

# RICH REAL WORLD

# PROBLEMS

**ROBERT KAPLINSKY**

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# GOALS

**WHAT IS A REAL WORLD PROBLEM?**

**HOW DO STUDENTS RESPOND?**

**WHY DO PEOPLE USE THEM?**

**HOW DO I INCORPORATE THEM?**

**FREQUENTLY ASKED QUESTIONS**

**WHERE CAN I FIND MORE?**









# SINKHOLE DIMENSIONS

- Slate Magazine
  - “A sinkhole, 65 feet across and 100 feet deep”





# How To Fix a Giant Sinkhole

The cement method vs. the graded-filter technique.



18

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By Brian Palmer



A sinkhole in Guatamala

It's not clear whether cement is the best option, however. A 6,500-cubic-foot wad of concrete may serve to concentrate water runoff in other areas, leading to more sinkholes. Many engineers prefer the **graded-filter technique**, in which the hole is filled with a layer of boulders, then a layer of smaller rocks, and, finally, a layer of gravel. This fills the hole, more or less, while permitting water to drain through the area.

Reply

Reply All

Forward



## 2010 Guatemalan Sinkhole

Kaplinsky, Robert

To:



Wednesday, February 06, 2013 1:39 PM

Hi Brian,

I am using your "How to Fix a Giant Sinkhole" article for a math lesson on volume of a cylinder. I have one question for you. You mentioned.

"It's not clear whether cement is the best option, however. A 6,500-cubic-foot wad of concrete may serve to concentrate water runoff in other areas, leading to more sinkholes."

Can you please tell me where you got 6500 cubic feet from? Did you do  $65 \times 100$ ? We get something closer to 342,000 cubic feet.

Thanks,  
Robert

[Reply](#)

[Reply All](#)

[Forward](#)



# Re: 2010 Guatemalan Sinkhole

Brian Palmer

**To:** [Kaplinsky, Robert](#)

Wednesday, February 06, 2013 2:01 PM

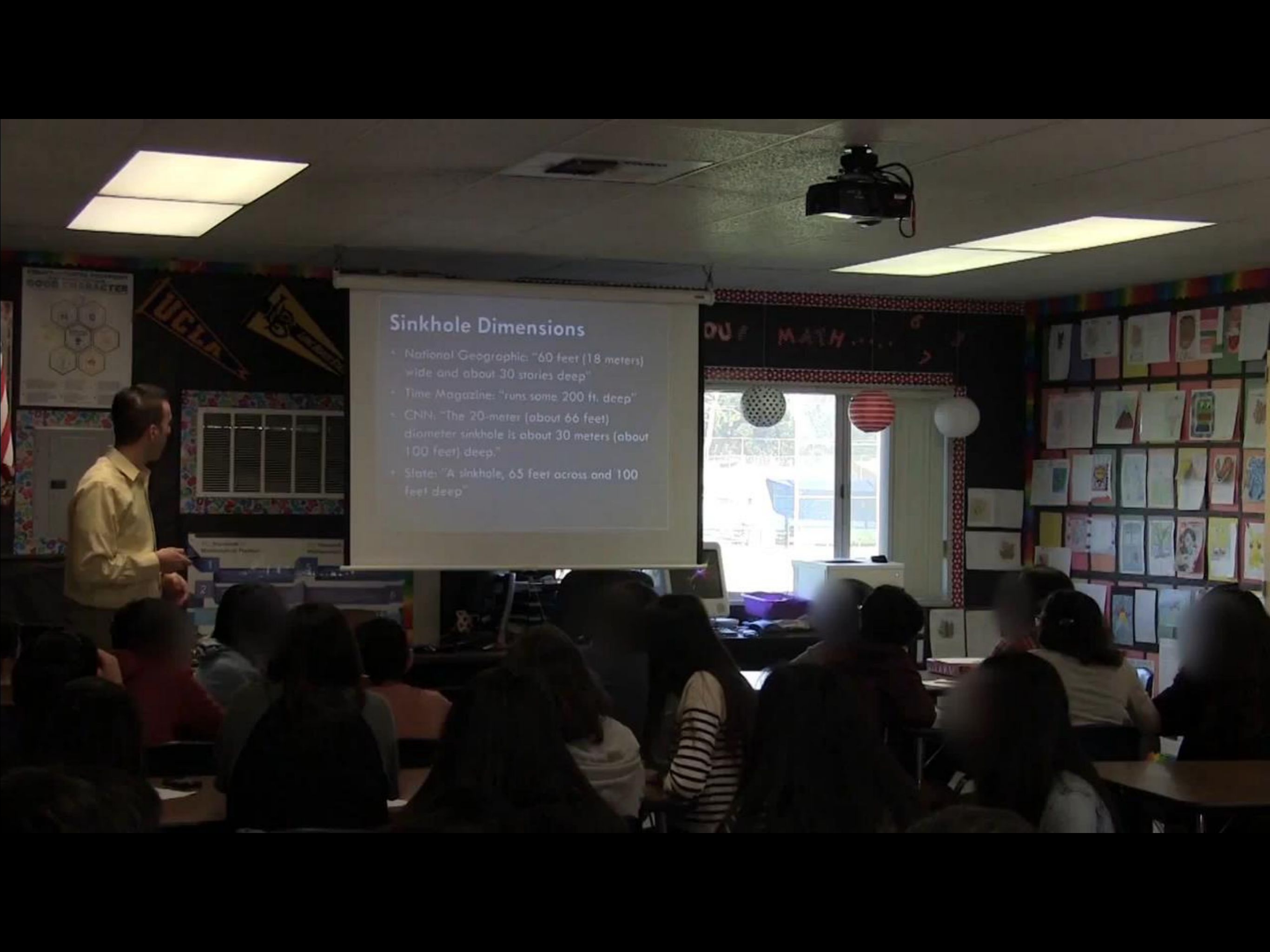
Apparently you picked the wrong article for a math lesson! I apologize. It appears you are correct. I can't find anything in my notes to save myself-- I think I just screwed up. Dunce cap for me.

