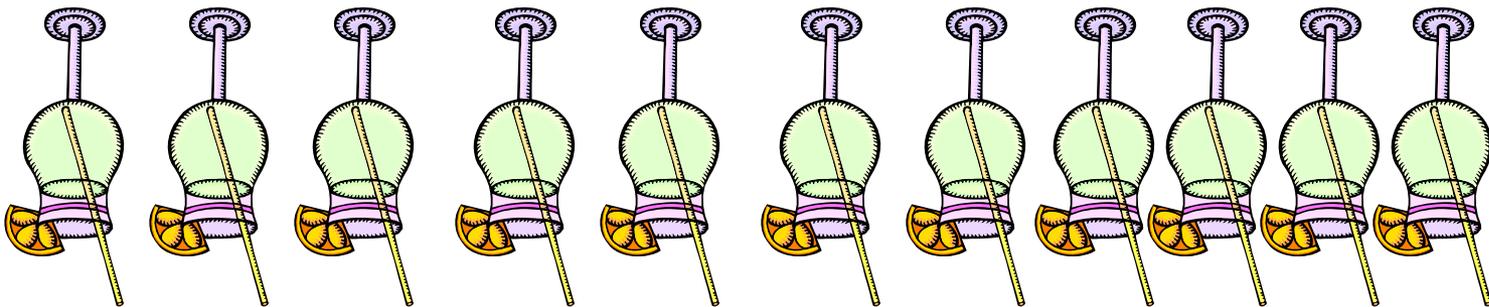


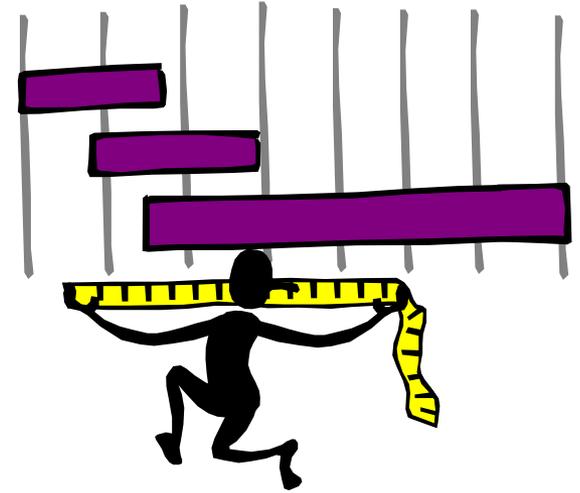


# Turning Glasses

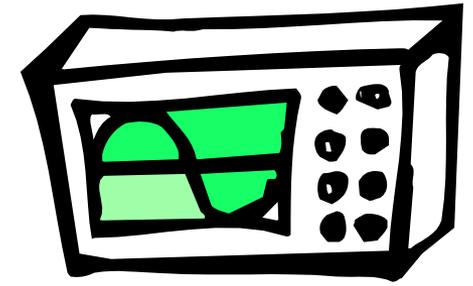
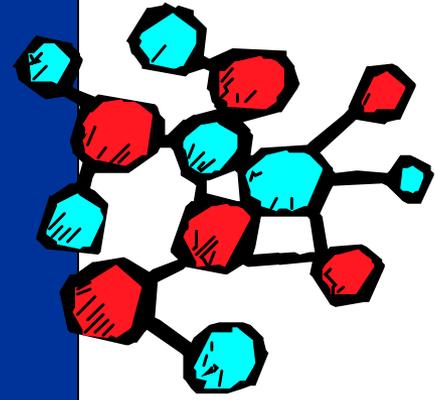
You must turn all the glasses right side up (there are 11), inverting three glasses at each move. How many moves will it take you?



*HSTW*



*Strengthening Numeracy in CTE:  
Technology Centers That Work*

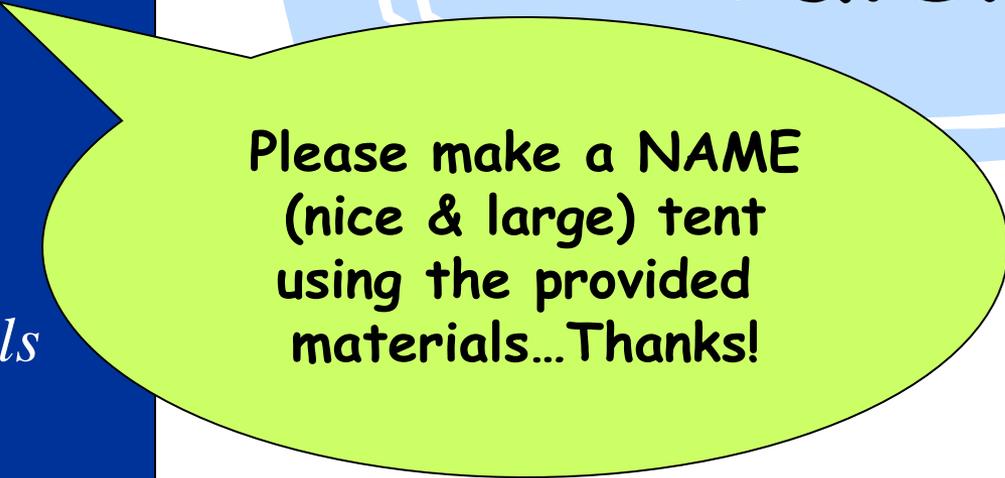


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Schools  
That  
Work*

*HSTW*



# Welcome South Carolina Talents!



Please make a NAME  
(nice & large) tent  
using the provided  
materials...Thanks!



Agenda on  
pages 2-4!

*High  
Schools  
That  
Work*

# The Damage of Disengagement

- By the end of third grade, half of all students don't want to take science anymore
- If students fail in grade nine, their chances of graduating high school is less than 50 percent
- Students invest over 14,000 hours sitting in K-12 classrooms

# The Mathematical Mind

HSTW

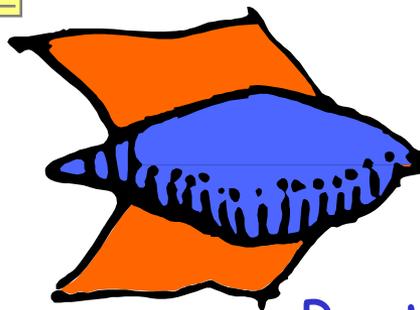
→ How many students in a mathematics class answered these questions as follows?



$$\frac{1}{3} + \frac{1}{2} = \frac{1}{5}$$

$$1\frac{1}{2} = 5.1$$

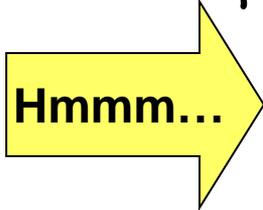
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Work



# Workshop Goals

- Participants will define numeracy and describe students as mathematicians
- Brainstorm mathematical connections already cooking and potential others!
- Review a set of readiness indicators from SREB and use as targets
- Model strategies for increasing numeracy in all classrooms
- Increase colleague base and network opportunities

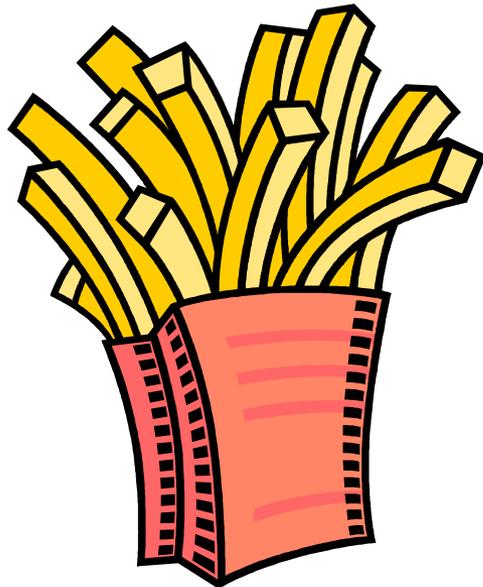
Take a moment and write one thing you'd like to learn, practice, talk about during the next two days on the back of your name tent



Hmmm...

Belief that mathematics is a language  
and a tool everywhere...

“Supersize” opportunities for  
students to develop their tools of  
description, communication and  
representation

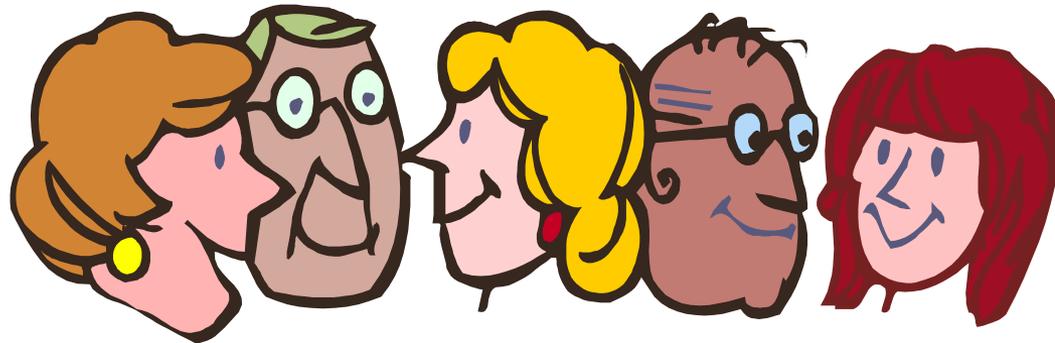


*HSTW*

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*HSTW*

# Welcome and Introductions



Let's hear that  
school slogan!

