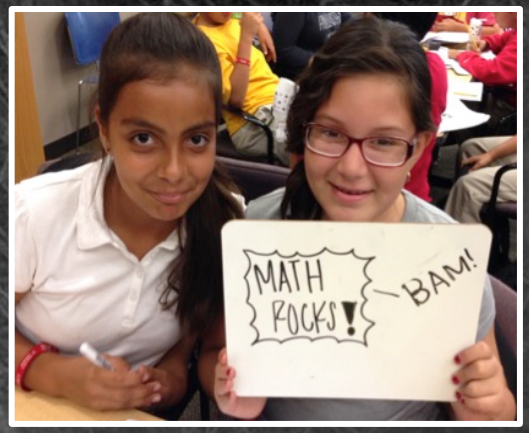
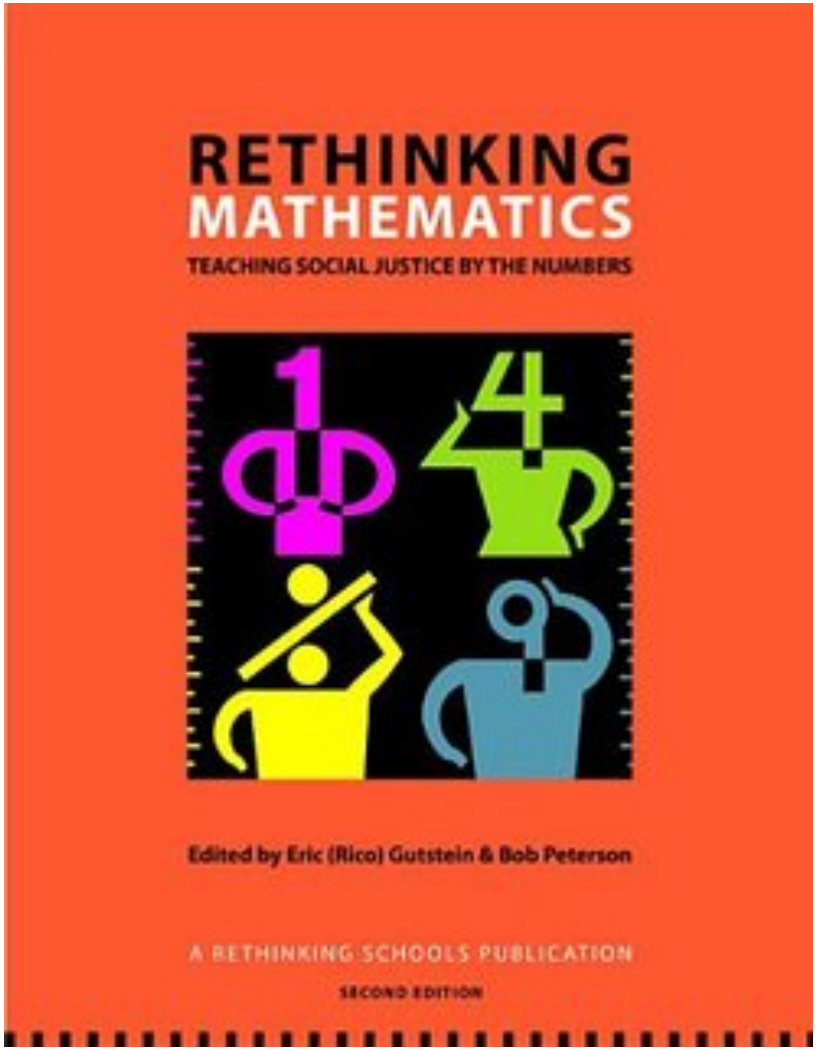
Stimulating math curriculum

(for students from challenging socio-economic backgrounds)



Alessandra Pantano, University of California, Irvine

"If students are not taught how math can be applied in their lives, they are robbed of an important tool to help them fully participate in society."



