Unit 2 - Ratios and Proportional Relationships

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Title Section

Department of Curriculum and Instruction

Belleville Public Schools

Curriculum Guide

MATHEMATICS

GRADE 6 - UNIT 2

Belleville Board of Education

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Unit Overview

Students should expect to learn from this unit:

- How to express ratios in different mathematical notations
- Understand ratios and ratio relationships between two quantities
- Reason about ratios through the use of tables, double number lines and graphs
- Create equivalent ratios
- Create and use unit rates to compare and solve real world applications
- Extend ratios to include percents
- Estimate and use benchmark percents
- Create and evaluate equivalent fractions, decimals and percents using hundredths grids
- Determine the unknown part given the percent and the whole
- Order fractions, decimals and percents
- How to use ratios and proportions to convert between different units of measure

NJSLS

Please link all standards that apply in this section within the curriculum of the unit being written. Please include all New Jersey Student Learning Standards.

MA.6.RP	Ratios and Proportional Relationships
MA.6.RP.A	Understand ratio concepts and use ratio reasoning to solve problems.
MA.6.RP.A.1	Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.
MA.6.RP.A.2	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.
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.6.RP.A.3a	Make tables of equivalent ratios relating quantities with whole number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.
MA.6.RP.A.3b	Solve unit rate problems including those involving unit pricing and constant speed.
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.
MA.6.RP.A.3d	Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.

Exit Skills

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

Connect ratio and rate to whole number multiplication and division and use concepts of ratio and rate to solve problems.

Students use reasoning about multiplication and division to solve ratio and rate problems about quatities. By viewing equivalent ratios and rates as deriving from, and extending, pairs of rows (or colums) in the multiplication table and by analyzing simple drawings that indicate the relative size of quatities, students connect their understanding of multiplication and division with ratios and rates. Thus students expand the scope of problems for which they can use multiplication and division to solve problems, and they connect ratios and fractions. Students solve a wide variety of problems involving rations and rates.

Enduring Understanding

Students will be able to understand that:

- Proportional relationships express how quantities change in relationship to each other
- Rates compare two values
- Rates can be part-to-part or part-to-whole
- Ratios can be expressed in colon notation, written notation or fractional notation
- A proportion is a relationship between two ratios
- An equivalent ratio is also an equivalent fraction
- Define rate, ratio and percent
- Fractions may represent a ratio

- A unit rate is a ratio relationship
- A percent is always a fraction based on 100
- Percents always have a denominator of 100
- Proportions can be used to convert between different units of measure

Essential Questions

- **Why does one need to compare numbers?**
- **When does one need ratios to compare quantities?**
- **How can one compare and contrast quantities?**
- **How can one use ratios to compare two values in everyday life?**
- **What is a rate and how is it related to proportional reasoning?**
- **How are ratios related to fractions and division?**
- **Why is it important to know how to solve for unit rates?**
- **How can one model and represent rates and ratios?**
- **What are similarities and differences between fractions and ratios?**
- **How can one compare unit rates to determine cost, unit pricing and constant rate?**
- **How can one use rates, ratios and percents to solve real world situations?**
- **What type(s) of problems can be solves using rates, ratios and percents?**
- **How are ratios and proportions used to convert between different units of measure?**

Learning Objectives

- **Distinguish between rates and ratios**
- **Define percent, ratio proportion, rates, and ratios**
- **Express and recognise ratios written in different forms**
- **Use ratio reasoning to solve problems**
- **Identify and create equivalent decimals and percents using hundredth grids**
- **Create and analyze models of rates and ratios**
- **Compare and order percents**
- **Convert unit rates of measurement**
- **Represent ratios and proportions using models**
- **Relate percents to fractions and decimals**
- **Analyze and solve percent problems**
- **Translate real world problems into ratios and percents**

Action Verbs

Below are examples of action verbs associated with each level of the Revised Bloom's Taxonomy. These are useful in writing learning objectives, assignment objectives and exam questions.

If you are utilizing the objectives, but want to address rigor, use the chart below.

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

Interdisciplinary Connections

Please list all and any cross-curricular content standards that link to this Unit.

Science

Social Studies

Health & Nutrition

Music

Alignment to 21st Century Skills & Technology

Key SUBJECTS AND 21st CENTURY THEMES

Mastery of key subjects and 21st century themes is essential for all students in the 21stcentury.

