Evergreen Public Schools

ROBERT KAPLINSKY

@robertkaplinsky

THIS UNIT NOT LABELED FOR INDIVIDUAL RETAIL SALE
1 FIRST QUALITY 1
Ralphs
grade AA
butter
NET WT. 4 OZ. (113g)

☐ 1/3 cup butter

☐ 1/3 cup white sugar

☐ 3 tablespoons and 1-3/4 teaspoons packed brown sugar

☐ 1/3 cup peanut butter

☐ 1/4 teaspoon vanilla extract

How can we tell where to cut the butter so you have 1/3 of a cup?

THIS UNIT NOT LABELED FOR INDIVIDUAL RETAIL SALE.

Ingredients: Pasteurized Cream, Salt.

DISTRIBUTED BY: RALPHS GROCERY CO. LOS ANGELES, CALIF. 90054

1 Tbsp.	2 Tbsp.	3 Tbsp.	4 Tbsp.	5 Tbsp.	6 Tbsp.	7 Tbsp.	8 Tbsp.

1/4 cup

1 FIRST QUALITY 1

Ralphs grade AA butter

NET WT. 4 OZ. (113g)

- ☐ 1/2 cup butter
- ☐ 1/2 cup white sugar
- ☐ 1/3 cup packed brown sugar
- ☐ 1/2 cup peanut butter
- ☐ 1/2 teaspoon vanilla extract

How can we tell where to cut the butter so you have 1/2 of a cup?

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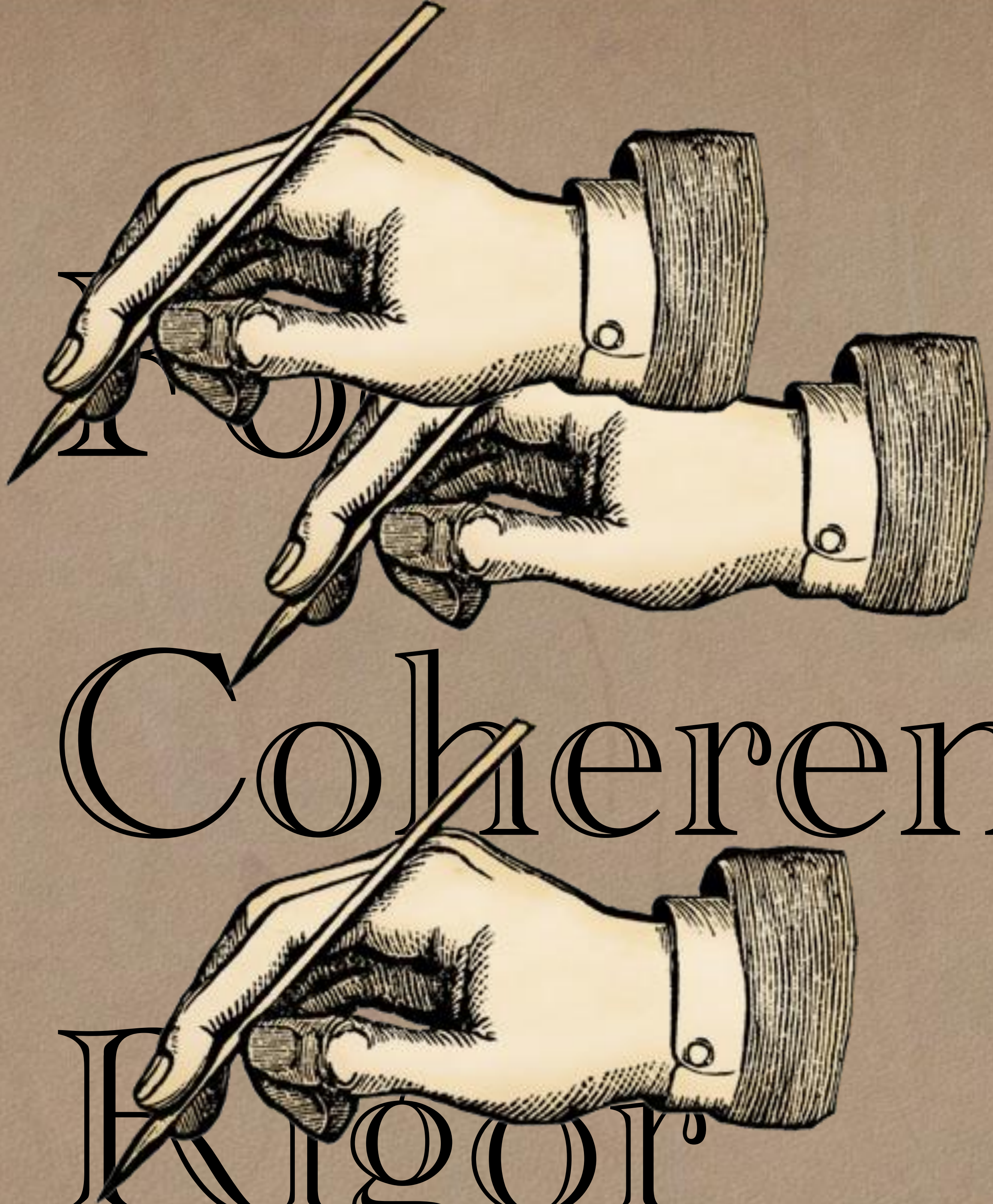
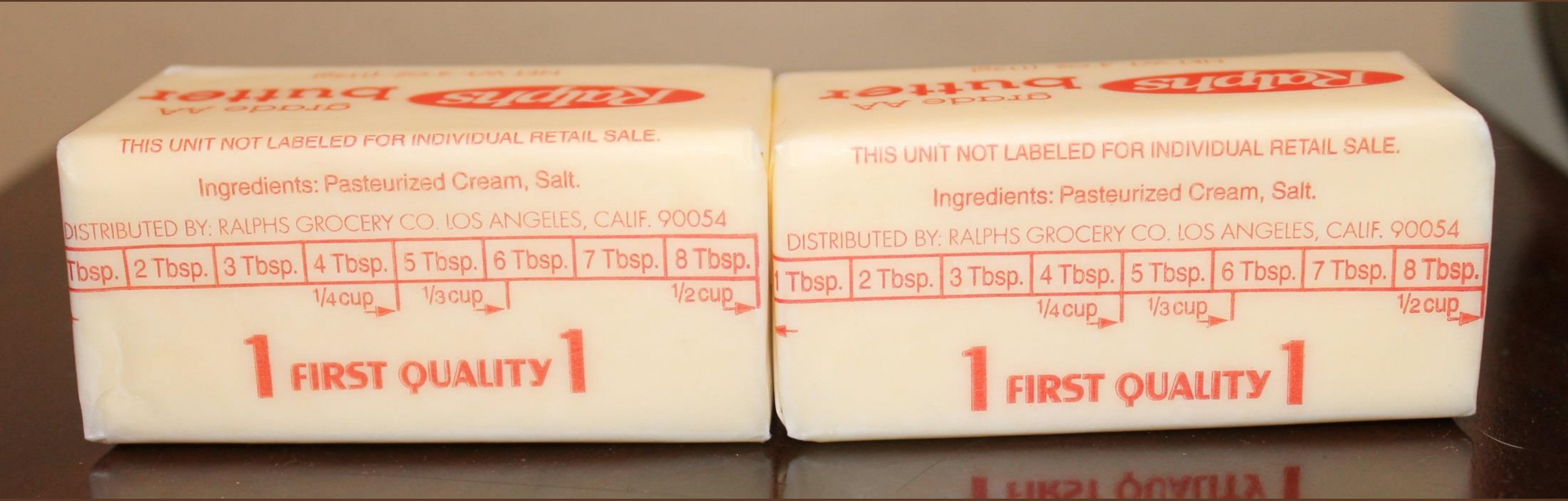


- Fo
- Coherence
- Rigor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1 FIRST QUALITY 1

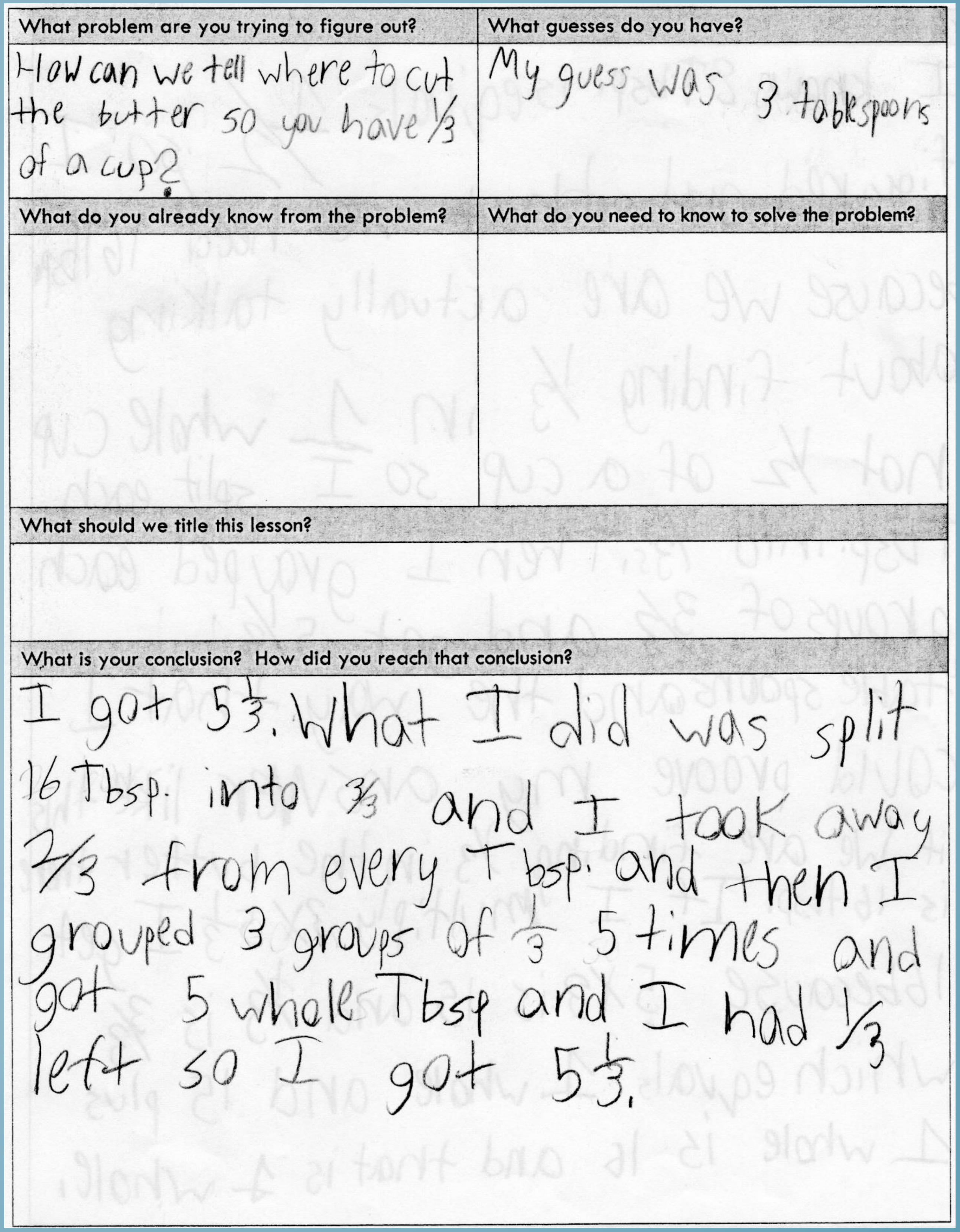
Standards for Mathematical Practice

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.

The Reality

- Students were not able to go straight to $\frac{1}{3}$ of a cup. We had to first do $\frac{1}{2}$ of a cup and then $\frac{1}{8}$ of a cup before returning to the original problem.
- It was very difficult for students to precisely apply the three different units of measure (cup, stick, and tablespoon).
- Students' lack of conceptual understanding of fractions led to many mini-lessons addressing issues such as:
  - Students thought that $\frac{1}{3}$ was smaller than $\frac{1}{4}$
  - Students thought that each tablespoon of butter corresponded with $\frac{1}{8}, \frac{1}{7}, \frac{1}{6}, \frac{1}{5}, \frac{1}{4}, \frac{1}{3}, \frac{1}{2},$ and 1.
  - Students simultaneously thought that $\frac{1}{2}$ of a stick was $\frac{1}{2}$ of a cup, even though it was labeled as $\frac{1}{4}$ of a cup.

STUDENT WORK

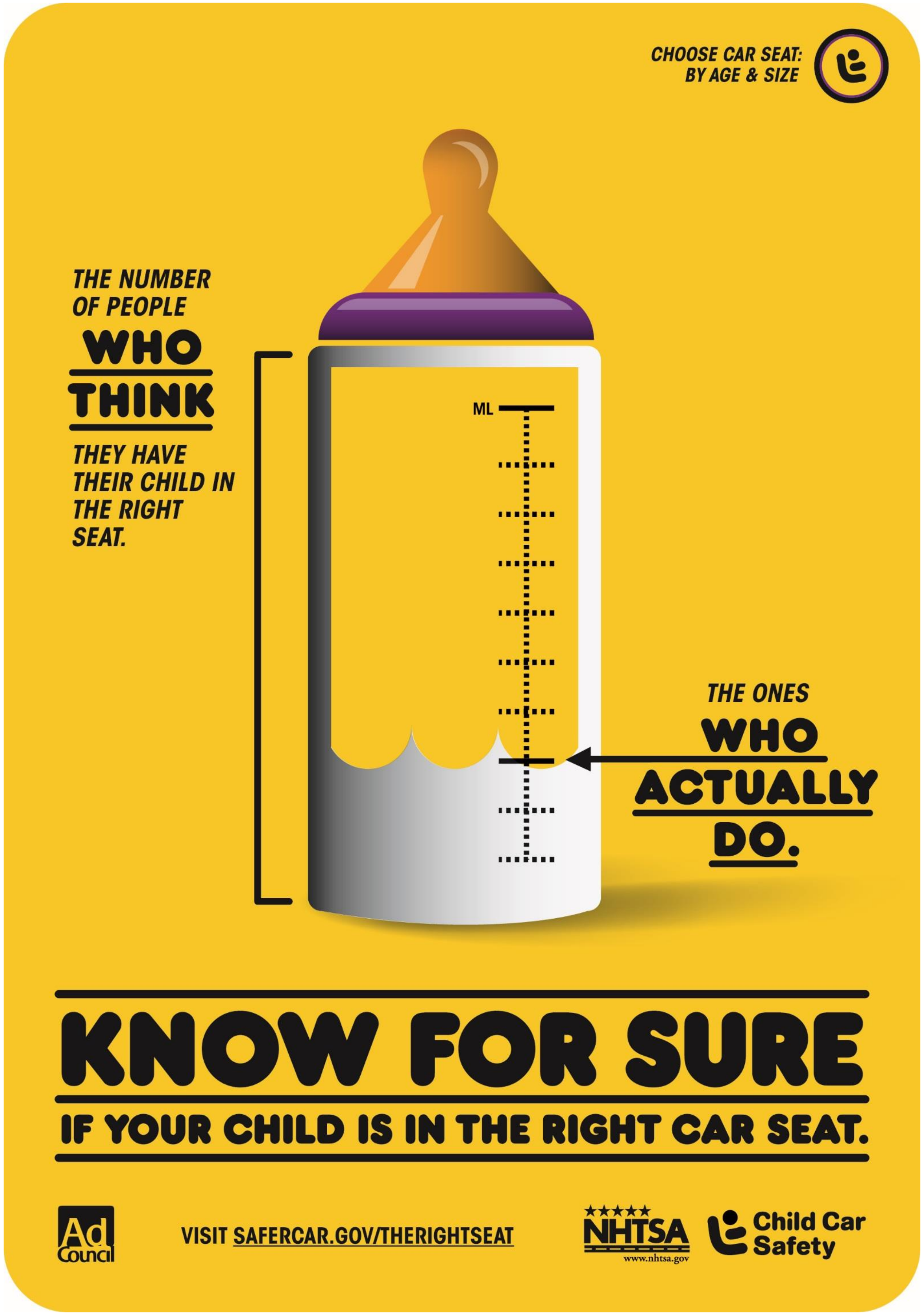


What problem are you trying to figure out?	What guesses do you have?
How can we tell where to cut the butter so you have $\frac{1}{3}$ of a cup?	My guess was 3 tablespoons
What do you already know from the problem?	**What do you need to know to solve the problem?**

What should we title this lesson?

What is your conclusion? How did you reach that conclusion?

I got $5\frac{1}{3}$. What I did was split 16 Tbsp. into $\frac{3}{3}$ and I took away $\frac{2}{3}$ from every Tbsp. and then I grouped 3 groups of $\frac{1}{3}$ 5 times and got 5 whole Tbsp and I had $\frac{1}{3}$ left so I got $5\frac{1}{3}$.



CHOOSE CAR SEAT:
BY AGE & SIZE

THE NUMBER
OF PEOPLE
WHO
THINK
THEY HAVE
THEIR CHILD IN
THE RIGHT
SEAT.

THE ONES
WHO
ACTUALLY
DO.

KNOW FOR SURE

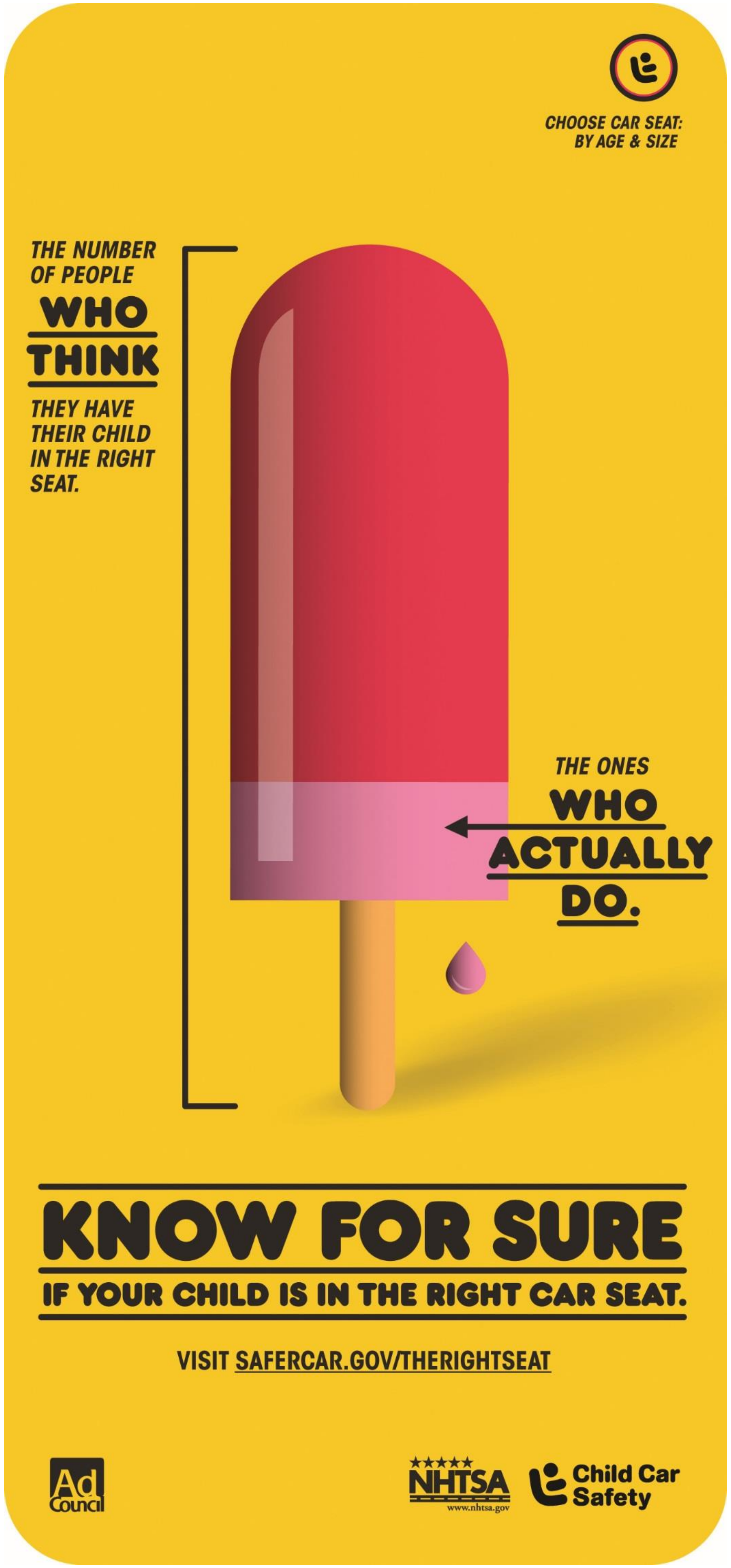
IF YOUR CHILD IS IN THE RIGHT CAR SEAT.

VISIT SAFERCAR.GOV/THERIGHTSEAT

Ad Council

NHTSA
www.nhtsa.gov

Child Car Safety



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Child Car Safety

There are 125 sheep and 5 dogs in a flock. How old is the shepherd?

What does it look like when students make sense of problems?

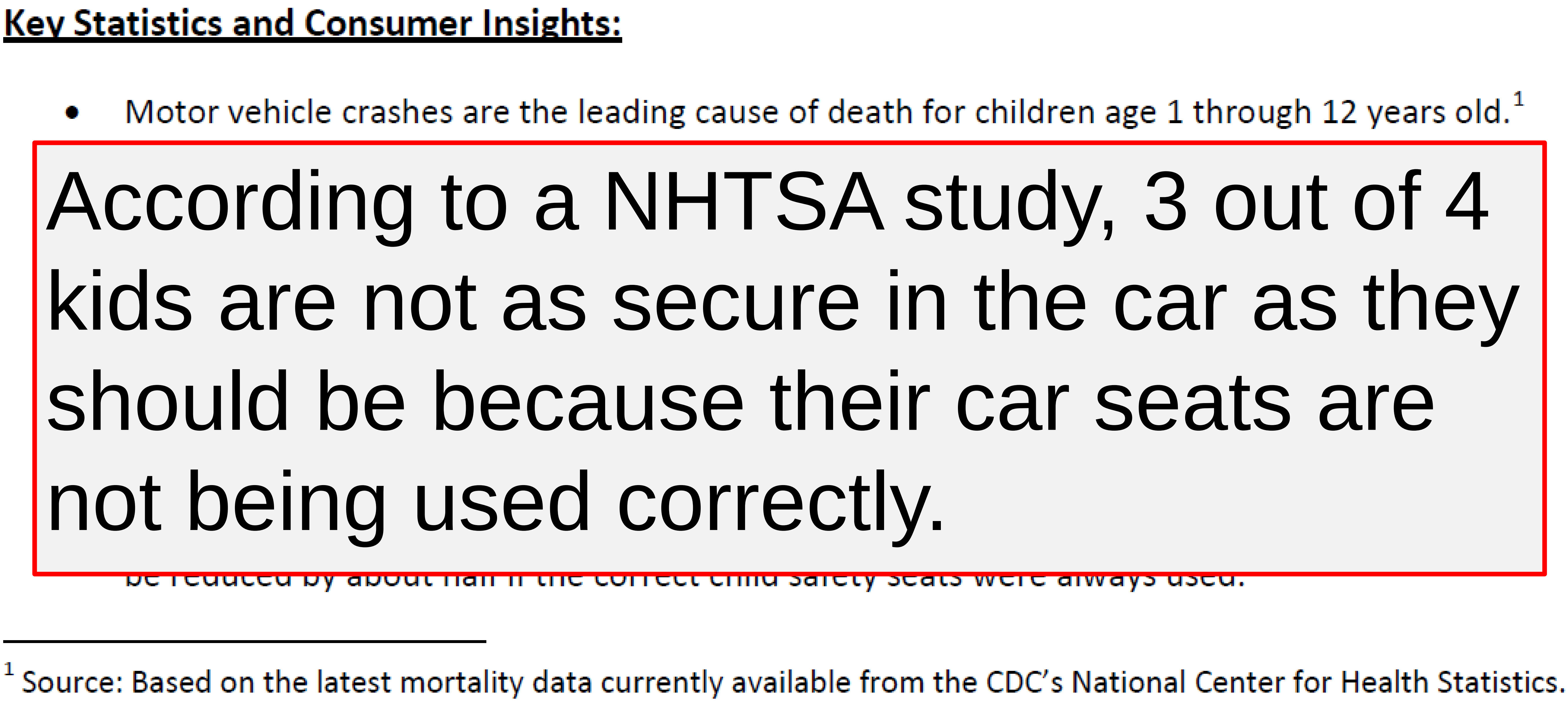
Of the 32 students I interviewed…

- 75% of them gave me numerical responses
- 2 students calculated the answer to be 130 (125 + 5)
- 2 students calculated the answer to be 120 (125 – 5)
- 12 students calculated the answer to be 25 (125 ÷ 5)
- 0 students calculated the answer to be 625 (125 x 5)
- 4 students stated that they guessed their answer (90, 5, 42, and 50)
- 4 students tried to divide 125 by 5 but could not correctly implement the procedure

Takeaways

- Making sense of mathematics
- Intellectual autonomy
    - Intellectual autonomy is about being able to think for yourself and not being dependent on others for the direction and control of one's thinking.

What Does the NHTSA Say?



Key Statistics and Consumer Insights:

- Motor vehicle crashes are the leading cause of death for children age 1 through 12 years old.[1]

be reduced by about half if the correct child safety seats were always used.

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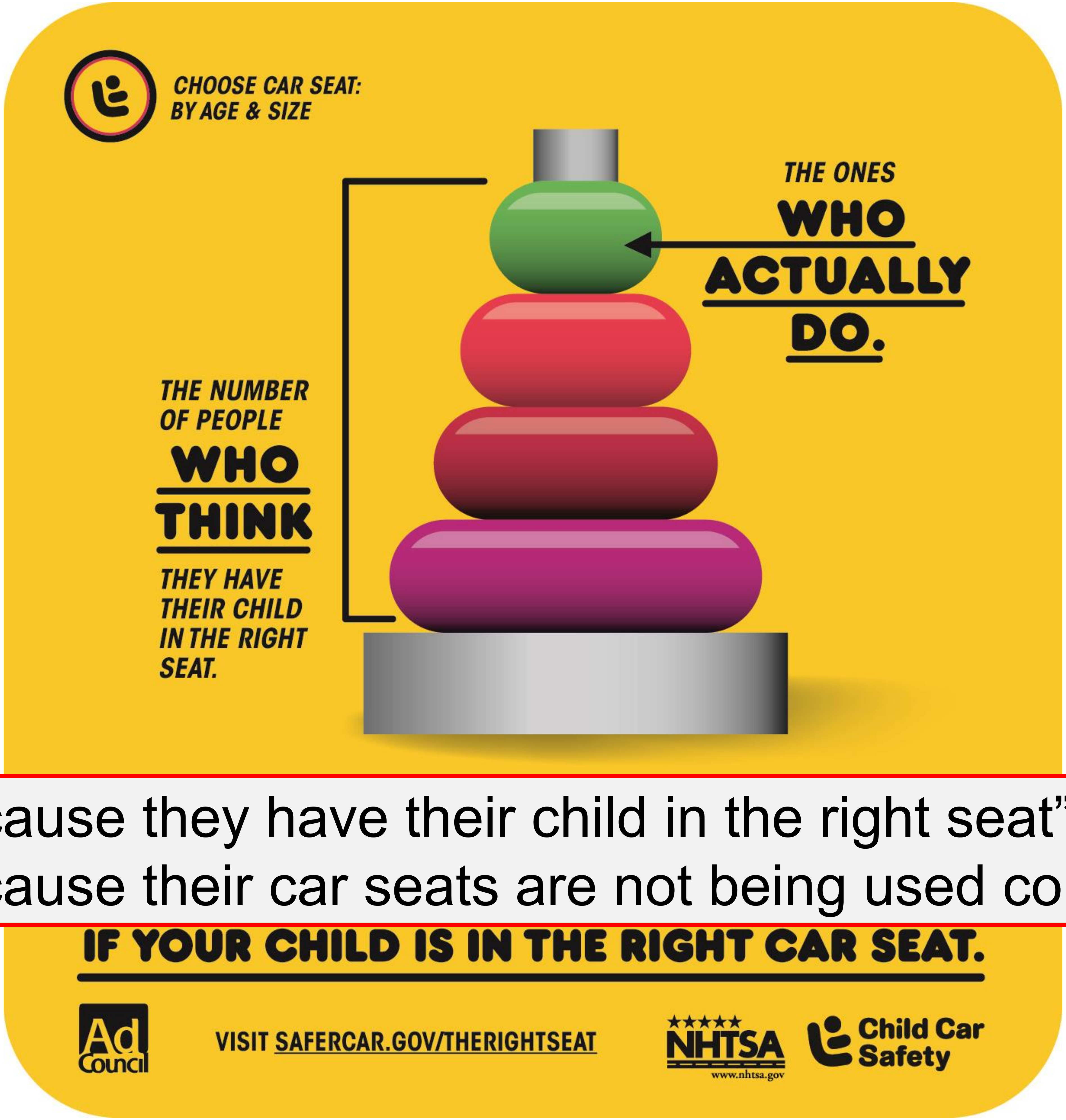
[1] Source: Based on the latest mortality data currently available from the CDC's National Center for Health Statistics.

According to a NHTSA study, 3 out of 4 kids are not as secure in the car as they should be because their car seats are not being used correctly.



CHOOSE CAR SEAT:
BY AGE & SIZE

THE NUMBER OF PEOPLE **WHO THINK** THEY HAVE THEIR CHILD IN THE RIGHT SEAT.

THE ONES **WHO ACTUALLY DO.**

- “because they have their child in the right seat”
- “because their car seats are not being used correctly”

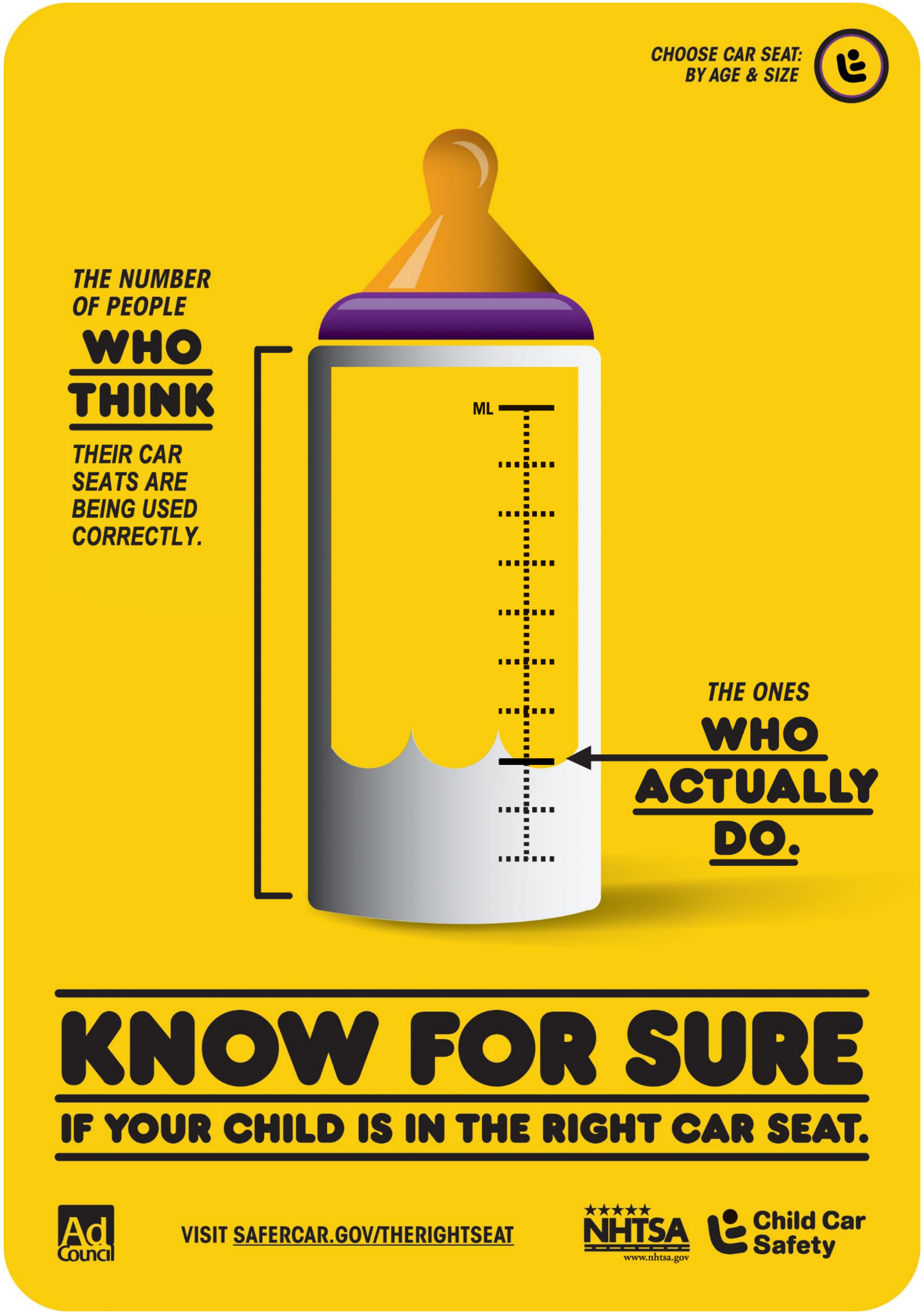
IF YOUR CHILD IS IN THE RIGHT CAR SEAT.

Ad Council

VISIT SAFERCAR.GOV/THERIGHTSEAT

NHTSA
www.nhtsa.gov

Child Car Safety



CHOOSE CAR SEAT:
BY AGE & SIZE

THE NUMBER
OF PEOPLE
WHO
THINK
THEIR CAR
SEATS ARE
BEING USED
CORRECTLY.

THE ONES
WHO
ACTUALLY
DO.

KNOW FOR SURE

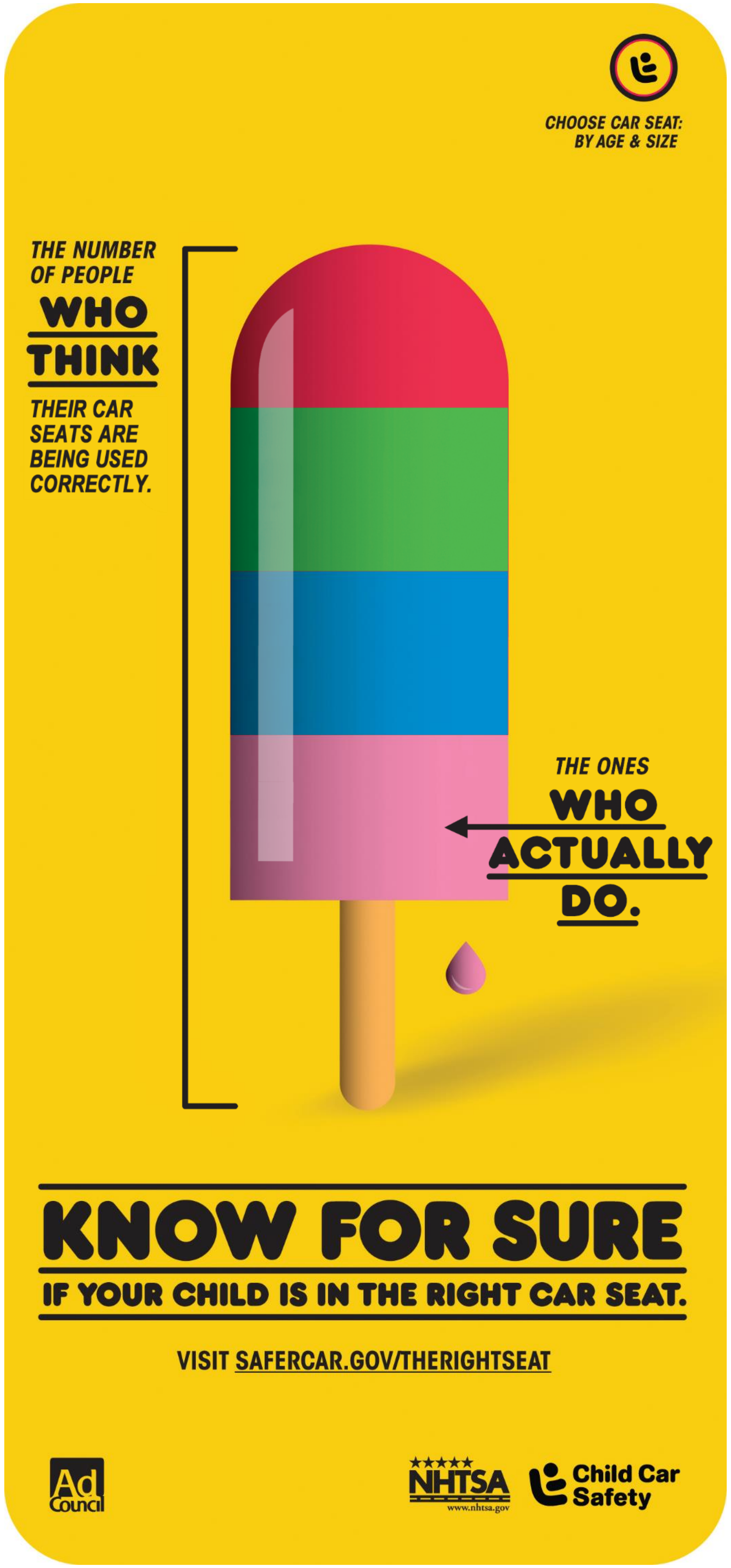
IF YOUR CHILD IS IN THE RIGHT CAR SEAT.

Ad Council

VISIT SAFERCAR.GOV/THERIGHTSEAT

NHTSA
www.nhtsa.gov

Child Car
Safety



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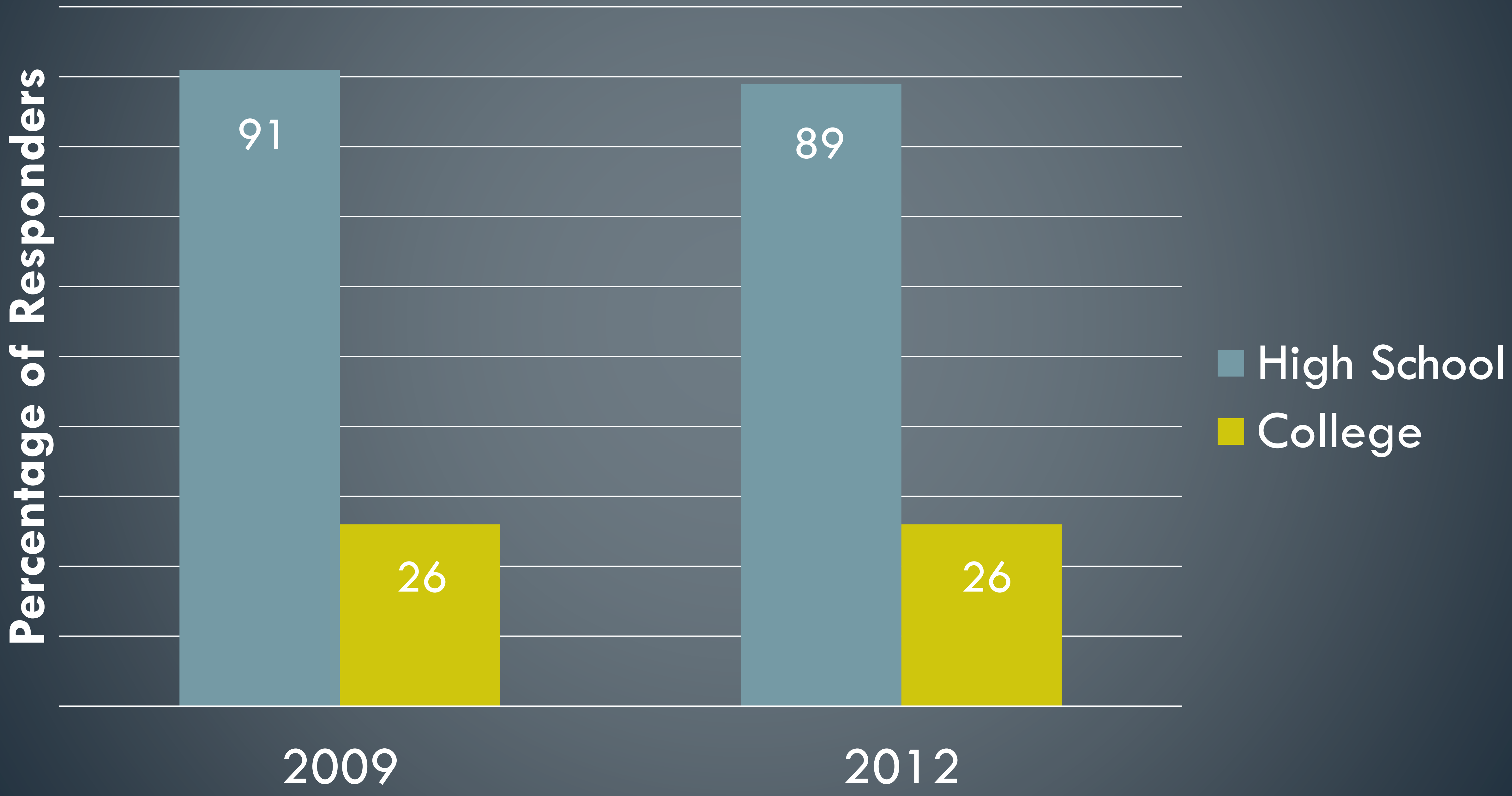
Child Car
Safety

WHAT IS THE PURPOSE OF A K-12 EDUCATION?

- *College readiness*
  - *ACT National Curriculum Survey*
  - *Surveyed 9,937 educators*

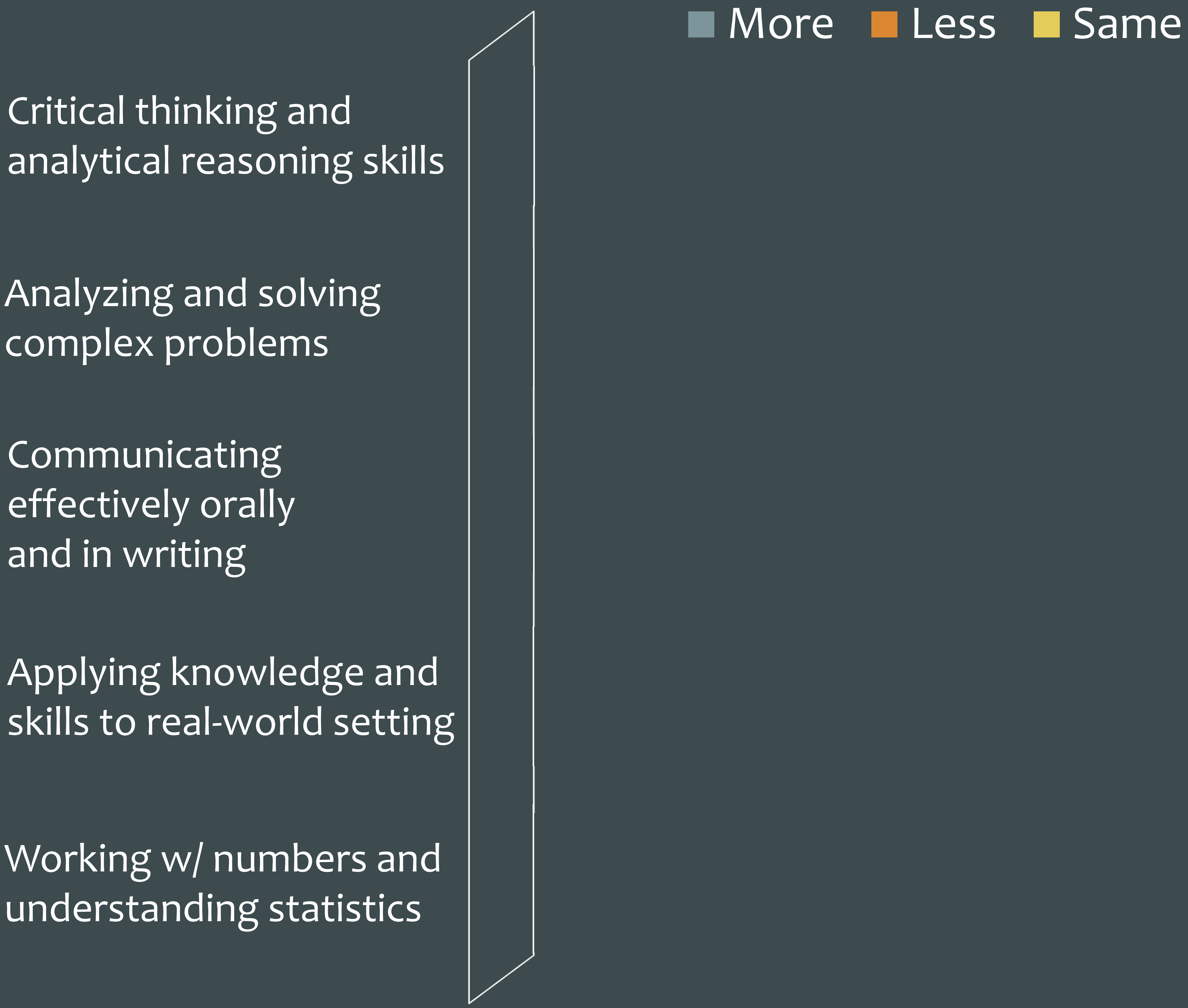
"Well" or "Very Well" Prepared for College



Source: http://www.act.org/research/policymakers/pdf/NCS-PolicySummary2012.pdf

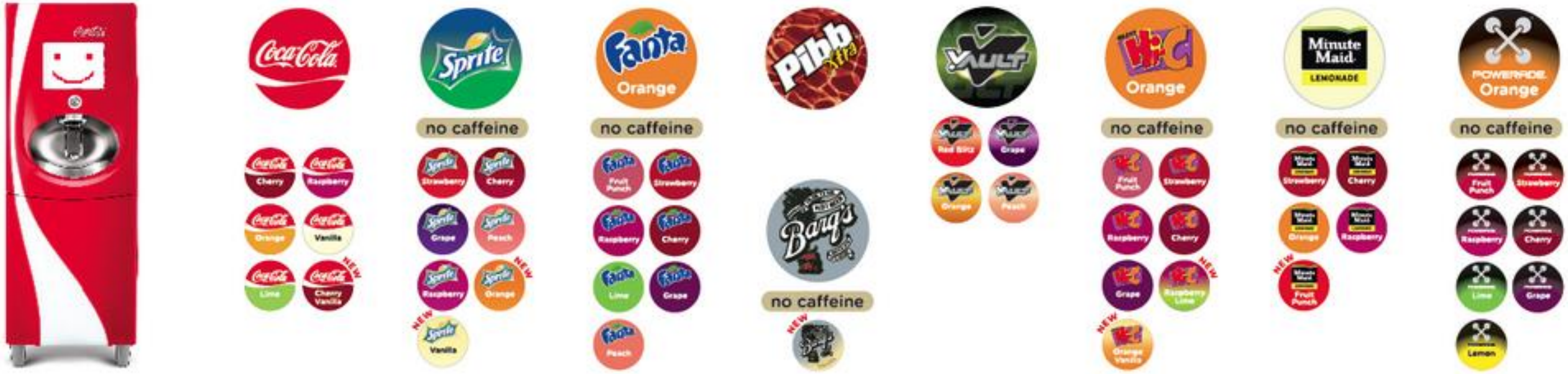
WHAT IS THE PURPOSE OF A K-12 EDUCATION?

- *College readiness*
- *Career readiness*
    - *Association of American Colleges and Universities survey*
    - *Surveyed over 300 employers with at least 25 employees and many new hires*

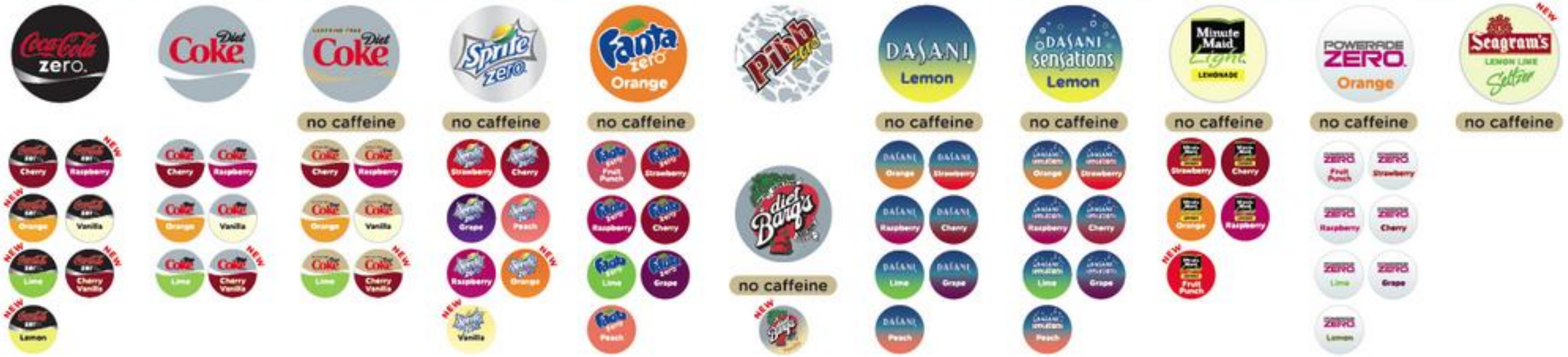


Source: http://www.aacu.org/leap/documents/2013_EmployerSurvey.pdf

Coca-Cola freestyle
discover something new
100+ drink choices
FUZE Tea
Grape
Vanilla
Hi-C Raspberry Lime
Coca-Cola Zero Vanilla
Fanta Orange
POWERADE Strawberry
Sprite Zero
Minute Maid Lemonade
POWERADE ZERO Raspberry
Coca-Cola Zero Cherry Vanilla
Coca-Cola
Cherry Vanilla
Lime
Raspberry
PUSH


Coca-Cola
Cherry
Raspberry
Orange
Vanilla
Lime
NEW
Cherry Vanilla
Sprite
no caffeine
Strawberry
Cherry
Grape
Peach
Raspberry
NEW
Orange
NEW
Vanilla
Fanta
Orange
no caffeine
Fruit Punch
Strawberry
Raspberry
Cherry
Lime
Grape
Peach
Pibb Xtra
Barq's
no caffeine
NEW
Vault
Red Blitz
Grape
Orange
Peach
Hi-C
Orange
no caffeine
Fruit Punch
Strawberry
Raspberry
Cherry
Grape
NEW
Raspberry Lime
NEW
Orange Vanilla
Minute Maid
Lemonade
no caffeine
Strawberry
Cherry
Orange
Raspberry
NEW
Fruit Punch
Powerade
Orange
no caffeine
Fruit Punch
Strawberry
Raspberry
Cherry
Lime
Grape
Lemon

low/no calories


Coca-Cola zero
Cherry
NEW
Raspberry
NEW
Orange
Vanilla
NEW
Lime
NEW
Cherry Vanilla
NEW
Lemon
Diet Coke
Cherry
Raspberry
Orange
Vanilla
Lime
NEW
Cherry Vanilla
Caffeine Free Diet Coke
no caffeine
Cherry
Raspberry
Orange
Vanilla
Lime
NEW
Cherry Vanilla
Sprite zero
no caffeine
Strawberry
Cherry
Grape
Peach
Raspberry
NEW
Orange
NEW
Vanilla
Fanta zero
Orange
no caffeine
Fruit Punch
Strawberry
Raspberry
Cherry
Lime
Grape
Peach
Pibb zero
diet Barq's
no caffeine
NEW
Dasani
Lemon
no caffeine
Orange
Strawberry
Raspberry
Cherry
Lime
Grape
Peach
Dasani sensations
Lemon
no caffeine
Orange
Strawberry
Raspberry
Cherry
Lime
Grape
Peach
Minute Maid Light
Lemonade
no caffeine
Strawberry
Cherry
Orange
Raspberry
NEW
Fruit Punch
Powerade Zero
Orange
no caffeine
Fruit Punch
Strawberry
Raspberry
Cherry
Lime
Grape
Lemon
NEW
Seagram's
Lemon Lime
Seltzer
no caffeine

The main attraction for a busload of Dover fifth-graders was supposed to be the Museum of Fine Arts, but that all changed when they stopped by Kelly's Roast Beef and got a glimpse of their soda-drinking future.

At the entrance of Kelly's sat a sleek Coca-Cola Freestyle fountain crafted to resemble an old-fashioned vending machine, but with a twist: a touchscreen computer embedded in the machine gives customers the option of 125 flavors. You can quench your thirst with a Coke or a Sprite, or try something more exotic — Sprite with Grape or a Hi-C Orange Vanilla.

WHAT ISN'T MATHEMATICAL MODELING?

