

College and Career Readiness Standards CCR

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



<http://lincs.ed.gov/publications/pdf/CCRStandardsAdultEd.pdf>, page 48

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College and Career Readiness Standards (CCR) X NRC Math Standards

CCR

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NRC Math Standards

- a. Adaptive reasoning
- b. Strategic competence
- c. Conceptual understanding
- d. Productive disposition
- e. Procedural fluency



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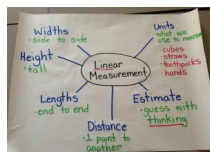
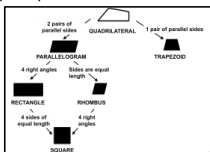
Teach Conceptual Understanding

Make Sense of Problems and Persevere in Solving Them
Reason abstractly and quantitatively
Look for and make use of structure

•Comprehension of mathematical concepts, operations, and relations

Examples:

- Teach vocabulary thoroughly and explicitly.
- Ask students to express the concept in multiple ways (e.g. draw, calculate, make a story problem).
- Make concept maps.



Try It Out: Countdown

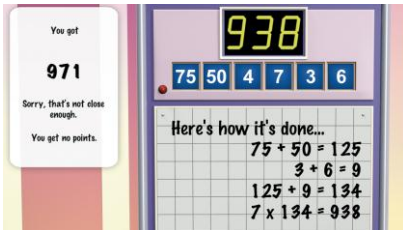
- Directions
 - Choose a group of starting numbers and a target number. See who can get closest to the target number by adding, subtracting, multiplying, and/or dividing the starting numbers.
- Example
 - Starting numbers: 2, 4, 5 Target number: 12
 - $4 \times 5 = 20$, and $2 \times 4 = 8$, then $20 - 8 = 12$
 - $5 \times 2 = 10$ and $10 + 2 = 12$
- Let's try one together.



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Teach Procedural Fluency: Countdown

There's a 99¢ app. for Countdown.



Credits: Photo is from http://www.nowgamer.com/features/993966/top_8_game_show_apps_for_ipad_and_iphone.html

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Example: $100 \times 4 = 400$, $400 \times 2 = 800$, $800 + 75 = 875$, $875 - 5 = 870$, $870 - 5 = 865$, $865 + 2 = 867$



Credit: mathgametime - <http://www.mathgametime.com/games/countdown-numbers>

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Teach Strategic Competence

Construct viable arguments and critique the reasoning of others

Use appropriate tools strategically

Look for and express regularity in repeated reasoning

- Mathematics is especially useful when it helps you predict, and number patterns are all about prediction. What will the 50th number of this pattern be?

2, 4, 6, ...



Credit: <http://www.learner.org/teacherslab/math/patterns/number.html>

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Teach Strategic Competence

Adult students can start to understand functions, such as $f(x) = 2x + 2$, where x is the numerical sequence 0, 1, 2, 3,... They begin with simple in-out machines and gradually adapt their understanding to the abstractions of algebra

X	$f(X) = 2X + 2$	Y
0	$f(0) = 2 \cdot 0 + 2$	2
1	$f(1) = 2 \cdot 1 + 2$	4
2	$f(2) = 2 \cdot 2 + 2$	6
3	$f(3) = 2 \cdot 3 + 2$	8



Credit: <http://www.learner.org/teacherslab/math/patterns/number.html>

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Teach Strategic Competence: Student Strategy Cards

Guess and Check.



~ Dr. J. Suh, <http://mason.gmu.edu/~jsuh4/teaching/resources/cards.pdf>

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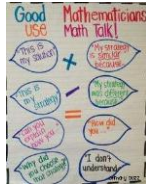
NRC Strand: Adaptive Reasoning

Reason abstractly and quantitatively

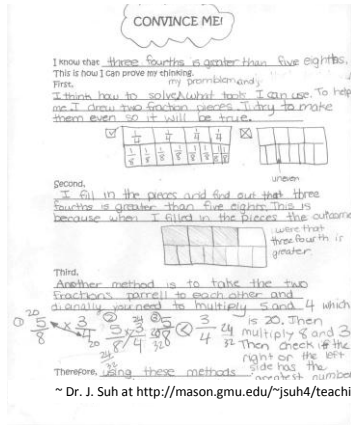
Capacity for logical thought, reflection, explanation, and justification

Examples

- Encourage students to discuss math and give them the language to do so.
- Reflect on problem solving.
- Make posters to prove solutions.
- Use "Convince Me" worksheets.



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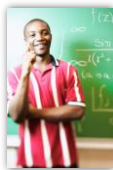
NRC Strand: Productive Disposition

Model with mathematics

Habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy.

Examples:

- Connect math to real life as you teach.
- Link math to other subjects.
- Ask students to share with the class their own examples of when they use math in real life.



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What MATH Happened to You?

Math is everywhere in our lives. Share a real life event (Math Happening) with the class! Tell the story to the class and give all the necessary information needed to solve the problem. Students should solve the problem by drawing a picture, and explaining their strategy with words and numbers.

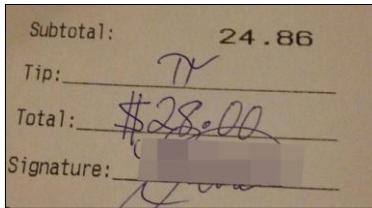
_____ Math Happening	
Numbers	Pictures
Strategy	Explanation

~ Dr. J. Suh <http://mason.gmu.edu/~jsuh4/teaching/mathhappens.pdf>



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**Teach Productive Disposition:
Real Life Connections**



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Teaching Tips to Reduce Math Anxiety

1. Prioritize skills to be taught.
2. Make connections to students' lives.
3. Take time to address vocabulary issues.
4. Focus on core concepts.
5. Select user-friendly books.
6. Individualize instruction.
7. Use appropriate technology.
8. Be flexible with teaching techniques.
9. Provide students with test-taking strategies.
10. Become familiar with NRC and CCR math proficiency attributes to support student learning.



