



# Implementing Real World Problem-Based Lessons

ROBERT KAPLINSKY









**DOUBLE-DOUBLE**<sup>®</sup> *Double Meat & Double Cheese* **2<sup>65</sup>**

**CHEESEBURGER** **1<sup>75</sup>**

**HAMBURGER** **1<sup>50</sup>**

**FRENCH FRIES** **1<sup>05</sup>**

**SHAKES** *Chocolate  
Strawberry  
Vanilla* **1<sup>55</sup>**

<u>SM</u>	<u>MED</u>	<u>LG</u>	<u>X-LG</u>
<b>99</b>	<b>1<sup>10</sup></b>	<b>1<sup>29</sup></b>	<b>1<sup>49</sup></b>
<b>COKE</b> <i>Classic or Diet</i>			
<b>SEVEN-UP</b>			
<b>ROOT BEER</b>			
<b>DR PEPPER</b>			
<b>LEMONADE</b>			
<b>ICED TEA</b>			

<b>MILK</b>	<b>70</b>
<b>COFFEE</b>	<b>70</b>



**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

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Cashier: SAM

**GUEST #: 98**

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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

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2004-10-31

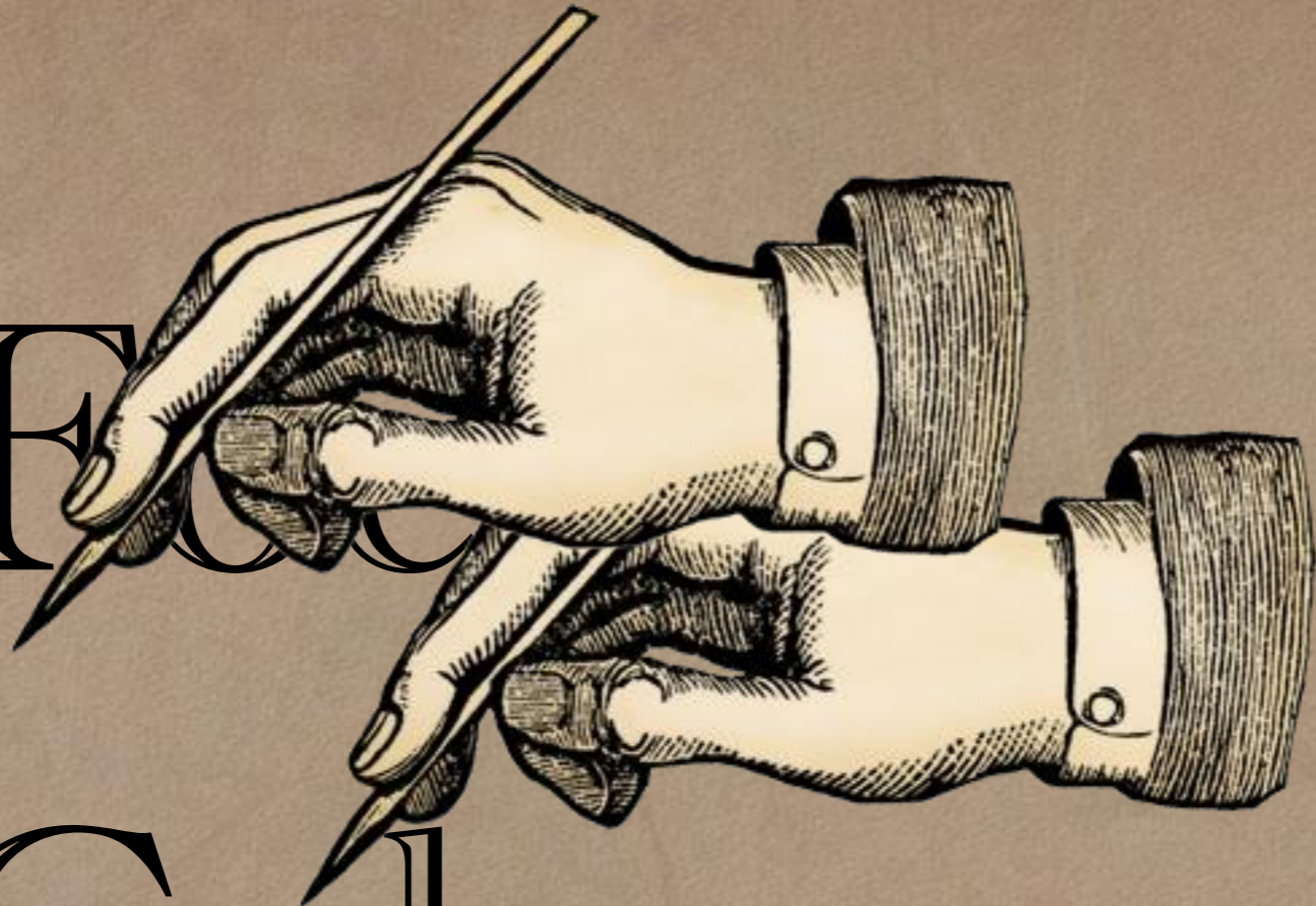
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	Serving Size (g)	Calories
Hamburger w/Onion	243	390
Cheeseburger w/Onion	268	480
Double-Double w/Onion	330	670