- *It is not modeling in the sense of, "I do; now you do."*
- *It is not modeling in the sense of using manipulatives to represent mathematical concepts.*
- *It is not modeling in the sense of a "model" being just a graph, equation, or function.*
- *It is not just starting with a real world situation and solving a math problem.*
- *It is not beginning with the mathematics and then moving to the real world.*

Source: http://www.cde.ca.gov/ci/ma/cf/documents/aug2013apxdmathmodel.pdf

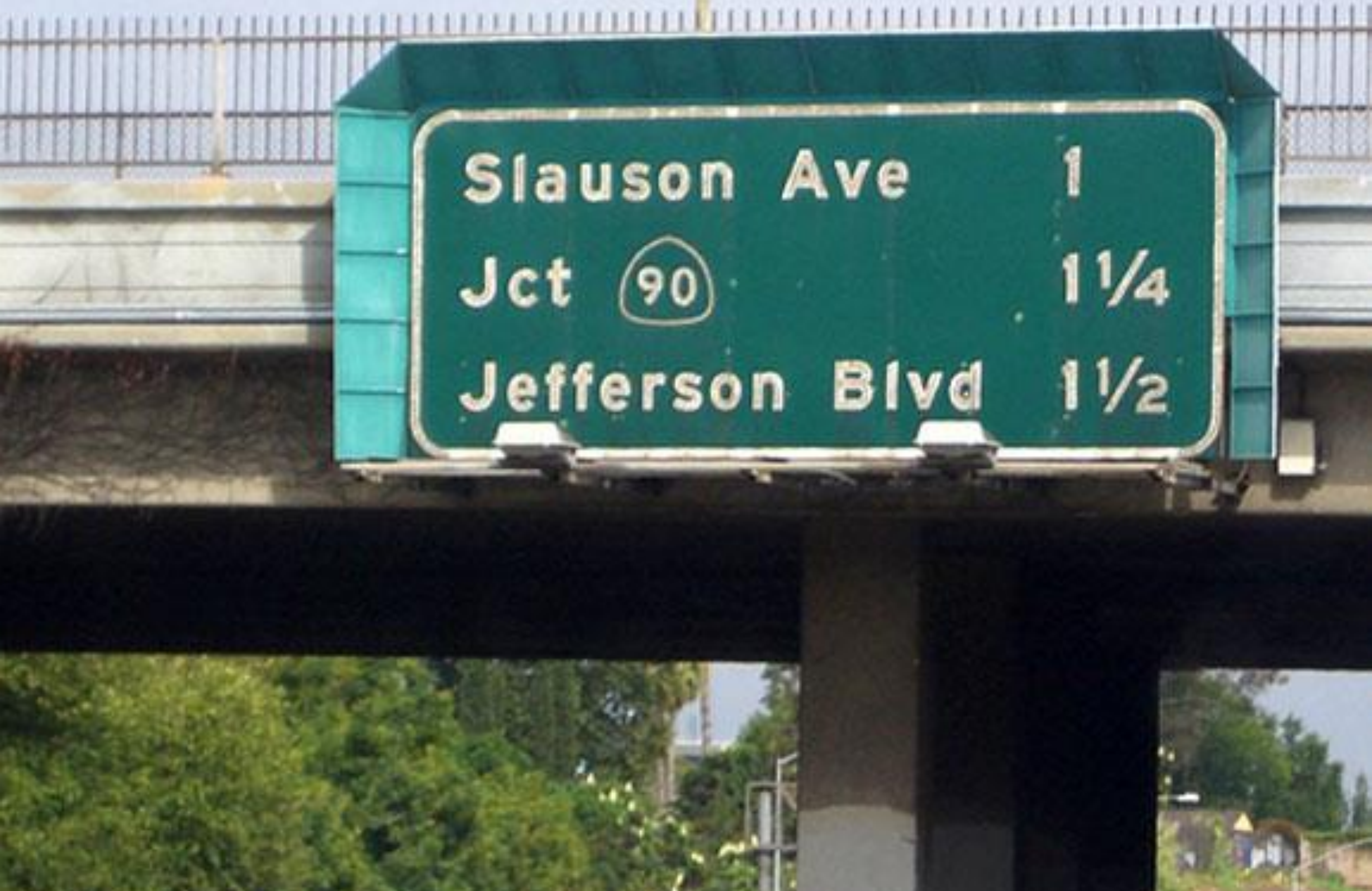
PROBLEM-BASED LEARNING FAQ

- *How long do problem based lessons take?*
- *How often do teachers do problem-based learning?*
- *Do teachers use problem-based lessons to introduce a topic or after you've already taught it?*
- *How is problem-based learning assessed?*
- *How much time does it take to create a problem-based lesson?*

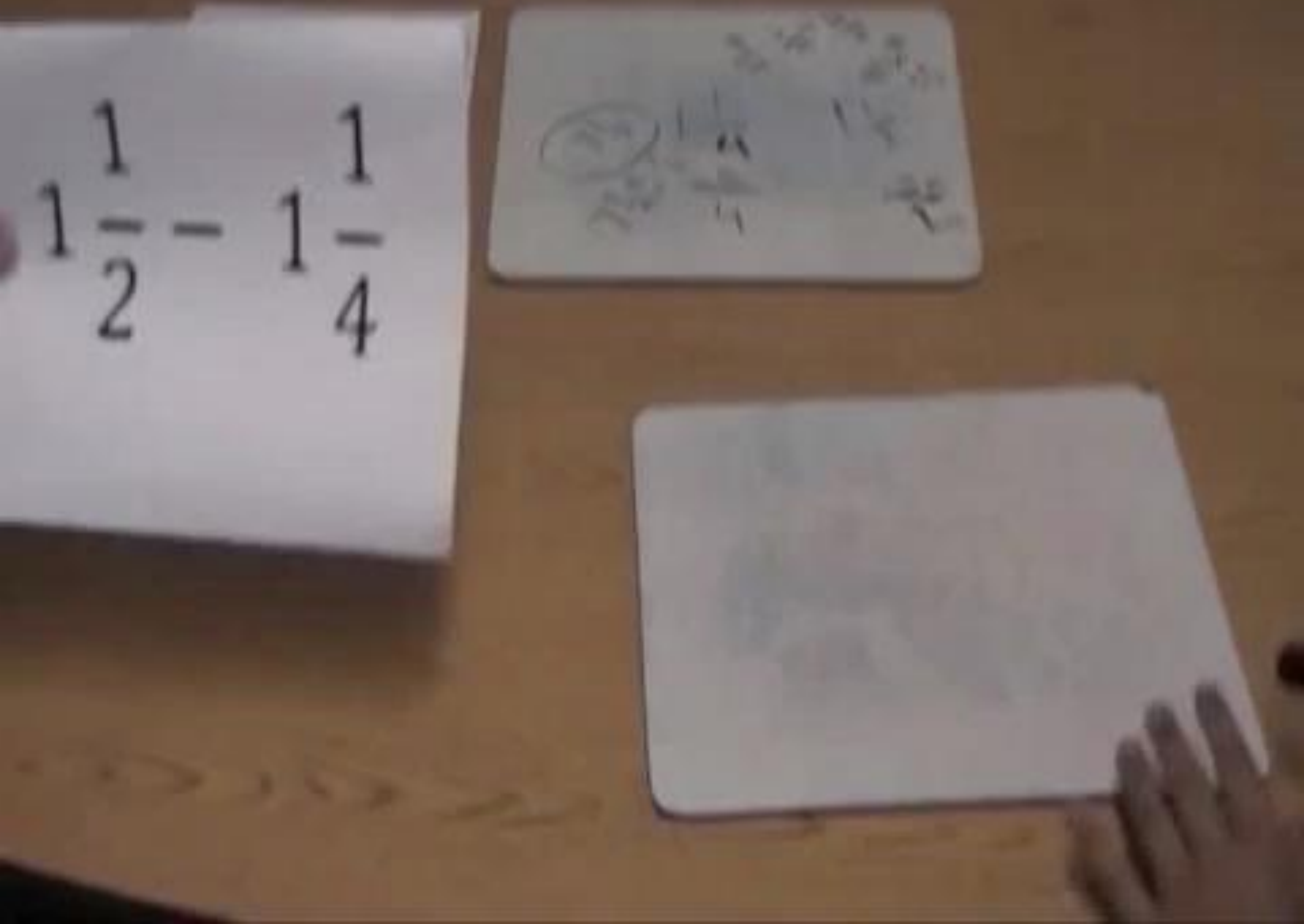
WHAT DOES IT LOOK LIKE…

- when students have procedural skill but not conceptual understanding or the ability to apply mathematics?
- when students **can** work with numbers but **cannot**:
  - critically think
  - applying knowledge and skills to real-world settings
  - analyze and solve complex problems

How far apart are the exits on this freeway: Jct 90 and Jefferson Blvd?


Slauson Ave 1
Jct 90 1¼
Jefferson Blvd 1½

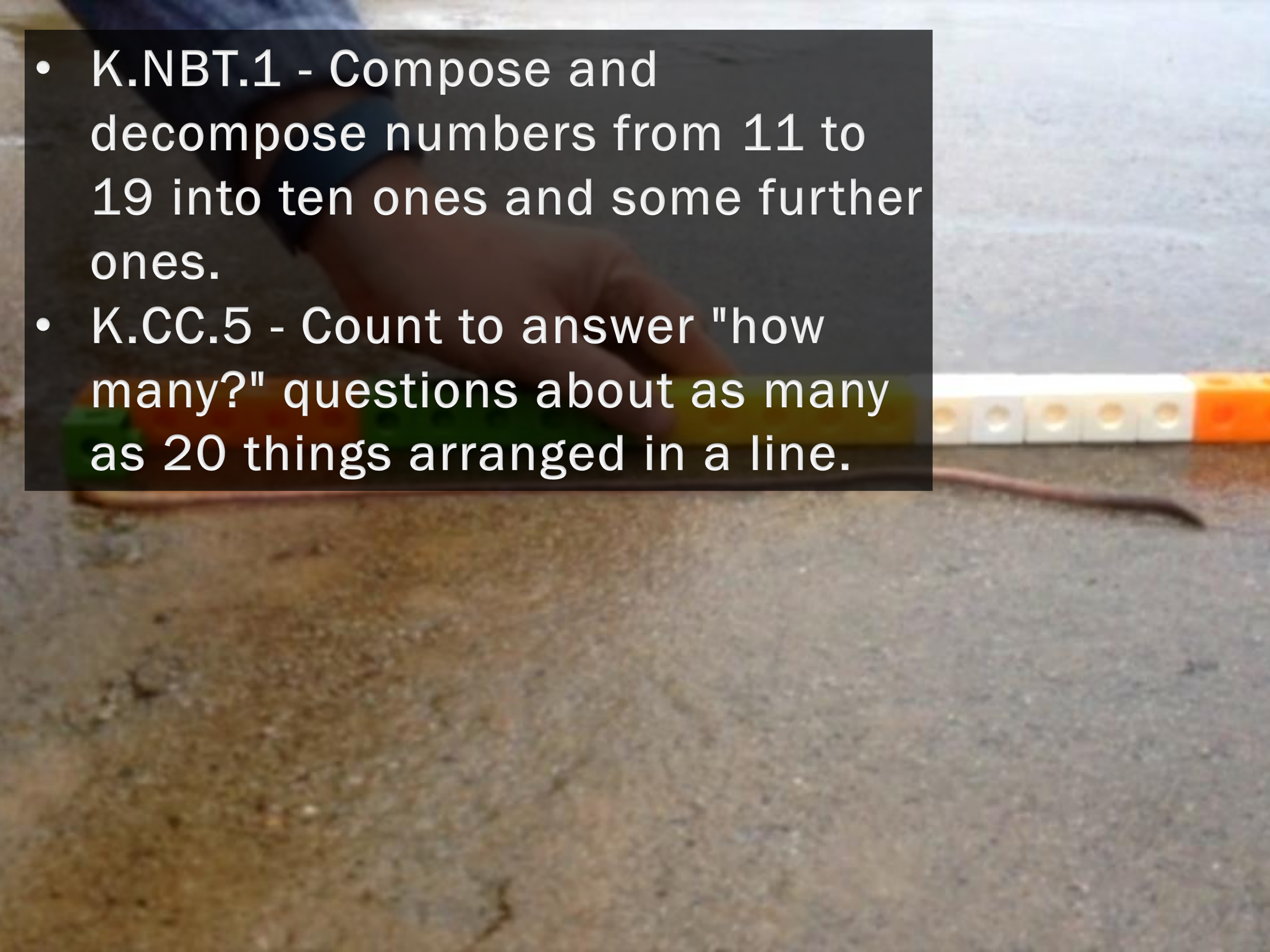
$$1\frac{1}{2} - 1\frac{1}{4}$$



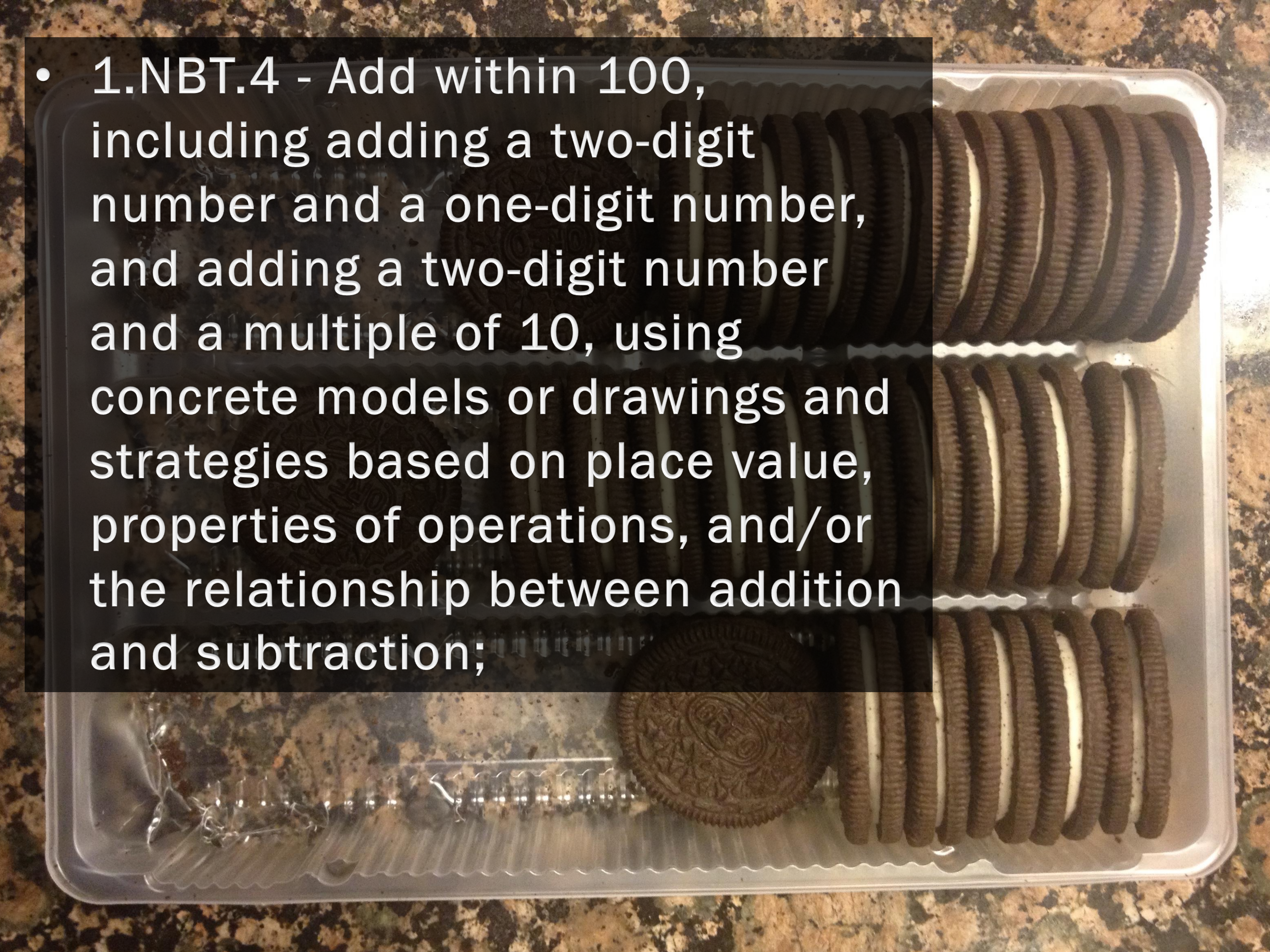
$$1\frac{1}{2} - 1\frac{1}{4}$$

The Four C's

- Communication
- Curiosity



- K.NBT.1 - Compose and decompose numbers from 11 to 19 into ten ones and some further ones.
- K.CC.5 - Count to answer "how many?" questions about as many as 20 things arranged in a line.

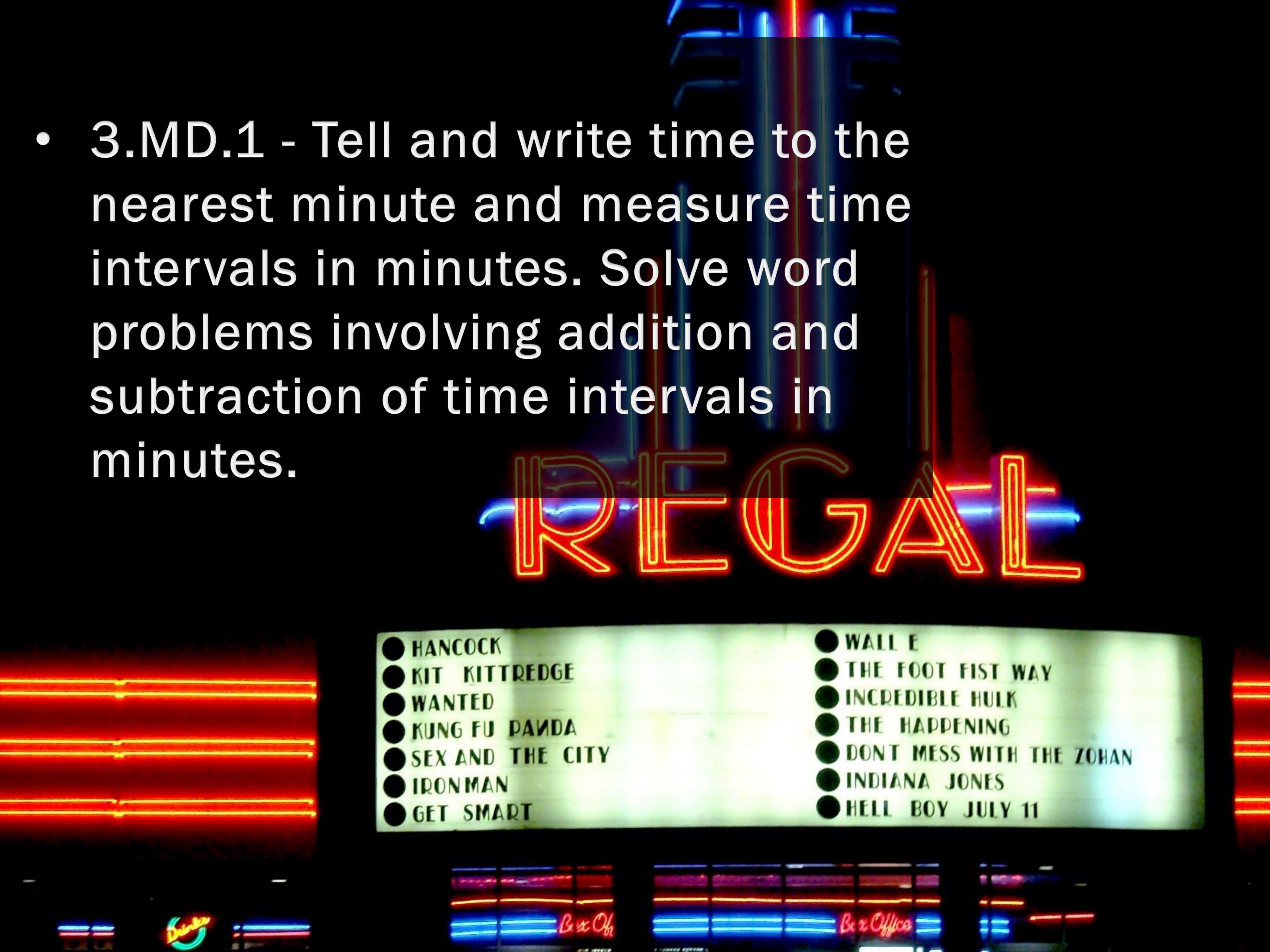


- 1.NBT.4 - Add within 100, including adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of 10, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction;

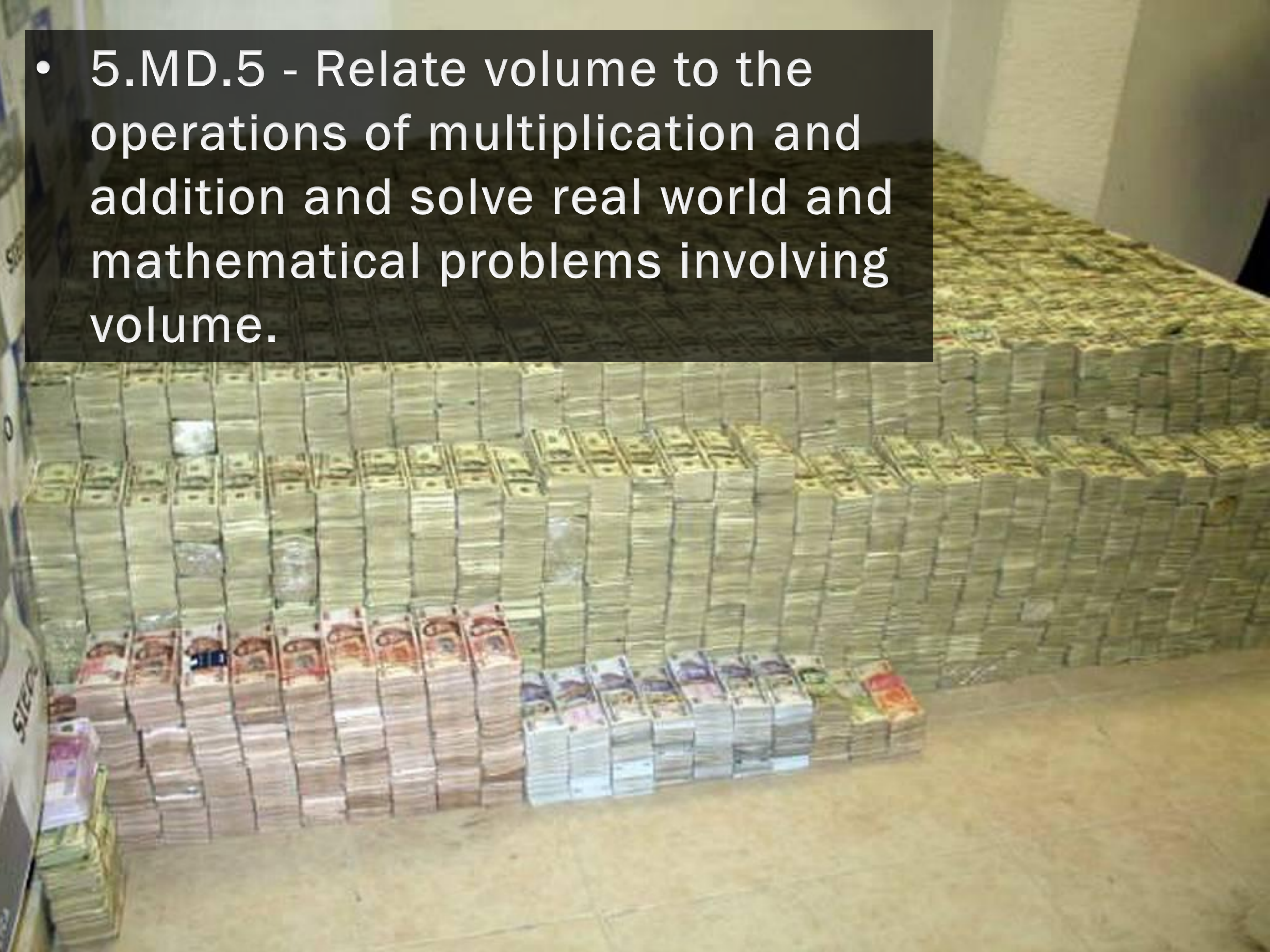
- 2.MD.8 - Solve word problems involving dollar bills, quarters, dimes, nickels, and pennies, using $ and ¢ symbols appropriately.

coinstar
Cash in your coins here
SWIPE CARD HERE
GET CARD HERE
INSERT BILLS HERE
$1, 5, 10, 20, 50, 100
INSERT BILL IN ANY DIRECTION
Touch the start button on the screen or on the keypad to begin.
Para comenzar, toque el botón de comienzo "START" en la pantalla o en el teclado.
If you need assistance operating, please contact any store associate or request assistance at the service desk.
LIBERTY
QUARTER DOLLAR

- 3.MD.1 - Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes.

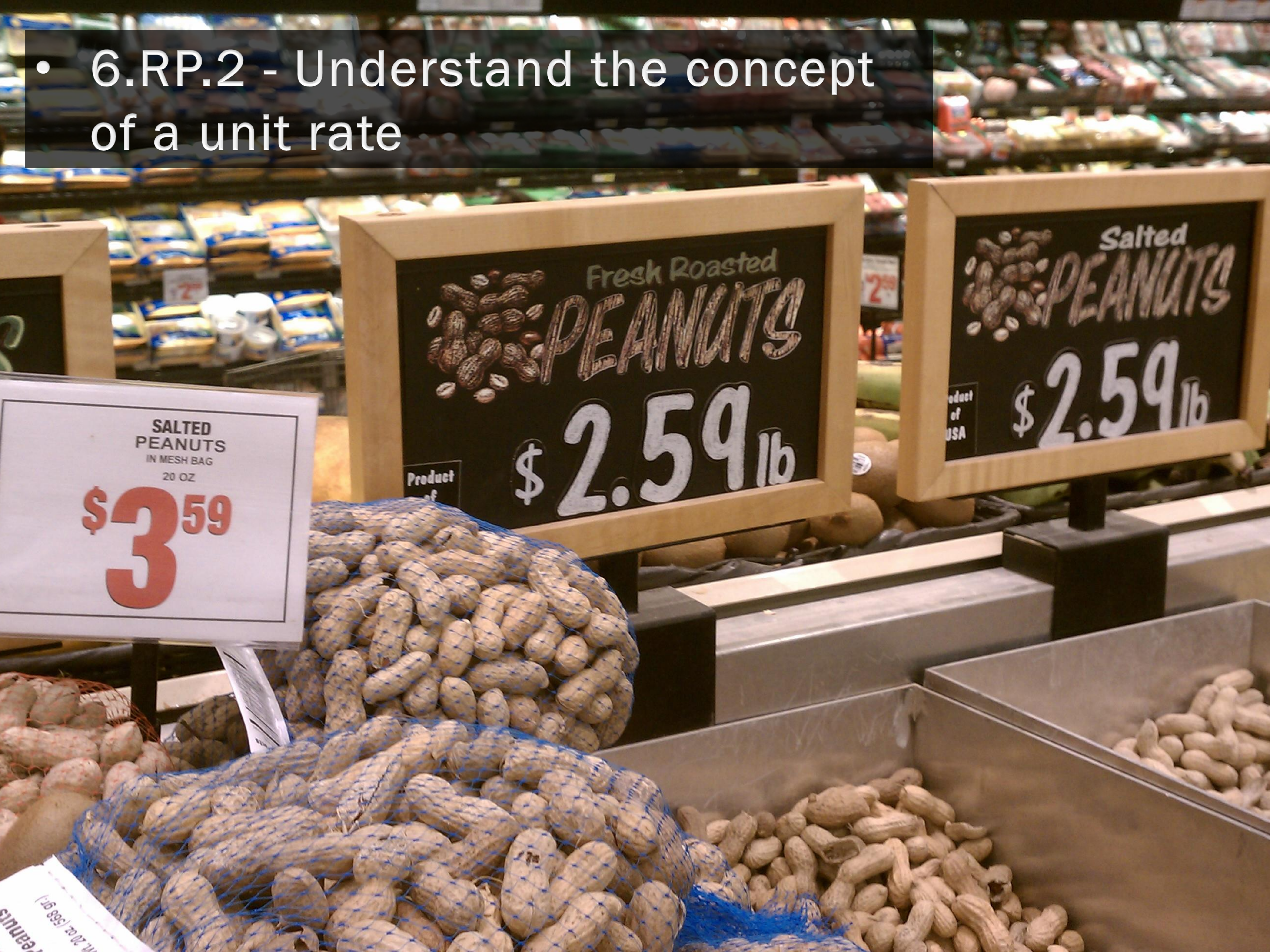

REGAL
HANCOCK
KIT KITTREDGE
WANTED
KUNG FU PANDA
SEX AND THE CITY
IRONMAN
GET SMART
WALL E
THE FOOT FIST WAY
INCREDIBLE HULK
THE HAPPENING
DONT MESS WITH THE ZOHAN
INDIANA JONES
HELL BOY JULY 11
Box Office
Box Office
Drinks

- 4.MD.3 - Apply the area and perimeter formulas for rectangles in real world and mathematical problems.



- 5.MD.5 - Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume.

- 6.RP.2 - Understand the concept of a unit rate

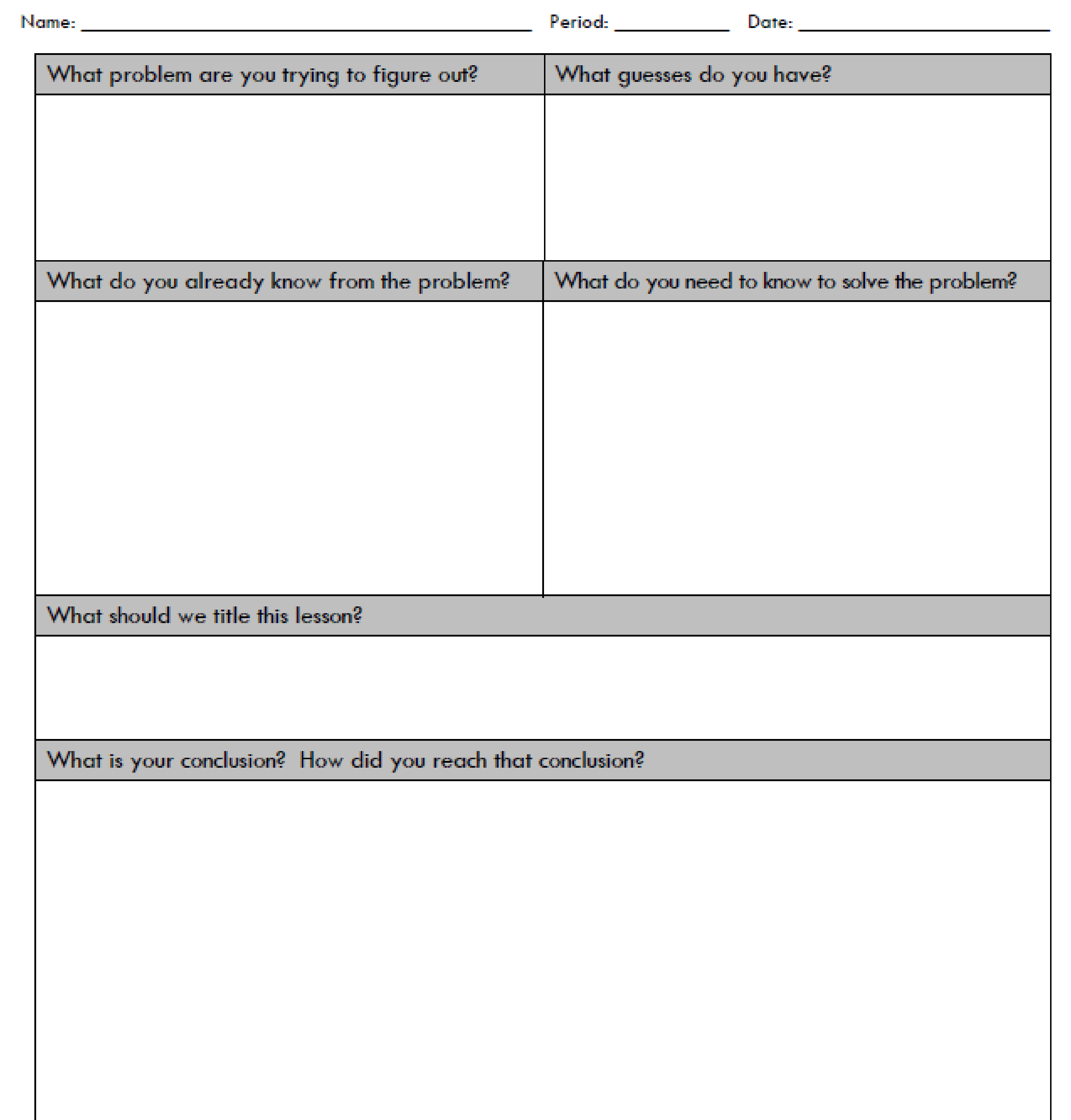

SALTED
PEANUTS
IN MESH BAG
20 OZ
$3.59
Fresh Roasted
PEANUTS
$2.59 lb
Product of
Salted
PEANUTS
Product of USA
$2.59 lb
$2.99
Peanuts
wt. 20 oz. (568 gr.)

The Four C's

- Communication
- Curiosity
- Critical Thinking

Problem Solving Framework

- Inspired by Geoff Krall's resources at emergentmath.com



Name: ______________________ Period: ________ Date: ______________

What problem are you trying to figure out?	What guesses do you have?
What do you already know from the problem?	What do you need to know to solve the problem?

What should we title this lesson?

What is your conclusion? How did you reach that conclusion?

The Four C's

- Communication
- Curiosity
- Critical Thinking
- Content Knowledge

Questioning Scenarios

- The activity begins with teachers in groups of three taking the roles of teacher, student, or observer.
- The individuals playing the role of teacher and student each receive a slip of paper describing their scenario.
- The individual playing the role of observer waits to record all of the teacher's questions to the student.
- Once the activity begins, the teacher will talk to the student in the context of the scenario they read about on the slips of paper.

What did you get for the area of a square with a side length of 4?

16

Great. Do you have any questions?

No

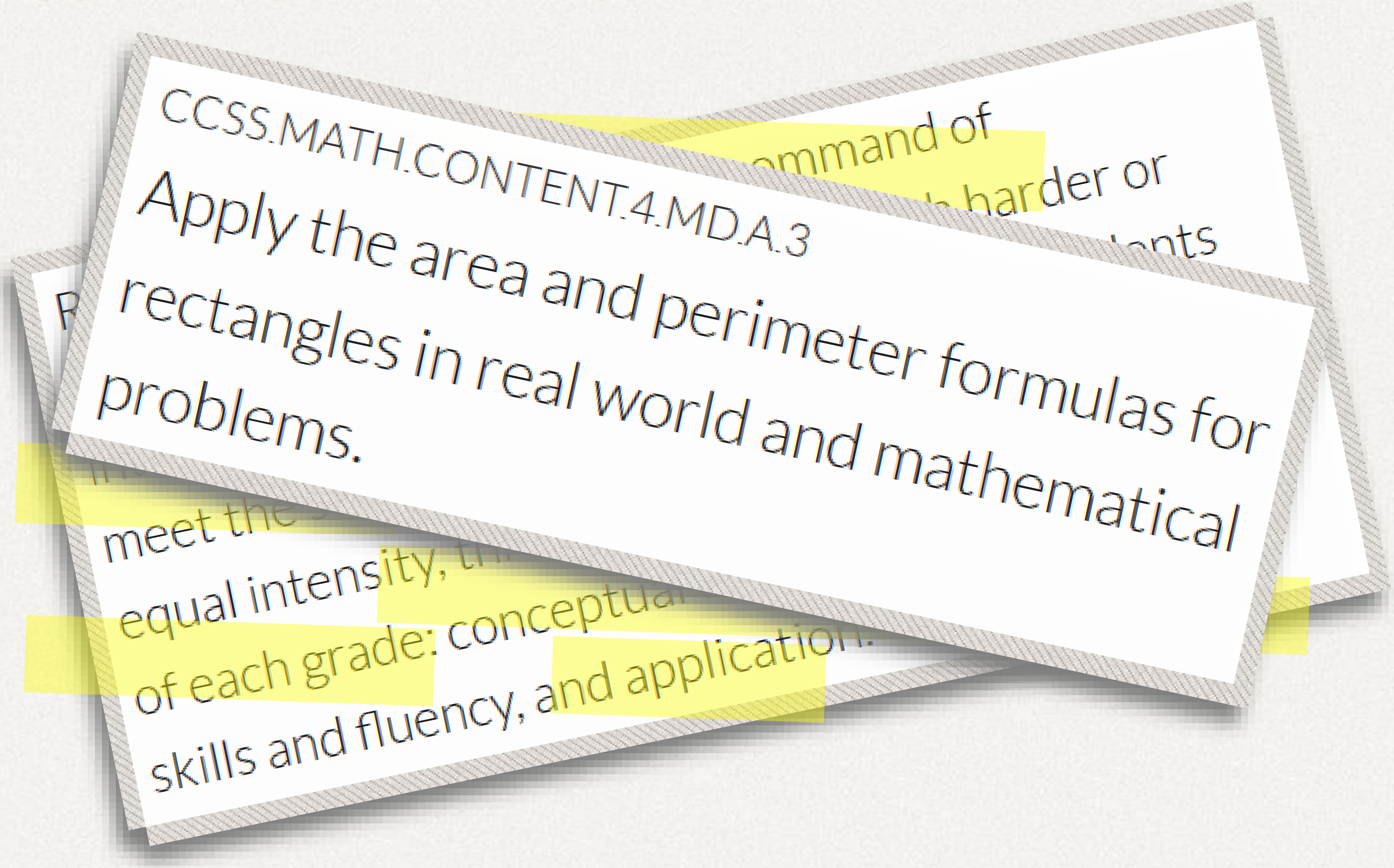
What did you get for the area of a square with a side length of 4?

16

Great. How did you get your answer?

I added up all the sides and 4 plus 4 plus 4 plus 4 is 16.

COMMON CORE
STATE STANDARDS INITIATIVE



CCSS.MATH.CONTENT.4.MD.A.3

Apply the area and perimeter formulas for rectangles in real world and mathematical problems.

…ommand of
…h harder or
…ents

R…

meet the…
equal intensity, th…
of each grade: conceptual
skills and fluency, and application.

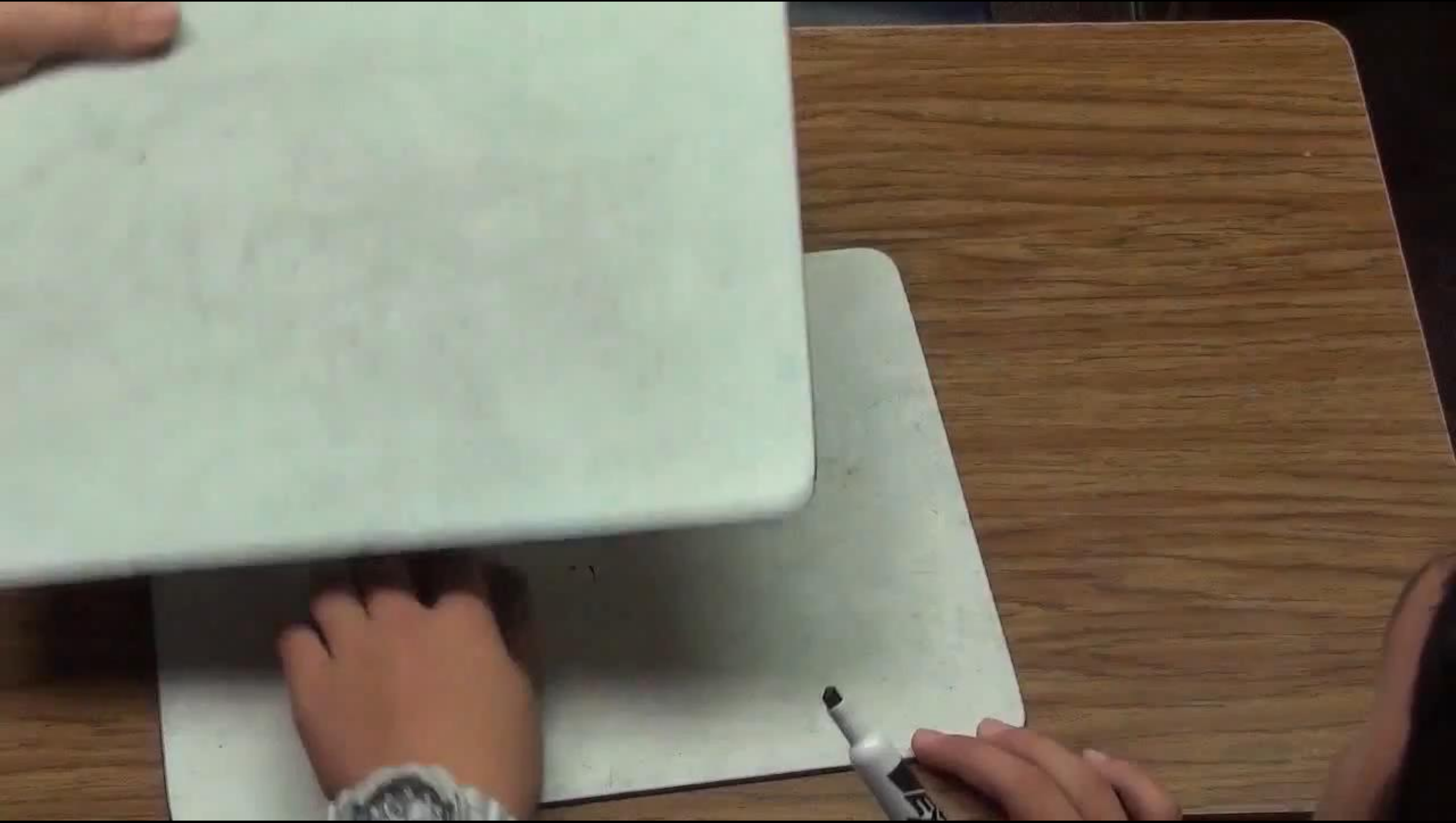
Source: http://www.corestandards.org/other-resources/key-shifts-in-mathematics/

What is the perimeter of a rectangle that measures 8 units by 4 units?

Components of Rigor

- ☑ Procedural Skill and Fluency
- ☑ Conceptual Understanding

List the dimensions of a rectangle with a perimeter of 24 units.

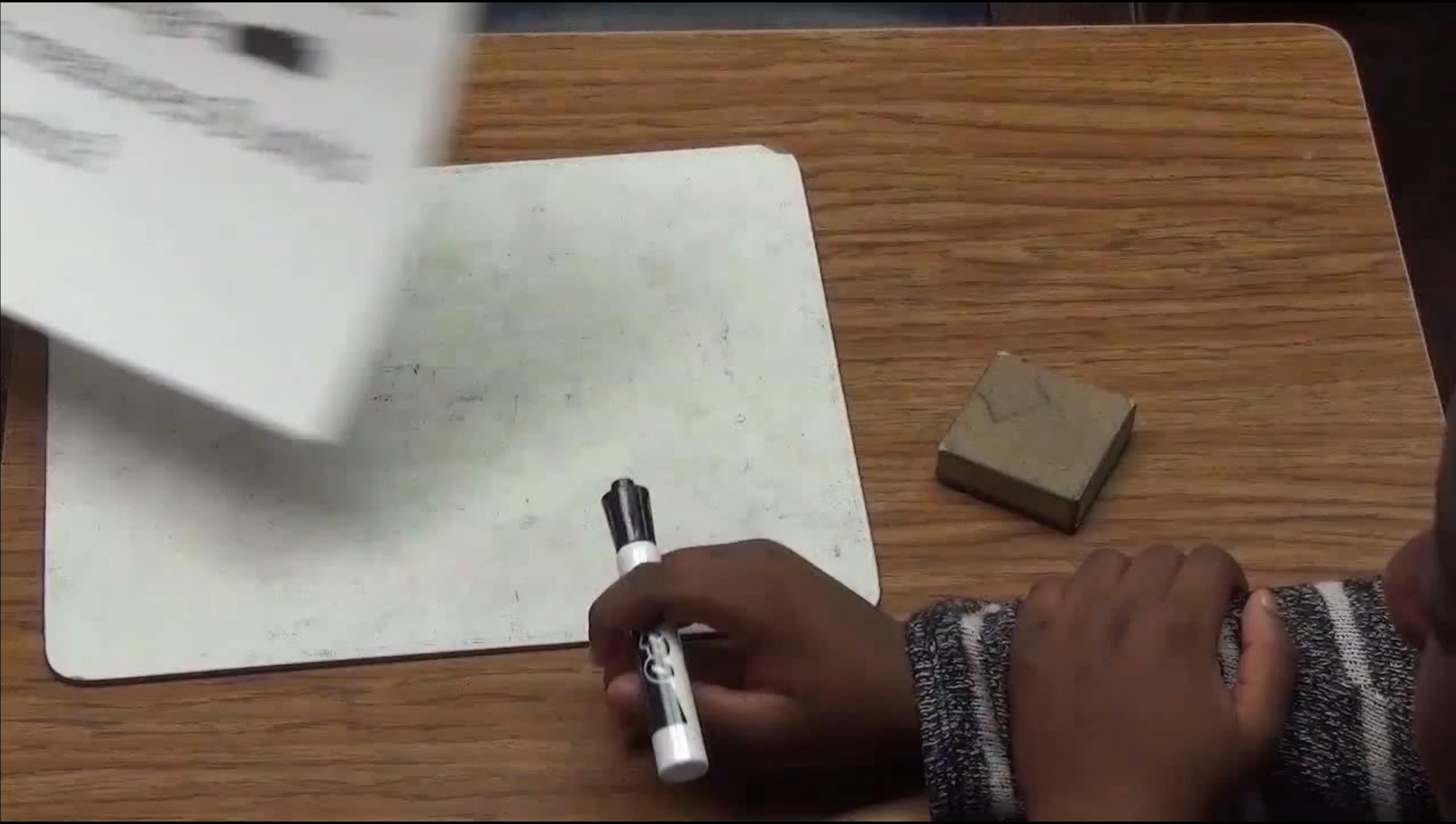


Components of Rigor

☒ Procedural Skill and Fluency

☒ Conceptual Understanding

WHY?



Components of Rigor

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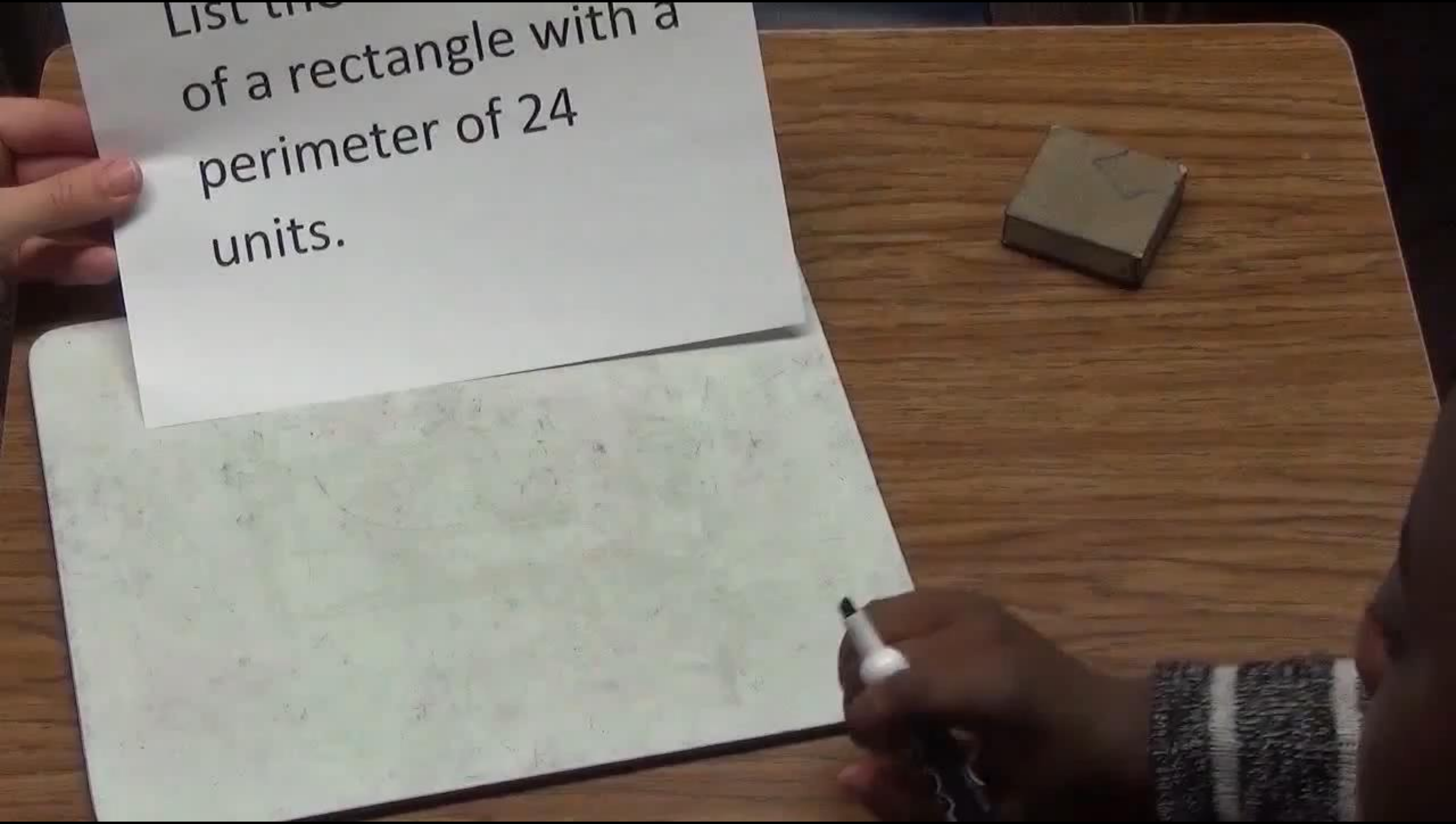
- ☑ Conceptual Understanding



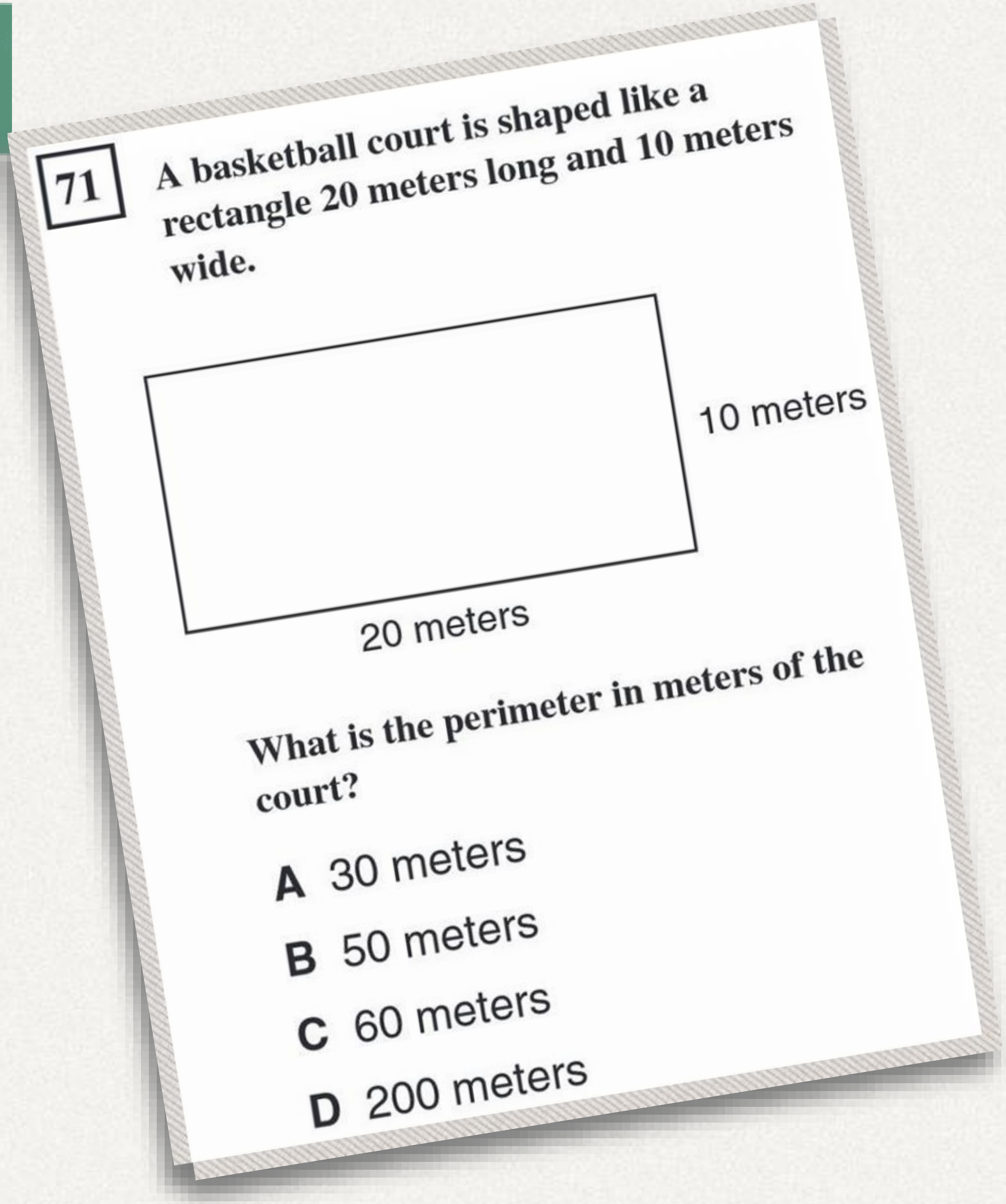
List th
of a rectangle with a
perimeter of 24
units.

Components of Rigor

- ☒ Procedural Skill and Fluency

- ☒ Conceptual Understanding

STAR



71 **A basketball court is shaped like a rectangle 20 meters long and 10 meters wide.**

10 meters

20 meters

What is the perimeter in meters of the court?

