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Belleville Public Schools

Curriculum Guide

MATH ESSENTIALS GRADES 11-12

UNIT 2 RATIO, PROPORTION AND PERCENT

Belleville Board of Education

102 Passaic Avenue

Belleville, NJ 07109

Prepared by: CHRISTINE D. PUCCIO

Dr. Richard Tomko, Ph.D., M.J., Superintendent of Schools

Ms. LucyAnn Demikoff, Director of Curriculum and Instruction K-12

Ms. Nicole Shanklin, Director of Elementary Education K-8, ESL Coordinator K-12

Mr. George Droste, Director of Secondary Education

Board Approved:September 23, 2019

Unit Overview

Unit 2: Ratio, Proportion and Percent

In this unit, students should learn to write and simplify ratios, convert a decimal to a percent and vice versa, solve word problems involving percent, and solve word problems involving proportions.

Enduring Understanding

Unit Enduring Understandings: Students will understand that..

- A ratio is a comparison of two numbers that is written as a fraction.
- Simple probabilities can be written as ratios and are simplified the same way as fractions.
- To convert from decimals to percents, the decimal point is moved two places to the right.
- To convert from percents to decimals, the decimal point is moved two places to the left.
- Percent means “for every 100”, or to divide by 100.
- To find commission, interest, tax, and discount, it is necessary to take a percent of a number.
- Tax gets added to the original price, and discount gets subtracted from the original price.
- A proportion is an equation involving two equivalent ratios.
- Word problems that involve a pair of values having the same ratio as two other values can be solved with a proportion.

- To solve a proportion, cross products can be set equal to each other
- Proportions can also be solved with either cross multiplication and division or by a conversion to an equivalent fraction.

Essential Questions

Unit Essential Questions: Students will keep considering..

- How can you represent write a ratio to represent a situation, and what does it mean?
- Can more than one ratio describe a situation?
- How are fractions, decimals and percents related?
- How do you convert between fractions, decimals and percents?
- What strategies can you use to solve problems using fractions, decimals and percents?
- How can proportional relationships be used to solve percent problems?
- What situations indicate a markup, a markdown, or just taking percent of a quantity?

Exit Skills

By the end of Unit 2 Students will be able to:

- Write ratios and proportions and use them to represent simple situations.
- Convert between fractions, decimals and percents.
- Distinguish between the wholes and parts in a given percent/proportion word problem.
- Determine which values are proportional in a percent/proportion word problem.
- Determine which operations are necessary in solving simple percent/proportion word problems.
- Solve word problems involving interest, tax, tip, discount and commission.

New Jersey Student Learning Standards (NJSLS-S)

MA.6.RP.A.1	Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.7.RP.A.2	Recognize and represent proportional relationships between quantities.
MA.K-12.4	Model with mathematics.
MA.7.RP.A.2c	Represent proportional relationships by equations.
MA.6.RP.A.3	Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.
MA.N-Q.A.1	Use units as a way to understand problems and to guide the solution of multi-step

	problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
MA.7.RP.A.3	Use proportional relationships to solve multistep ratio and percent problems.
MA.K-12.6	Attend to precision.
MA.6.RP.A.3c	Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.

Interdisciplinary Connections

LA.RL.11-12.4	Determine the meaning of words and phrases as they are used in the text, including figurative and connotative meanings; analyze the impact of specific word choices on meaning and tone, including words with multiple meanings or language that is particularly fresh, engaging, or beautiful. (e.g., Shakespeare as well as other authors.)
LA.W.11-12.2.D	Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.
LA.SL.11-12.4	Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience.
LA.L.11-12.6	Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.