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Schools  
That  
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# Ground Rules

1. For a good time...participate.
2. Respect the mailman.
3. Conversational courtesies.
4. Cell phones are turned off or on vibrate.
5. Biology breaks.
6. Lunch scoop
7. Math Anxiety is OK!



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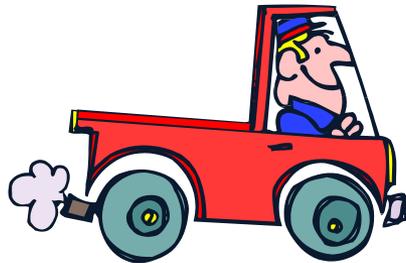
# Facilitation Parking Lot

QUESTIONS

SUGGESTIONS

CONCERNS

FOLLOW-UP



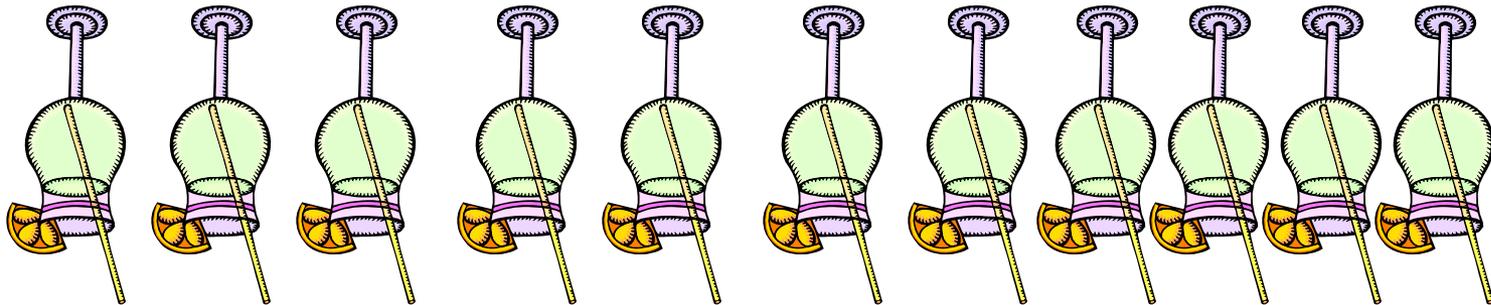
*HSTW*

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# Turning Glasses

You must turn all the glasses right side up (there are 11), inverting three glasses at each move. How many moves will it take you?



# The Power of Team Dynamics



- Instructions on handout
- 20 minutes to plan, practice
- I will act as timekeeper and give the start signal
- After the challenge, there are reflection questions to ponder
- **GOAL:** Build the tallest free-standing structure

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# Essential Questions:

- ➔ Why is helping students understand math everyone's job?
- ➔ What does math look like in the non-math classroom?
- ➔ How do math and CTE teachers support student understanding of math?





# 10 TCTW Key Practices



- High Expectations
- Challenging Career/Technical Studies
- College-prep Curriculum
- Academic Core and a Concentration
- Work-based Learning
- Integration of Academic and Career/Technical Studies
- Active Engagement
- Guidance and Advisement
- Extra Help
- Data-based Decision Making

---

---

Strongly agree that their center emphasizes academic standards (English/language arts, mathematics and science) to ensure students' success in postsecondary studies and careers.

---

---

All Sites

37%

---

---

Somewhat or strongly agree that students' success or failure at the center is largely due to factors beyond them.