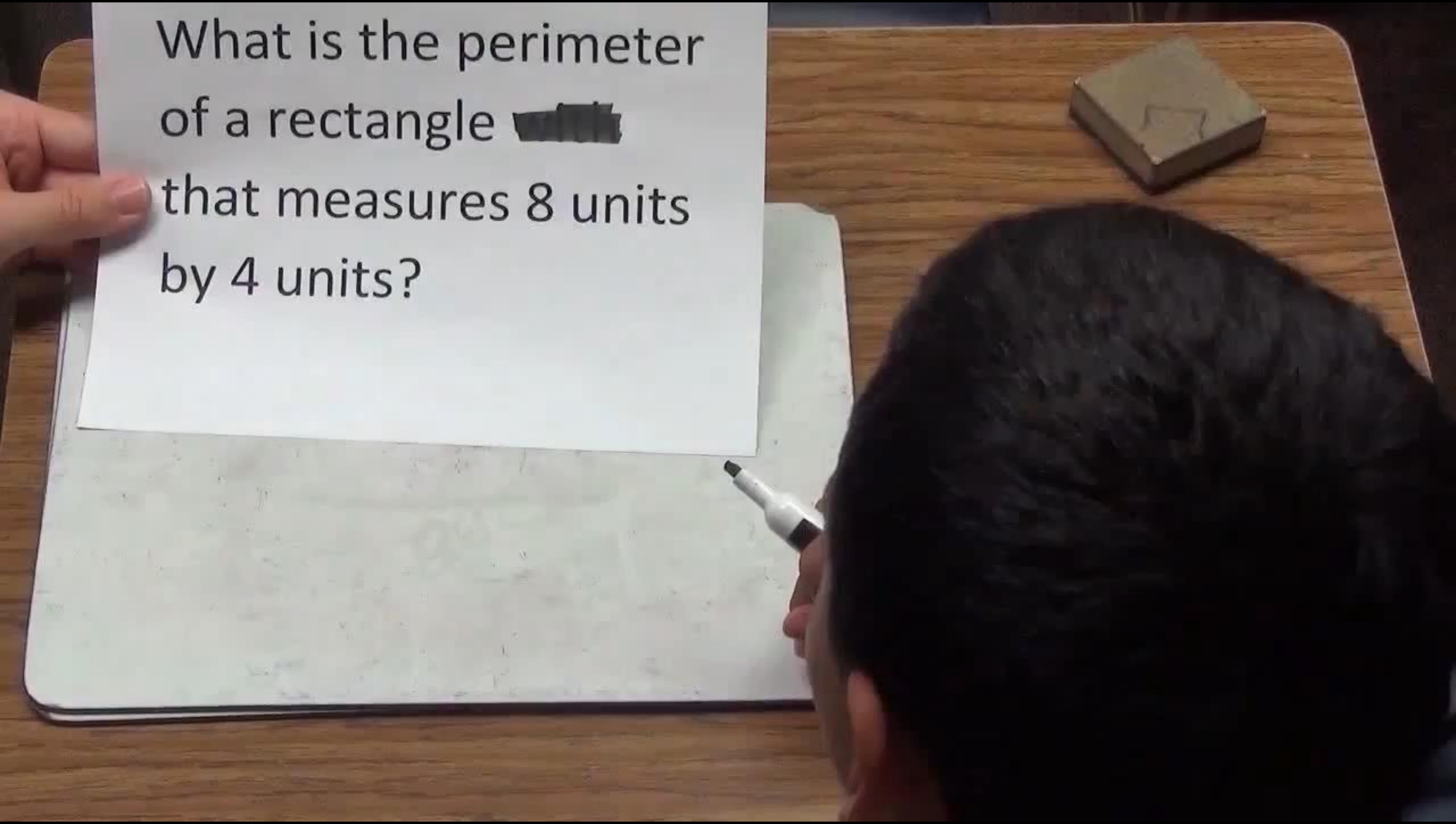
A 30 meters

B 50 meters

C 60 meters

D 200 meters

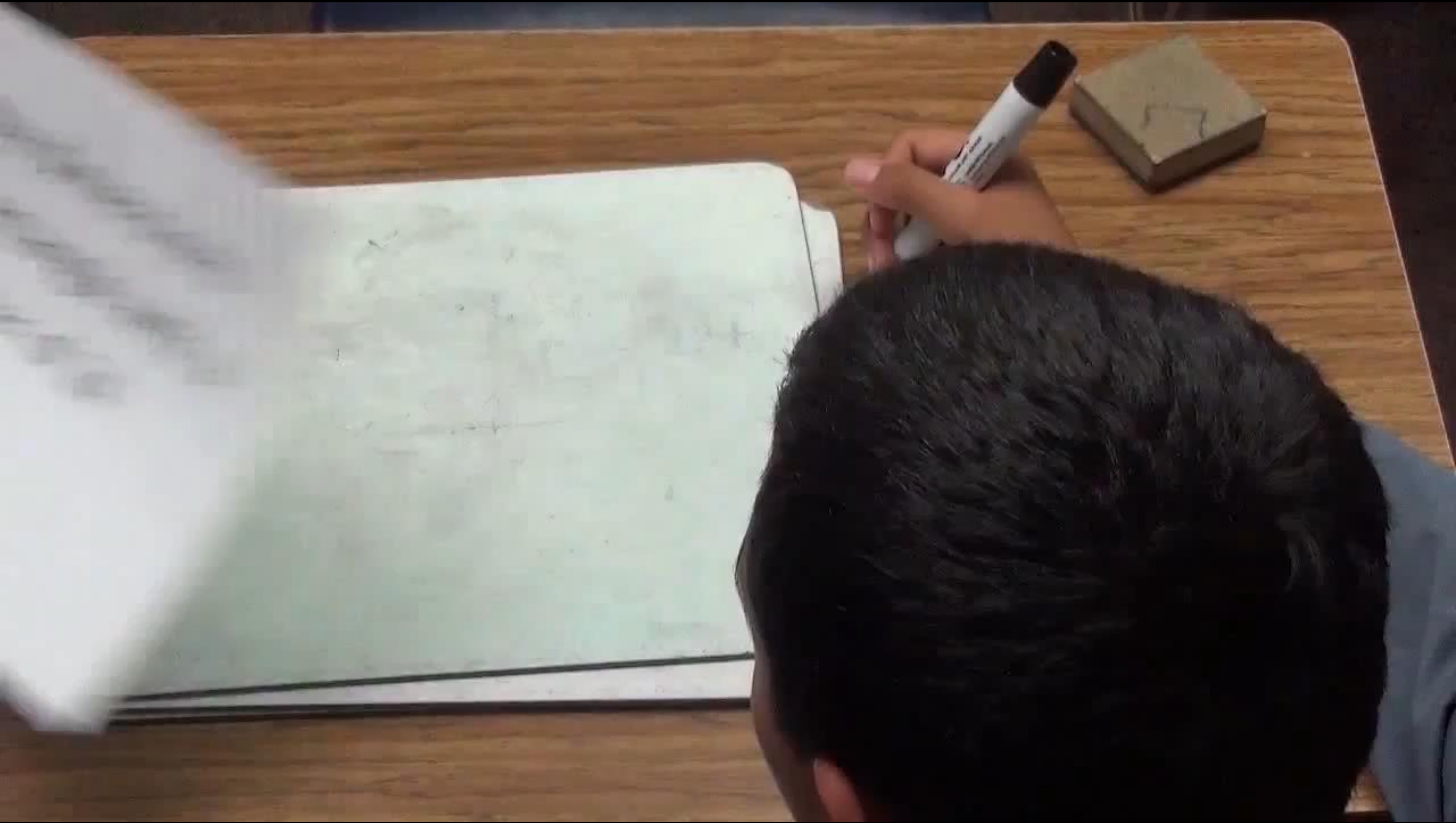
Source: http://www.cde.ca.gov/ta/tg/sr/documents/cstrtqmath3.pdf



What is the perimeter of a rectangle [redacted] that measures 8 units by 4 units?

Components of Rigor

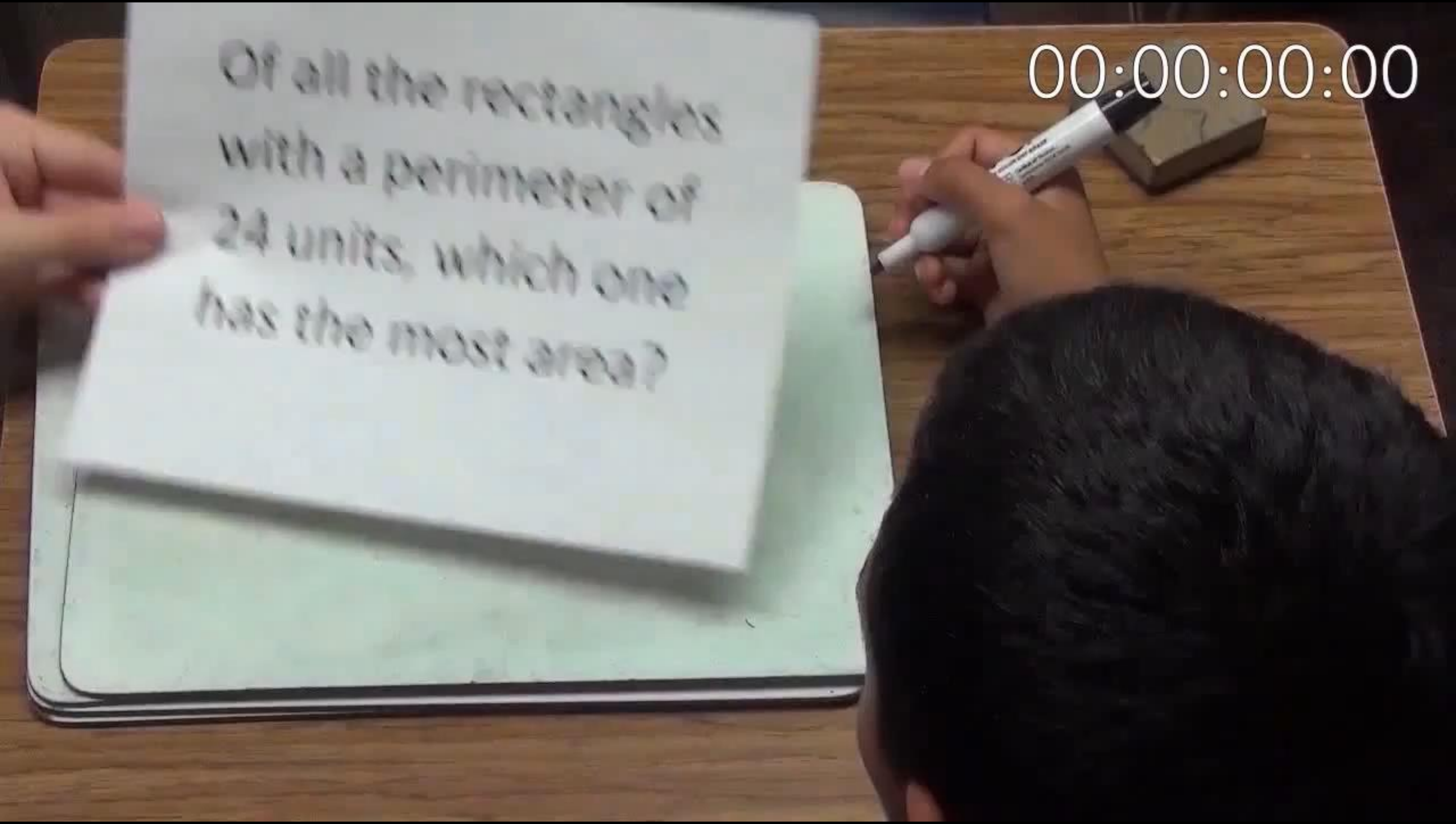
- ☑ Procedural Skill and Fluency
- ☑ Conceptual Understanding



Components of Rigor

- ☑ Procedural Skill and Fluency
- ☑ Conceptual Understanding

Of all the rectangles with a perimeter of 24 units, which one has the most area?



Of all the rectangles with a perimeter of 24 units, which one has the most area?

Components of Rigor

☒ Procedural Skill and Fluency

☒ Conceptual Understanding

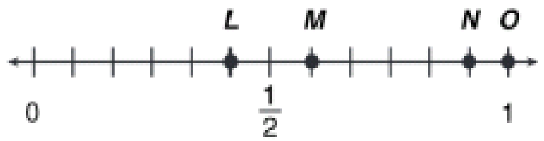
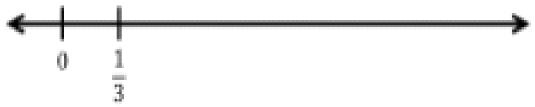
Defining the Problem

- Students appear to demonstrate "deep, authentic command of mathematical concepts" when given commonly used problems.
- However with more challenging problems, the same students seem to no longer demonstrate that command.

Addressing the Problem

- First, we must have a clear understanding about why these problems are different from one another.
- Next, we need to practice implementing these problems such that all students are engaged in a problem that is at the right challenge level for them.
- Last, we need a source that can provide us with a variety of free problems.

DOK | Distinguishing Between Depth of Knowledge Levels in Mathematics

Topic	Adding Whole Numbers	Money	Fractions on a Number Line	Area and Perimeter	Subtracting Mixed Numbers
CCSS Standard(s)	• 1.NBT.4 • 2.NBT.5	• 2.MD.8	• 3.NF.2	• 3.MD.8 • 4.MD.3	• 5.NF.1
DOK 1 Example	Find the sum. $44 + 27 =$	If you have 2 dimes and 3 pennies, how many cents do you have	Which point is located at $\frac{7}{12}$ below?  	Find the perimeter of a rectangle that measures 4 units by 8 units.	Find the difference. $5\frac{1}{2} - 4\frac{2}{3} =$
DOK 2 Example	Fill in the boxes below using the whole numbers 1 through 9, no more than one time each, so that you make a true equation. $\square\square + 53 = \square\square$	Make 47¢ in three different ways with either quarters, dimes, nickels, or pennies.	Label the point where $\frac{3}{4}$ belongs on the number line below. Be as precise as possible.  	List the measurements of three different rectangles that each has a perimeter of 20 units.	Create three different mixed numbers that will make the equation true by using the whole numbers 1 through 9, no more than one time each,. You may reuse the same whole numbers for each of the three mixed numbers. $5\frac{4}{5} - \square\frac{\square}{\square} = 3\frac{1}{20}$
DOK 3 Example	Make the largest sum by filling in the boxes below using the whole numbers 1 through 9, no more than one time each. $\square\square + \square\square =$	Make 47¢ using exactly 5 coins with either quarters, dimes, nickels, or pennies.	Create 5 fractions using the whole numbers 0 through 9, no more than one time each, as numerators and denominators and correctly place them all on a number line.	What is the greatest area you can make with a rectangle that has a perimeter of 24 units?	Make the smallest difference by filling in the boxes below using the whole numbers 1 through 9, no more than one time each. $\square\frac{\square}{\square} - \square\frac{\square}{\square}$

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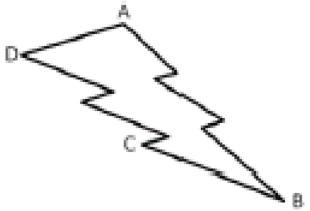
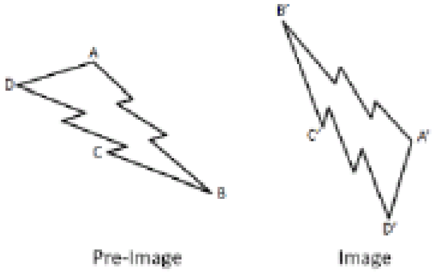
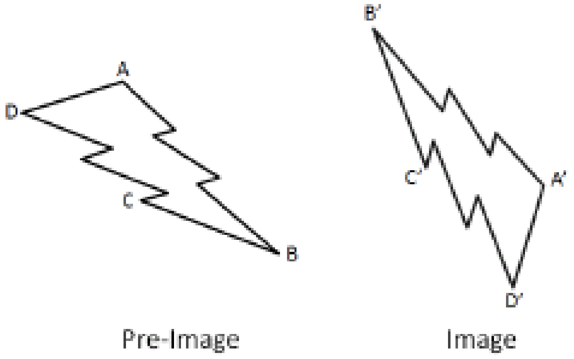
Version 1.9

DOK | Distinguishing Between Depth of Knowledge Levels in Mathematics

Topic	Surface Area and Volume	Probability	Transformations	Factoring Quadratics	Quadratics in Vertex Form
CCSS Standard(s)	• 6.G.4 • 7.G.6	• 7.SP.5 • 7.SP.7	• 8.G.1 • G-CO.5	• A-SSE.3a	• F-IF.7a
DOK 1 Example	Find the surface area of a rectangular prism that measures 3 units by 4 units by 5 units.	What is the probability of rolling a sum of 5 using two 6-sided dice?	Rotate the image below 90° counterclockwise and reflect it across a horizontal line. 	Find the factors: $2x^2+7x+3$	Find the roots and maximum of the quadratic equation below. $y=3(x-4)^2-3$
DOK 2 Example	List the measurements of three different rectangular prisms that each has a surface area of 20 square units.	What value(s) have a 1/12 probability of being rolled as the sum of two 6-sided dice?	List three sequences of transformations that take pre-image ABCD to image A'B'C'D'.  A D C B Pre-Image B' C' A' D' Image	Fill in the blank with integers so that the quadratic expression is factorable. $x^2+\_\_x+4$	Create three equations for quadratics in vertex form that have roots at 3 and 5 but have different maximum and/or minimum values.
DOK 3 Example	What is the greatest volume you can make with a rectangular prism that has a surface area of 20 square units?	Fill in the blanks to complete this sentence using the whole numbers 1 through 9, no more than one time each. Rolling a sum of ___ on two ___-sided dice is the same probability as rolling a sum of ___ on two ___-sided dice.	What is the fewest number of transformations needed to take pre-image ABCD to image A'B'C'D'?  A D C B Pre-Image B' C' A' D' Image	Fill the blank by finding the largest and smallest integers that will make the quadratic expression factorable. $2x^2+3x+\_\_$	Create a quadratic equation with the largest maximum value using the whole numbers 1 through 9, no more than one time each. $y=-\square(x-\square)^2+\square$

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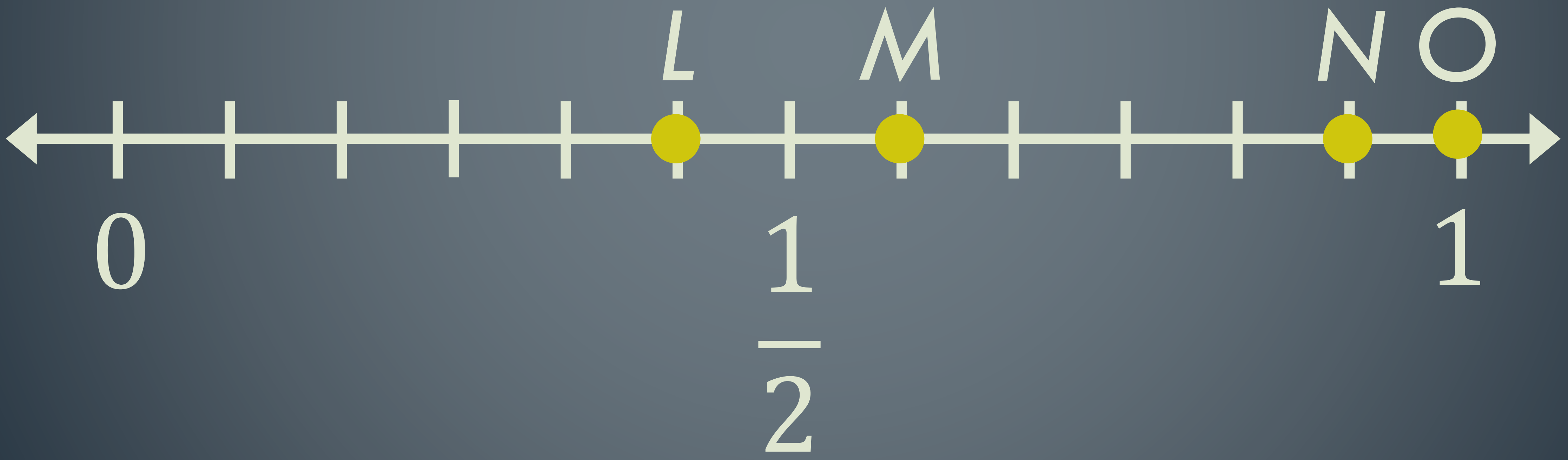
Version 1.9

DOK Level Differences

- **Level 1: Recall & Reproduction**
  - Often a trivial application of facts.
  - Requires little to no cognitive effort beyond remembering the right formula.
  - Usually only one answer.
- **Level 2: Skills & Concepts**
  - Usually requires more than one step to solve.
  - Often multiple answers.
- **Level 3: Strategic Thinking**
  - Usually requires critical thinking about the best way to approach a problem.
  - May be multiple answers or a single optimal answer.
  - Often challenging enough to make your head hurt.
- **Level 4: Extended Thinking**
  - In mathematics these are generally represented by performance tasks or problem-based lessons.

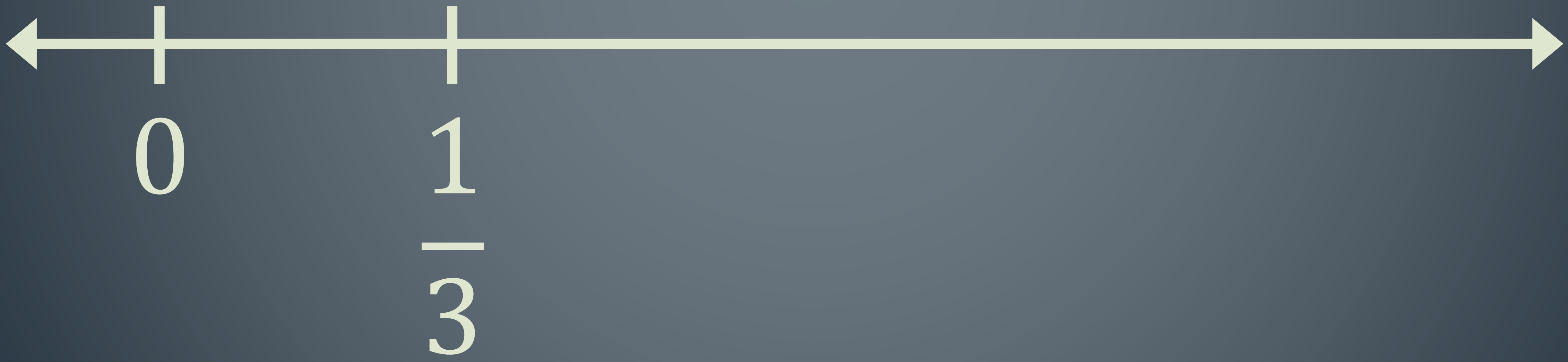
Fractions on a Number Line

Which point is located at $\frac{7}{12}$ below?


L
M
N
O
0
$\frac{1}{2}$
1

Fractions on a Number Line

Label the point where $\frac{3}{4}$ belongs on the number line below. Be as precise as possible.

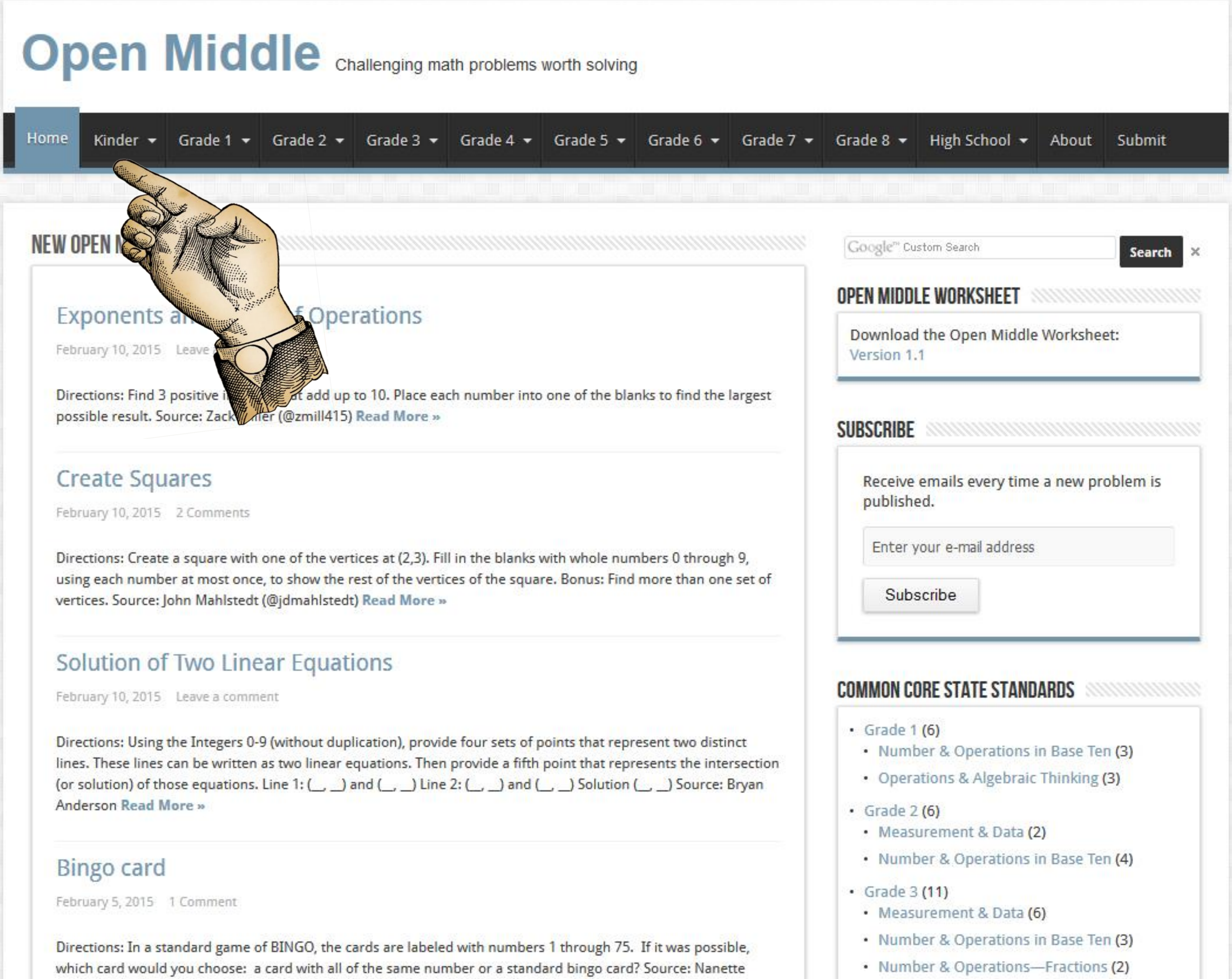


Fractions on a Number Line

Create 5 fractions using the whole numbers 0 through 9, no more than one time each, as numerators and denominators and correctly place them all on a number line.

DOK FAQ

- *What DOK level should I start students off with?*
- *How do teachers fit these problems into their pacing?*
- *How do I help prevent students from giving up after trying the problem once or twice?*
- *Where can I find other DOK 2 and DOK 3 problems?*
- *How can I share DOK 2 and DOK 3 problems I've made?*



Open Middle

Challenging math problems worth solving

NEW OPEN M

Exponents a f Operations

February 10, 2015 Leave

Directions: Find 3 positive i at add up to 10. Place each number into one of the blanks to find the largest possible result. Source: Zack ler (@zmill415) **Read More »**

Create Squares

February 10, 2015 2 Comments

Directions: Create a square with one of the vertices at (2,3). Fill in the blanks with whole numbers 0 through 9, using each number at most once, to show the rest of the vertices of the square. Bonus: Find more than one set of vertices. Source: John Mahlstedt (@jdmahlstedt) **Read More »**

Solution of Two Linear Equations

February 10, 2015 Leave a comment

Directions: Using the Integers 0-9 (without duplication), provide four sets of points that represent two distinct lines. These lines can be written as two linear equations. Then provide a fifth point that represents the intersection (or solution) of those equations. Line 1: (_, _) and (_, _) Line 2: (_, _) and (_, _) Solution (_, _) Source: Bryan Anderson **Read More »**

Bingo card

February 5, 2015 1 Comment

Directions: In a standard game of BINGO, the cards are labeled with numbers 1 through 75. If it was possible, which card would you choose: a card with all of the same number or a standard bingo card? Source: Nanette

OPEN MIDDLE WORKSHEET

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COMMON CORE STATE STANDARDS

- Grade 1 (6)
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  - Operations & Algebraic Thinking (3)
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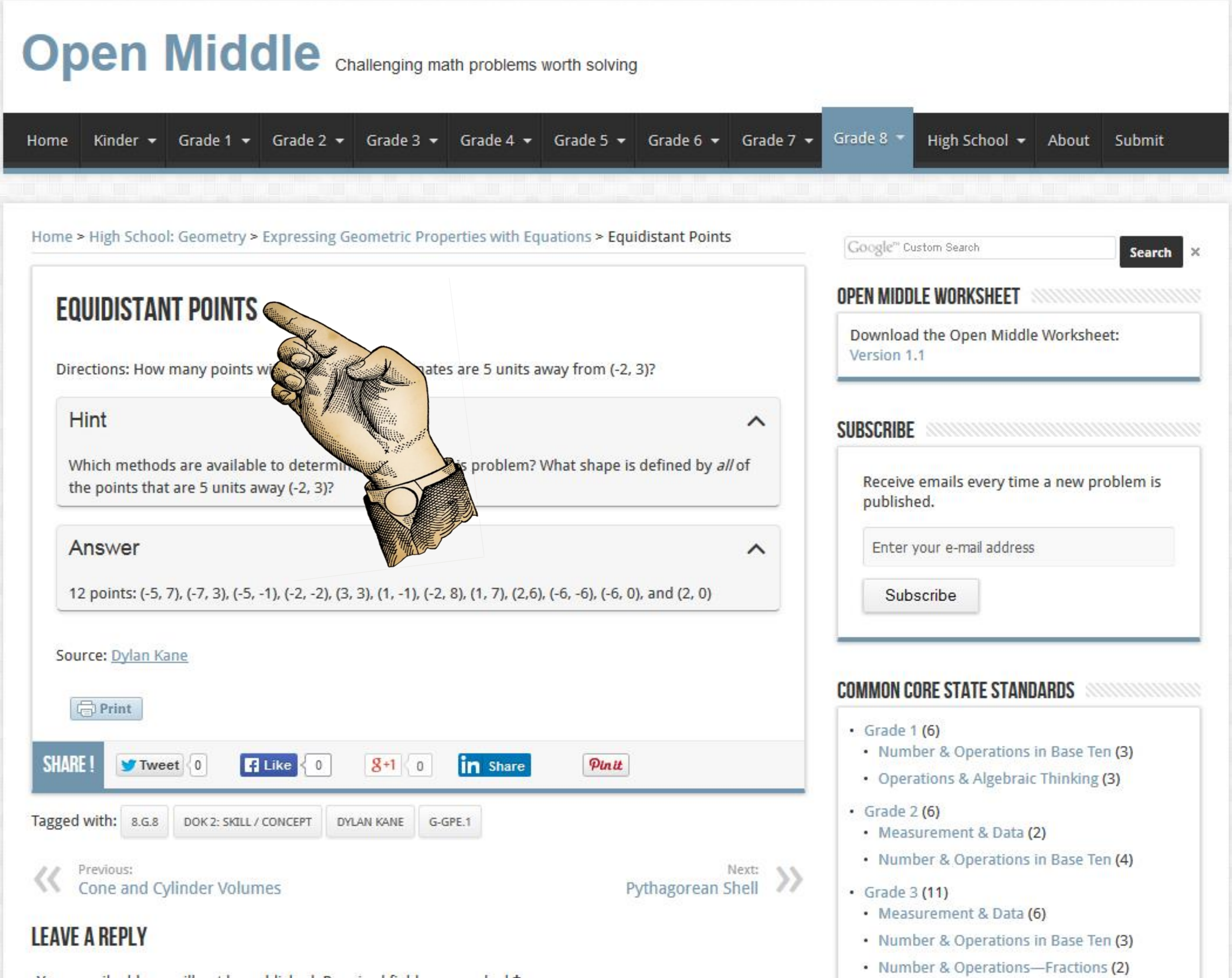
  - Measurement & Data (2)
  - Number & Operations in Base Ten (4)
- Grade 3 (11)
  - Measurement & Data (6)
  - Number & Operations in Base Ten (3)
  - Number & Operations—Fractions (2)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Home > High School: Geometry > Expressing Geometric Properties with Equations > Equidistant Points

EQUIDISTANT POINTS

Directions: How many points wi nates are 5 units away from (-2, 3)?

Hint

Which methods are available to determin s problem? What shape is defined by *all* of the points that are 5 units away (-2, 3)?

Answer

12 points: (-5, 7), (-7, 3), (-5, -1), (-2, -2), (3, 3), (1, -1), (-2, 8), (1, 7), (2,6), (-6, -6), (-6, 0), and (2, 0)

Source: Dylan Kane

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Next: Pythagorean Shell

LEAVE A REPLY

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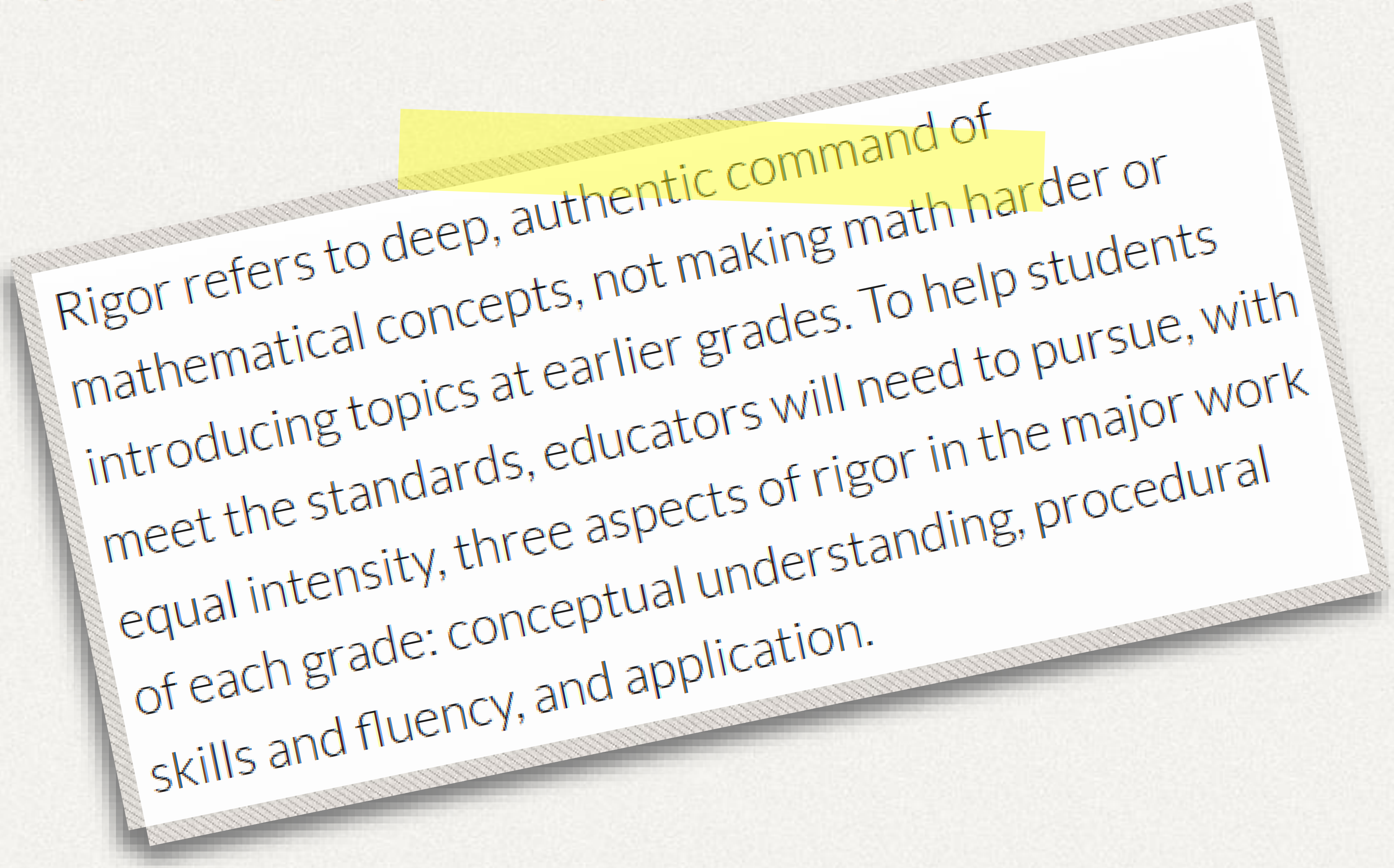
  - Number & Operations in Base Ten (4)
- Grade 3 (11)
  - Measurement & Data (6)
  - Number & Operations in Base Ten (3)
  - Number & Operations—Fractions (2)

COMMON CORE
STATE STANDARDS INITIATIVE

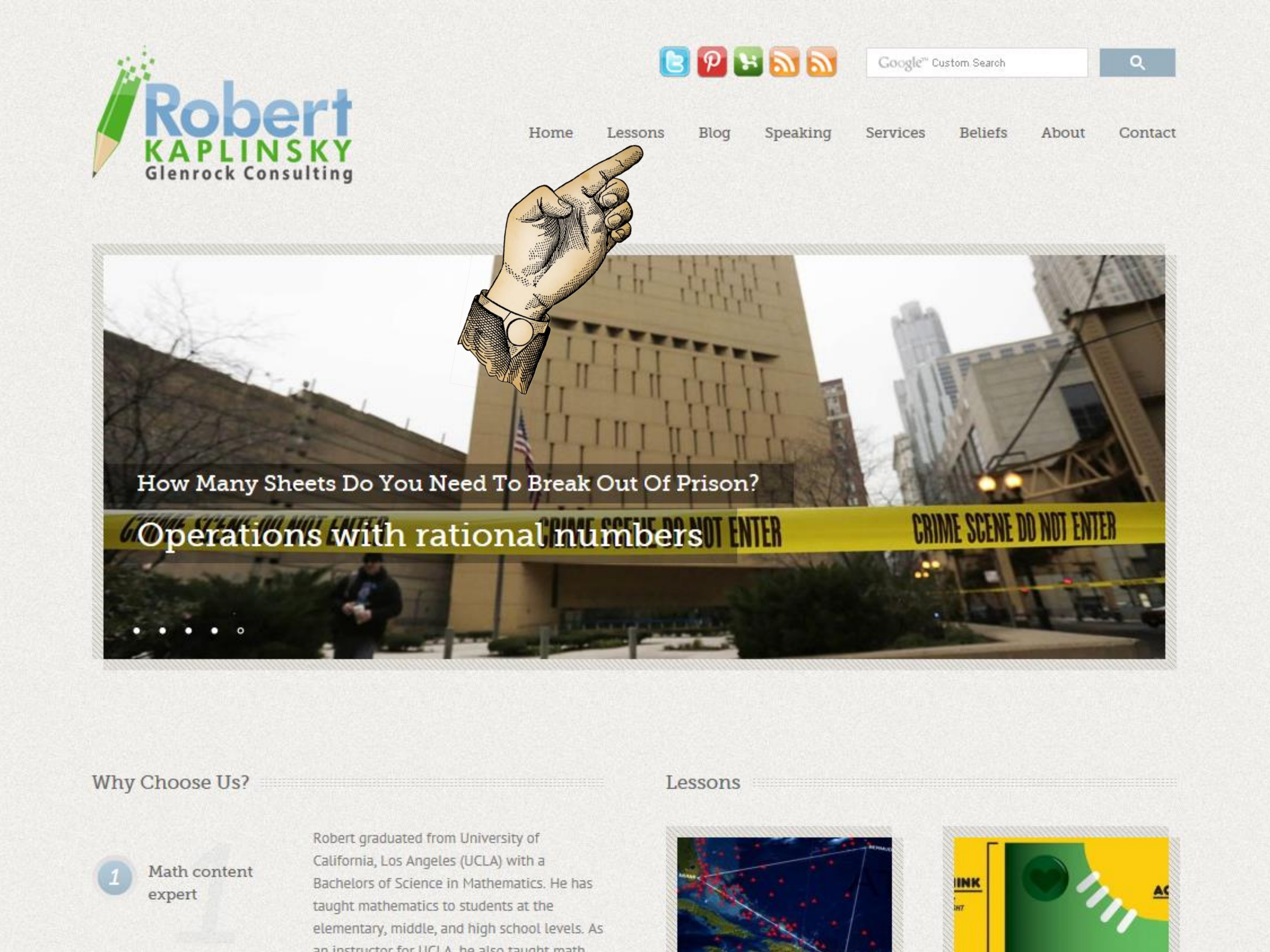


Rigor refers to deep, authentic command of mathematical concepts, not making math harder or introducing topics at earlier grades. To help students meet the standards, educators will need to pursue, with equal intensity, three aspects of rigor in the major work of each grade: conceptual understanding, procedural skills and fluency, and application.

Source: http://www.corestandards.org/other-resources/key-shifts-in-mathematics/

Problem-Based Lesson Resources

- Problem-based lesson search engine: http://robertkaplinsky.com/prbl-search-engine/
- My lessons: http://www.robertkaplinsky.com/lessons
- Graham Fletcher: http://gfletchy.com/3-act-lessons/
- Dan Meyer: http://threeacts.mrmeyer.com
- Andrew Stadel: http://tinyurl.com/mrstadel
- Geoff Krall: http://tinyurl.com/PrBLmaps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How Many Sheets Do You Need To Break Out Of Prison?

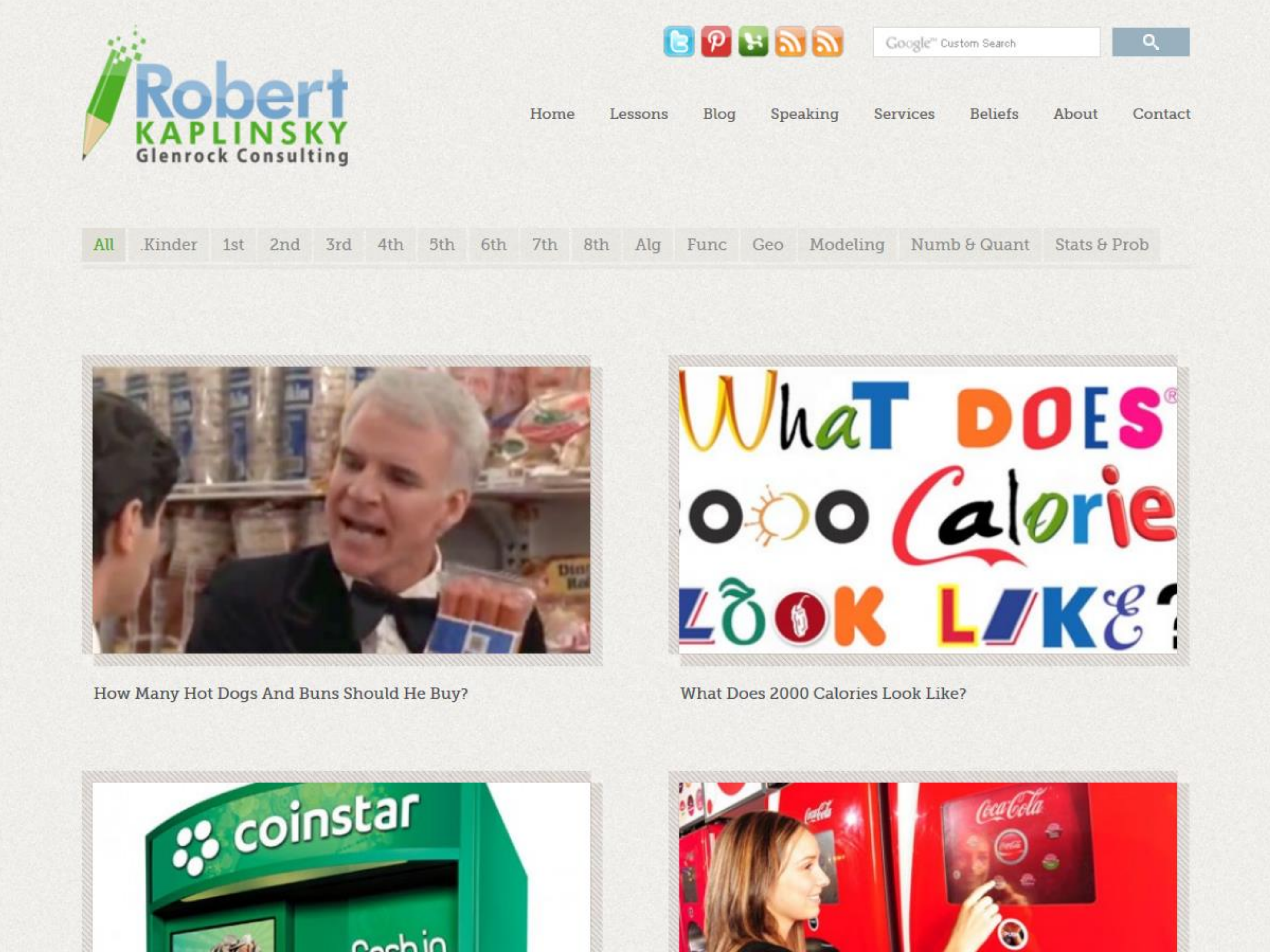
Operations with rational numbers

Why Choose Us?

1 Math content expert

Robert graduated from University of California, Los Angeles (UCLA) with a Bachelors of Science in Mathematics. He has taught mathematics to students at the elementary, middle, and high school levels. As an instructor for UCLA, he also taught math

Lessons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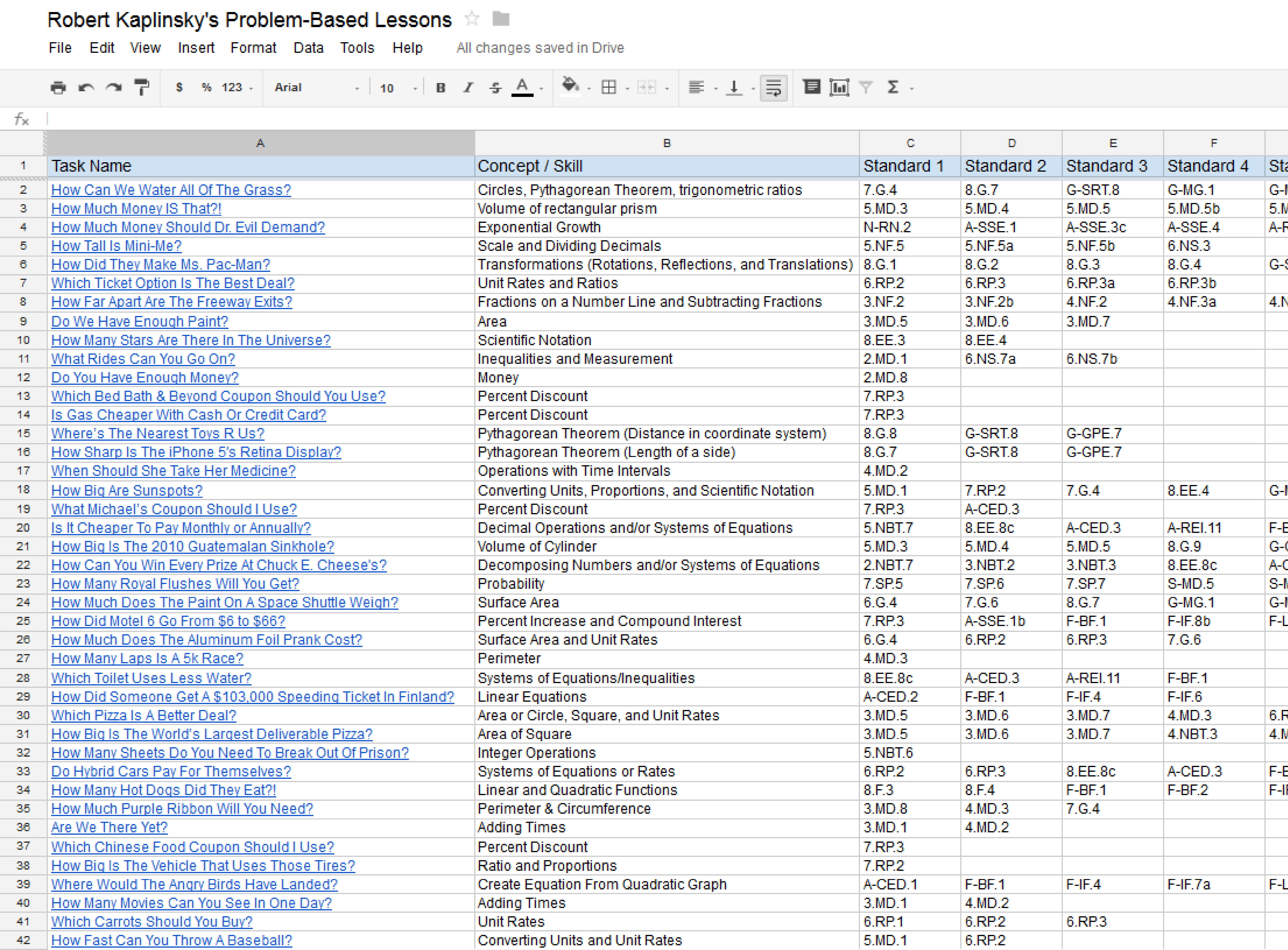
How Many Hot Dogs And Buns Should He Buy?

What Does 2000 Calorie Look Like?

