Unit 1 Number and Number Sense

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Department of Curriculum and Instruction

Belleville Public Schools

Curriculum Guide

MATH ESSENTIALS GRADES 11-12

UNIT 1 NUMBER and NUMBER SENSE

Belleville Board of Education

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Unit Overview

Unit 1: Rational and Irrational Numbers, Rounding and Comparing Numbers, Operations with Rational Numbers

In this unit, students should learn to determine a number as rational or irrational, round numbers to a given decimal place, compare and order real numbers, perform operations with rational numbers, and solve word problems involving operations of rational numbers.

Enduring Understanding

Unit Enduring Understandings: Students will understand that..

- Rational and irrational numbers together make a set of real numbers.
- Real numbers can be compared by looking at them in decimal form.
- Real numbers can be approximated by rounding them to a given decimal place, making operations on them possible to do by hand.
- Addition and subtraction of decimals requires them to be aligned to the same decimal place, and when

necessary, zeros may be placed next to one of them.

- When multiplying decimals, the placement of the decimal point depends of the sum of their number of digits after the decimal point.
- Addition and subtraction of fractions can only be done once they have a common denominator.
- When multiplying and dividing fractions, it is not necessary for them to have a common denominator.
- When dividing one fraction by another, it is equivalent to inverting the divisor and finding the product of the two fractions.
- Many simple mathematical problems require one of the four basic operations of numbers: addition, subtraction, multiplication, division.

Essential Questions

Unit Essential Questions: Students will keep considering..

- How can we compare and contrast numbers?
- What is the advantage of rounding numbers?
- When is it necessary to place extra zeros after the digits in a decimal?
- Can fractions that appear to be different be equivalent?
- When is it necessary to perform one single mathematical operation in a given word problem?
- What key words and situations indicate each of the four basic mathematical operations?

Exit Skills

By the end of Unit 1 Students will be able to:

- Determine whether a number is rational or irrational and allocate it on a number line.
- Round decimals to a given decimal place.
- Compare and order rational and irrational numbers.
- Add, subtract, multiply and divide decimals.
- Add, subtract, multiply and divide fractions and mixed numbers.
- Determine which operation(s) are necessary to solve a real-world or mathematical problem.

New Jersey Student Learning Standards (NJSLS-S)

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.N-RN.B.3	Explain why the sum or product of two rational numbers is rational; that the sum of a

	rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.
MA.K-12.4	Model with mathematics.
MA.A-SSE.B	Write expressions in equivalent forms to solve problems
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.K-12.6	Attend to precision.
MA.N-Q.A.3	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
MA.K-12.7	Look for and make use of structure.

Interdisciplinary Connections

LA.RI.11-12.4	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines faction in Federalist No. 10).
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.