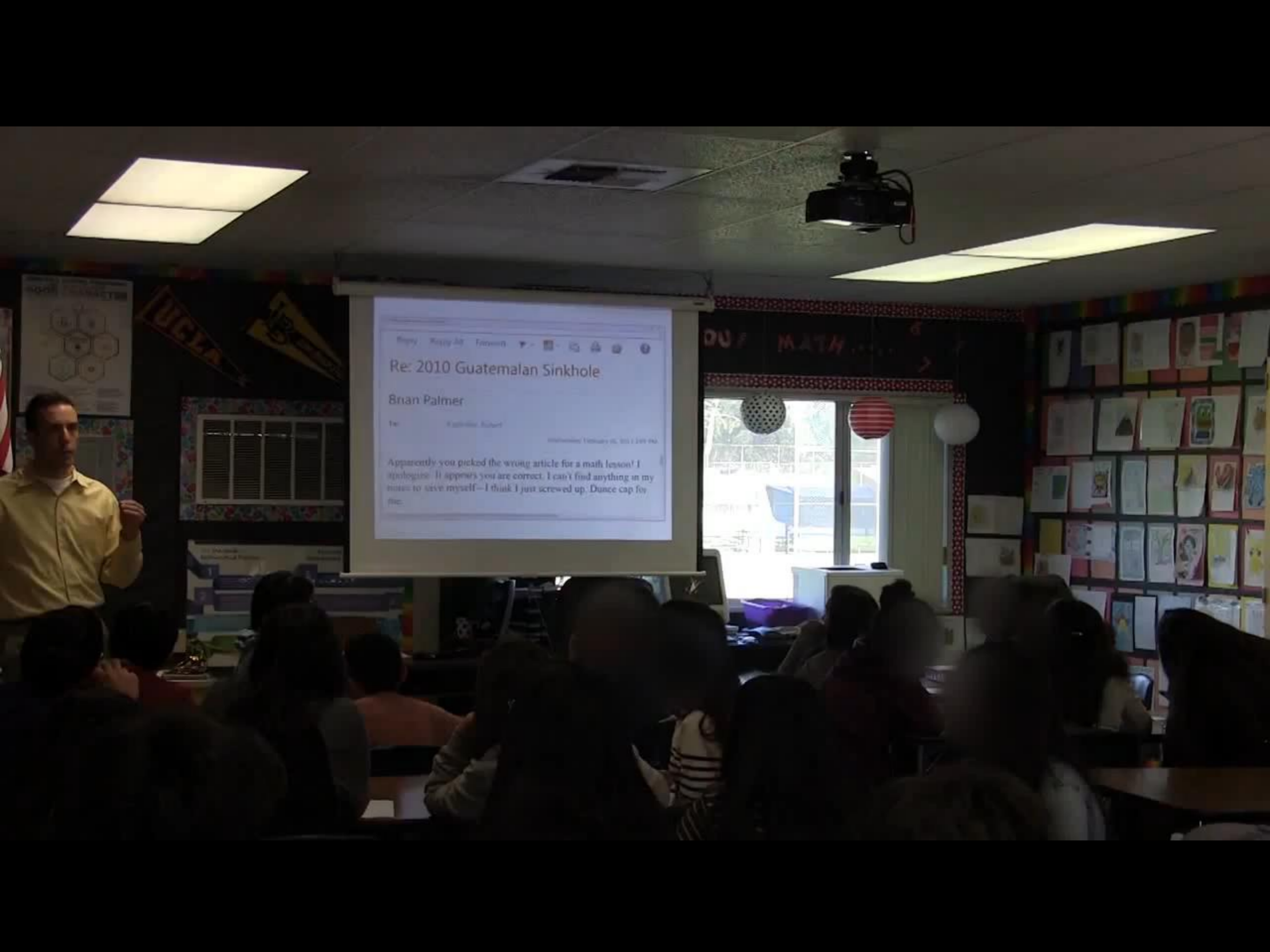
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## Sinkhole Dimensions

- National Geographic: "60 feet (18 meters) wide and about 30 stories deep"
- Time Magazine: "runs some 200 ft. deep"
- CNN: "The 20-meter (about 66 feet) diameter sinkhole is about 30 meters (about 100 feet) deep."
- Slate: "A sinkhole, 65 feet across and 100 feet deep"





Reply Reply All Forward

### Re: 2010 Guatemalan Sinkhole

Brian Palmer

To: [Kaprielian, Robert](#)

Wednesday, February 10, 2011 1:09 PM

Apparently you picked the wrong article for a math lesson! I apologize. It appears you are correct. I can't find anything in my notes to save myself—I think I just screwed up. Dunc cap for me.