A. Fitness and Nutrition

For elementary school kids

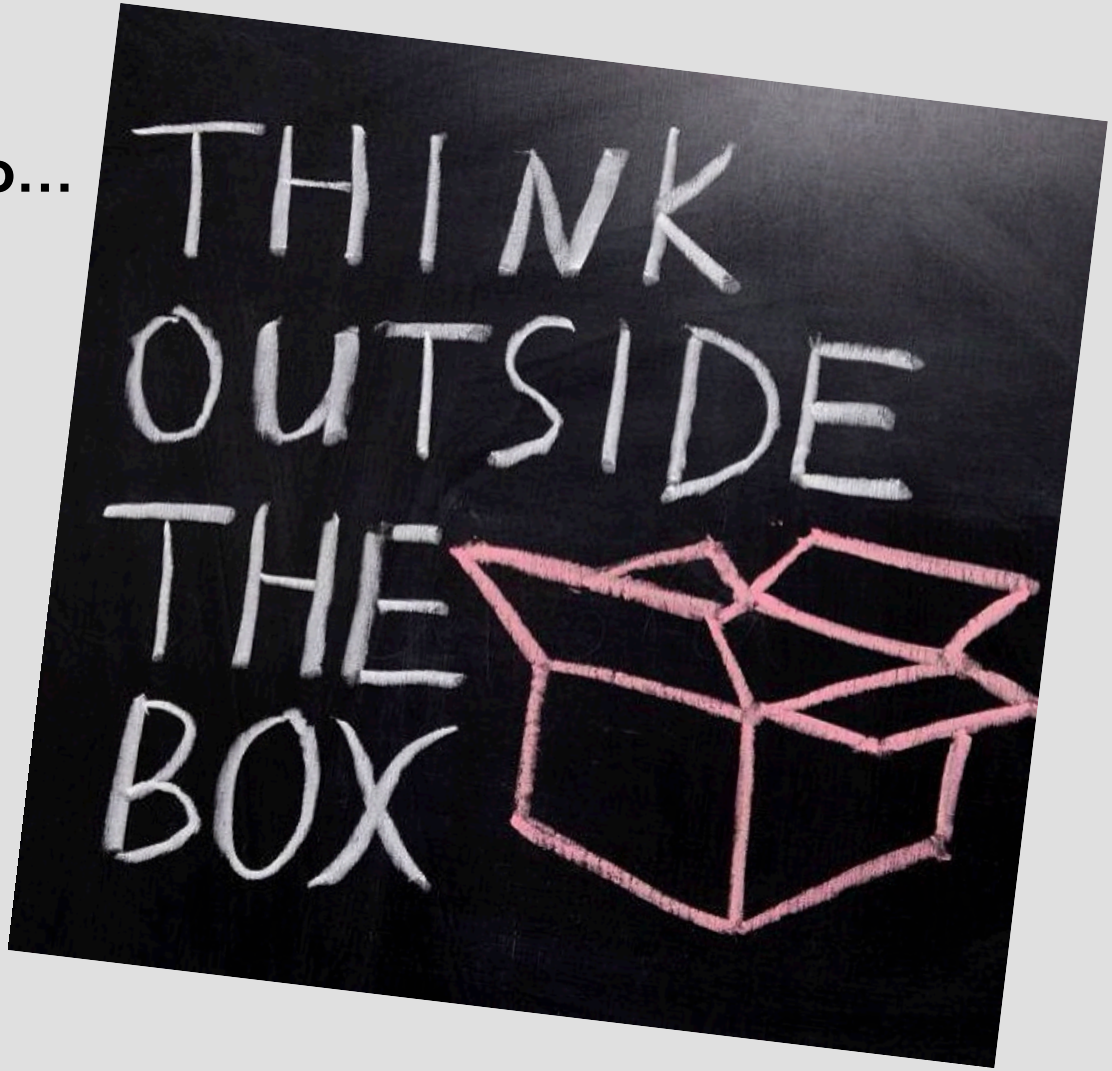
B. Water preservation

For Math and Science Teachers

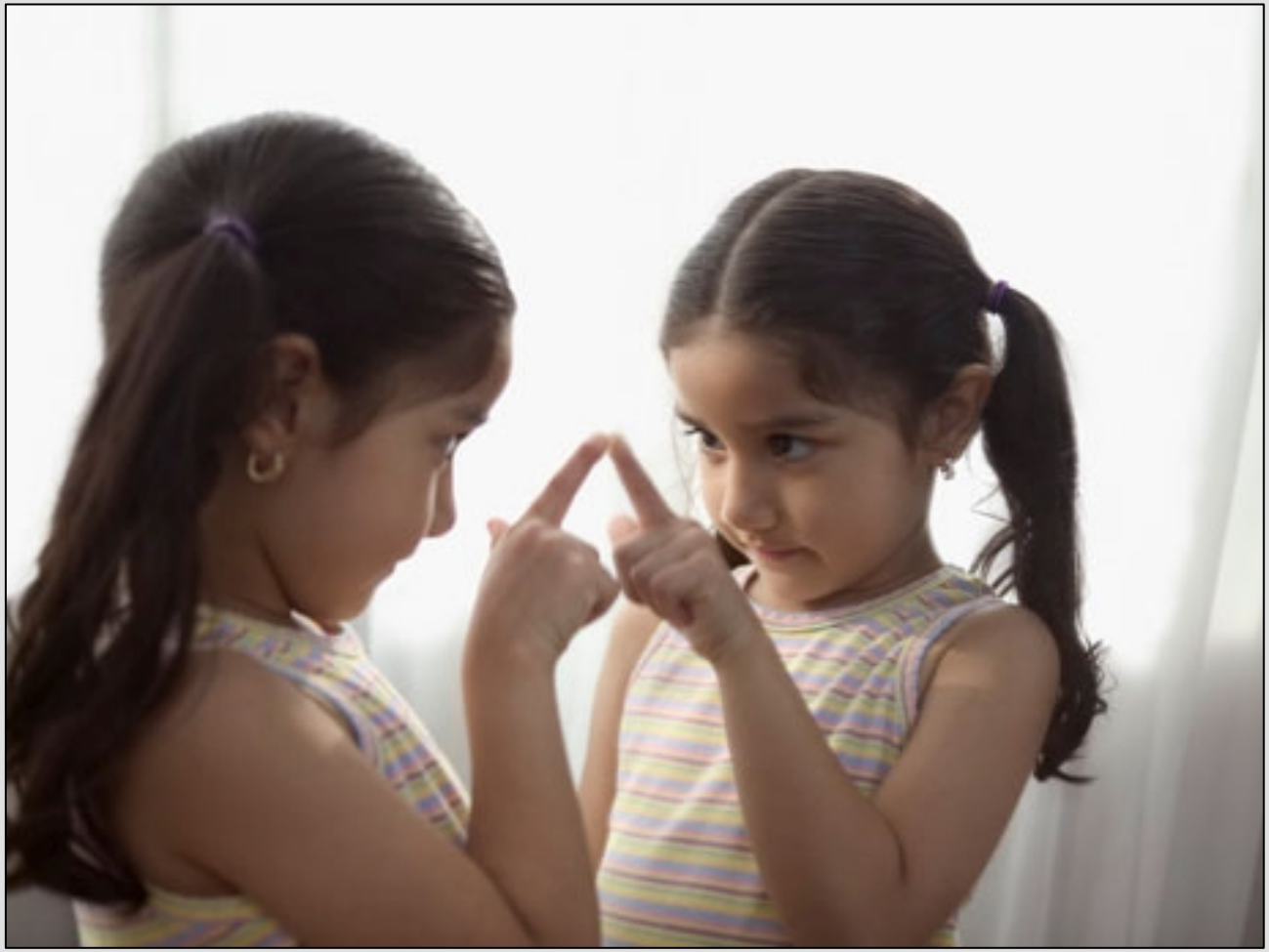
Common goals

Common goals:

1) Challenge students to…

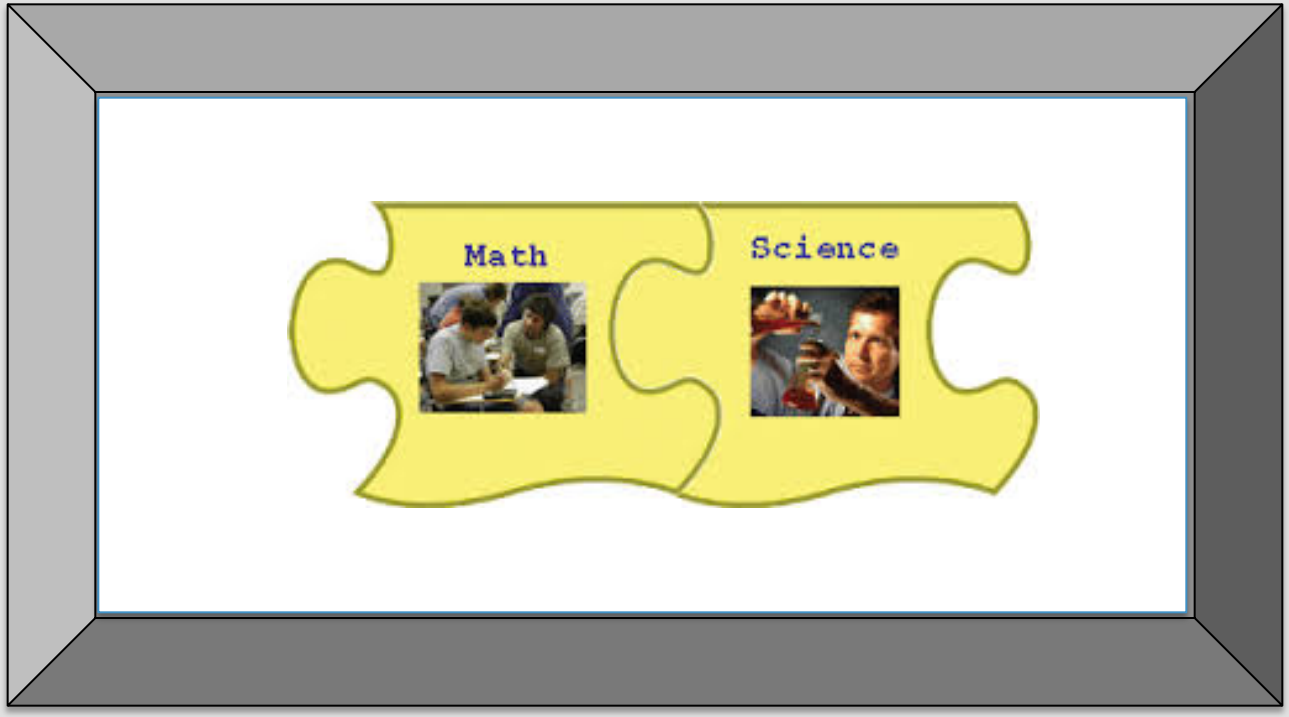


2) Let students reflect upon issues that directly affect their lives



3) Comply with the CA Standards of Mathematical Practice, and help students learn/review/practice the fundamentals.

4) Facilitate the integration of math and science



A. Fitness and Nutrition

THE GREEN PROJECT

SCHOOL OF MEDICINE
UNIVERSITY of CALIFORNIA · IRVINE

Madison Park NEIGHBORHOOD ASSOCIATION MPNA

The UCI School of Medicine and the Madison Park Neighborhood Association run

- **Saturday Science Academy** for children
- **Education and fitness classes** for parents.