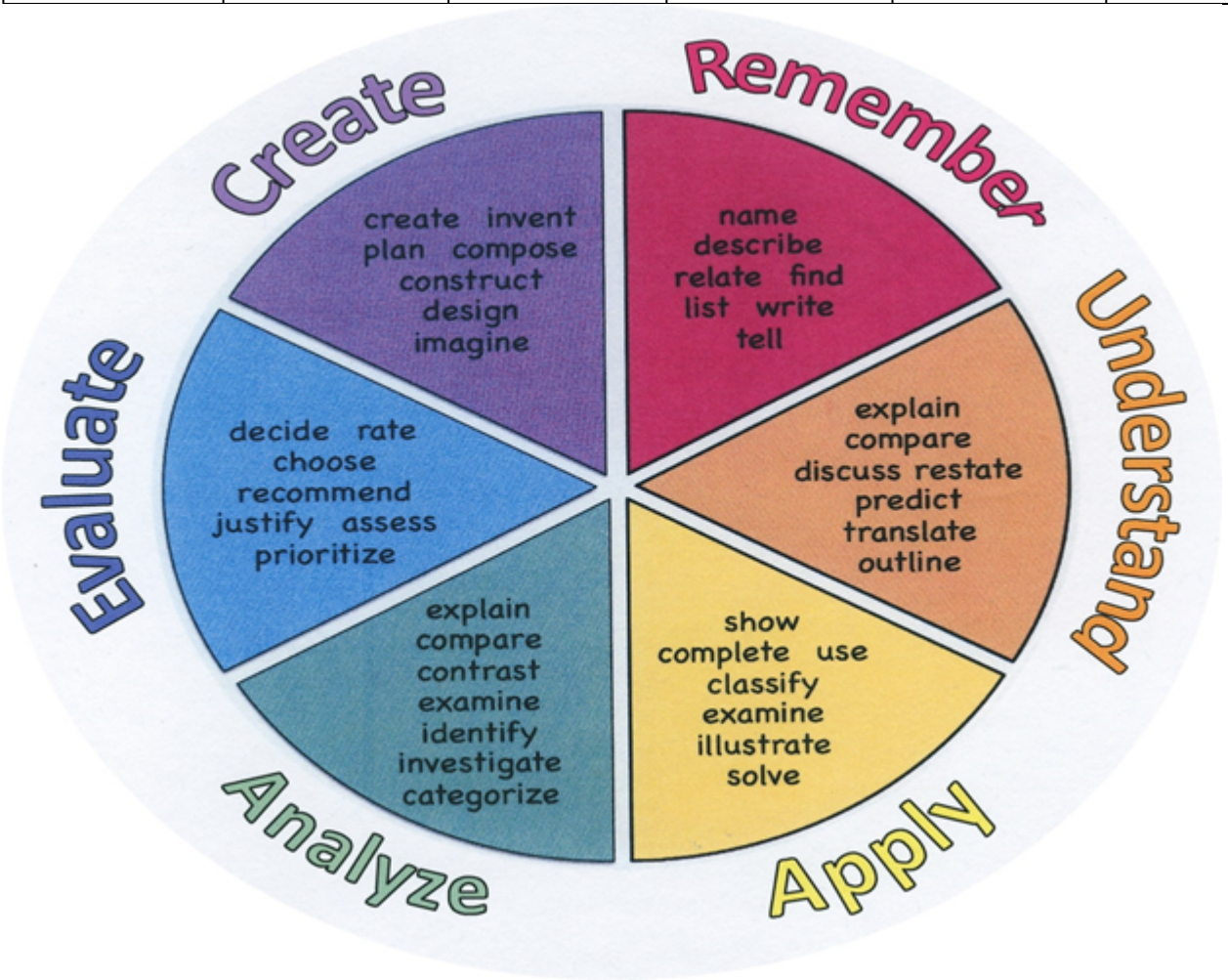
Learning Objectives

Students will be able to...

- Use ratios to compare two quantities and rewrite them in simplified form.
- Explain how to convert a percent to a decimal and vice versa.
- Explain how to convert a fraction to a percent and vice versa.
- Distinguish between the whole and a part in a given percent/proportion word problem.
- Determine which of the four operations are necessary to solve a given percent/proportion word problem.
- Compare and contrast the process of solving the different types of percent word problems.

