long-term payout for their game! • See *What Do You Expect?* Investigations 3 & 4 Suppose Nishi has a 60% free-throw percentage and is in a one-and-one free-throw situation 100 times during the season. a. How many times can she expect to score 0 points? 1 point? 2 points? b. What total number of points do you expect Nishi to score in 100 situations at the free-throw line? c. What would Nishi's average number of points (expected value) per situation be?	• Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. *For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."* • Understand the concept of a unit rate a/b associated with a ratio $a:b$ with $b \neq 0$, and use rate language in the context of a ratio relationship. *For example, "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is 3/4 cup of flour for each cup of sugar." "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger."* • Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape

KNOW		UNDERSTAND	DO
Students will know that:		***Students will understand that:***	***Students will be able to:***
			diagrams, double number line diagrams, or equations.
	Probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Probability allows us to make predictions. Methods of counting (like combination and permutation) help determine sample space.		• 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. • 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.* • 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.

KNOW	UNDERSTAND	DO
Students will know that:	***Students will understand that:***	***Students will be able to:***
		Use methods of counting to determine sample space (*use combination and permutations)
Using thoughts, ideas, and conceptual understanding efficiently, accurately and in a compelling manner will enhance the oral or written presentation through the use of technology		Present a proposal for the charity event including technology and answer panel questions.

21st Century Skills

Creativity and Innovation	***Critical Thinking and Problem Solving***	***Communication and Collaboration***
Information Literacy	***Media Literacy***	***ICT Literacy***
Life and Career Skills	***Technology Based Activities***	

http://www.p21.org/index.php?option=com_content&task=view&id=254&Itemid=119
http://www.iste.org/standards/nets-for-students.aspx

Learning Activities

Technology: see below for use of presentation software

Performance Assessment Task Sample	Throughout the project, students will use advanced features and utilities of presentation software (e.g., design templates, design layouts (fonts/ colors/ backgrounds) animation and graphics, inserting pictures, objects, movies, sound, charts, hyperlinks, and graphs) to create an original product with their carnival game.

Assessment Models

- **NOTE: The assessment models provided in this document are suggestions for the teacher. If the teacher chooses to develop his/her own model, *it must be of equal or better quality and at the same or higher cognitive levels (as noted in parentheses*).**
- **Depending upon the needs of the class, the assessment questions may be answered in the form of essays, quizzes, mobiles, PowerPoint, oral reports, booklets, or other formats of measurement used by the teacher.**

Pre-Assessment/Diagnostic:

- Please distribute the "**PBL Pre- and Post-Affective Assessment**" both before and after each major project.
- Teachers can assign diagnostic measures (KWL, pre-test, do now) to assess student prior knowledge of GCF, LCM, fractions, decimals, percents, and probability.

Open-Ended (Formative) Assessment:

- Group and individual work is assigned daily, from various sources *(Synthesis, Analysis, and Evaluation).*
- Introductory and Closing Activities will be done every day to pre-assess student knowledge and assess understanding of topics *(Synthesis, Analysis, and Evaluation).*

Summative Assessment:

- Assessment questions should be open-ended and should follow the general format illustrated in the Essential Questions/Sample Conceptual Understanding section. *(Synthesis, Analysis, Evaluation)*
- Students will be given quizzes that provide a brief review of the concepts and skills in the previous lessons.
- Students will be responsible for maintaining and providing evidence of understanding in their "project portfolios"

Additional Resources

Teacher made Performance Assessment Tasks (PATs)
Released PATs

- ***How Likely Is It?***
- ***What Do You Expect?*** **(Particularly Investigations 3 & 4)**

Online Resource; See the Buck Institute for Education http://www.bie.org/
"**Step Right Up for a Good Cause**" http://wveis.k12.wv.us/teach21/public/project/Guide.cfm?upid=3314&tsele1=2&tsele2=106

COURSE NAME: PROJECT-BASED LEARNING (PBL) MATHEMATICS

1. **Modeling** links classroom mathematics and statistics to everyday life, work, and decision-making.

2. Modeling is the process of choosing and using appropriate mathematics and statistics to analyze empirical situations, to understand them better, and to improve decisions.

3. Quantities and their relationships in physical, economic, public policy, social, and everyday situations can be modeled using mathematical and statistical methods.

4. When making mathematical models, technology is valuable for varying assumptions, exploring consequences, and comparing predictions with data.

5. Mathematics is a specialized language that we can use to communicate our ideas clearly and efficiently

6. Numbers can be expressed in a variety of ways with equal values.

7. Probability of a chance event is between 0 and 1 that expresses the likelihood of the event occurring.

8. There are a variety of ways to calculate probability, both theoretical and experimental.

9. A ratio is a multiplicative comparison of two quantities, or it is a joining of two quantities in a composed unit.

10. In a proportion, the ratio of two quantities remains constant as the corresponding values of the quantities change.