DEPARTMENT OF MATHEMATICS
UNIVERSITY of CALIFORNIA · IRVINE

MADISON ELEMENTARY

Students at Madison Elementary	
Hispanic or Latino (mostly 4th-6th graders)	95.9%
Socioeconomically disadvantaged	94.8%
English learners	71.5%
Students meeting or exceeding state MATH standards	23%
5th graders meeting 4 (of the 6) state FITNESS standards	27.2%
5th graders meeting 5 (of the 6) state FITNESS standards	23.1%
5th graders meeting 6 (of the 6) state FITNESS standards	7.50%

Emphasis on fitness and nutrition

*Every fifth grader in the state of California takes the **CA State Physical Fitness Test** (6 components)

Math
Donald's

Mother's
day lunch

Math Donald's

Menu Item	
Double Quarter Pounder with Cheese	
Big Mac	
Artisan Grill Chicken Sandwich	
Bacon Clubhouse Burger	
Mc Chicken	
Cheeseburger	
Filet-O-Fish	

Menu Item	
Premium Southwest Salad w/ Buttermilk Crispy Chicken	
Premium Bacon Ranch Salad with Grilled Chicken	
World famous fries	
Fat Free Chocolate Milk Jug	
McCafé Strawberry Shake	
McCafé Iced Coffee	
Diet coke	

Menu Item	
McFlurry with M&M'S	
Soft Baked Chocolate Chip Cookie	
Vanilla Cone	
Baked Apple Pie	

A meal @ Math Donald's

Order your favorite meal from the Math Donald's menu. Your meal should include:

- *A **sandwich or** a **salad***
- *A **drink***
- ***Fries** and/or a **dessert**.*

On a scale from 1 to 10, how much do you enjoy the the meal you pick?

1	2	3	4	5	6	7	8	9	10

Color the boxes (1 square per "appreciation point").

*Let's think about the **nutritional value** of your favorite Math Donald's meal (all items combined).*

What **percentage of the suggested daily intake of calories, fat and sodium** do you think is in your meal?

Color the boxes. Each box is 10%...

100%

CALORIES

100%

TOTAL FAT

100%

SODIUM

Calories Needed Each Day for Boys and Men

Age	Not Active	Somewhat Active	Very Active
2–3 years	1,000–1,200 calories	1,000–1,400 calories	1,000–1,400 calories
4–8 years	1,200–1,400 calories	1,400–1,600 calories	1,600–2,000 calories
9–13 years	1,600–2,000 calories	1,800–2,200 calories	2,000–2,600 calories
14–18 years	2,000–2,400 calories	2,400–2,800 calories	2,800–3,200 calories
19–30 years	2,400–2,600 calories	2,600–2,800 calories	3,000 calories
31–50 years	2,200–2,400 calories	2,400–2,600 calories	2,800–3,000 calories
51 years and older	2,000–2,200 calories	2,200–2,400 calories	2,400–2,800 calories

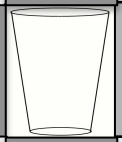
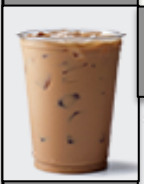
THE RECOMMENDED DAILY CALORIES INTAKE DEPENDS ON AGE, GENDER and LEVEL OF ACTIVITY

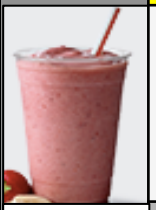
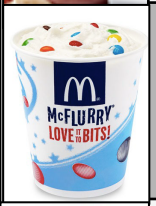
Calories Needed Each Day for Girls and Women

Age	Not Active	Somewhat Active	Very Active
2–3 years	1,000 calories	1,000–1,200 calories	1,000–1,400 calories
4–8 years	1,200–1,400 calories	1,400–1,600 calories	1,400–1,800 calories
9–13 years	1,400–1,600 calories	1,600–2,000 calories	1,800–2,200 calories
14–18 years	1,800 calories	2,000 calories	2,400 calories
19–30 years	1,800–2,000 calories	2,000–2,200 calories	2,400 calories
31–50 years	1,800 calories	2,000 calories	2,200 calories
51 years and older	1,600 calories	1,800 calories	2,000–2,200 calories

Students estimate the amount of calories they need for 1 day, and for 1 meal

	Menu Item	Calories	Total Fat (% of daily value)	Proteins (amount in grams)	Sugars (amount in grams)	Sodium (% of daily value)
	Double Quarter Pounder with Cheese	750	66%	48g	10g	53%
	Big Mac	540	45%	25g	9g	40%
	Artisan Grill Chicken Sandwich	360	9%	32g	11g	39%
	Bacon Clubhouse Burger	720	62%	39g	14g	61%
	Mc Chicken	370	25%	14g	3.5g	37%
	Cheeseburger	300	17%	7g	6g	31%
	Filet-O-Fish	370	29%	13%	5g	28%

	Menu Item	Calories	Total Fat (% of daily value)	Protein (amount in grams)	Sugar (amount in grams)	Sodium (% of daily value)
	Premium Southwest Salad w/ Buttermilk Crispy Chicken	510	40%	14%	28g	33%
	Premium Bacon Ranch Salad with Grilled Chicken	310	22%	38g	3g	47%
	World famous fries (small)	210	17%	3g	0g	6%
	Fat Free Chocolate Milk Jug	130	0%	9g	22g	6%
	Water	0	0%	0g	0g	0%
	McCafé Iced Coffee (with sugar free vanilla syrup)	130	12%	1g	2g	4%
	Diet coke	0	0%	0g	0g	1%

	Menu Item	Calories	Total Fat (% of daily value)	Proteins (amount in grams)	Sugars (amount in grams)	Sodium (% of daily value)
	McCafé Strawberry Shake	520	24%	11g	76g	7%
	McFlurry with M&M'S	650	35%	13g	89g	8%
	Soft Baked Chocolate Chip Cookie	170	12%	2g	21g	4%
	Vanilla Cone	170	8%	5g	20g	8%
	Baked Apple Pie	230	19%	2g	13g	7%

How healthy is your favorite Math Donald's meal?

Use the nutritional information provided in the tables to **compute the percentage of suggested daily intake of calories/fat/carbs and sodium contained in your favorite Math Donald's meal**.

Menu Item	**Calories Count**	**Your recommended daily calories intake**	**Total calories (as % of daily value)**	**Total fat (as % of daily value)**	**Total sodium (as % of daily value)**
Your Sandwich/ salad					
Your Fries					
Your Drink					
Your Dessert					
TOTAL MEAL					

Healthier options

Refer back to the nutritional tables.

Select items from the menu so that the **total amount of calories** for the meal (sandwich/salad, drink, fries and/or dessert) **is smaller than 750**.

MEAL 1	*MEAL 2*	*MEAL 3*
• _____	• _____	• _____
• _____	• _____	• _____
• _____	• _____	• _____
• _____	• _____	• _____
• _____	• _____	• _____
• _____	• _____	• _____