---

---

All Sites

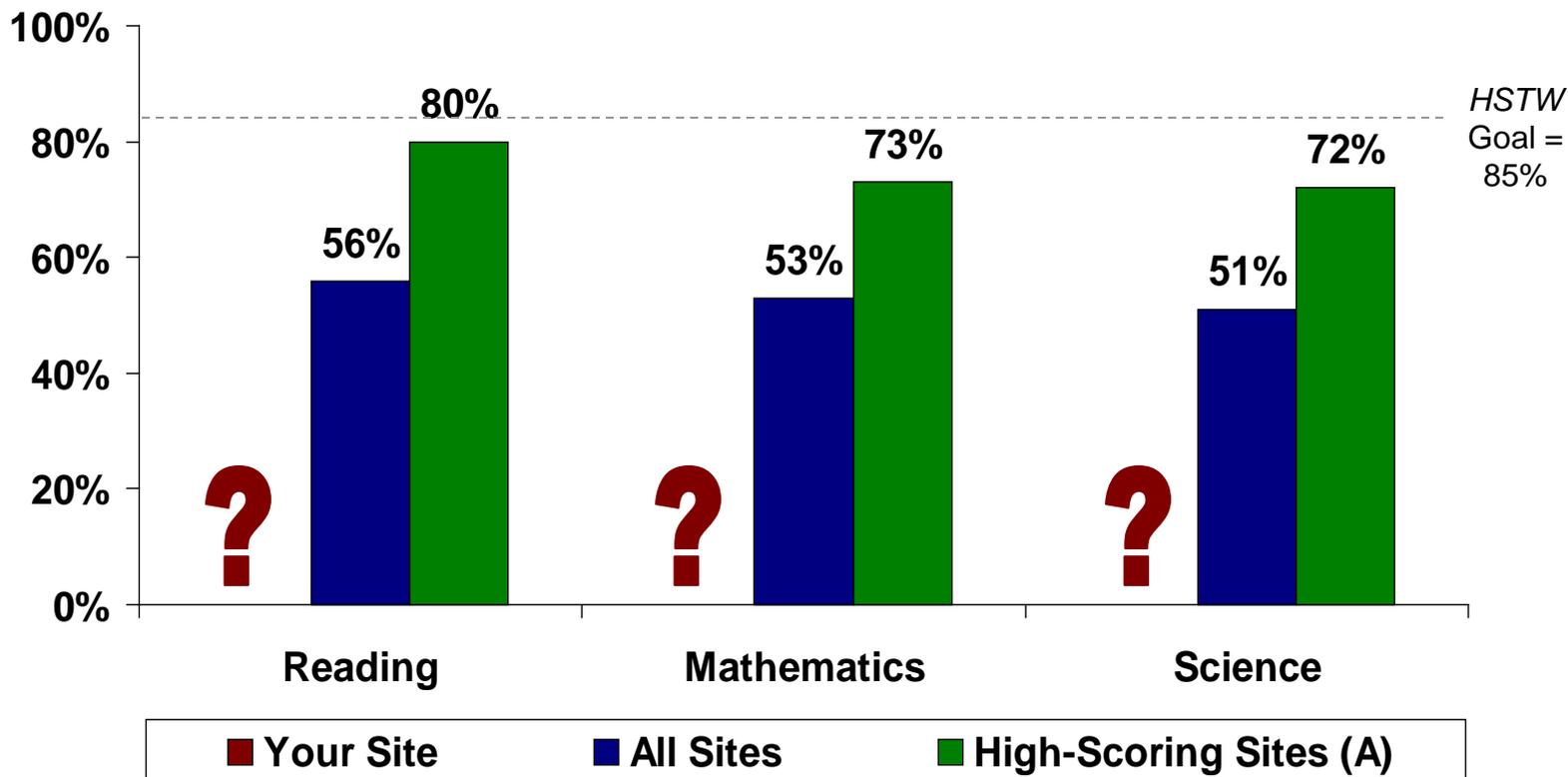
60%

**2008 TCTW Teacher Survey Report**

# 2008 *HSTW* Assessment Results

*HSTW*

Percentage of Students Meeting Readiness Goals

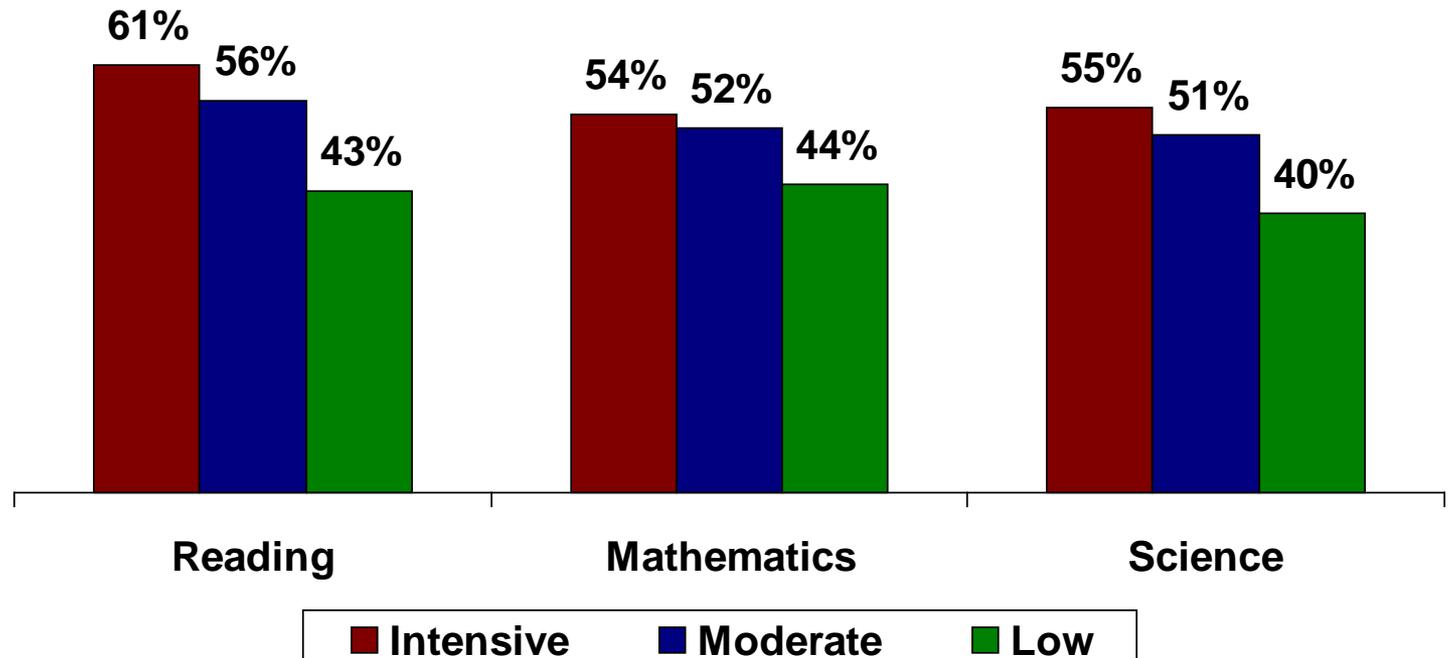


Source: 2008 *HSTW* Assessment

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# Emphasis on Integrating Academics into CT

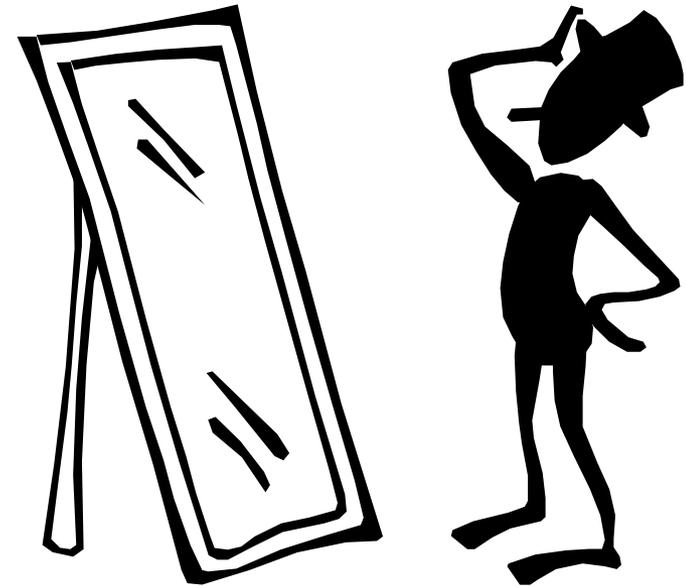
Percentage of Students Meeting Readiness Goals by Level of Emphasis



Source: 2008 HSTW Assessment, All Sites

# What is Numeracy?

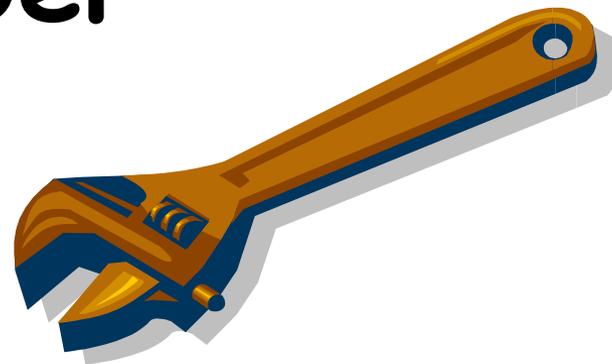
- More than just mathematics
- Coined in 1959 by the UK Department of Education
- *"Mirror image of literacy"*
- *Jot your thoughts down in your handout page four*



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# Team Member Roles



- **Facilitator:** keeps the work moving forward and on-track
- **Recorder:** captures all the groups' work in written form
- **Reporter:** verbally shares findings to larger group
- **Timekeeper:** alerts team to amount of time left when working
- **Materials manager:** gathers necessary materials for the group

# Mystery Madness!

- Each group is provided three stories
- Have each person read and record any ideas
- Facilitator will ask to hear various ideas before group comes to consensus
- Be ready to share conclusions with large group



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# Personal Reflection

- Take a quiet moment to reflect on the concept of numeracy on pages 5-6... from your perspective
- Answer thought questions on page 5 (misconceptions and innumeracy)



# Definitions: UK 1980's

1. Being "at-ease" with all those aspects of mathematics that enable a person to cope with the practical demands of everyday life.
2. The ability to understand information presented in mathematical terms.



-British Cockroft Committee

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# Numbers as Information

...understanding the role of numbers in the world. It provides the ability to see below the surface and to demand enough information to get at the real issues.

- Ted Porter, Historian

From *Why Numbers Count: Quantitative Literacy for Tomorrow's America*, 1997

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# How to reason and think...

*HSTW*

It enables individuals to analyze evidence, to read graphs, to understand logical arguments, to detect logical fallacies, to understand evidence, and to evaluate risks. Quantitative literacy means knowing how to reason and how to think.

- Gina Kolata, journalist

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Work*

From *Why Numbers Count: Quantitative Literacy for  
Tomorrow's America*, 1997

# Aspect of Citizenry...

...can be defined as the level of mathematical knowledge and skills required of all citizens. It includes the ability to apply aspects of mathematics to understand, predict, and control routine events in people's lives.

- John Dossey, mathematics educator

From *Why Numbers Count: Quantitative Literacy for Tomorrow's America*, 1997

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Work*

# Role in Scientific Inquiry

...requires one to understand the nature of mathematics and its role in scientific inquiry and technological progress; to grasp sufficient mathematics to understand important scientific and engineering concepts.

- F. James Rutherford, physics educator

From *Why Numbers Count: Quantitative Literacy for Tomorrow's America*, 1997

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# Experiments and Modeling...

...deals with numbers, uncertainty, errors in data, design of experiments, creation of models, validations, inferences, making tradeoffs, etc.

- Peter Denning, computer scientist

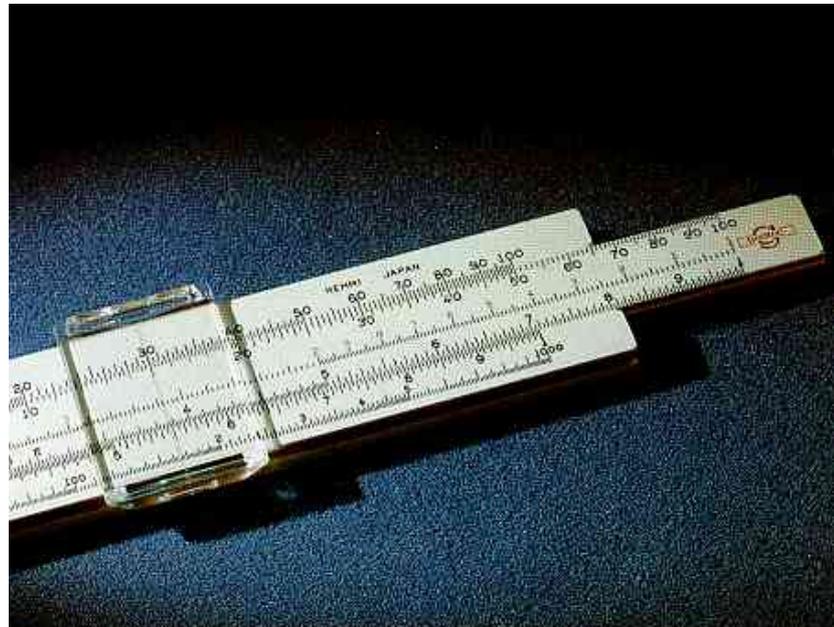
From *Why Numbers Count: Quantitative Literacy for Tomorrow's America*, 1997

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"Numeracy is to mathematics  
as literacy is to language"

*~Lynn Arthur Steen*



# Numbers as Information

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- Ted Porter, Historian

From *Why Numbers Count: Quantitative Literacy for Tomorrow's America*, 1997

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Work*

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*HSTW*

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Work*

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*HSTW*

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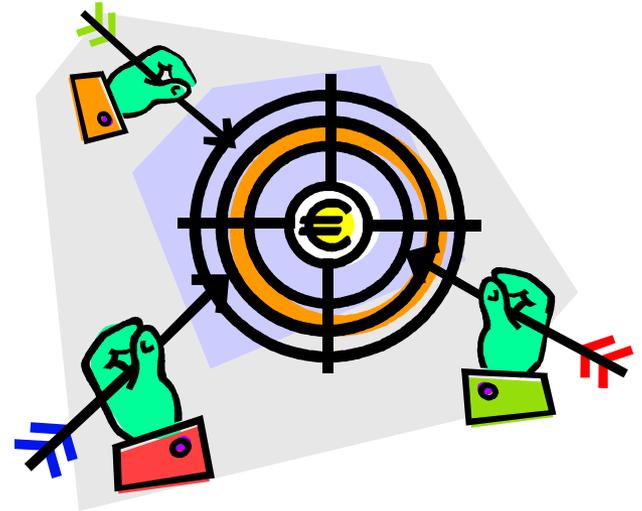
From *Why Numbers Count: Quantitative Literacy for Tomorrow's America*, 1997

*HSTW*

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That  
Work*

# Why the need to focus on numeracy?

- The impact of technology on the workplace
- The need to be a knowledgeable consumer
- The need for an informed citizenry
- Advancements in scientific research



# Reasons Companies Reject Applicants - Hourly Workers

69%	Inadequate basic employability skills (attendance, timeliness, work ethic)
34%	Insufficient work experience
32%	Inadequate reading/writing skills

Source: National Association of Manufacturers

Two Decades:  
What Employers  
Want

1. Employability skills
2. Experience/technical skills
3. Communication/literacy skills

Source: ETS – High School Reform and Work:  
Facing Labor Market Realities (2006)

# New Generation Workforce



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# My Generation...