# STUDENT REFLECTIONS

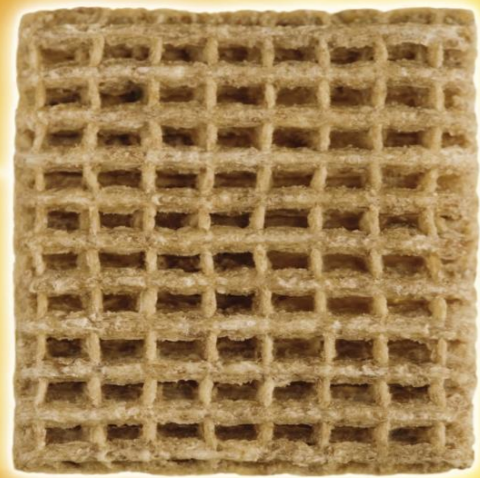
- “I didn’t say his answer was wrong since he is supposed to know more than an average 8th grader.”
- “Even though Brian was wrong, no one corrected him, because of fear of being wrong and lack of confidence in ourselves.”

# STUDENT REFLECTIONS

- “I didn’t say anything when we were shown the ‘right’ answer because I thought that it must be right because he’s the author, but I knew in my mind he was actually wrong.”
- “I think that I should be the one who argues for my opinion, not just listening to others and accepting that my answer is wrong all the time.”







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**(Boring)**

**NEW**  
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**Shreddies**

Cereal



**NEW**  
**(Exciting!)**





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- Low in Fat



**“Kraft Foods saw an immediate 18% increase in baseline sales of Shreddies within the first month alone, and for months thereafter.”**

Source: <http://www.visualtargeting.com/diamondshreddies.html>

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# WHY ARE YOU USING?

## Introduce a new concept

- **Best Case:**
  - Great context for beginning a unit
- **Worst Case:**
  - What was the purpose of this problem?
  - Why didn't you finish it?
  - Why didn't you let students struggle through it?
  - Did the teacher end the problem because he or she was confused and gave up?

# WHY ARE YOU USING?

## Productive struggle

- **Best Case:**
  - Students worked hard and made connections
- **Worst Case:**
  - Why did the teacher let the students sit there confused instead of telling them what to do?
  - Did the students even learn anything because they never figured out the answer?
  - Why didn't the teacher finish the problem? Did she lose track of time?



# WHY ARE YOU USING?

## Problem completion

- **Best Case:**
  - Everyone experienced a complete problem.
- **Worst Case:**
  - Who did the work today: the students or teacher?
  - Why did the teacher not see all those great opportunities for students to make their own connections and take advantage of them?
  - Why did the teacher give such obvious hints and tell them what to do?

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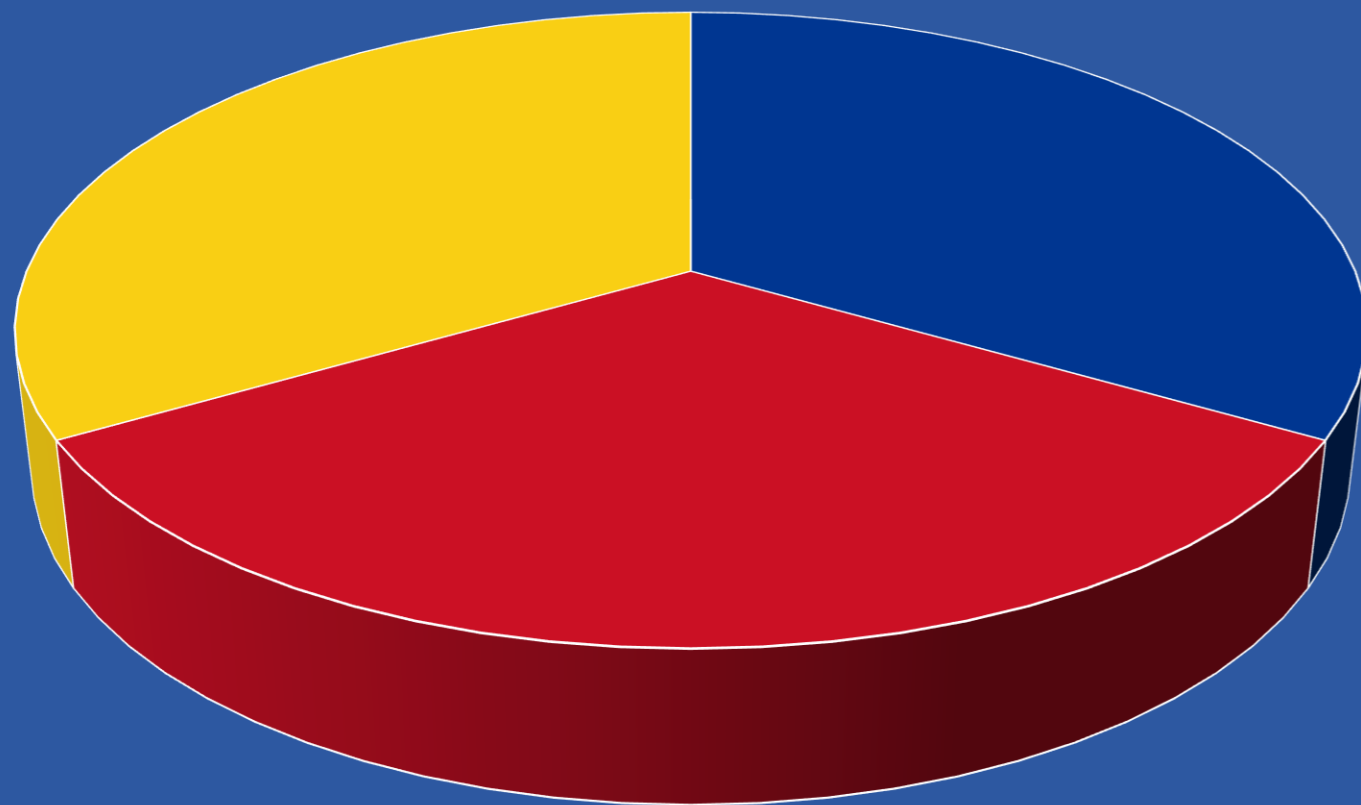
$h$