WILD
Expo

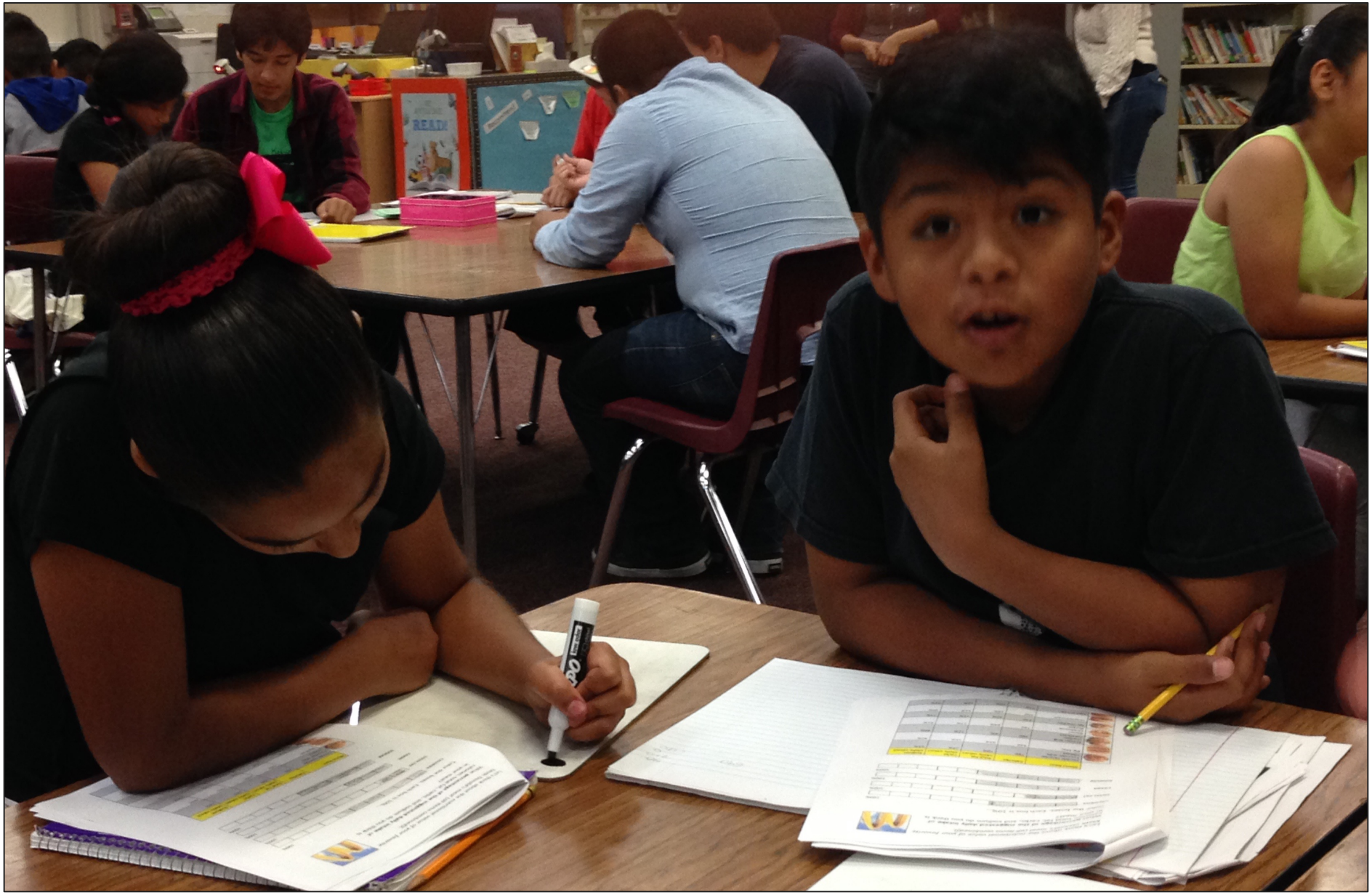
I enjoyed doing the Math Donalds.

Students gained a deeper appreciation of math

I learnd about Math to keep everyone Healthy.

I learned that math can be used in every thing!

Today I learn that in science you use math



We purposely kept the math relatively simple (4th graders in the group).

More challenging question

Find all menus (sandwich or salad, drink, fries and/or dessert) which give exactly 870 calories.

Sandwich or salad	Drink	Fries and/or dessert
Grill Chicken Sandwich (360)	Chocolate Milk (130)	Fries (210) + Cookie (170)
Grill Chicken Sandwich (360)	Coffee (130)	Fries (210) + Cookie (170)
Grill Chicken Sandwich (360)	Chocolate Milk (130)	Fries (210) + Vanilla cone (170)
Grill Chicken Sandwich (360)	Coffee (130)	Fries (210) + Vanilla cone (170)
Cheeseburger (300)	Chocolate Milk (130)	Fries (210) + Apple pie (230)
Cheeseburger (300)	Coffee (130)	Fries (210) + Apple pie (230)
Premium Southwest Salad w/ Buttermilk Crispy Chicken (510)	Chocolate Milk (130)	Apple pie (230)
Premium Southwest Salad w/ Buttermilk Crispy Chicken (510)	Coffee (130)	Apple pie (230)

Is your list is complete? How do you know?


Happy
mothers
Day

Mother's day lunch

Tomorrow, May 8 2016, it will be Mother's day.
You have decided to treat your mom for a special lunch at the Cheesecake Factory.

The menu looks delicious.

Your mom is undecided among three dishes:

- **Farfalle with chicken and roasted garlic**
- **Fresh grilled salmon**
- **Godiva® chocolate cheesecake.**

They are all really tasty, so she decides to order the most healthy one...
Can you help her choose?

FARFALLE WITH CHICKEN AND ROASTED GARLIC

Bow-Tie Pasta, Chicken, Mushrooms, Tomato, Pancetta, Peas and Caramelized Onions in a Roasted Garlic-Parmesan Cream Sauce.

Estimated calories: _____

FRESH GRILLED SALMON

Served with Mashed Potatoes and Broccoli

Estimated calories: _____

GODIVA® CHOCOLATE CHEESECAKE

Layers of Flourless Godiva Chocolate Cake, Godiva Chocolate Cheesecake and Chocolate Mousse.

Estimated calories: _____

After asking the waiter, you find out the calories content of each dish:

FARFALLE WITH CHICKEN AND ROASTED GARLIC

2190 Calories

FRESH GRILLED SALMON

830 Calories

GODIVA® CHOCOLATE CHEESECAKE

1110 Calories

The past dish contains more calories than you're supposed to eat in an entire day.

You'd better choose between salmon and chocolate cheesecake…. Both yummy!

Because it's mother's day (after all), you tell your mom to order both. Then you offer your mom to do some activities with her after lunch, to burn off the cheesecake calories…

You google "***how to burn off cheesecake calories***" on your mom's phone, and the following info comes up:

Calories burned in 15 minutes of...

Pushing a stroller with child	19
Walking the dog	25
Dancing tango	**34**
Dancing disco music	60
Playing soccer	102
Mountain biking	128
Swimming breaststroke	153

Pick an activity that you and your mom may enjoy doing together, and figure out *for how long* you should do that activity in order to burn off all of the (1110) cheesecake calories.

WHAT did you enjoy the most in the math circle meeting today?

I enjoy the most the mother's Day Lunch

The specific setting of the problem made it more enjoyable.

(Celebrating Mother's day is important for Latino kids.)

Students enjoyed the activity...They learned about ratios and proportions, but also fitness and health

WHAT did you enjoy the most in the math circle meeting today? (Please write one full sentence.)
I enjoyed learning about health.

I learned that math is a part of life and we always use math.