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Math Vocabulary Anxiety

- Math is **NOT** a universal language as commonly believed.
- Teaching math vocabulary explicitly helps your English Language Learners as well as your native speakers.



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Math Vocabulary Anxiety

Do these instructions make you anxious?

To change a **mixed number** into an **improper fraction**, simply multiply the **denominator** by the **whole number** and add the **numerator** to the resulting **product**.



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Manipulatives, Visual Aids, and Graphic Organizers

Manipulatives, visual aids, and graphic organizers are especially helpful for English language learners because they allow students to demonstrate high quality math thinking with relatively low language demand.



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Manipulatives, Visual Aids, and Graphic Organizers

1. T-chart for adding and subtracting positive and negative integers
2. Compare and contrast diagram / Venn diagram
3. Graphic organizers for word problems
4. Hierarchical graphic organizer
5. Vertical number elevator
6. Order of operations ladder
7. Sequence chart
8. Box multiplication chart



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Manipulatives, Visual Aids, and Graphic Organizers

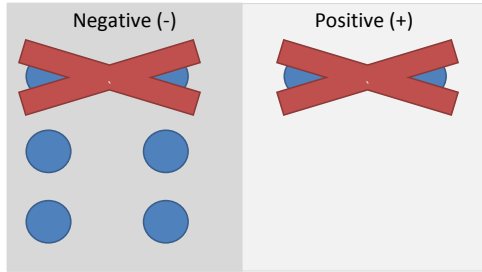
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Example of Using a Visual Aid

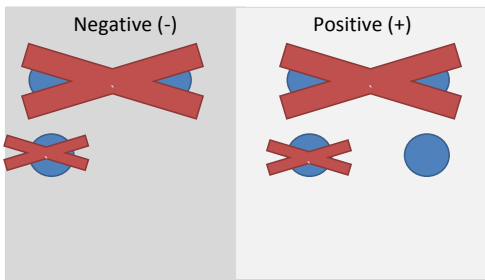
$-6 + 2$



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Example of Using a Visual Aid

$4 + (-3)$



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Example of Using a Visual Aid

$(-2) + (-3)$



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Math Skill Areas

1. Number Sense
2. Measurement and Geometry
3. Statistics, Data Analysis, Probability
4. Algebra and Functions
5. Math Reasoning
6. Algebra I



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Highlight Math Skill Area

- 1. Number Sense**
2. Measurement and Geometry
3. Statistics, Data Analysis, Probability
4. Algebra and Functions
5. Math Reasoning
6. Algebra I



Example:
 $5/10 = 50\% = 0.5$
 $21/5 = 4 \frac{1}{5} = 4.20 = 420\%$



$1/2 = 2/4 = 3/6 = 4/8$

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Number Sense: Human Fractions

- Quick, kinesthetic activity
- Teaches equivalent fractions
- Best once a day for several days



~ Kate Nonesuch, 2006



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Human Fractions

1. Form groups of any size as long as half of the people are wearing x .
2. Ask each group: "What fraction of the people in this group are wearing x ?"
3. Count groups to check
4. Write the fraction on the board
5. Combine small groups into bigger groups in order to write more fractions on the board until entire class is combined.



~ Kate Nonesuch, 2006

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Human Fractions



- 1- What fraction of the people are wearing colored shirts?
- 2- What is the ratio of light shirts to colored shirts?



- 3- What fraction of the people are women?
- 4- What is the ratio of man to women?
- 5- What is the ratio of man to total?



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Reflect

- Vocabulary page with definition, pictures, and real world connection
- Concept math
- Mental gymnastics – Countdown game
- Solving word problems with thinking blocks
- Convince me worksheet
- What math happened to you?
- Slope Vocabulary using your body
- T-chart for adding and subtracting positive and negative integers
- Human Fractions



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Human Fractions



1- What fraction of the people are wearing colored shirts?

2- What is the ratio of light shirts to colored shirts?

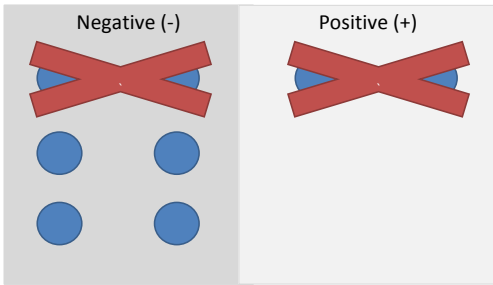


3- What fraction of the people are women?

4- What is the ratio of man to women?

5- What is the ratio of man to total? 43

T-chart for adding and subtracting positive and negative integers



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Slope Vocabulary using your body



POSITIVE SLOPE



ZERO SLOPE



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CALPRO Offerings

- Regional Community of Practice (CoP)
 - Hybrid training that includes some online and two face-to-face workshops
- Online Self-Paced Course

To host or participate in a regional CoP, please contact Dr. Cherise G. Moore at cmoore@air.org

You can visit the CALPRO website for more information at: www.calpro-online.org



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Closing

- Today’s highlight session was the tip of the iceberg. Join a Community of Practice to get even more teaching ideas grounded in best practices. How? Read your handout.
- Please fill out the evaluation.
- Thank you!



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