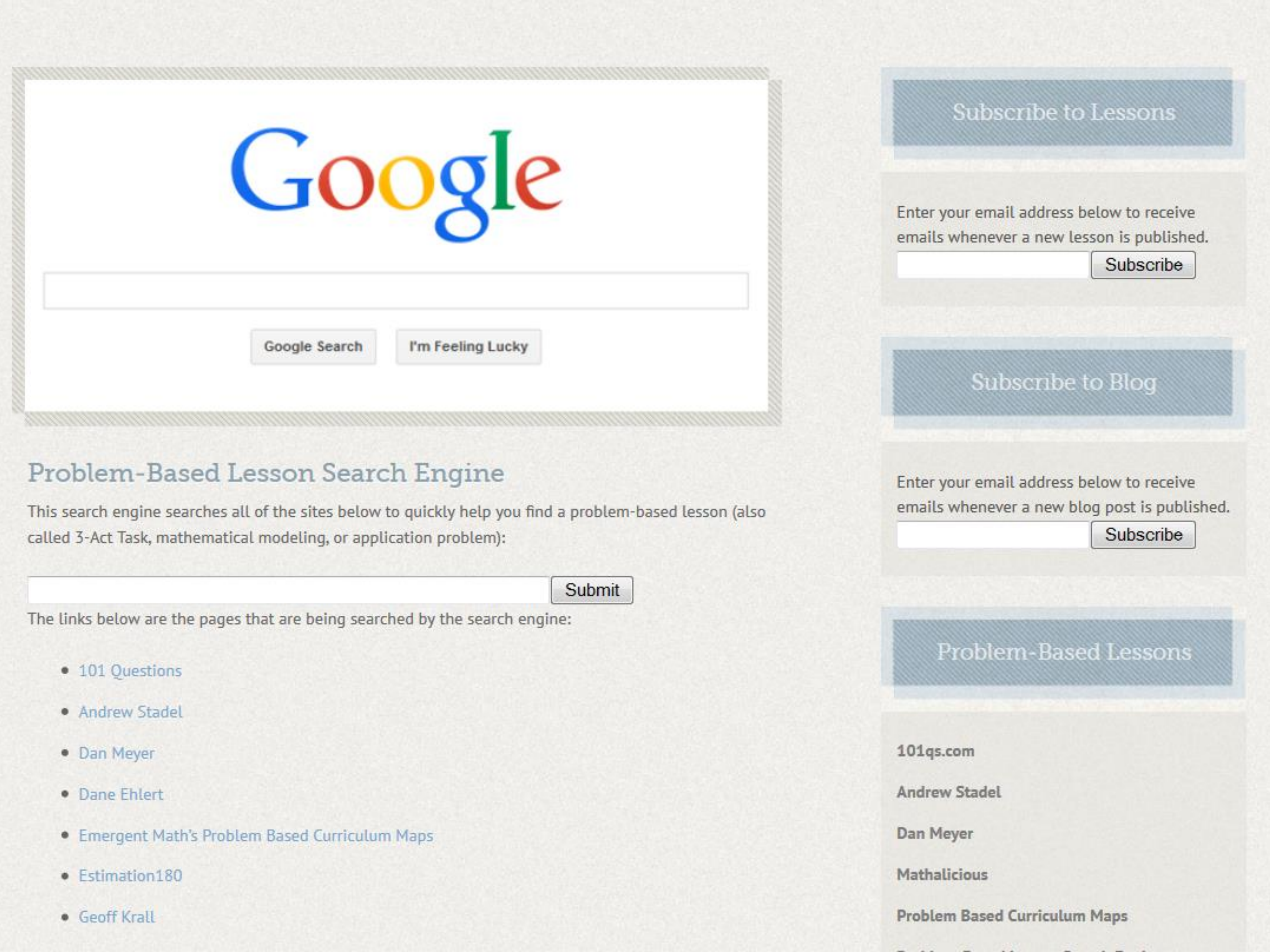
What Does 2000 Calories Look Like?

coinstar
Coca-Cola



Robert Kaplinsky's Problem-Based Lessons

1	Task Name	Concept / Skill	Standard 1	Standard 2	Standard 3	Standard 4	Sta
2	How Can We Water All Of The Grass?	Circles, Pythagorean Theorem, trigonometric ratios	7.G.4	8.G.7	G-SRT.8	G-MG.1	G-M
3	How Much Money IS That?!	Volume of rectangular prism	5.MD.3	5.MD.4	5.MD.5	5.MD.5b	5.M
4	How Much Money Should Dr. Evil Demand?	Exponential Growth	N-RN.2	A-SSE.1	A-SSE.3c	A-SSE.4	A-R
5	How Tall Is Mini-Me?	Scale and Dividing Decimals	5.NF.5	5.NF.5a	5.NF.5b	6.NS.3	
6	How Did They Make Ms. Pac-Man?	Transformations (Rotations, Reflections, and Translations)	8.G.1	8.G.2	8.G.3	8.G.4	G-S
7	Which Ticket Option Is The Best Deal?	Unit Rates and Ratios	6.RP.2	6.RP.3	6.RP.3a	6.RP.3b	
8	How Far Apart Are The Freeway Exits?	Fractions on a Number Line and Subtracting Fractions	3.NF.2	3.NF.2b	4.NF.2	4.NF.3a	4.N
9	Do We Have Enough Paint?	Area	3.MD.5	3.MD.6	3.MD.7		
10	How Many Stars Are There In The Universe?	Scientific Notation	8.EE.3	8.EE.4			
11	What Rides Can You Go On?	Inequalities and Measurement	2.MD.1	6.NS.7a	6.NS.7b		
12	Do You Have Enough Money?	Money	2.MD.8				
13	Which Bed Bath & Beyond Coupon Should You Use?	Percent Discount	7.RP.3				
14	Is Gas Cheaper With Cash Or Credit Card?	Percent Discount	7.RP.3				
15	Where's The Nearest Toys R Us?	Pythagorean Theorem (Distance in coordinate system)	8.G.8	G-SRT.8	G-GPE.7		
16	How Sharp Is The iPhone 5's Retina Display?	Pythagorean Theorem (Length of a side)	8.G.7	G-SRT.8	G-GPE.7		
17	When Should She Take Her Medicine?	Operations with Time Intervals	4.MD.2				
18	How Big Are Sunspots?	Converting Units, Proportions, and Scientific Notation	5.MD.1	7.RP.2	7.G.4	8.EE.4	G-M
19	What Michael's Coupon Should I Use?	Percent Discount	7.RP.3	A-CED.3			
20	Is It Cheaper To Pay Monthly or Annually?	Decimal Operations and/or Systems of Equations	5.NBT.7	8.EE.8c	A-CED.3	A-REI.11	F-B
21	How Big Is The 2010 Guatemalan Sinkhole?	Volume of Cylinder	5.MD.3	5.MD.4	5.MD.5	8.G.9	G-C
22	How Can You Win Every Prize At Chuck E. Cheese's?	Decomposing Numbers and/or Systems of Equations	2.NBT.7	3.NBT.2	3.NBT.3	8.EE.8c	A-C
23	How Many Royal Flushes Will You Get?	Probability	7.SP.5	7.SP.6	7.SP.7	S-MD.5	S-M
24	How Much Does The Paint On A Space Shuttle Weigh?	Surface Area	6.G.4	7.G.6	8.G.7	G-MG.1	G-M
25	How Did Motel 6 Go From $6 to $66?	Percent Increase and Compound Interest	7.RP.3	A-SSE.1b	F-BF.1	F-IF.8b	F-L
26	How Much Does The Aluminum Foil Prank Cost?	Surface Area and Unit Rates	6.G.4	6.RP.2	6.RP.3	7.G.6	
27	How Many Laps Is A 5k Race?	Perimeter	4.MD.3				
28	Which Toilet Uses Less Water?	Systems of Equations/Inequalities	8.EE.8c	A-CED.3	A-REI.11	F-BF.1	
29	How Did Someone Get A $103,000 Speeding Ticket In Finland?	Linear Equations	A-CED.2	F-BF.1	F-IF.4	F-IF.6	
30	Which Pizza Is A Better Deal?	Area or Circle, Square, and Unit Rates	3.MD.5	3.MD.6	3.MD.7	4.MD.3	6.R
31	How Big Is The World's Largest Deliverable Pizza?	Area of Square	3.MD.5	3.MD.6	3.MD.7	4.NBT.3	4.M
32	How Many Sheets Do You Need To Break Out Of Prison?	Integer Operations	5.NBT.6				
33	Do Hybrid Cars Pay For Themselves?	Systems of Equations or Rates	6.RP.2	6.RP.3	8.EE.8c	A-CED.3	F-B
34	How Many Hot Dogs Did They Eat?!	Linear and Quadratic Functions	8.F.3	8.F.4	F-BF.1	F-BF.2	F-I
35	How Much Purple Ribbon Will You Need?	Perimeter & Circumference	3.MD.8	4.MD.3	7.G.4		
36	Are We There Yet?	Adding Times	3.MD.1	4.MD.2			
37	Which Chinese Food Coupon Should I Use?	Percent Discount	7.RP.3				
38	How Big Is The Vehicle That Uses Those Tires?	Ratio and Proportions	7.RP.2				
39	Where Would The Angry Birds Have Landed?	Create Equation From Quadratic Graph	A-CED.1	F-BF.1	F-IF.4	F-IF.7a	F-L
40	How Many Movies Can You See In One Day?	Adding Times	3.MD.1	4.MD.2			
41	Which Carrots Should You Buy?	Unit Rates	6.RP.1	6.RP.2	6.RP.3		
42	How Fast Can You Throw A Baseball?	Converting Units and Unit Rates	5.MD.1	6.RP.2			



Problem-Based Lesson Search Engine

This search engine searches all of the sites below to quickly help you find a problem-based lesson (also called 3-Act Task, mathematical modeling, or application problem):

The links below are the pages that are being searched by the search engine:

- 101 Questions
- Andrew Stadel
- Dan Meyer
- Dane Ehlert
- Emergent Math's Problem Based Curriculum Maps
- Estimation180
- Geoff Krall

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Problem-Based Lessons

101qs.com

Andrew Stadel

Dan Meyer

Mathalicious

Problem Based Curriculum Maps

Call to Action

- Commit to one of these choices:
  - Implement a problem-based lesson that is at or below grade level in your class(es) within the week.
  - Implement a single DOK 2 or DOK 3 problem from openmiddle.com in your class(es) within the week.

Contact

Robert Kaplinsky

✉ robert@robertkaplinsky.com

🌐 robertkaplinsky.com/eps15

🐦 @robertkaplinsky

Evergreen Public Schools

ROBERT KAPLINSKY

@robertkaplinsky

THIS UNIT NOT LABELED FOR INDIVIDUAL RETAIL SALE
1 FIRST QUALITY 1
Ralphs
grade AA
butter
NET WT. 4 OZ. (113g)

☐ 1/3 cup butter

☐ 1/3 cup white sugar

☐ 3 tablespoons and 1-3/4 teaspoons packed brown sugar

☐ 1/3 cup peanut butter

☐ 1/4 teaspoon vanilla extract

How can we tell where to cut the butter so you have 1/3 of a cup?

THIS UNIT NOT LABELED FOR INDIVIDUAL RETAIL SALE.

Ingredients: Pasteurized Cream, Salt.

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1 Tbsp.	2 Tbsp.	3 Tbsp.	4 Tbsp.	5 Tbsp.	6 Tbsp.	7 Tbsp.	8 Tbsp.

← 1/4 cup →

1 FIRST QUALITY 1

Ralphs

grade AA

butter

NET WT. 4 OZ. (113g)

- ☐ 1/2 cup butter
- ☐ 1/2 cup white sugar
- ☐ 1/3 cup packed brown sugar
- ☐ 1/2 cup peanut butter
- ☐ 1/2 teaspoon vanilla extract

How can we tell where to cut the butter so you have 1/2 of a cup?

THIS UNIT NOT LABELED FOR INDIVIDUAL RETAIL SALE.

Ingredients: Pasteurized Cream, Salt.

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1 Tbsp.	2 Tbsp.	3 Tbsp.	4 Tbsp.	5 Tbsp.	6 Tbsp.	7 Tbsp.	8 Tbsp.
			1/4 cup				1/2 cup

1 FIRST QUALITY 1

Ralphs grade AA **butter**

NET WT. 4 OZ. (113g)

THIS UNIT NOT LABELED FOR INDIVIDUAL RETAIL SALE.

Ingredients: Pasteurized Cream, Salt.

DISTRIBUTED BY: RALPHS GROCERY CO. LOS ANGELES, CALIF. 90054

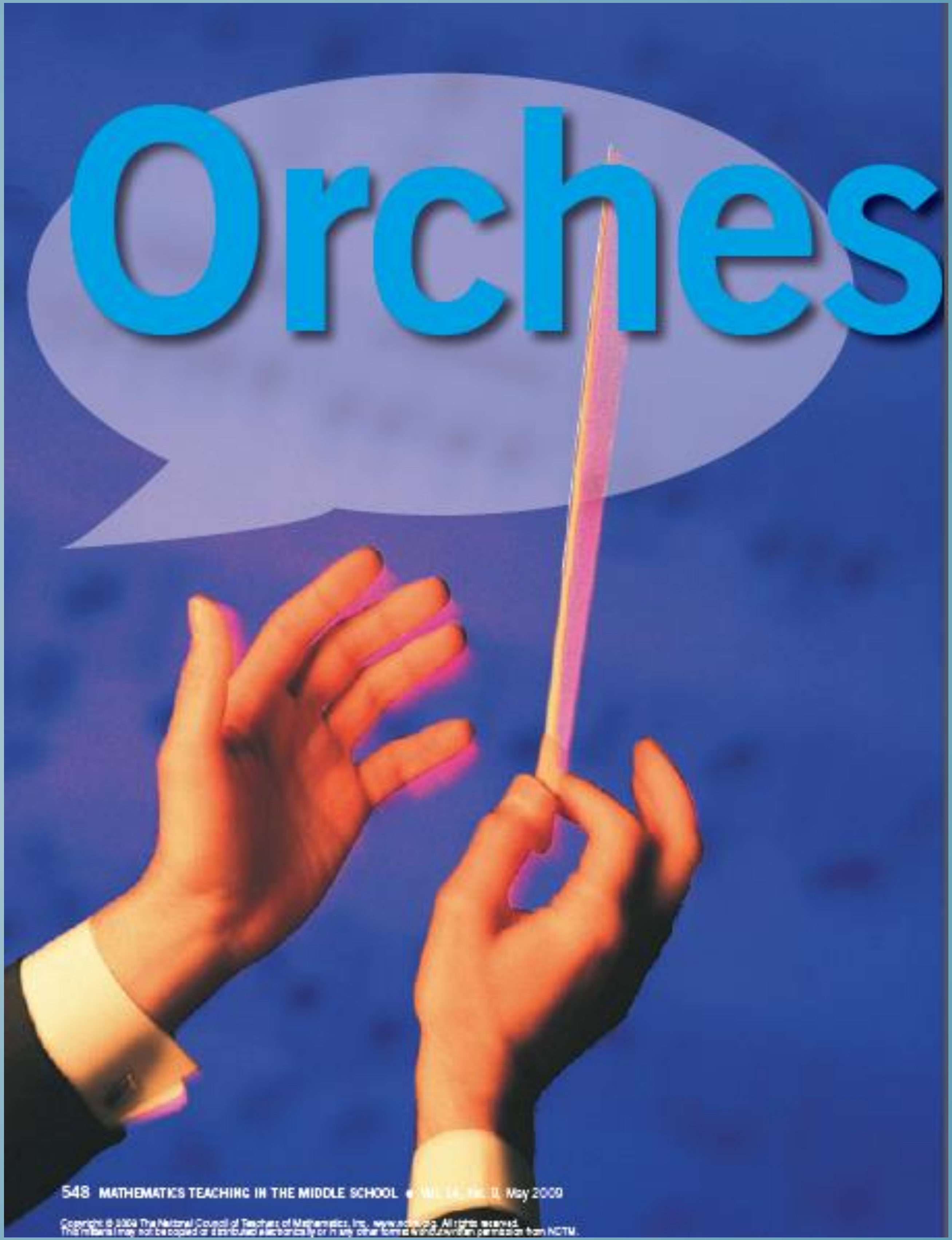
1 Tbsp.	2 Tbsp.	3 Tbsp.	4 Tbsp.	5 Tbsp.	6 Tbsp.	7 Tbsp.	8 Tbsp.
			1/4 cup	1/3 cup			1/2 cup

1 FIRST QUALITY 1

Ralphs grade AA **butter**

NET WT. 4 OZ. (113g)

FIVE PRACTICES



Orches

548 MATHEMATICS TEACHING IN THE MIDDLE SCHOOL • Vol. 14, No. 9, May 2009

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Discussion Questions

- "Giving students too much or too little support, or too much direction, can result in a decline in the cognitive demands of the task." (p. 550) Why?
- "By making purposeful choices about the order in which students' work is shared, teachers can maximize the chances that their mathematical goals for the discussion will be achieved." (p. 554) What ways do teachers currently select students? How would you suggest they change their selection process after reading this?
- What challenges might teachers have when trying to "connect" student solutions? (p. 554)

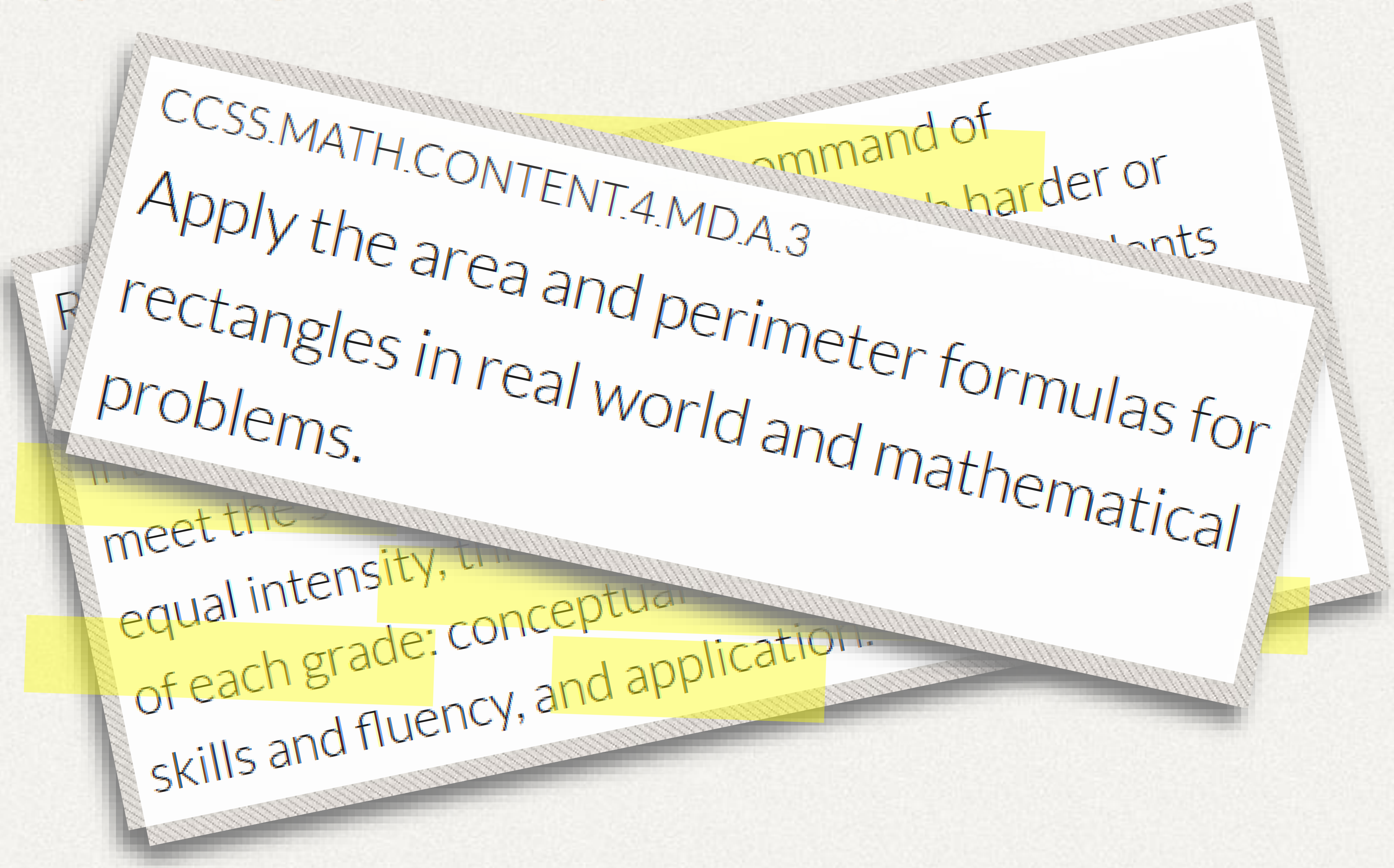
Implementing the Five Practices

1. Anticipate potential student responses to the butter stick fraction problem.
2. Review the ten student work samples that represent students in your classroom.
3. Figure out which students you would have share their mathematical work.
4. Determine the order you would have those students present their work.
5. Decide on which connections you would emphasize between the students' work and mathematical ideas.

Posters

- At the top of the poster, list the selection strategy used by your group. For example:
    - Starting with the most commonly used strategy and moving to one that few students used.
    - Starting with a strategy that is more concrete and moving to strategies that are more abstract.
    - Incorporating wrong answers to address common misconceptions.
- Attach those students' work to the poster in the order that you would present it.
- Next to the student work list the questions you would ask the student(s) or ideas that you would want to come out as a result of showing that student's work.

COMMON CORE
STATE STANDARDS INITIATIVE



CCSS.MATH.CONTENT.4.MD.A.3

Apply the area and perimeter formulas for rectangles in real world and mathematical problems.

meet the

equal intensity, th

of each grade: conceptua

skills and fluency, and application.

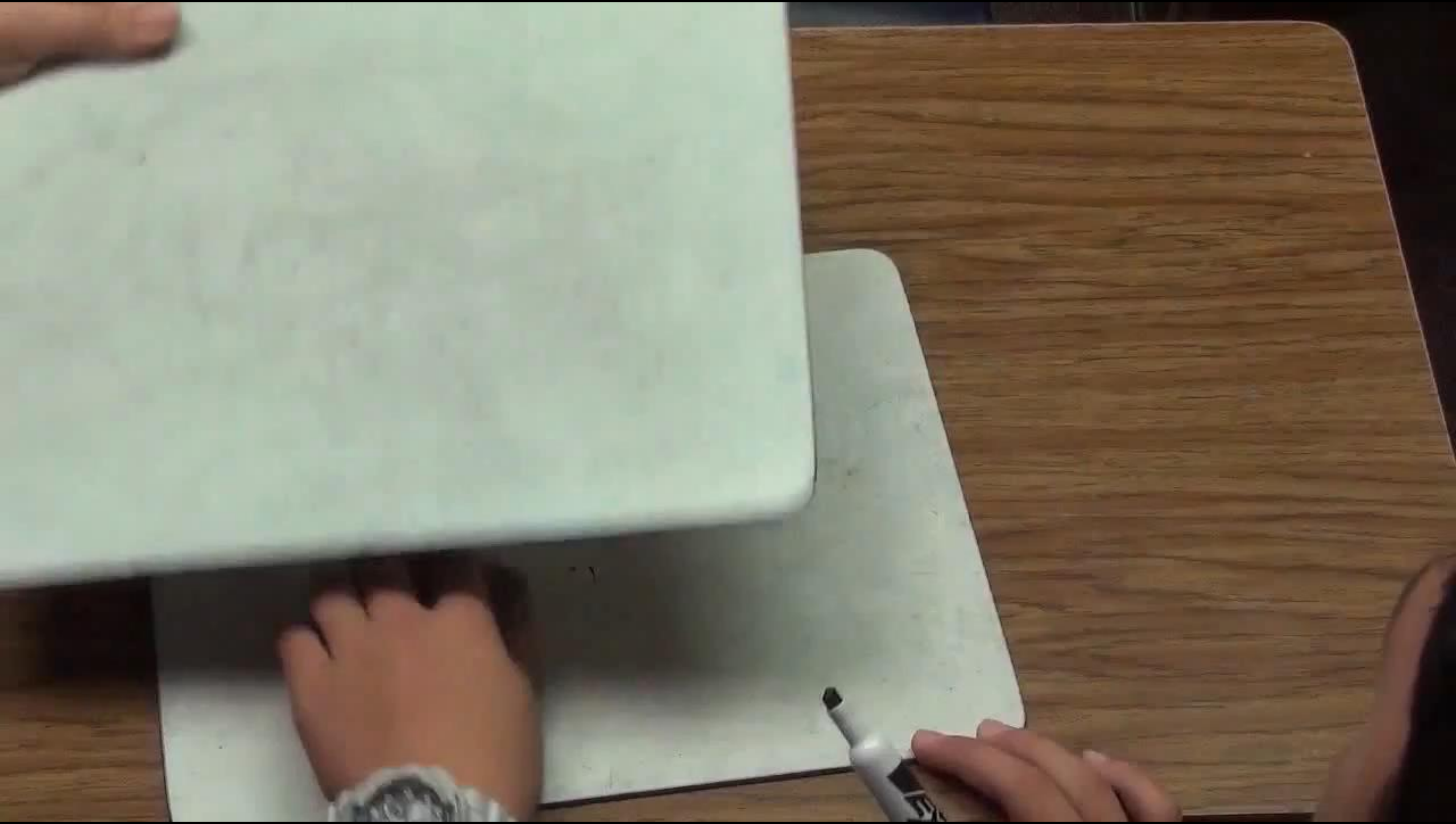
Source: http://www.corestandards.org/other-resources/key-shifts-in-mathematics/

What is the perimeter of a rectangle that measures 8 units by 4 units?

Components of Rigor

- ☑ Procedural Skill and Fluency
- ☑ Conceptual Understanding

List the dimensions of a rectangle with a perimeter of 24 units.

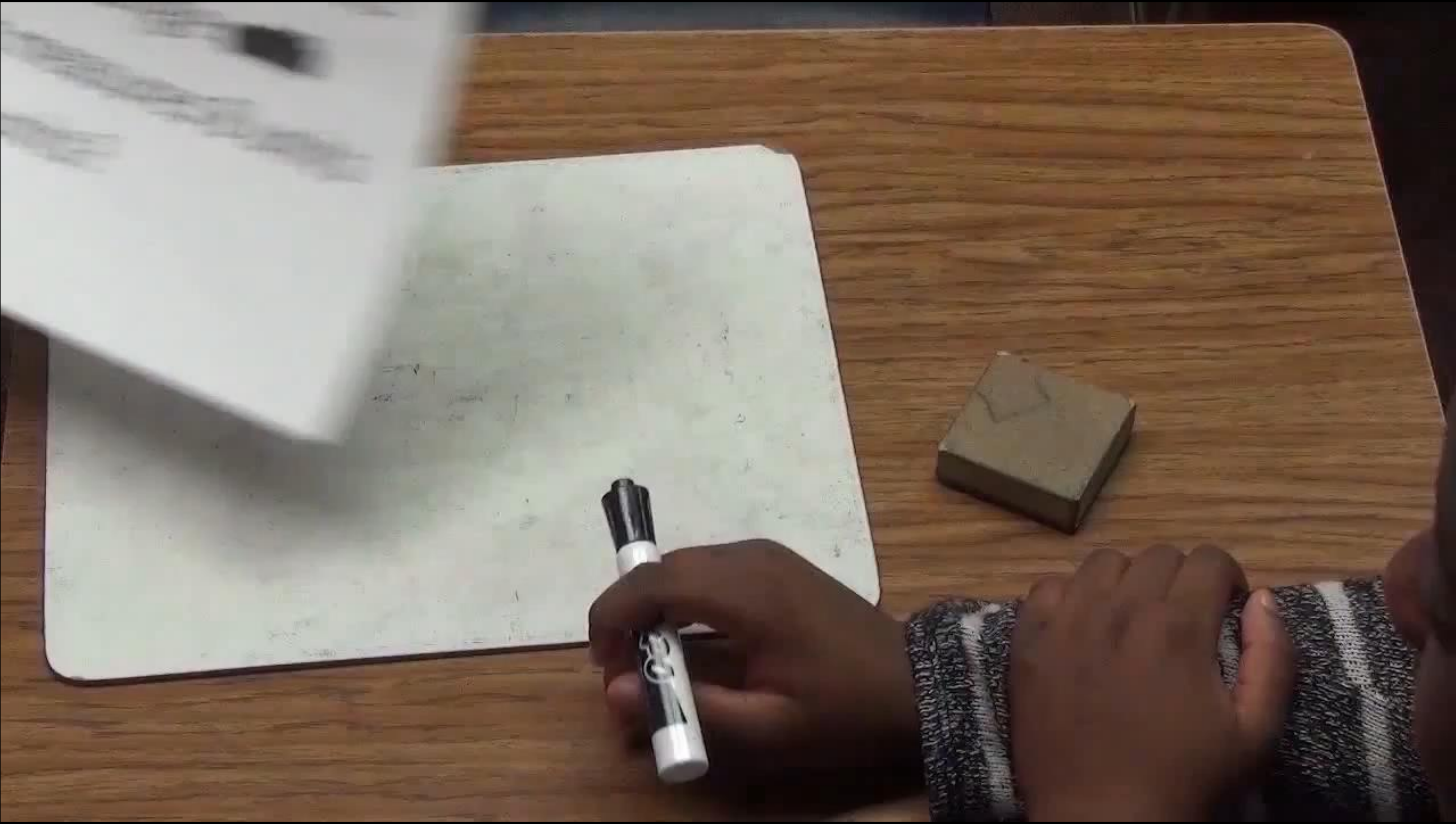


Components of Rigor

☒ Procedural Skill and Fluency

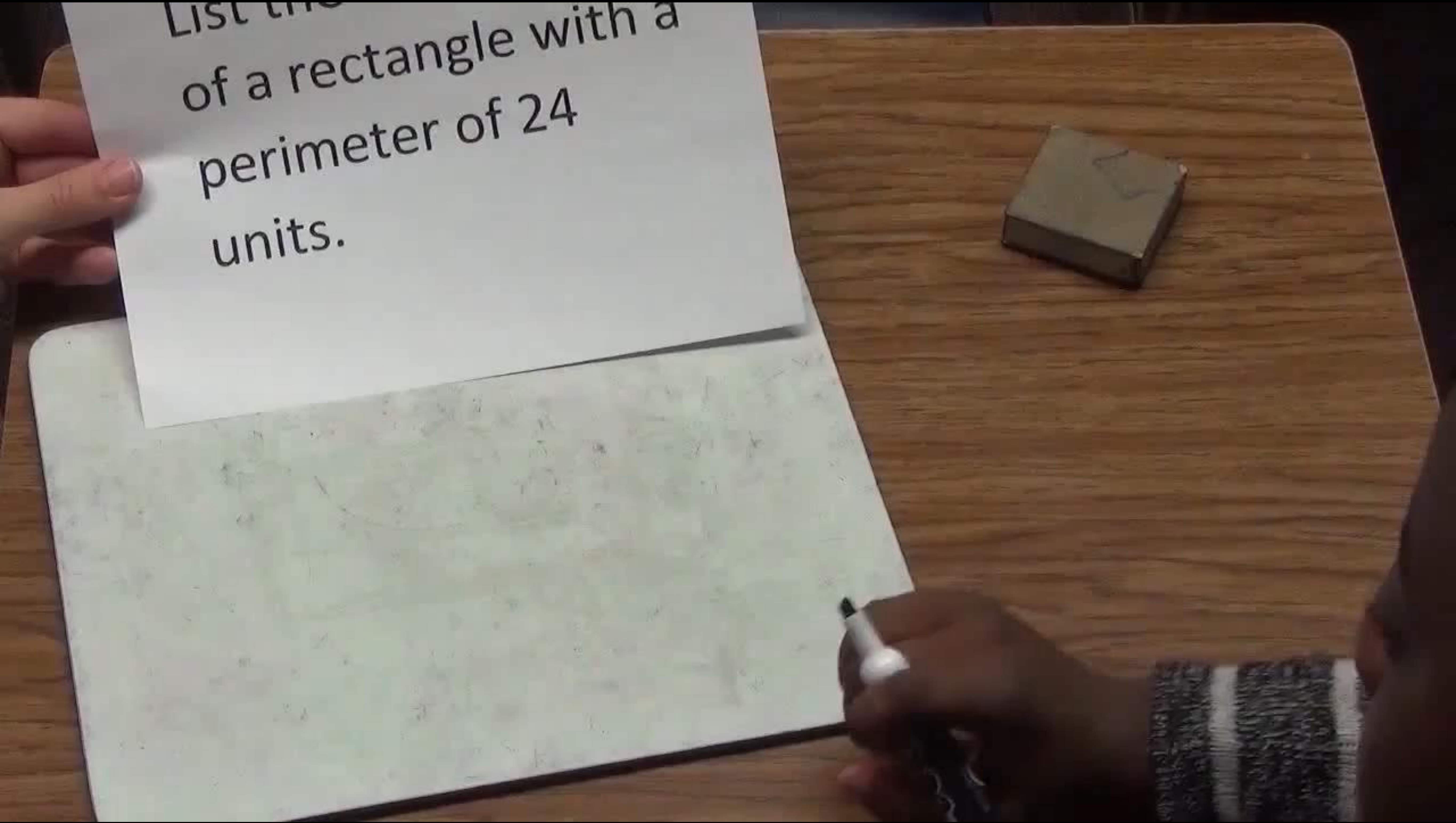
☒ Conceptual Understanding

WHY?



Components of Rigor

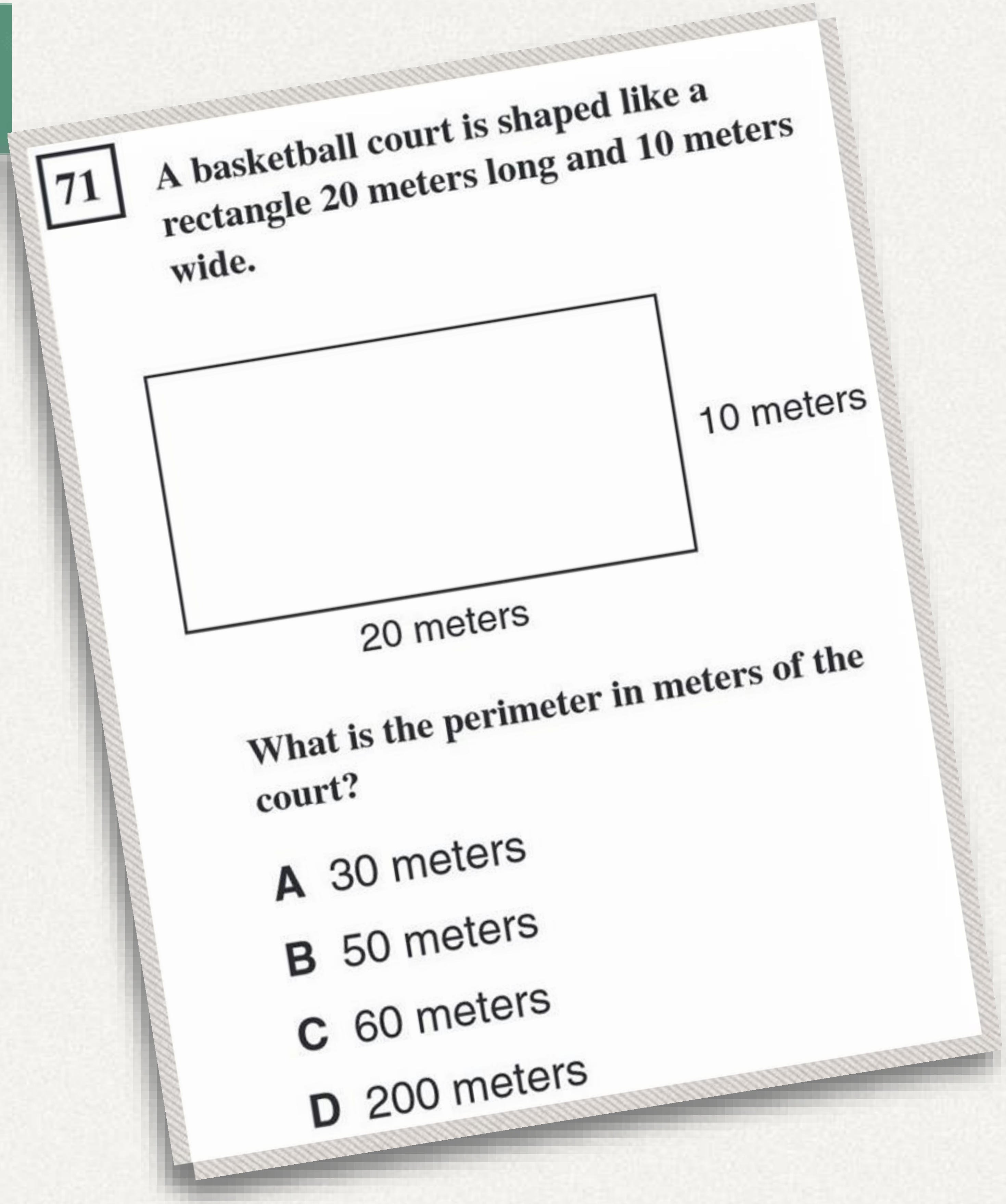
- ☑ Procedural Skill and Fluency
- ☑ Conceptual Understanding



List th
of a rectangle with a
perimeter of 24
units.

Components of Rigor

- ☒ Procedural Skill and Fluency
- ☒ Conceptual Understanding



71 A basketball court is shaped like a rectangle 20 meters long and 10 meters wide.

10 meters

20 meters

What is the perimeter in meters of the court?

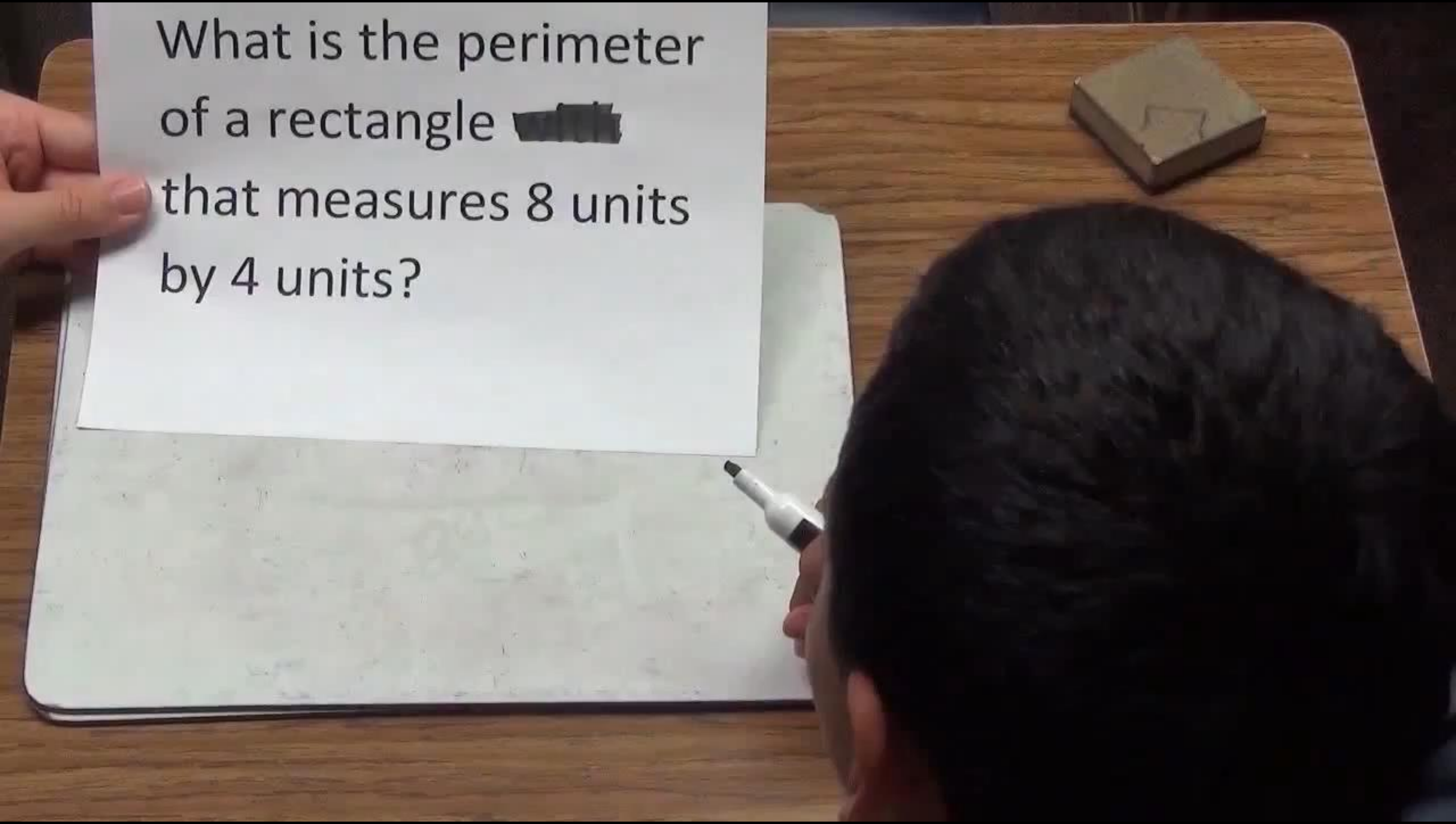
A 30 meters

B 50 meters

C 60 meters

D 200 meters

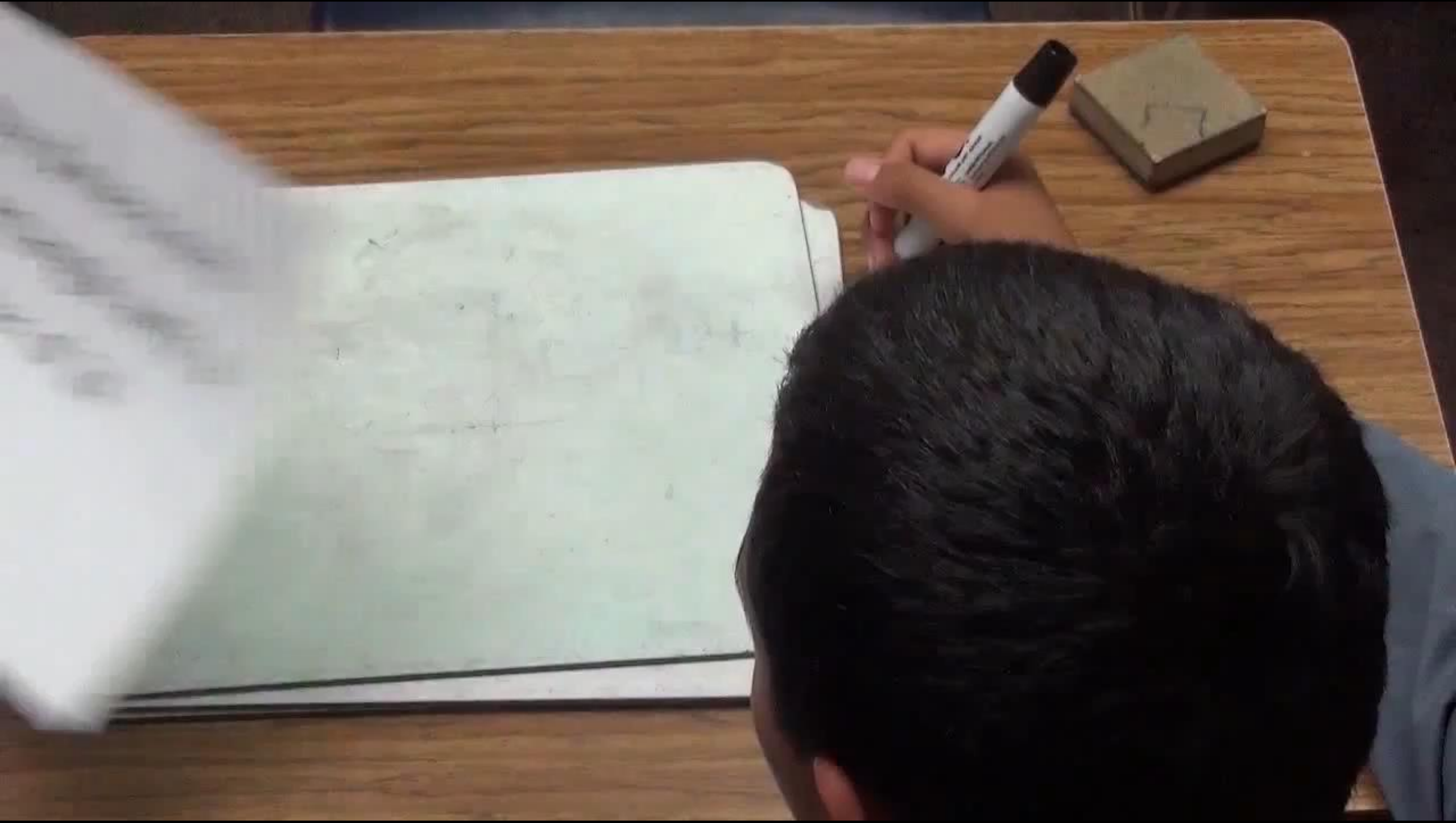
Source: http://www.cde.ca.gov/ta/tg/sr/documents/cstrtqmath3.pdf



What is the perimeter of a rectangle [redacted] that measures 8 units by 4 units?

Components of Rigor

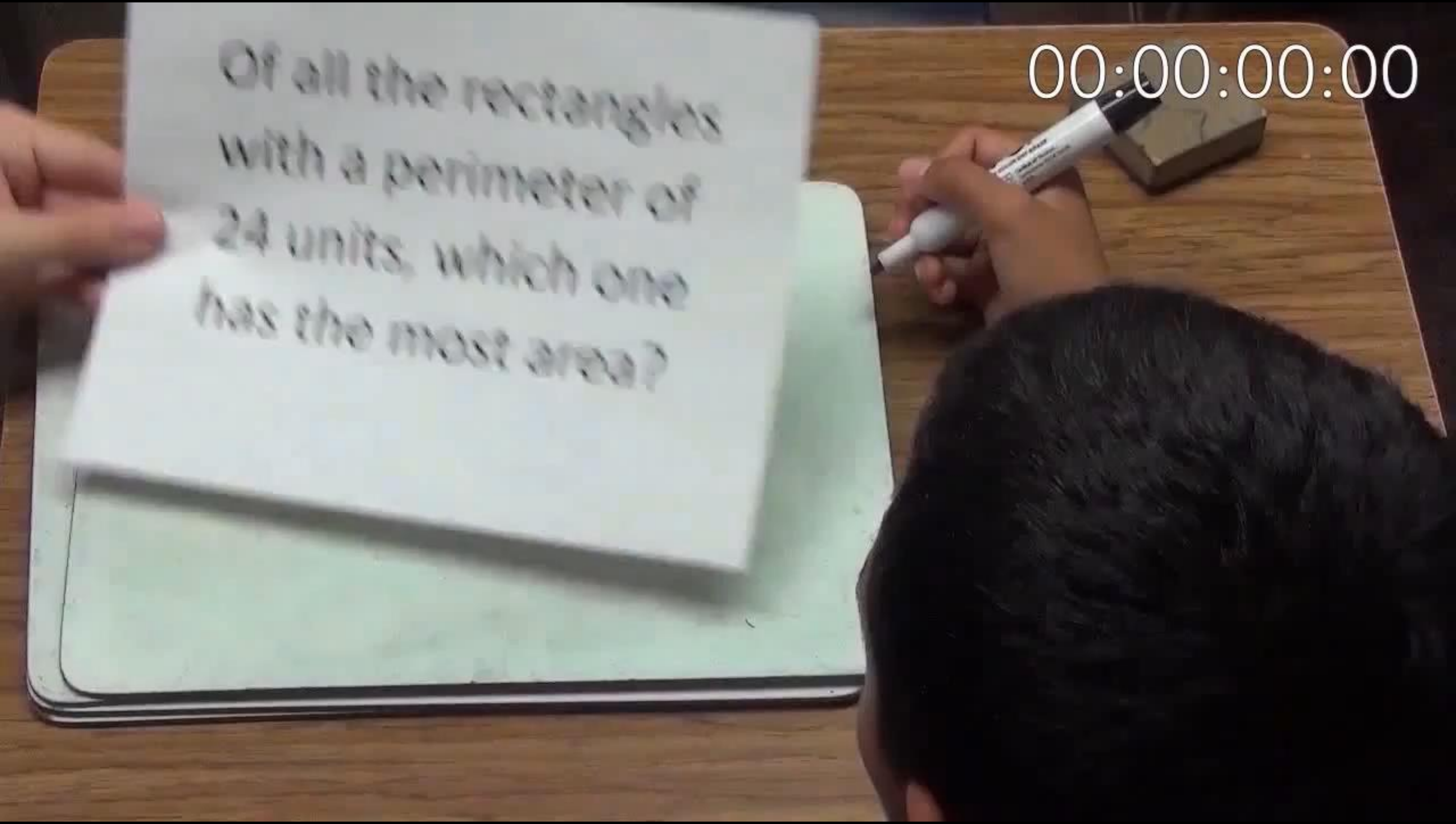
- ☑ Procedural Skill and Fluency
- ☑ Conceptual Understanding



Components of Rigor

- ☑ Procedural Skill and Fluency
- ☑ Conceptual Understanding

Of all the rectangles with a perimeter of 24 units, which one has the most area?



Of all the rectangles with a perimeter of 24 units, which one has the most area?

Components of Rigor

- ☒ Procedural Skill and Fluency
- ☒ Conceptual Understanding

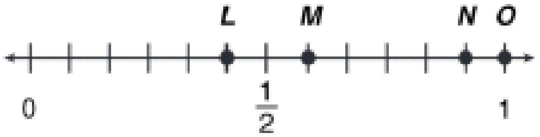
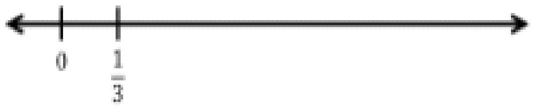
Defining the Problem

- Students appear to demonstrate "deep, authentic command of mathematical concepts" when given commonly used problems.
- However with more challenging problems, the same students seem to no longer demonstrate that command.

Addressing the Problem

- First, we must have a clear understanding about why these problems are different from one another.
- Next, we need to practice implementing these problems such that all students are engaged in a problem that is at the right challenge level for them.
- Last, we need a source that can provide us with a variety of free problems.

DOK | Distinguishing Between Depth of Knowledge Levels in Mathematics

Topic	Adding Whole Numbers	Money	Fractions on a Number Line	Area and Perimeter	Subtracting Mixed Numbers
CCSS Standard(s)	• 1.NBT.4 • 2.NBT.5	• 2.MD.8	• 3.NF.2	• 3.MD.8 • 4.MD.3	• 5.NF.1
DOK 1 Example	Find the sum. $44 + 27 =$	If you have 2 dimes and 3 pennies, how many cents do you have	Which point is located at $\frac{7}{12}$ below? 	Find the perimeter of a rectangle that measures 4 units by 8 units.	Find the difference. $5\frac{1}{2} - 4\frac{2}{3} =$
DOK 2 Example	Fill in the boxes below using the whole numbers 1 through 9, no more than one time each, so that you make a true equation. $\square\square + 53 = \square\square$	Make 47¢ in three different ways with either quarters, dimes, nickels, or pennies.	Label the point where $\frac{3}{4}$ belongs on the number line below. Be as precise as possible. 	List the measurements of three different rectangles that each has a perimeter of 20 units.	Create three different mixed numbers that will make the equation true by using the whole numbers 1 through 9, no more than one time each,. You may reuse the same whole numbers for each of the three mixed numbers. $5\frac{4}{5} - \square\frac{\square}{\square} = 3\frac{1}{20}$
DOK 3 Example	Make the largest sum by filling in the boxes below using the whole numbers 1 through 9, no more than one time each. $\square\square + \square\square =$	Make 47¢ using exactly 5 coins with either quarters, dimes, nickels, or pennies.	Create 5 fractions using the whole numbers 0 through 9, no more than one time each, as numerators and denominators and correctly place them all on a number line.	What is the greatest area you can make with a rectangle that has a perimeter of 24 units?	Make the smallest difference by filling in the boxes below using the whole numbers 1 through 9, no more than one time each. $\square\frac{\square}{\square} - \square\frac{\square}{\square}$

ROBERT KAPLINSKY

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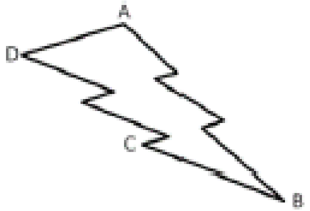
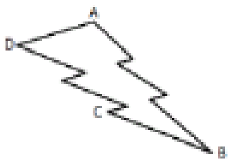
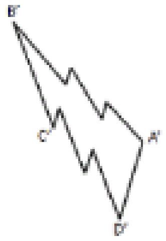
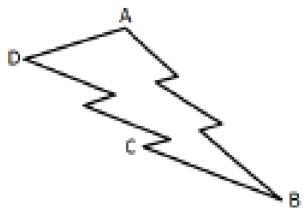
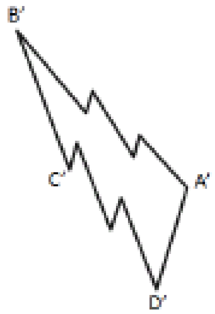
Version 1.9

DOK | Distinguishing Between Depth of Knowledge Levels in Mathematics

Topic	Surface Area and Volume	Probability	Transformations	Factoring Quadratics	Quadratics in Vertex Form
CCSS Standard(s)	• 6.G.4 • 7.G.6	• 7.SP.5 • 7.SP.7	• 8.G.1 • G-CO.5	• A-SSE.3a	• F-IF.7a
DOK 1 Example	Find the surface area of a rectangular prism that measures 3 units by 4 units by 5 units.	What is the probability of rolling a sum of 5 using two 6-sided dice?	Rotate the image below 90° counterclockwise and reflect it across a horizontal line. 	Find the factors: $2x^2 + 7x + 3$	Find the roots and maximum of the quadratic equation below. $y = 3(x-4)^2 - 3$
DOK 2 Example	List the measurements of three different rectangular prisms that each has a surface area of 20 square units.	What value(s) have a 1/12 probability of being rolled as the sum of two 6-sided dice?	List three sequences of transformations that take pre-image ABCD to image A'B'C'D'.  Pre-Image  Image	Fill in the blank with integers so that the quadratic expression is factorable. $x^2 + \_\_x + 4$	Create three equations for quadratics in vertex form that have roots at 3 and 5 but have different maximum and/or minimum values.
DOK 3 Example	What is the greatest volume you can make with a rectangular prism that has a surface area of 20 square units?	Fill in the blanks to complete this sentence using the whole numbers 1 through 9, no more than one time each. Rolling a sum of ___ on two ___-sided dice is the same probability as rolling a sum of ___ on two ___-sided dice.	What is the fewest number of transformations needed to take pre-image ABCD to image A'B'C'D'?  Pre-Image  Image	Fill the blank by finding the largest and smallest integers that will make the quadratic expression factorable. $2x^2 + 3x + \_\_$	Create a quadratic equation with the largest maximum value using the whole numbers 1 through 9, no more than one time each. $y = -\square(x-\square)^2 + \square$

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Version 1.9

DOK Level Differences

- **Level 1: Recall & Reproduction**
  - Often a trivial application of facts.
  - Requires little to no cognitive effort beyond remembering the right formula.
  - Usually only one answer.
- **Level 2: Skills & Concepts**
  - Usually requires more than one step to solve.
  - Often multiple answers.
- **Level 3: Strategic Thinking**
  - Usually requires critical thinking about the best way to approach a problem.
  - May be multiple answers or a single optimal answer.
  - Often challenging enough to make your head hurt.
- **Level 4: Extended Thinking**
  - In mathematics these are generally represented by performance tasks or problem-based lessons.

Probability

What is the probability of rolling a sum of 5 using two 6-sided dice?

Probability

What value(s) have a $\frac{1}{12}$ probability of being rolled as the sum of two 6-sided dice?

Author: Daniel Luevanos

Probability

Fill in the blanks to complete this sentence using the whole numbers 1 through 9, no more than one time each.

Rolling a sum of ____ on two ____-sided dice is the same probability as rolling a sum of ____ on two ____-sided dice.

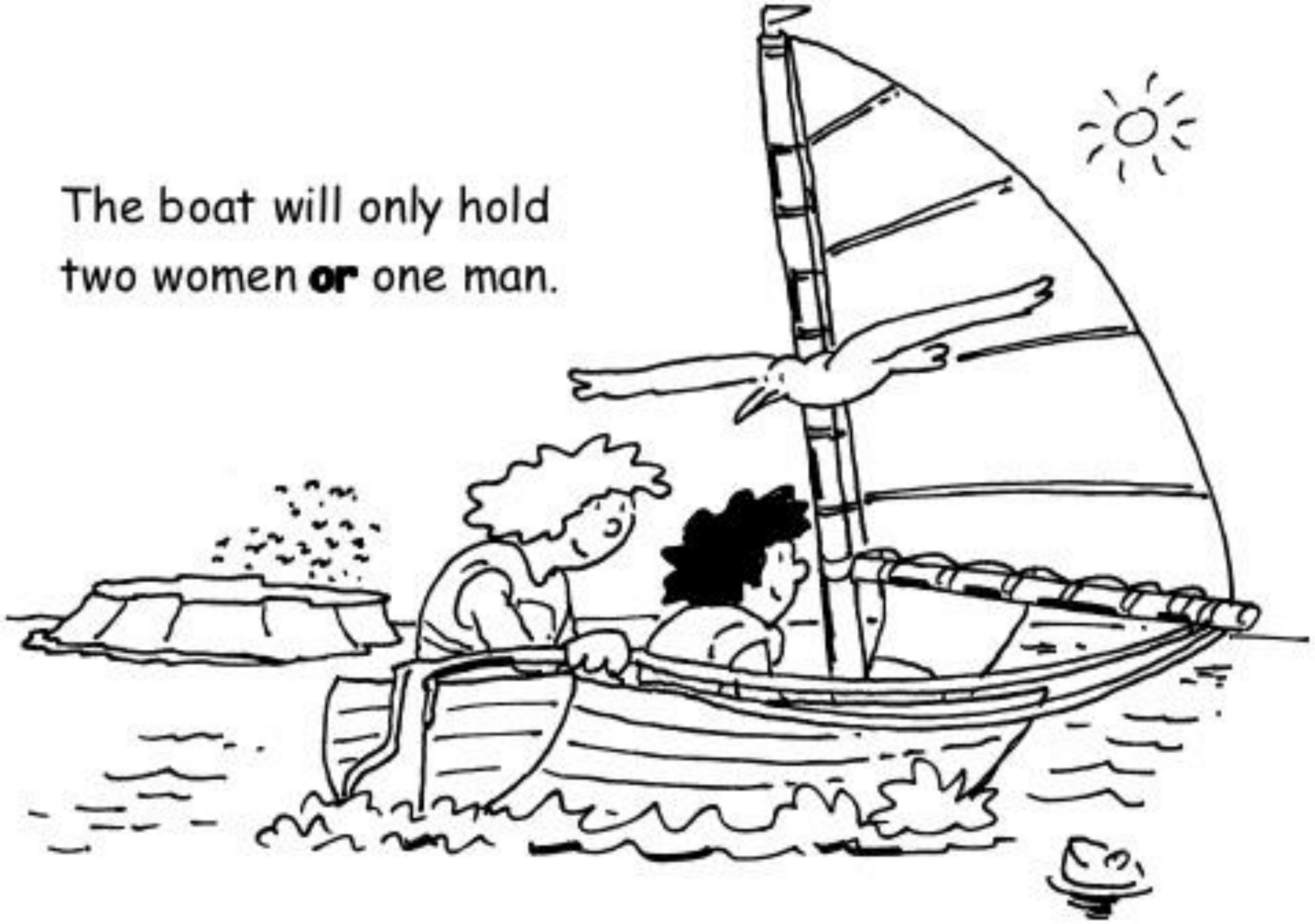
Authors: Audrey Mendivil, Daniel Luevanos, and Robert Kaplinsky

JUST
BRAIN
TEASERS?