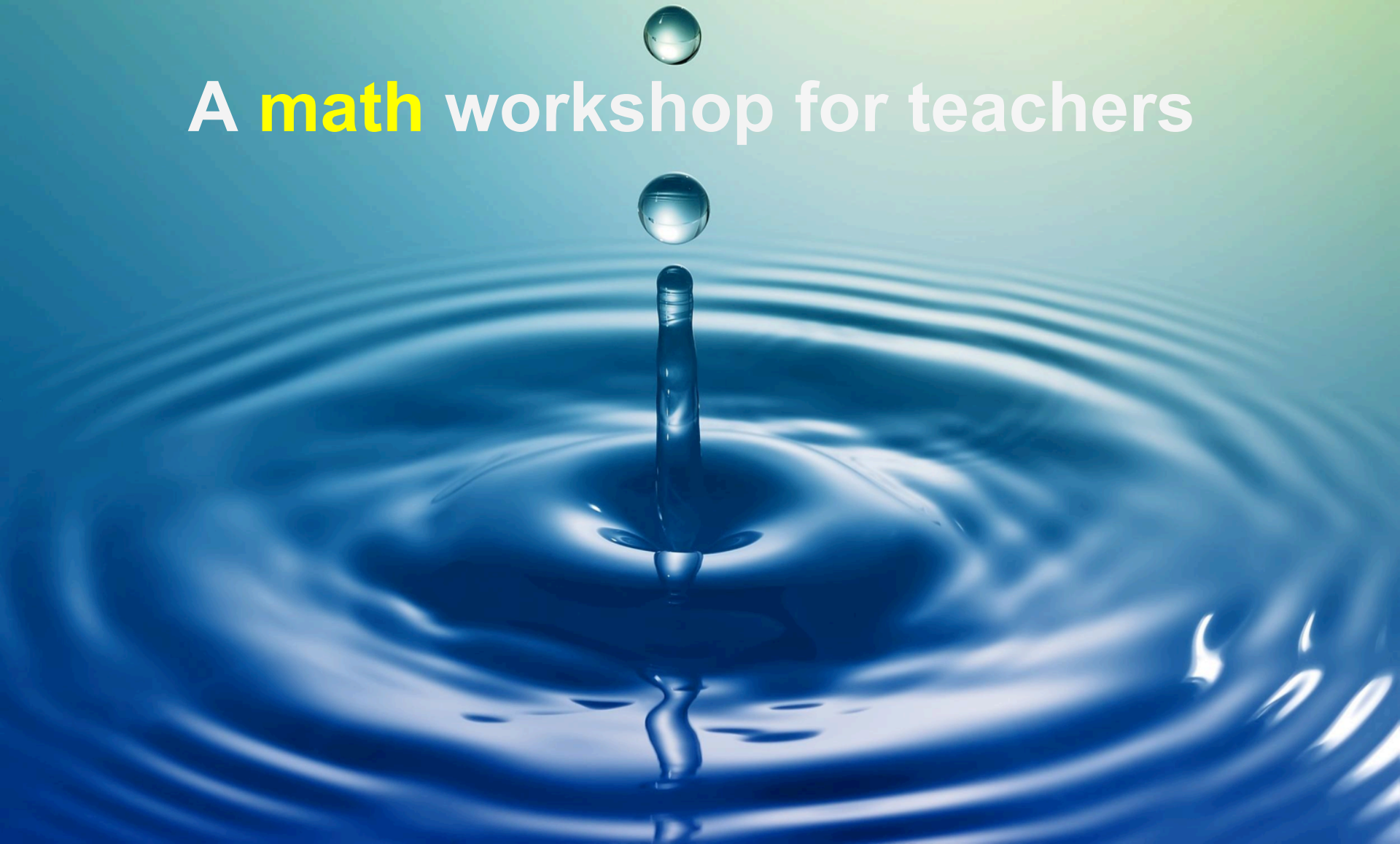
B. Water Preservation

- In collaboration with the Orange County Department of Education
- Teacher training program
- Math and Science Teachers

As CA drought worsens, the state encourages schools to develop science and engineering projects related to water conservation.

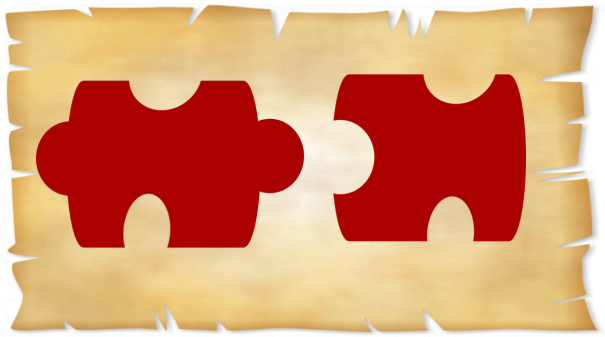
and math

Preserving CA water



A math workshop for teachers

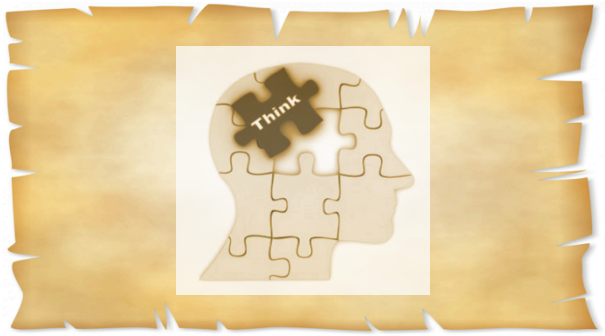
Used in (math and science) Teachers Training



PROBLEM SOLVING:

- **Solve** assigned math task with your group
- **Create a poster** that displays your reasoning
- **Prepare to share.** Engage in group conversation around your task

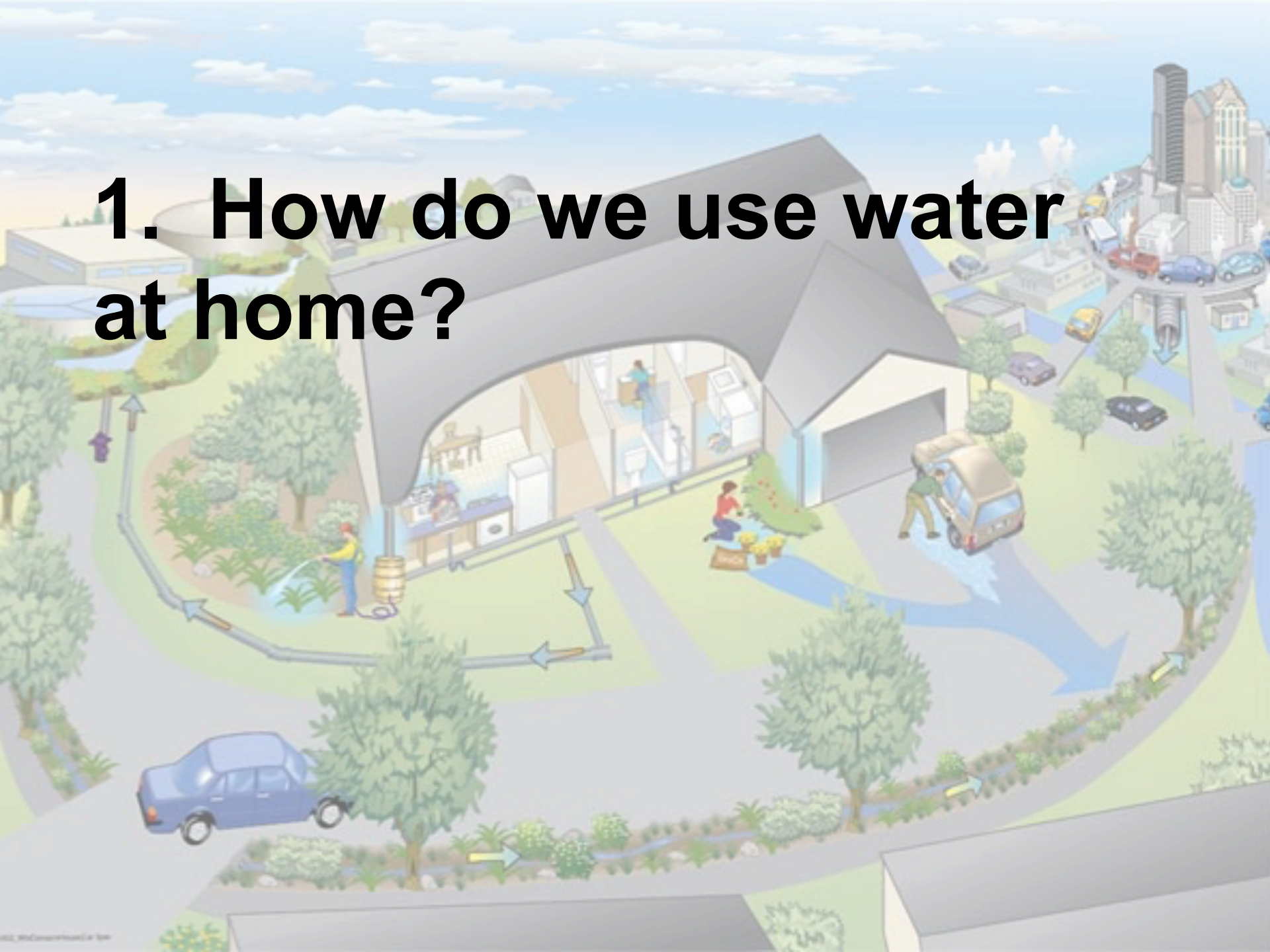
GALLERY WALK: Group's presenter stays with the poster and present. Other group members go from station to station. As you listen, fill out a chart to **decide which Standard for Math Practice** is most evident in each task.