Remember	Understand	Apply	Analyze	Evaluate	Create
Choose	Classify	Choose	Categorize	Appraise	Combine
Describe	Defend	Dramatize	Classify	Judge	Compose
Define	Demonstrate	Explain	Compare	Criticize	Construct
Label	Distinguish	Generalize	Differentiate	Defend	Design
List	Explain	Judge	Distinguish	Compare	Develop
Locate	Express	Organize	Identify	Assess	Formulate
Match	Extend	Paint	Infer	Conclude	Hypothesize
Memorize	Give Examples	Prepare	Point out	Contrast	Invent
Name	Illustrate	Produce	Select	Critique	Make
Omit	Indicate	Select	Subdivide	Determine	Originate

Recite Select State Count Draw Outline Point Quote Recall Recognize Repeat Reproduce	Interrelate Interpret Infer Match Paraphrase Represent Restate Rewrite Select Show Summarize Tell Translate Associate Compute Convert Discuss Estimate Extrapolate Generalize Predict	Show Sketch Solve Use Add Calculate Change Classify Complete Compute Discover Divide Examine Graph Interpolate Manipulate Modify Operate Subtract	Survey Arrange Breakdown Combine Detect Diagram Discriminate Illustrate Outline Point out Separate	Grade Justify Measure Rank Rate Support Test	Organize Plan Produce Role Play Drive Devise Generate Integrate Prescribe Propose Reconstruct Revise Rewrite Transform



Suggested Activities & Best Practices

Supplemental Materials:

- khanacademy.com
- njctl.org
- coolmath.com
- mathbitsnotebook.com/
- https://parcc-assessment.org/released-items/
- https://accuplacer.collegeboard.org/student/practice

Assessment and Learning:

- aleks.com
- Google Forms
- edulastic.com
- Google Classroom
- https://kahoot.com/explore/collections/math-kahoot-algebra/ (has all levels of math in the collections)

Motivation & Mindset:

- https://www.youtube.com/watch?v=3icoSeGqQtY
- http://www.youcubed.org/wp-content/uploads/Positive-Classroom-Norms2.pdf

Strategies:

- https://www.teachervision.com/problem-solving/problem-solving
- https://ies.ed.gov/ncee/wwc/Docs/PracticeGuide/wwc_mps_tips_072517.pdf

Assessment Evidence - Checking for Understanding (CFU)

Edulastic Formative Assessment (Formative)

Kahoots - Various Topics (Formative)

Glencoe McGraw-Hill EAssessment Test Generator (Summative)

Common benchmarks on OnCourse (Benchmark)

"Do Now/Exit Ticket" Activity (Formative)

- Admit Tickets
- Anticipation Guide
- Common Benchmarks
- Compare & Contrast
- Create a Multimedia Poster

- Define
- Describe
- Evaluate
- Evaluation rubrics
- Exit Tickets
- Explaining
- Illustration
- Journals
- KWL Chart
- Learning Center Activities
- Multimedia Reports
- Outline
- Question Stems
- Quickwrite
- Quizzes
- Red Light, Green Light
- Self- assessments
- Socratic Seminar
- Study Guide
- Teacher Observation Checklist
- Think, Pair, Share
- Think, Write, Pair, Share
- Top 10 List
- Unit review/Test prep
- Unit tests
- Web-Based Assessments

Primary Resources & Materials

- https://www.nj.gov/education/cccs/2016/math/standards.pdf
- aleks.com
- edulastic.com
- njctl.org
- Glencoe McGraw-Hill Algebra 1 2014
- https://accuplacer.collegeboard.org/student/practice

Ancillary Resources

- teacher-prepared worksheets, notes and slides
- ASVAB for Dummies
- CliffsTestPrep ASVAB
- collegeboard.org
- homeschoolmath.net
- Glencoe Math Accelerated 2017