•

• **F**ocus



•

• **C**oherence

•

• **R**igor



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  $100 \times 100$
- Common wrong answers included:
  - \$175.00 ( $\$1.75 \times 100$  cheeseburgers)
  - \$132.50 ( $\$2.65 \times 50$  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

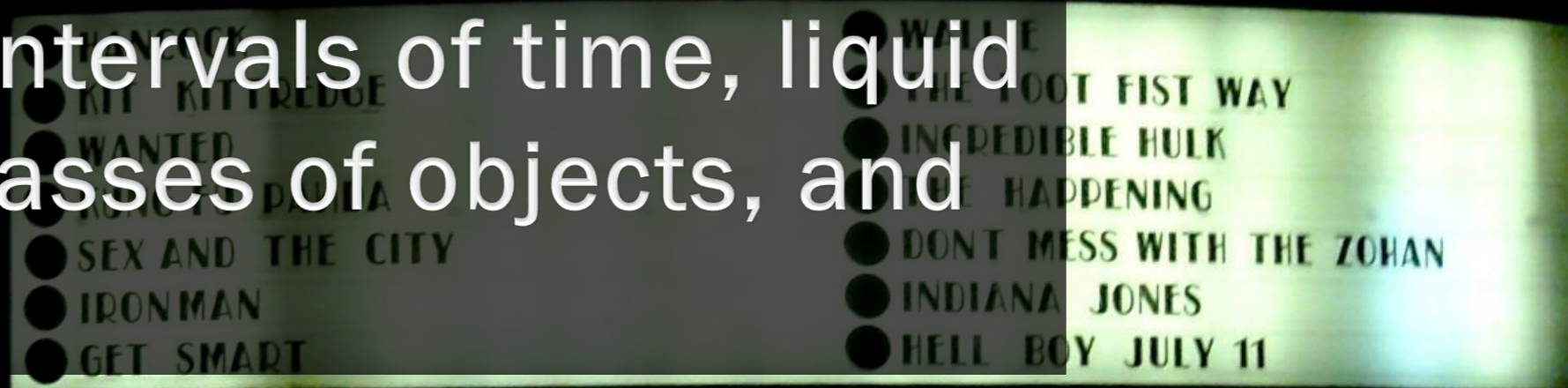
# STUDENT WORK

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"> <li>• there's 100 beef patties</li> <li>• costs 2.50</li> </ul>	<ul style="list-style-type: none"> <li>• How much does a regular cheeseburger cost. 25.1 -</li> </ul> <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 &amp; double-double cheeseburgers are. From there I subtracted the price of the produce &amp; buns, then multiplied by 100. That gave me the answer, which I once again had to add the price of the buns &amp; produce.</p> <p style="text-align: center;"> <math>22.8 + 00.1 - xOP_0 = P</math>  <math>128.0 + xOP_0 = P</math> </p>	

