

DAY 1





Duarte USD

AUGUST 22, 2014









DOUBLE-DOUBLE[®] *Double Meat & Double Cheese* **2⁶⁵**

CHEESEBURGER **1⁷⁵**

HAMBURGER **1⁵⁰**

FRENCH FRIES **1⁰⁵**

SHAKES *Chocolate
Strawberry
Vanilla* **1⁵⁵**

<u>SM</u>	<u>MED</u>	<u>LG</u>	<u>X-LG</u>
99	1¹⁰	1²⁹	1⁴⁹
COKE <i>Classic or Diet</i>			
SEVEN-UP			
ROOT BEER			
DR PEPPER			
LEMONADE			
ICED TEA			

MILK	70
COFFEE	70



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

2004-10-31

8:21 PM

YOUR GUEST NUMBER IS
98

IN-N-OUT BURGER LAS VEGAS EASTERN
2004-10-31

165 1 5 98

8:21 PM

Cashier: SAM

GUEST #: 98

Counter-Eat In

Db Db	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

Cashier: SAM

GUEST #: 98

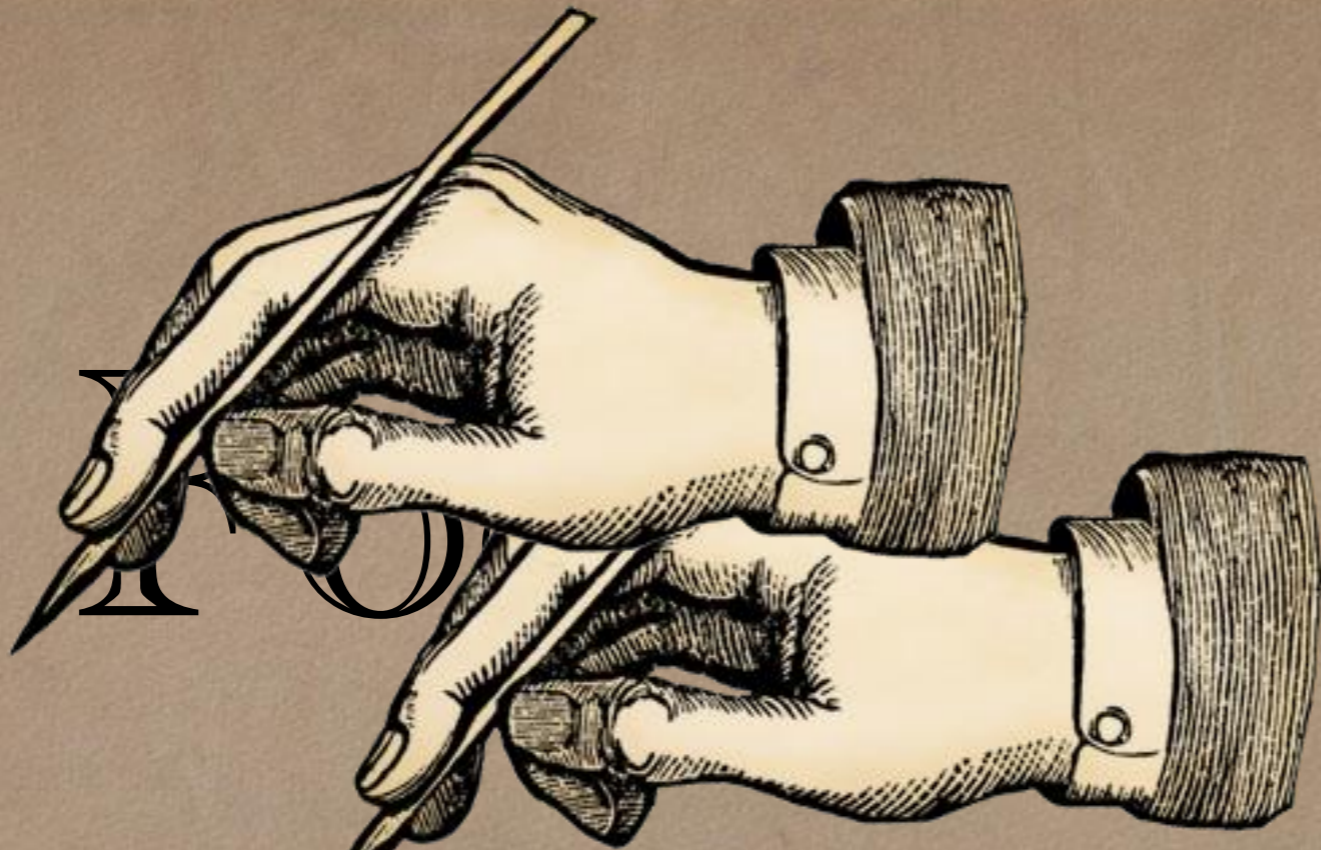
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Change	\$97.66
	\$.00

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



•

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 100×100
- Common wrong answers included:
 - \$175.00 ($\1.75×100 cheeseburgers)
 - \$132.50 ($\2.65×50 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?	
<p>How much does a 100x100 burger cost?</p> <p style="text-align: right;">Regular (one patty) \$1.25</p> <p style="text-align: center;">\$132.50</p>	
What do you already know from the problem?	What do you need to know to solve the problem?
<ul style="list-style-type: none"> • there's 100 beef patties • costs 2.50 	<ul style="list-style-type: none"> • How much does a regular cheeseburger cost. 25.1 - <p style="text-align: center;">OP.</p> <p style="text-align: center;">OP. OP.</p>
What is your conclusion?	
<p>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, then multiplied by 100. That gave me the answer, which I once again had to add the price of the buns & produce.</p> <p style="text-align: center;"> $22.8 + 00.1 - xOP_0 = P$ $128_0 + xOP_0 = P$ </p>	

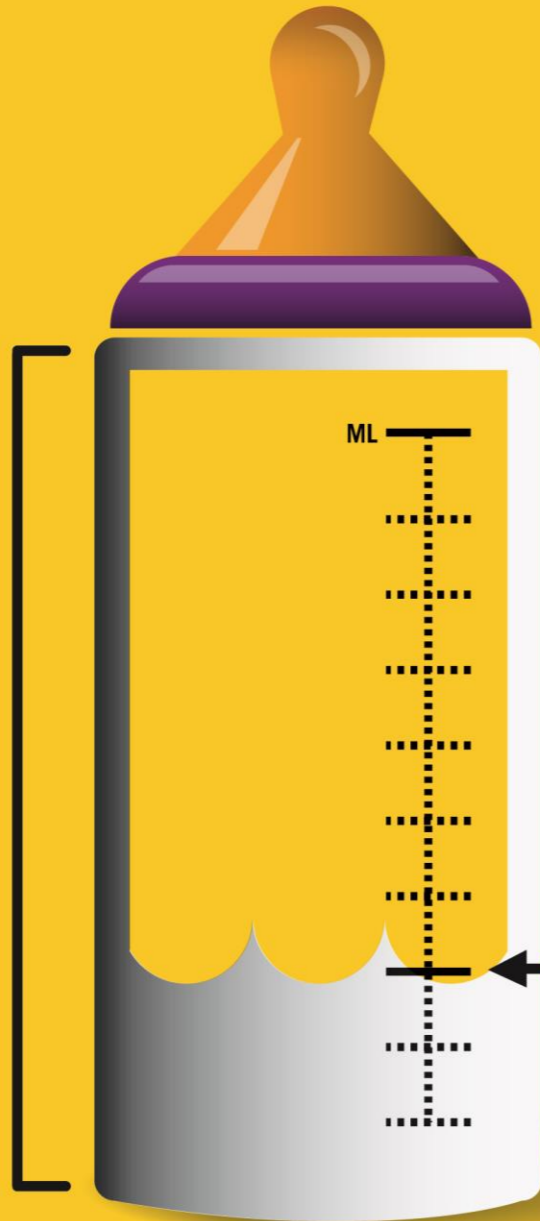
CHOOSE CAR SEAT:
BY AGE & SIZE



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

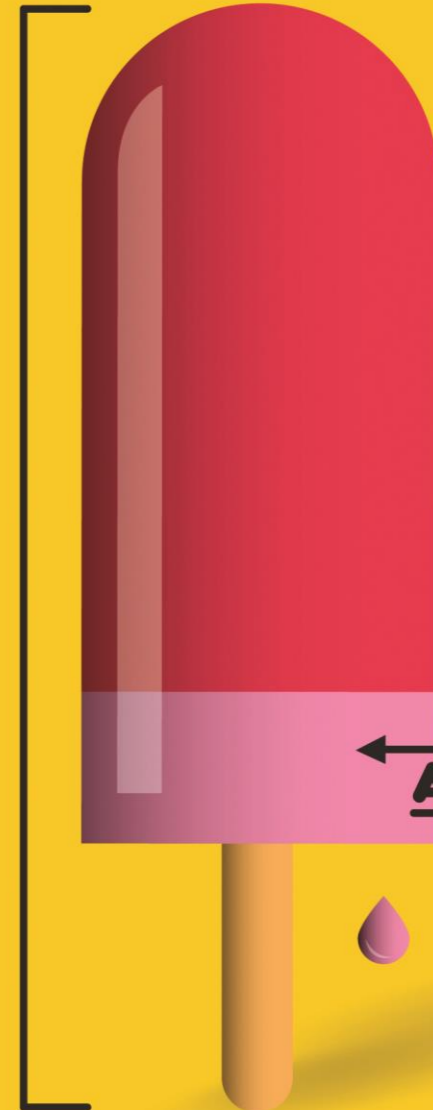


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Math Question

- Solve the problem on your own. Do not work or share your answer with anyone else.
- You will have 30 seconds to complete it.
- Write your answer down on a paper.

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

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 ($125 \div 5$)
- 0 students calculated the answer to be 625 (125×5)
- 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

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.

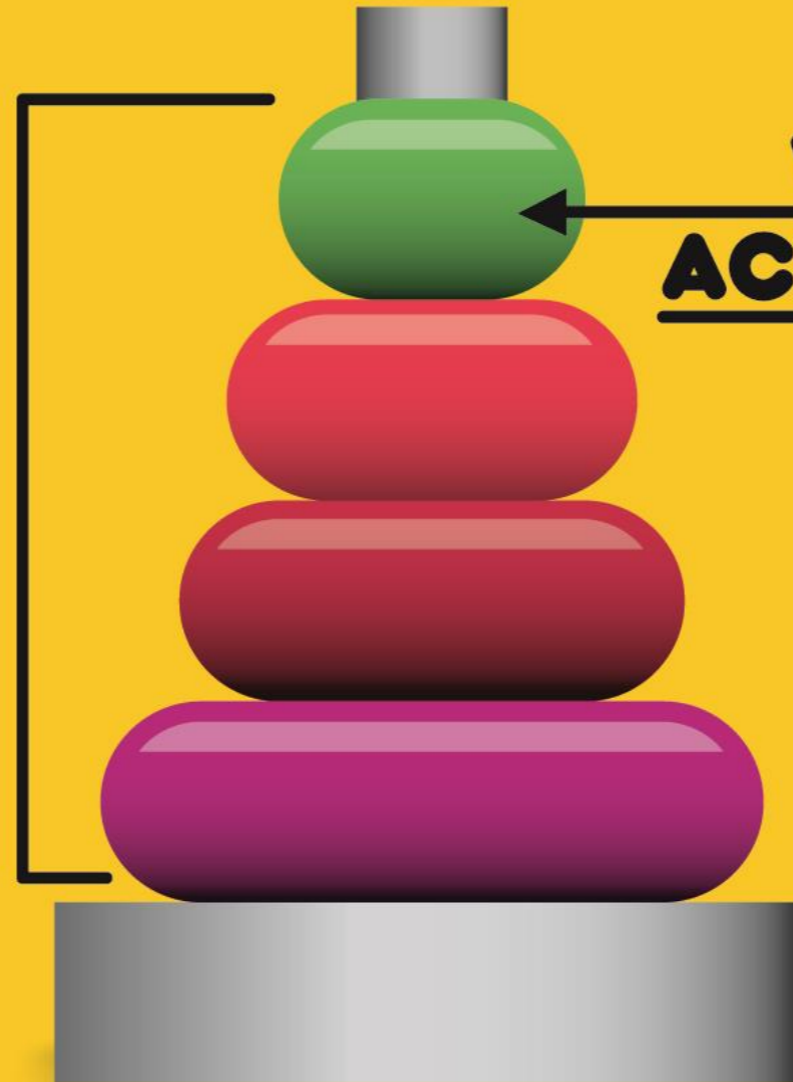
be reduced by about half if the correct child safety seats were always used.

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



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.



VISIT SAFERCAR.GOV/THERIGHTSEAT



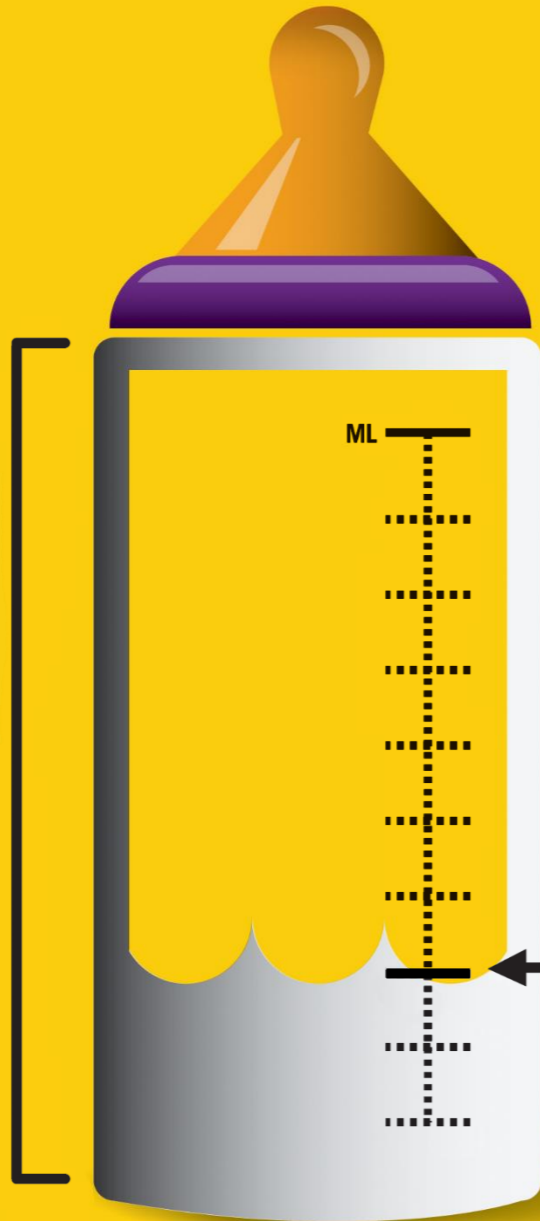
CHOOSE CAR SEAT:
BY AGE & SIZE



THE NUMBER
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**WHO
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THEIR CAR
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THE ONES
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ACTUALLY
DO.**

KNOW FOR SURE
IF YOUR CHILD IS IN THE RIGHT CAR SEAT.