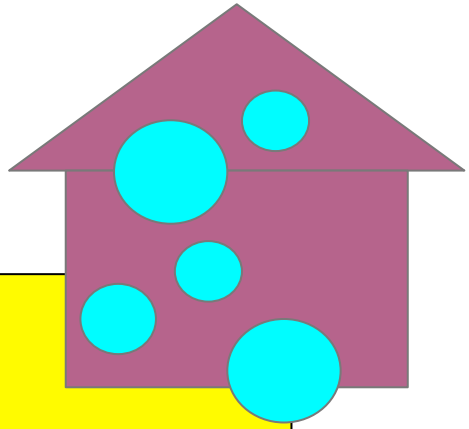
REFLECTIONS:

- ❑ *How do we provide opportunities for students to **reflect upon issues that directly affect their lives while getting at content standards?***
- ❑ *How do we support students in learning to **"think outside the box"?***

1. How do we use water at home?



Think about all the water we use daily at home.



What is bigger:

- the amount of water we use through faucets

or

- the amount of water we waste in leaks?

Which uses more water:

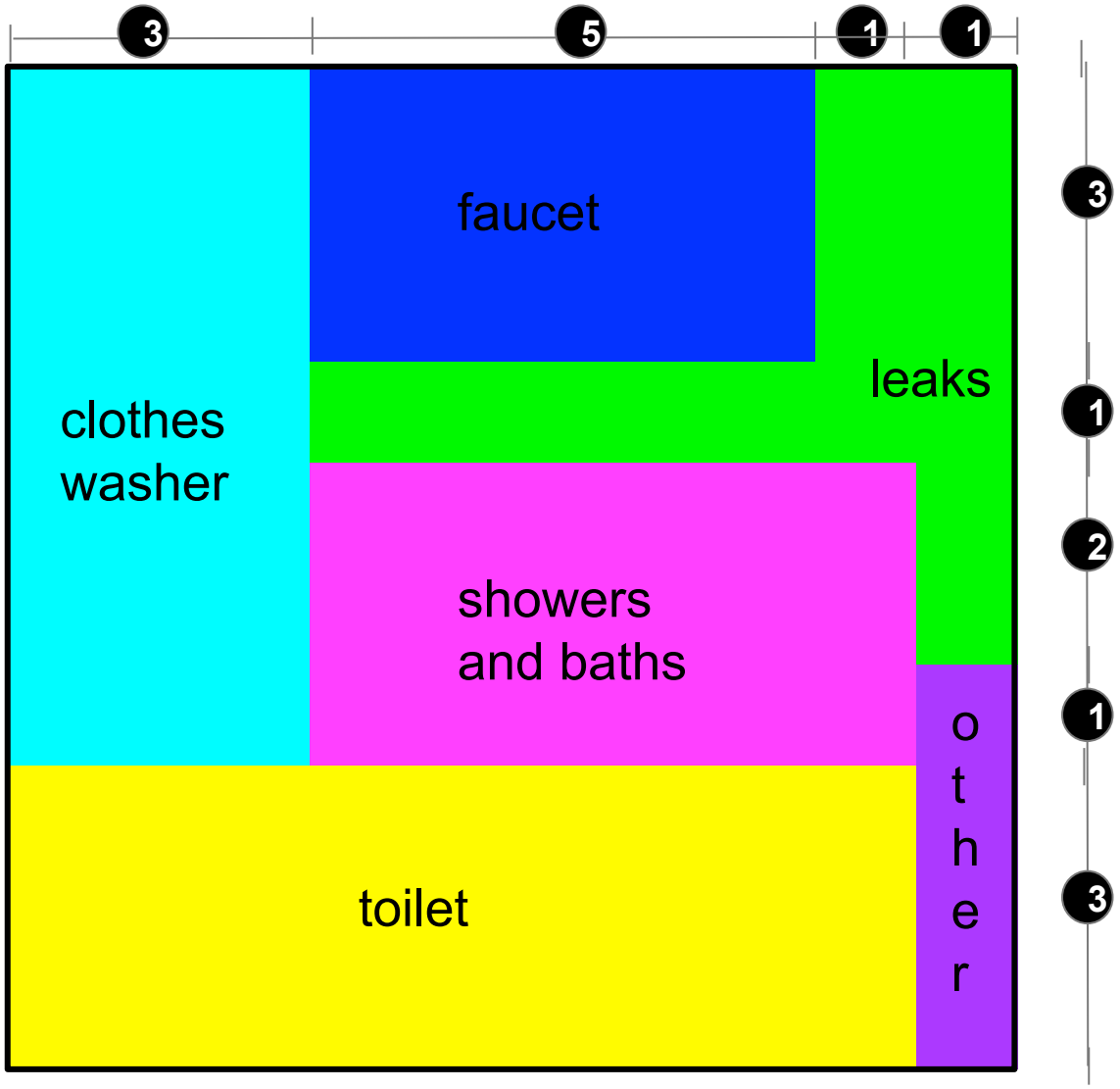
- flushing toilets

or

- washing clothes?

Answer quantitatively. Use the mathematical evidence provided on the next slide.

Each area is labeled with a different water use. Because the square is 10x10, its total area is 100. The area of each region is a fraction of 100, representing the percentage of water used for that activity.



2. Saving water in the shower

There are two ways to save water in the shower:

1) Take shorter showers

2) Install a slow-flow shower head.

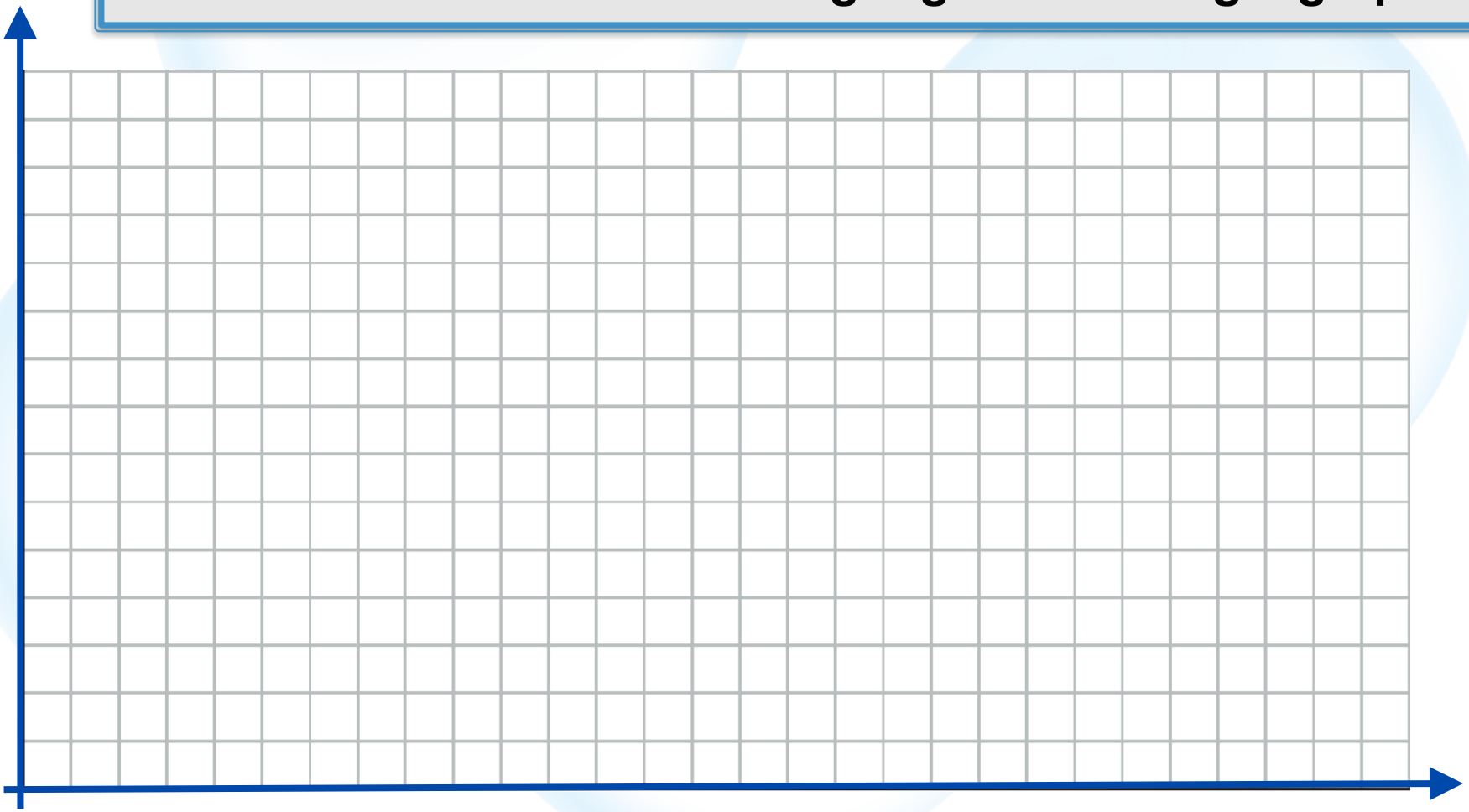
- **With a regular shower head, a 10 minutes shower uses 25 gallons of water.**
- **With a slow-flow shower head, a 10 minutes shower uses 20 gallons of water.**