Technology Infusion

Create and assign exit tickets using Google Forms

Create and display slide presentations using Google Slides

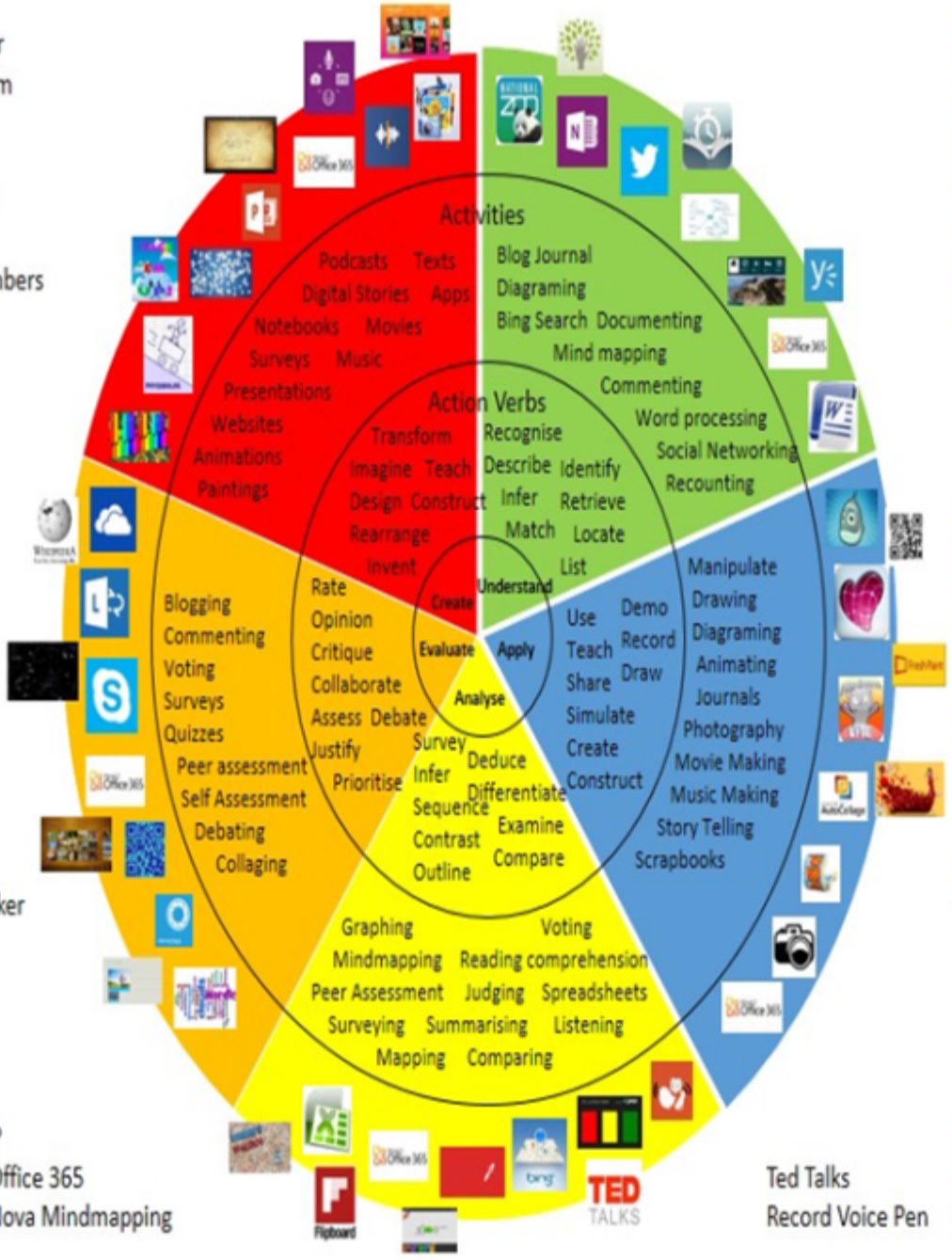
Explore area of figures using Geogebra

- Youtube
- Khan academy
- MS Word
- Google Slides
- Google Classroom
- Edulastic
- ALEKS
- Desmos.com
- Geogebra.org
- Smart Exchange
- McGraw-Hill Education

Win 8.1 Apps/Tools Pedagogy Wheel

Podcasts
Photostory 3
Kid Story Builder
Music Maker Jam
Paint A Story
Office 365
MS PowerPoint
Stack 'Em Up
NqSquared Numbers
Physamajig
Xylophone 8