$\pi r^2$

# CCSS 8.G.9

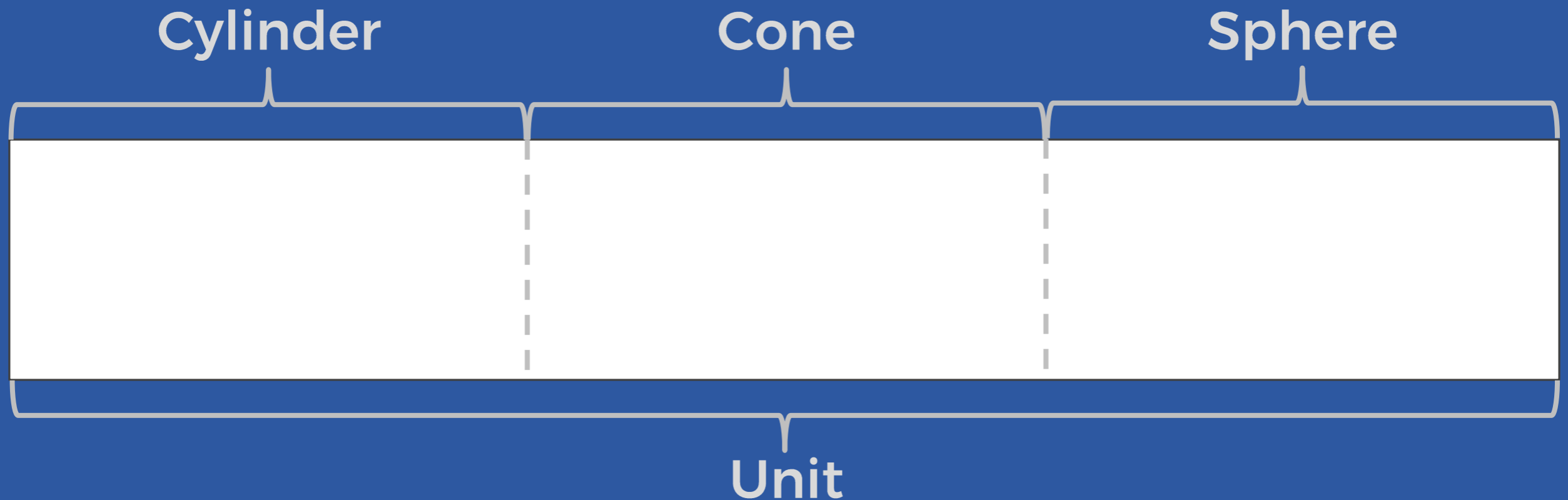
- Know the formulas for the volumes of **cones**, **cylinders**, and **spheres** and use them to solve real-world and mathematical problems.