How much water do you save on a 15 minute shower if you install a slow-flow shower head? **Solve this problem using as many different representations as you can.**

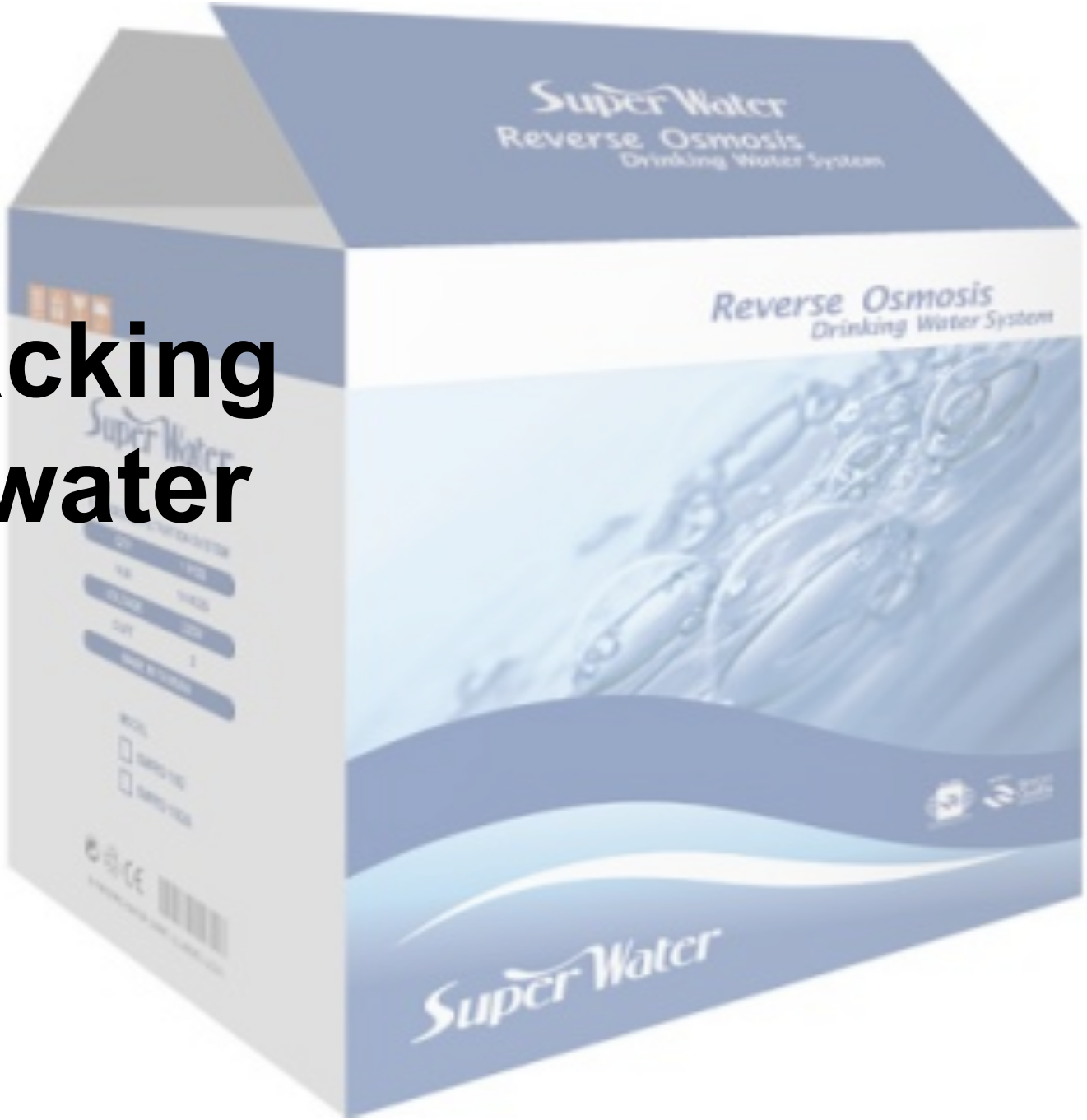
3. Shower or Bath?

A bath uses 55 gallons of water. On the other hand, the amount of water used in a shower depends on the length of the shower, for example a 10 minute shower (with regular shower head) uses 25 gallons of water.

After how many minutes does a shower use more water than a bath? **Build a convincing argument using a graph.**

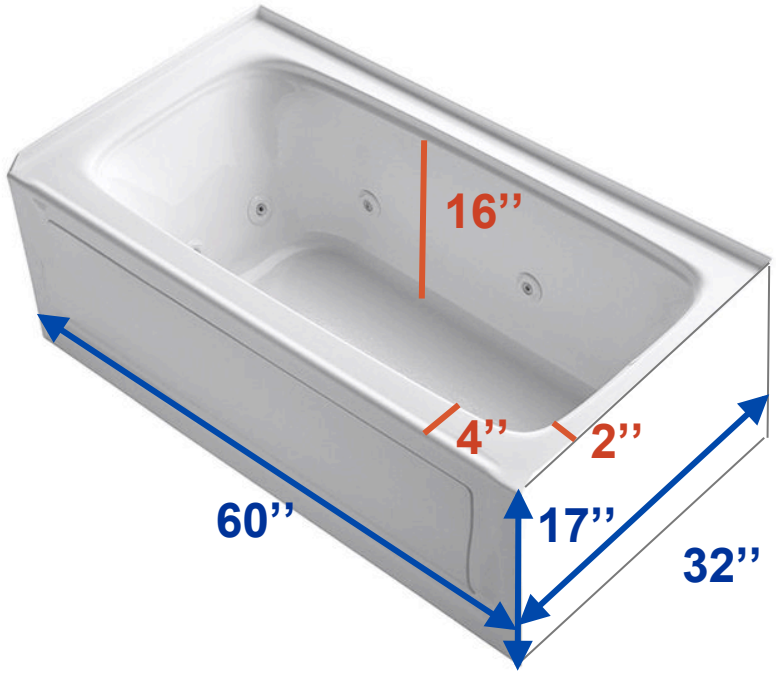


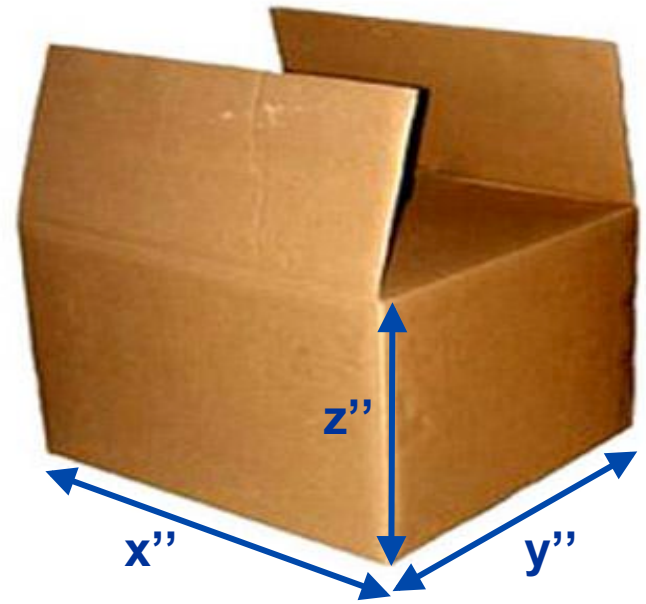
4. Packing the water



Design 10 boxes that would hold the same amount of water as the standard bathtub drawn below. The dimensions of the box (in inches) should be integers.