People try to put us d-down (Talkin' 'bout my generation)

Just because we get around (Talkin' 'bout my generation)

Things they do look awful c-c-cold (Talkin' 'bout my generation)

I hope I die before I get old (Talkin' 'bout my generation)

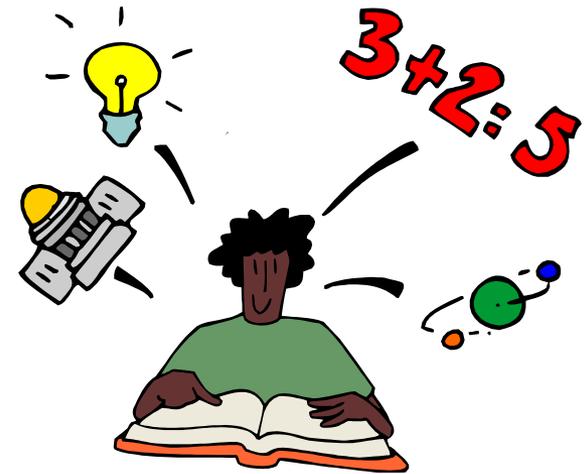
# Smells Like Teen Spirit...

It's fun to lose  
And to pretend  
She's overboard  
Myself assured  
I know I know  
A dirty word

With the lights out its less dangerous  
Here we are now  
Entertain us  
I feel stupid and contagious

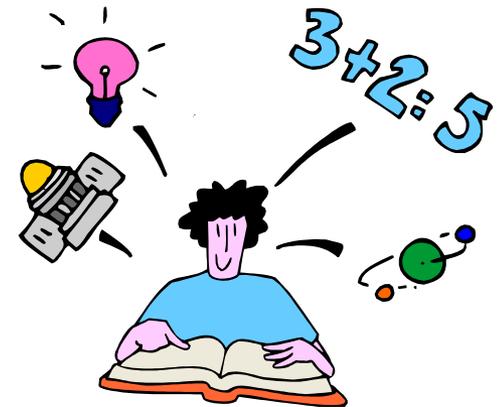
# Who are the Millennials?

- Bottle caps always plastic
- McDonalds food never came in styrofoam containers
- Google has always been a verb
- Internet is better than TV
- Doing rather than knowing
- Typing rather than handwriting
- Zero tolerance for delays



# Who are the Millennials?

- Personality descriptors:
  - Special, sheltered, confident, team oriented, conventional, pressured, achieving, ambitious!
- Staying connected
- Reality no longer real...like e-mails
- Consumer/creator blurring
- Multi-tasking a way of life
- We need to build on their technological competence



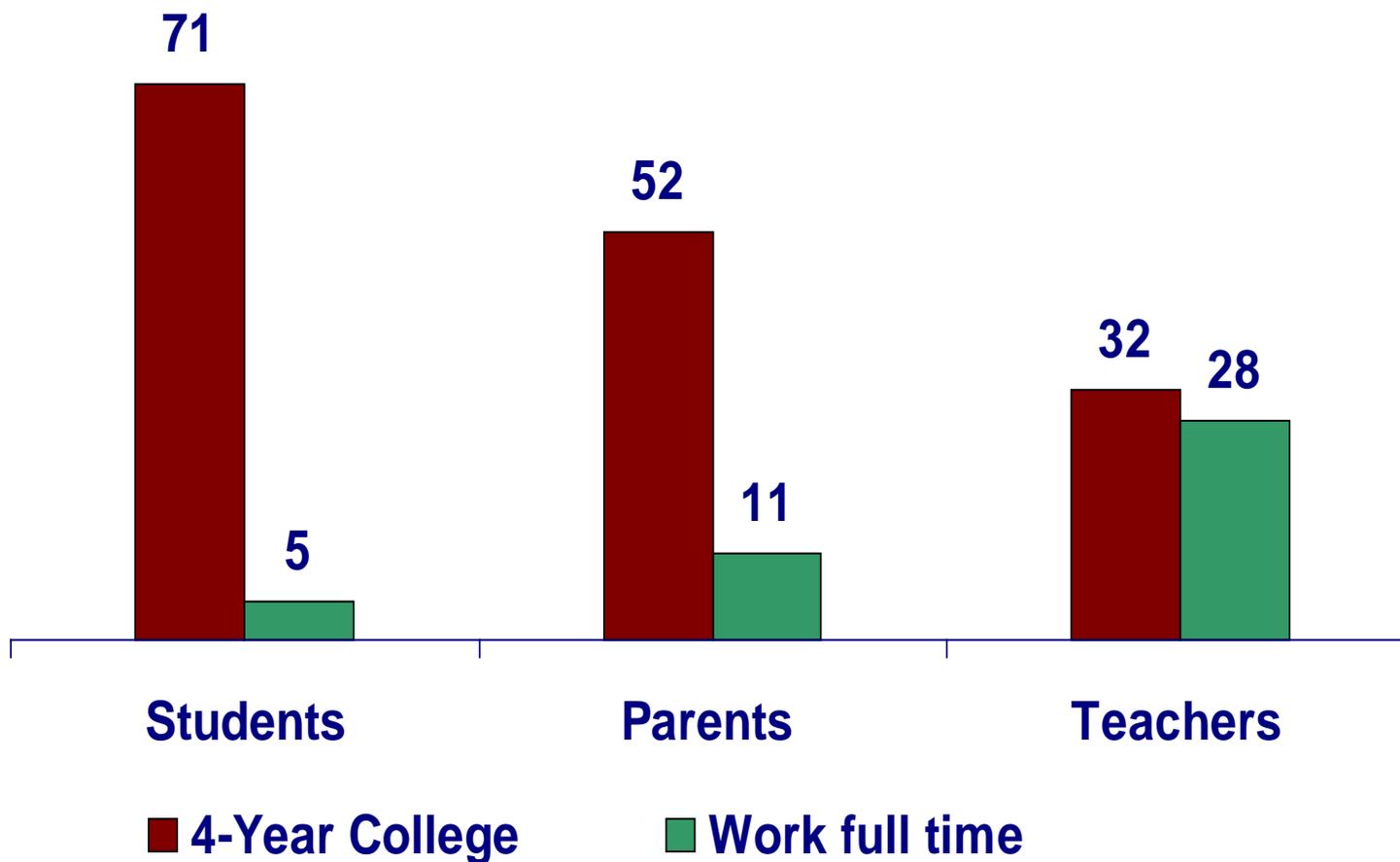
*"Email is for  
old people"*

*- A student*

# Gaps in Expectations for Post-High School Plans

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# Further Disconnects

- About half of all senior male students and 2/3 of all senior female students say they are going to work in professional occupations
- Only 8.4% of males and 3.7% of females indicate aspirations in technical occupations

The Disconnect: Only 21% of all jobs in the U.S. require a 4-year degree or higher

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**“It’s kind of fun to do the  
impossible”  
~ Walt Disney**



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*HSTW*

"Seventy percent of students who drop out of high school say they would have finished if their classes had given them more interesting, real-world learning opportunities"

*The Silent Epidemic: Perspectives of High School Dropouts; 2006*

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# Fundamental Ground Rules

- ➔ High motivation and engagement in learning have consistently been linked to reduced dropout rates and increased levels of student success
- ➔ Student engagement in school drops considerably as students get older
- ➔ Teachers can influence student motivation
- ➔ Even when students use strategies that are self-defeating, their goal is actually to protect their sense of self-worth
- ➔ Teachers can influence student motivation
- ➔ In teaching/learning, it is important to assist students to develop self-attribution ~ **EFFORT (internal/control)**

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*HSTW*

# Wear math goggles!

- \* Look for math being used
- \* Purposefully plan to enhance the mathematics as a complement to your technical lesson/teaching



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# Numeracy-by-Cluster



## Team Challenge: Create a Poster

- A **title**.
- A **description** of your career cluster occupations
- A **list** of NCTM Process Standards (like a menu)
- Lists of **identified** math skills (categorized)

**PAGE 8 in your PLANNER!**  
**\* Planning pages on 7 and 9**

# Cross~walking Numeracy-by-Cluster

Crosswalk each of the following to see if you can add additional math skills or process standards:

- All Aspects of Industry (pg. 10)
- NCTM Standards (handout)
- Career Clusters Knowledge and Skills Statements (on-line: [www.careerclusters.org](http://www.careerclusters.org))
- Power Standards (post-secondary readiness )



Add thoughts in a different colored-marker print! 😊

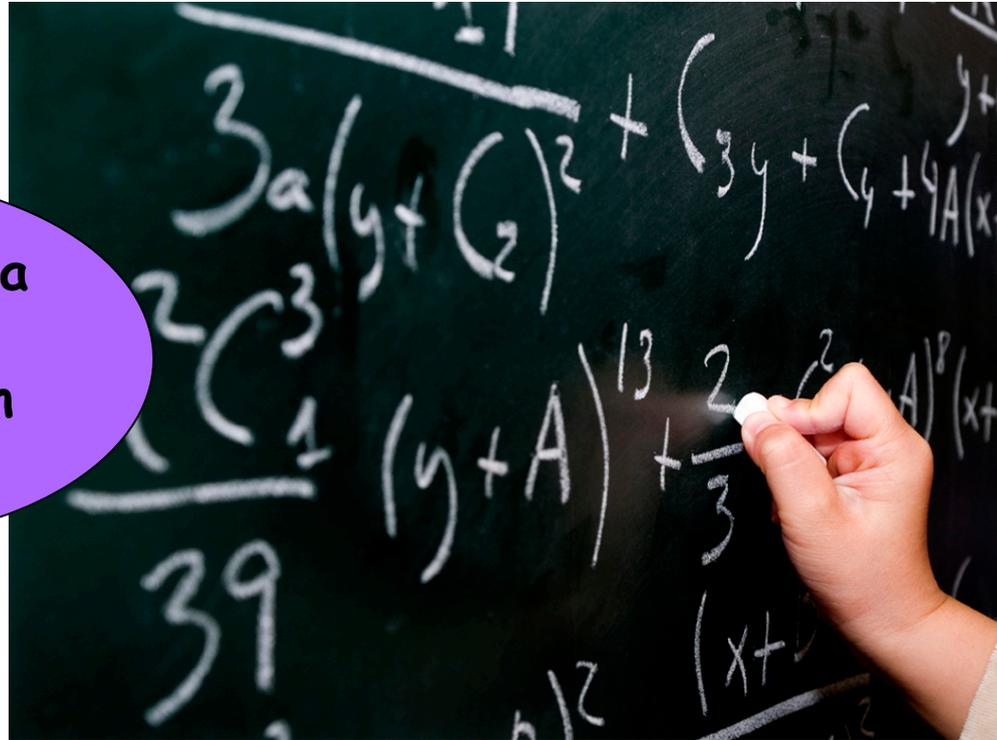
*HSTW*

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# What does "mathematics readiness" really mean?

*HSTW*

Let's review a set of indicators on page 11!



**But first...let's experiment!**

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# Help Capture a Criminal

- Each group is provided a set of clues (total = 8)
- Have each person responsible for sharing a clue to the entire group
- Brainstorm possible problem solving approaches
- Bring ideas to Kathleen for inspection and the green light!



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# Casino Connections!



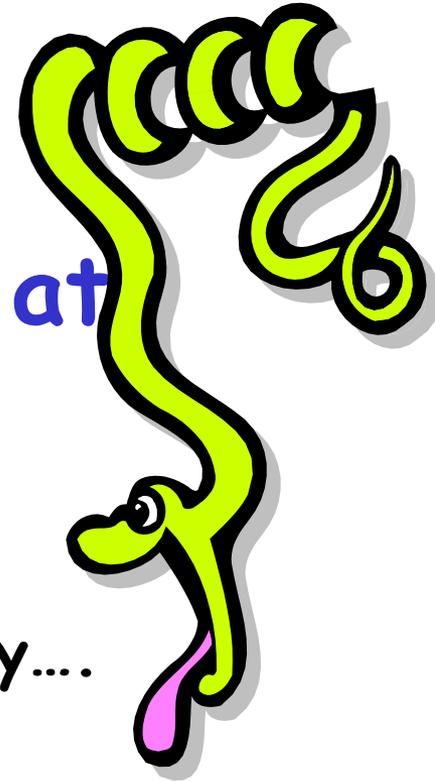
*HSTW*

# Team Challenge: Strategy Spotlights!

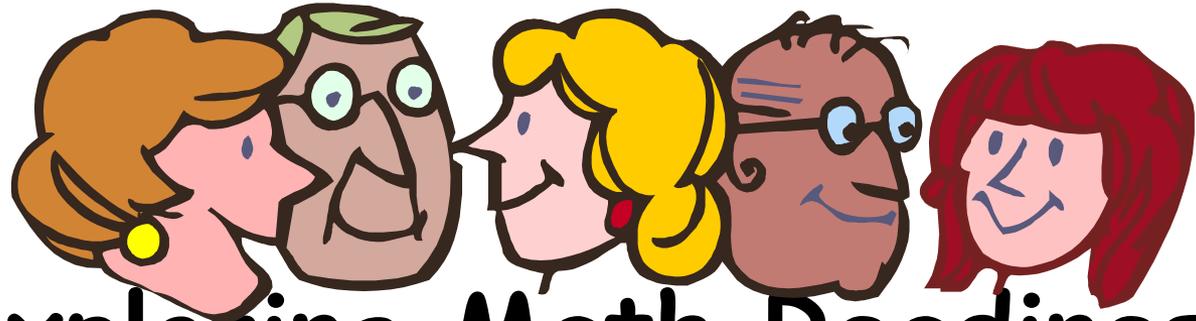


**"Strategy Sharing at  
its Best!"**

**Teams will be determined by...  
Cluster area?**



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# Exploring Math Readiness!

Generating math enhancement strategies!

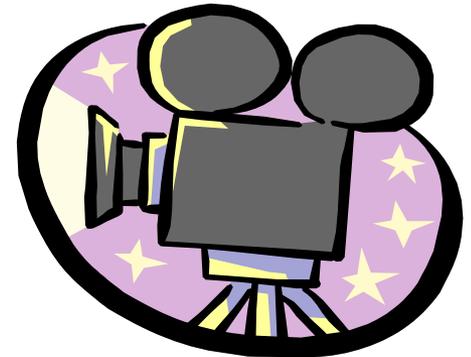
- Real-world problems (1): Kings
- Language of math (2): Jacks
- Recognize correctness (3): Tens
- Arguments and conclusions (4): Nines
- Your choice! (??): Eights
- Different number types (6): Sevens
- Exponents and roots (7): Sixes
- Proportional reasoning (8): Fives
- Measures and conversions (9): Fours
- Multiple pieces of data (10): Threes

Jot  
thoughts  
on page 12

# Mini Lesson Madness!

- Prepare a mini lesson for your colleagues to explore your indicator—examples, an activity, model a strategy, make it authentic...
- Creativity is encouraged...**EVERYONE** participates! 😊
- Check in with Kathleen with ideas...
- Prep time = 60 min.

**Challenge: Make it ACTIVE!**



*HSTW*

60 minutes to plan...



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# Things to consider when enhancing mathematics...

Have fun with dialoguing and write down mathematical thinking...

Consider math anxiety

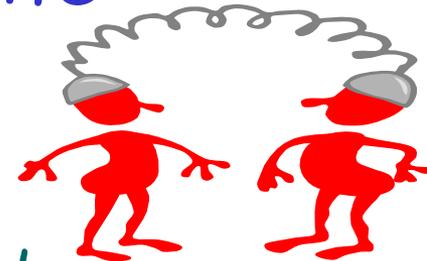
Time to understand each others' curriculum

Developing vocabulary by using it!!

Growth and sharing in teaching strategies

Ask for support and for feedback!

Intentional and deliberate!



# Keep Cooking with Hotel/Home Work!

- Review any two project examples on pages 13-14
- Complete the questions for each example on page 15
- Be ready to share thoughts in the A.M.! 😊



*HSTW*

# Keep leveraging that Numeracy!

Kathleen McNally

[Kathleen.mcnally@sreb.org](mailto:Kathleen.mcnally@sreb.org)

Thank you for the awesome  
Opportunities you provide across  
South Carolina!