VISIT SAFERCAR.GOV/THERIGHTSEAT



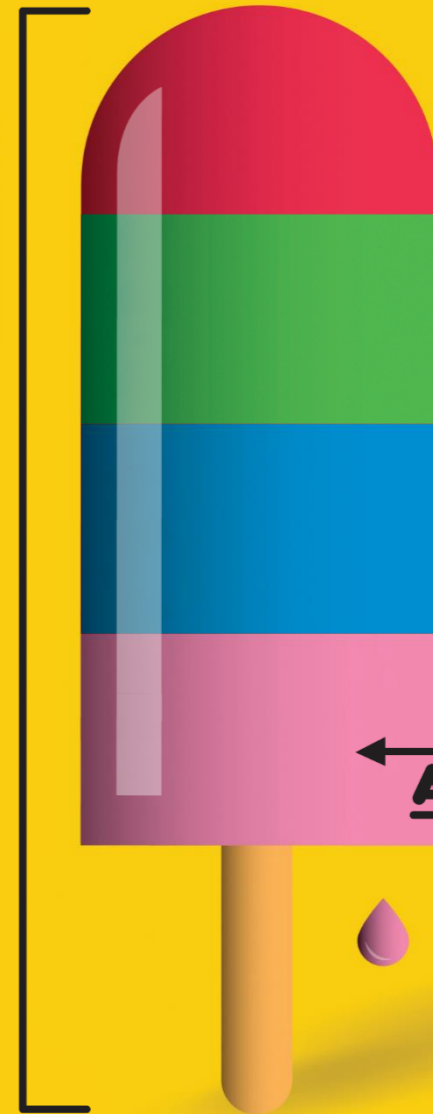
CHOOSE CAR SEAT:
BY AGE & SIZE



THE NUMBER
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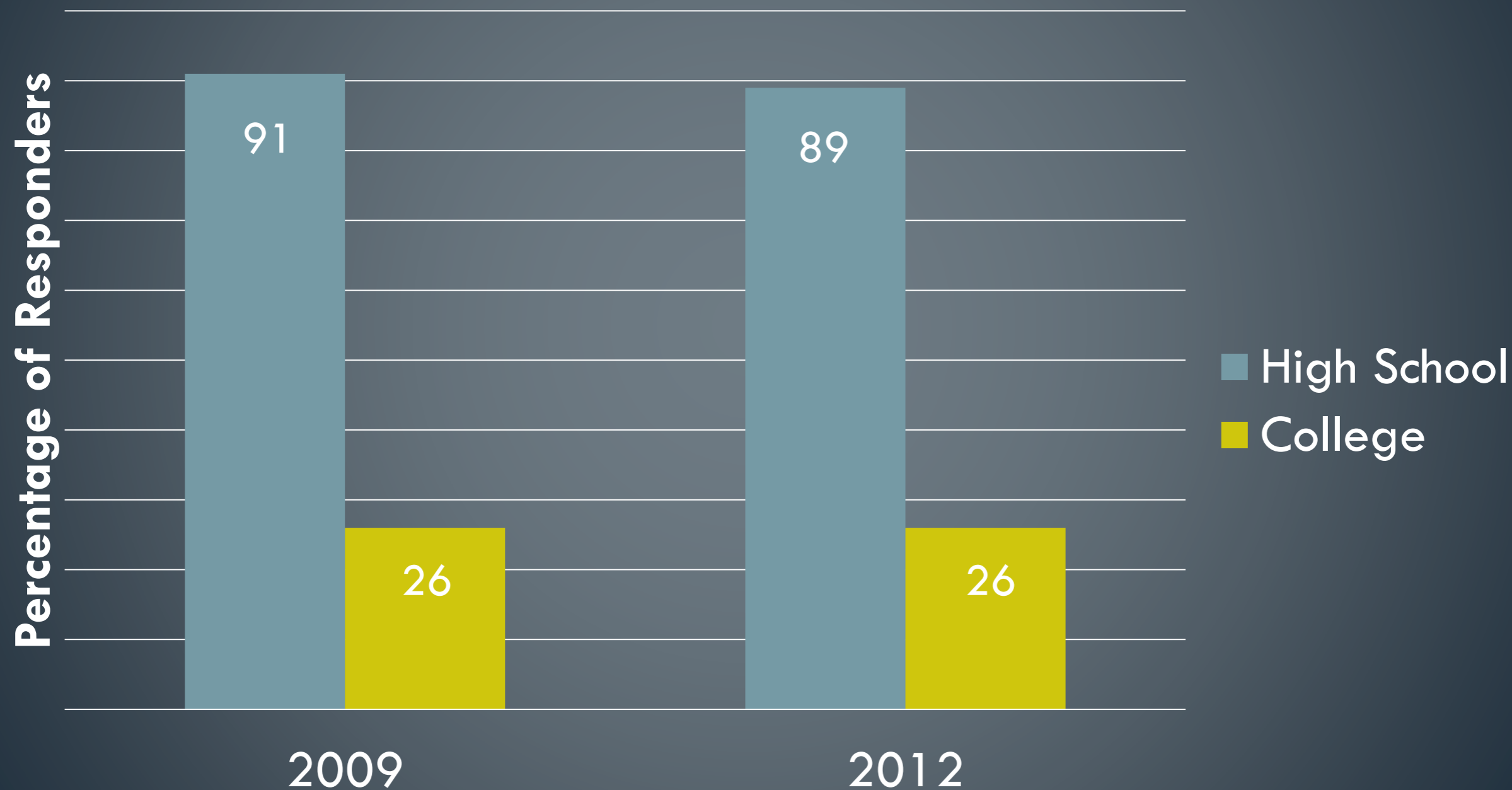
VISIT SAFERCAR.GOV/THERIGHTSEAT



***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



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

■ More ■ Less ■ Same

Critical thinking and analytical reasoning skills

Analyzing and solving complex problems

Communicating effectively orally and in writing

Applying knowledge and skills to real-world setting

Working w/ numbers and understanding statistics



IVE

FOX
NEWS

Junction



PGR
PROCURADURÍA
GENERAL DE
LA REPÚBLICA

SUBPROCURADURIA DE INVESTIGACIÓN ESPECIALIZADA EN DELINCUENCIA ORGANIZADA

PGR
PROCURADURÍA
GENERAL DE
LA REPÚBLICA





FOX



...you

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.*

PROBLEM- BASED LEARNING FAQ

- *How often do teachers do problem-based learning?*
- *How long do problem based lessons take?*
- *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?





Stinson Ave
201 10
201000 100

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

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

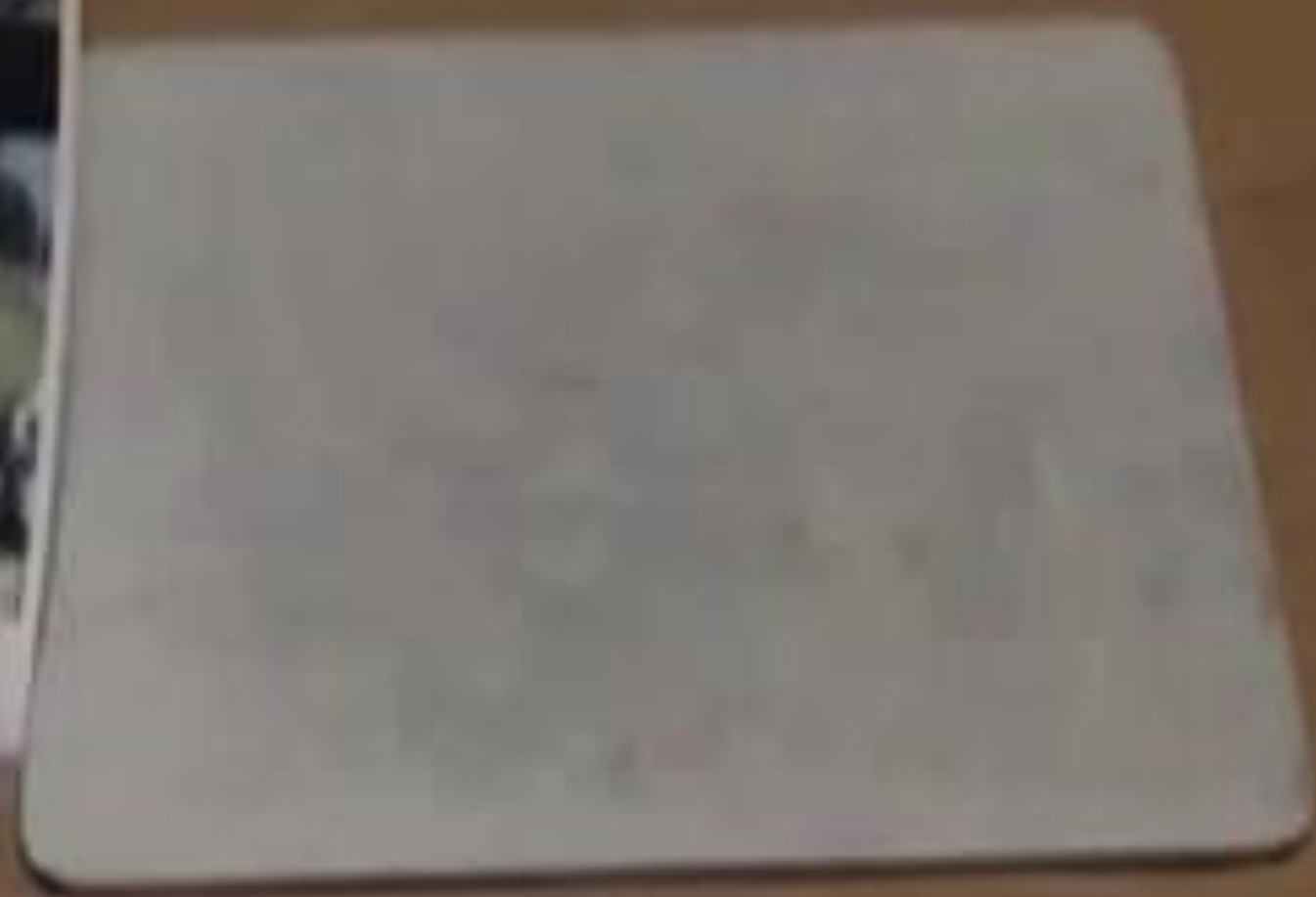
$1\frac{1}{2} - 1\frac{1}{4}$

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

$\frac{1}{4}$

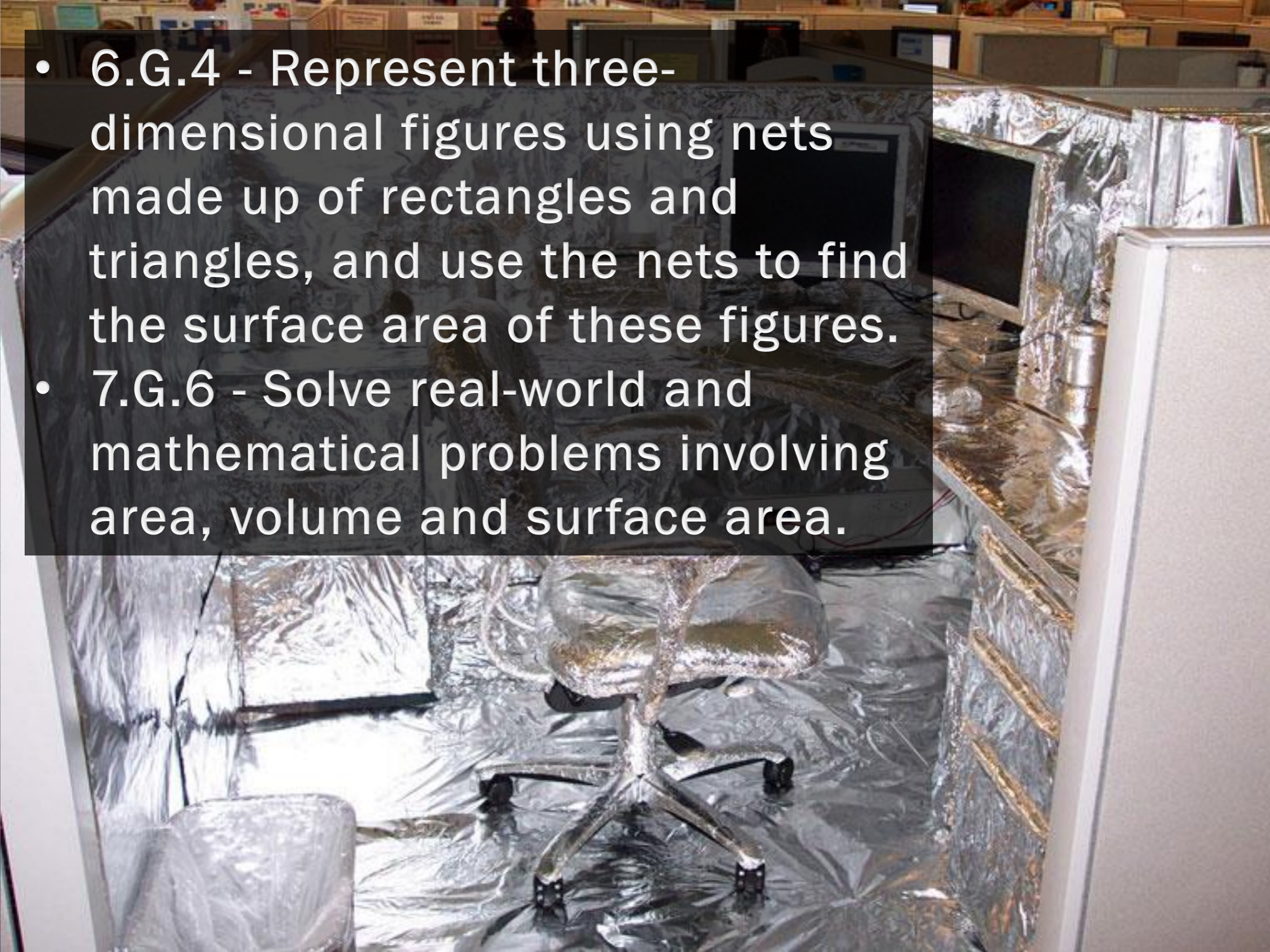




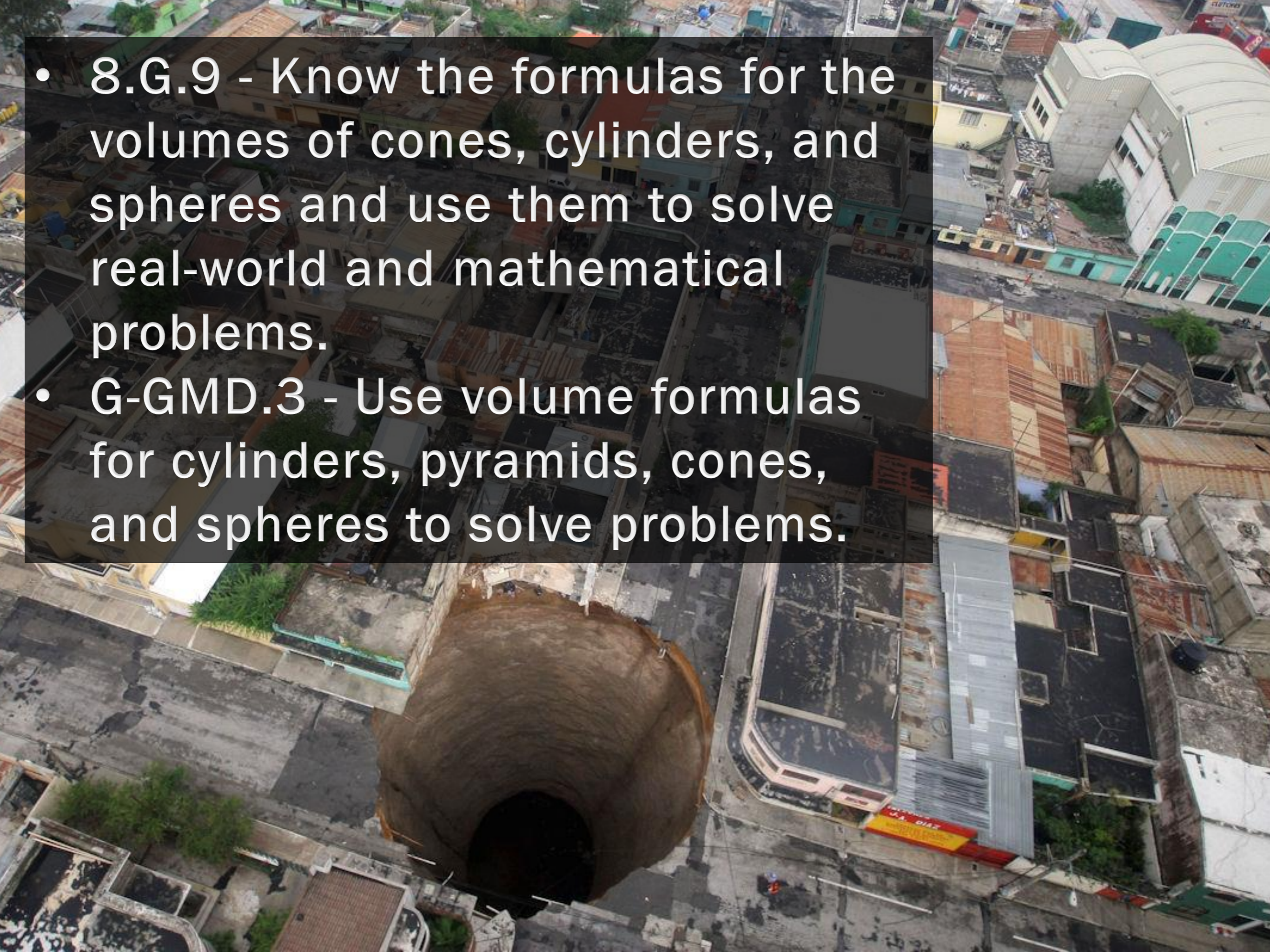
The Four C's

- o Communication
- o Curiosity

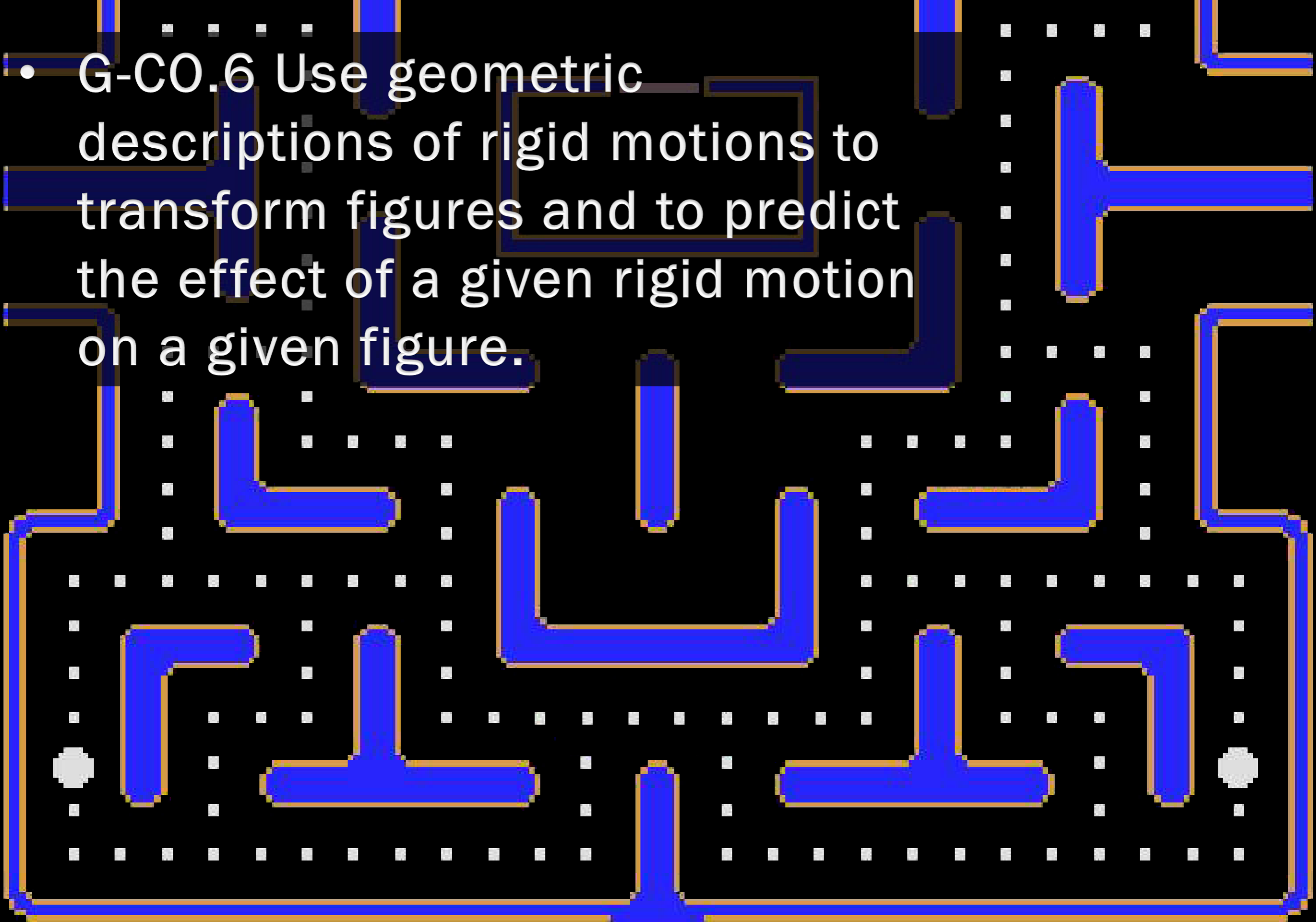
- 6.G.4 - Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures.
- 7.G.6 - Solve real-world and mathematical problems involving area, volume and surface area.



