Adaptation.

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TEACHER'S EDITION

ALGEBRA 1

CORD COMMUNICATIONS

Algebra 1 Common Core

PEARSON

TWE

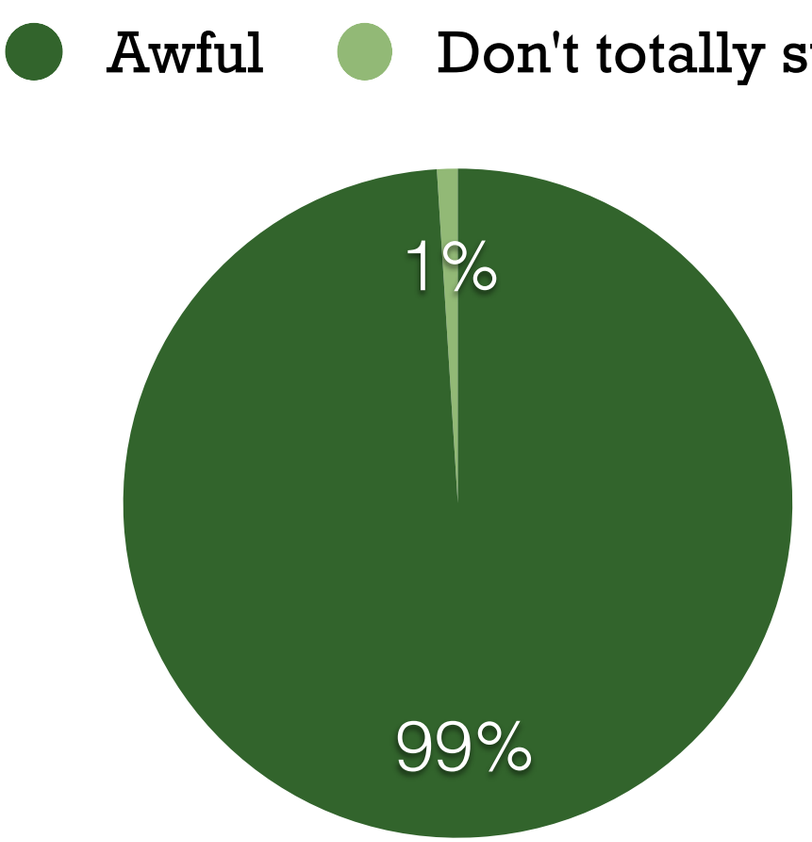
California

Geometry

Glencoe

… and now for some Fermi estimation.

9-12 chapters / textbook **x** 6-10 sections / chapter **x** 25-50 practice problems / section **=** 1350 to 4800 problems / textbook



13.5 to 48 problems

Instruction

Problem(s)

Student generated Need-to-Knows

Our agenda for the day

WHY HOW WHAT

Adapting tasks from existing curricula


Geometry
Geometry

WHY

Ideas

Ensures standard hitting

Time

Your students

Good Formative Assessment and Assessment Practice

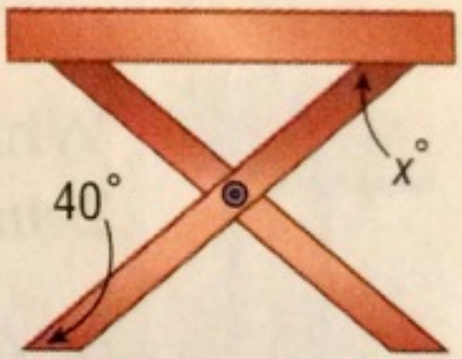
Assessment is at its best when it is ongoing and most difficult to distinguish from the teaching that is occurring. - Martin-Kniep, G. & Picone-Zocchia, J.