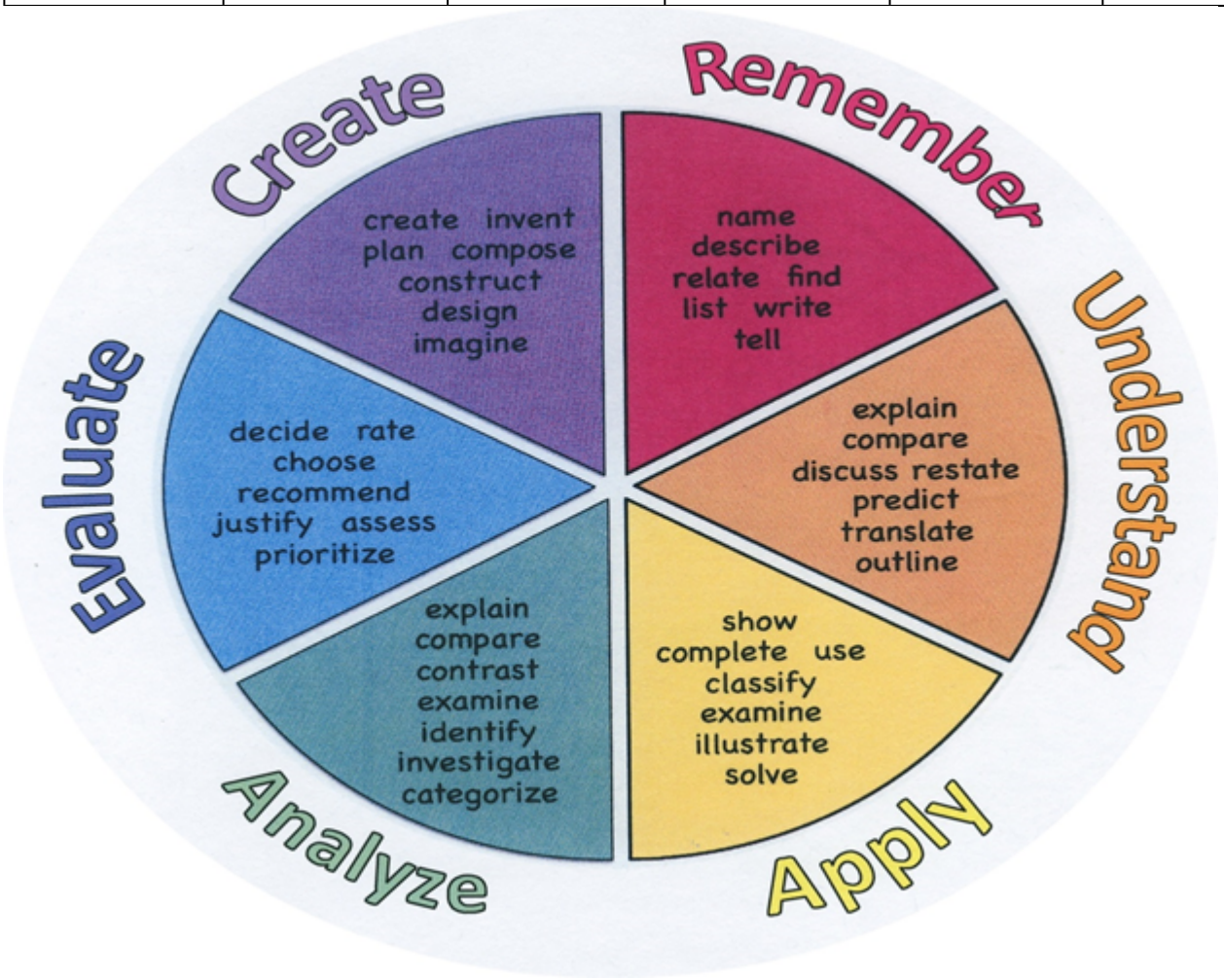
Learning Objectives

Students will be able to...

- Determine whether a numbers is rational or irrational and allocate it on a number line (Every rational number has a decimal expansion that terminates or eventually repeats).
- Explain how to round a real number to a given decimal place.
- Integrate the skill of rounding with solving word problems.
- Rewrite a fraction to its equivalent form with a different denominator.
- Integrate equivalent fractions with operations that require fractions that have the same denominator.
- Contrast the process of multiplying and dividing fractions with adding and subtracting them.
- Compare and contrast the multiplication of fractions with division of fractions.
- Determine which operation is necessary in solving a given real-world or mathematical problem.
- Calculate the correct answer after performing one of the four operations of rational numbers.

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				



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
- Newspaper Headline
- 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
- Written Reports