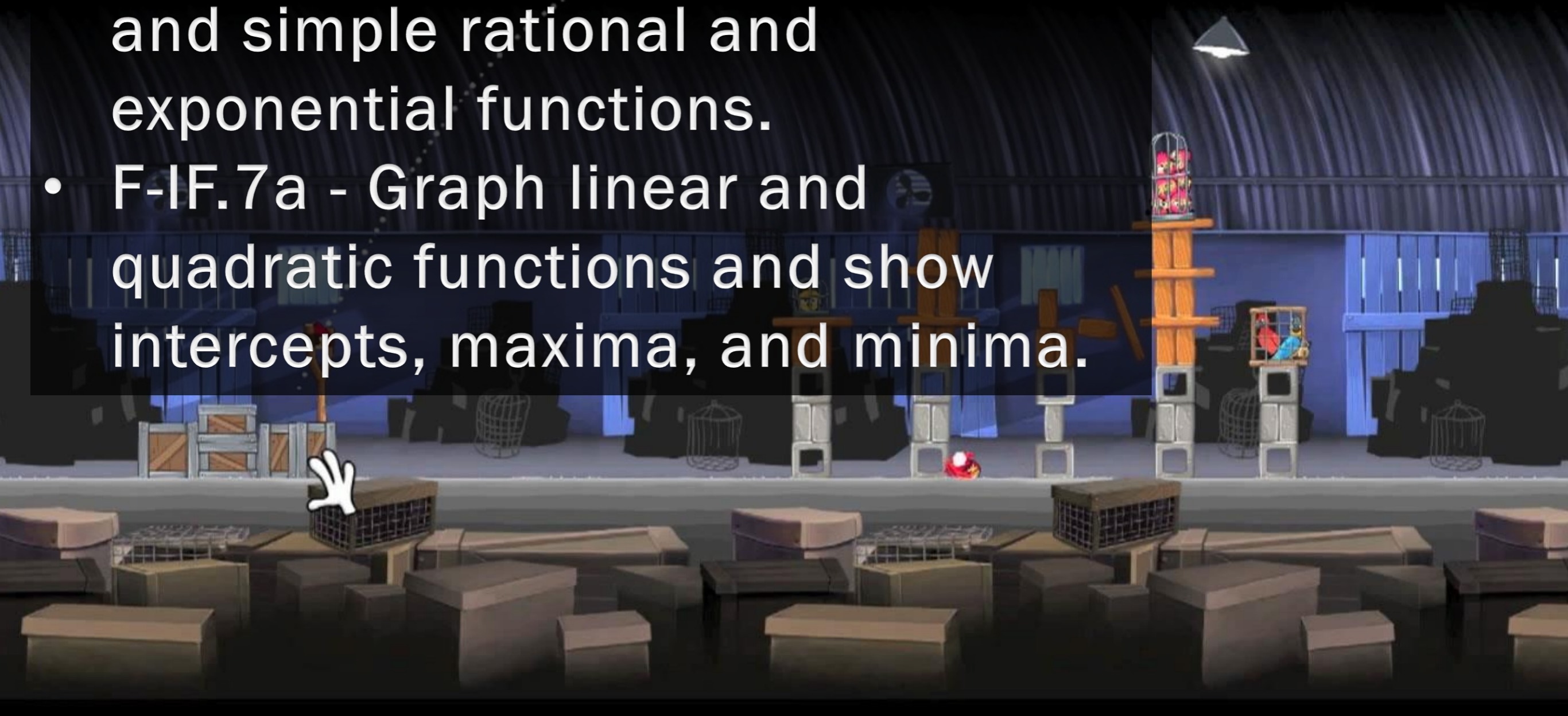
- 8.G.9 - Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.
- G-GMD.3 - Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.



- G-CO.6 Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure.



- A-CED.1 - Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.
- F-IF.7a - Graph linear and quadratic functions and show intercepts, maxima, and minima.



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



The Four C's

- o Communication
- o Curiosity
- o 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

- o Communication
- o Curiosity
- o Critical Thinking
- o 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 the circle with a radius of 2 units?

4 pi

Great. Do you have any questions?

No

What did you get for the area of the circle with a radius of 2 units?

4 pi

Great. How did you get your answer?

The radius is 2 so I plugged it into $2\pi r$ and got 4 pi.

Depth of Knowledge

- What?

Depth of Knowledge Examples

Perimeter

- DOK 1 – What is the perimeter of a rectangle with that measures 8 units by 4 units?
- DOK 2 – List the dimensions of a rectangle with a perimeter of 24 units.
- DOK 3 – Of all the rectangles with a perimeter of 24 units, which one has the most area?

Surface Area

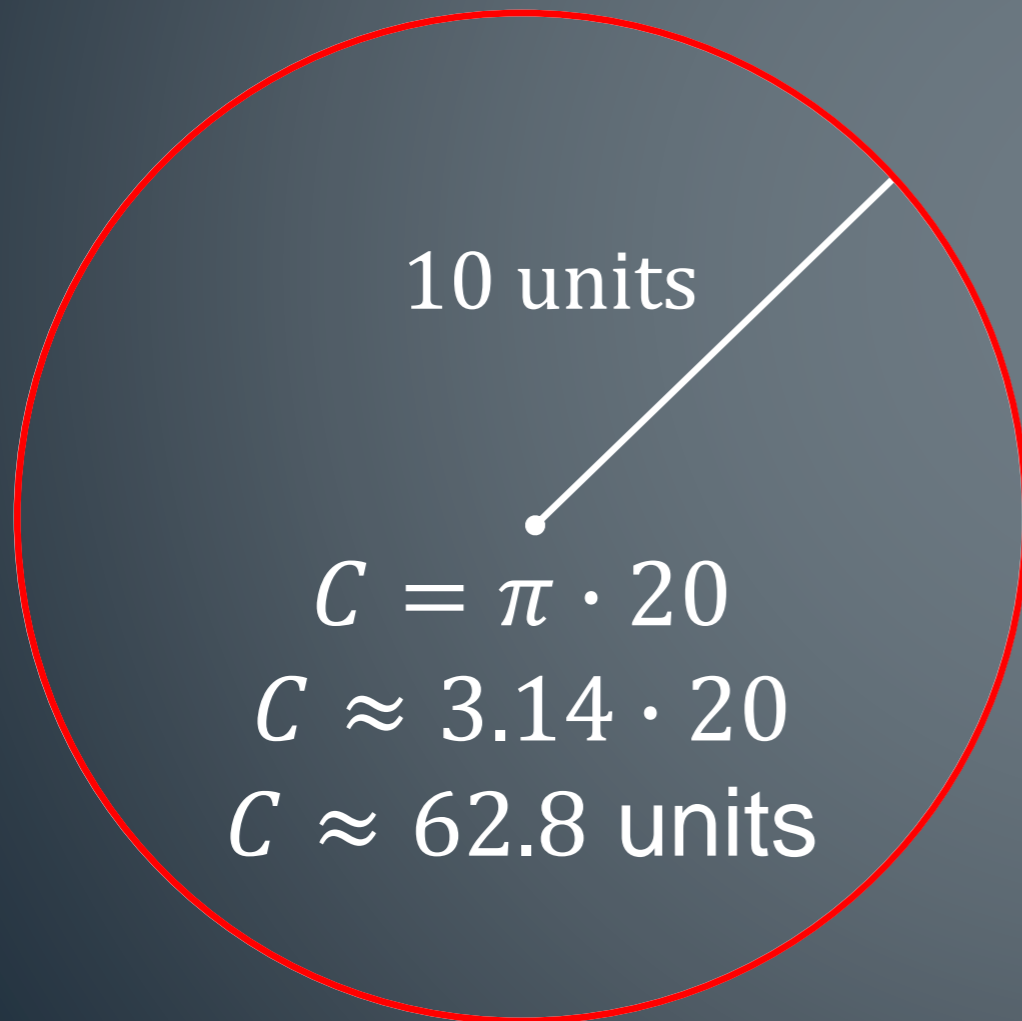
- DOK 1 – What is the surface area of a rectangular prism that measures 8 units by 4 units by 3 units?
- DOK 2 – List the dimensions of a rectangular prism with a surface area of 20 square units.
- DOK 3 – Of all the rectangular prisms with a surface area of 20 square units, which one has the most volume?

Depth of Knowledge

- What?
- How?
- Why?

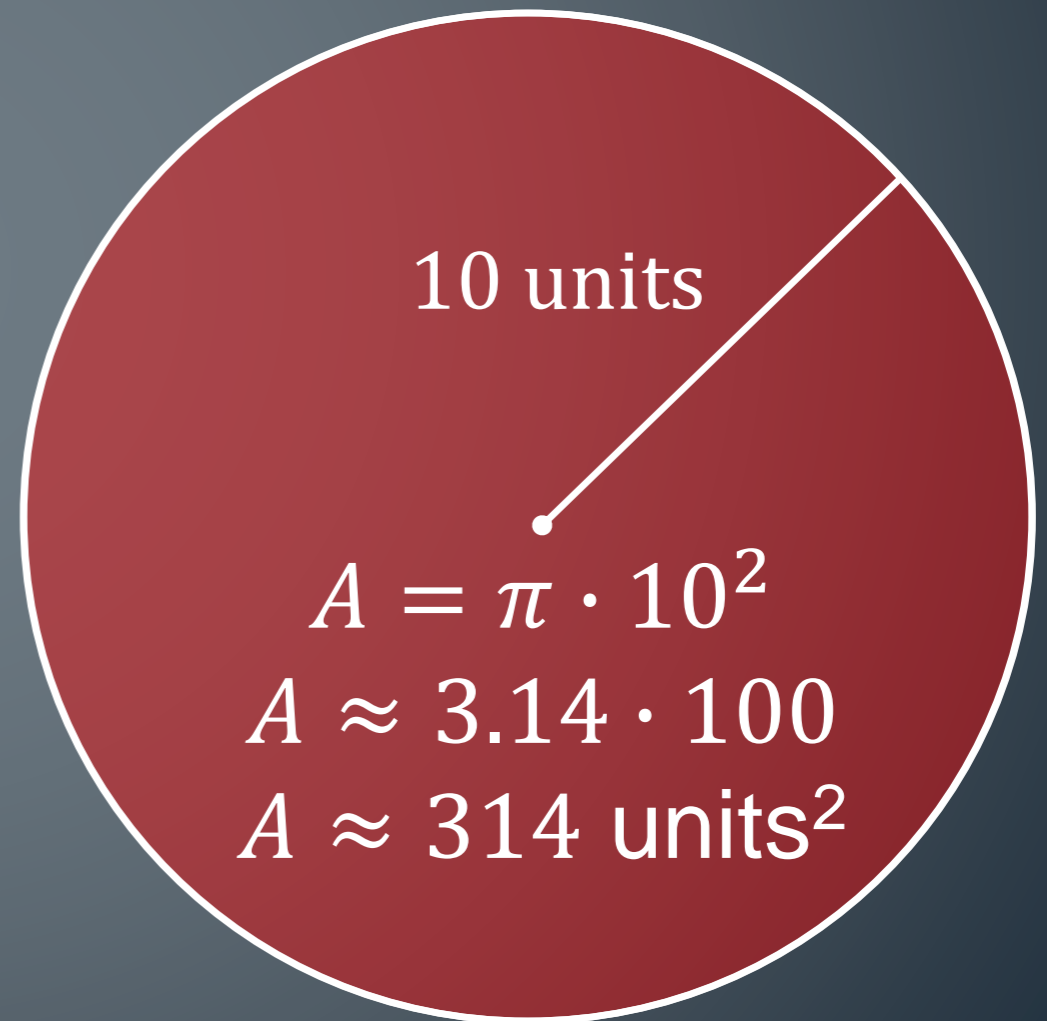
Depth of Knowledge – Level One

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



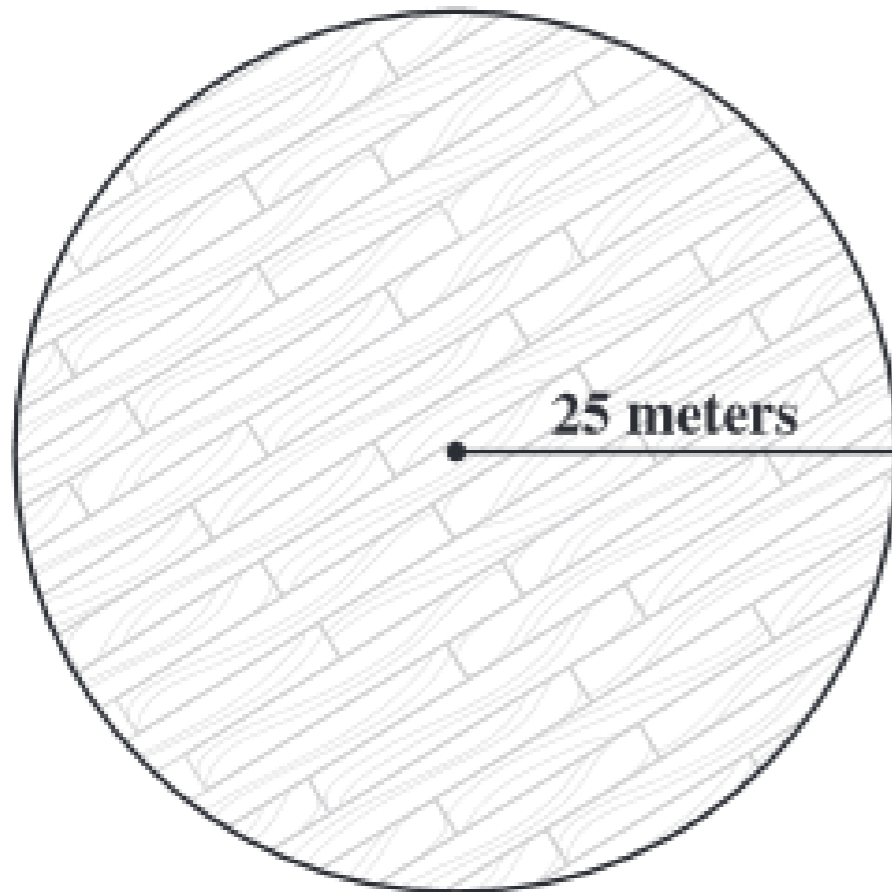
$$C = \pi d \text{ or } C = 2\pi r$$

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



$$A = \pi r^2$$

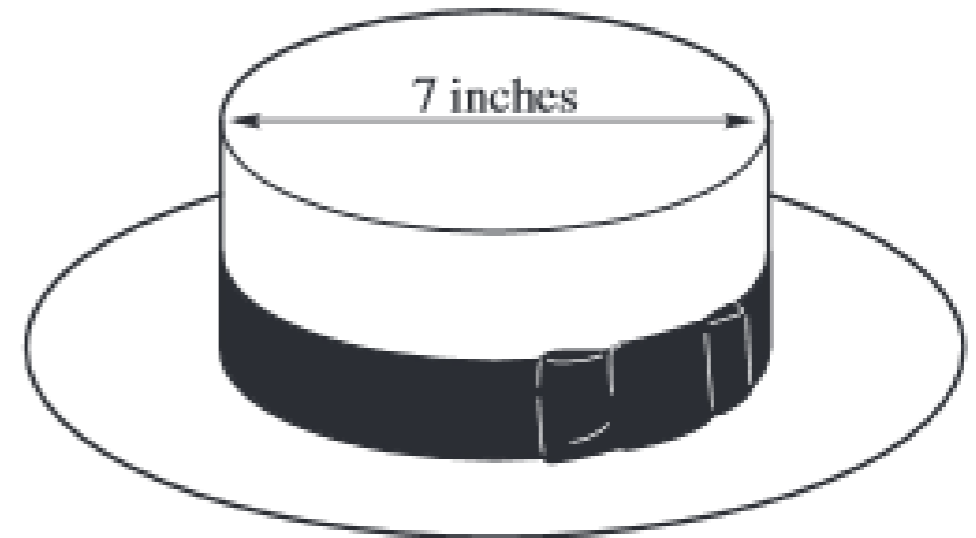
70 This circular stage has a radius of 25 meters.