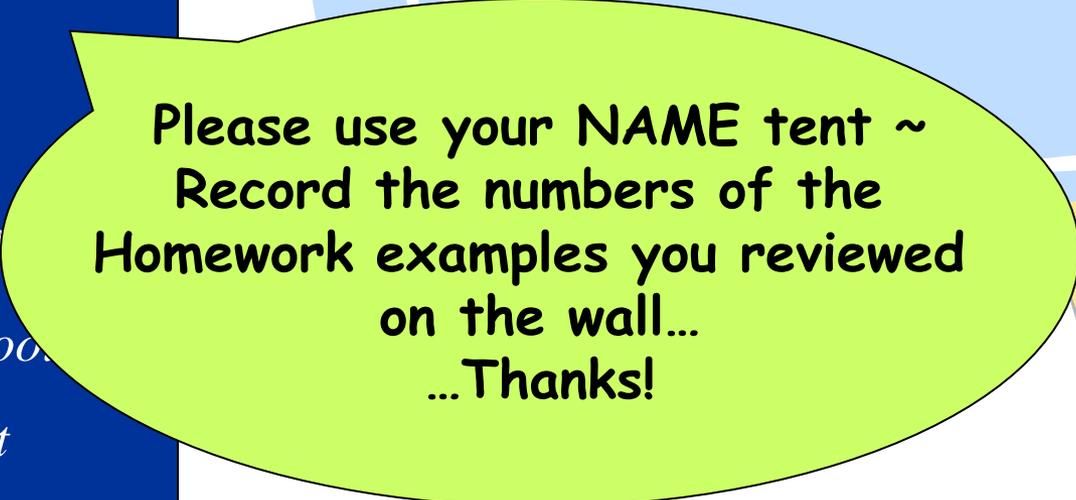
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*HSTW*



# Welcome Back...Day Two!

*Greetings from Rodney and Kathleen!*



Please use your NAME tent ~  
Record the numbers of the  
Homework examples you reviewed  
on the wall...  
...Thanks!

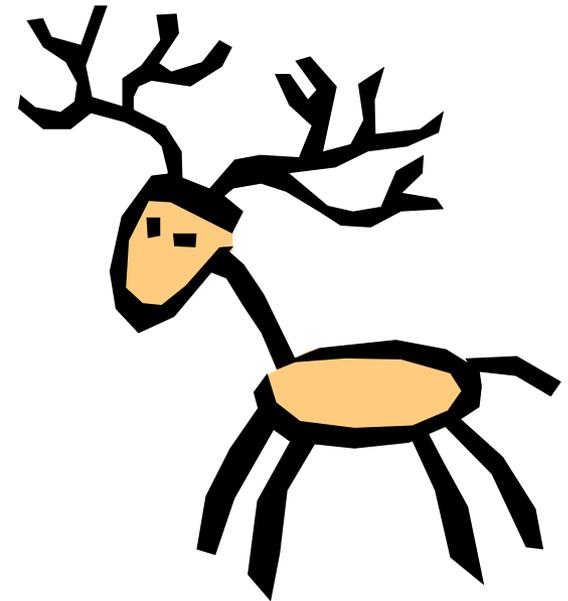


Thursday's agenda  
9:00 – 2:45 p.m. 😊

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# Say hello to your tablemates and the large group!

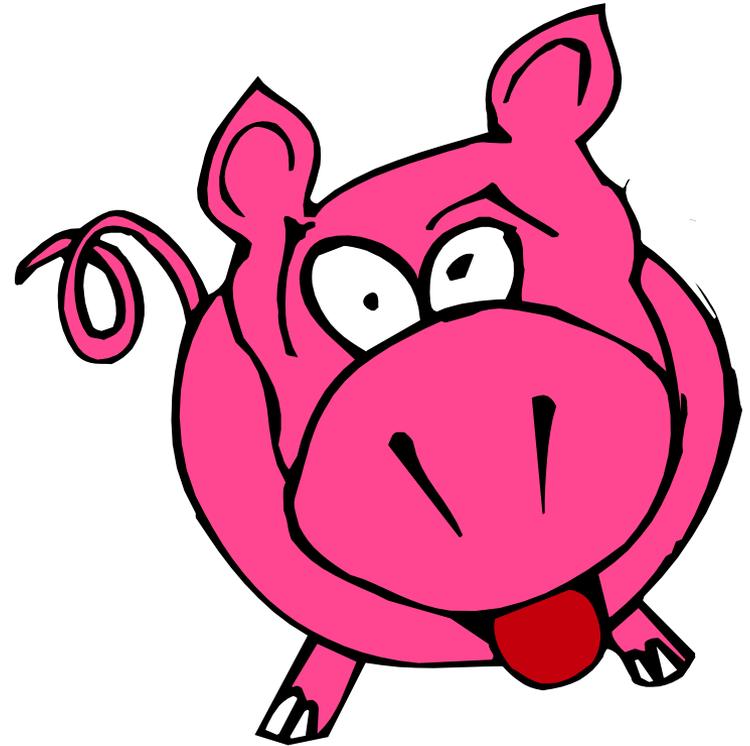
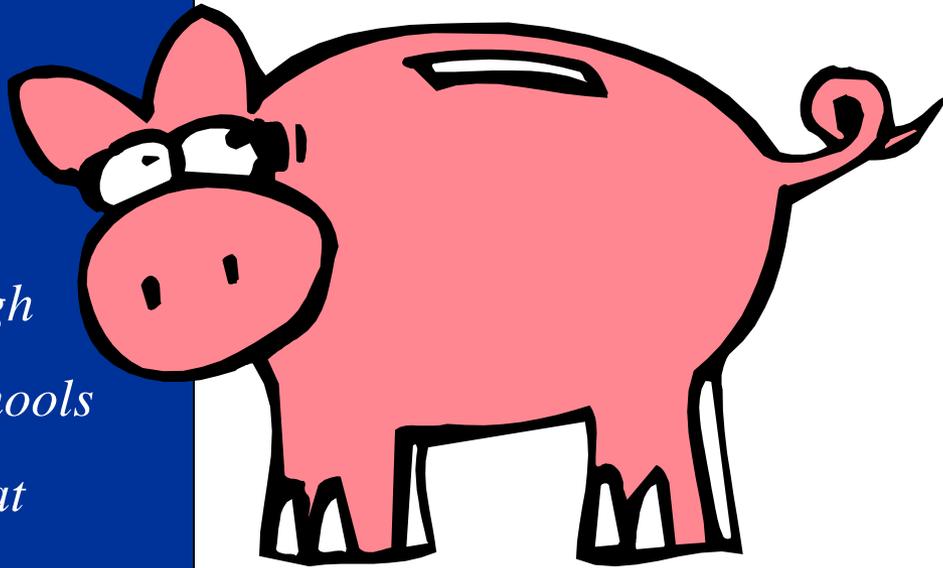
- Any Greenville stories to share?
- Any ah-ha's about yesterday's conversations?



# Remember: These guys are innocent!

*HSTW*

Things that  
make you go  
hmmmm...



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That  
Work*

# Students as Customers

Yeah  
Man

Reflect on our  
numeracy work based on  
students' interests,  
experience,  
environment &  
feedback

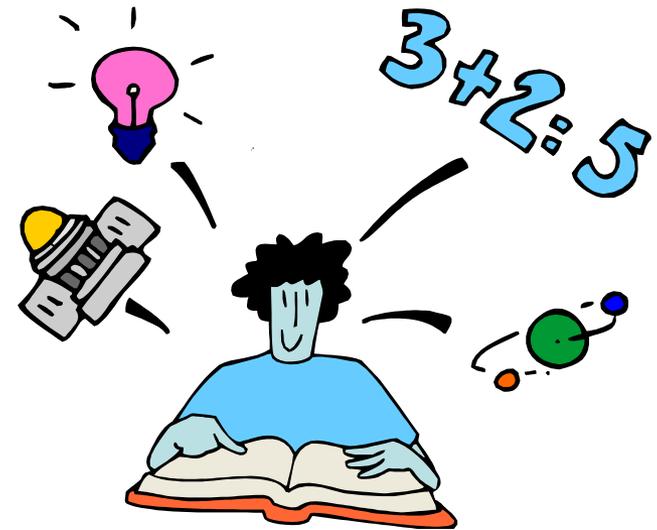


*HSTW*

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# Motivation Fill-in's!

1. Fill in the blanks to complete the statements about student motivation:
2. Let students know how much \_\_\_\_\_
3. Assign problems/activities that are neither too \_\_\_\_\_ or too \_\_\_\_\_
4. Recognize \_\_\_\_\_ and show how this relates to growth and success!
5. Let's students tell \_\_\_\_\_
6. Encourage students to work with \_\_\_\_\_



# Goals for our December 9<sup>th</sup> Session

- CTE Teachers *and* mathematics partners: create and teach five (5) math-enhanced lessons for CTE classroom
- Lessons criteria on page 40
- Make a presentation about your lessons
  - Tell us about the context of each
  - Tell us how your efforts impacted student understanding
  - Provide a copy of Cycle-of-Learning lesson plan for each
  - Bonus: math teachers keep track of contextual examples used...

*HSTW*

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# Keep Parkin'!



**Questions**

**Suggestions**

**Follow-up**

**Opportunity for  
Change**

Keep a look  
out for  
today's **HOT**  
**TOPIC!**



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*HSTW*

# Hotel/Home Work Processing...

*HSTW*

- Requested: Review any two project examples on pages 13-14
- Complete the questions for each example on page 15
- Connect with those that have also reviewed the same project and share findings

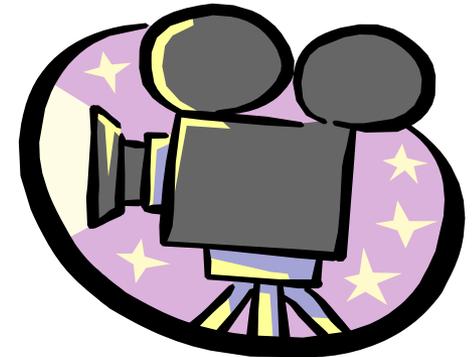


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# Mini Lesson Madness!