Wikipedia
Skydrive
Lync
SkyMap
Skype
Office 365
Puzzle Touch
Easy QR
Memorylage
Life Moments
Word Cloud Maker



Where's Waldo?
MS Excel Office 365
Flipboard Nova Mindmapping

Ted Talks
Record Voice Pen

Originally taken from http://www.coetail.com/vzimmer/files/2013/02/iPadagogy-Wheel.001.jpg
And adapted for Windows 8.1 devices by Charlotte Beckhurst @CharBeckhurst

Alignment to 21st Century Skills & Technology

Mastery and infusion of **21st Century Skills & Technology** and their Alignment to the core content areas is essential to student learning. The core content areas include:

- English Language Arts;
- Mathematics;
- Science and Scientific Inquiry (Next Generation);
- Social Studies, including American History, World History, Geography, Government and Civics, and Economics;
- World languages;
- Technology;
- Visual and Performing Arts.

CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP11	Use technology to enhance productivity.
CAEP.9.2.12.C.2	Modify Personalized Student Learning Plans to support declared career goals.
TECH.8.1.12.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.12.A.3	Collaborate in online courses, learning communities, social networks or virtual worlds to discuss a resolution to a problem or issue.
TECH.8.1.12.A.CS1	Understand and use technology systems.
TECH.8.1.12.A.CS2	Select and use applications effectively and productively.
TECH.8.1.12.B	Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.

21st Century Skills/Interdisciplinary Themes

- Communication and Collaboration
- Creativity and Innovation
- Critical thinking and Problem Solving
- ICT (Information, Communications and Technology) Literacy
- Information Literacy

- Life and Career Skills
- Media Literacy

21st Century Skills

- Financial, Economic, Business and Entrepreneurial Literacy
- Global Awareness

Differentiation

Use of Glencoe virtual manipulatives: http://www.glencoe.com/sites/common_assets/mathematics/ebook_assets/vmf/VMF-Interface.html

Study Guides provided prior to tests and quizzes

Use of ALEKS for differentiated practice or extension of skills

Differentiations:

- Small group instruction
- Small group assignments
- Extra time to complete assignments
- Pairing oral instruction with visuals
- Repeat directions
- Use manipulatives
- Center-based instruction
- Study guides
- Teacher reads assessments allowed
- Scheduled breaks
- Rephrase written directions
- Multisensory approaches
- Additional time
- Preview vocabulary
- Preview content & concepts
- Behavior management plan
- Highlight text
- Student(s) work with assigned partner
- Visual presentation
- Assistive technology
- Auditory presentations
- Large print edition
- Dictation to scribe
- Small group setting

Hi-Prep Differentiations:

- Alternative formative and summative assessments
- Choice boards
- Group investigations
- Guided Reading
- Independent research and projects

- Interest groups
- Learning contracts
- Leveled rubrics
- Multiple intelligence options
- Multiple texts
- Personal agendas
- Project-based learning
- Problem-based learning
- Stations/centers
- Think-Tac-Toes
- Tiered activities/assignments
- Tiered products
- Varying organizers for instructions

Lo-Prep Differentiations

- Choice of books or activities
- Cubing activities
- Exploration by interest
- Flexible grouping
- Goal setting with students
- Jigsaw
- Mini workshops to re-teach or extend skills
- Open-ended activities
- Think-Pair-Share
- Reading buddies
- Varied supplemental materials

Special Education Learning (IEP's & 504's)

Flash cards for vocabulary and new concepts
One-on-one questioning during testing to elicit responses
Use of Glencoe personal tutor or The Video Math Tutor for additional instruction

- printed copy of board work/notes provided
- additional time for skill mastery
- assistive technology
- behavior management plan
- Center-Based Instruction
- check work frequently for understanding
- computer or electronic device utilizes
- extended time on tests/ quizzes
- have student repeat directions to check for understanding