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

- A $A = 25\pi$
- B $A = 50\pi$
- C $A = \pi \cdot 25^2$
- D $A = \pi \cdot 50^2$

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



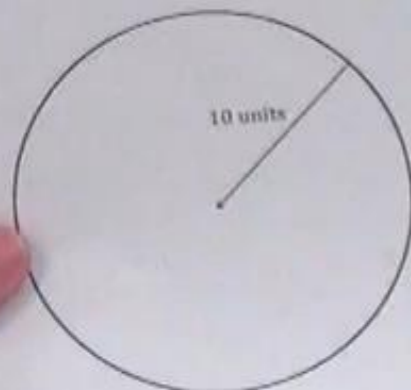
Which measure is *closest* to the length of the band that goes around the outside of the hat?

- A 10.1 inches
- B 11.0 inches
- C 22.0 inches
- D 38.5 inches

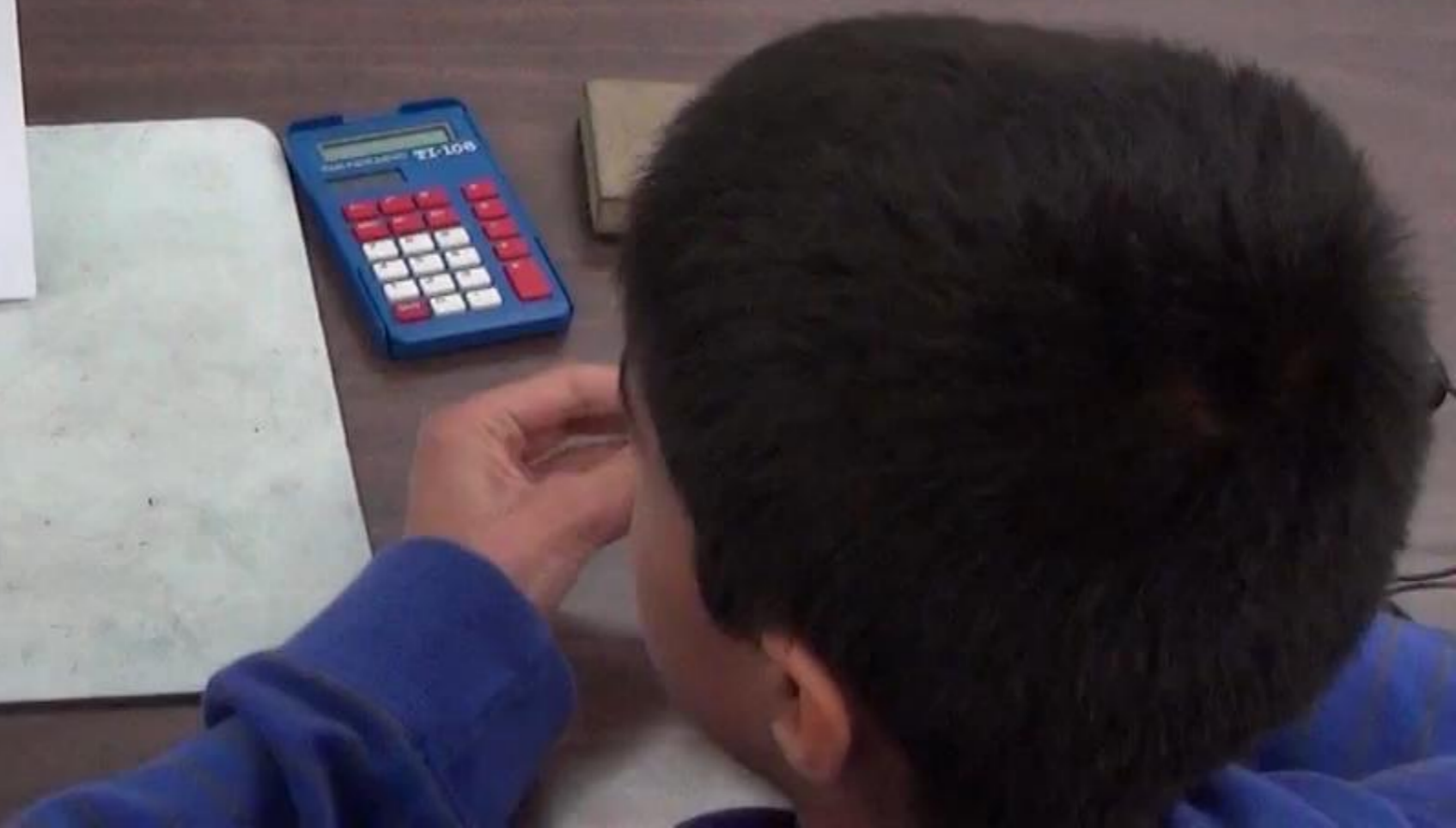
CSM00268

CSM00269

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



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

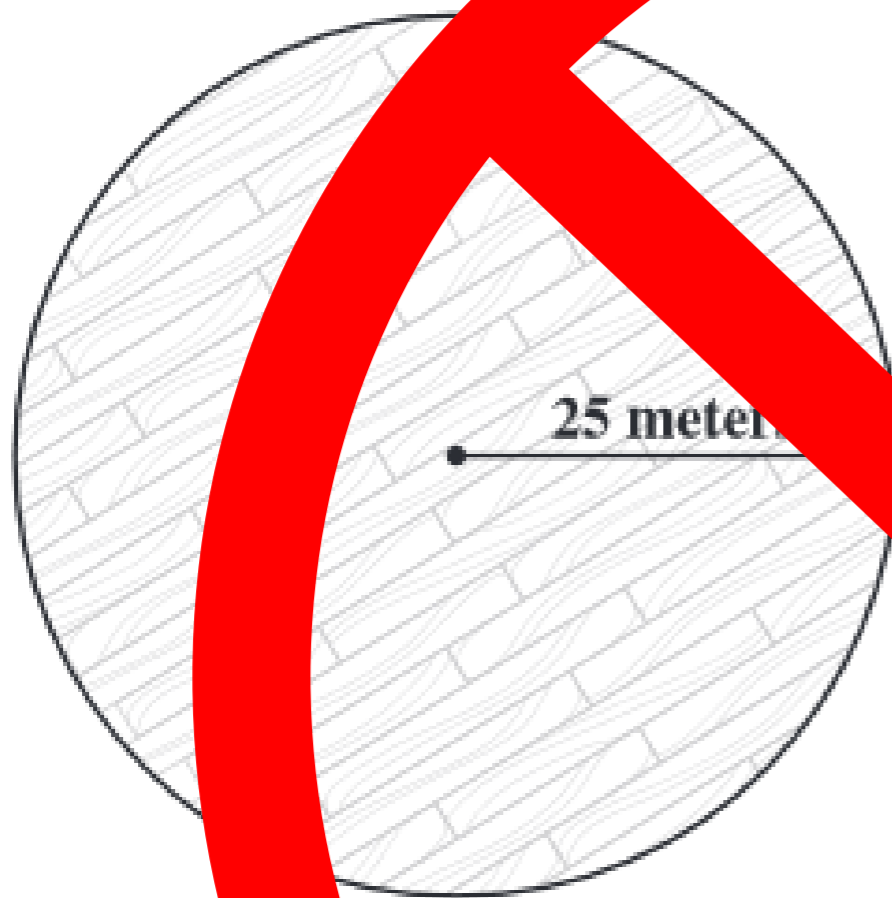


Student Data Facts

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

Claim	Content Category	Assessment Targets	DOK	Minimum # Scored Tasks		Minimum # Items per Item Type		Min/Max Number of Items	
				CAT	PT/ECR	SR	CR		
Supporting	Supporting Cluster	A. Analyze proportional relationships and use them to solve real-world and mathematical problems.	1,2	p(9)=1.0					
		E. Draw, construct, and describe geometrical figures and describe the relationship between them.					2,3		
		F. Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.						1,2	
		problems involving angle measure, area, surface area, and volume.	1,2						
		G. Use random sampling to draw inferences about a population.	1,2		0	2	1	5/8	
		H. Draw informal comparative inferences about two populations.	1,2	p(2)=1.0					
		I. Investigate chance processes and develop, use, and evaluate probability models.	1,2						

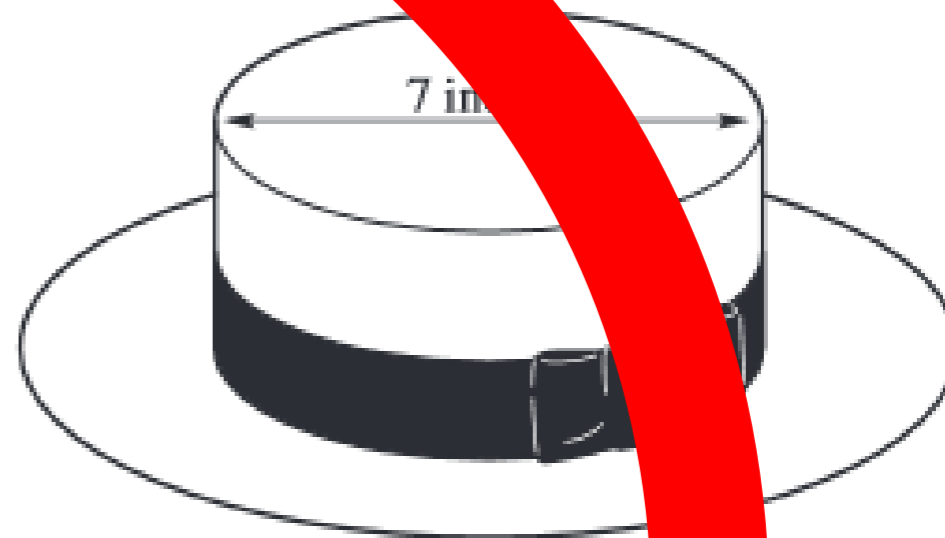
70 This circular stage has a radius of 25 meters.



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

- A $A = 25\pi$
- B $A = 50\pi$
- C $A = \pi \cdot 25^2$
- D $A = \pi \cdot 50^2$

72 The top of this hat is shaped like a cylinder with a diameter of 14 inches.



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

- A 10.1 inches
- B 14 inches
- C 22 inches
- D 38.5 inches

Depth of Knowledge – Level Two

Which circle is bigger? How do you know?

Circle A

Area = 36 units²

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

$$36 \approx 6.28 \cdot r$$

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

$$5.73 \text{ units} \approx r$$

Circle B

Circumference = 36 units

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

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

$$A \approx 3.14 \cdot 32.83$$

$$A \approx 103.15 \text{ units}^2$$

SBAC Constructed Response Rubric

- For full credit (2 points):
 - Student reaches the correct conclusion.

AND

 - Student provides sufficient reasoning to support this conclusion.
- For partial credit (1 point):
 - Student reaches the correct conclusion but does not provide sufficient reasoning to support this conclusion.

OR

 - Student does not reach the correct conclusion but provides reasoning to support this conclusion that contains a minor conceptual or computation error.

Which circle is bigger? How do you know?

Circle A
Area = 36 units²

Circle B
Circumference = 36 units

36



Video Facts

- Of the ten students interviewed:
 - Ten correctly answered both of the DOK 1 questions.
 - One earned two points on the DOK 2 question.
 - Six earned one point on the DOK 2 question.
 - Three earned zero points on the DOK 2 question.

Student Data Facts

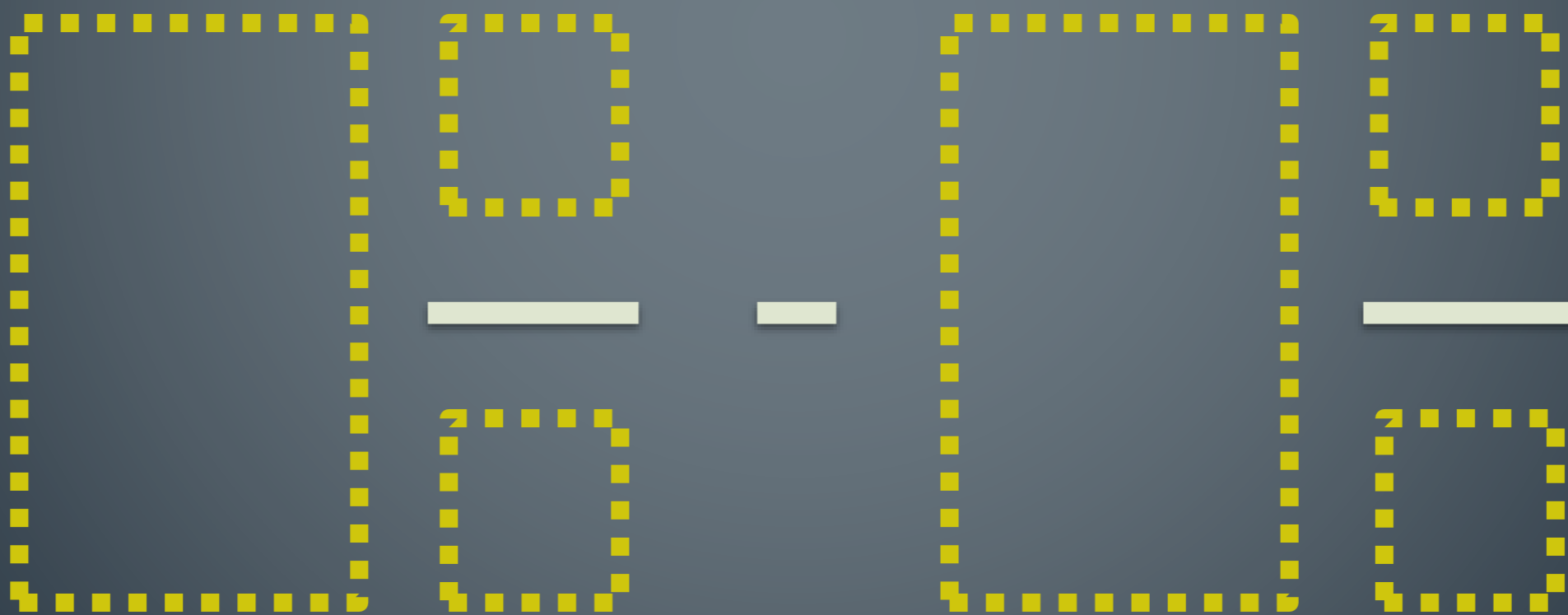
- Of the 396 seventh grade students who were assessed, 12.12% earned two points on the DOK 2 question.
- 97.92% of the students who correctly answered the DOK 2 question also correctly answered both of the two DOK 1 questions.
- 10.61% of the students who correctly answered both of the two DOK 1 questions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

Assessing Deeper Understanding

Make the smallest difference using the numbers 1 through 9 no more than one time each.



Implementing Higher DOK Problems

- Attempt #1: DOK 3 Subtracting Mixed Numbers
 - Lesson learned

ORDER OF OPERATIONS

RECTANGLES: MAXIMIZING AREA

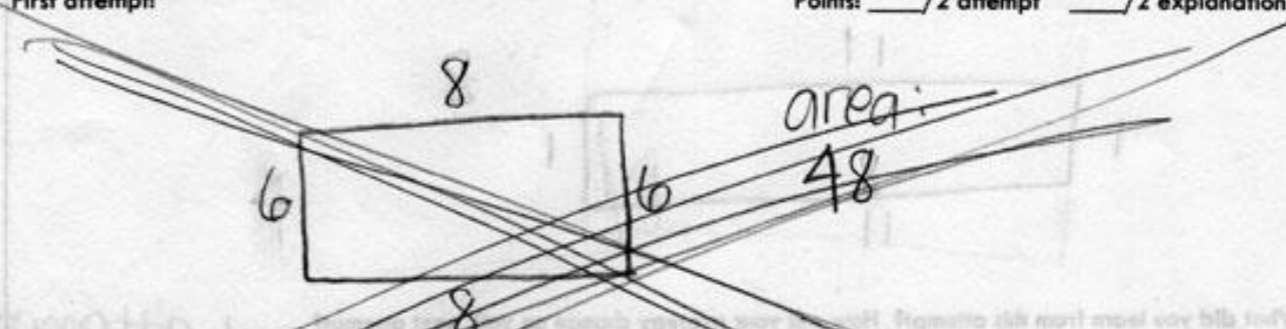
Directions: What is the greatest area you can make on a rectangle with a perimeter of 24 units?

⋮⋮⋮ ÷ ⋮⋮⋮ (⋮⋮⋮ + ⋮⋮⋮) ⋮⋮⋮ ⋅ ⋮⋮⋮ - ⋮⋮⋮

- Attempt #3: DOK 3 Area and Perimeter
 - Lessons learned:
 - Most of the 8th graders struggled even with this problem.
 - Would have been wiser to start with a DOK 1, then a DOK 2, and then this DOK 3 problem.

STUDENT WORK

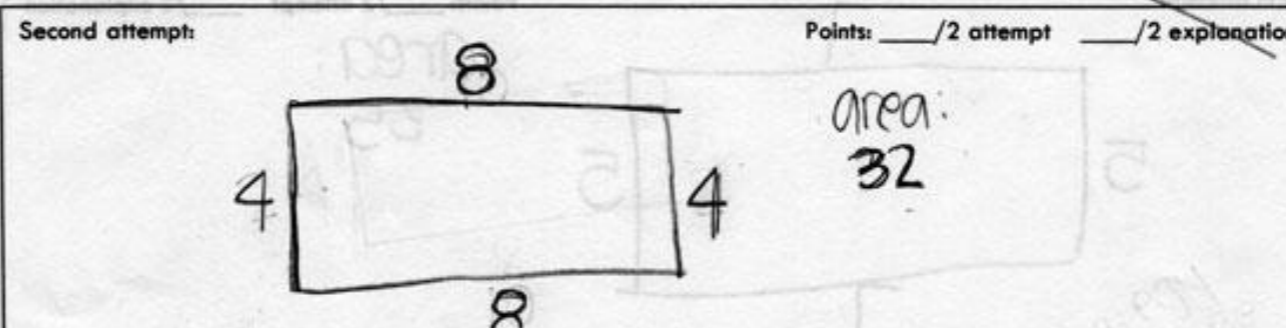
First attempt: Points: ___/2 attempt ___/2 explanation



area: 48

What did you learn from this attempt? How will your strategy change on your next attempt?
This attempt doesn't equal 24.