# The Four C's

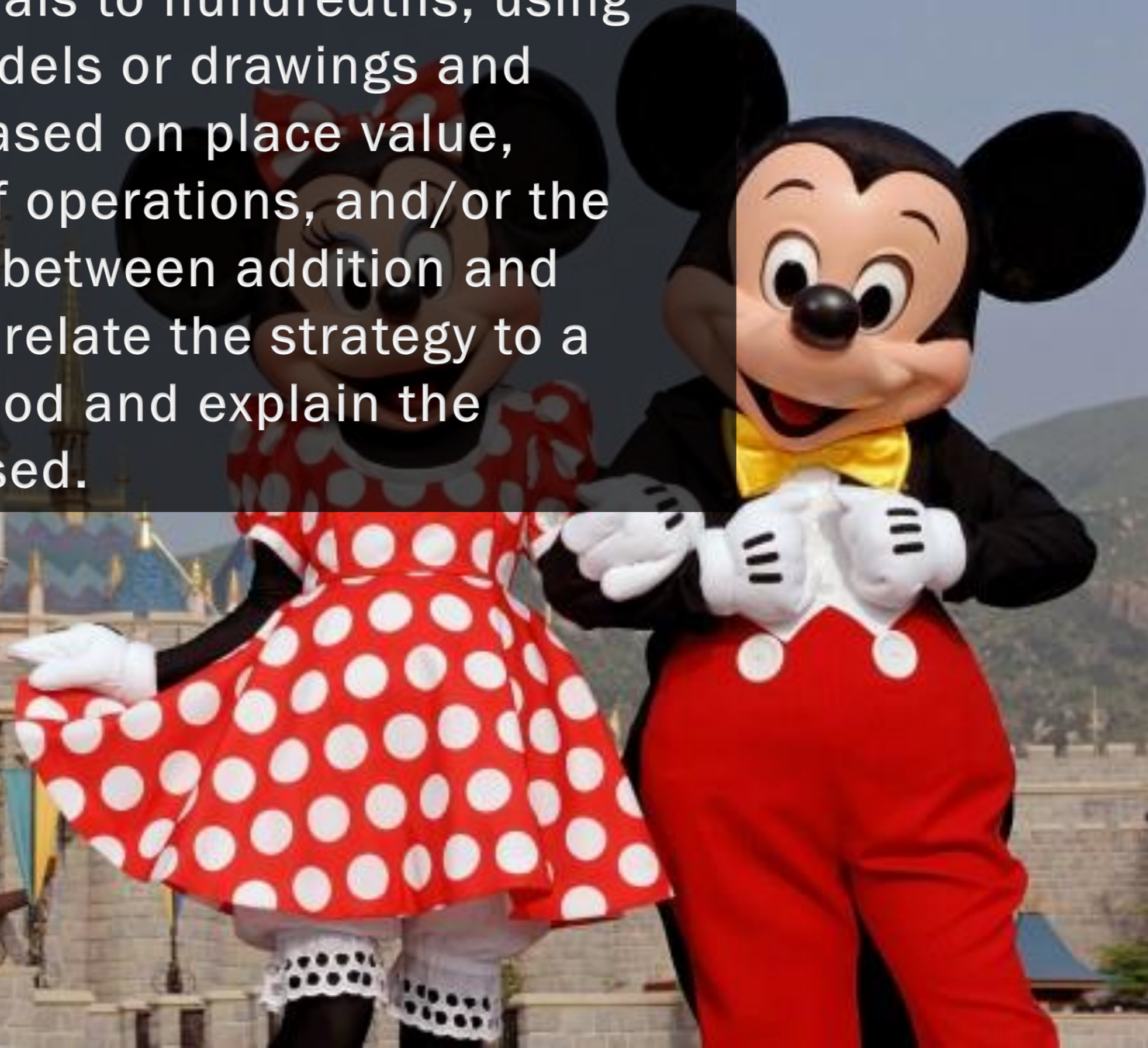
- o Communication
- o Curiosity

- 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.
- 4.MD.2 - Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money.