How

Task Analysis

[Task to analyze A]

★ **24. CARPENTRY** Anthony is building a picnic table for his patio. He cut one of the legs at an angle of 40°. At what angle should he cut the other end to ensure that the top of the table is parallel to the ground? Explain. **See margin.**



[Task to analyze B]

54. Open-Ended Give a counterexample to show that $(x + y)^2 = x^2 + y^2$ is false.

[Task to analyze C]

1. A house has a 500-cubic-foot propane tank to provide gas to its appliances. The family uses an average of 0.95 cubic foot per day. Use the information to answer the following questions:

   a. Write an equation for the number of cubic feet of gas in the tank after *t* days.

   b. To the nearest cubic foot, how much gas will have been used in 45 days?

   c. To the nearest day, how long will it take for the entire tank to be used up?

Do the data in each table represent a *direct variation* or an *inverse variation*? Write an equation to model the data in each table. See Problem 4.

25.

x	y
2	1
5	2.5
8	4

26.

x	y
4	15
6	10
10	6

27.

x	y
−3	−24
9	8
12	6

Tell whether each situation represents a *direct variation* or an *inverse variation*. Explain your reasoning. See Problem 5.

28. You buy some chicken for $1.79/lb.

29. An 8-slice pizza is shared equally by a group of friends.

30. You find the length and width of several rectangles. Each has an area of 24 cm^2.

Suppose y varies inversely with x. Find the constant of variation k for each inverse variation. Then write an equation for the inverse variation.

31. $y = -8$ when $x = -32$

32. $x = \frac{1}{2}$ when $y = 5$

33. $y = 25$ when $x = 0.04$

Each pair of points is on the graph of an inverse variation. Find the missing value.

34. $(3, 5)$ and $(1, y)$

35. $(2.5, 4)$ and $(x, 2)$

36. $\left(x, \frac{1}{2}\right)$ and $\left(\frac{1}{3}, \frac{1}{4}\right)$

Measurement **Does each formula represent a *direct variation* or an *inverse variation*? Explain your reasoning.**

37. the perimeter P of an equilateral triangle with side length s: $P = 3s$

38. the time t to travel 150 mi at a rate of r mi/h: $t = \frac{150}{r}$

39. the circumference C of a circle with radius r: $C = 2\pi r$

40. Think About a Plan Suppose 4 people can paint a house if they work 3 days each. How long would it take a crew of 5 people to paint the house?

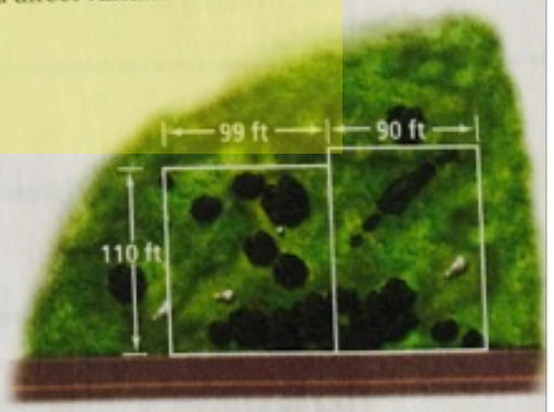
- Can you determine whether this situation represents a direct variation or an inverse variation?
- How can you write an equation that will help you solve the problem?

41. Writing Explain how the variable y changes in each situation.

a. y varies directly with x. The value of x is doubled.

b. y varies inversely with x. The value of x is doubled.