Box 1:	*Box 2:*	*Box 3:*	*Box 4:*	*Box 5:*	*Box 6:*	*Box 7:*	*Box 8:*	*Box 9:*	*Box 10:*
x = y = z =	x = y = z =	x = y = z =	x = y = z =	x = y = z =	x = y = z =	x = y = z =	x = y = z =	x = y = z =	x = y = z =





5. A visit to the Irvine Ranch Water District

5. A visit to the Irvine Ranch Water District

Jack and Jill are curious to find out where the water in Orange County comes from, so they go to the Irvine Ranch Water District and ask some questions.

The place is awesome.

A very wise worker explains to Jack and Jill that the water used by Orange County folks is obtained in 3 ways:

- ***Drilling local underground wells***
- ***Buying water from Northern California and Colorado***
- ***Recycling water.***

Jack and Jill are surprised, and ask more questions.

Do we really drink recycled water?
Why do we need to go all the way to Colorado to get our water?
How much water can we pull from underground?

The gentleman from the water district provides more details.

48%

Ground Water

(25 groundwater wells in Orange County)

27%

Imported water

(from CA Aqueduct and Colorado River Aqueduct)

21%

Recycled water

(reused for irrigation and other non-potable uses)

What about the rest?

Jill did not have time to add up those percentages in her head, yet… she instantly knew that the given numbers (48, 21 and 27) could not possibly add to 100.

Why not?

Choose one of the reasons below, and explain your choice.

A. If the sum of three numbers is *even*, each number must be *even*

B. If each of the numbers you add is a *multiple of 3*, then the resulting sum must be a *multiple of 3*.

C. If the resulting sum is a multiple of 5, each of the numbers you add must be a *multiple of 5.*

5 What about the rest?

$48+21+27 \neq 100$ without adding

$3a+3b+3c =$

$3(a+b+c)$

$3+6+9=18$

$6+12+15=33$

B is correct

must be multiple of 3

100 is not a multiple of 3.

A is false ...

Odd + Odd + Even = Even

5 + 7 + 4 = 16

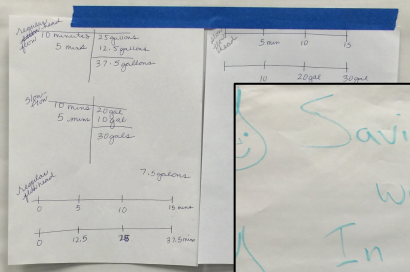
C is false ...

5 + 3 + 2 = 10

multiple of 5 — NOT multiples of 5 — multiple of 5

10 min. uses 25 gallons

10 min. uses 20 gallons



Regular flow

$\frac{10}{25} = \frac{5}{12.5} = \frac{3}{7.5} = \frac{15}{37.5}$

Slow flow

$\frac{5}{10} \cdot \frac{3}{4} = \frac{15}{20} = \frac{15}{30}$

$37.5 - 30 = 7.5$ gallons saved

Saving Water In The Shower

10 min.

$25 \div 10 = 2.5$ gpm

15 min.

$15 \times 2.5 = 37.50$

10 min.

$20 \div 10 = 2$ gpm

$10 \times 2 = 30.00$

4 Packing the Water

Bathtub

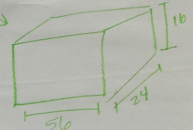
$60_{in} \times 32_{in} \times 17_{in}$

Minus sides

$56_{in} \times 24_{in} \times 16_{in}$

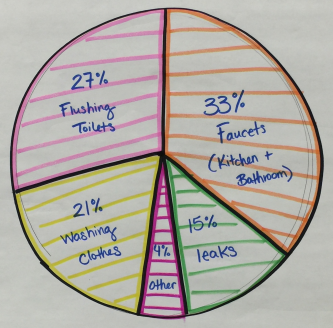
Volume = $21,504 in^3$

10 Boxes = Volume



1. $56 \times 24 \times 16$
2. ~~12×24~~ $\times \frac{2}{8} \times 8$
3. $32 \times 2 \times 336$
4. $42 \times 256 \times 2$
5. $14 \times 24 \times 64$
6. $8 \times 168 \times 16$
7. $56 \times 96 \times 4$
8. $28 \times 48 \times 16$
9. $21 \times 16 \times 64$
10. $28 \times 24 \times 32$

Inside Home Water Usage



- Faucets use more water than leaks.
- Flushing toilets use more water than washing clothes.

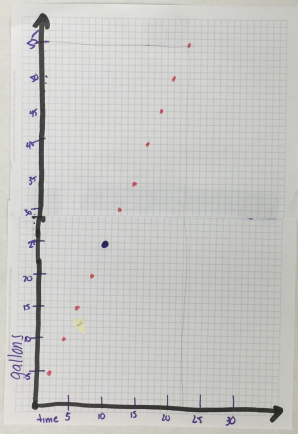
$Y = 2.5X$

$Y > 22$ min

$\frac{25}{10} = \frac{10x}{10}$

$2.5 = x$

↑ linear (slope)



BATH = 55 gal

(10, 25) given

(20, 50) - Double

$\frac{10}{25} = \frac{x}{55}$ Rate

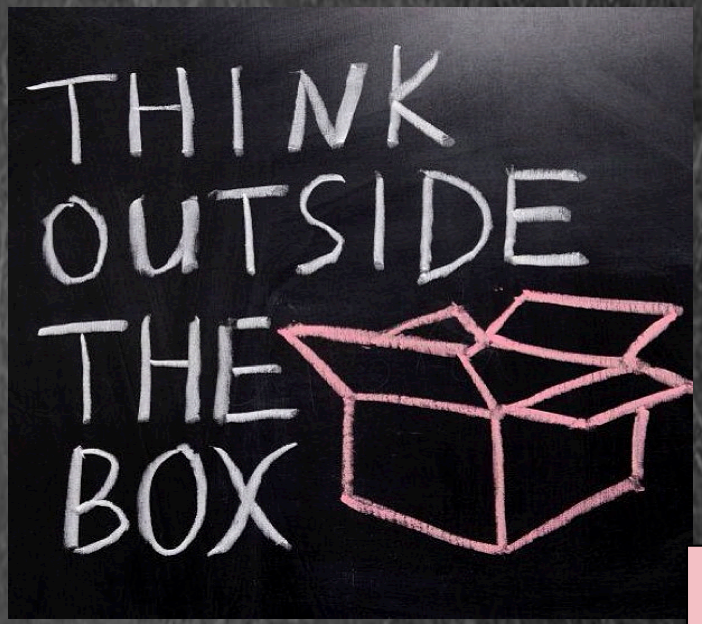
Reflections

- Water Conservation Tasks will connect to district areas of focus
- Saw ways to extend tasks to re-engage Ss with the math @ various grades and across disciplines
- Through this collaboration extend to community

Reflection 2

- Math tied to Science
  - Coordinate between our two disciplines
- Importance of <u>how</u> Ss do the Math
  - Connection to Science Processes
- Connected w/ their PBL (water conv. based)
- Challenge: How to tie it in with other materials? Time. Flipped Classroom. Access to internet from home

I too will apply the math lessons with water as a 4th grade lab using the water lab we got from discovery center and moving into a PBL type unit with math lessons and how they can conserve water and electricity in their home.



GET AT CONTENT STANDARDS

= A more meaningful and more enjoyable mathematical experience for the kids.

Helping a friend

It is recommended that people at risk of developing type 2 diabetes limit the daily sugar intake to

- 22 grams for adult women
- 36 grams for adult men
- 12 grams for children.

Reducing daily intake of fat can also prevent diabetes. Think of a person you know who has pre-diabetes, or is risk of developing type-2 diabetes, and design an optimal Math Donald's meal for your friend. It should be yummy, nutritious, and low in calories, fat and sugar.