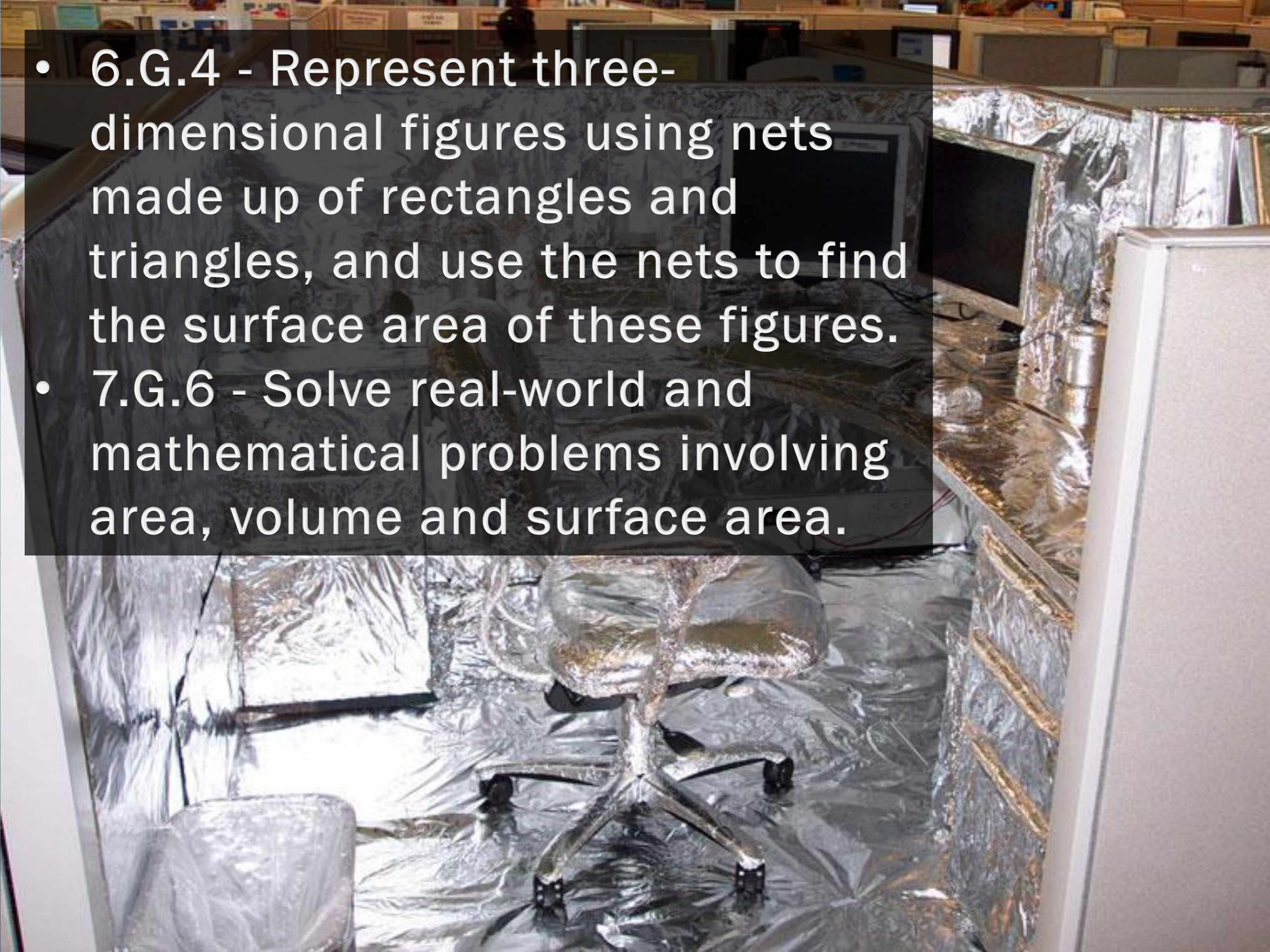




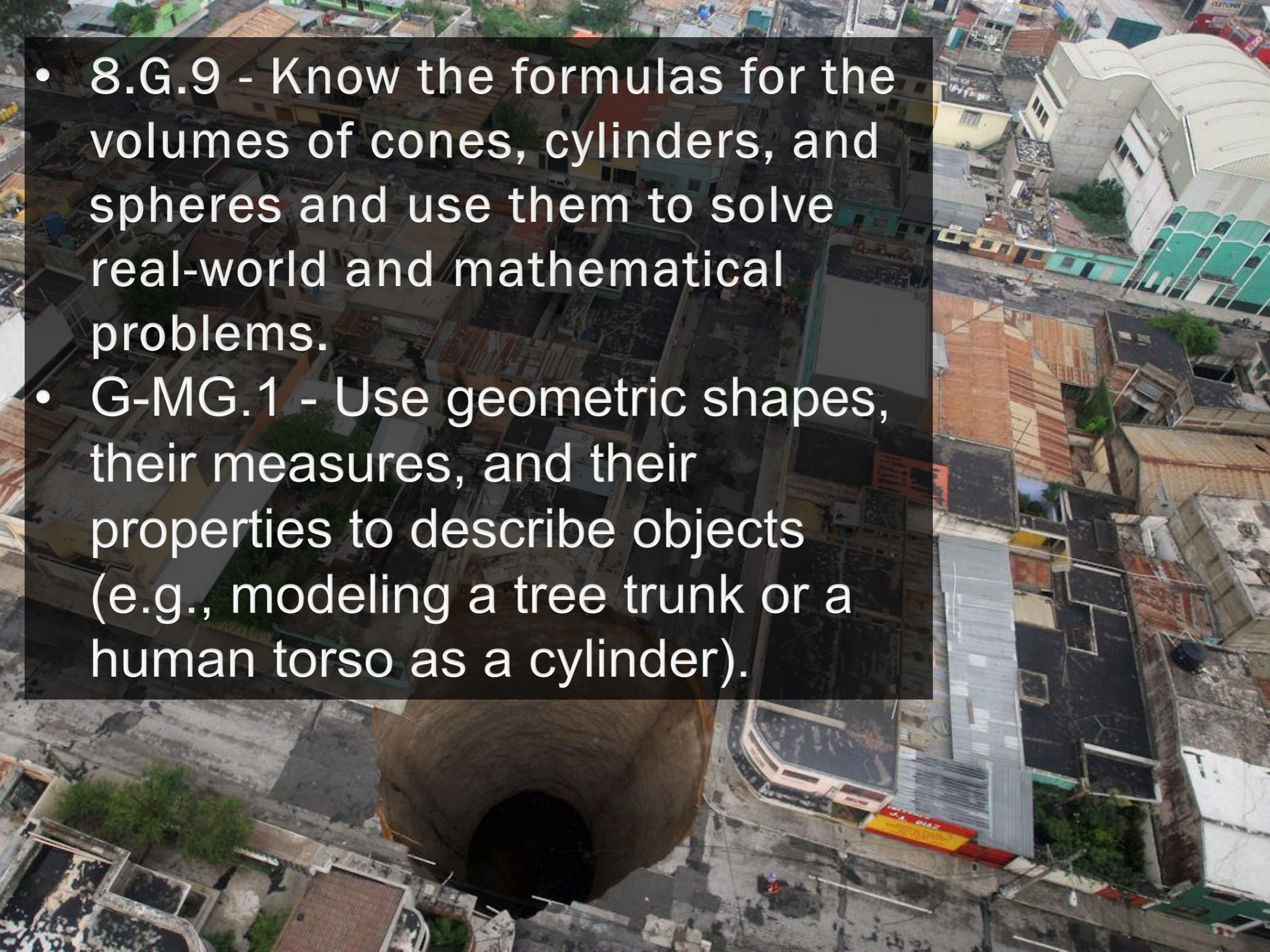
- 5.NBT.7 Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.