Sail away

Two men and two women want to sail to an island.

The boat will only hold
two women **or** one man.



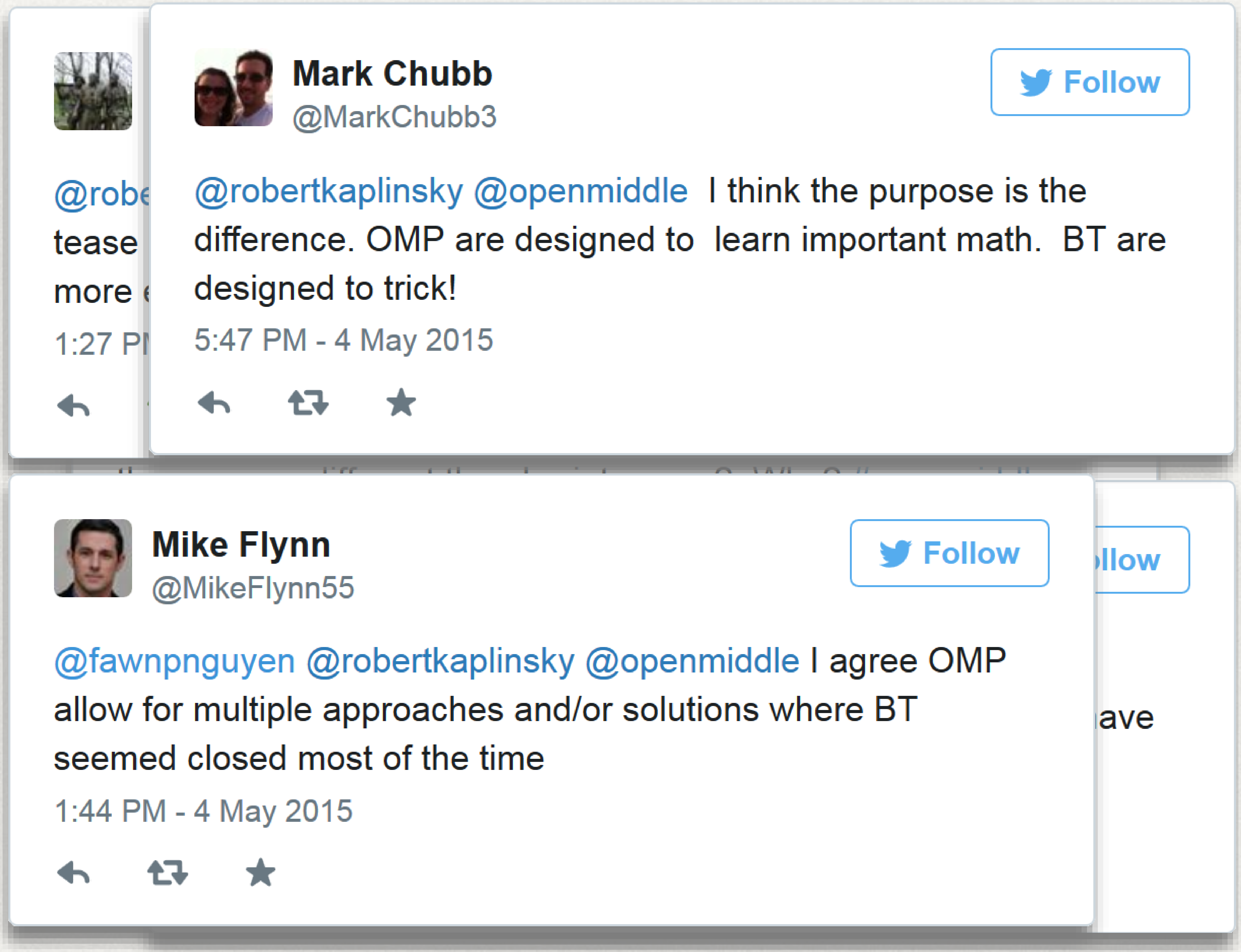
How can all four of them get to the island?

Teaching objectives

Solve mathematical problems or puzzles.
Explain methods and reasoning.

Make the largest sum by filling in the boxes below using the whole numbers 1 through 9, no more than one time each.

☐☐ + ☐☐ =



@robe
tease
more
1:27 P

Mark Chubb
@MarkChubb3

@robertkaplinsky @openmiddle I think the purpose is the difference. OMP are designed to learn important math. BT are designed to trick!

5:47 PM - 4 May 2015

Mike Flynn
@MikeFlynn55

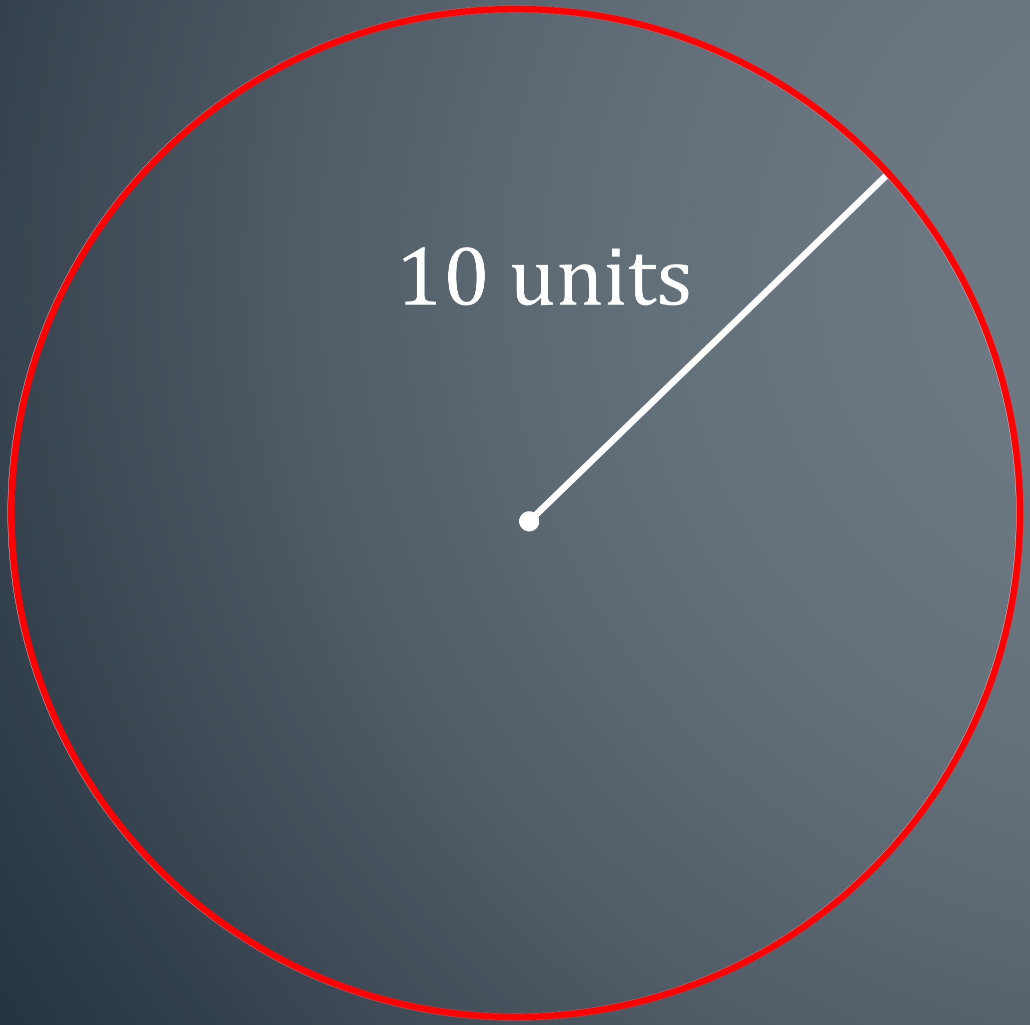
@fawnpnguyen @robertkaplinsky @openmiddle I agree OMP allow for multiple approaches and/or solutions where BT seemed closed most of the time

1:44 PM - 4 May 2015

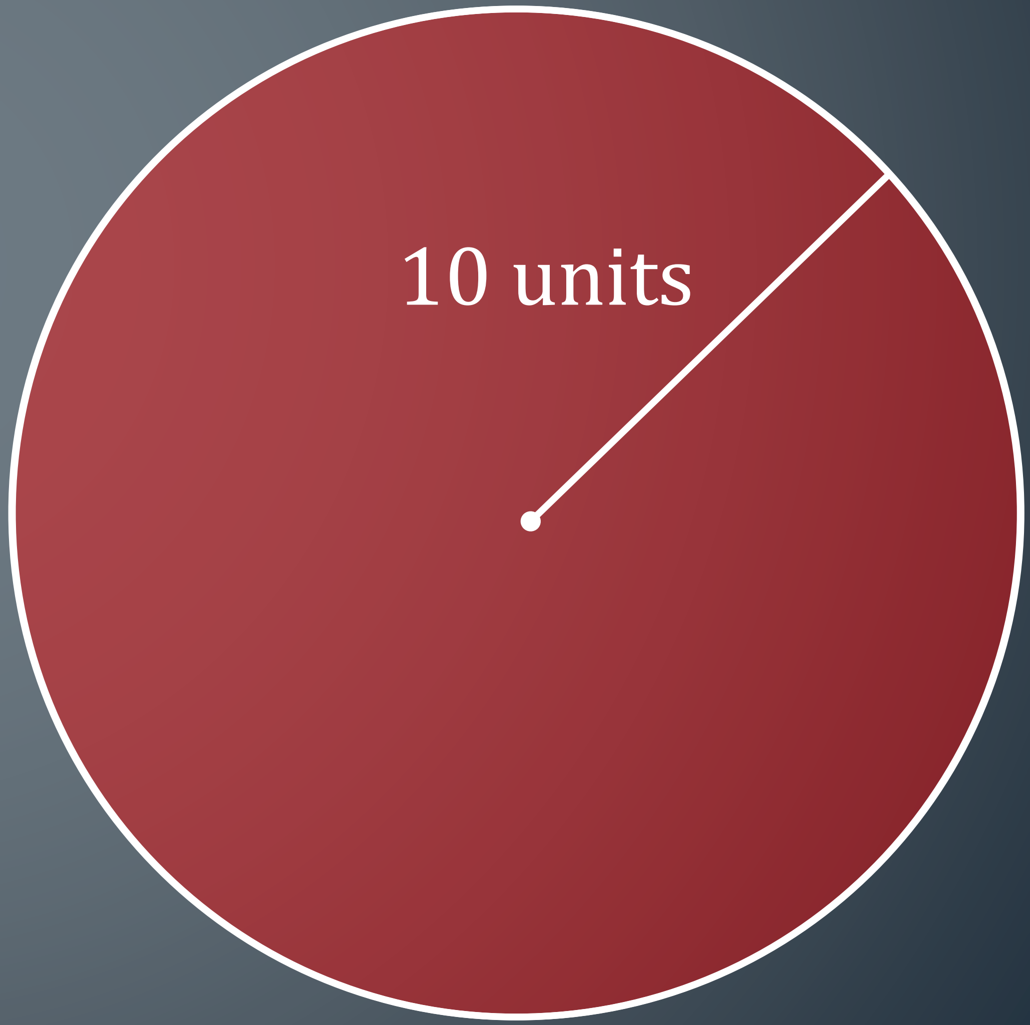
ave

Depth of Knowledge – Level One

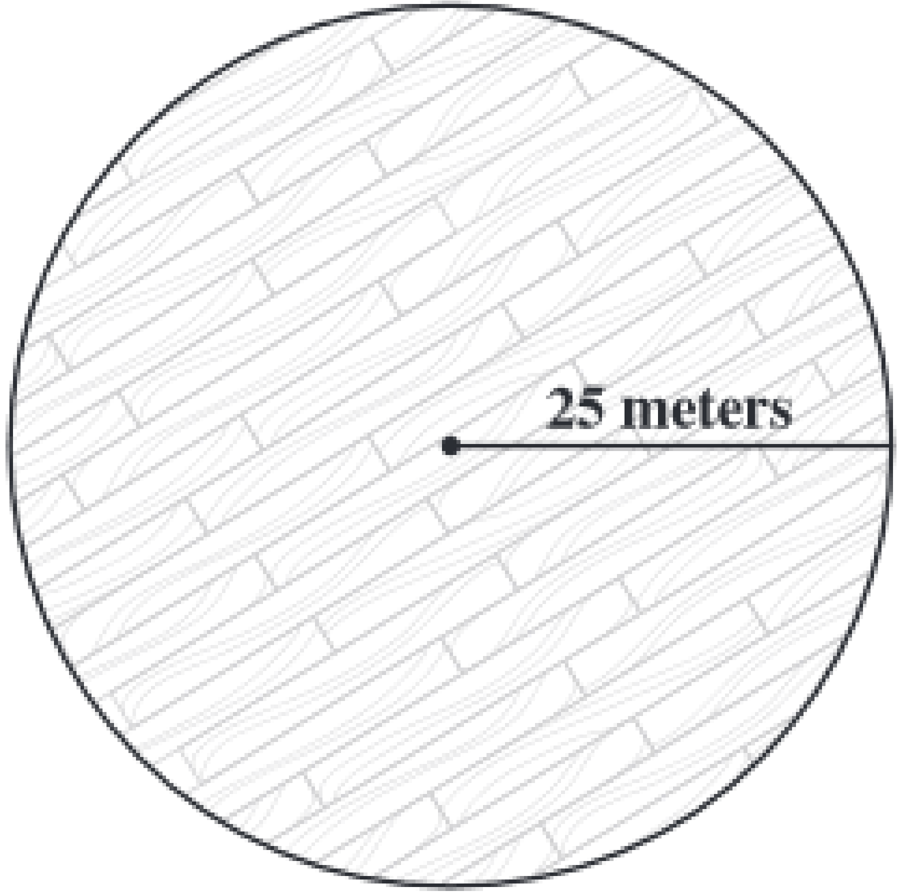
What is the circle's circumference? $\pi \approx 3.14$



What is the circle's area? $\pi \approx 3.14$



70 **This circular stage has a radius of 25 meters.**



Which equation could be used to find the area of the stage in square meters?

A $A = 25\pi$

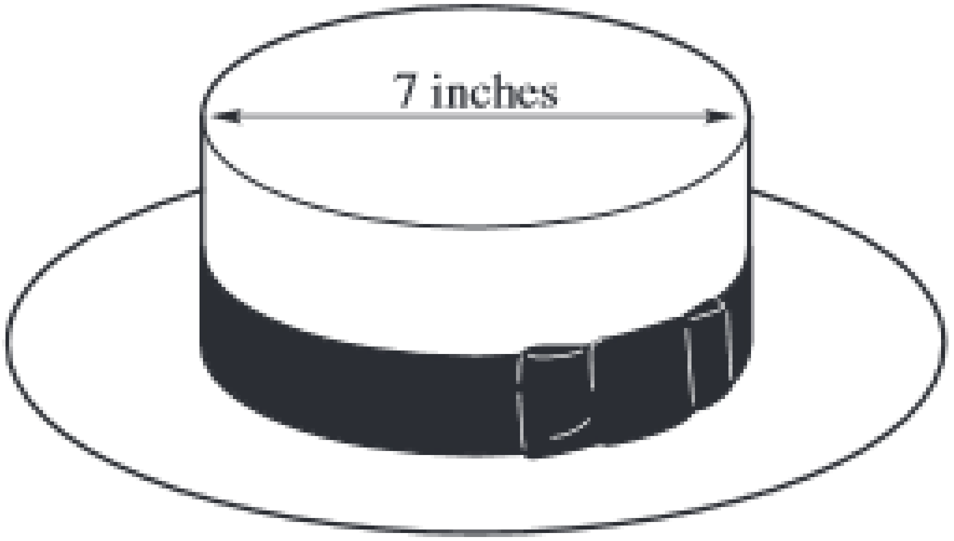
B $A = 50\pi$

C $A = \pi \bullet 25^2$

D $A = \pi \bullet 50^2$

CSM02059

72 **The top part of this hat is shaped like a cylinder with a diameter of 7 inches.**



Which measure is *closest* to the length of the band that goes around the outside of the hat?

A 10.1 inches

B 11.0 inches

C 22.0 inches

D 38.5 inches

CSM00268

Source: 6th Grade CST Released Test Questions - http://www.cde.ca.gov/ta/tg/sr/documents/cstrtqmath6.pdf

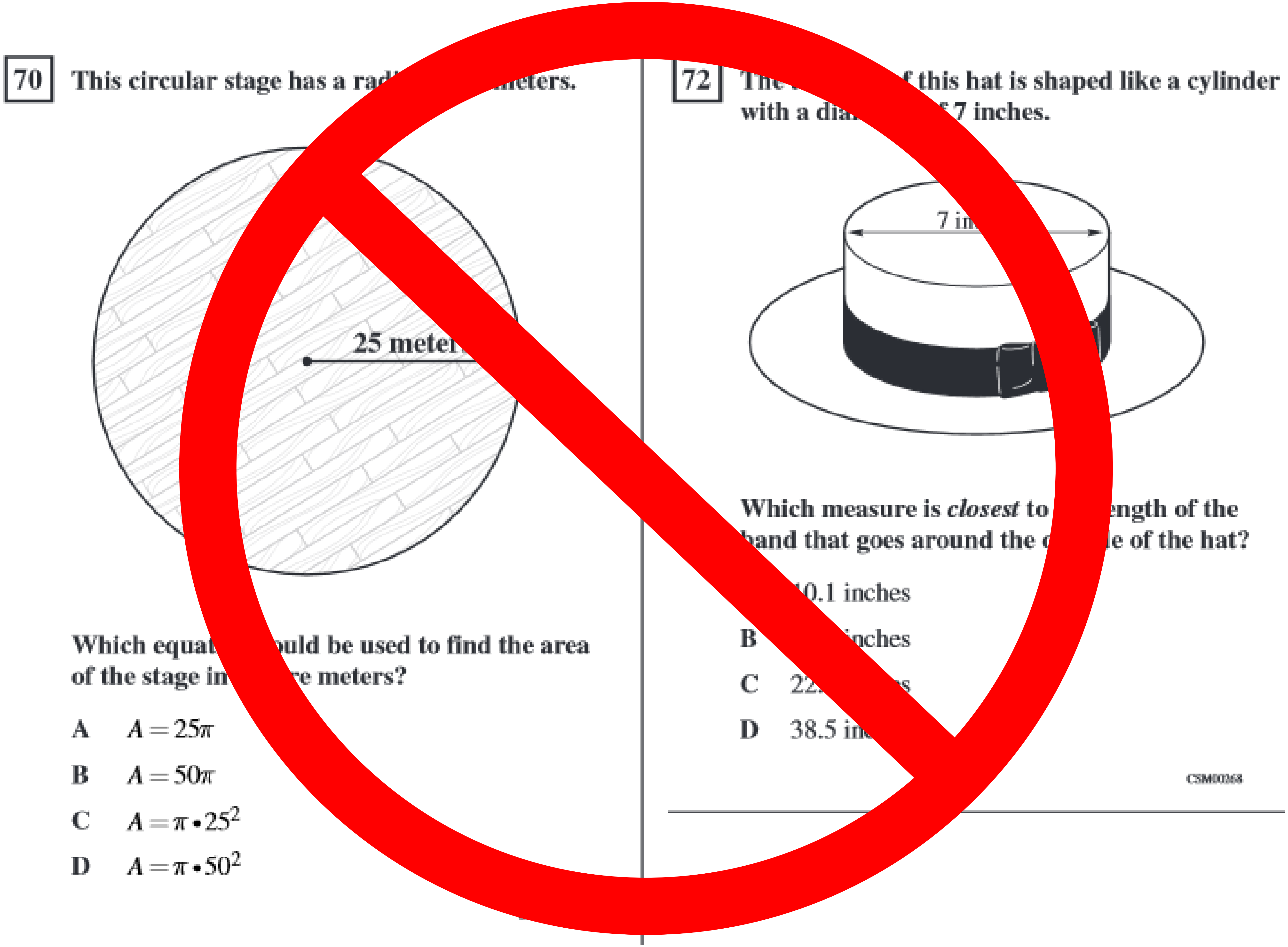
Student Data Facts

- 396 seventh grade students were assessed
- 68.26% correctly answered the circumference question
- 78.59% correctly answered the area question

Mathematics Preliminary Summative Assessment Blueprint
Target Sampling Mathematics Grade 7—Table 6b

Claim	Content Category	Assessment Targets	DOK	Minimum # Scored Tasks		Minimum # Items per Item Type		Min/Max Number of Items
				CAT	PT/ECR	SR	CR	
		A. Analyze proportional relationships and use them to solve real-world and mathematical problems.	1,2	p(9)=1.0				
		B. Solve real-life and mathematical						
	Supporting Cluster	problems involving angle measure, area, surface area, and volume.	1,2		0	2	1	5/8
		G. Use random sampling to draw inferences about a population.	1,2	p(2)=1.0				
		H. Draw informal comparative inferences about two populations.	1,2					
		I. Investigate chance processes and develop, use, and evaluate probability models.	1,2					

	E. Draw, construct, and describe geometrical figures and describe the relationship between them.	2,3
Supporting	F. Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.	1,2



70 This circular stage has a rad meters.

Which equat uld be used to find the area of the stage in re meters?

A $A = 25\pi$

B $A = 50\pi$

C $A = \pi \cdot 25^2$

D $A = \pi \cdot 50^2$

72 The f this hat is shaped like a cylinder with a dia f 7 inches.

Which measure is *closest* to ength of the band that goes around the e of the hat?

0.1 inches

B inches

C 22. s

D 38.5 in

CSM00268

Depth of Knowledge – Level Two

Which circle is bigger? How do you know?

Circle A

Area = 36 units^2

$$C = \pi \cdot 2 \cdot r$$

$$36 \approx 6.28 \cdot r$$

$$\frac{36}{6.28} \approx r$$

$$5.73\, units \approx r$$

Circle B

Circumference = 36 units

$$A = \pi \cdot r^2$$

$$A \approx 3.14 \cdot 5.73^2$$

$$A \approx 3.14 \cdot 32.83$$

$$A \approx 103.15\, units^2$$

Student Data Facts

- Of the 396 seventh grade students who were assessed, 12.12% earned two points on the DOK 2 question.
- 97.92% of the students who correctly answered the DOK 2 question also correctly answered both of the two DOK 1 questions.
- 10.61% of the students who correctly answered both of the two DOK 1 questions also correctly answered the DOK 2 question.

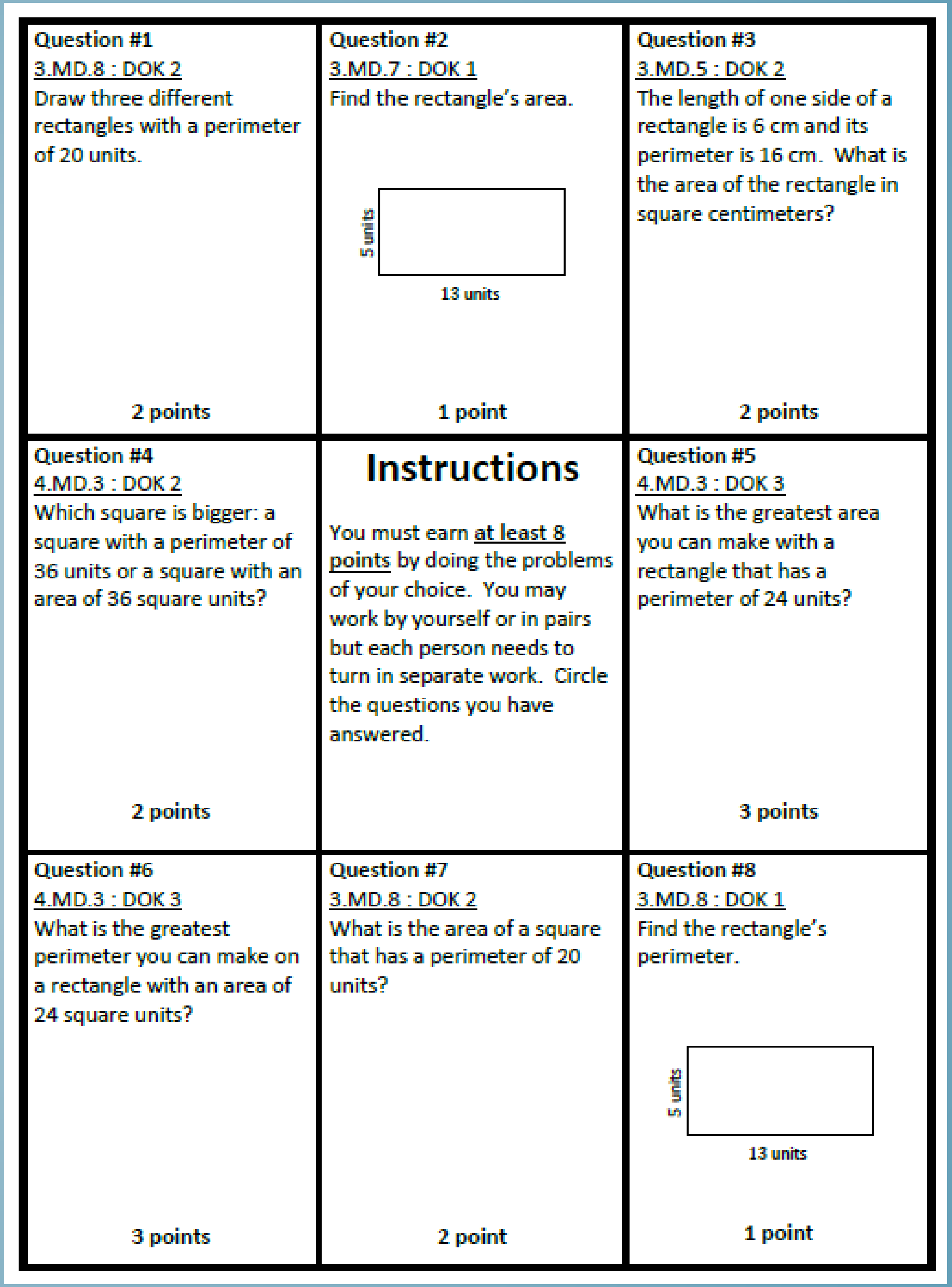
More Student Data Facts

- 28.28% of the students earned only one point.
- All of them earned one point by choosing Circle B and providing insufficient reasoning.
- 59.59% of the students earned no points.

Mathematics Preliminary Summative Assessment Blueprint
Target Sampling Mathematics Grade 7—Table 6b

Claim	Content Category	Assessment Targets	DOK	Minimum # Scored Tasks		Minimum # Items per Item Type		Min/Max Number of Items
				CAT	PT/ECR	SR	CR	
1. Concepts and Procedures	Priority Cluster	A. Analyze proportional relationships and use them to solve real-world and mathematical problems.	1,2	p(9)=1.0	0	7	4	15/20
		D. Solve real-life and mathematical problems using numerical and algebraic expressions and equations.	1,2					
		B. Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.	1,2	p(6)=1.0				
		C. Use properties of operations to generate equivalent expressions.	1					
	Supporting Cluster	E. Draw, construct, and describe geometrical figures and describe the relationship between them.	2,3	p(3)=1.0	0	2	1	5/8
		F. Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.	1,2					
		G. Use random sampling to draw inferences about a population.	1,2	p(2)=1.0				
		H. Draw informal comparative inferences about two populations.	1,2					
		I. Investigate chance processes and develop, use, and evaluate probability models.	1,2					

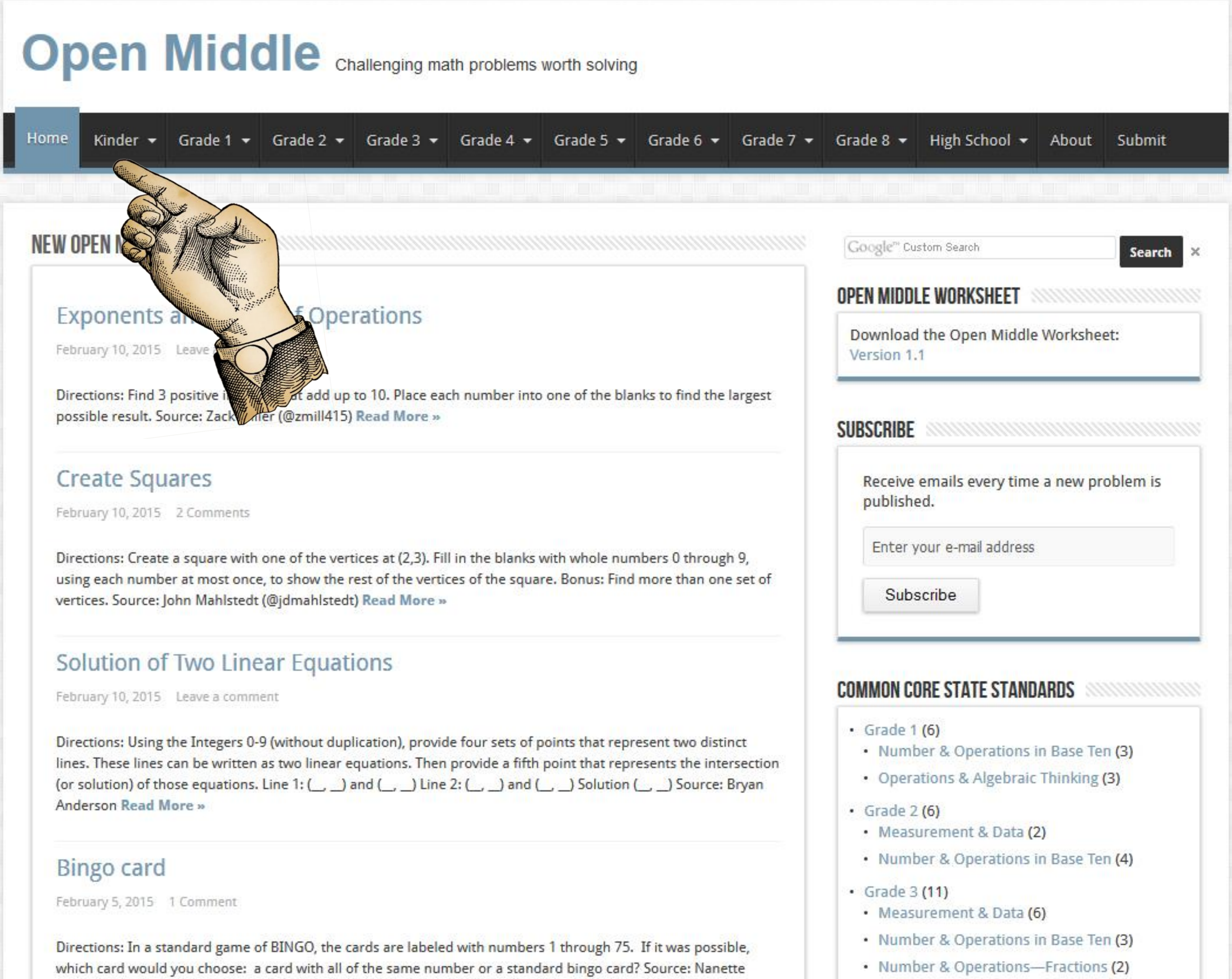
DEPTH OF KNOWLEDGE EXTENSIONS MENU



Question #1 3.MD.8 : DOK 2 Draw three different rectangles with a perimeter of 20 units. **2 points**	**Question #2** 3.MD.7 : DOK 1 Find the rectangle's area. 5 units 13 units **1 point**	**Question #3** 3.MD.5 : DOK 2 The length of one side of a rectangle is 6 cm and its perimeter is 16 cm. What is the area of the rectangle in square centimeters? **2 points**
Question #4 4.MD.3 : DOK 2 Which square is bigger: a square with a perimeter of 36 units or a square with an area of 36 square units? **2 points**	**Instructions** You must earn **at least 8 points** by doing the problems of your choice. You may work by yourself or in pairs but each person needs to turn in separate work. Circle the questions you have answered.	**Question #5** 4.MD.3 : DOK 3 What is the greatest area you can make with a rectangle that has a perimeter of 24 units? **3 points**
Question #6 4.MD.3 : DOK 3 What is the greatest perimeter you can make on a rectangle with an area of 24 square units? **3 points**	**Question #7** 3.MD.8 : DOK 2 What is the area of a square that has a perimeter of 20 units? **2 point**	**Question #8** 3.MD.8 : DOK 1 Find the rectangle's perimeter. 5 units 13 units **1 point**

Lessons Learned

- Strangely little collaboration
  - Students could pick their own problems.
  - Few neighbors were working on the same problem.
  - Next time had kids pair up and pick the same problem to work on.
- The fraction sheet was chaos
  - Just because a problem is below grade level, doesn't mean they can do it.
  - Make sure students can do a DOK 1 before giving them DOK 2 and 3 problems.
- Some problems weren't chosen
  - Problem wording wasn't always as clear for students as it was to me.
  - Point values need fine tuning



Open Middle

Challenging math problems worth solving

NEW OPEN M

Exponents a f Operations

February 10, 2015 Leave

Directions: Find 3 positive i at add up to 10. Place each number into one of the blanks to find the largest possible result. Source: Zack ller (@zmill415) **Read More »**

Create Squares

February 10, 2015 2 Comments

Directions: Create a square with one of the vertices at (2,3). Fill in the blanks with whole numbers 0 through 9, using each number at most once, to show the rest of the vertices of the square. Bonus: Find more than one set of vertices. Source: John Mahlstedt (@jdmahlstedt) **Read More »**

Solution of Two Linear Equations

February 10, 2015 Leave a comment

Directions: Using the Integers 0-9 (without duplication), provide four sets of points that represent two distinct lines. These lines can be written as two linear equations. Then provide a fifth point that represents the intersection (or solution) of those equations. Line 1: (_, _) and (_, _) Line 2: (_, _) and (_, _) Solution (_, _) Source: Bryan Anderson **Read More »**

Bingo card

February 5, 2015 1 Comment

Directions: In a standard game of BINGO, the cards are labeled with numbers 1 through 75. If it was possible, which card would you choose: a card with all of the same number or a standard bingo card? Source: Nanette

OPEN MIDDLE WORKSHEET

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- Grade 1 (6)
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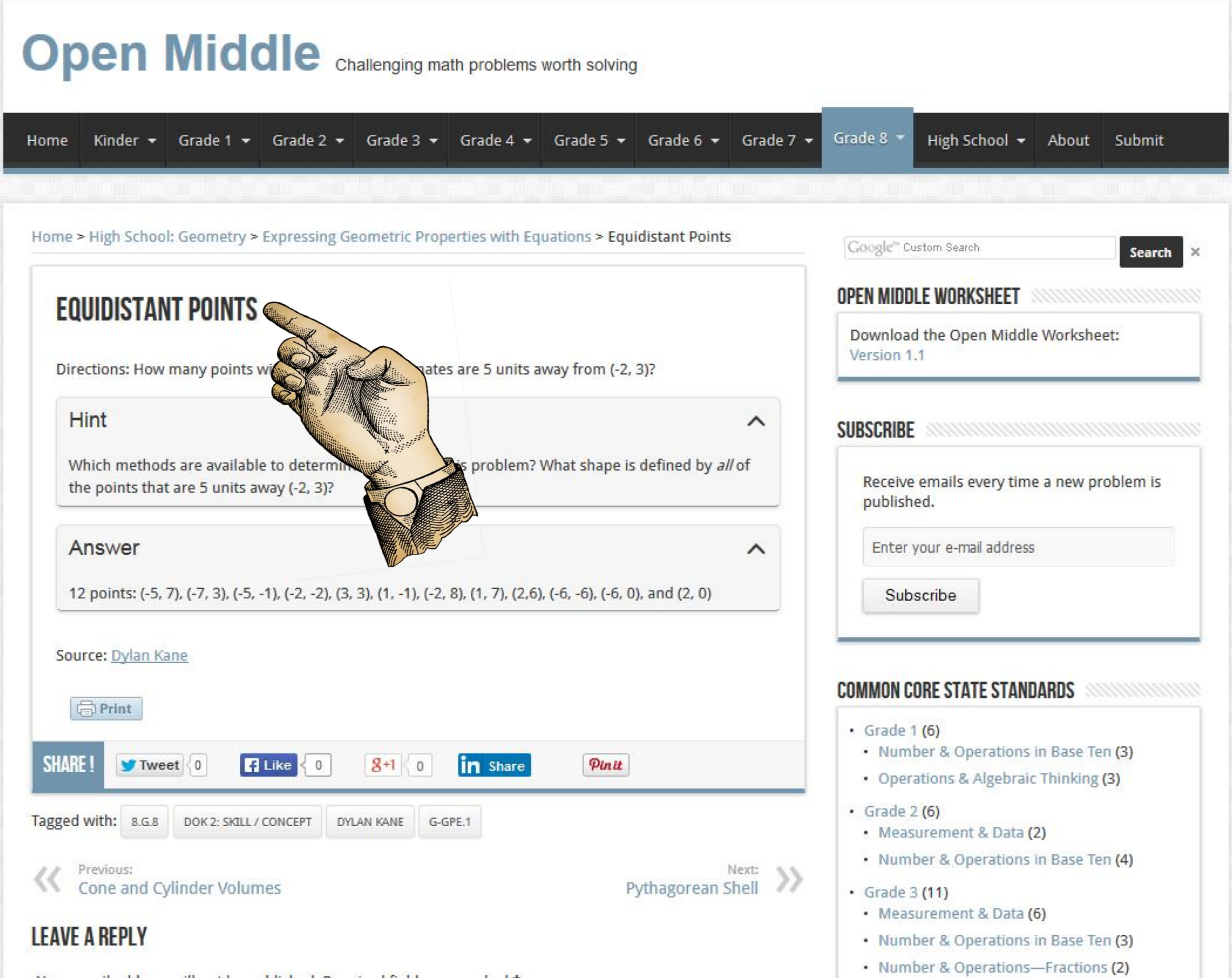
  - Operations & Algebraic Thinking (3)
- Grade 2 (6)
  - Measurement & Data (2)
  - Number & Operations in Base Ten (4)
- Grade 3 (11)
  - Measurement & Data (6)
  - Number & Operations in Base Ten (3)
  - Number & Operations—Fractions (2)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Open Middle

Challenging math problems worth solving

Home > High School: Geometry > Expressing Geometric Properties with Equations > Equidistant Points

EQUIDISTANT POINTS

Directions: How many points wi ates are 5 units away from (-2, 3)?

Hint

Which methods are available to determin s problem? What shape is defined by *all* of the points that are 5 units away (-2, 3)?

Answer

12 points: (-5, 7), (-7, 3), (-5, -1), (-2, -2), (3, 3), (1, -1), (-2, 8), (1, 7), (2,6), (-6, -6), (-6, 0), and (2, 0)

Source: Dylan Kane

Tagged with: 8.G.8 DOK 2: SKILL / CONCEPT DYLAN KANE G-GPE.1

Previous: Cone and Cylinder Volumes

Next: Pythagorean Shell

LEAVE A REPLY

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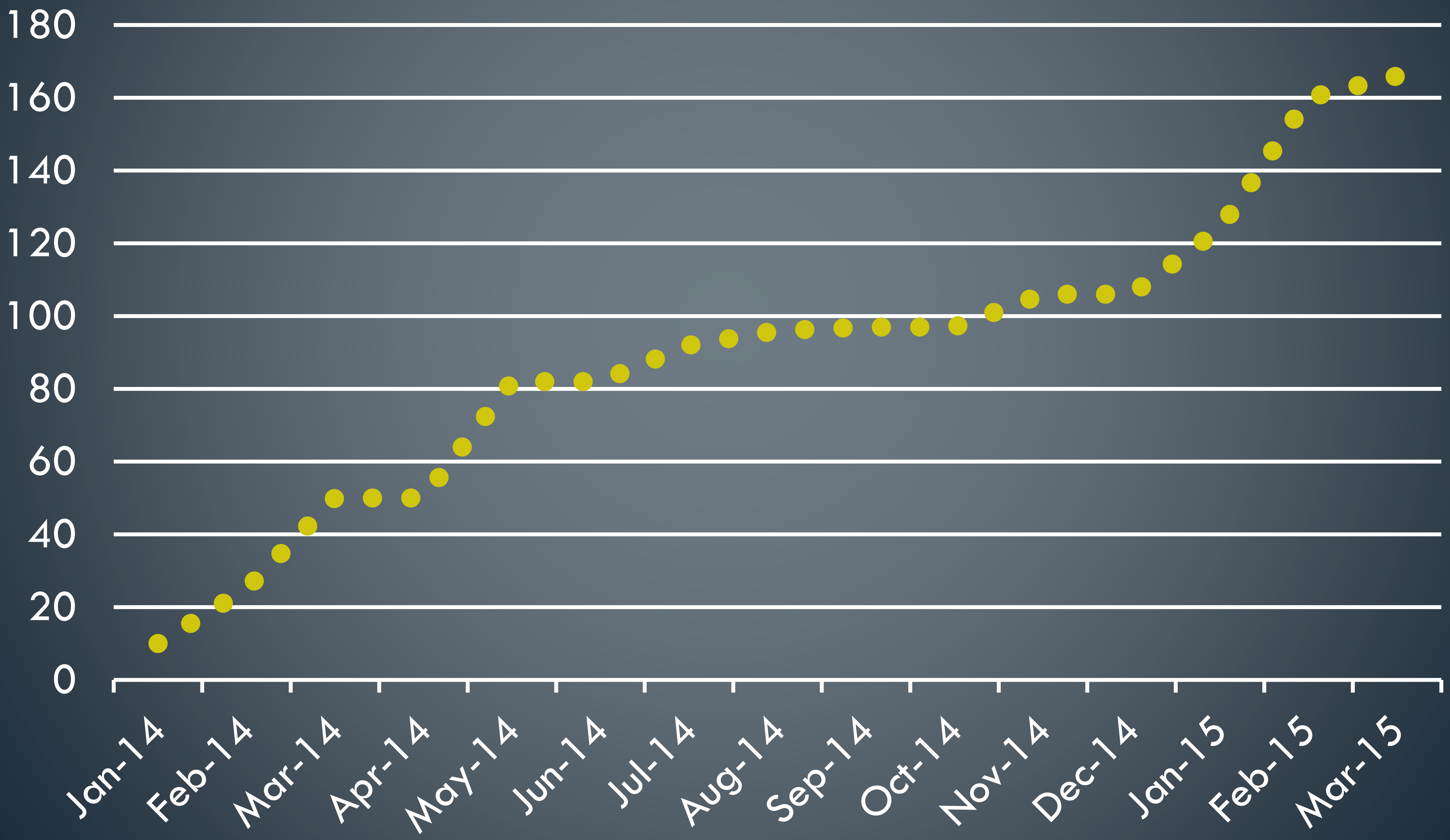
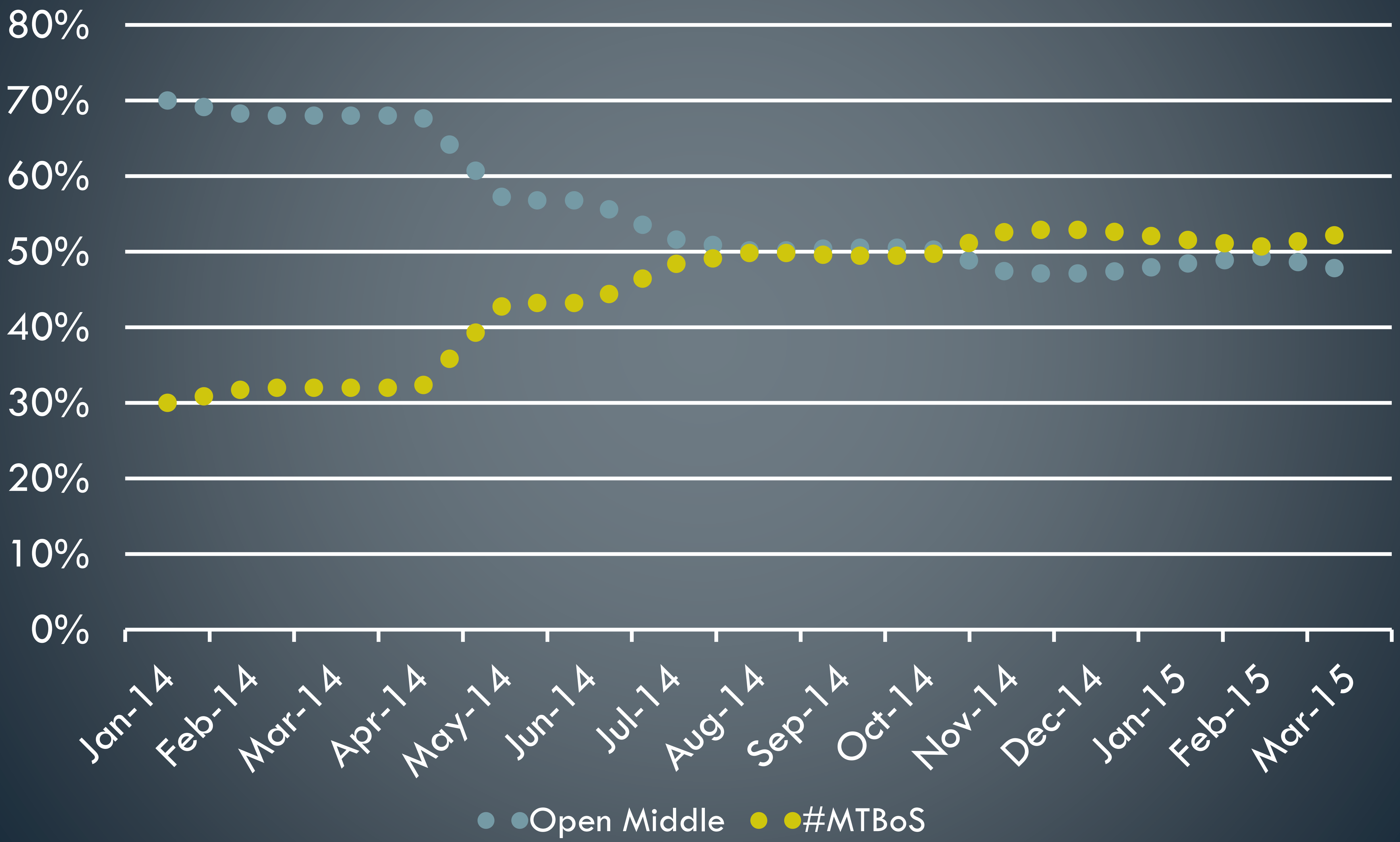
- Grade 2 (6)
  - Measurement & Data (2)
  - Number & Operations in Base Ten (4)
- Grade 3 (11)
  - Measurement & Data (6)
  - Number & Operations in Base Ten (3)
  - Number & Operations—Fractions (2)

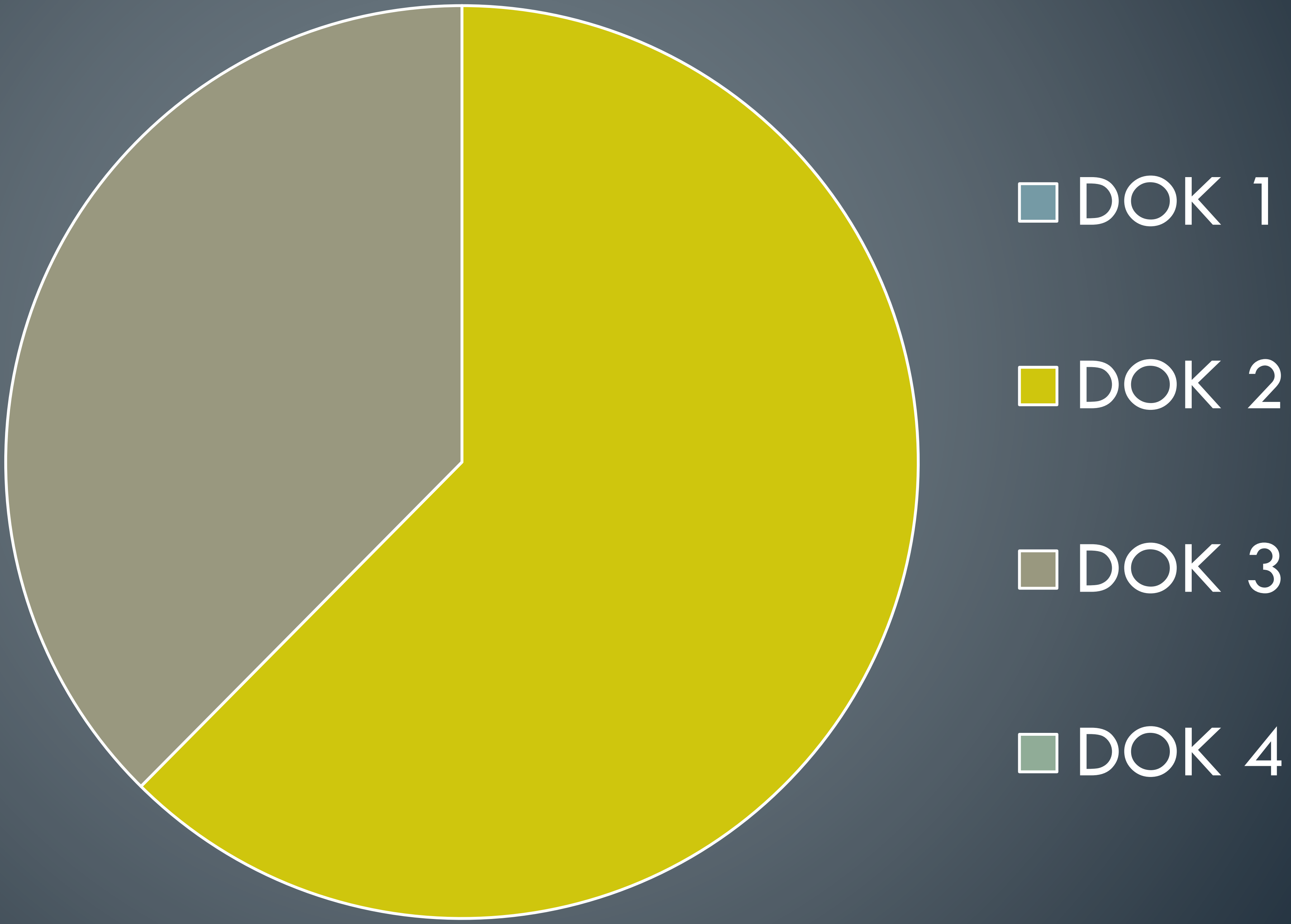
Total Open Middle Problems



Open Middle Author Percentages

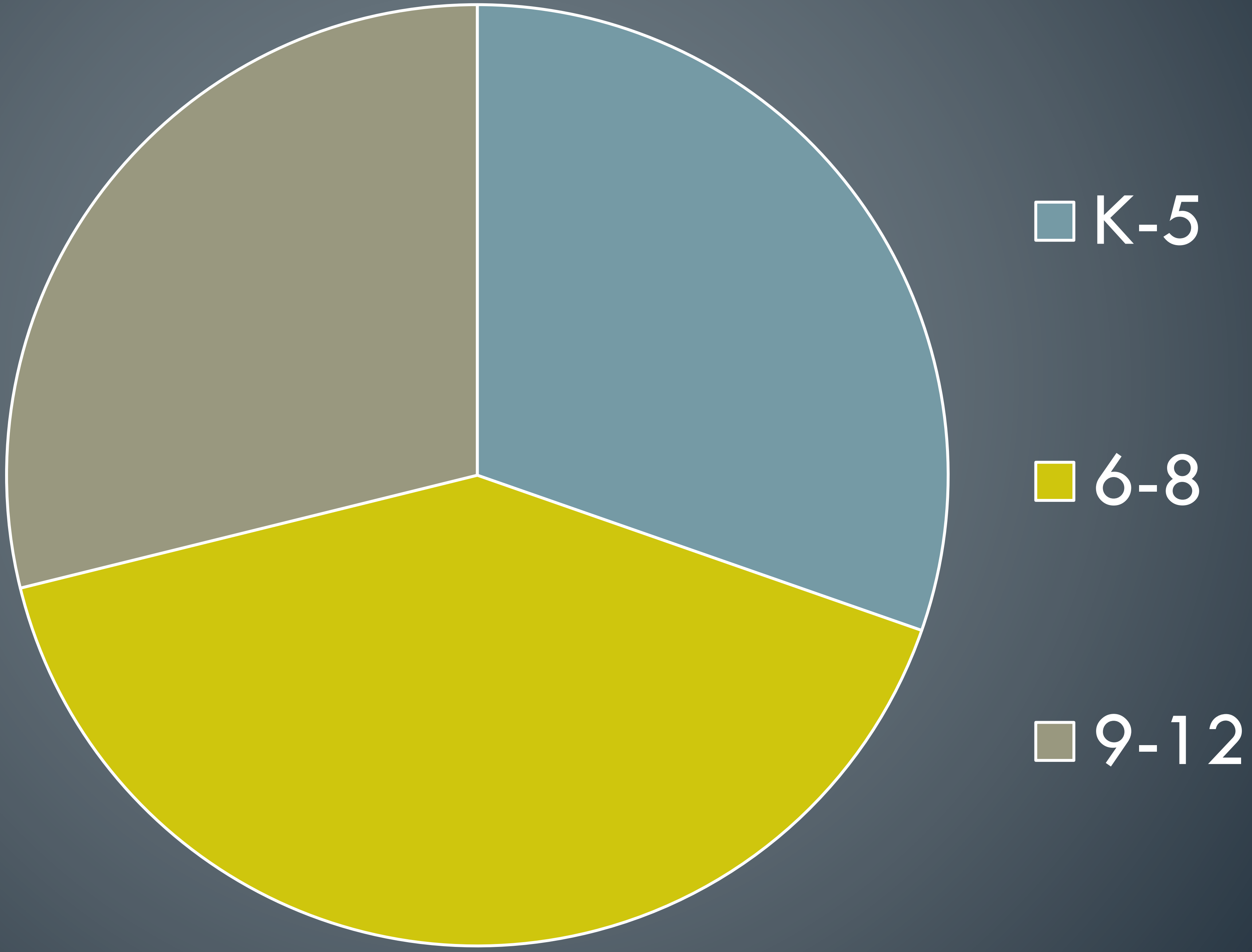


Problems by DOK Level



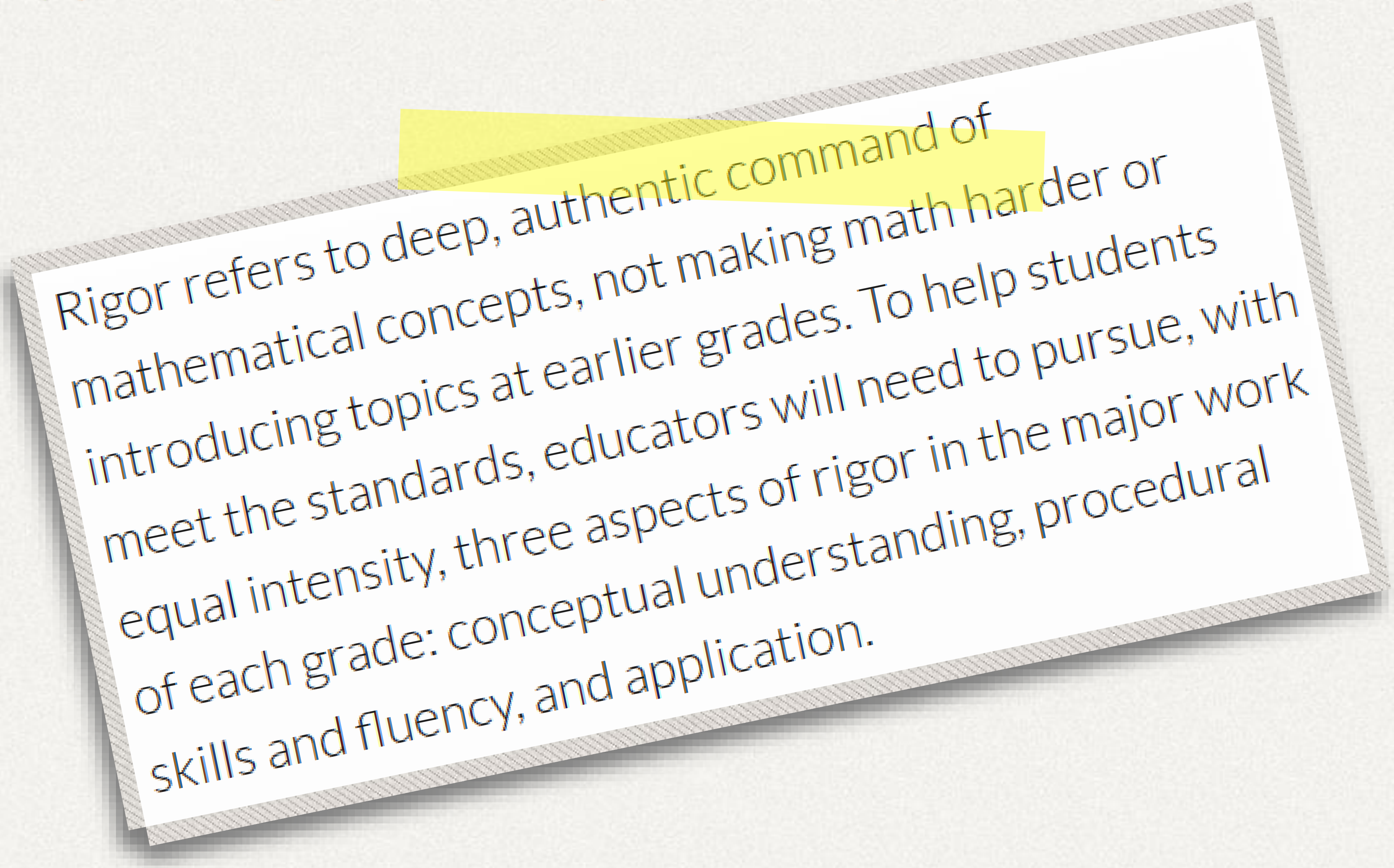
Note: Data as of March 2015

Problems by Grade Band



Note: Data as of March 2015

COMMON CORE
STATE STANDARDS INITIATIVE



Rigor refers to deep, authentic command of mathematical concepts, not making math harder or introducing topics at earlier grades. To help students meet the standards, educators will need to pursue, with equal intensity, three aspects of rigor in the major work of each grade: conceptual understanding, procedural skills and fluency, and application.