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

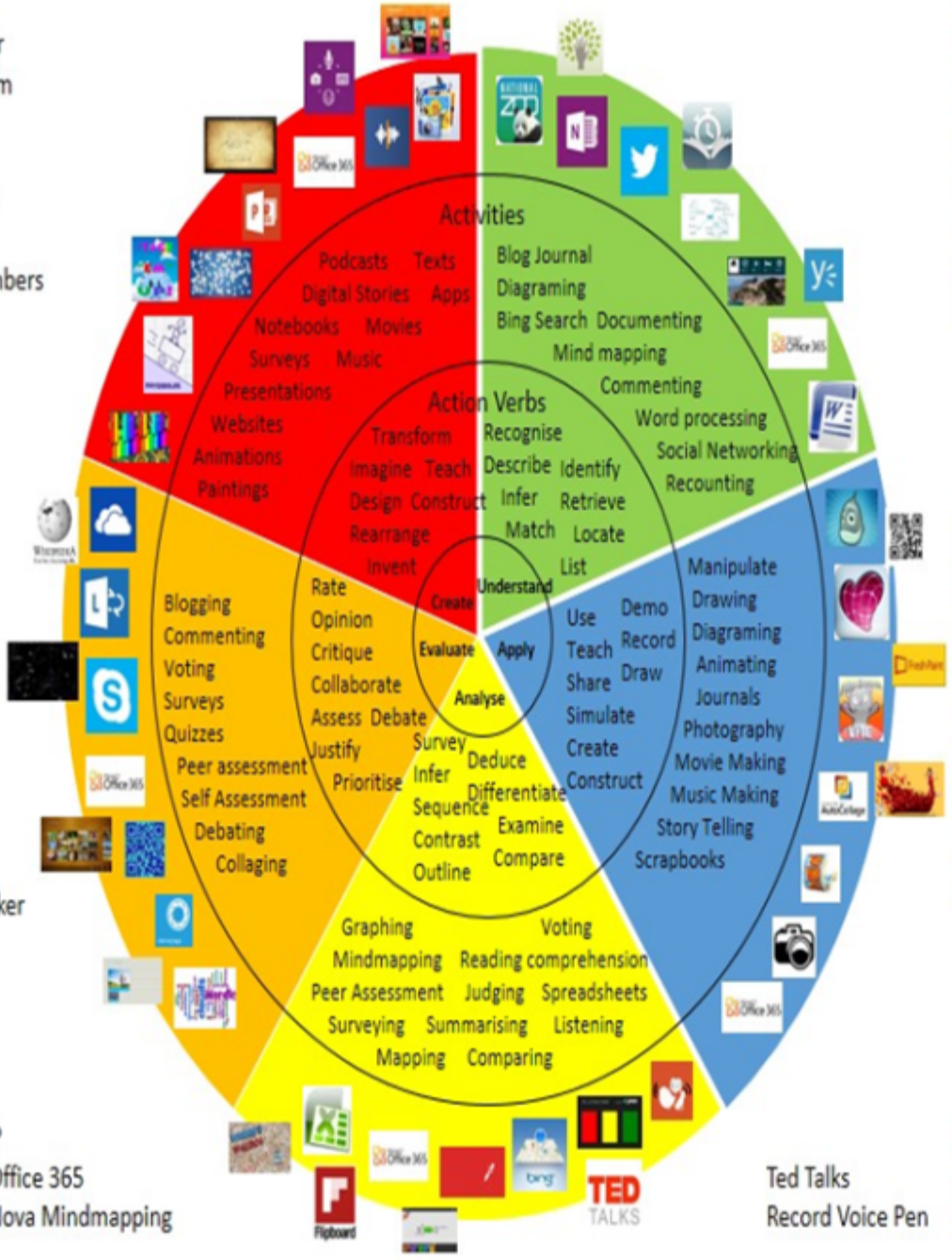
Practice operations on numbers using Geogebra

- Youtube
- Khan academy
- MS Word
- Google Slides
- Google Classroom
- Google Forms
- 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

CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
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.CS1	Understand and use technology systems.
TECH.8.1.12.A.CS2	Select and use applications effectively and productively.
TECH.8.1.12.F.1	Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.

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

GENERAL EXAMPLES INCLUDE:

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
- Story guides
- 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:

https://www.mathleague.com/index.php/annualcontestinformation/samplecontests

- 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: Basic Operation Word Problems with Fractions

NJSLS: *MA.7.7.NS.A.3 Solve real-world and mathematical problems involving the four operations with rational numbers.*

Interdisciplinary Connection: Business Connection: How many pairs of shorts can be made with 3 yards if it takes ½ yard of material to make each pair?

Statement of Objective: SWDT Calculate quotients/products and sums/differences of fractions to solve basic ASVAB word problems.

Anticipatory Set/Do Now: Add two fractions w/ unlike denominators.

Learning Activity: Notes: Basic Operation Word Problems with Fractions; Students practice examples; Selected students place examples on board; Other students justify work as Summary, Exit Cards.

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

Materials: use of whiteboard, Notes & Practice: Basic Operation Word Problems with Fractions, Google Forms, Google Slides

21st Century Themes and Skills: communication, critical thinking, problem solving

Differentiation: highlight text, team work with peer tutoring, have study guides with model problems Integration of Technology: use of Smart TV, Exit Cards on Google Forms, Google Slides