Second attempt: Points: ___/2 attempt ___/2 explanation

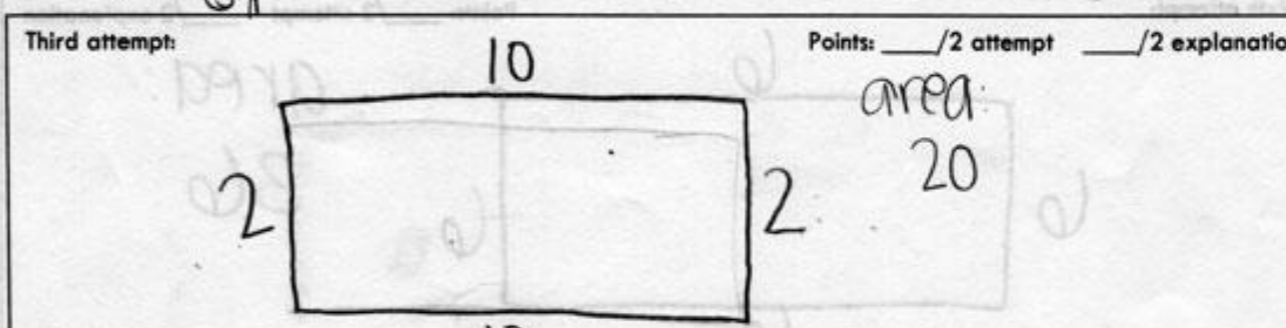


area: 32

What did you learn from this attempt? How will your strategy change on your next attempt?
The perimeter was 24, and the area was 32 but I think there's a bigger #

Strategy:

Third attempt: Points: ___/2 attempt ___/2 explanation



area: 20

What did you learn from this attempt? How will your strategy change on your next attempt?
I learned that the perimeter is 24 but there's a bigger area

Strategy:



Open Middle Problems

- Open middle problems require a higher depth of knowledge than most problems that assess procedural and conceptual understanding.
- They often have a “closed beginning” meaning that they all start with the same initial problem
- They often have a “closed end” meaning that they all end with the same answer
- They have an “open middle” meaning that there are multiple ways to approach and ultimately solve the problem

www.openmiddle.com

Problem-Based Lesson Resources

- Problem-based lesson search engine:

<http://robertkaplinsky.com/prbl-search-engine/>

- My lessons: <http://www.robertkaplinsky.com/lessons>

- Dan Meyer: <http://threeacts.mrmeyer.com>

- Andrew Stadel: <http://tinyurl.com/mrstadel>

- Geoff Krall: <http://tinyurl.com/PrBLmaps>

- Dan Meyer's TED talk: <http://tinyurl.com/meyer-TED>



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





How Much Is One Third Of A Cup Of Butter?



How Do Skytypers Write Messages?



Robert Kaplinsky's Problem-Based Lessons

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

\$ % 123 Arial 10 B I U A

	A	B	C	D	E	F	Sta
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-E
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-E
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-IF
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			



Google Search

I'm Feeling Lucky

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

Contact

Robert Kaplinsky



robert@robertkaplinsky.com



robertkaplinsky.com/duarte



[@robertkaplinsky](https://twitter.com/robertkaplinsky)



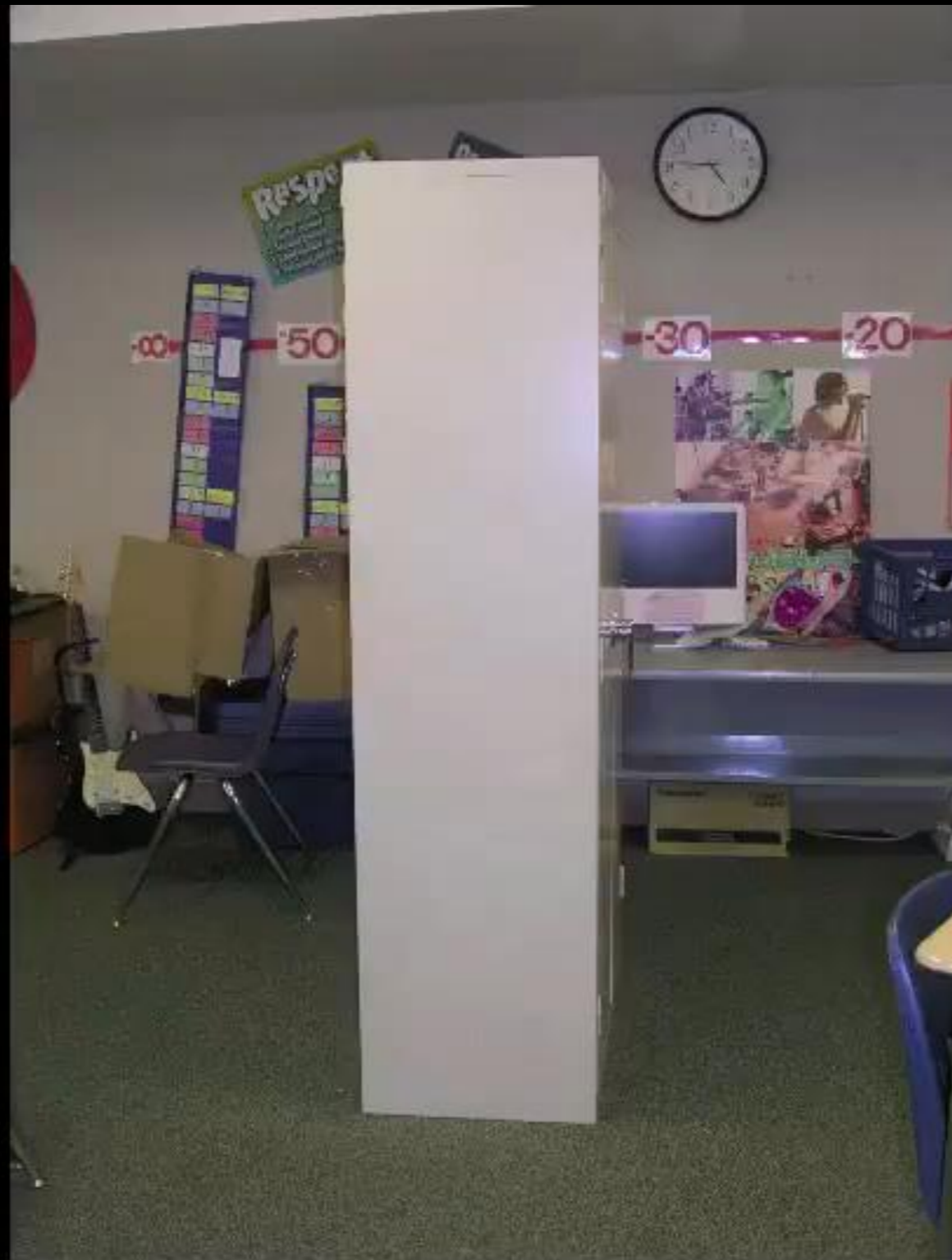
DAY 2





Duarte USD

NOVEMBER 18, 2014



Source: Andrew Stadel via www.esteemation180.com



**Height:
72 inches**



**Height:
72 inches**



**Width:
36 inches**





**Height:
72 inches**



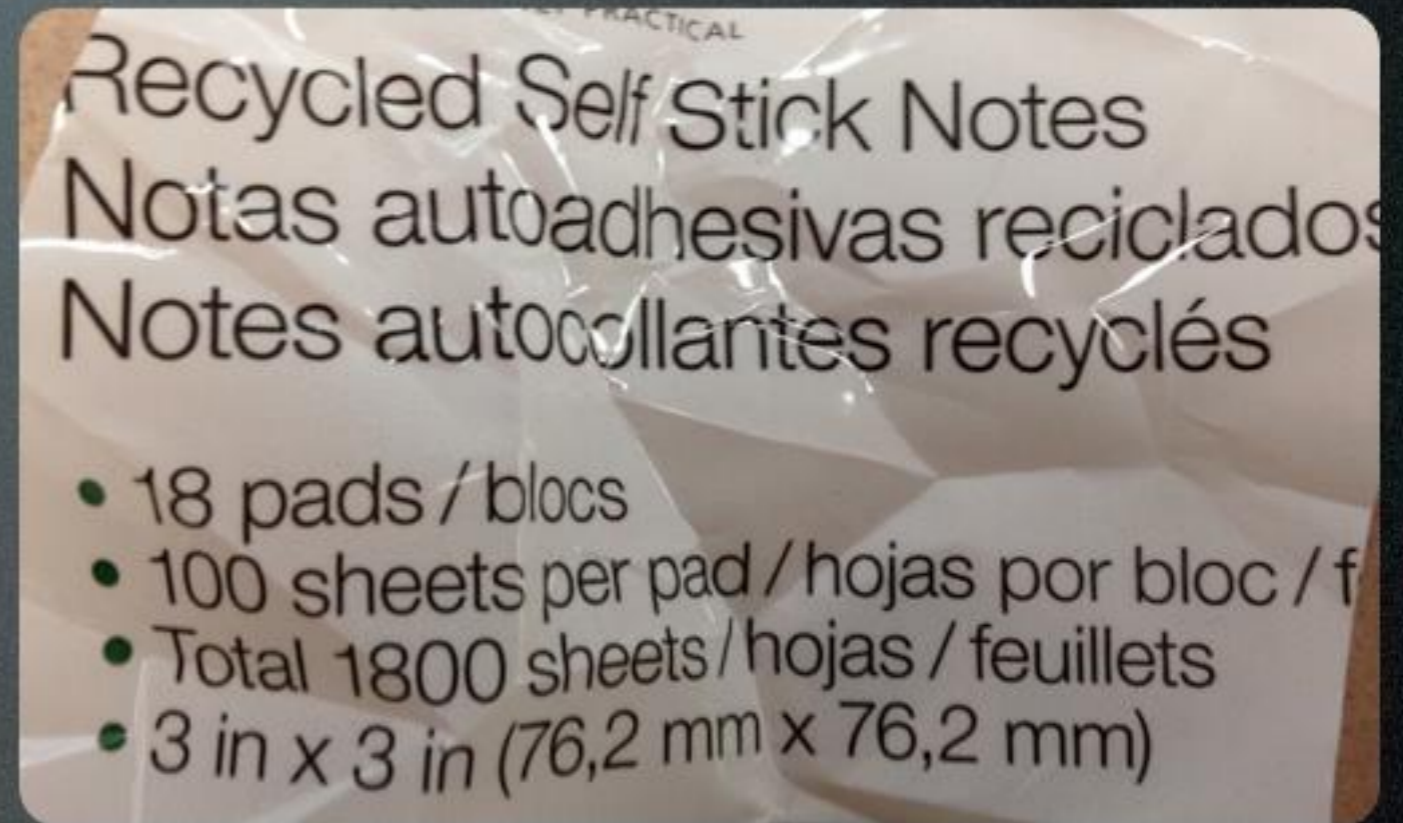
**Width:
36 inches**



**Depth:
18 inches**



Sticky note



Dimensions:

3" x 3"



Source: Andrew Stadel via www.estimated180.com

6TH GRADE PERFORMANCE TASK

CEREAL BOXES

A cereal company uses cereal boxes that are rectangular prisms. The boxes have the dimensions shown.

- 12 inches high
- 8 inches wide
- 2 inches deep

The managers of the company want a new size for their cereal boxes. The new boxes have to be rectangular prisms. You will evaluate one box design the company proposed. Then you will create and propose your own design for the company.

Requirements for the new boxes:

- The new boxes have to use less cardboard than the

1

Determine the volume of the current cereal box with the dimensions 12 inches high, 8 inches wide, and 2 inches deep.

Find the volume, V , in cubic inches, of each box.

Volume of Original Box: $V = \underline{\hspace{1cm}} \text{ in}^3$



1	2	3
4	5	6
7	8	9
0	.	-

2

Label the dimensions of the net for the current cereal box with dimensions 12 inches high, 8 inches wide, and 2 inches deep.

FIVE PRACTICES



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 file cabinet 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.



Setting Up The Problem

- What do you do when students ask for data/information I don't have, hadn't considered, or forgot to get?
- What do you do when students ask for information that is probably not important or that they don't actually need?

TICKET BOOTHS

1 TICKET = \$.50

12 TICKETS = \$5.00

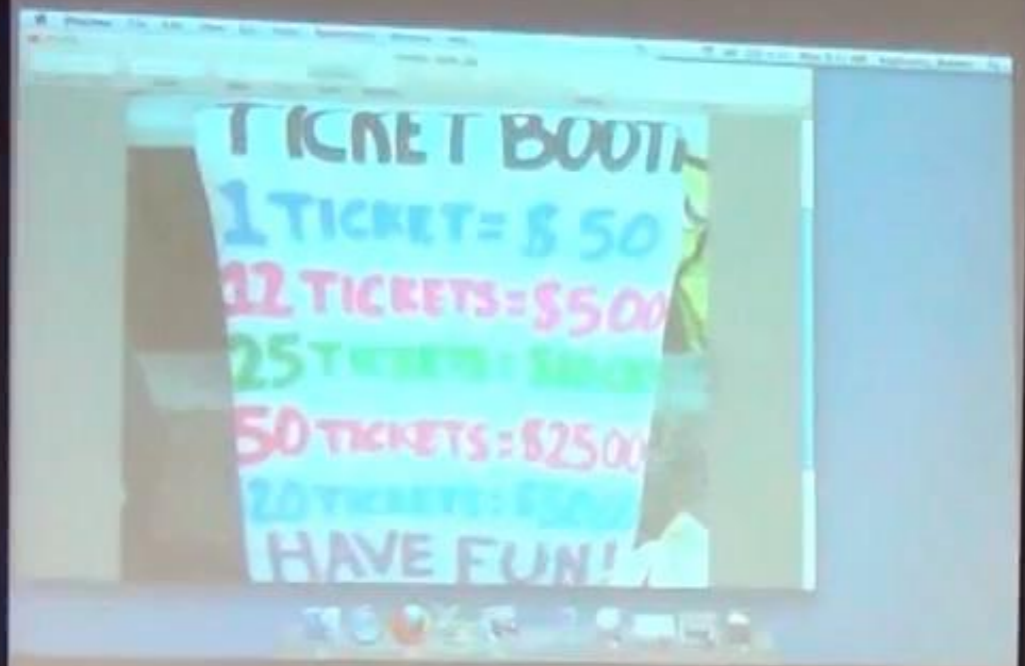
25 TICKETS = \$10.00

50 TICKETS = \$25.00

120 TICKETS = \$50.00

HAVE FUN!





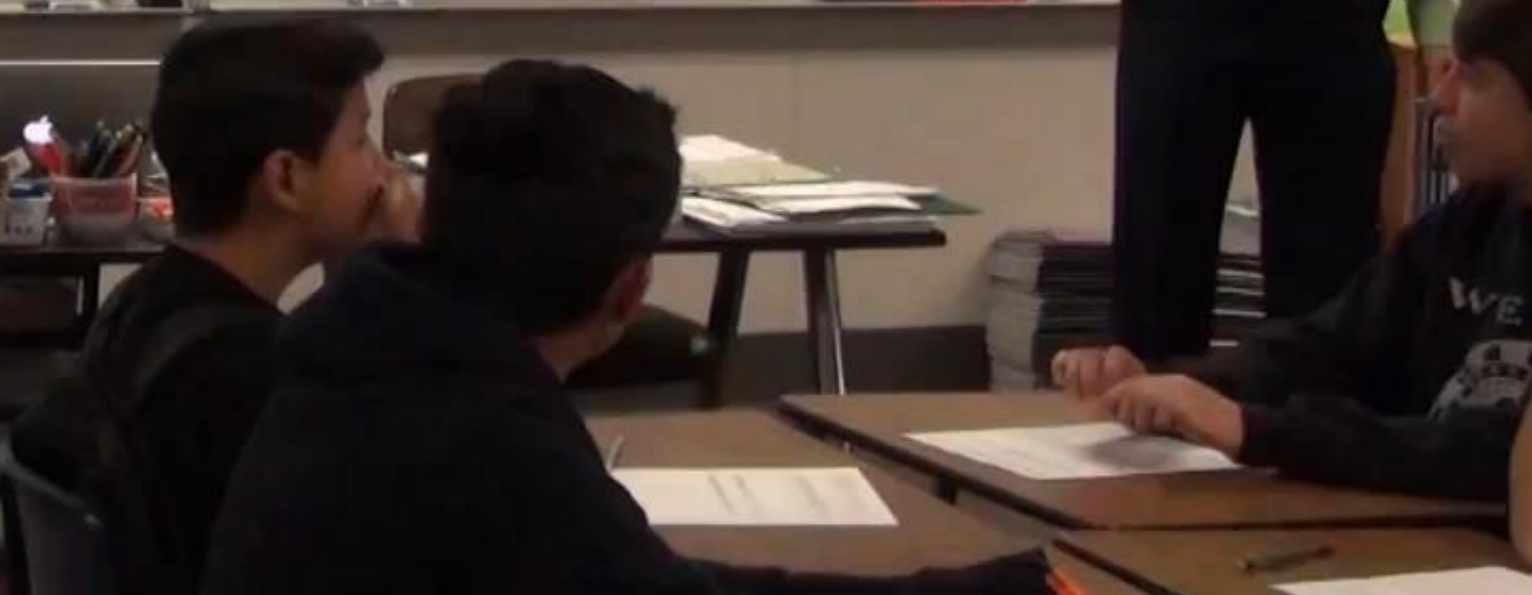
PLACE VALUE SYSTEM																							
ns		Billions		Millions			Thousands			Units		Tenths		Hundredths		Thousandths		Millionths		Billionths		Trillionths	
10 ¹	10 ²	10 ³	10 ⁴	10 ⁵	10 ⁶	10 ⁷	10 ⁸	10 ⁹	10 ¹⁰	10 ¹¹	10 ¹²	10 ¹³	10 ¹⁴	10 ¹⁵	10 ¹⁶	10 ¹⁷	10 ¹⁸	10 ¹⁹	10 ²⁰	10 ²¹	10 ²²	10 ²³	10 ²⁴