Source: http://www.corestandards.org/other-resources/key-shifts-in-mathematics/

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ROBERT KAPLINSKY

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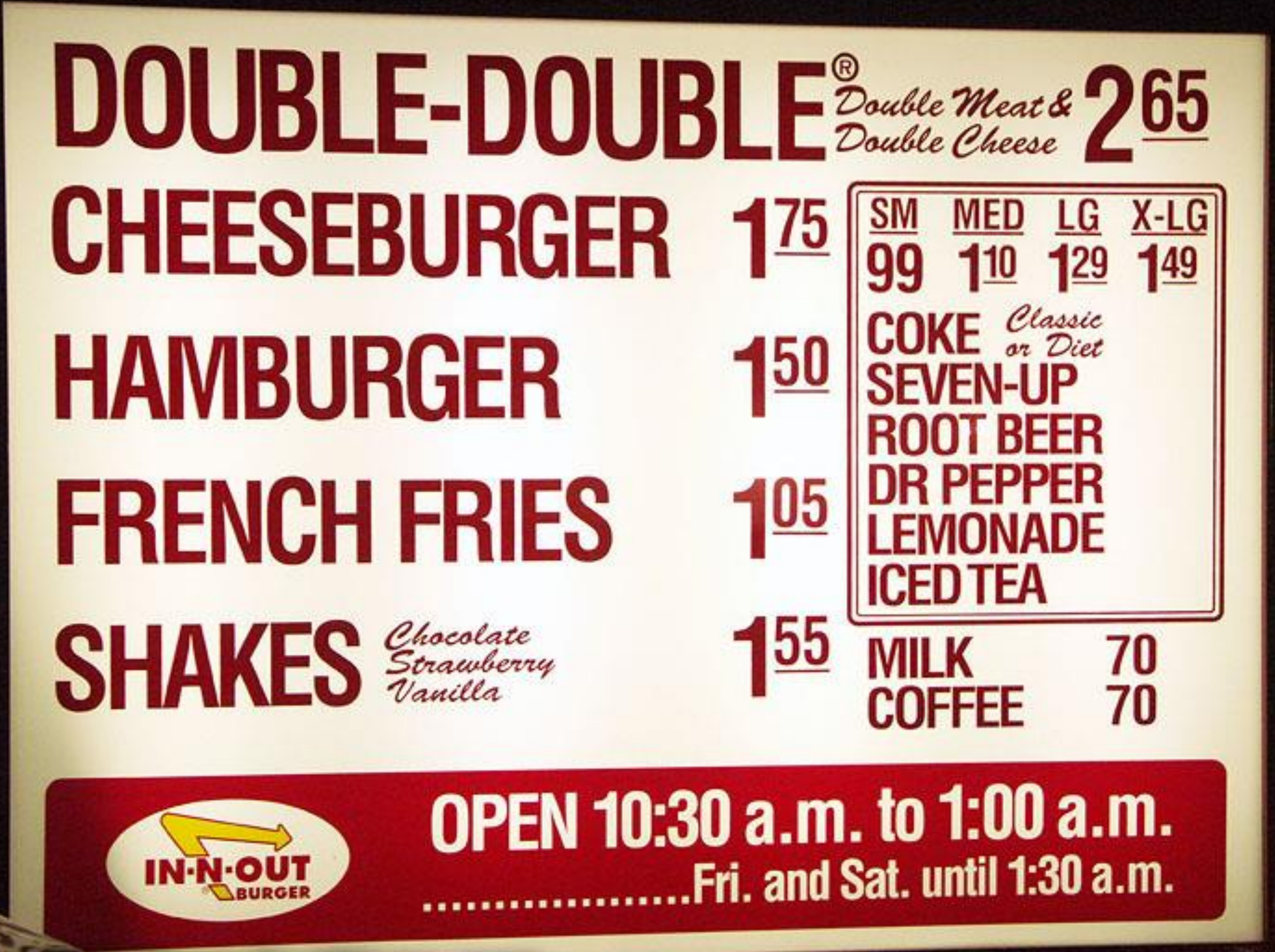


DOUBLE-DOUBLE®

DOUBLE-DOUBLE®	*Double Meat & Double Cheese*	$2^{\underline{65}}$
CHEESEBURGER		$1^{\underline{75}}$
HAMBURGER		$1^{\underline{50}}$
FRENCH FRIES		$1^{\underline{05}}$
SHAKES	*Chocolate Strawberry Vanilla*	$1^{\underline{55}}$

SM	MED	LG	X-LG
99	$1^{\underline{10}}$	$1^{\underline{29}}$	$1^{\underline{49}}$

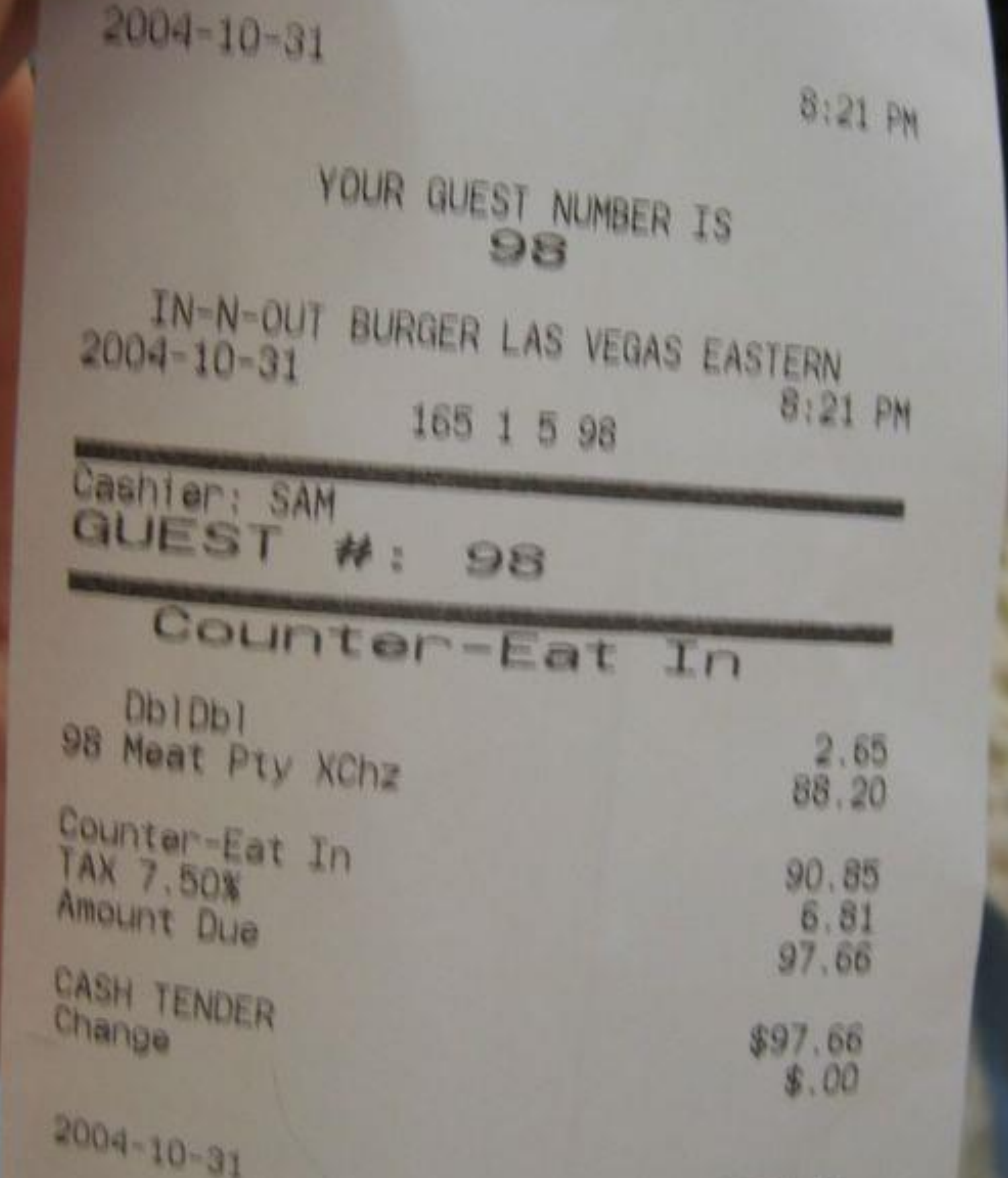
COKE *Classic or Diet*
SEVEN-UP
ROOT BEER
DR PEPPER
LEMONADE
ICED TEA

MILK	70
COFFEE	70

IN-N-OUT® BURGER

OPEN 10:30 a.m. to 1:00 a.m.
....................Fri. and Sat. until 1:30 a.m.

www.FriedmanArchives.com



2004-10-31

8:21 PM

YOUR GUEST NUMBER IS
98

IN-N-OUT BURGER LAS VEGAS EASTERN
2004-10-31
8:21 PM
165 1 5 98

Cashier: SAM
GUEST #: 98

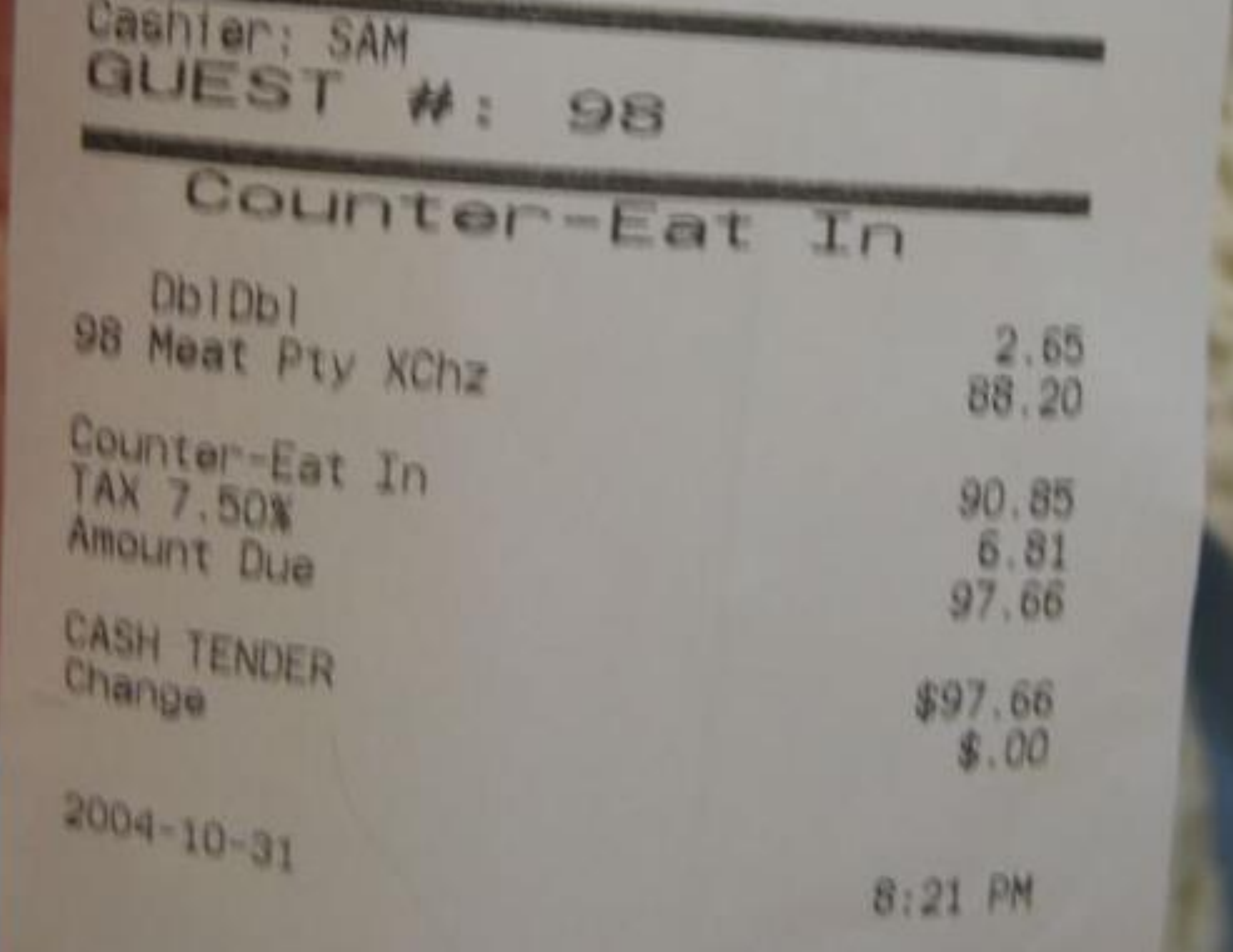
Counter-Eat In

DblDbl
98 Meat Pty XChz
2.65
88.20

Counter-Eat In
TAX 7.50%
Amount Due
90.85
6.81
97.66

CASH TENDER
Change
$97.66
$.00

2004-10-31



Cashier: SAM

GUEST #: 98

Counter-Eat In

DblDbl	2.65
98 Meat Pty XChz	88.20
Counter-Eat In	90.85
TAX 7.50%	6.81
Amount Due	97.66
CASH TENDER	$97.66
Change	$.00

2004-10-31

8:21 PM

	Serving Size (g)	Calories
Hamburger w/Onion	243	390
Cheeseburger w/Onion	268	480
Double-Double w/Onion	330	670

- Fo
- Coherence
- Rigor

Layers	Cost
1	$1.75
2	$2.65
3	$3.55
4	$4.45
.	.
.	.
20	$18.85
.	.
.	.
100	$90.85
.	.
.	.
N	$1.75 + (N-1)*$0.90

bun + produce + meat + cheese + meat + cheese = $2.65

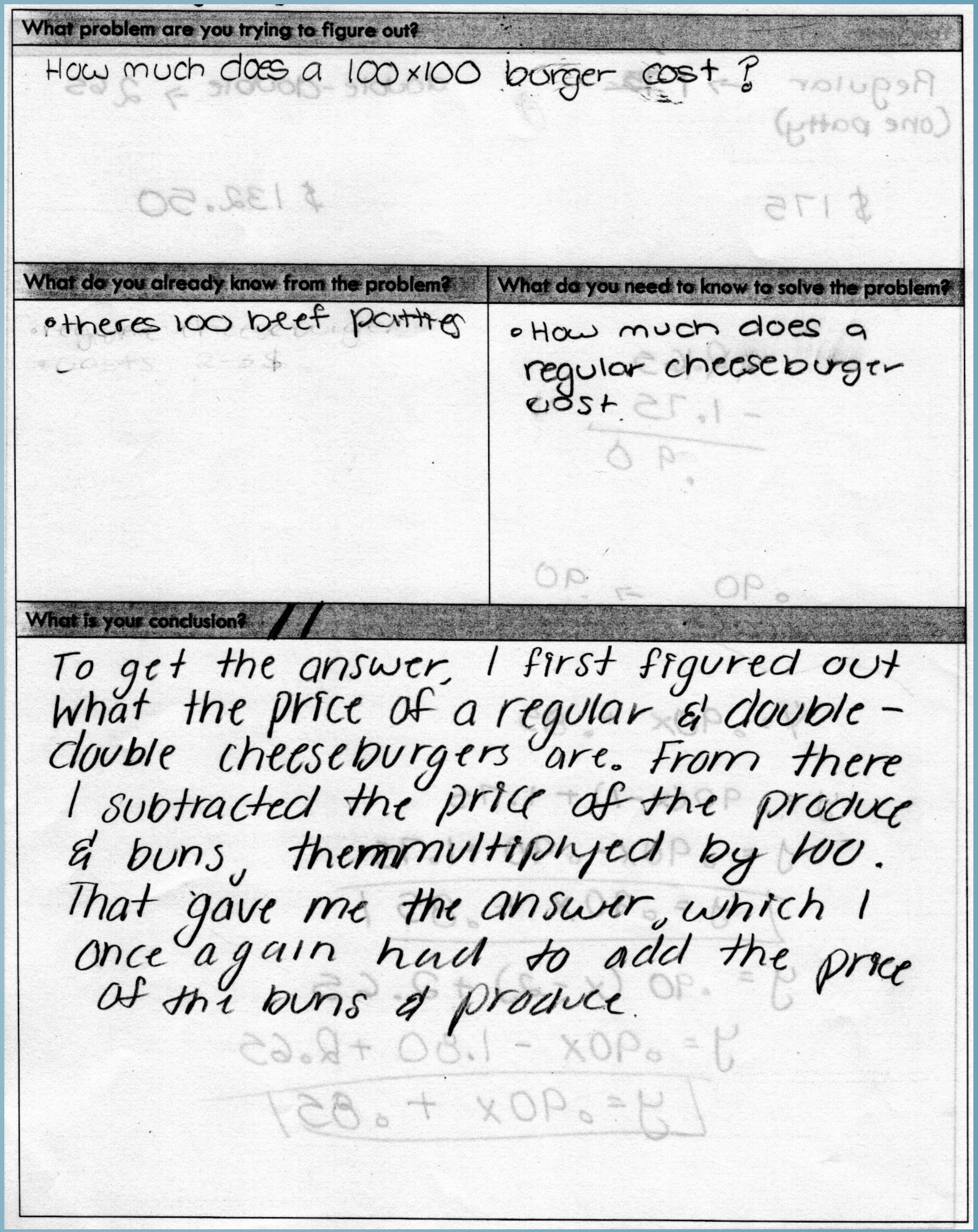
bun + produce + meat + cheese = $1.75

meat + cheese = $0.90

The Reality

- Students needed guidance to figure out a layer's cost
- Not every class is ready to go straight to 100x100
- Common wrong answers included:
  - $175.00 ($1.75 x 100 cheeseburgers)
  - $132.50 ($2.65 x 50 Double-Doubles)
- Students had equations that had more than X patties
- Students were surprised to see three different equations:
  - Starting with a Double-Double
  - Starting with a cheeseburger
  - Starting with produce and bun only

STUDENT WORK



What problem are you trying to figure out?

How much does a 100×100 burger cost?

What do you already know from the problem?

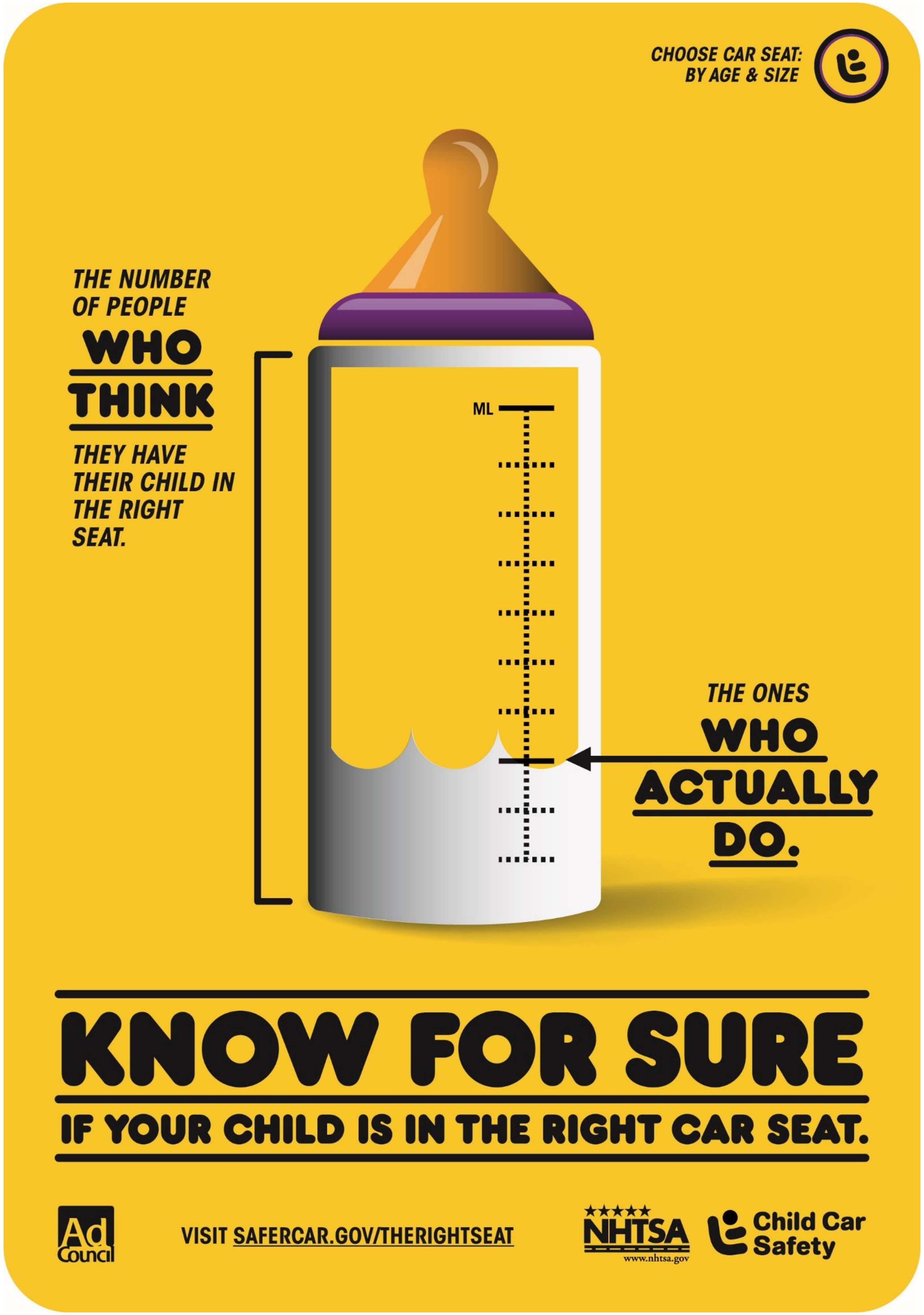
- theres 100 beef patties

What do you need to know to solve the problem?

- How much does a regular cheeseburger cost.

What is your conclusion?

To get the answer, I first figured out what the price of a regular & double-double cheeseburgers are. From there I subtracted the price of the produce & buns, themmultiplyed by 100. That gave me the answer, which I once again had to add the price of the buns & produce.



CHOOSE CAR SEAT:
BY AGE & SIZE

THE NUMBER
OF PEOPLE
WHO
THINK
THEY HAVE
THEIR CHILD IN
THE RIGHT
SEAT.

THE ONES
WHO
ACTUALLY
DO.

KNOW FOR SURE

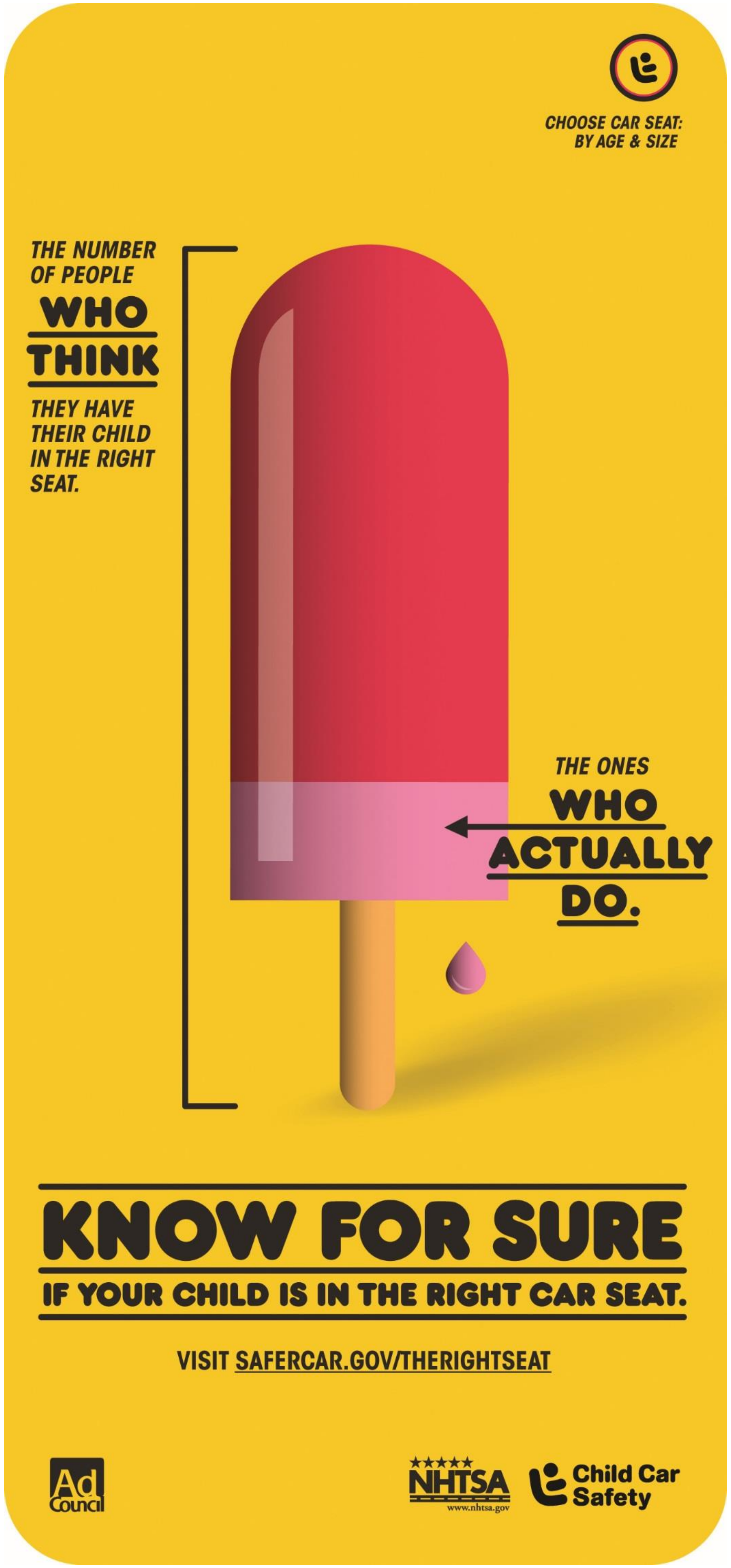
IF YOUR CHILD IS IN THE RIGHT CAR SEAT.

Ad Council

VISIT SAFERCAR.GOV/THERIGHTSEAT

NHTSA
www.nhtsa.gov

Child Car Safety



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Ad Council

NHTSA
www.nhtsa.gov

Child Car Safety

There are 125 sheep and 5 dogs in a flock. How old is the shepherd?

What does it look like when students make sense of problems?

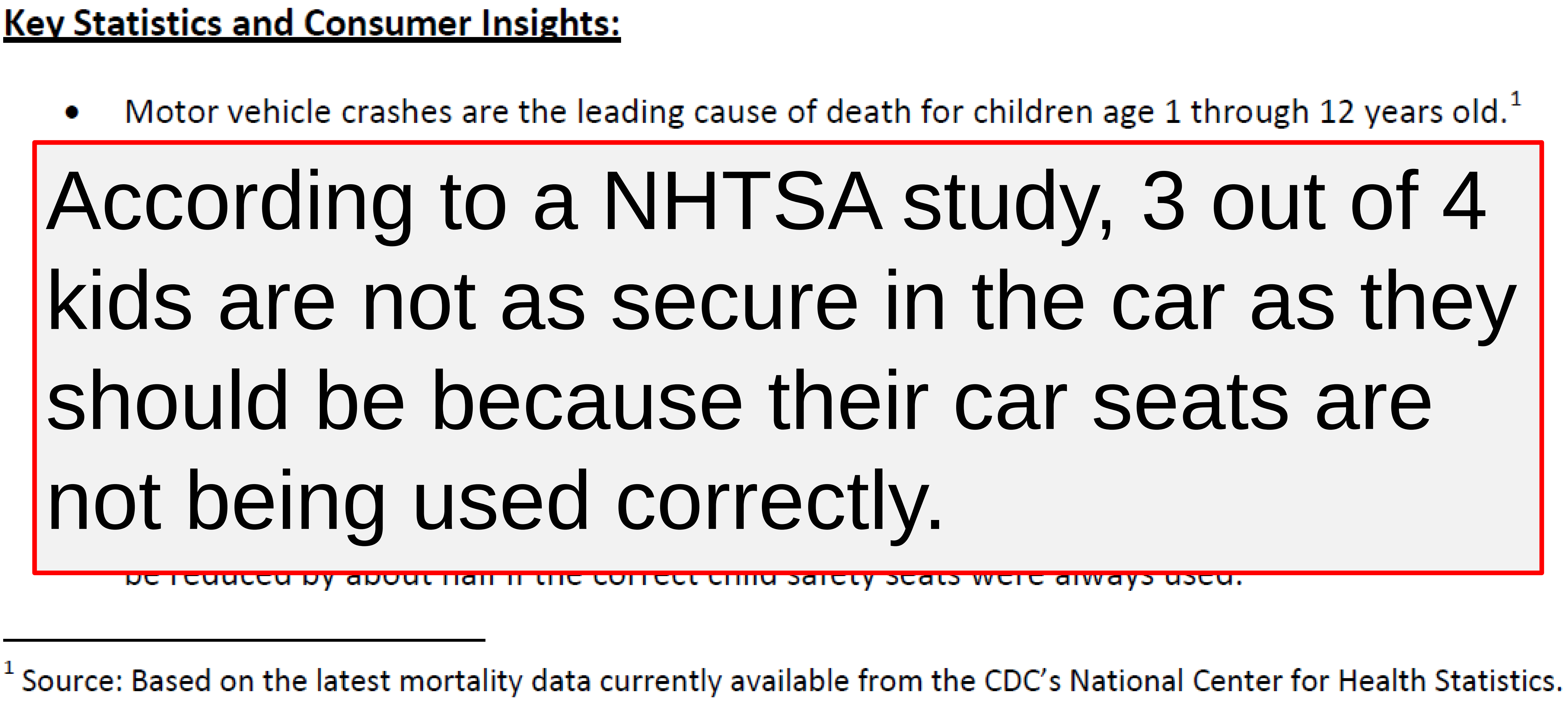
Of the 32 students I interviewed…

- 75% of them gave me numerical responses
- 2 students calculated the answer to be 130 (125 + 5)
- 2 students calculated the answer to be 120 (125 – 5)
- 12 students calculated the answer to be 25 (125 ÷ 5)
- 0 students calculated the answer to be 625 (125 x 5)
- 4 students stated that they guessed their answer (90, 5, 42, and 50)
- 4 students tried to divide 125 by 5 but could not correctly implement the procedure

Takeaways

- Making sense of mathematics
- Intellectual autonomy
  - Intellectual autonomy is about being able to think for yourself and not being dependent on others for the direction and control of one's thinking.

What Does the NHTSA Say?



Key Statistics and Consumer Insights:

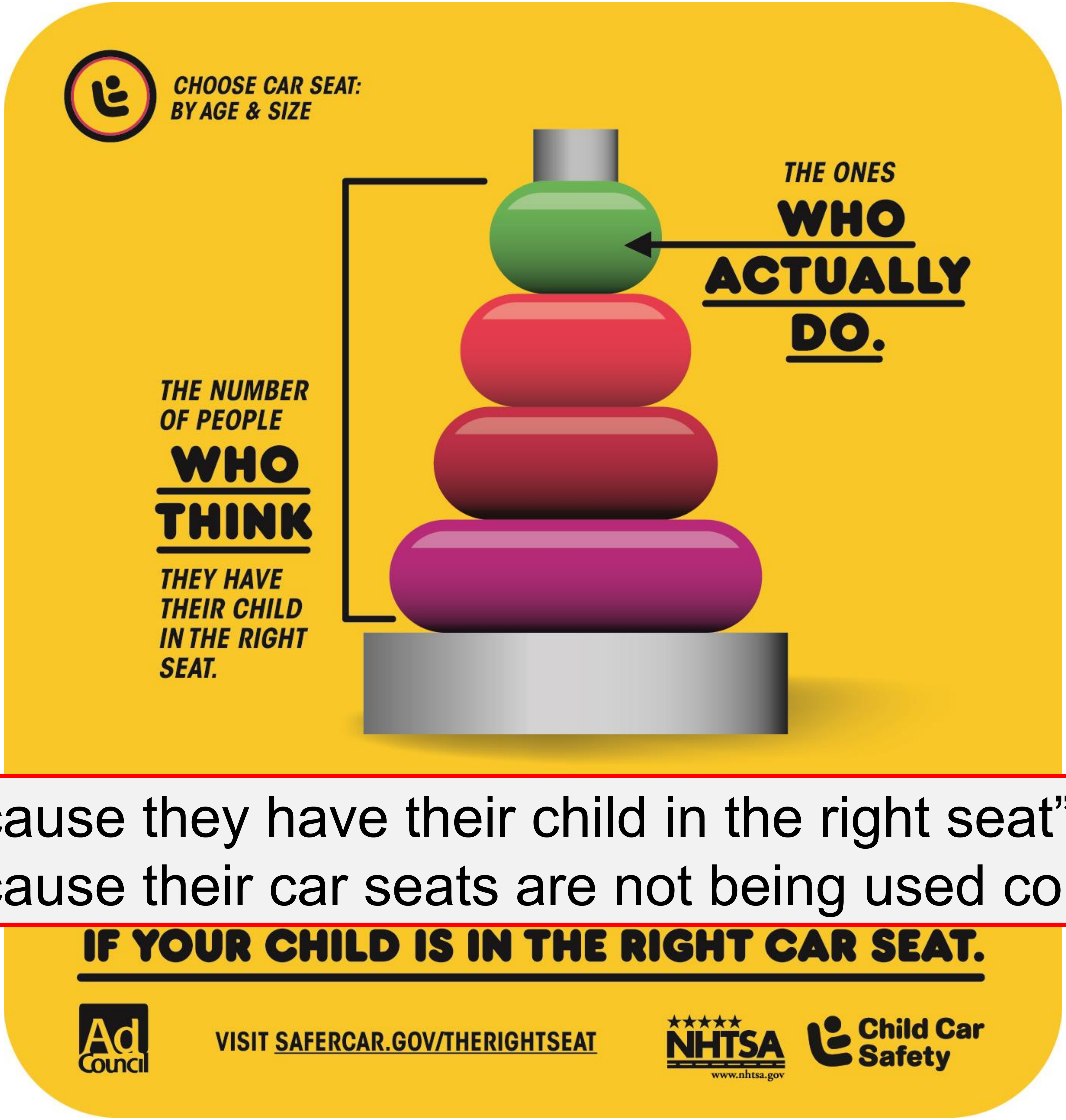
- Motor vehicle crashes are the leading cause of death for children age 1 through 12 years old.[1]

be reduced by about half if the correct child safety seats were always used.

---

[1] Source: Based on the latest mortality data currently available from the CDC's National Center for Health Statistics.

According to a NHTSA study, 3 out of 4 kids are not as secure in the car as they should be because their car seats are not being used correctly.


CHOOSE CAR SEAT:
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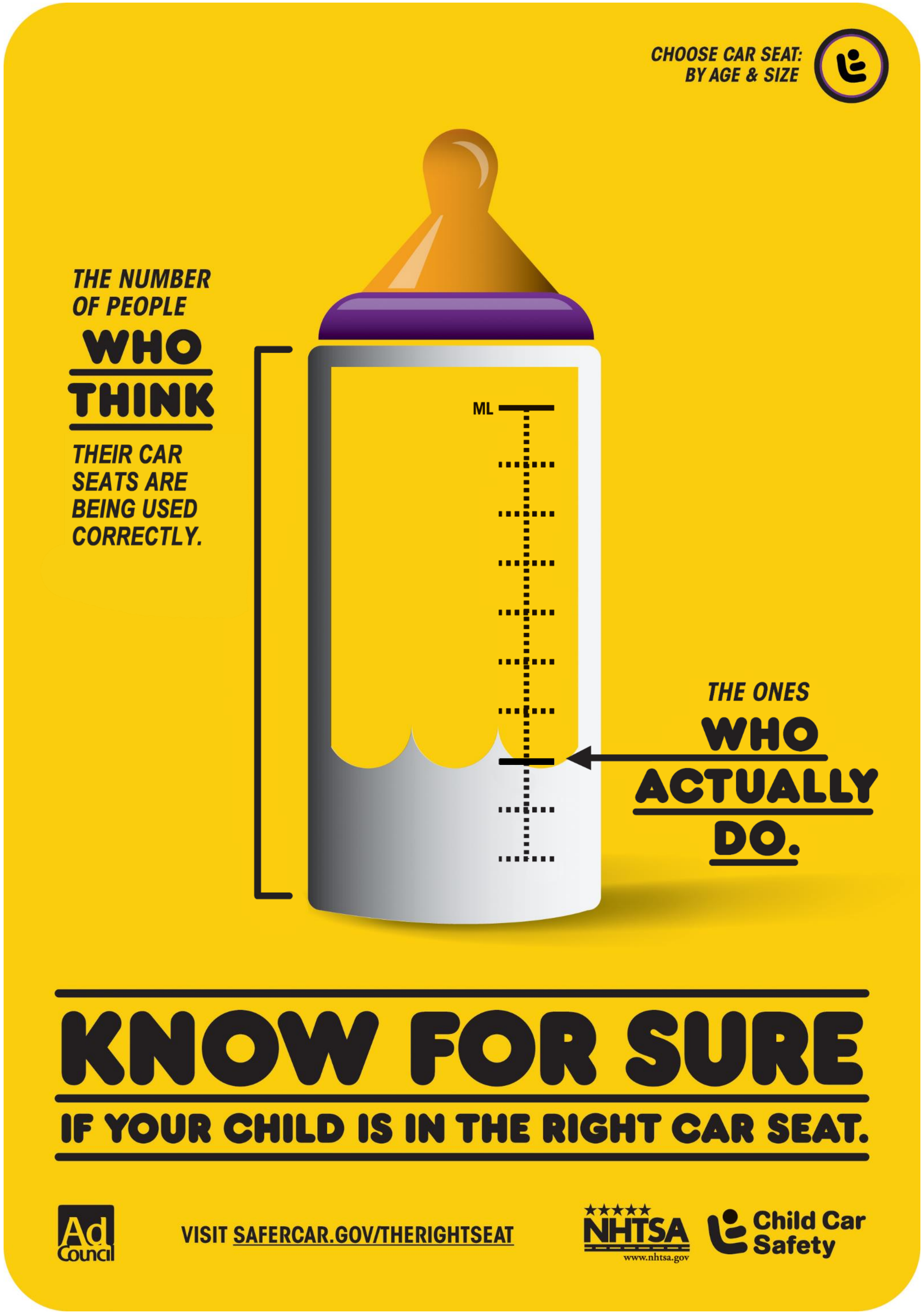
SEAT.
IF YOUR CHILD IS IN THE RIGHT CAR SEAT.
Ad Council
VISIT SAFERCAR.GOV/THERIGHTSEAT
NHTSA
www.nhtsa.gov
Child Car
Safety

- “because they have their child in the right seat”
- “because their car seats are not being used correctly”



CHOOSE CAR SEAT:
BY AGE & SIZE

THE NUMBER OF PEOPLE **WHO THINK** THEIR CAR SEATS ARE BEING USED CORRECTLY.

ML

THE ONES **WHO ACTUALLY DO.**

KNOW FOR SURE

IF YOUR CHILD IS IN THE RIGHT CAR SEAT.

Ad Council

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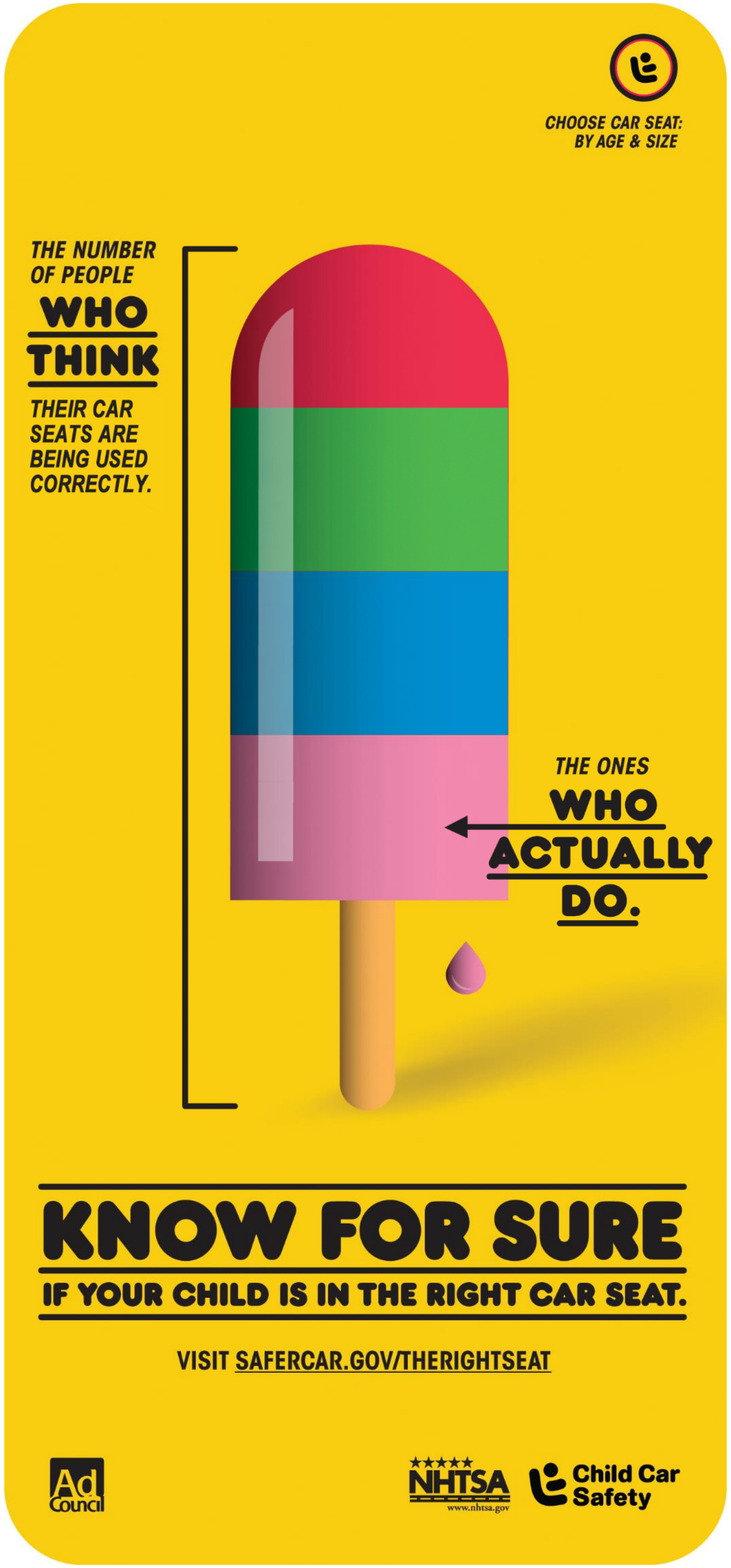
Child Car Safety



CHOOSE CAR SEAT:
BY AGE & SIZE

THE NUMBER OF PEOPLE **WHO THINK** THEIR CAR SEATS ARE BEING USED CORRECTLY.

THE ONES **WHO ACTUALLY DO.**

KNOW FOR SURE

IF YOUR CHILD IS IN THE RIGHT CAR SEAT.

VISIT SAFERCAR.GOV/THERIGHTSEAT

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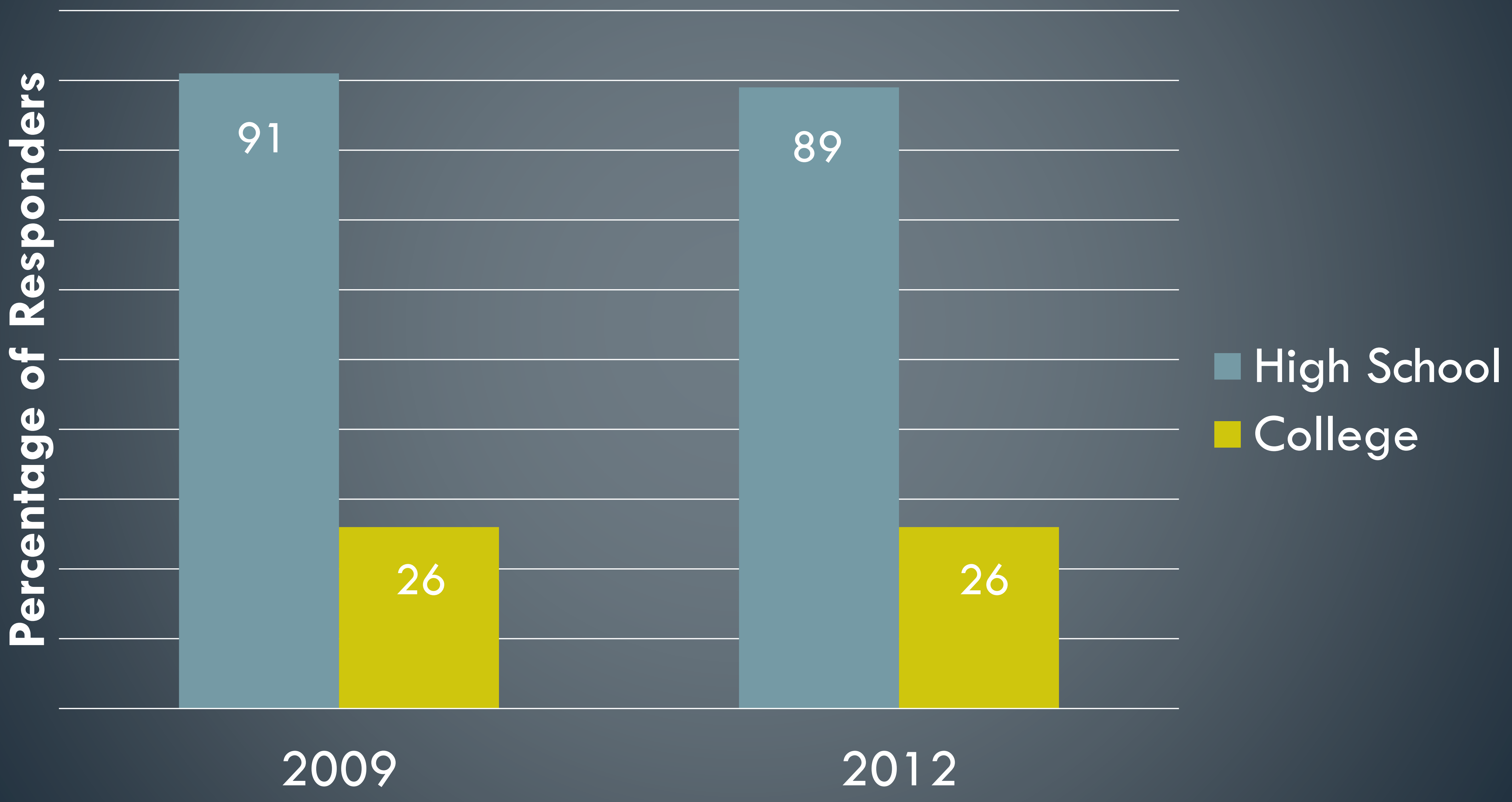
NHTSA
www.nhtsa.gov

Child Car Safety

WHAT IS THE PURPOSE OF A K-12 EDUCATION?