# INTENSITY BREAKDOWN



- Procedural Skills & Fluency
- Conceptual Understanding
- Application

# SETTING UP THE UNIT

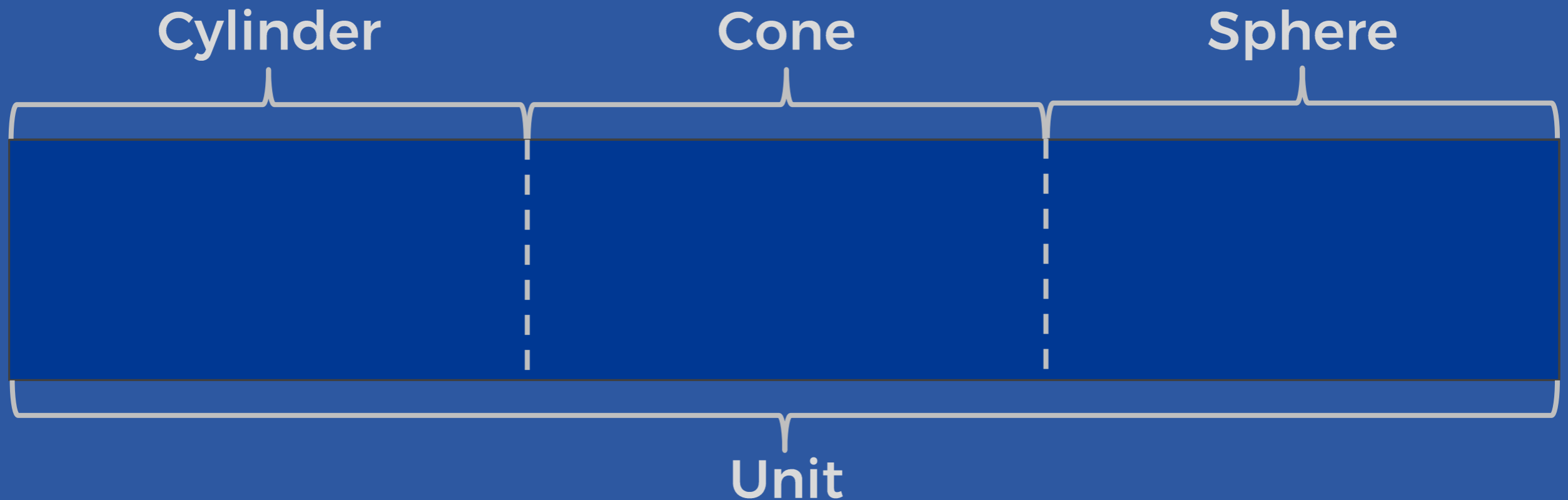


■ Procedural

■ Conceptual

■ Application

# HOW I USED TO TEACH

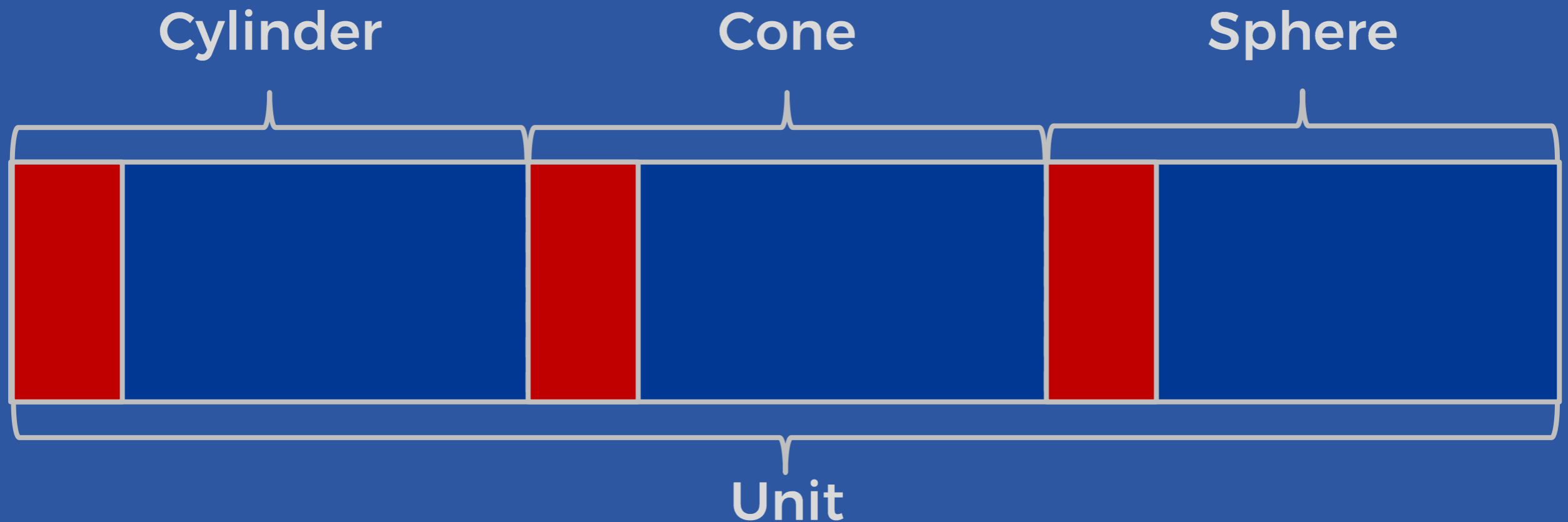


■ Procedural

■ Conceptual

■ Application

# NEXT CAME CONCEPTUAL



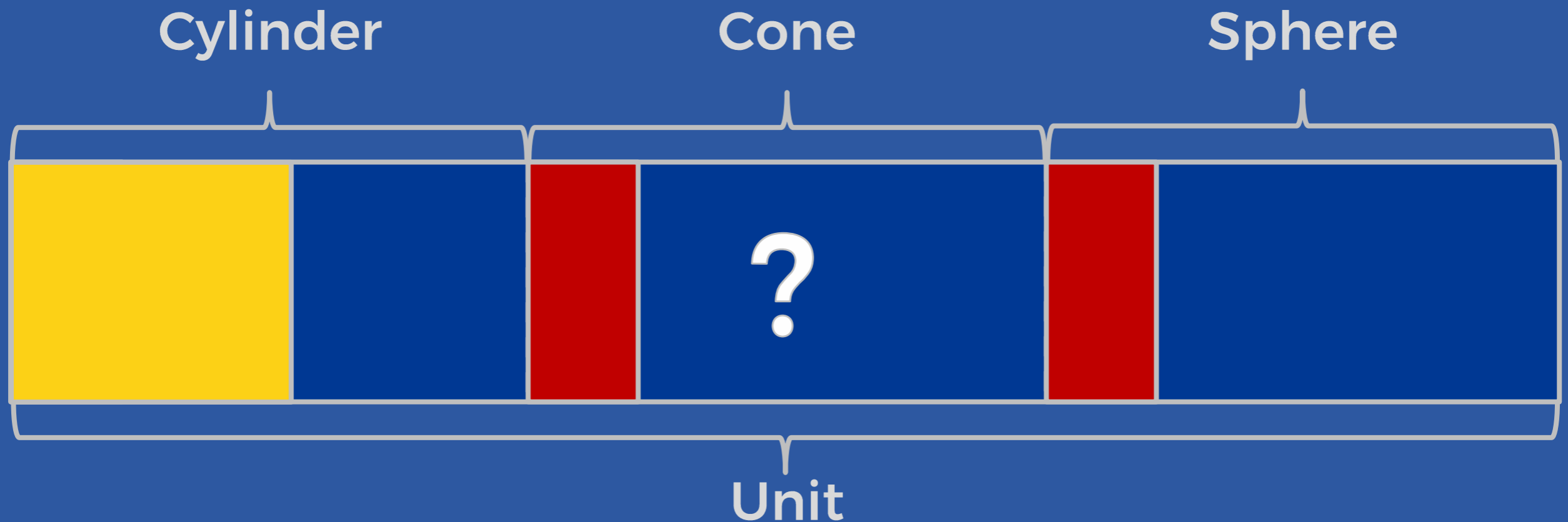
■ Procedural

■ Conceptual