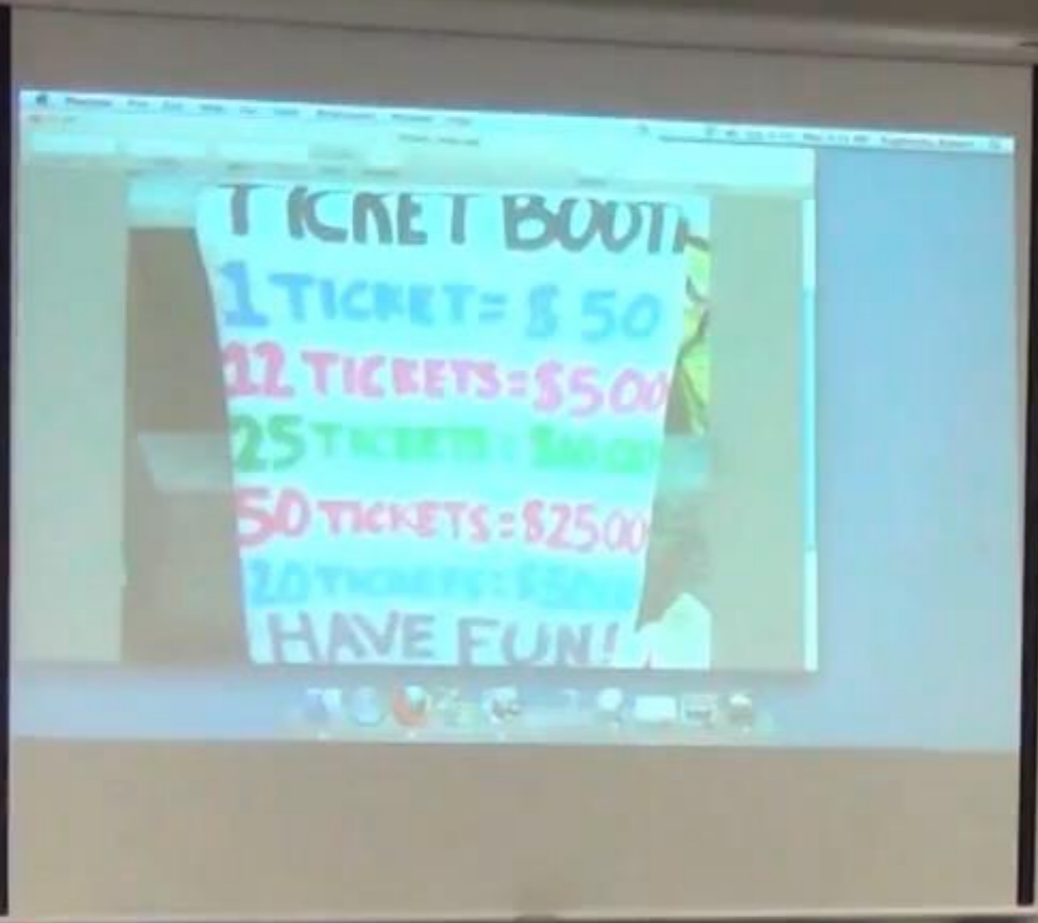
3/11/14 Agenda

7 th Grade	8 th Grade
Video Lesson	Video Lesson
Homework	Homework

Mr. Kaplinsky

40 objectives due





PLACE VALUE SYSTEM																			
Billions			Millions			Thousands			Units			Thousandths		Millionths		Billionths		Trillionths	
10 ⁹	10 ⁸	10 ⁷	10 ⁶	10 ⁵	10 ⁴	10 ³	10 ²	10 ¹	10 ⁰	10 ⁻¹	10 ⁻²	10 ⁻³	10 ⁻⁴	10 ⁻⁵	10 ⁻⁶	10 ⁻⁷	10 ⁻⁸	10 ⁻⁹	

3/17/14 agenda

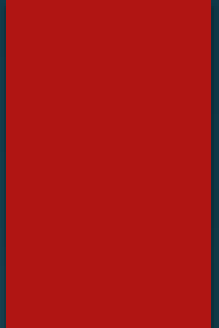
7th Grade Video Lesson Homework	8th Grade Video Lesson Homework
--	--

Mr. Kaplinsky

- # of tickets for a ride
- How many rides there are
- How much money you need
- # of people in group
- How long you will stay

40 objectives due by 4/30





Does a
hybrid car
pay for
itself?

How many years will it
take from saved gas
money to pay for the
extra cost for a hybrid?

Mr. Kaplinsky

9.55

best
guess

couple months — 25 years

SUCCESS

Handwritten notes on the right whiteboard, including "P463" and "Feb 21, 2014".

TOKYO

Mr. Kaplinsky

1.55

best
guess

couple months - 25 years

Quiz Ch. 7 #7

Age	Male	Female	Total
16-19	8,206	6,873	15,079
20-34	17,976	12,004	29,980
35-54	18,858	11,464	30,322
55-64	15,859	7,780	23,639
65+	10,304	4,785	15,089
Average	16,550	10,142	26,692

SUCCESS

Cost of hybrid car
vs
regular car
7-900 dollars
miles per gallon
miles driven
how much
saved

Mr. Kaplinsky
7.55
best guess
couple months - 25 years

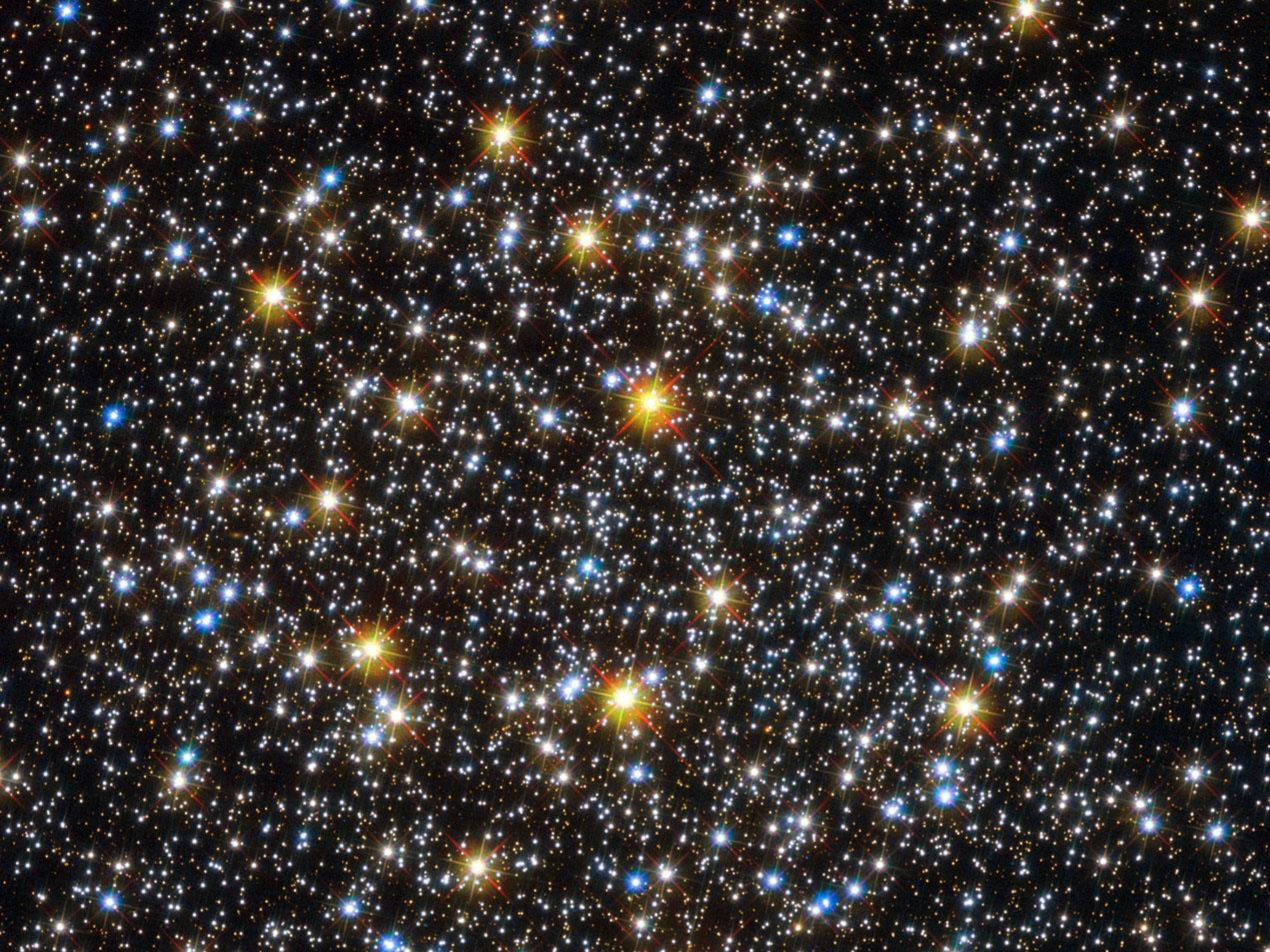
Quiz ch. 7 #3

Age	Male	Female	Total
16-19	8,206	6,873	15,079
20-34	17,376	13,004	30,380
35-54	18,850	11,494	30,344
55-64	15,859	7,780	23,639
65+	10,304	4,785	15,089
Average	16,550	10,142	26,692

SUCCESS

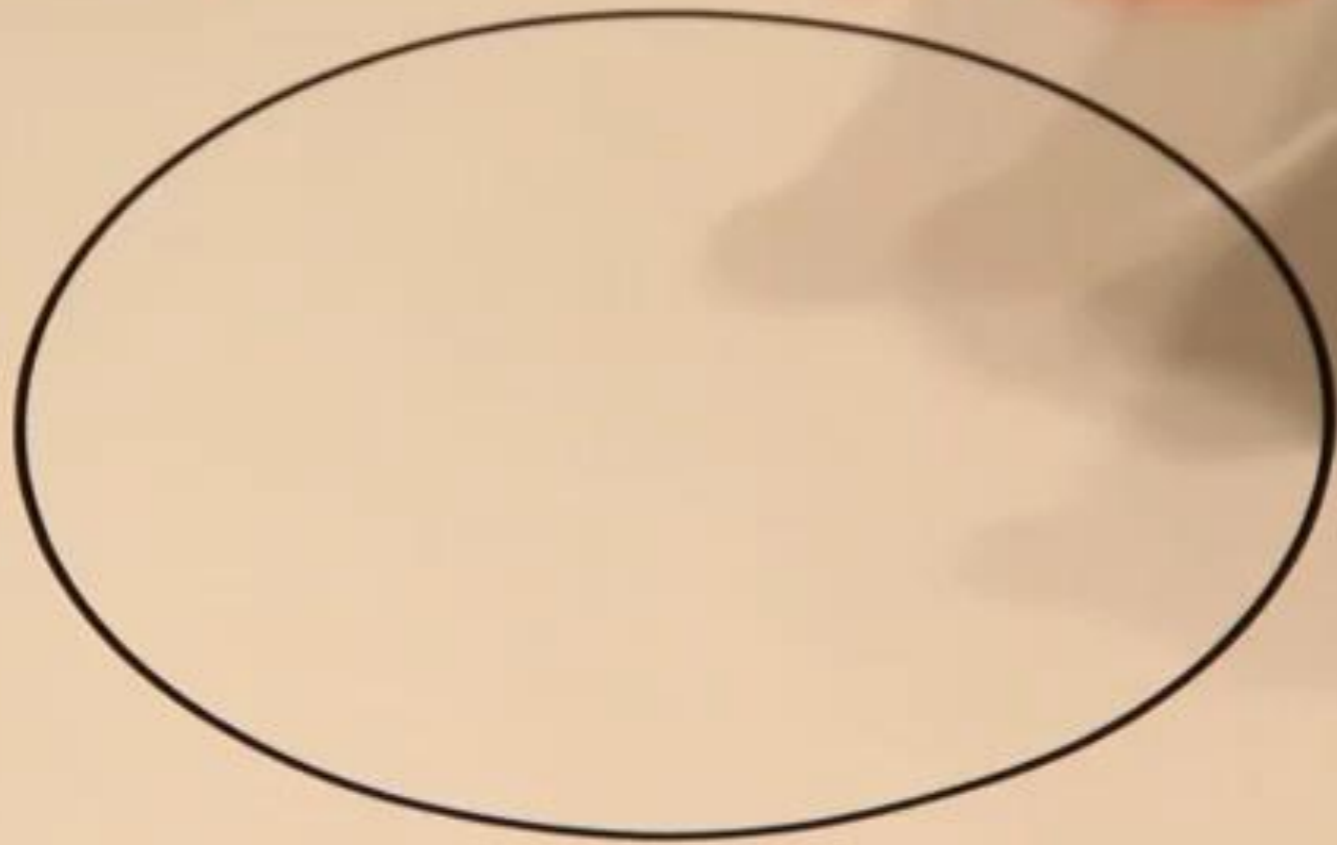
Cost of hybrid car
" " regular car
- gas prices
miles per gallon
miles per hour
SAVINGS





Setting Up The Problem

- What do you do when students ask for data/information I don't have, hadn't considered, or forgot to get?
- What do you do when students ask for information that is probably not important or that they don't actually need?
- What do you do when students don't know what to write for what they know and don't know?
- What do you do when you ask for a guess and they don't know?
- What do you do when they don't ask you for information that they need to solve the problem?



Problem Solving Process

- What do you do when students don't use the strategy you anticipated they would use?

TICKET BOOTHS

1 TICKET = \$.50

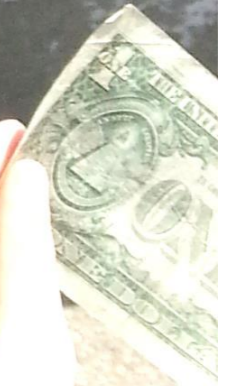
12 TICKETS = \$5.00

25 TICKETS = \$10.00

50 TICKETS = \$25.00

120 TICKETS = \$50.00

HAVE FUN!





American Standard

Item | Artículo: 84065
Model | Modelo: 3381.216.020

Clean™ Cadet® 3

Overall dimensions: 15 in W x 31 in H x 29-3/4 in D
Rough-in dimensions: 12 in
Trapway size: 2 in

Dimensiones generales: 38,10 cm de ancho x 78,74 cm de alto x 75,57 cm de profundidad
Dimensiones aproximadas: 30,48 cm
Tamaño de canal de sifón: 5,08 cm

- High-efficiency, dual flush toilet—1.6 gal. or 1.0 gal. flush
- Stays cleaner longer with EverClean® surface & PowerWash™ flush
- Features No Tools™ installation
- ADA approved chair height

- Inodoro de descarga doble de alta eficiencia con descarga de 6,06 litros o 3,79 litros
- Permanece limpio por más tiempo con la superficie EverClean® y la descarga PowerWash™
- Cuenta con instalación No Tools™
- Altura de silla aprobada por ADA

Elongated
Alergada
18.5 in
46.99 cm

Chair Height
Altura de silla
16.5 in
41.91 cm

10 Year
Año
Limited Warranty
Garantía limitada

\$199 Everyday Low Price
CLEAN CADET 3 DUAL FLUSH CH EL H
Aisle Bay Loc 40 W 1
Item # 84065 Model # 3381.216.020



Recorder # P117364



American Standard

Item | Artículo: 88575
Model | Modelo: 2514.101.020

Clean™ Cadet® 3

Overall dimensions: 15-3/4 in W x 30-3/4 in H x 30-1/4 in D
Rough-in dimensions: 12 in
Trapway size: 2-1/16 in

Dimensiones generales: 40,01 cm de ancho x 78,11 cm de alto x 76,84 cm de profundidad
Dimensiones aproximadas: 30,48 cm
Tamaño de canal de sifón: 5,24 cm

- Smooth-sided toilet design
- Stays cleaner longer with EverClean® surface & PowerWash™ flush
- Features No Tools™ installation
- ADA approved chair height

- Diseño de inodoro de lados lisos
- Permanece limpio por más tiempo con la superficie EverClean® y la descarga PowerWash™
- Cuenta con instalación No Tools™
- Altura de silla aprobada por ADA

Elongated
Alergada
18.5 in
46.99 cm

Chair Height
Altura de silla
16.5 in
41.91 cm

10 Year
Año
Limited Warranty
Garantía limitada

\$239 Everyday Low Price
ASD CLEAN CADET3 EL CH 1.28GPF
Aisle Bay Loc 40 W 5
Item # 88575 Model # 2514.101.020