- *College readiness*
  - *ACT National Curriculum Survey*
  - *Surveyed 9,937 educators*

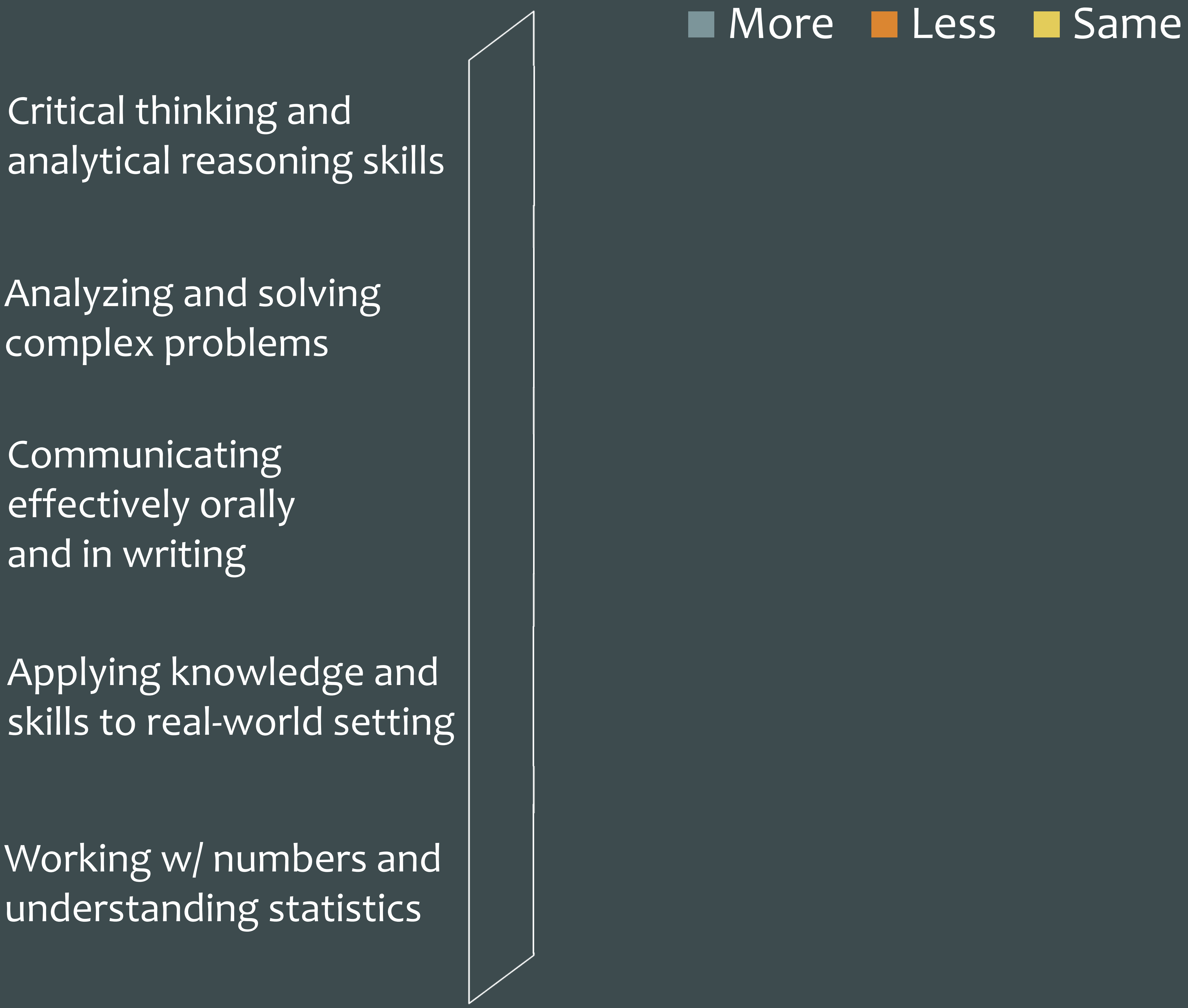
“Well” or “Very Well” Prepared for College



Source: http://www.act.org/research/policymakers/pdf/NCS-PolicySummary2012.pdf

WHAT IS THE PURPOSE OF A K-12 EDUCATION?

- *College readiness*
- *Career readiness*
  - *Association of American Colleges and Universities survey*
  - *Surveyed over 300 employers with at least 25 employees and many new hires*



Source: http://www.aacu.org/leap/documents/2013_EmployerSurvey.pdf

WHAT ISN'T MATHEMATICAL MODELING?

- *It is not modeling in the sense of, "I do; now you do."*
- *It is not modeling in the sense of using manipulatives to represent mathematical concepts.*
- *It is not modeling in the sense of a "model" being just a graph, equation, or function.*
- *It is not just starting with a real world situation and solving a math problem.*
- *It is not beginning with the mathematics and then moving to the real world.*

Source: http://www.cde.ca.gov/ci/ma/cf/documents/aug2013apxdmathmodel.pdf

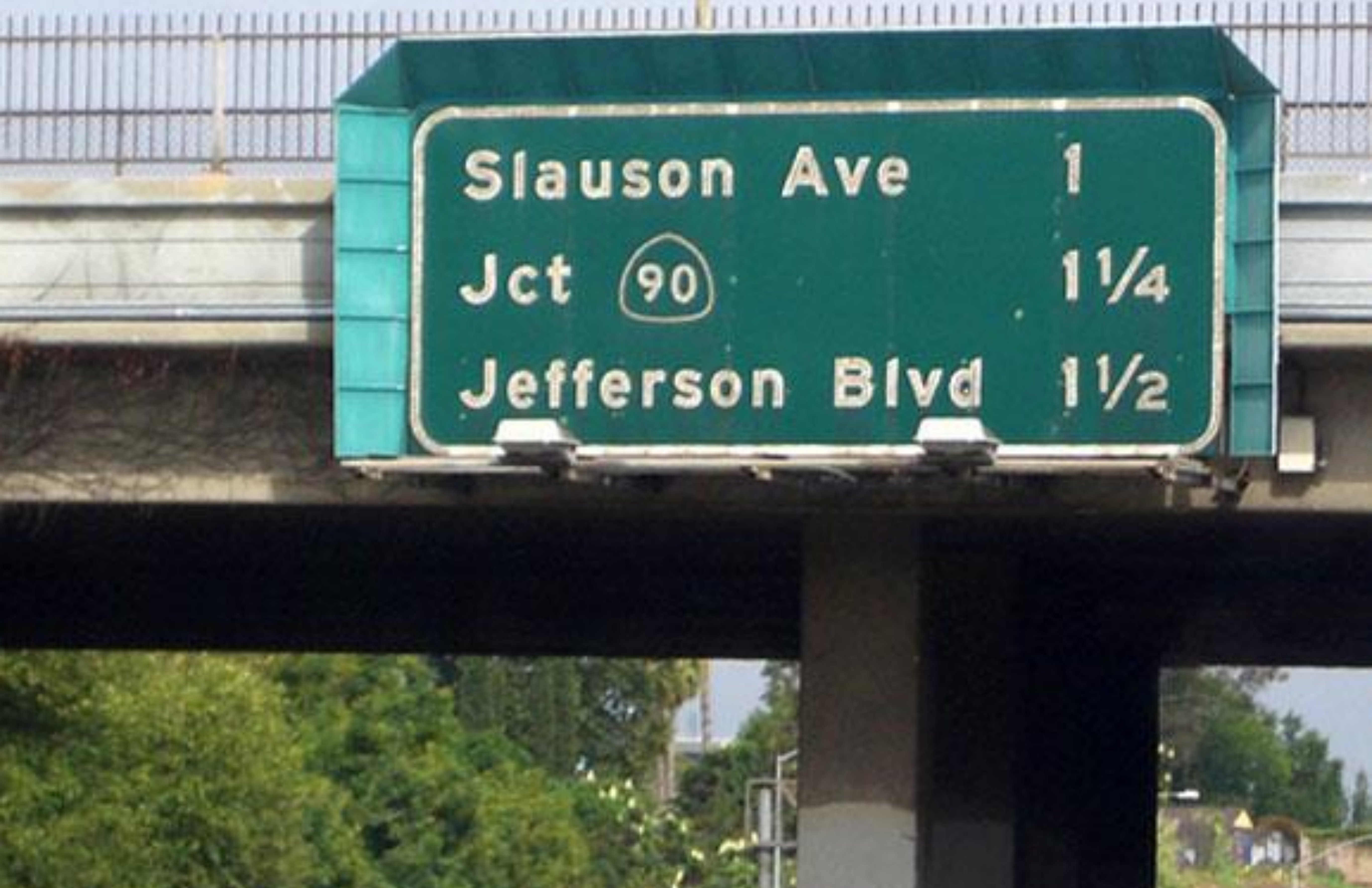
PROBLEM-BASED LEARNING FAQ

- *How long do problem based lessons take?*
- *How often do teachers do problem-based learning?*
- *Do teachers use problem-based lessons to introduce a topic or after you've already taught it?*
- *How is problem-based learning assessed?*
- *How much time does it take to create a problem-based lesson?*

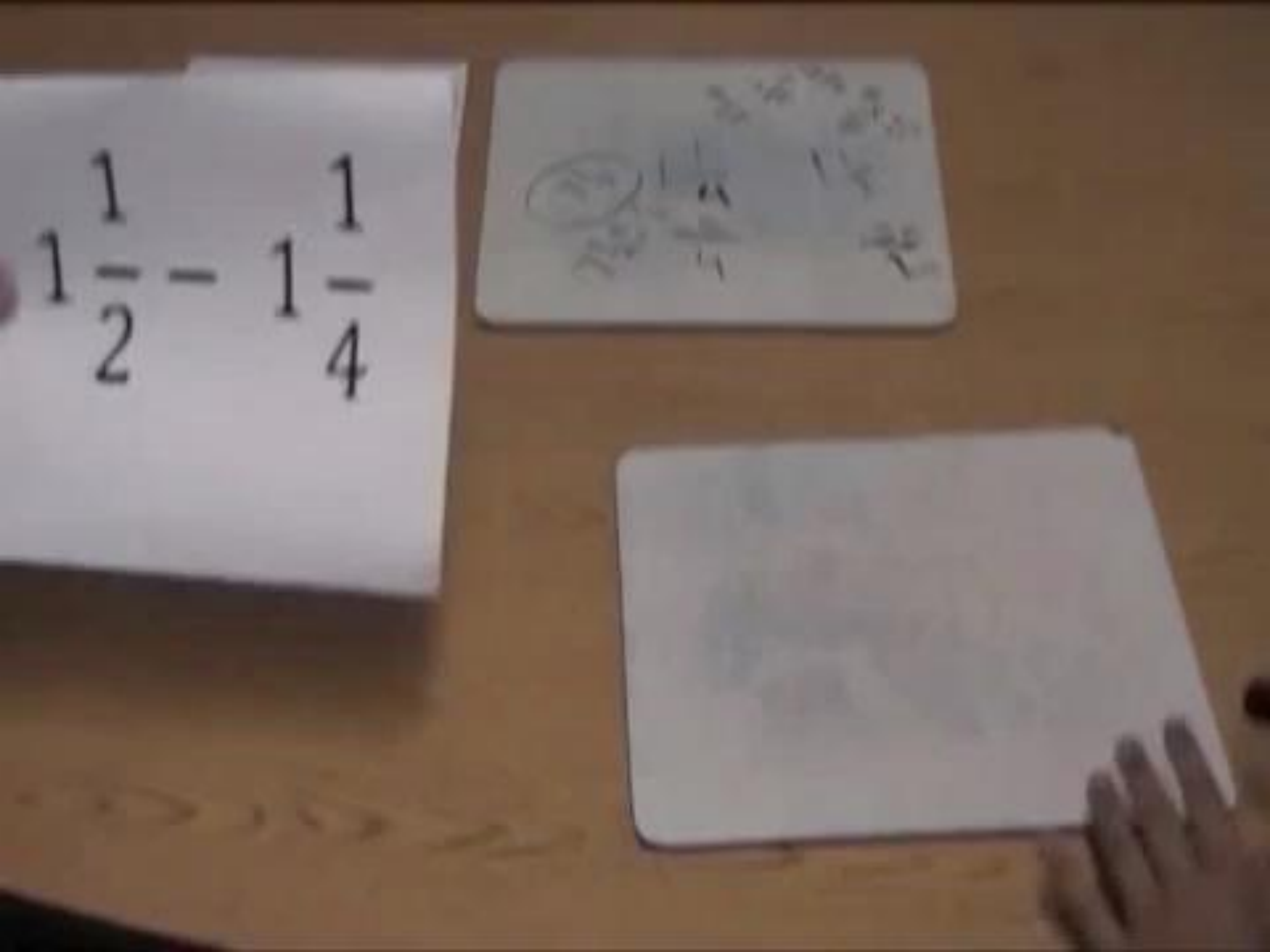
WHAT DOES IT LOOK LIKE…

- when students have procedural skill but not conceptual understanding or the ability to apply mathematics?
- when students **can** work with numbers but **cannot**:
  - critically think
  - applying knowledge and skills to real-world settings
  - analyze and solve complex problems

How far apart are the exits on this freeway: Jct 90 and Jefferson Blvd?


Slauson Ave 1
Jct 90 1¼
Jefferson Blvd 1½

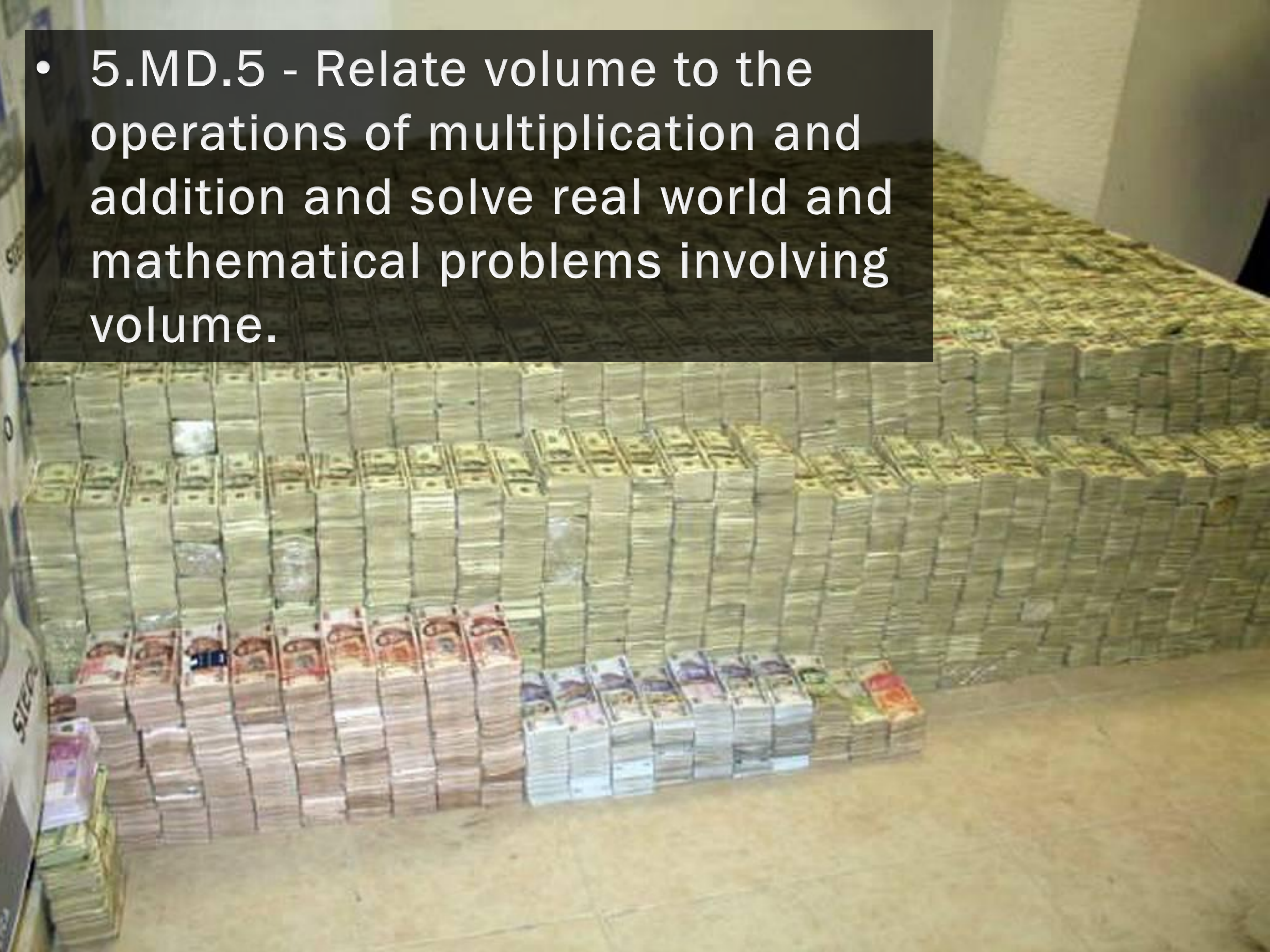
$$1\frac{1}{2} - 1\frac{1}{4}$$


$1\frac{1}{2} - 1\frac{1}{4}$

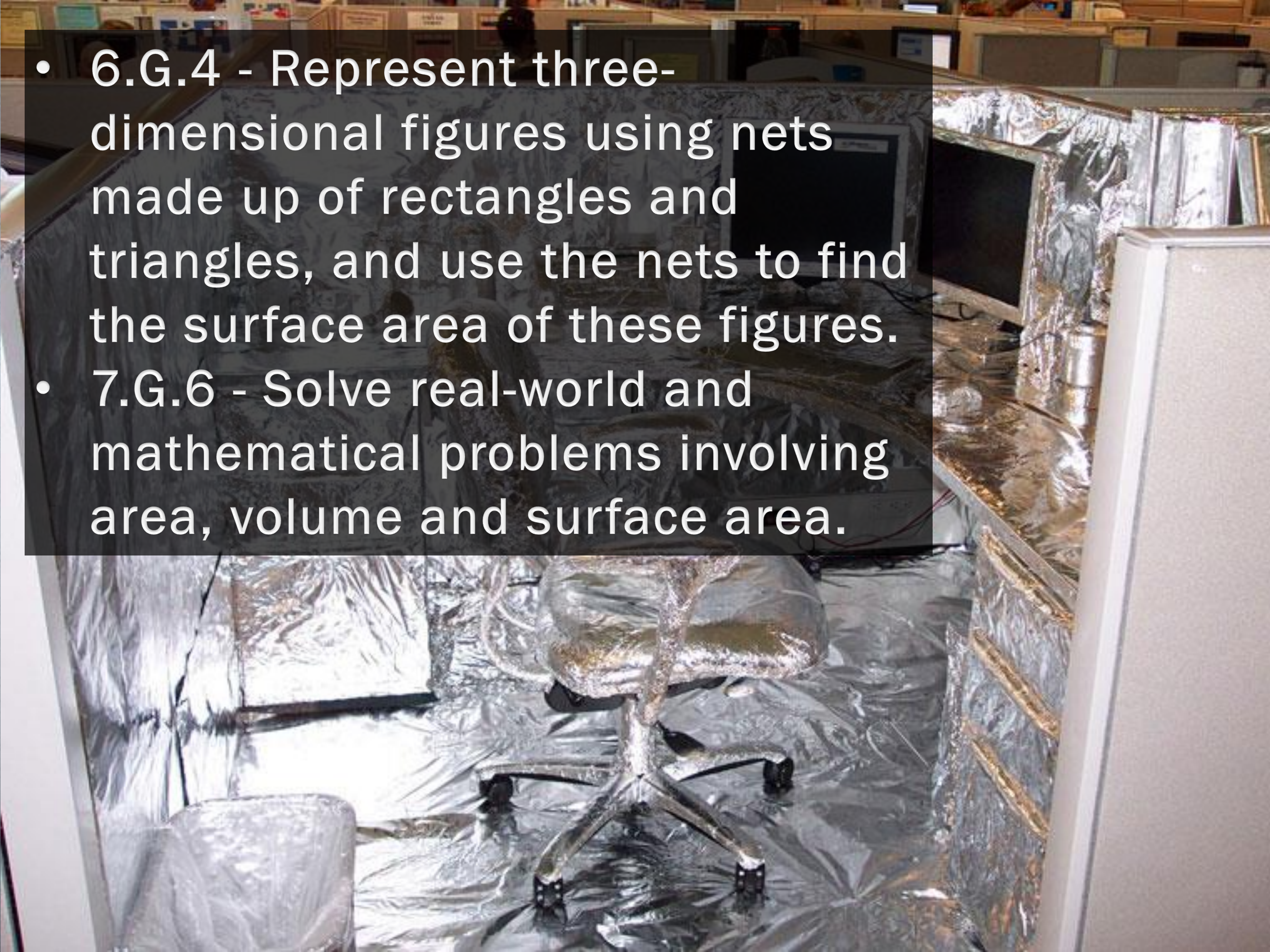
The Four C's

- Communication
- Curiosity

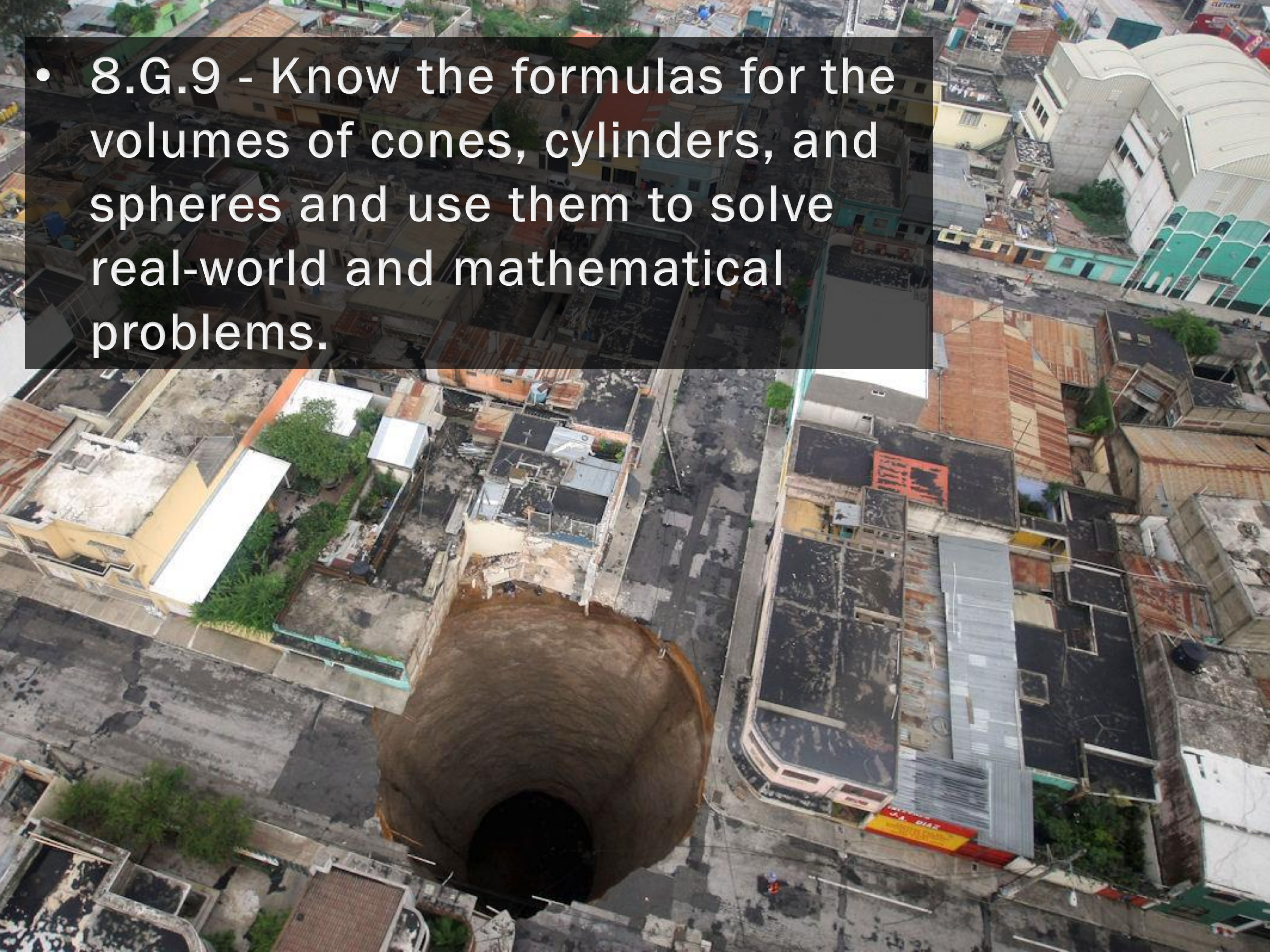
- 4.MD.3 - Apply the area and perimeter formulas for rectangles in real world and mathematical problems.



- 5.MD.5 - Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume.

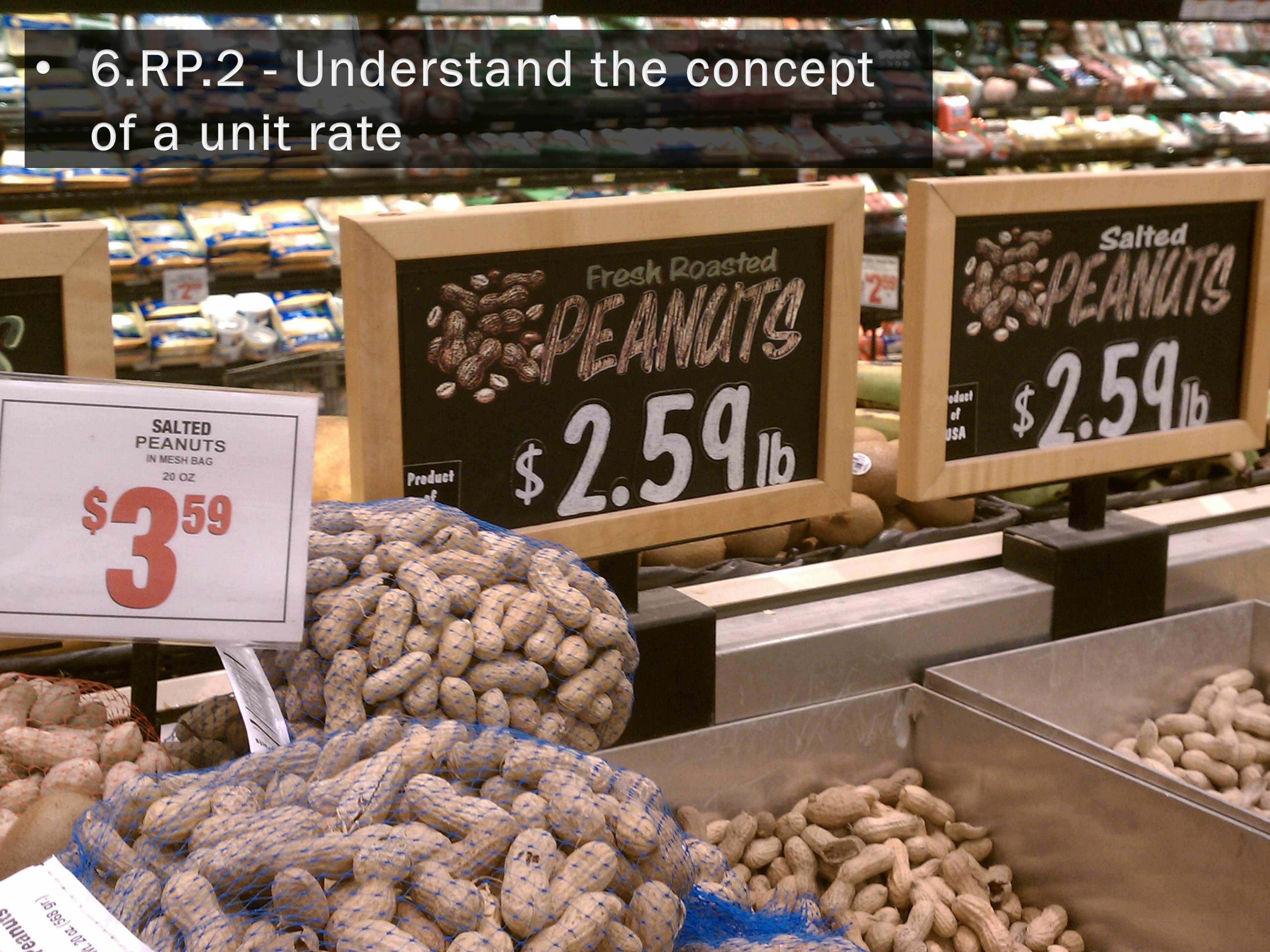


- 6.G.4 - Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures.
- 7.G.6 - Solve real-world and mathematical problems involving area, volume and surface area.



- 8.G.9 - Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

- 6.RP.2 - Understand the concept of a unit rate

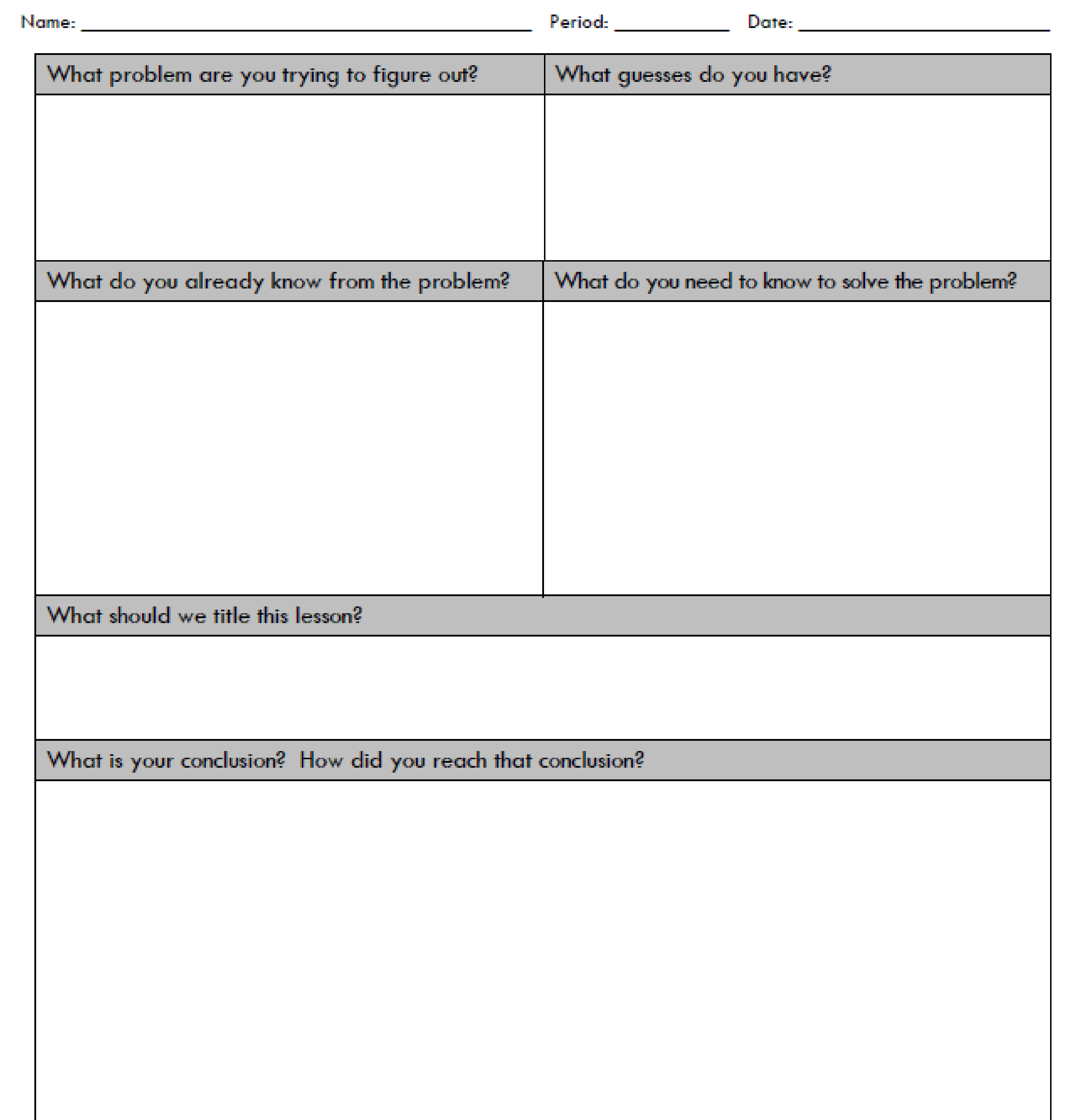

SALTED PEANUTS
IN MESH BAG
20 OZ
$3 59
Fresh Roasted
PEANUTS
$2.59 lb
Product of
Salted
PEANUTS
$2.59 lb
Product of USA

The Four C's

- Communication
- Curiosity
- Critical Thinking

Problem Solving Framework

- Inspired by Geoff Krall's resources at emergentmath.com



Name: ____________________________ Period: _________ Date: ________________

What problem are you trying to figure out?	What guesses do you have?
What do you already know from the problem?	What do you need to know to solve the problem?

What should we title this lesson?

What is your conclusion? How did you reach that conclusion?

The Four C's

- Communication
- Curiosity
- Critical Thinking
- Content Knowledge

Questioning Scenarios

- The activity begins with teachers in groups of three taking the roles of teacher, student, or observer.
- The individuals playing the role of teacher and student each receive a slip of paper describing their scenario.
- The individual playing the role of observer waits to record all of the teacher's questions to the student.
- Once the activity begins, the teacher will talk to the student in the context of the scenario they read about on the slips of paper.

What did you get for the area of a square with a side length of 4?

16

Great. Do you have any questions?

No

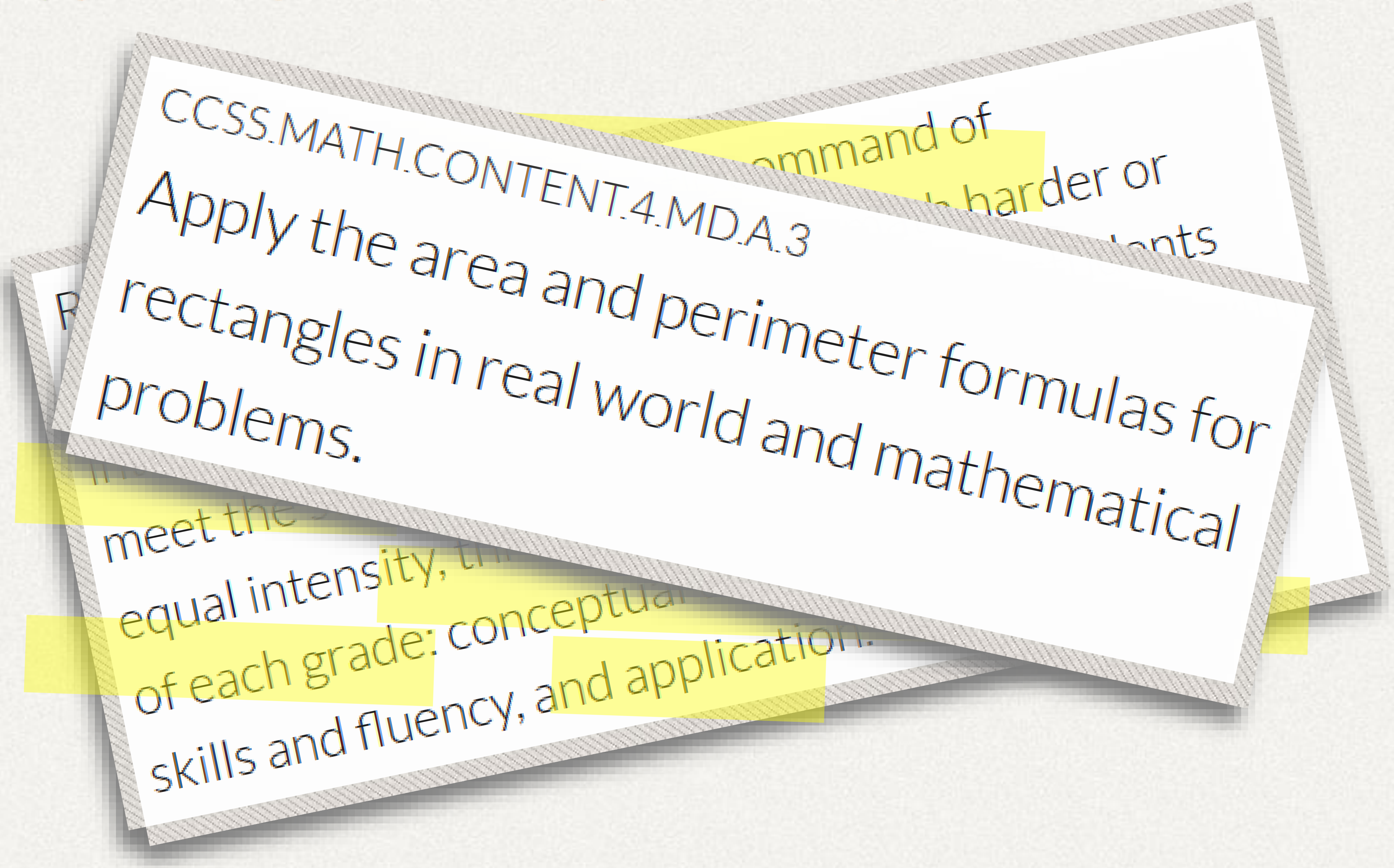
What did you get for the area of a square with a side length of 4?

16

Great. How did you get your answer?

I added up all the sides and 4 plus 4 plus 4 plus 4 is 16.

COMMON CORE
STATE STANDARDS INITIATIVE



CCSS.MATH.CONTENT.4.MD.A.3

Apply the area and perimeter formulas for rectangles in real world and mathematical problems.

ommand of
harder or

meet the
equal intensity,
of each grade: conceptual
skills and fluency, and application.

Source: http://www.corestandards.org/other-resources/key-shifts-in-mathematics/

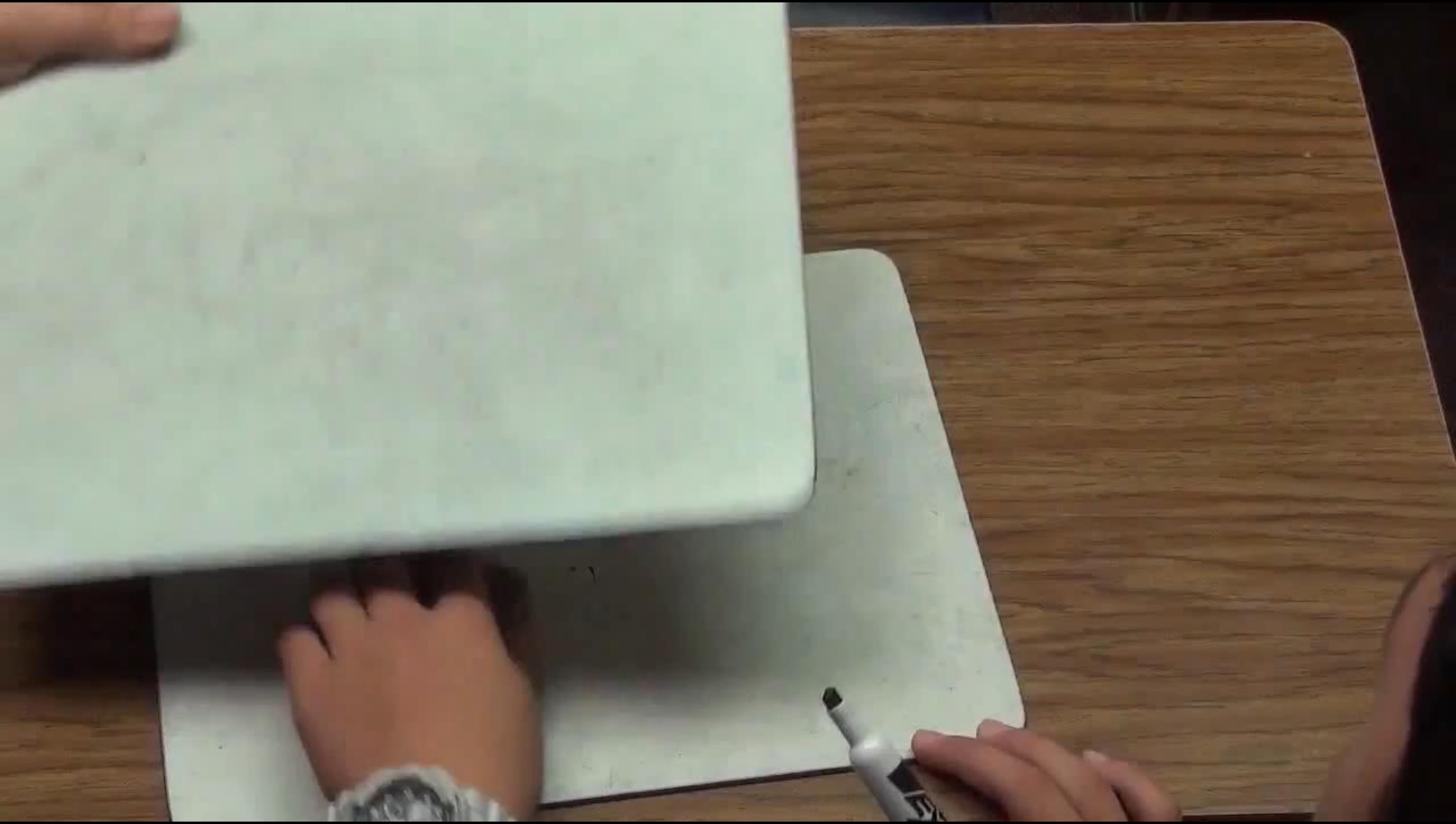
What is the perimeter of a rectangle that measures 8 units by 4 units?

Components of Rigor

☑ Procedural Skill and Fluency

☑ Conceptual Understanding

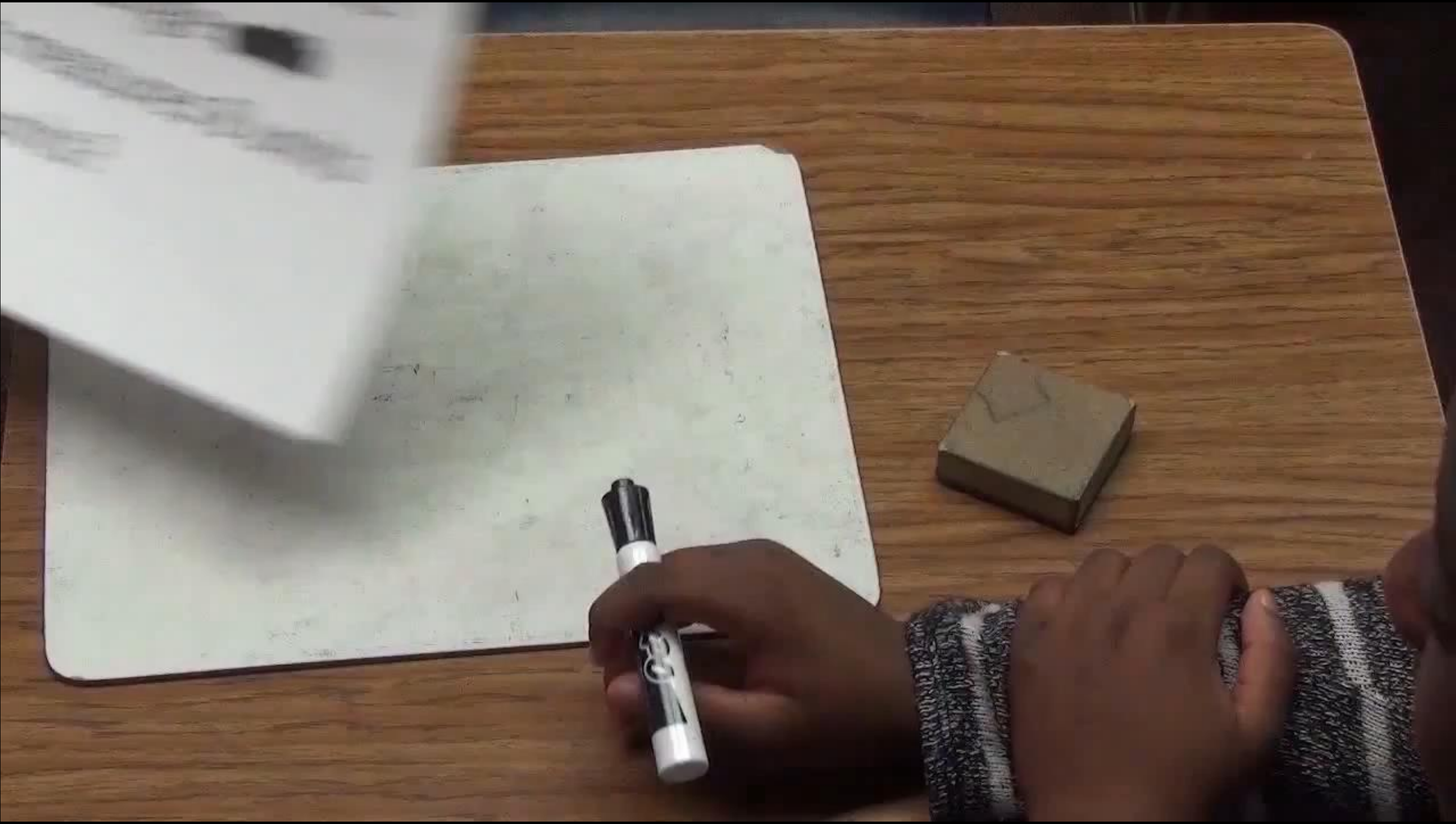
List the dimensions of a rectangle with a perimeter of 24 units.



Components of Rigor

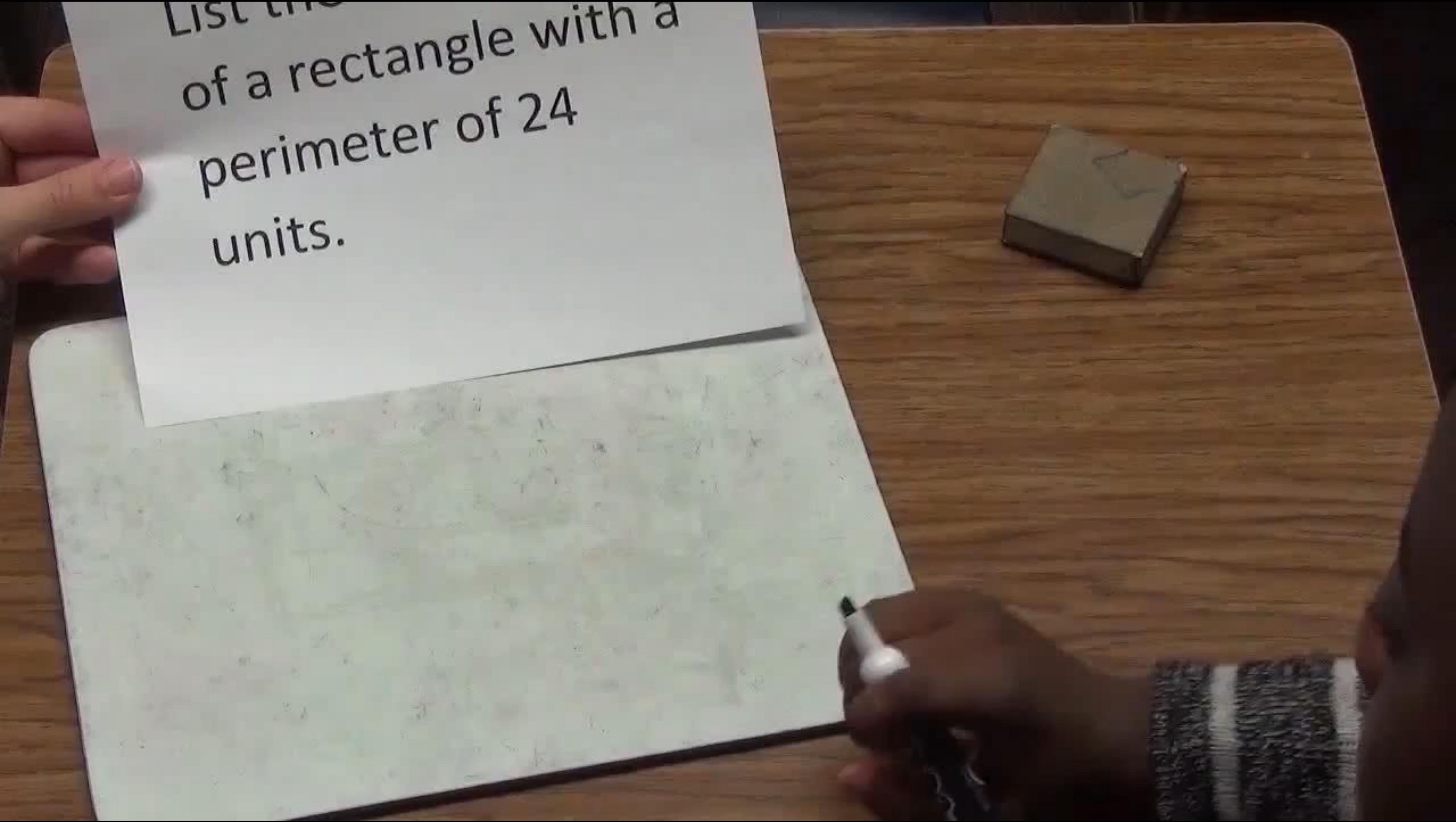
- ☒ Procedural Skill and Fluency
- ☒ Conceptual Understanding

WHY?



Components of Rigor

- ☑ Procedural Skill and Fluency
- ☑ Conceptual Understanding

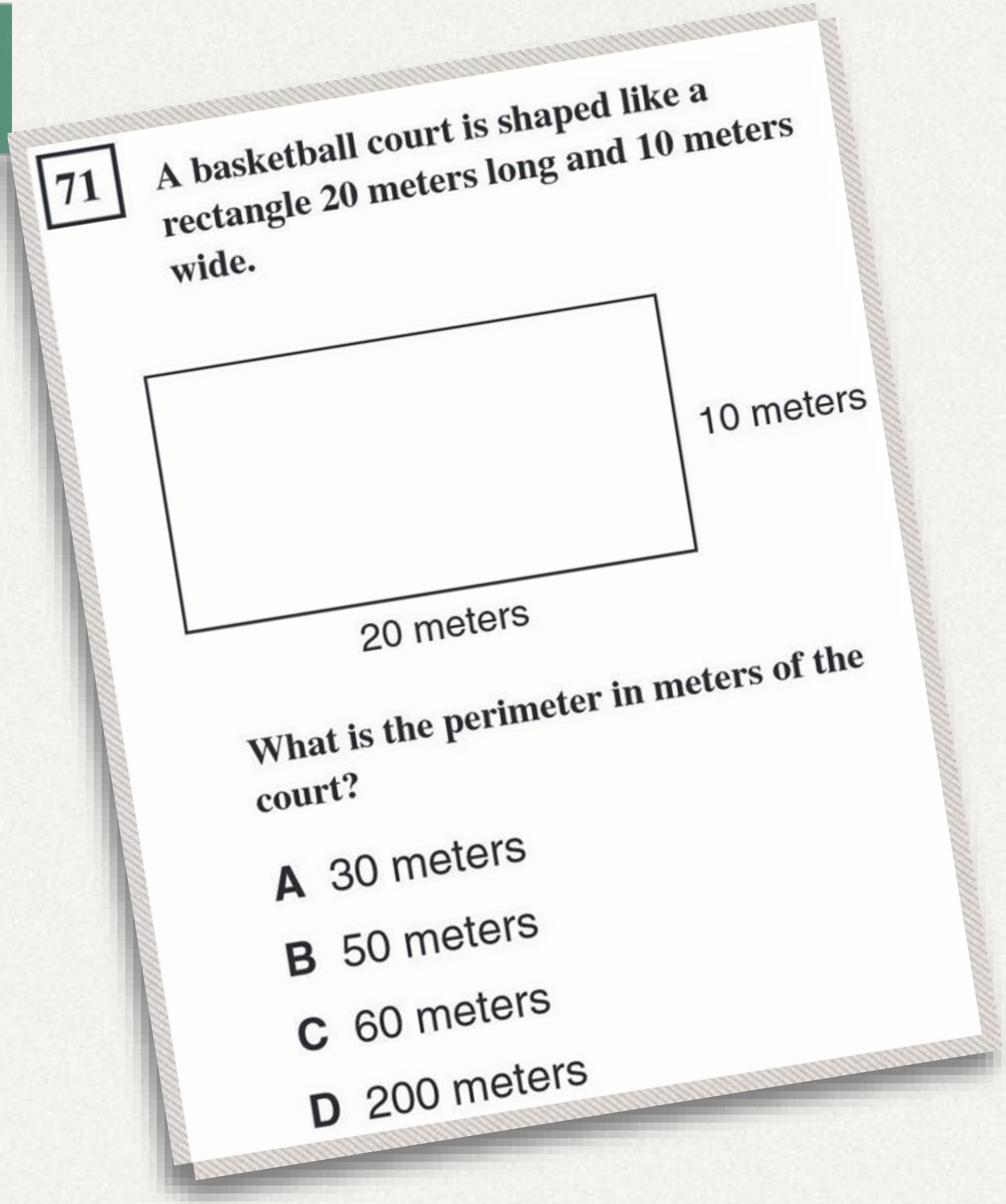


List th
of a rectangle with a
perimeter of 24
units.

Components of Rigor

- ☒ Procedural Skill and Fluency
- ☒ Conceptual Understanding

STAR



71 A basketball court is shaped like a rectangle 20 meters long and 10 meters wide.

10 meters

20 meters

What is the perimeter in meters of the court?