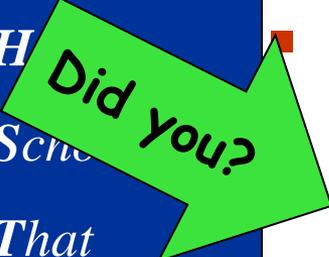
- Prepare a mini lesson for your colleagues to explore your indicator—examples, an activity, model a strategy, make it authentic...
- Creativity is encouraged...**EVERYONE** participates! 😊
- Check in with Kathleen with ideas...
- Prep time = 60 min.

**Challenge: Make it ACTIVE!**



*HSTW*

*H  
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That  
Work*



# Give a hand...all of them!

- Challenge: each table will "cash in" their hands--- one at a time:
  - Commendation for a presenting team
  - Suggested application from another field



# The Sweetest Story...

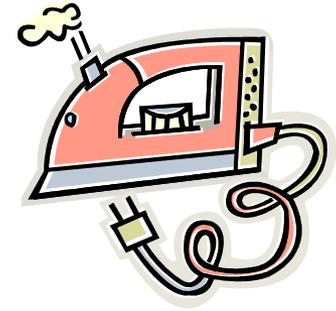
- Smarties
- Snickers
- Life savers
- Pay Day
- 100 Grand



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Work*

# Re-group by schools teams...



- ☑ Facilitator ~ keeps it all moving and smooth
- ☑ Recorder ~ captures all discussions and decisions in writing for group members
- ☑ Reporter ~ oral sharing of work to the larger group when requested
- ☑ Time Keeper ~ keeps group on track and within assigned times
- ☑ Materials Master! ~ fetches (and returns) all needed materials/supplies

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# Build the daily instruction of your numeracy work...



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# Cycle of Learning

- For all classes
- Creates a pattern of learning
- Moves students into deeper understanding
- Allows for formative assessment

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# What is the Cycle of Learning?

- Get started
- Engage
- Explore
- Explain
- Practice together
- Practice in pairs
- Practice alone
- Evaluate
- Close

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*HSTW*

# Foldables



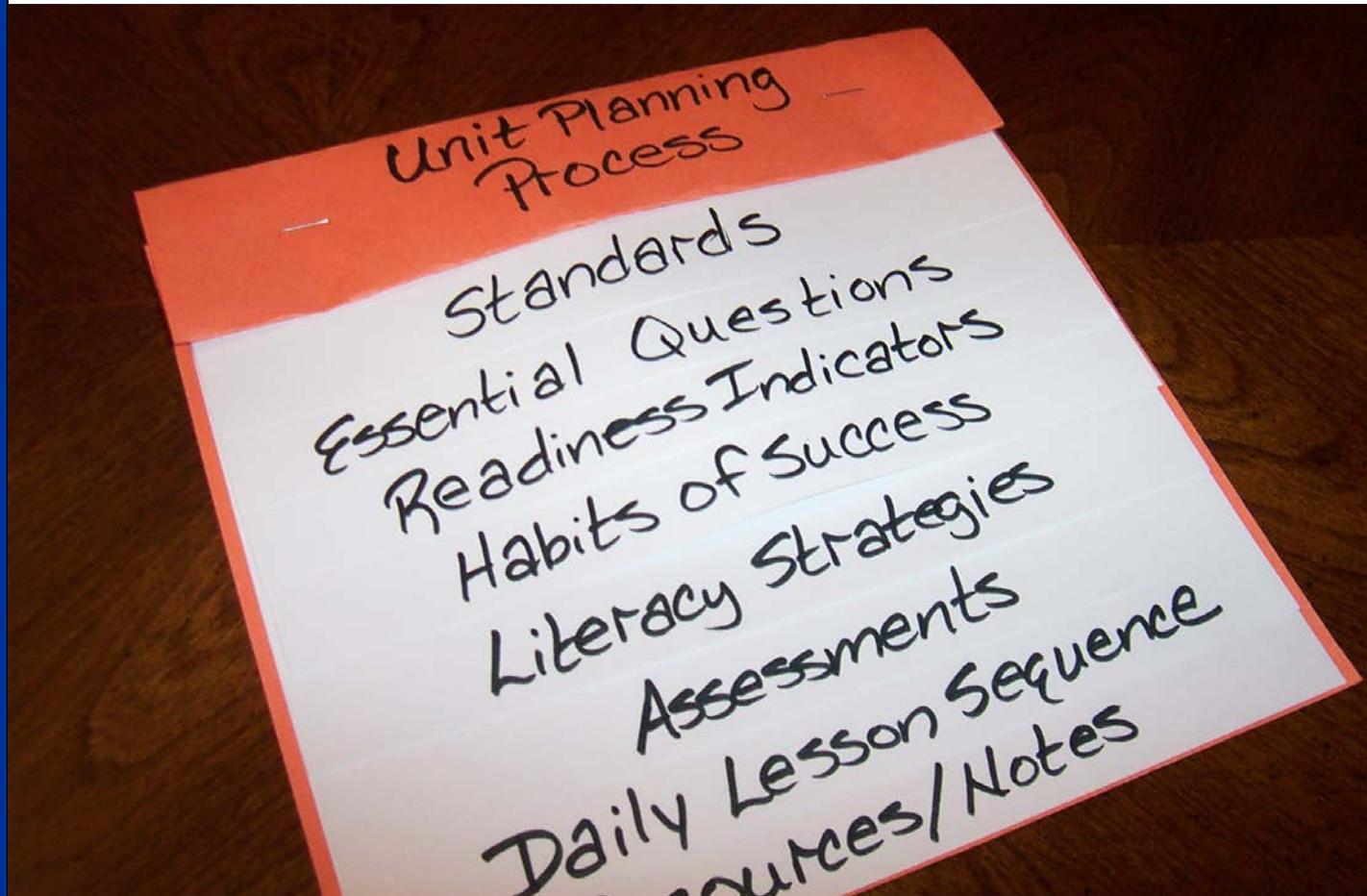
**Dinah Zike**

**[www.dinah.com](http://www.dinah.com)**

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*HSTW*

Plan each day's lesson

Getting Started

Engage

Explore

Explain

Practice Together

Practice in Teams

Practice Alone

Evaluate Understanding (daily,  
weekly, post-assessment)

Close

All on one tab

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# First: Getting Started

- Quick
- All students can be successful.
- Not new learning.
- Establishes routine.

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# Second: Engage

- Introduces focus for the day
- Provides relevance for the lesson
- Provides motivation for learning

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# Third: Explore

- Creates personal learning
- Sets the stage for content
- Allows for interaction
- Creates investment in content

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# Fourth: Explain

- Multiple types
- Short bursts of new content
- Within context of exploration
- "Teacher talk"

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# Fifth: Stages of Practice

- Practice together
- Practice in small groups
- Practice alone

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# Sixth: Evaluation

- Formative assessment usually
- Indicates mastery or re-teaching
- Usually brief
- Often informal

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# Seventh: Closing activities

- Bring closure to each class
- Enhance retention

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# The Cycle can take more than one day!

- Sample two day cycle:

## Day One

Getting Started  
Engage  
Explore  
Explain  
Practice together  
Closure

## Day Two

Getting Started  
Engage  
Practice in teams  
Practice alone  
Evaluate  
Closure

# R-A-F-T

**Role (of  
the writer)**



What is the writer's role: reporter, critic, observer, eyewitness?

**Audience**



Who will be reading this writing: the teacher, other students, a parent, community members?

**Format**



What is the best way to present this writing: in a letter, an article, a report, a poem?

**Topic**



Who or what is the subject of this writing: a famous inventor, life in the future?

# RAFT Examples for Math

Choose one item from each column

<b>Role</b>	<b>Audience</b>	<b>Format</b>	<b>Topic</b>
Zero	Whole Numbers	Campaign Speech	The importance of the number 0
Percent	Student	Tip Sheet	Mental ways to calculate percents
Prime Number	Rational Numbers	Instructions	Rules for divisibility
Parts of a Graph	TV Show Audience	Script	How to read a graph
Exponent	Jury	Instructions to the jury	Laws of exponents
Acute Triangle	Obtuse Triangle	Letter	Explaining their differences
Square Root	Whole Number	Love Letter	Explain Relationship
Repeating Decimal	Set of Rational Numbers	Petition	Prove you belong to the set

# School Team Lesson Challenge!



As a school team....

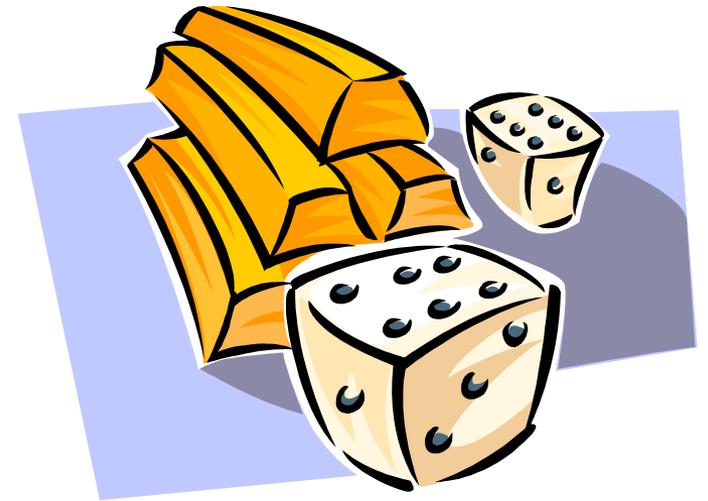
- Prep time frame: 19 minutes
- Prepare an informal (fun!) lesson plan with your 'random' RAFT
- Present your lesson on flipchart and be ready to share!
- All team members involved!
- Thank you!