Recorder # P117363



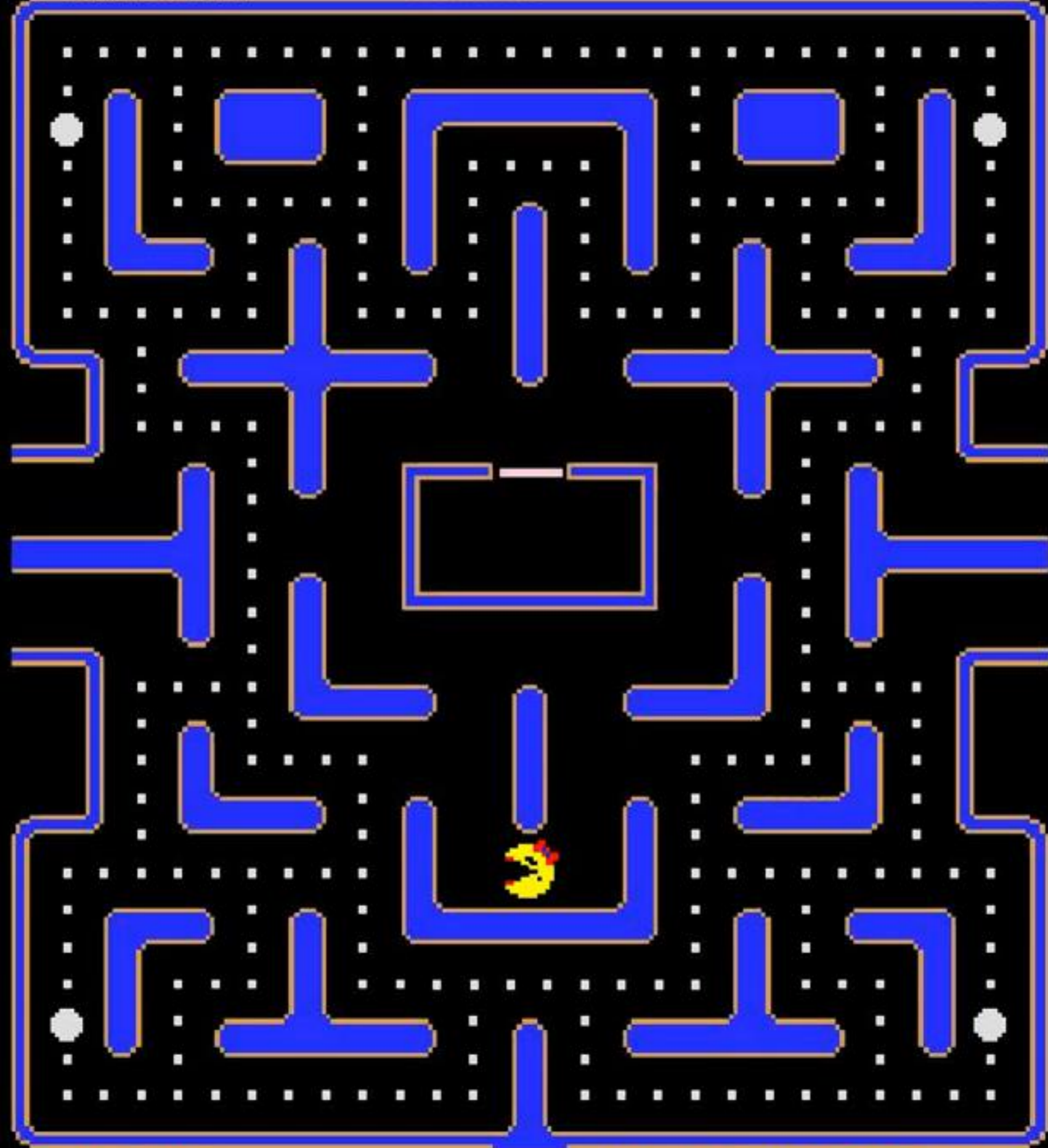
Problem Solving Process

- What do you do when students don't use the strategy you anticipated they would use?
- What do you do when a student comes up with a strategy for solving the problem that I do not understand?

HIGH SCORE

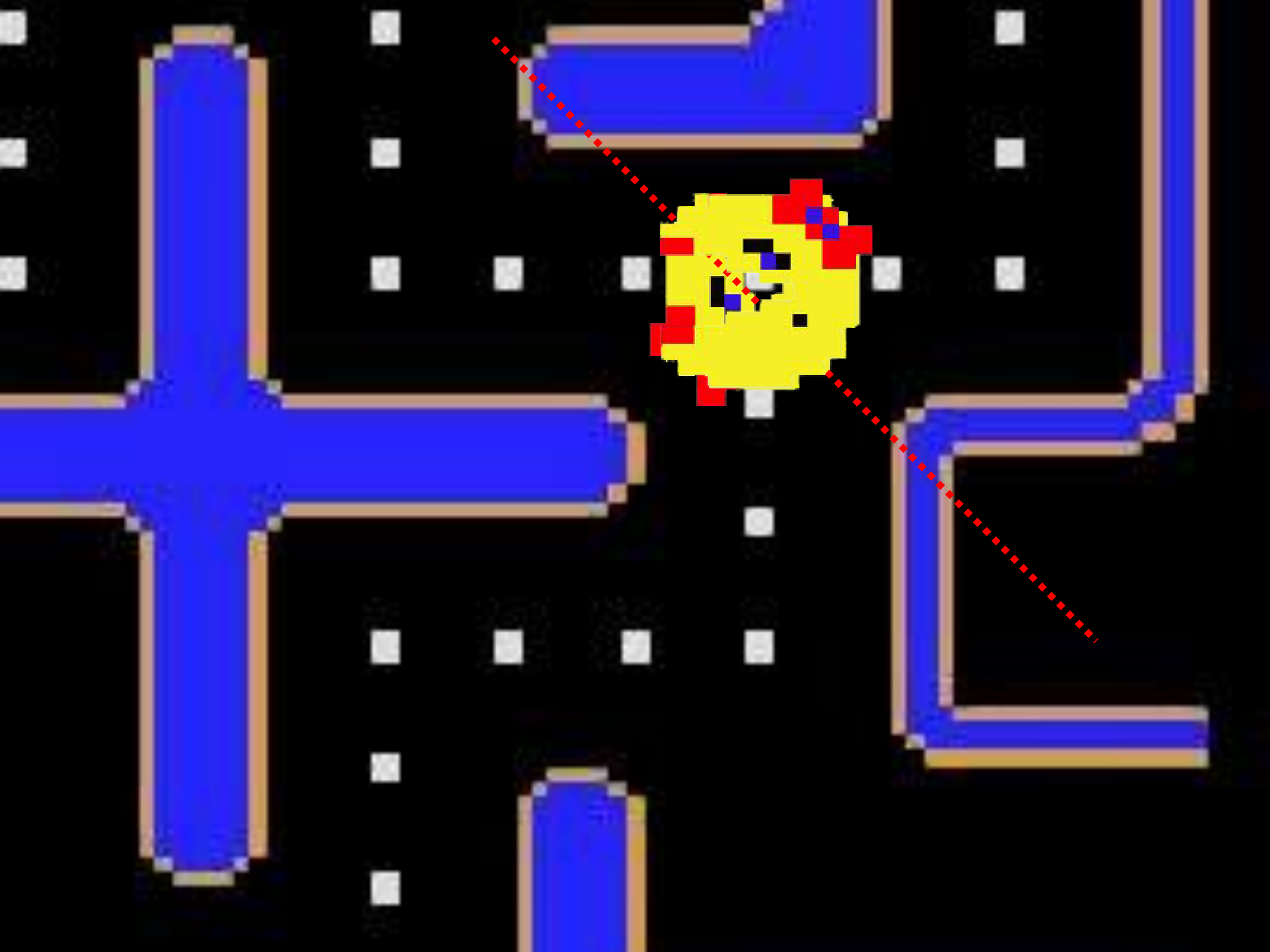
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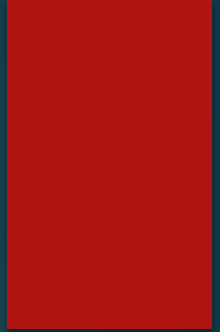
Problem Solving Process

- What do you do when students don't use the strategy you anticipated they would use?
- What do you do when a student comes up with a strategy for solving the problem that I do not understand?
- What do you do when the answer we calculate does not match with the actual answer?
- What do you do when students get stuck during the problem solving process and are not sure what to do?

NON-STAGGERED

STAGGERED

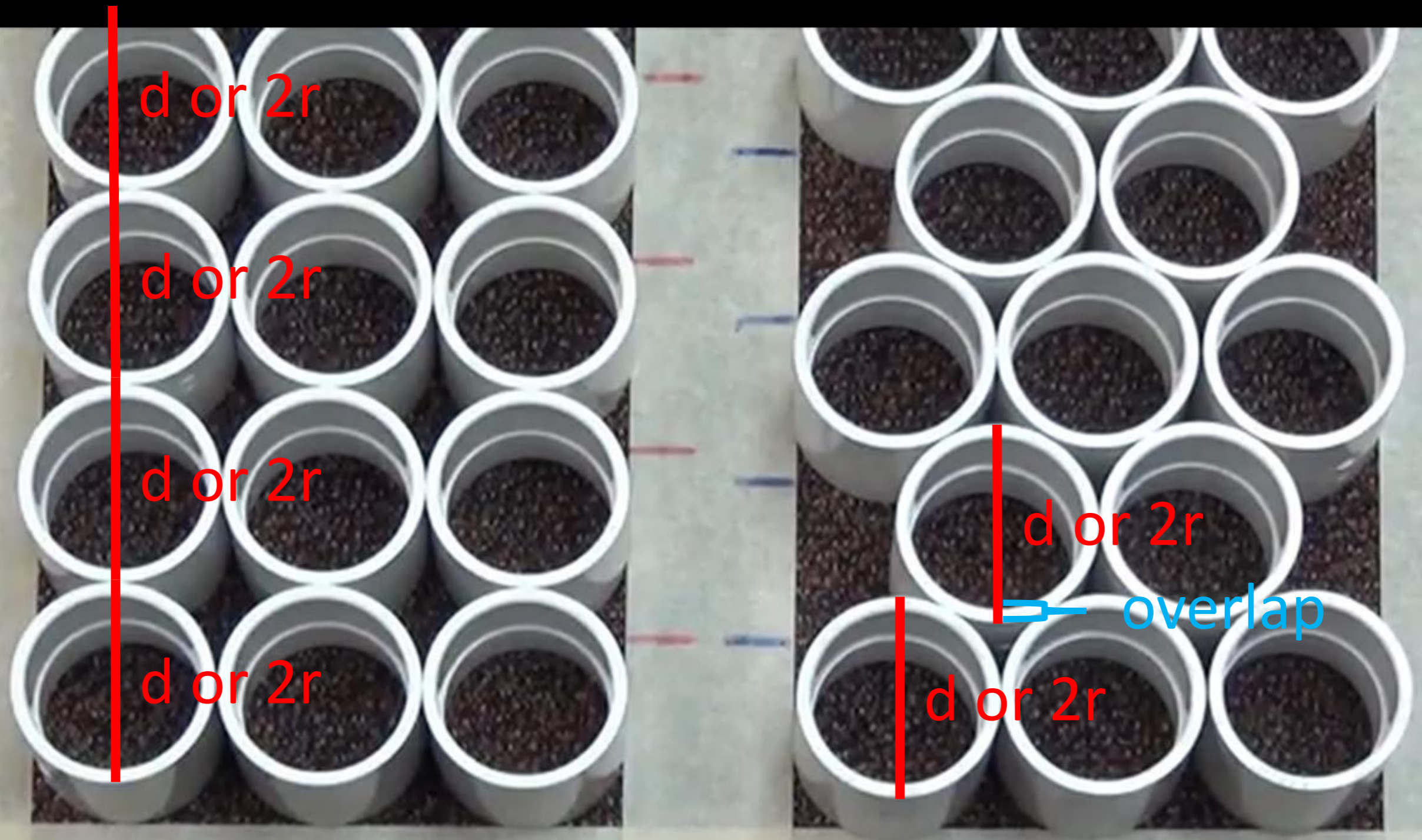


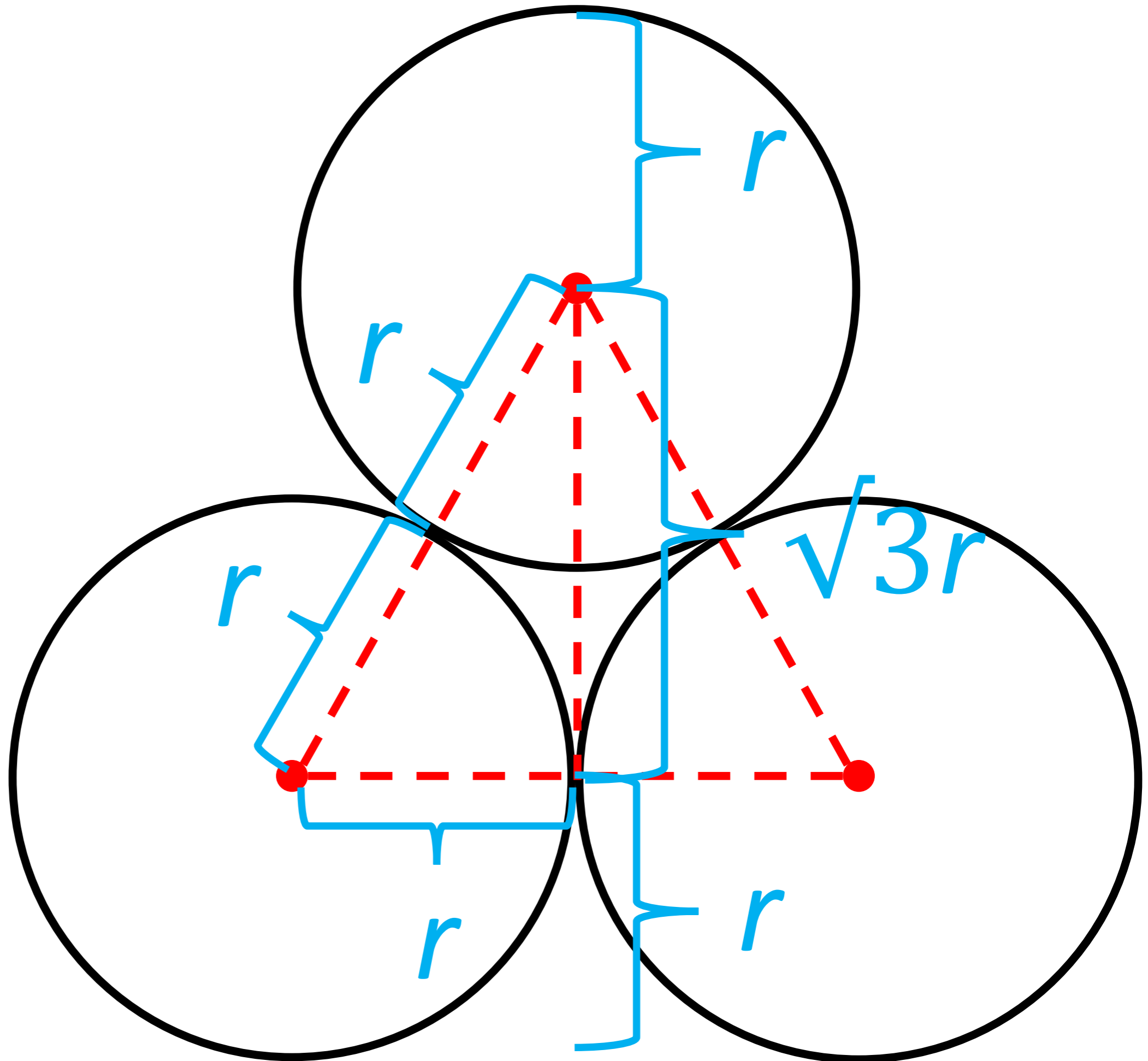
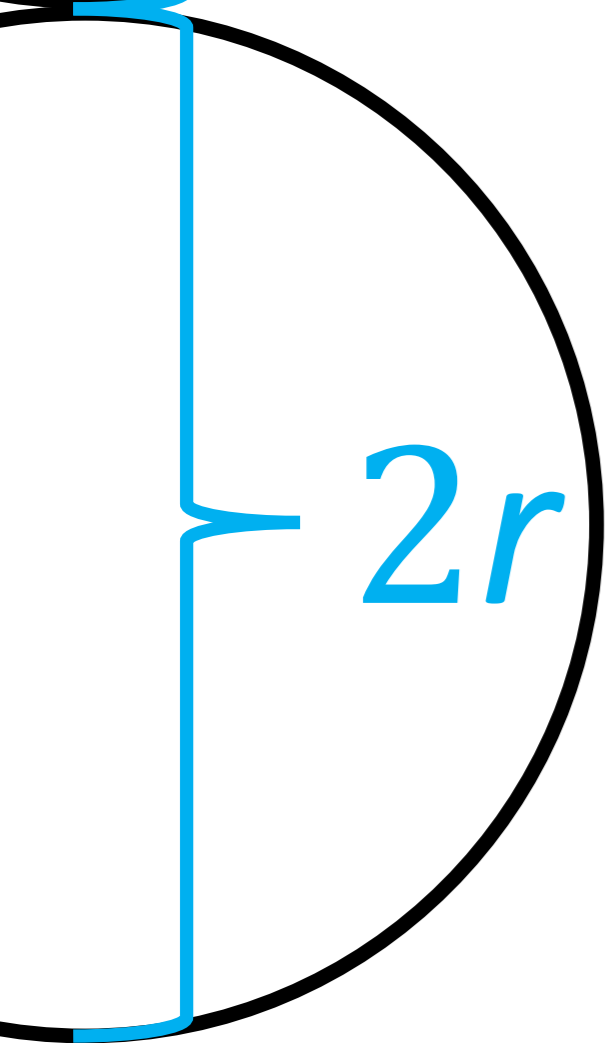
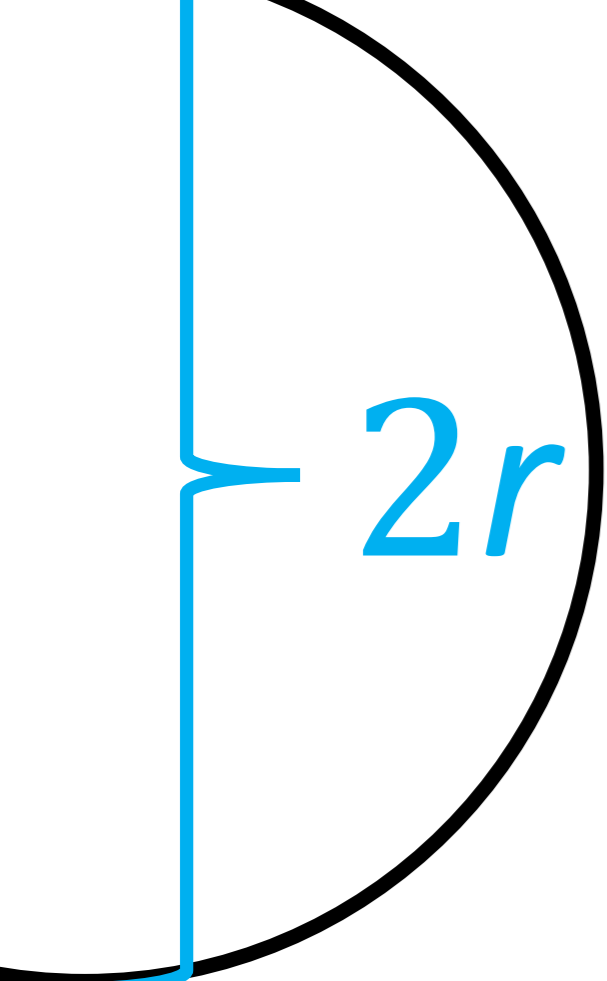


How much
shorter are 20
layers of
staggered
pipe stacks?