■ Application



# WHERE'S APPLICATION?

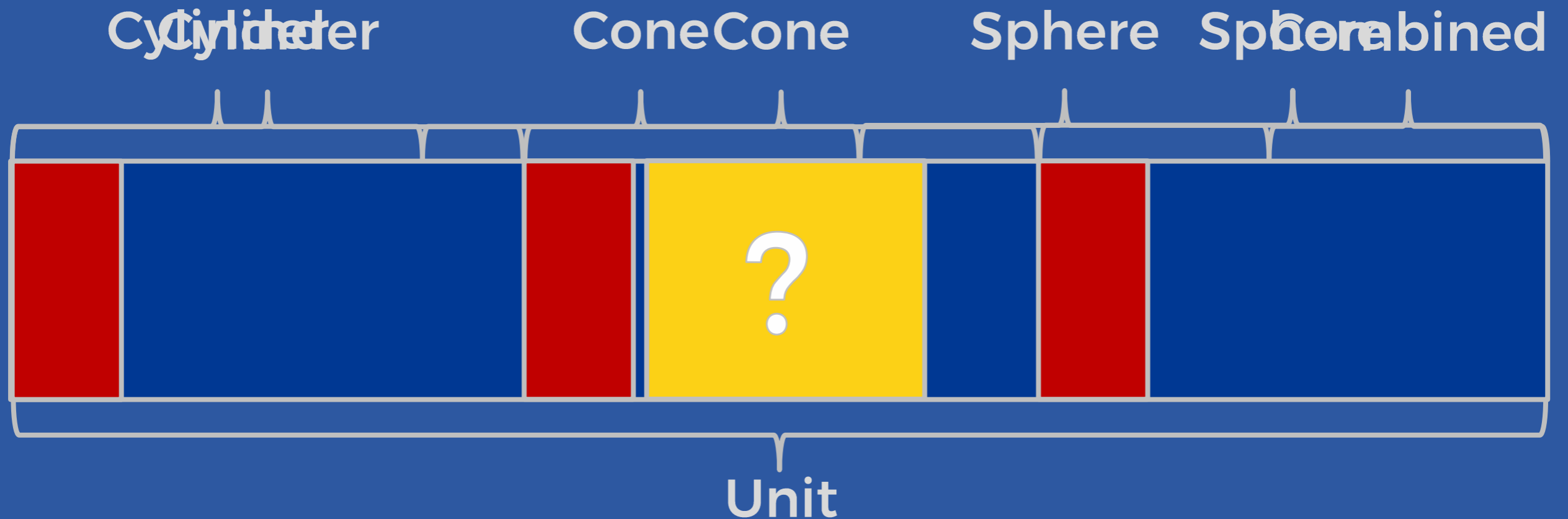


■ Procedural

■ Conceptual

■ Application

# OPTION 1: DO AT THE END



■ Procedural

■ Conceptual

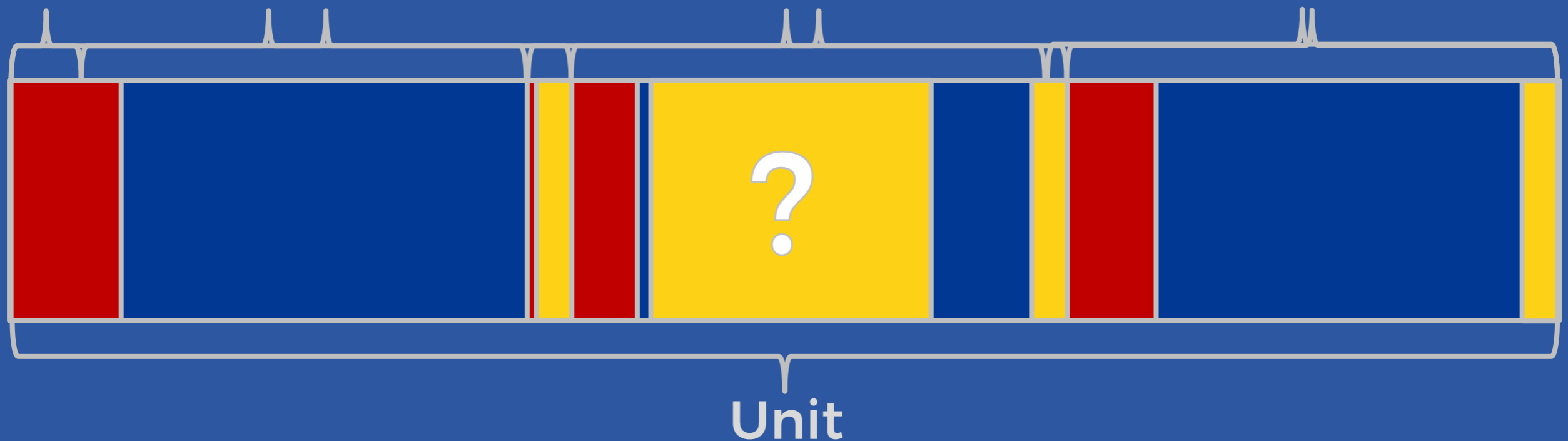
■ Application

# OPTION 2: EVERYWHERE

Context Cylinder

Cone

Sphere



■ Procedural

■ Conceptual

■ Application

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## Content Objective Example