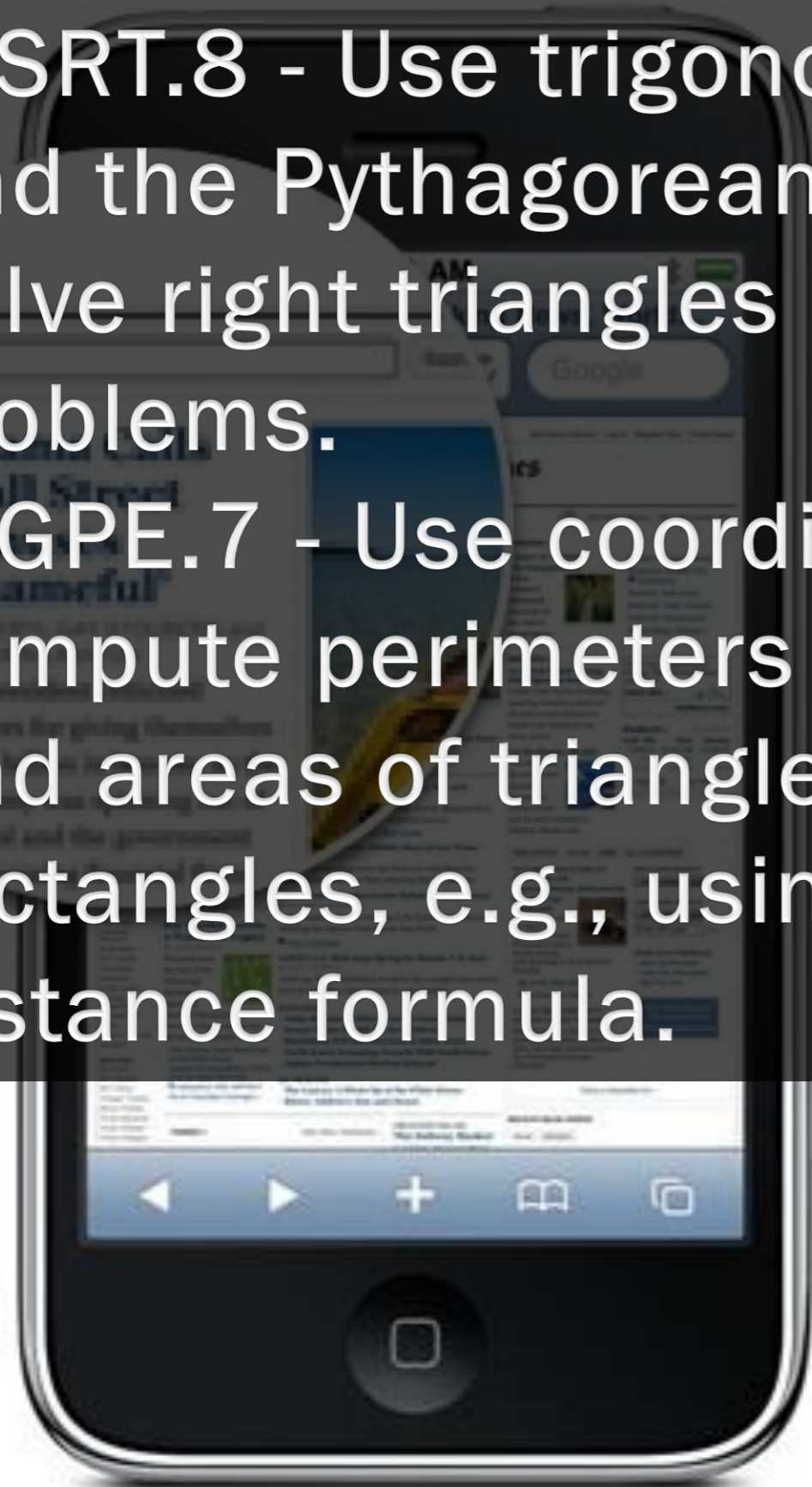
- 6.G.4 - Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures.
- 7.G.6 - Solve real-world and mathematical problems involving area, volume and surface area.



- 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-MG.1 - Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).



- G-SRT.8 - Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.
- G-GPE.7 - Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.