- highlighted text visual presentation
- modified assignment format
- modified test content
- modified test format
- modified test length
- multi-sensory presentation
- multiple test sessions
- preferential seating
- preview of content, concepts, and vocabulary
- Provide modifications as dictated in the student's IEP/504 plan
- reduced/shortened reading assignments
- Reduced/shortened written assignments
- secure attention before giving instruction/directions
- shortened assignments
- student working with an assigned partner
- teacher initiated weekly assignment sheet
- Use open book, study guides, test prototypes

English Language Learning (ELL)

Use of multilingual mathematics glossary including definitions in English and its translations to other languages:

https://my.hrw.com/math06_07/nsmedia/tools/glossary/msm/glossary.html

Use of Spanish instructional videos of concepts:

https://www.youtube.com/user/KhanAcademyEspanol/videos

https://www.mathtv.com/

Peer partners for assignments with students that can verbally translate material and meanings of concepts

- teaching key aspects of a topic. Eliminate nonessential information
- using videos, illustrations, pictures, and drawings to explain or clarify
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student’s learning;
- allowing students to correct errors (looking for understanding)
- allowing the use of note cards or open-book during testing
- decreasing the amount of work presented or required
- having peers take notes or providing a copy of the teacher’s notes

- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using computer word processing spell check and grammar check features
- using true/false, matching, or fill in the blank tests in lieu of essay tests

At Risk

Printed or video copy of material missed during excessive absences
Retests or test corrections of incorrect work on tests
Working contract to ensure completion of prioritized tasks

- allowing students to correct errors (looking for understanding)
- teaching key aspects of a topic. Eliminate nonessential information
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student's learning
- allowing students to select from given choices
- allowing the use of note cards or open-book during testing
- collaborating (general education teacher and specialist) to modify vocabulary, omit or modify items to reflect objectives for the student, eliminate sections of the test, and determine how the grade will be determined prior to giving the test.
- decreasing the amount of work presented or required
- having peers take notes or providing a copy of the teacher's notes
- marking students' correct and acceptable work, not the mistakes
- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using authentic assessments with real-life problem-solving
- using true/false, matching, or fill in the blank tests in lieu of essay tests
- using videos, illustrations, pictures, and drawings to explain or clarify

Talented and Gifted Learning (T&G)

Glencoe Enrichment Activities and Chapter Projects

Complete higher level learning problems in textbook

Complete math league sample contest problems:

- Above grade level placement option for qualified students
- Advanced problem-solving
- Allow students to work at a faster pace
- Cluster grouping
- Complete activities aligned with above grade level text using Benchmark results
- Create a plan to solve an issue presented in the class or in a text
- Flexible skill grouping within a class or across grade level for rigor
- Higher order, critical & creative thinking skills, and discovery
- Multi-disciplinary unit and/or project
- Teacher-selected instructional strategies that are focused to provide challenge, engagement, and growth opportunities
- Utilize exploratory connections to higher-grade concepts
- Utilize project-based learning for greater depth of knowledge

Sample Lesson

Unit Name: Ratio and Proportion Problems

NJSLS: MA.7.7.RP.A.2c Represent proportional relationships by equations.

Interdisciplinary Connection: Home Economics connection - How much flour is needed to make a different quantity of muffins from what is given in the recipe?

Statement of Objective: SWAT Solve mathematics and real-life problems by using proportions and ratios.

Anticipatory Set/Do Now: Use equivalent fractions to find the solution to a proportion.

Learning Activity: Review Do Now, Notes: Ratio and Proportion Problems, some comparing a sample to a whole and others to find a missing quantity, Practice Exercises: Students complete individually or in pairs, Class Discussion to Summarize.

Student Assessment/CFU's: questioning, observation, compare & contrast

Materials: calculators, WS: Notes & Practice: Ratio & Proportion, use of Smart TV, use of whiteboard

21st Century Themes and Skills: communication, critical thinking, global awareness, financial literacy

Differentiation/Modifications: cooperative groups, teacher's notes, calculator, highlighting and labeling

Integration of Technology: use of SMART TV, Google Slides, calculator