Key subjects include:

- English, reading or language arts
- World languages
- Arts
- Mathematics
- Economics
- Science
- Geography
- History
- Government and Civics

21st Century/Interdisciplinary Themes

- Civic Literacy

- Environmental Literacy

- Financial, Economic, Business and Entrepreneurial Literacy

- Global Awareness

- Health Literacy

21st Century Skills

- Communication and Collaboration

- Creativity and Innovation

- Critical thinking and Problem Solving

- ICT (Information, Communications and Technology) Literacy

- Information Literacy

- Life and Career Skills

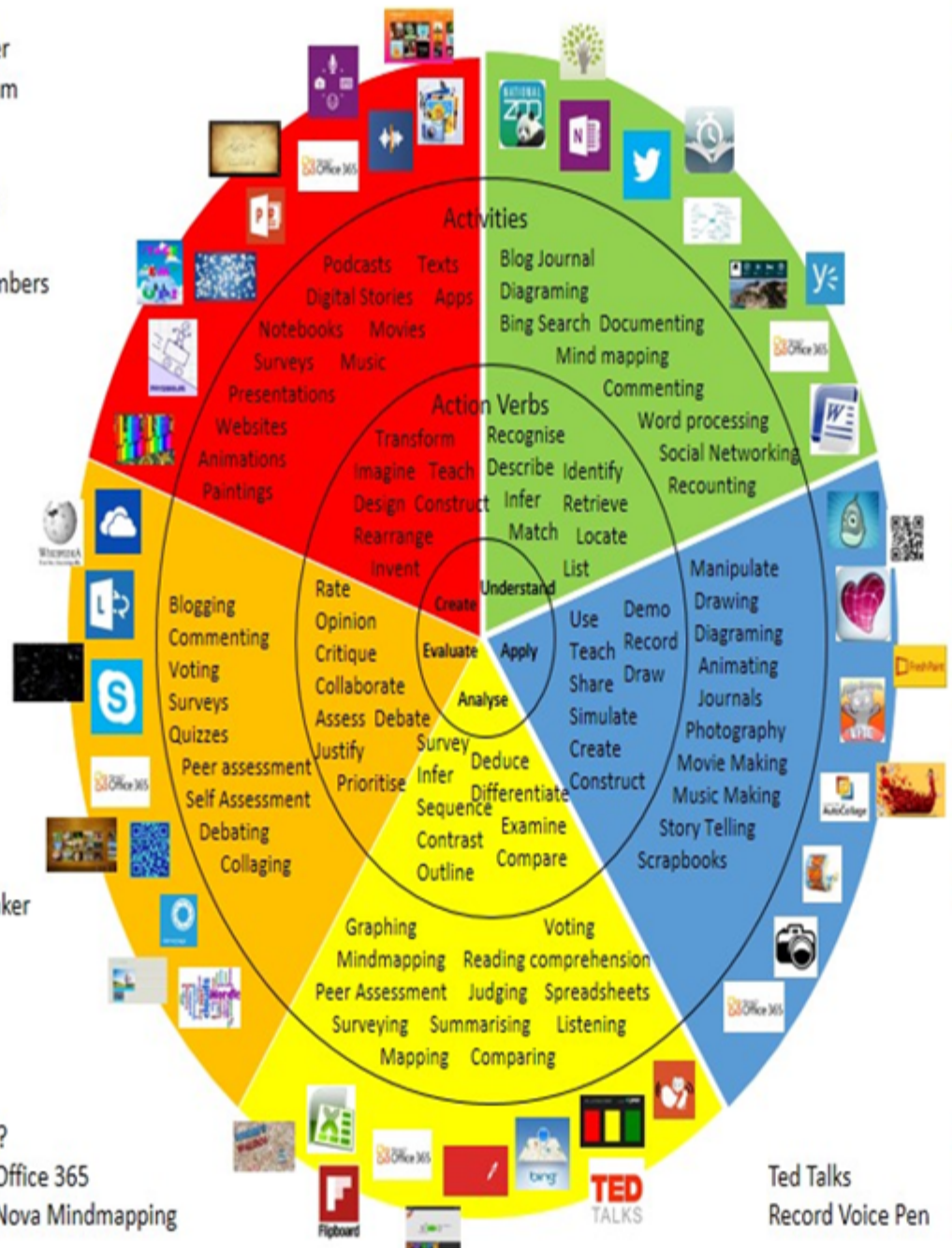- Media Literacy

Technology Infusion

What technology can be used in this unit to enhance learning?

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

The wheel contains the following labelled sections:

Activities: Podcasts, Texts, Digital Stories, Apps, Notebooks, Movies, Surveys, Music, Presentations, Websites, Animations, Paintings, Blog Journal, Diagraming, Bing Search, Documenting, Mind mapping, Commenting, Word processing, Social Networking, Recounting

Action Verbs: Transform, Recognise, Imagine, Teach, Describe, Identify, Design, Construct, Infer, Retrieve, Rearrange, Match, Locate, Invent, List, Rate, Opinion, Critique, Collaborate, Assess, Debate, Justify, Prioritise, Survey, Infer, Deduce, Sequence, Differentiate, Contrast, Examine, Outline, Compare, Manipulate, Drawing, Diagraming, Animating, Journals, Photography, Movie Making, Music Making, Story Telling, Scrapbooks, Use, Demo, Teach, Record, Share, Draw, Simulate, Create, Construct

Inner ring: Create, Understand, Evaluate, Apply, Analyse

Bottom activities: Graphing, Voting, Mindmapping, Reading comprehension, Peer Assessment, Judging, Spreadsheets, Surveying, Summarising, Listening, Mapping, Comparing

Left activities: Blogging, Commenting, Voting, Surveys, Quizzes, Peer assessment, Self Assessment, Debating, Collaging

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Differentiation

As a Reminder:

The basis of good differentiation in a lesson lies in differentiating by content, process, and/or product.