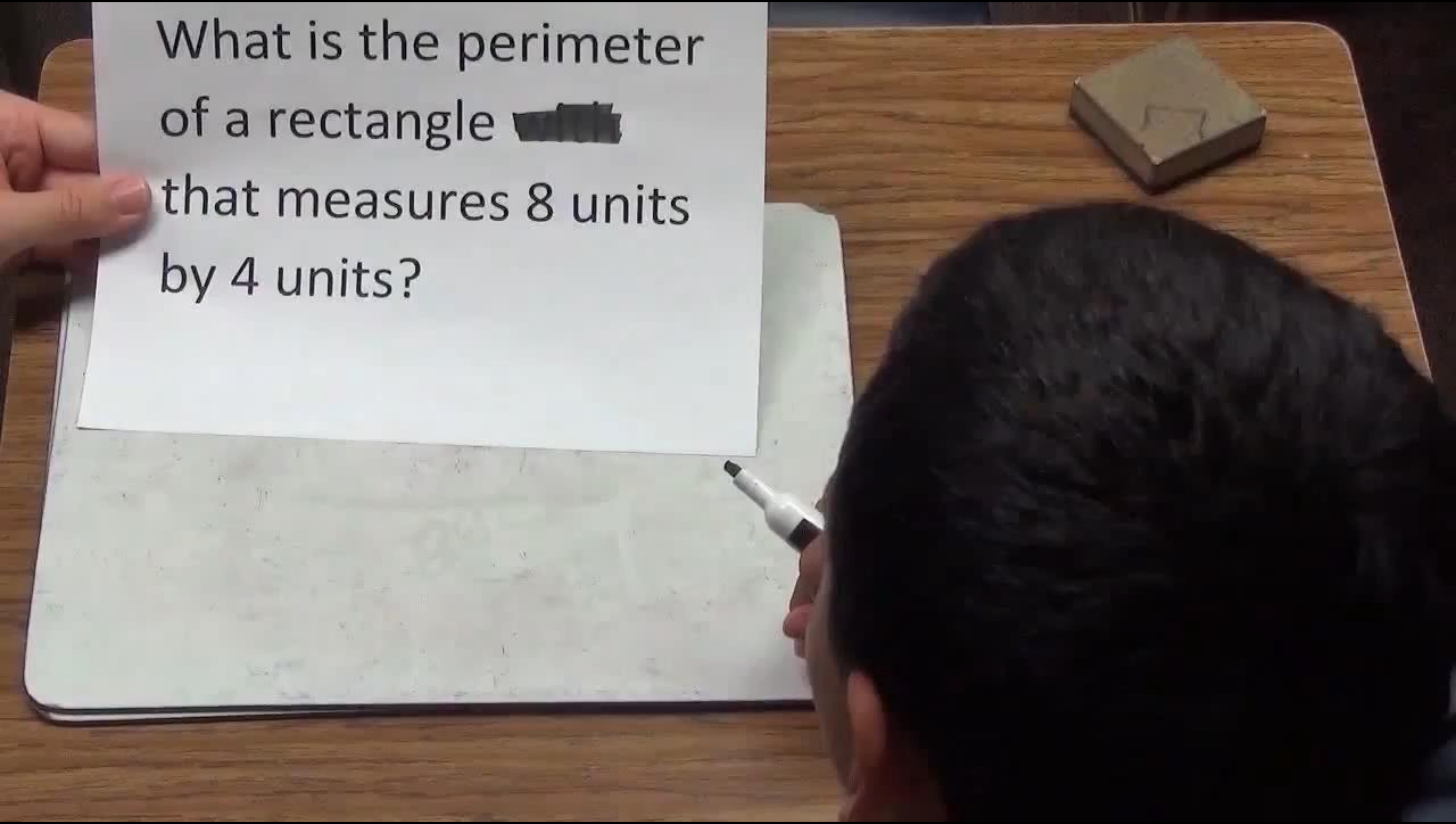
A 30 meters

B 50 meters

C 60 meters

D 200 meters

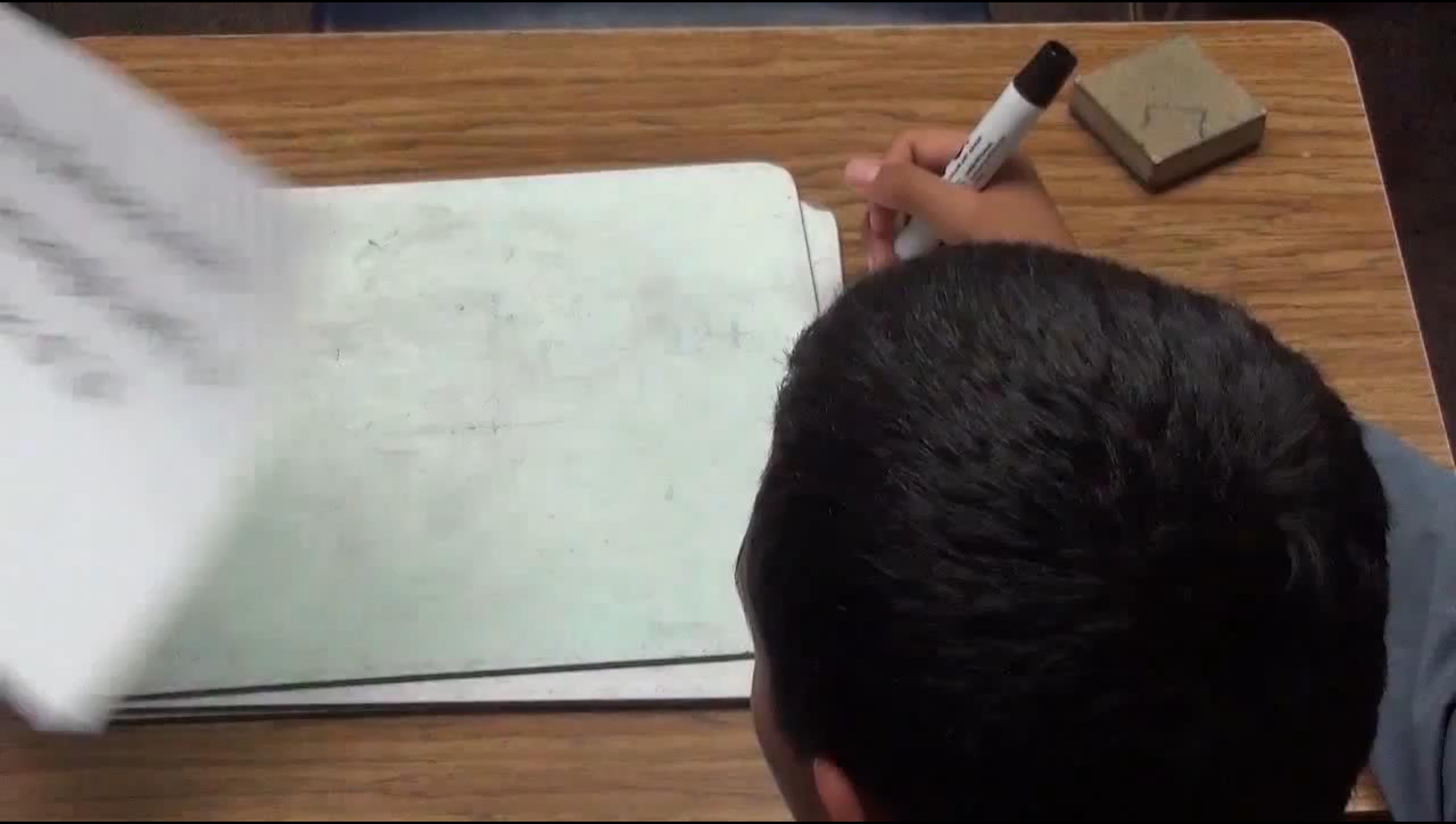
Source: http://www.cde.ca.gov/ta/tg/sr/documents/cstrtqmath3.pdf



What is the perimeter of a rectangle [redacted] that measures 8 units by 4 units?

Components of Rigor

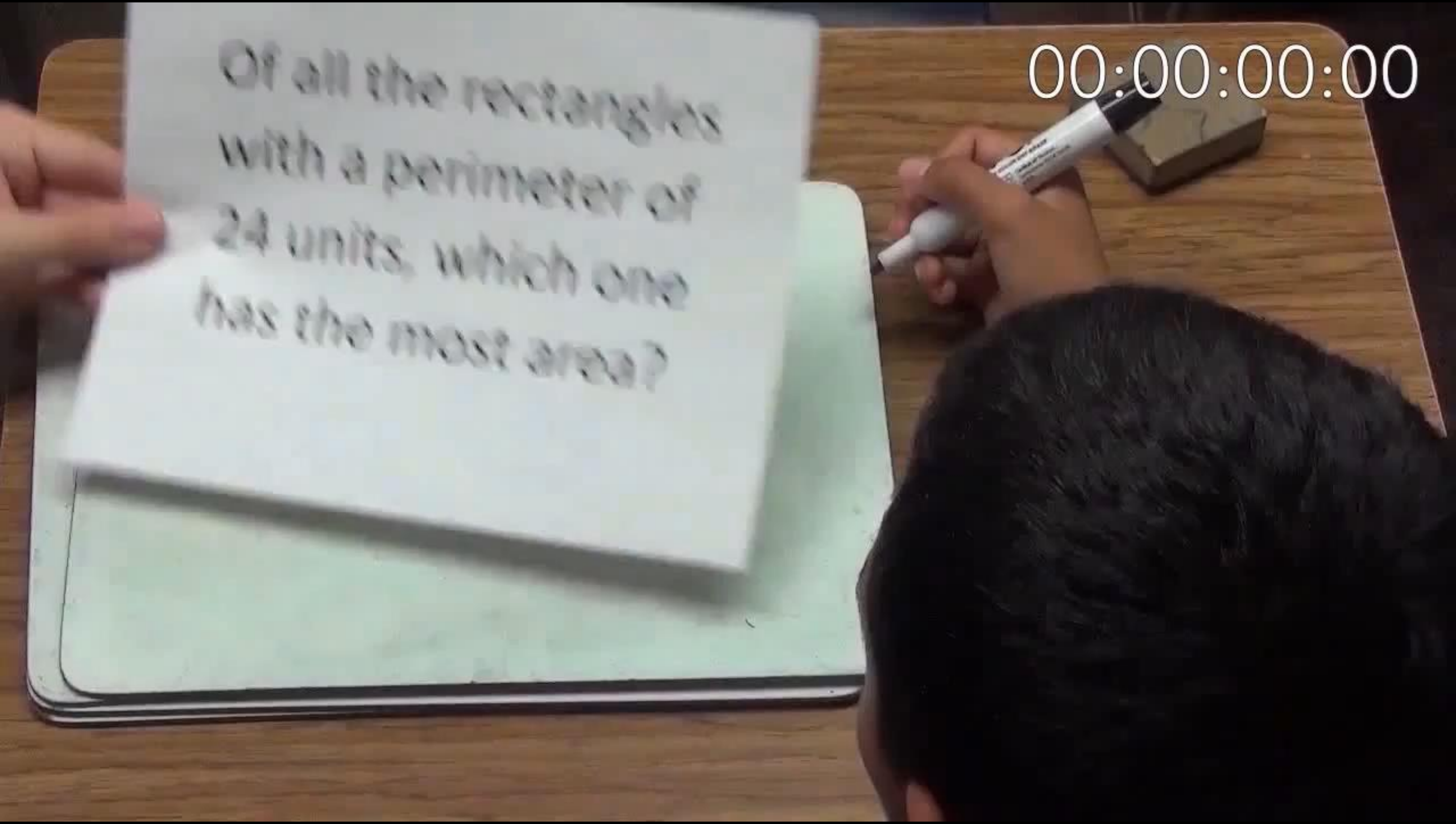
- ☑ Procedural Skill and Fluency
- ☑ Conceptual Understanding



Components of Rigor

- ☑ Procedural Skill and Fluency
- ☑ Conceptual Understanding

Of all the rectangles with a perimeter of 24 units, which one has the most area?



Of all the rectangles with a perimeter of 24 units, which one has the most area?

Components of Rigor

- ☒ Procedural Skill and Fluency
- ☒ Conceptual Understanding

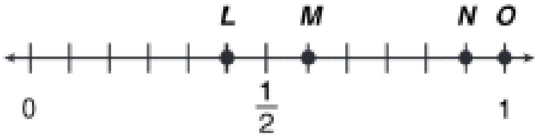
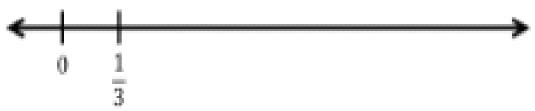
Defining the Problem

- Students appear to demonstrate "deep, authentic command of mathematical concepts" when given commonly used problems.
- However with more challenging problems, the same students seem to no longer demonstrate that command.

Addressing the Problem

- First, we must have a clear understanding about why these problems are different from one another.
- Next, we need to practice implementing these problems such that all students are engaged in a problem that is at the right challenge level for them.
- Last, we need a source that can provide us with a variety of free problems.

DOK | Distinguishing Between Depth of Knowledge Levels in Mathematics

Topic	Adding Whole Numbers	Money	Fractions on a Number Line	Area and Perimeter	Subtracting Mixed Numbers
CCSS Standard(s)	- 1.NBT.4 - 2.NBT.5	- 2.MD.8	- 3.NF.2	- 3.MD.8 - 4.MD.3	- 5.NF.1
DOK 1 Example	Find the sum. $44 + 27 =$	If you have 2 dimes and 3 pennies, how many cents do you have	Which point is located at $\frac{7}{12}$ below? 	Find the perimeter of a rectangle that measures 4 units by 8 units.	Find the difference. $5\frac{1}{2} - 4\frac{2}{3} =$
DOK 2 Example	Fill in the boxes below using the whole numbers 1 through 9, no more than one time each, so that you make a true equation. $\square\square + 53 = \square\square$	Make 47¢ in three different ways with either quarters, dimes, nickels, or pennies.	Label the point where $\frac{3}{4}$ belongs on the number line below. Be as precise as possible. 	List the measurements of three different rectangles that each has a perimeter of 20 units.	Create three different mixed numbers that will make the equation true by using the whole numbers 1 through 9, no more than one time each,. You may reuse the same whole numbers for each of the three mixed numbers. $5\frac{4}{5} - \square\frac{\square}{\square} = 3\frac{1}{20}$
DOK 3 Example	Make the largest sum by filling in the boxes below using the whole numbers 1 through 9, no more than one time each. $\square\square + \square\square =$	Make 47¢ using exactly 5 coins with either quarters, dimes, nickels, or pennies.	Create 5 fractions using the whole numbers 0 through 9, no more than one time each, as numerators and denominators and correctly place them all on a number line.	What is the greatest area you can make with a rectangle that has a perimeter of 24 units?	Make the smallest difference by filling in the boxes below using the whole numbers 1 through 9, no more than one time each. $\square\frac{\square}{\square} - \square\frac{\square}{\square}$

ROBERT KAPLINSKY

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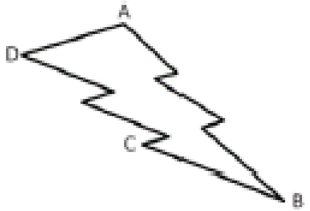
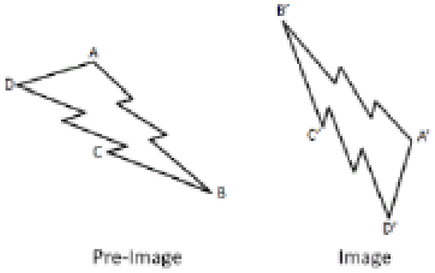
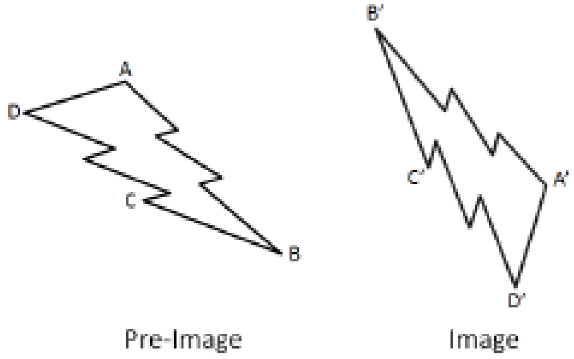
Version 1.9

DOK | Distinguishing Between Depth of Knowledge Levels in Mathematics

Topic	Surface Area and Volume	Probability	Transformations	Factoring Quadratics	Quadratics in Vertex Form
CCSS Standard(s)	6.G.4 7.G.6	7.SP.5 7.SP.7	8.G.1 G-CO.5	A-SSE.3a	F-IF.7a
DOK 1 Example	Find the surface area of a rectangular prism that measures 3 units by 4 units by 5 units.	What is the probability of rolling a sum of 5 using two 6-sided dice?	Rotate the image below 90° counterclockwise and reflect it across a horizontal line. 	Find the factors: $2x^2 + 7x + 3$	Find the roots and maximum of the quadratic equation below. $y = 3(x-4)^2 - 3$
DOK 2 Example	List the measurements of three different rectangular prisms that each has a surface area of 20 square units.	What value(s) have a 1/12 probability of being rolled as the sum of two 6-sided dice?	List three sequences of transformations that take pre-image ABCD to image A′B′C′D′.  A D C B B′ C′ A′ D′ Pre-Image Image	Fill in the blank with integers so that the quadratic expression is factorable. $x^2 + \_\_x + 4$	Create three equations for quadratics in vertex form that have roots at 3 and 5 but have different maximum and/or minimum values.
DOK 3 Example	What is the greatest volume you can make with a rectangular prism that has a surface area of 20 square units?	Fill in the blanks to complete this sentence using the whole numbers 1 through 9, no more than one time each. Rolling a sum of ___ on two ___-sided dice is the same probability as rolling a sum of ___ on two ___-sided dice.	What is the fewest number of transformations needed to take pre-image ABCD to image A′B′C′D′?  A D C B B′ C′ A′ D′ Pre-Image Image	Fill the blank by finding the largest and smallest integers that will make the quadratic expression factorable. $2x^2 + 3x + \_\_$	Create a quadratic equation with the largest maximum value using the whole numbers 1 through 9, no more than one time each. $y = -\square(x-\square)^2 + \square$

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DOK Level Differences

- **Level 1: Recall & Reproduction**
  - Often a trivial application of facts.
  - Requires little to no cognitive effort beyond remembering the right formula.
  - Usually only one answer.
- **Level 2: Skills & Concepts**
  - Usually requires more than one step to solve.
  - Often multiple answers.
- **Level 3: Strategic Thinking**
  - Usually requires critical thinking about the best way to approach a problem.
  - May be multiple answers or a single optimal answer.
  - Often challenging enough to make your head hurt.
- **Level 4: Extended Thinking**
  - In mathematics these are generally represented by performance tasks or problem-based lessons.

Probability

What is the probability of rolling a sum of 5 using two 6-sided dice?

Probability

What value(s) have a $\frac{1}{12}$ probability of being rolled as the sum of two 6-sided dice?

Author: Daniel Luevanos

Probability

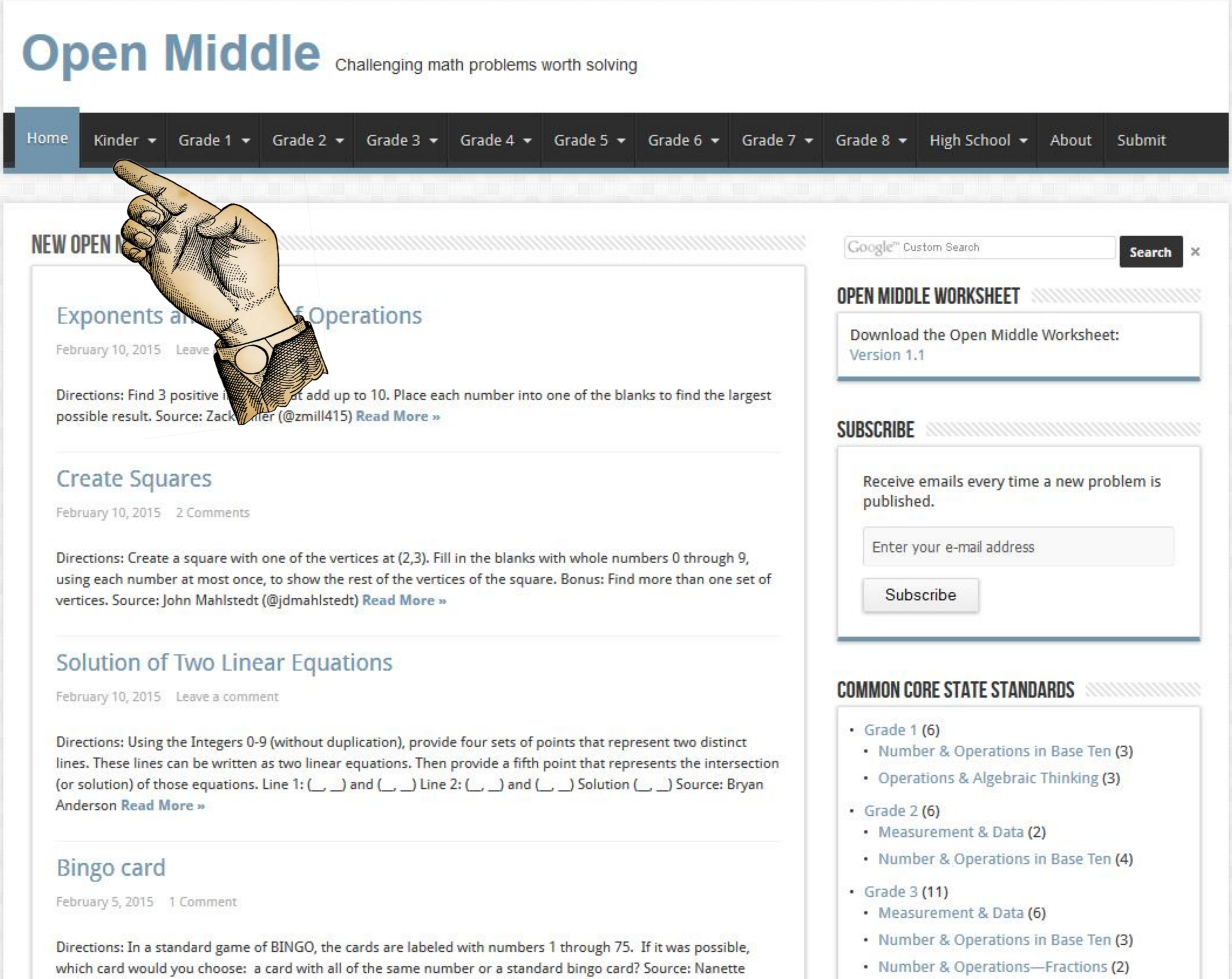
Fill in the blanks to complete this sentence using the whole numbers 1 through 9, no more than one time each.

Rolling a sum of ____ on two ____-sided dice is the same probability as rolling a sum of ____ on two ____-sided dice.

Authors: Audrey Mendivil, Daniel Luevanos, and Robert Kaplinsky

DOK FAQ

- *What DOK level should I start students off with?*
- *How do teachers fit these problems into their pacing?*
- *How do I help prevent students from giving up after trying the problem once or twice?*
- *Where can I find other DOK 2 and DOK 3 problems?*
- *How can I share DOK 2 and DOK 3 problems I've made?*



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Exponents a f Operations

February 10, 2015 Leave

Directions: Find 3 positive i t add up to 10. Place each number into one of the blanks to find the largest possible result. Source: Zack ller (@zmill415) **Read More »**

Create Squares

February 10, 2015 2 Comments

Directions: Create a square with one of the vertices at (2,3). Fill in the blanks with whole numbers 0 through 9, using each number at most once, to show the rest of the vertices of the square. Bonus: Find more than one set of vertices. Source: John Mahlstedt (@jdmahlstedt) **Read More »**

Solution of Two Linear Equations

February 10, 2015 Leave a comment

Directions: Using the Integers 0-9 (without duplication), provide four sets of points that represent two distinct lines. These lines can be written as two linear equations. Then provide a fifth point that represents the intersection (or solution) of those equations. Line 1: (_, _) and (_, _) Line 2: (_, _) and (_, _) Solution (_, _) Source: Bryan Anderson **Read More »**

Bingo card

February 5, 2015 1 Comment

Directions: In a standard game of BINGO, the cards are labeled with numbers 1 through 75. If it was possible, which card would you choose: a card with all of the same number or a standard bingo card? Source: Nanette

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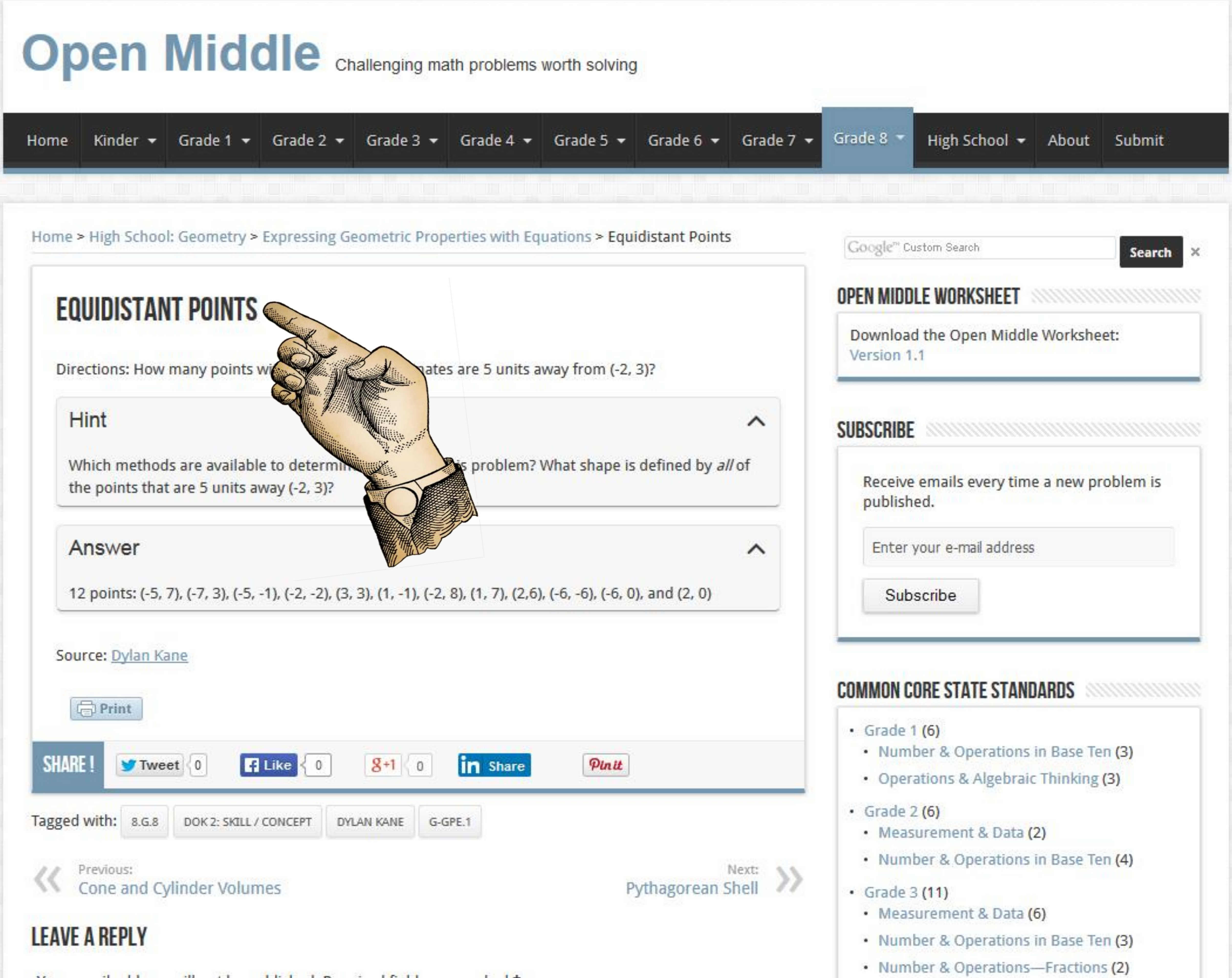
- Grade 2 (6)
  - Measurement & Data (2)
  - Number & Operations in Base Ten (4)
- Grade 3 (11)
  - Measurement & Data (6)
  - Number & Operations in Base Ten (3)
  - Number & Operations—Fractions (2)



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EQUIDISTANT POINTS

Directions: How many points wi ates are 5 units away from (-2, 3)?

Hint

Which methods are available to determin s problem? What shape is defined by *all* of the points that are 5 units away (-2, 3)?

Answer

12 points: (-5, 7), (-7, 3), (-5, -1), (-2, -2), (3, 3), (1, -1), (-2, 8), (1, 7), (2,6), (-6, -6), (-6, 0), and (2, 0)

Source: Dylan Kane

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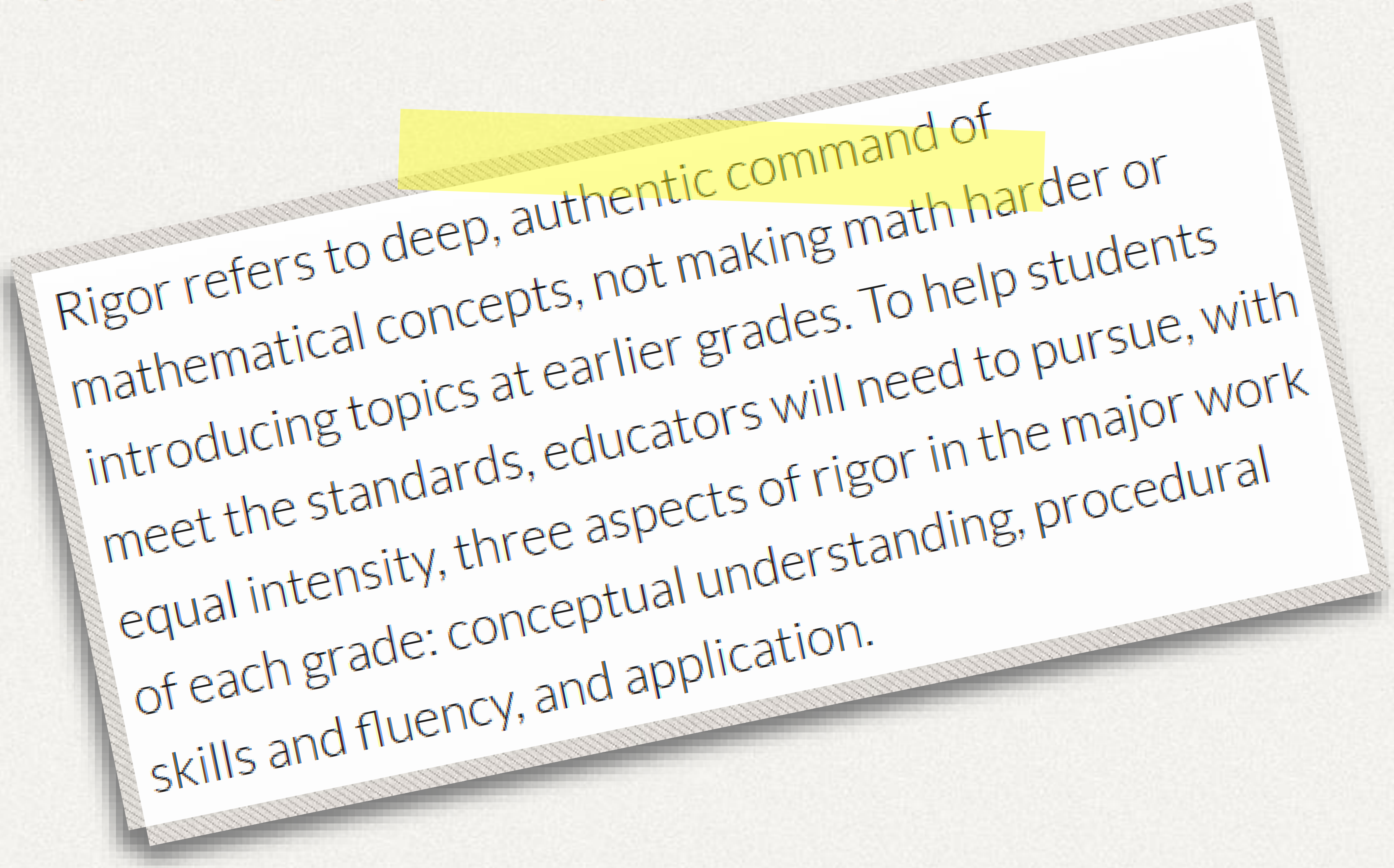
- Grade 3 (11)
  - Measurement & Data (6)
  - Number & Operations in Base Ten (3)
  - Number & Operations—Fractions (2)

COMMON CORE
STATE STANDARDS INITIATIVE

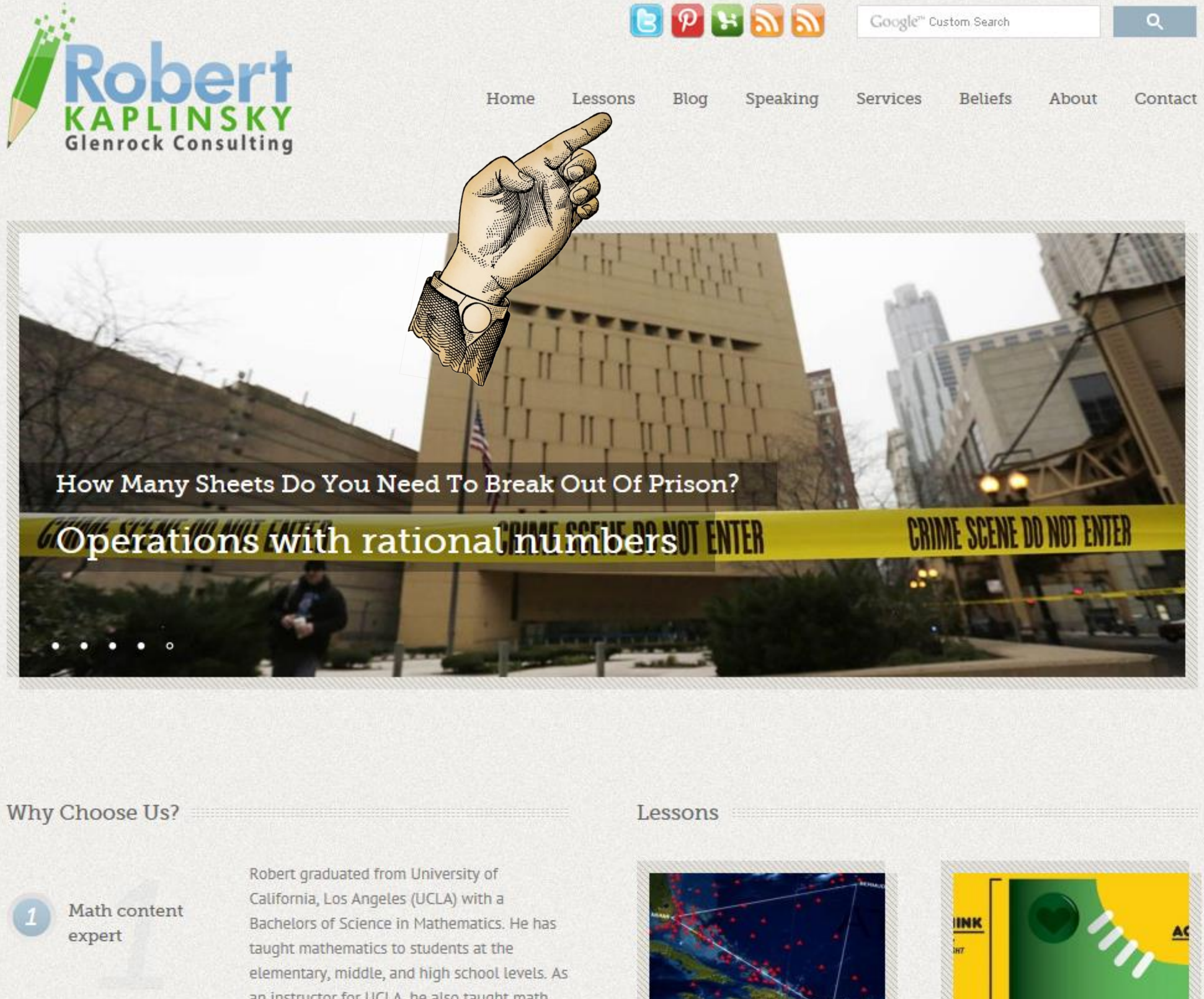


Rigor refers to deep, authentic command of mathematical concepts, not making math harder or introducing topics at earlier grades. To help students meet the standards, educators will need to pursue, with equal intensity, three aspects of rigor in the major work of each grade: conceptual understanding, procedural skills and fluency, and application.

Source: http://www.corestandards.org/other-resources/key-shifts-in-mathematics/

Problem-Based Lesson Resources

- Problem-based lesson search engine: http://robertkaplinsky.com/prbl-search-engine/
- My lessons: http://www.robertkaplinsky.com/lessons
- Graham Fletcher: http://gfletchy.com/3-act-lessons/
- Dan Meyer: http://threeacts.mrmeyer.com
- Andrew Stadel: http://tinyurl.com/mrstadel
- Geoff Krall: http://tinyurl.com/PrBLmaps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How Many Sheets Do You Need To Break Out Of Prison?

Operations with rational numbers

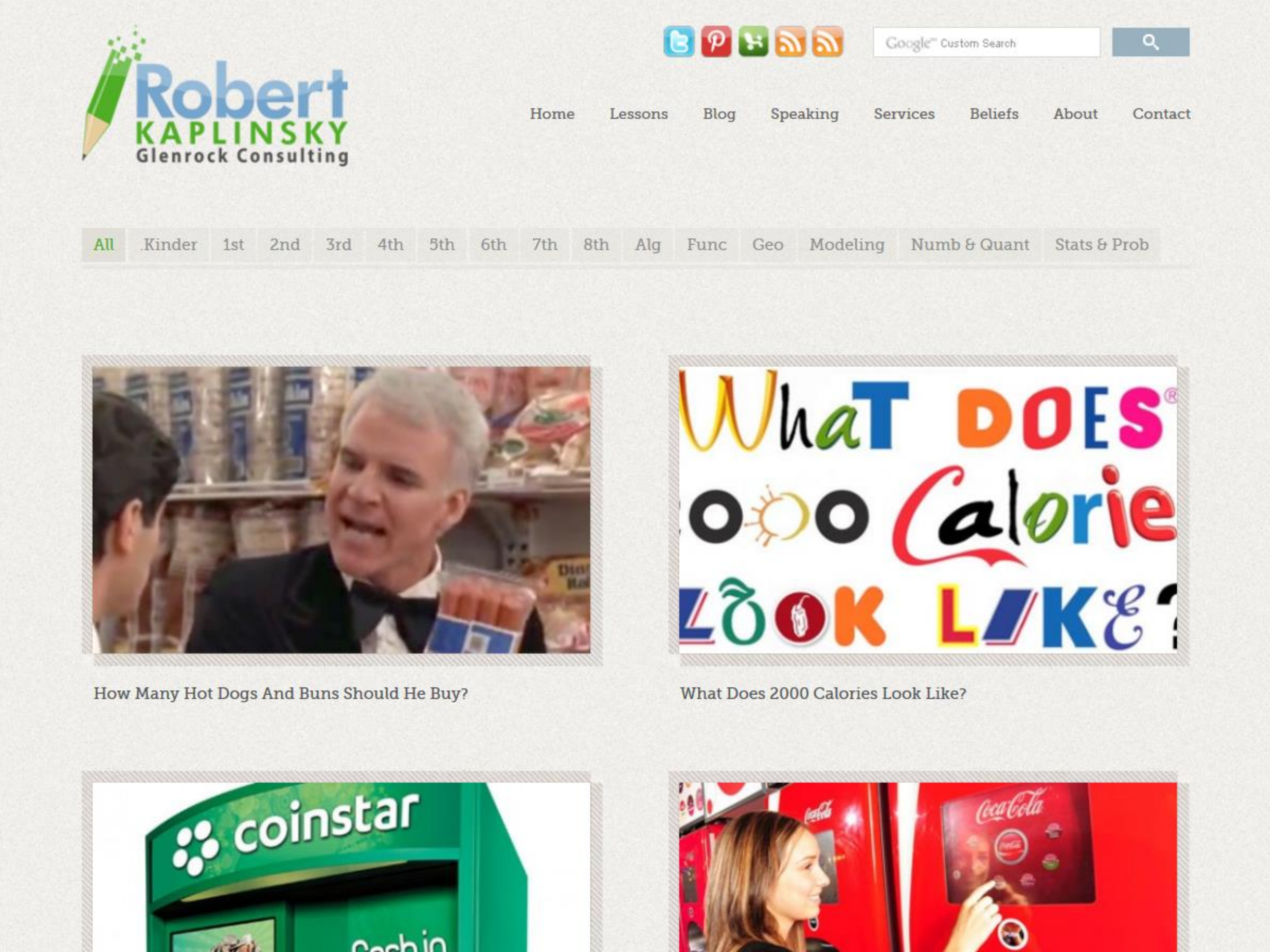
● ● ● ● ○

Why Choose Us?

1 Math content expert

Robert graduated from University of California, Los Angeles (UCLA) with a Bachelors of Science in Mathematics. He has taught mathematics to students at the elementary, middle, and high school levels. As an instructor for UCLA, he also taught math

Lessons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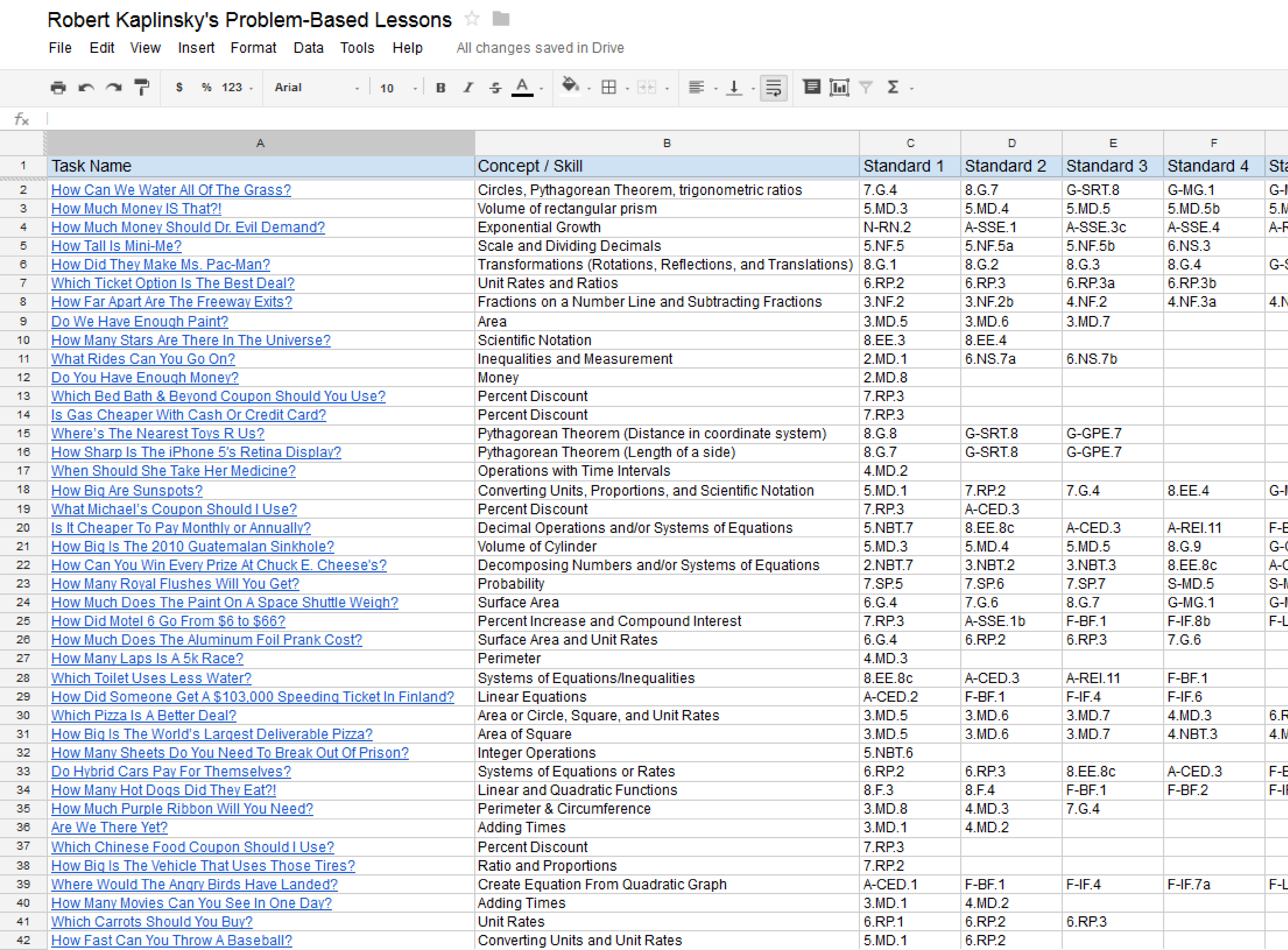
Coca-Cola

How Many Hot Dogs And Buns Should He Buy?

What Does 2000 Calories Look Like?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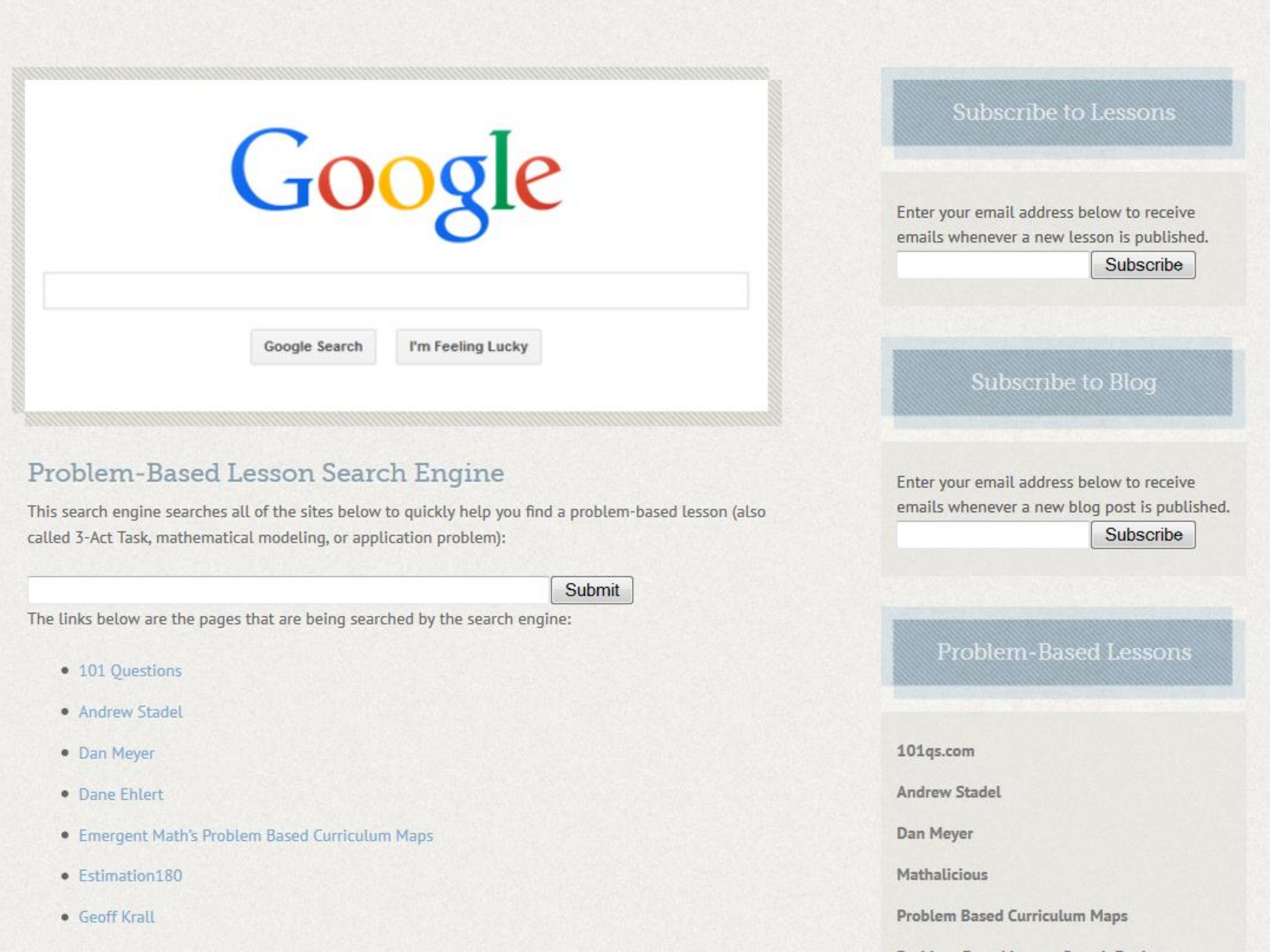
	A	B	C	D	E	F	
1	Task Name	Concept / Skill	Standard 1	Standard 2	Standard 3	Standard 4	Sta
2	How Can We Water All Of The Grass?	Circles, Pythagorean Theorem, trigonometric ratios	7.G.4	8.G.7	G-SRT.8	G-MG.1	G-M
3	How Much Money IS That?!	Volume of rectangular prism	5.MD.3	5.MD.4	5.MD.5	5.MD.5b	5.M
4	How Much Money Should Dr. Evil Demand?	Exponential Growth	N-RN.2	A-SSE.1	A-SSE.3c	A-SSE.4	A-F
5	How Tall Is Mini-Me?	Scale and Dividing Decimals	5.NF.5	5.NF.5a	5.NF.5b	6.NS.3	
6	How Did They Make Ms. Pac-Man?	Transformations (Rotations, Reflections, and Translations)	8.G.1	8.G.2	8.G.3	8.G.4	G-S
7	Which Ticket Option Is The Best Deal?	Unit Rates and Ratios	6.RP.2	6.RP.3	6.RP.3a	6.RP.3b	
8	How Far Apart Are The Freeway Exits?	Fractions on a Number Line and Subtracting Fractions	3.NF.2	3.NF.2b	4.NF.2	4.NF.3a	4.N
9	Do We Have Enough Paint?	Area	3.MD.5	3.MD.6	3.MD.7		
10	How Many Stars Are There In The Universe?	Scientific Notation	8.EE.3	8.EE.4			
11	What Rides Can You Go On?	Inequalities and Measurement	2.MD.1	6.NS.7a	6.NS.7b		
12	Do You Have Enough Money?	Money	2.MD.8				
13	Which Bed Bath & Beyond Coupon Should You Use?	Percent Discount	7.RP.3				
14	Is Gas Cheaper With Cash Or Credit Card?	Percent Discount	7.RP.3				
15	Where's The Nearest Toys R Us?	Pythagorean Theorem (Distance in coordinate system)	8.G.8	G-SRT.8	G-GPE.7		
16	How Sharp Is The iPhone 5's Retina Display?	Pythagorean Theorem (Length of a side)	8.G.7	G-SRT.8	G-GPE.7		
17	When Should She Take Her Medicine?	Operations with Time Intervals	4.MD.2				
18	How Big Are Sunspots?	Converting Units, Proportions, and Scientific Notation	5.MD.1	7.RP.2	7.G.4	8.EE.4	G-M
19	What Michael's Coupon Should I Use?	Percent Discount	7.RP.3	A-CED.3			
20	Is It Cheaper To Pay Monthly or Annually?	Decimal Operations and/or Systems of Equations	5.NBT.7	8.EE.8c	A-CED.3	A-REI.11	F-B
21	How Big Is The 2010 Guatemalan Sinkhole?	Volume of Cylinder	5.MD.3	5.MD.4	5.MD.5	8.G.9	G-C
22	How Can You Win Every Prize At Chuck E. Cheese's?	Decomposing Numbers and/or Systems of Equations	2.NBT.7	3.NBT.2	3.NBT.3	8.EE.8c	A-C
23	How Many Royal Flushes Will You Get?	Probability	7.SP.5	7.SP.6	7.SP.7	S-MD.5	S-M
24	How Much Does The Paint On A Space Shuttle Weigh?	Surface Area	6.G.4	7.G.6	8.G.7	G-MG.1	G-M
25	How Did Motel 6 Go From $6 to $66?	Percent Increase and Compound Interest	7.RP.3	A-SSE.1b	F-BF.1	F-IF.8b	F-L
26	How Much Does The Aluminum Foil Prank Cost?	Surface Area and Unit Rates	6.G.4	6.RP.2	6.RP.3	7.G.6	
27	How Many Laps Is A 5k Race?	Perimeter	4.MD.3				
28	Which Toilet Uses Less Water?	Systems of Equations/Inequalities	8.EE.8c	A-CED.3	A-REI.11	F-BF.1	
29	How Did Someone Get A $103,000 Speeding Ticket In Finland?	Linear Equations	A-CED.2	F-BF.1	F-IF.4	F-IF.6	
30	Which Pizza Is A Better Deal?	Area or Circle, Square, and Unit Rates	3.MD.5	3.MD.6	3.MD.7	4.MD.3	6.R
31	How Big Is The World's Largest Deliverable Pizza?	Area of Square	3.MD.5	3.MD.6	3.MD.7	4.NBT.3	4.M
32	How Many Sheets Do You Need To Break Out Of Prison?	Integer Operations	5.NBT.6				
33	Do Hybrid Cars Pay For Themselves?	Systems of Equations or Rates	6.RP.2	6.RP.3	8.EE.8c	A-CED.3	F-B
34	How Many Hot Dogs Did They Eat?!	Linear and Quadratic Functions	8.F.3	8.F.4	F-BF.1	F-BF.2	F-I
35	How Much Purple Ribbon Will You Need?	Perimeter & Circumference	3.MD.8	4.MD.3	7.G.4		
36	Are We There Yet?	Adding Times	3.MD.1	4.MD.2			
37	Which Chinese Food Coupon Should I Use?	Percent Discount	7.RP.3				
38	How Big Is The Vehicle That Uses Those Tires?	Ratio and Proportions	7.RP.2				
39	Where Would The Angry Birds Have Landed?	Create Equation From Quadratic Graph	A-CED.1	F-BF.1	F-IF.4	F-IF.7a	F-L
40	How Many Movies Can You See In One Day?	Adding Times	3.MD.1	4.MD.2			
41	Which Carrots Should You Buy?	Unit Rates	6.RP.1	6.RP.2	6.RP.3		
42	How Fast Can You Throw A Baseball?	Converting Units and Unit Rates	5.MD.1	6.RP.2			



Problem-Based Lesson Search Engine

This search engine searches all of the sites below to quickly help you find a problem-based lesson (also called 3-Act Task, mathematical modeling, or application problem):

The links below are the pages that are being searched by the search engine:

- 101 Questions
- Andrew Stadel
- Dan Meyer
- Dane Ehlert
- Emergent Math's Problem Based Curriculum Maps
- Estimation180
- Geoff Krall

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Problem Based Curriculum Maps

Call to Action

- Commit to one of these choices:
  - Implement a problem-based lesson that is at or below grade level in your class(es) within the week.
  - Implement a single DOK 2 or DOK 3 problem from openmiddle.com in your class(es) within the week.

Contact

Robert Kaplinsky

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🌐 robertkaplinsky.com/eps15

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