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# Roll your Choices...

- One team member will roll the die to determine the **Topic (T)** and one will roll to determine the **Audience (A)** for your challenge!
- Format will be a "Cycle-of-Learning" lesson



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# RAFT (canoe) Lesson Learning!

Roll the dice to determine the row of choices!

Roll a...	Audience	Roll a...	Topic/Aim
1.	Kindergarten students	1.	Bathing a cat
2.	Aliens	2.	YOUR choice ~ have fun!
3.	Airline pilots	3.	How to drive a standard vehicle
4.	High school Principals	4.	How to load a dishwasher
5.	Football team	5.	Proper hand-washing
6.	80-90 year olds	6.	Dating in the modern world

# School Team Lesson Challenge!



As a school team....

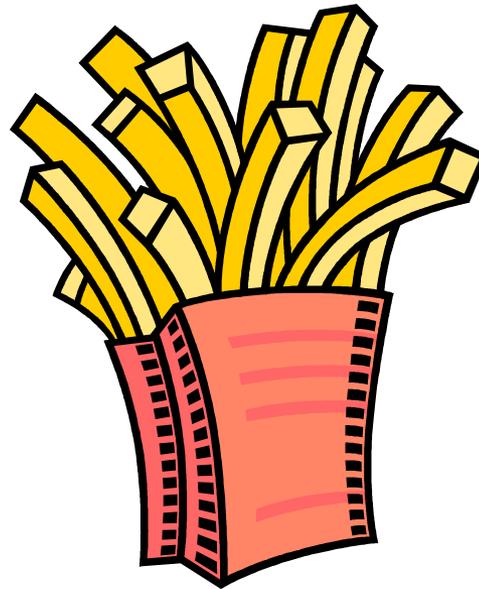
- Prep time frame: 19 minutes
- Prepare an informal (fun!) lesson plan with your 'random' RAFT
- Present your lesson on flipchart and be ready to share!
- All team members involved!
- Thank you!

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*HSTW*

Remember the Goal:  
"Supersize" Numeracy in CTE  
lessons



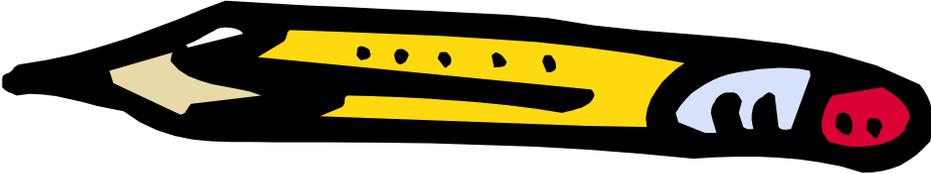
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Plan for enhancing  
mathematics skills  
embedded in  
technical lessons or  
projects

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# Overview *Enhancement* Process

- The seven elements of a math-enhanced lesson on pages 16-17
- "Marriage" of the Cycle of Learning and the seven elements on page 18
- Most effective lessons include: authentic problems, varying levels questions, literacy strategies and bridging of vocabulary (T-Chart!)



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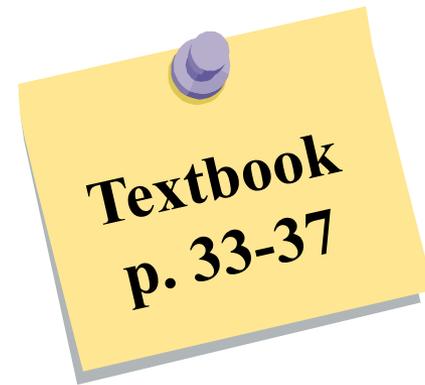
# "SuperSize" Tool: Levels of Questions



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What does varying levels mean?



Getting to mastery  
at the proficient level is the  
key!

Basic

Proficient

Advanced

Stem Questions from Bloom's

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Tootsie Roll Pops  
Teaching Bloom's Taxonomy



**Knowledge**

List the sports and games shown on your Tootsie Roll wrapper.

**Comprehension**

Describe the ways your classmates eat their Tootsie Rolls.

**Application**

Interview your classmates about their favorite flavor of Tootsie Roll Pops. Graph the results.

**Analysis**

Compare/ Contrast the outer and inner candy parts of a Tootsie Roll Pop.

**Synthesis**

Create a new Tootsie Roll Pop flavor and present a slogan or jingle to sell your idea.

**Evaluation**

Argue for the use of candy in the classroom or argue against it. Why or why not have it in the classroom?

-Author Unknown-

**Record your work on Poster Paper**

# Show us your Blooms!

- Knowledge: List the sports and games listed on your Tootsie Pop wrapper
- Comprehension: Describe the ways your classmates eat their Tootsie Pops
- Application: Interview classmates about their favorite flavor of Tootsie Pop...graph results!
- Analysis: Compare and contrast the outer and inner candy parts of a Tootsie Pop
- Evaluate: Argue for use of candy in the classroom or argue against it. Why or why not have it in the classroom.
- Create: Create a new Tootsie Pop flavor and present a slogan or jingle to sell your idea.

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Time:  
13 min.

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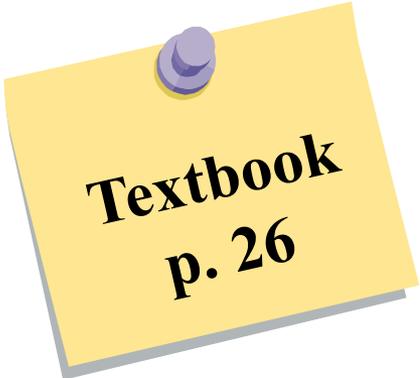
# "Supersize" Tool: Authentic Problems



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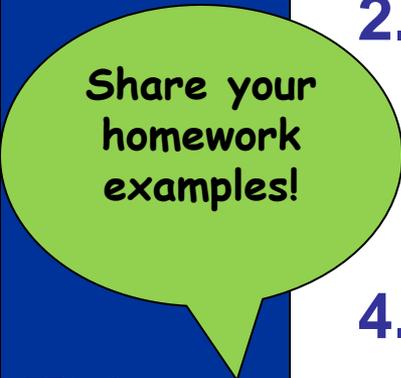
# Authentic Problems- problems presented in context



Textbook  
p. 26

## Guidelines for Developing

1. Apply desired math content.
2. Use a non-contrived scenario.
3. Include real-world numbers with appropriate units of measure.
4. Remain faithful to the selected occupational area.
5. Include some extraneous data.
6. Avoid hand-holding or step-by-step guidance.



Share your  
homework  
examples!

**See Examples of non-authentic problems**

# Structured Sharing: Peer Review

Record each assessment question (from your homework) on a note card....circulate to peers so they can write suggestions, study your peers' problems looking at (1) guidelines (pg. 26) and (2) level of question

Use back of note card to make comments



# "Supersize" Tool: Literacy Strategies



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# Reinforce Numeracy through Literacy Strategies

- Identify literacy strategies that support priority readiness indicators
- Example strategies in your planner, pages 38-39



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# Keep the momentum!

Where do we go now?

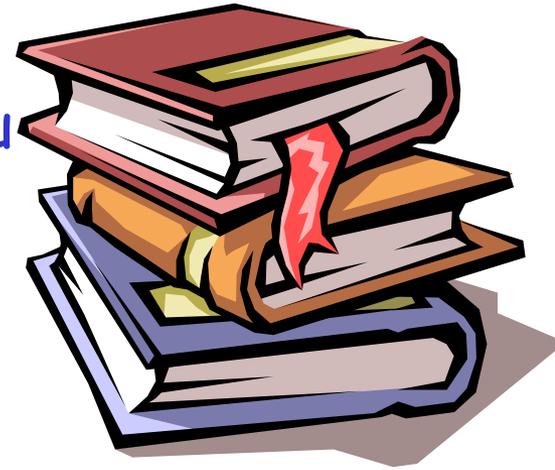


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# School Team Action Planning

- How do you plan to implement what you have learned when you return to school?
- What planning steps are you going to take?
- Develop your lessons using the check list in your planner (page 40)
- Tools include: RAP, T-Chart, authentic problems, recorded questions of various levels



# Goals for our December 9<sup>th</sup> Session

- CTE Teachers *and* mathematics partners: create and teach five (5) math-enhanced lessons for CTE classroom
- Lessons criteria on page 40
- Make a presentation about your lessons
  - Tell us about the context of each
  - Tell us how your efforts impacted student understanding
  - Provide a copy of Cycle-of-Learning lesson plan for each



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Keep "super-sizing" that  
Numeracy!

Kathleen McNally

[Kathleen.mcnally@sreb.org](mailto:Kathleen.mcnally@sreb.org)

See you in  
December!

Thank you for the awesome  
opportunities you provide across  
South Carolina!

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