Resources:

- NJDOE: Instructional Supports and Scaffolds for Success in Implementing the Common Core State Standards http://www.state.nj.us/education/modelcurriculum/success/math/k2/

- Pre-teach vocabulary and meaning of symbols
- Connect new vocabulary and symbols to background knowledge
- Breal down nterms to familiar parts, suffixes and prefixes
- Make dictionaries available to learners
- Increase experience to academic vocabulary and language
- Provide flash cards
- Incorporate as many learners senses as possible to enhance the learning experience
- Brainstorm examples of new use of new terms or symbols making real world applications
- Engage student in relevant discussion about conceptual process
- Post and refer to math guides and anchor charts when applicable
- Clarify the relationship between operations
- Develop graphic representations of math procesess
- Make connections to formulas, concepts or structures previously learned
- Utiliza manipulatives to display structures
- Offer various ways to solve math problems
- Provide opportunites to integrate math, technology and art
- Provide graphic organizers and anchor charts for all symbols and formulas
- Create math journals for terms, formulas and symbols
- Develop interactive games and activities to promote retention
- Integrate videos
- Utilize grahics, diagrams, charts

Special Education

- 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
- multiple test sessions
- multi-sensory presentation
- preferential seating
- preview of content, concepts, and vocabulary
- reduced/shortened reading 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

ELL

- using videos, illustrations, pictures, and drawings to explain or clarif
- 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 workpresented or required
- having peers take notes or providing a copy of the teacher's notes
- providing study guides
- tutoring by peers
- using true/false, matching, or fill in the blank tests in lieu of essay tests

Intervention Strategies

- 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 workpresented or required
- having peers take notes or providing a copy of the teacher's notes
- marking students' correct and acceptable work, not the mistakes

- providing study guides

- 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

Evidence of Student Learning-CFU's

Please list ways educators may effectively check for understanding in this secion.

- Admit Tickets

- Anticipation Guide

- Compare & Contrast

- Create a Multimedia Poster

- Define

- Describe

- Evaluate

- Evaluation rubrics

- Exit Tickets

- Explaining

- Fist- to-Five or Thumb-Ometer

- Illustration

- Journals

- KWL Chart

- Outline

- Question Stems

- Quickwrite

- Quizzes

- Self- assessments

- Socratic Seminar

- Study Guide

- Teacher Observation Checklist

- Think, Pair, Share

- Unit tests

Primary Resources

Carnegie Learning Textbook Course 1

Standards Solution

NJ Model Curriculum

PARCC/Pearson

Ancillary Resources

Dinah Zike's Foldables-Interactive Study Guides, Macmillan/MacGraw Hill

Glencoe/MacGraw Hill Workbooks

http://www.khanacademy.org

http://mathgoodies.com

http://purplemath.com

http://buzzmath.com

http://IXL.com/math

http://www.ncpublicschools.org/acre/standards/common-core-tools/

http://www.uen.org/commoncore/

 http://www.parcconline.org/math-plds

http://www.parcconline.org/mcf/mathematics/parcc-model-content-frameworks-browser

http://ime.math.arizona.edu/progressions/

http://www.nciea.org/publications/Math_LPF_KH11.pdf

http://www.nciea.org/publications/Math%20Expanded%20LPF%205-8_KH11.pdf

http://www.corestandards.org/the-standards/mathematics

Dan Meyer's Three-Act Lessons
https://docs.google.com/spreadsheet/ccc?key=0AjIqyKM9d7ZYdEhtR3BJMmdBWnM2YWxWYVM1UWowTEE#gid=0

Sample Lesson

Unit Name:Ratios and Proportions

CCSS/NJCCCS:6RPA3c

Interdisciplinary Connection: Art

Statement of Objective:Students will be able to demonstrate their ability to determine, analyze and convert equivalent fractions, decimals, and percents using a 100's grid and student supplied data in a hands-on project.

Anticipatory Set/Do Now: Using 1 large 100's grid students create a design in three colors. Students determine the fraction out of 100 for each color and checking that their amount equals 1 whole, i.e; 100/100. Students convert these to decimals and percents.

Learning Activity: Students use one 100's grid for each letter of their name, a with minimum of 6 letters. Advanced or accellerated students may create more than 6. Students will create a block style letter using units of the 100's grid. Students then determine (for each letter) a portion out of 100, turn that fraction into an equivalent decimal and percent, also simplifying the original fraction. Fractions are randomly created by the students as they use the letters in their names to color the grids. Students will have previously learned how to convert fractions with denominators of 100 into decimals and percents.Letters are mounted to construction paper. This cal also be done on a computer in excel.

Student Assessment/CFU's: Thumb-o-meter/five finger, grading rubric

Materials:Copies of 10 x 10 grids, pencils, erasers, glue, scissors, construction paper, coloring materials, rulers, calculators

21st Century Themes and Skills: Computer (if that version is used.)

Differentiation/Modifications: Students may use larger grids, or do fewer letters. Students with motor skills challenges may try this on excel.

Integration of Technology: calculator and/or computer skills