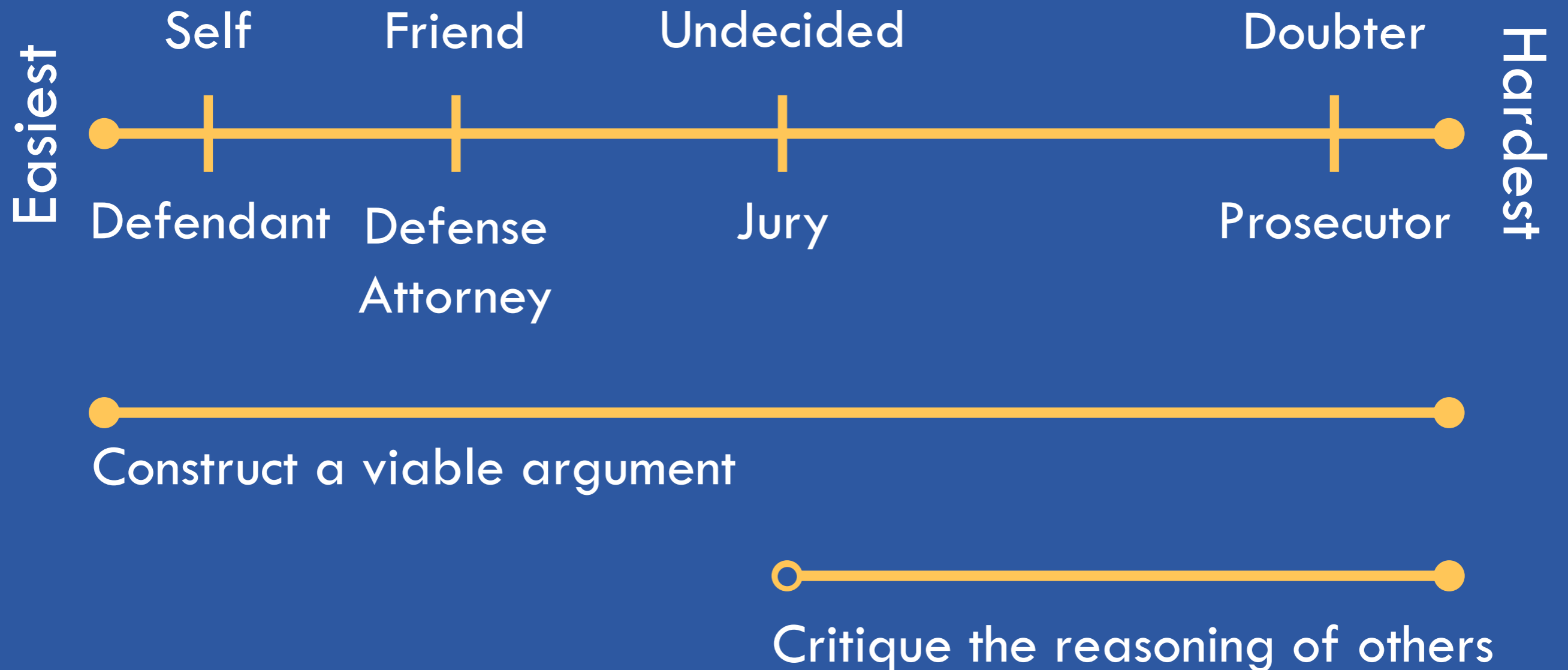
- **SWBAT** apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. (MP4)

## Language Objective Example

- **SWBAT** explain correspondences between equations, verbal descriptions, tables, and graphs. (MP1)

- In early grades, this might be as simple as writing an addition equation to describe a situation. (MP4)
- In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. (MP4)
- By high school, a student might use geometry to solve a design problem or use a function to describe how one

# LEVELS OF CONVINCING



Inspired by *Connecting Mathematical Ideas* by Jo Boaler and Cathy Humphreys

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# PBL RESOURCES

- Problem-based lesson search engine:  
[robertkaplinsky.com/prbl-search-engine](http://robertkaplinsky.com/prbl-search-engine)
- My lessons (Elementary, Middle, and High School)  
[robertkaplinsky.com/lessons](http://robertkaplinsky.com/lessons)
- Dan Meyer (Middle and High School)  
[threeacts.mrmeyer.com](http://threeacts.mrmeyer.com)
- Andrew Stadel (Elementary and Middle School)  
[www.estimated180.com/lessons.html](http://www.estimated180.com/lessons.html)
- Graham Fletcher (Elementary and Middle School)  
[gfletchy.com/3-act-lessons](http://gfletchy.com/3-act-lessons)





## Home



How Big Is The World's Largest Deliverable Pizza?  
(Area of Rectangles)

### Search

Type and hit enter ...

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Do you like the ideas you're reading? If so, you'll love having the best ones sent to you via email!

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If you live in the United States, enter your zip code and I'll use it to let you know about events near you.

First Name

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### How I Can Help You



#### Real World Problems

My workshops help teachers implement problem-based lessons by helping them experience them from both student and teacher perspective, leading to increase students' success with performance tasks and the Common Core State Standards.



#### Depth of Knowledge

Problems at higher depth of knowledge levels have the potential to challenge your most talented student yet remain accessible to everyone. I can help teachers develop best practices for implementing them so that students persevere longer towards finding the solution.

## Lessons

- [View all](#)
- [Kinder](#)
- [1st](#)
- [2nd](#)
- [3rd](#)
- [4th](#)
- [5th](#)
- [6th](#)
- [7th](#)
- [8th](#)
- [Alg 1](#)
- [Geo](#)
- [Alg 2](#)



### How Much Money Were Those Pennies?



### How Can We #SaveNelly?



### How Many Chip Bags Will There Be?



### How Can We Make Stronger Passwords?

### Search

### Subscribe for Updates

Do you like the ideas you're reading? If so, you'll love having the best ones sent to you via email!

Enter your information below and I'll send you a short email each Tuesday about an idea you can use with your students right away.

If you live in the United States, enter your zip code and I'll use it to let you know about events near you.