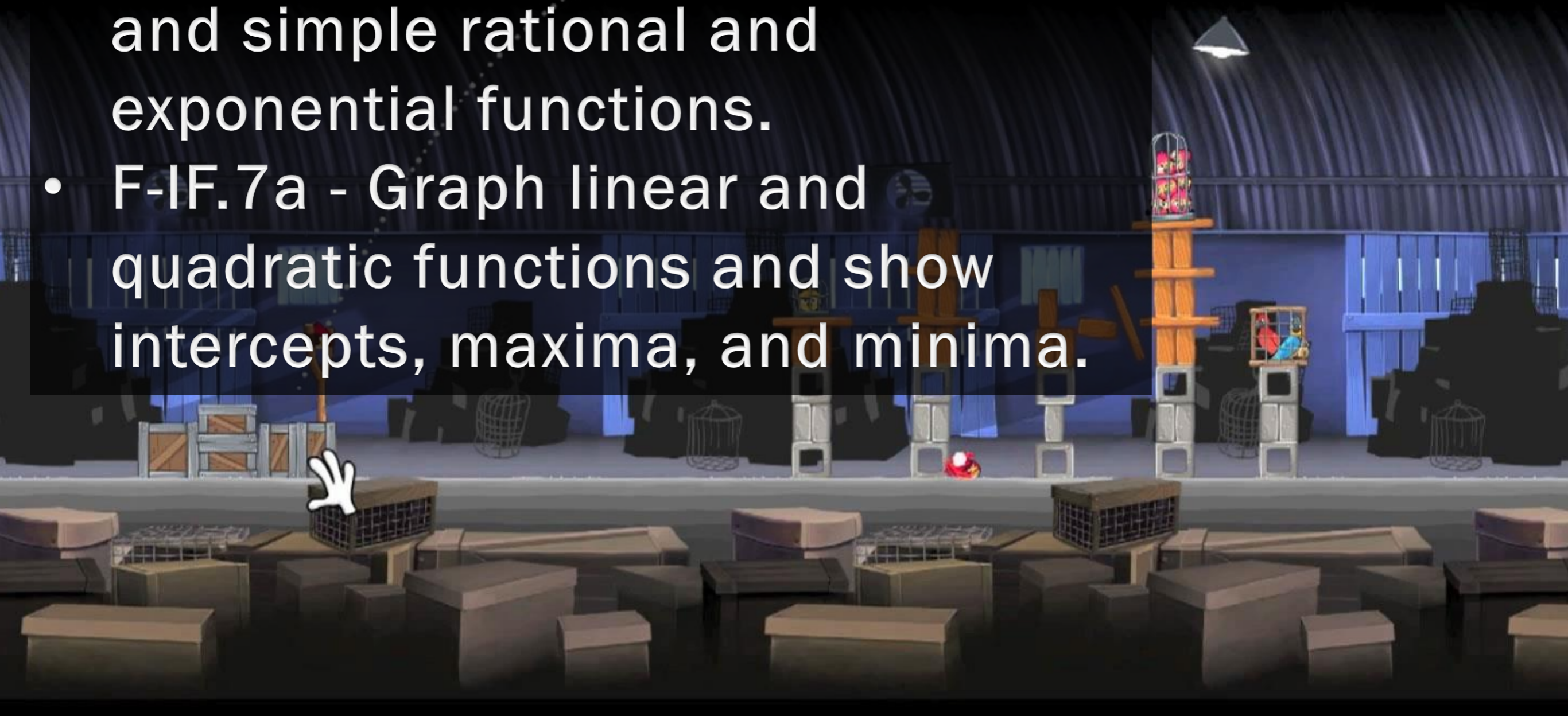


No Retina Display

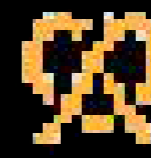
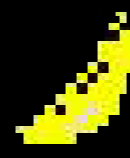
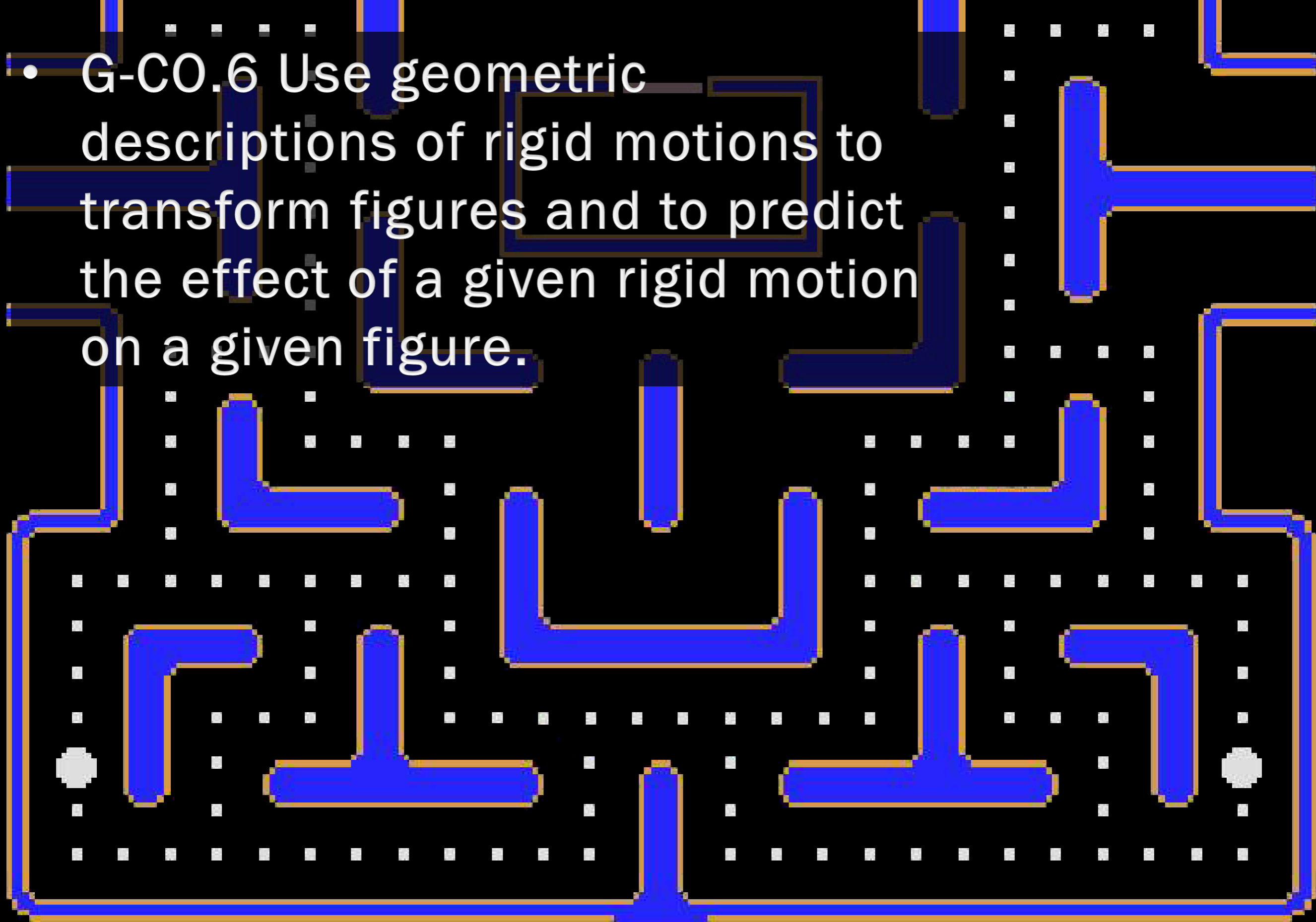


Retina Display

- 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.



- 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.



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

Salted  
**PEANUTS**  
\$2.59 lb

# The Four C's

- o Communication
- o Curiosity
- o Critical Thinking



# Problem Solving Framework

- ▶ Inspired by Geoff Krall's resources at [emergentmath.com](http://emergentmath.com)

Name: \_\_\_\_\_ Period: \_\_\_\_\_ Date: \_\_\_\_\_

What problem are you trying to figure out?

What do you already know from the problem?

What do you need to know to solve the problem?

What is your conclusion?

# The Four C's

- o Communication
- o Curiosity
- o Critical Thinking
- o Content Knowledge

# ***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?*

# Problem-Based Lesson Resources

- 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>
- Mathalicious: <http://www.mathalicious.com>
- Yummy Math: <http://www.yummymath.com>
- 101 Questions: <http://www.101qs.com>



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