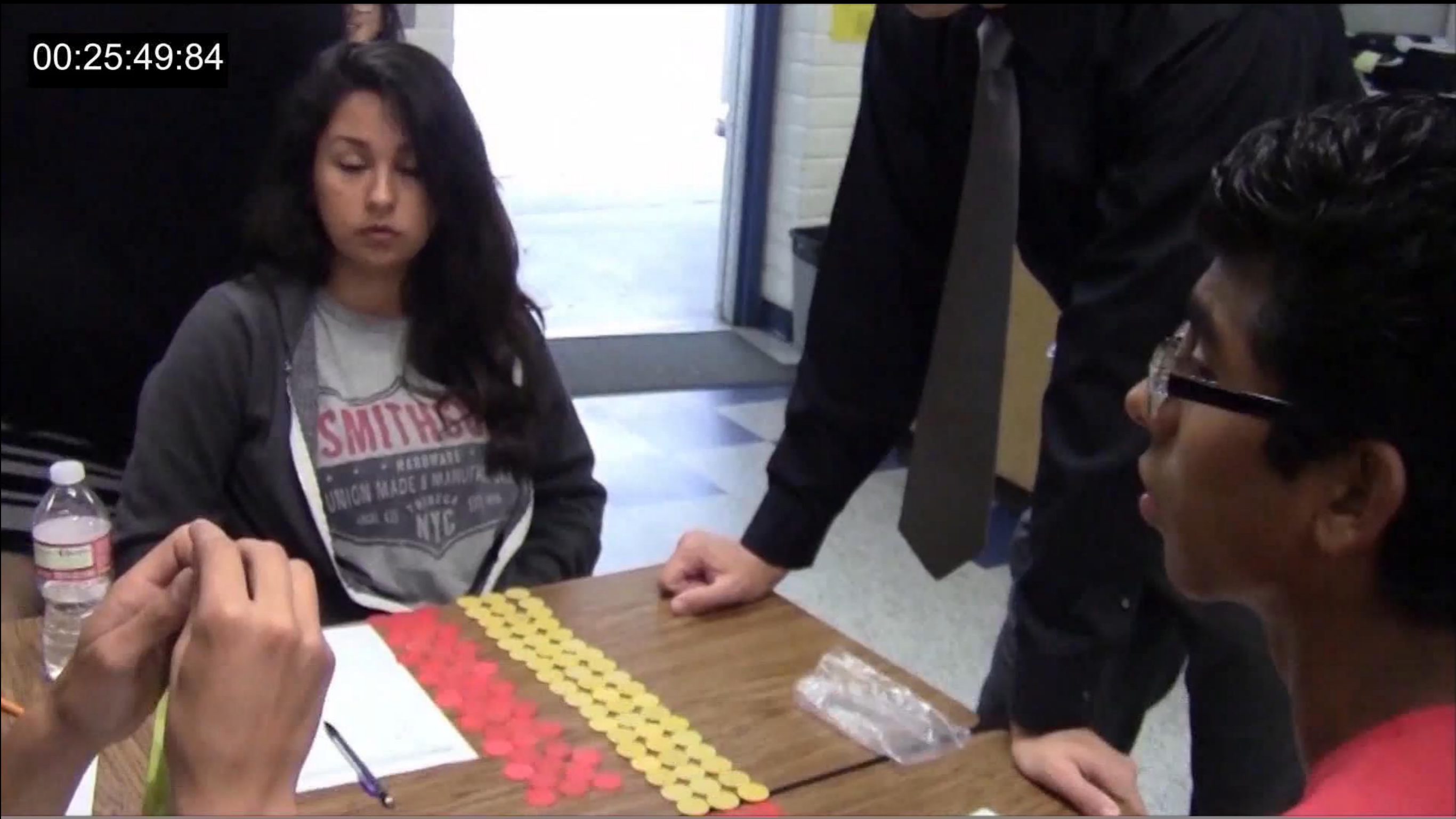




00:00:00:00



00:25:49:84



Problem Solving Process

- What do you do when students don't use the strategy you anticipated they would use?
- What do you do when a student comes up with a strategy for solving the problem that I do not understand?
- What do you do when the answer we calculate does not match with the actual answer?
- What do you do when students get stuck during the problem solving process and are not sure what to do?
- What do you do when you ask students questions and few to no people are ready to respond?

00:32:29:68



Problem Solving Process

- What do you do when students don't use the strategy you anticipated they would use?
- What do you do when a student comes up with a strategy for solving the problem that I do not understand?
- What do you do when the answer we calculate does not match with the actual answer?
- What do you do when students get stuck during the problem solving process and are not sure what to do?
- What do you do when you ask students questions and few to no people are ready to respond?
- What do you do when the student conclusions are low quality and/or effort?

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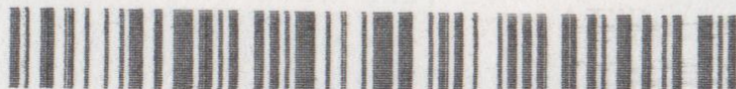
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one single item.**
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Also excludes Starbucks
Also excludes Dyson vacuums and Miele

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G47QR-V2

BBC31313

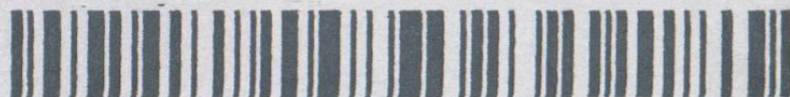
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of \$15 or more.

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

IA conclusion each
for different items

CONCLUSION Each Item is good

in store purchase, exclusions

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

If the item is \$15 use the \$5 off because

$$15 - 5 = 10 \text{ and } 15 - 20\% = 12$$

If the item is \$47 it is better to use the 20% off coupon because

$$47 - 5 = 42 \quad 47 - 20\% = 37.60$$

\$5 off 20% off
42 vs 37.60

$$\begin{array}{ll} \$5 \text{ off} & 20\% \text{ off} \\ 18 \text{ vs } & 18.40 \end{array}$$

$$23 - 5 = 18$$

$$23 - 20\% = 18.40$$

Orange Chicken	5.25	🔪 Eggplant with Garlic Sauce	5.25
Chicken Lo Mein	5.25	🔪 Ma Po Tofu	5.25
Cashew Nut Chicken	5.25	🔪 Broccoli with Garlic Sauce	5.25
🔪 Pungent Chicken	5.25	🔪 String Bean with Garlic Sauce	5.25
Sweet & Sour Chicken	5.25	Vegetable Delight	5.25
Curry Chicken	5.25	Bamboo Fungus Tofu	5.25
Lemon Chicken	5.25	Shrimp with Asparagus	6.25
Vegetable Chicken	5.25	Shrimp with Lobster Sauce	6.25
Mongolian Beef	5.25	🔪 Fish Fillet with Szuchuan Sauce	6.25
Broccoli Beef	5.25	🔪 Fish Fillet with Black Bean Sauce	6.25
🔪 Pungent Beef	5.25	Crab meat with Asparagus	6.25
Sweet & Sour Pork	5.25	Sweet & Sour Shrimp	6.25

FREE
ORANGE
CHICKEN

WITH COUPON

with purchase from
\$50+tax/up

Not redeemable on lunch &
special dinners & party items or
with any other coupon
exp. 3/31/07

FREE
CHICKEN
L.O MEIN

WITH COUPON

with purchase from
\$25+tax/up

Not redeemable on lunch &
special dinners & party items or
with any other coupon
exp. 3/31/07

FREE

Cheese Wonton

WITH COUPON

with purchase from
\$25+tax/up

Not redeemable on lunch &
special dinners & party items or
with any other coupon
exp. 3/31/07

10% OFF **10% OFF**

WITH COUPON

WITH COUPON

with purchase from
\$20+tax/up

Not redeemable on lunch &
special dinners & party items or
with any other coupon
exp. 3/31/07

with purchase from
\$20+tax/up

Not redeemable on lunch &
special dinners & party items or
with any other coupon
exp. 3/31/07

Free ~~to~~ chicken lomein
if spend \$25 and not redeemable
on lunch, special dinners and
party items

and chicken 10 main.

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

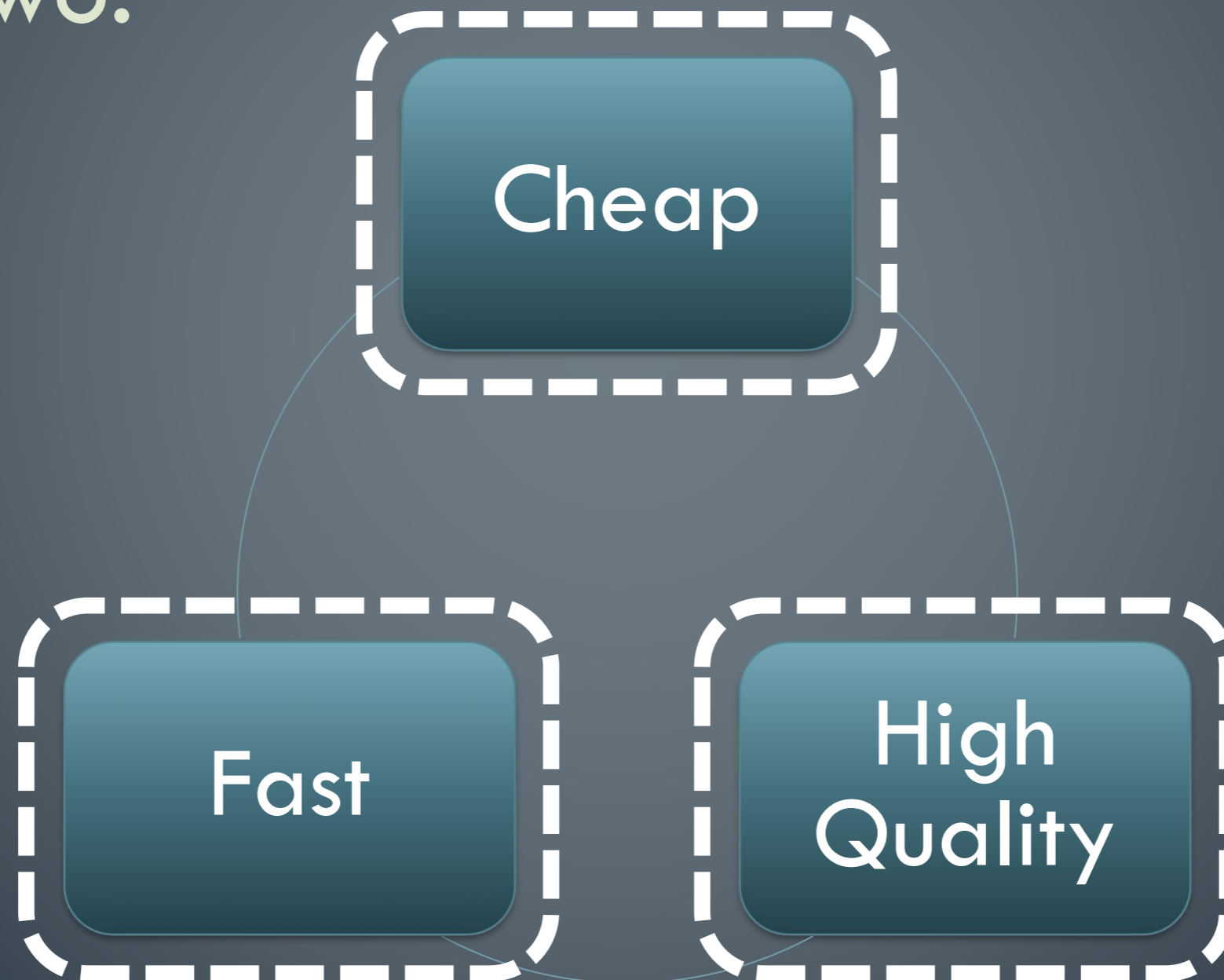
The 10% carbon is best with high
prices and small orders is best
with the free chicken lomein or chesse warden

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

You can use the 10% off when you pay 20-24.99 or more
the Free chicken Lorraine when you pay 25-49.99 or more
and the Free orange Chicken when you pay 50 or more.

Construction

- Pick two:



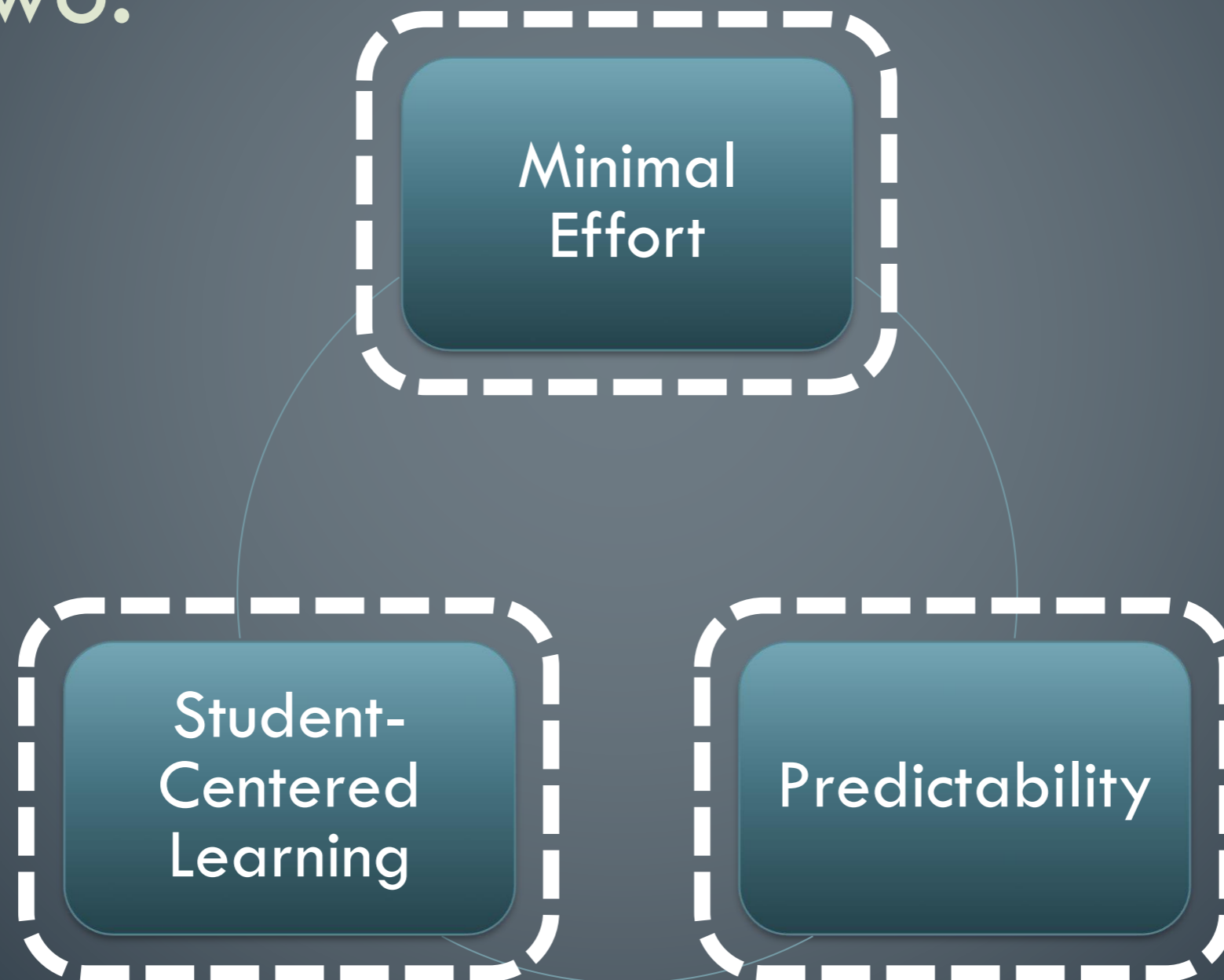
Family

- Pick two:



Problem-Based Learning

- Pick two:



Contact

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