First Name

Last Name

# Robert Kaplinsky's Problem-Based Lessons

File Edit View Insert Format Data Tools Add-ons Help All changes saved in Drive

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	A	B	C	D	E
1	Lesson	Concept / Skill	Standard 1	Standard 2	Standard 3
2	<a href="#">How Much Money Were Those Pennies?</a>	Money, Multiplying Decimals, Proportions	4.MD.2	5.NBT.5	5.NF.5
3	<a href="#">How Can We #SaveNelly?</a>	Dividing Decimals	6.NS.3		
4	<a href="#">How Many Chip Bags Will There Be?</a>	Ratio and Proportions, Population Sampling	6.RP.3	6.RP.3c	7.SP.8
5	<a href="#">How Can We Make Stronger Passwords?</a>	Permutations, Combinations, Probability, Exponents, Exponential Growth	7.SP.8	8.EE.1	9.SP.8
6	<a href="#">How Many Hot Dogs And Buns Should He Buy?</a>	Least Common Multiple (LCM)	6.NS.4		
7	<a href="#">What Does 2000 Calories Look Like?</a>	Unit Rates, Ratios, Solving Equations, and Solving Inequalities	6.EE.3	6.EE.4	6.EE.5
8	<a href="#">How Much Money Are The Coins Worth?</a>	Decimal Operations and Coin Counting	2.MD.8	5.NBT.7	6.NS.3
9	<a href="#">How Many Times Will A Case of Paper Jam?</a>	Interpreting Percentages	6.RP.3c	7.RP.3	
10	<a href="#">How Many Soda Combinations Are There On A Coke Freestyle?</a>	Counting, Composing, and Decomposing Numbers	K.CC.5	K.CC.6	K.CC.7
11	<a href="#">What Should The Freeway Sign Show?</a>	Fractions on Number Lines, Converting Units, Decimal and Fraction Operations	3.NF.1	3.NF.2	3.NF.3
12	<a href="#">How Fast Was The Fastest Motorcycle Speeding Ticket Ever?</a>	Converting Units and Unit Rates	5.MD.1	6.RP.3d	7.SP.8
13	<a href="#">How Much Did Patrick Peterson Lose By Not Cashing His Check?</a>	Compound and/or Simple Interest	7.RP.3	N-RN.2	A-SSE.1
14	<a href="#">How Many Biscuits Can You Make?</a>	Dividing Fractions and Mixed Numbers	5.NF.7	5.NF.7a	5.NF.7b
15	<a href="#">How Much Bigger Should They Make Zoolander's School?</a>	Scale and Proportions	5.NF.5A	7.RP.2	7.SP.8
16	<a href="#">Where Is The Freeway Sign Located?</a>	Identifying Fractions on a Number Line	3.NF.1	3.NF.2	3.NF.3
17	<a href="#">How Far Apart Are Exits On A Ring Road?</a>	Arc length measures	G-C.5		
18	<a href="#">How Much Is One Third Of A Cup Of Butter?</a>	Identifying Fractions on a Number Line	3.NF.1	3.NF.2	3.NF.3
19	<a href="#">How Do Skytypers Write Messages?</a>	Transformations (Rotations, Reflections, Dilations, and Translations)	8.G.1	8.G.2	8.G.3
20	<a href="#">How Big Is The Bermuda Triangle?</a>	Coordinate Geometry: Area of Triangle	G-GPE.7		
21	<a href="#">What Fraction Of Children Are In The Right Car Seat?</a>	Representing and Comparing Fractions	3.NF.1	3.NF.2	3.NF.3
22	<a href="#">How Much Did The Temperature Drop?</a>	Absolute Value	6.NS.7c	7.NS.1c	
23	<a href="#">How Much Shorter Are Staggered Pipe Stacks?</a>	Circles, Pythagorean Theorem, trigonometric ratios, and linear functions	8.G.7	A-CED.1	A-SSE.1
24	<a href="#">How Do You Write A Check To Pay For Something?</a>	Expanded Form	2.NBT.3	4.NBT.2	5.NF.5
25	<a href="#">How Can We Correct The Scarecrow?</a>	Pythagorean Theorem	8.G.6	G-SRT.4	
26	<a href="#">How Much Does A 100x100 In-N-Out Cheeseburger Cost?</a>	Building and Interpreting Linear Functions	8.F.1	8.F.3	8.F.4
27	<a href="#">How Can We Water All Of The Grass?</a>	Circles, Pythagorean Theorem, trigonometric ratios	7.G.4	8.G.7	8.G.8
28	<a href="#">How Much Money IS That?!</a>	Volume of rectangular prism	5.MD.3	5.MD.4	5.MD.5
29	<a href="#">How Much Money Should Dr. Evil Demand?</a>	Exponential Growth	N-RN.2	A-SSE.1	A-SSE.2
30	<a href="#">How Tall Is Mini-Me?</a>	Scale and Dividing Decimals	5.NF.5	5.NF.5a	5.NF.5b
31	<a href="#">How Did They Make Ms. Pac-Man?</a>	Transformations (Rotations, Reflections, and Translations)	8.G.1	8.G.2	8.G.3
32	<a href="#">Which Ticket Option Is The Best Deal?</a>	Unit Rates and Ratios	6.RP.2	6.RP.3	6.RP.4
33	<a href="#">How Far Apart Are The Freeway Exits?</a>	Fractions on a Number Line and Subtracting Fractions	3.NF.2	3.NF.2b	4.NF.3
34	<a href="#">Do We Have Enough Paint?</a>	Area	3.MD.5	3.MD.6	3.MD.7

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