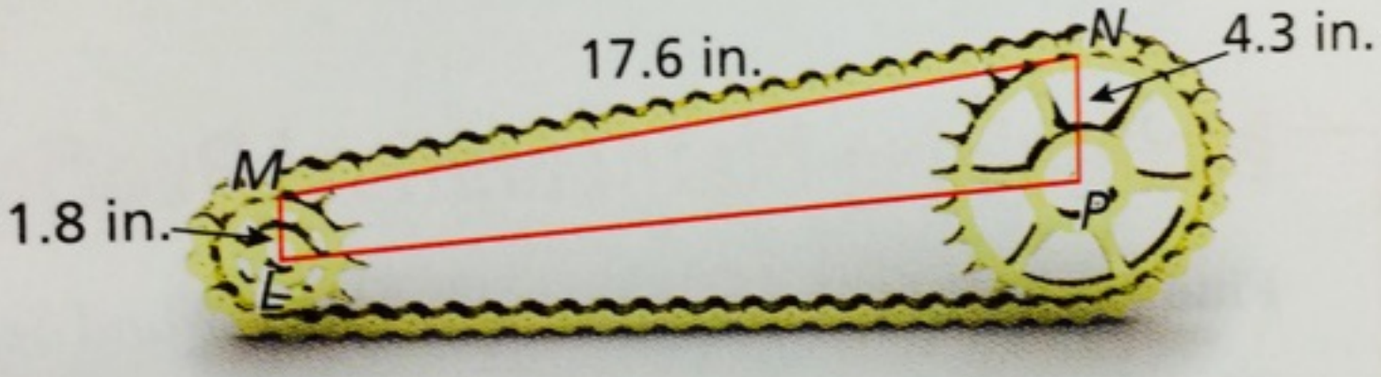
42. Surveying Both of the two rectangular building lots shown at the right have the same area. Write an equation to find the length of the second lot.



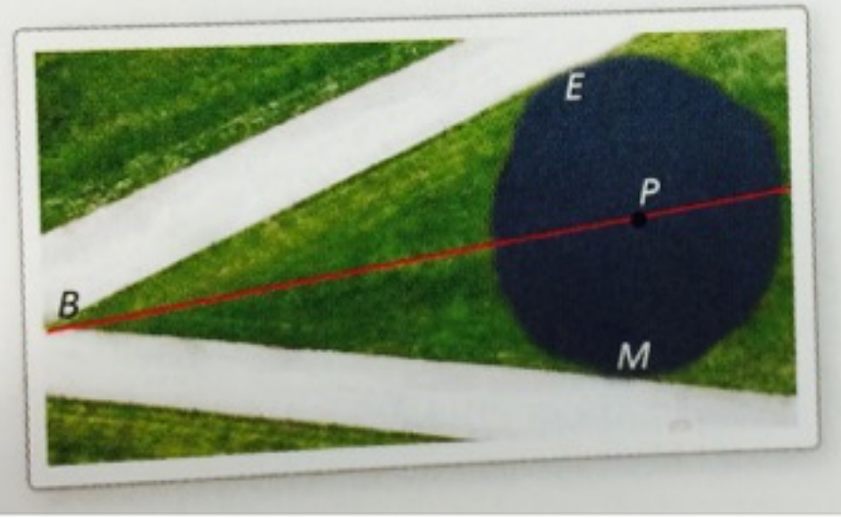
Task

A satellite orbiting the earth in a circular path stays at a constant altitude of 100 kilometers throughout its orbit. Given that the radius of the earth is 6370 kilometers, find the distance that the satellite travels in completing 70% of one complete orbit.

MODELING WITH MATHEMATICS A bicycle chain is pulled tightly so that $\overline{MN}$ is a common tangent of the gears. Find the distance between the centers of the gears.



MAKING AN ARGUMENT Two bike paths are tangent to an approximately circular pond. Your class is building a nature trail that begins at the intersection B of the bike paths and runs between the bike paths and over a bridge through the center P of the pond. Your classmate uses the Converse of the Angle Bisector Theorem (Theorem 6.4) to conclude that the trail must bisect the angle formed by the bike paths. Is your classmate correct? Explain your reasoning.



Satellite Problem (2 days)

==========

Alert! The X-400 Satellite only has enough fuel to sustain it for 70% of a complete orbit of the earth. Determine how far it will travel in that time.

==========

Anticipated Need-to-Knows:

- How big the earth is? (the radius)
- Height of the orbit?

Suggested next-steps:

- Creating a drawing / diagram (~15 minutes?)
- Research the radius of the earth

End of day 1: Correct diagram (with vocab and annotation), revisit NTKs, radius of the earth, height of the orbit
End of day 2: Complete solutions with diagrams, justification, annotation, and the word "arc-length"

Final product:

- Prezi (with photographed picture)
- Poster paper
- Present to one another
- Gallery walk
- Video Shorts

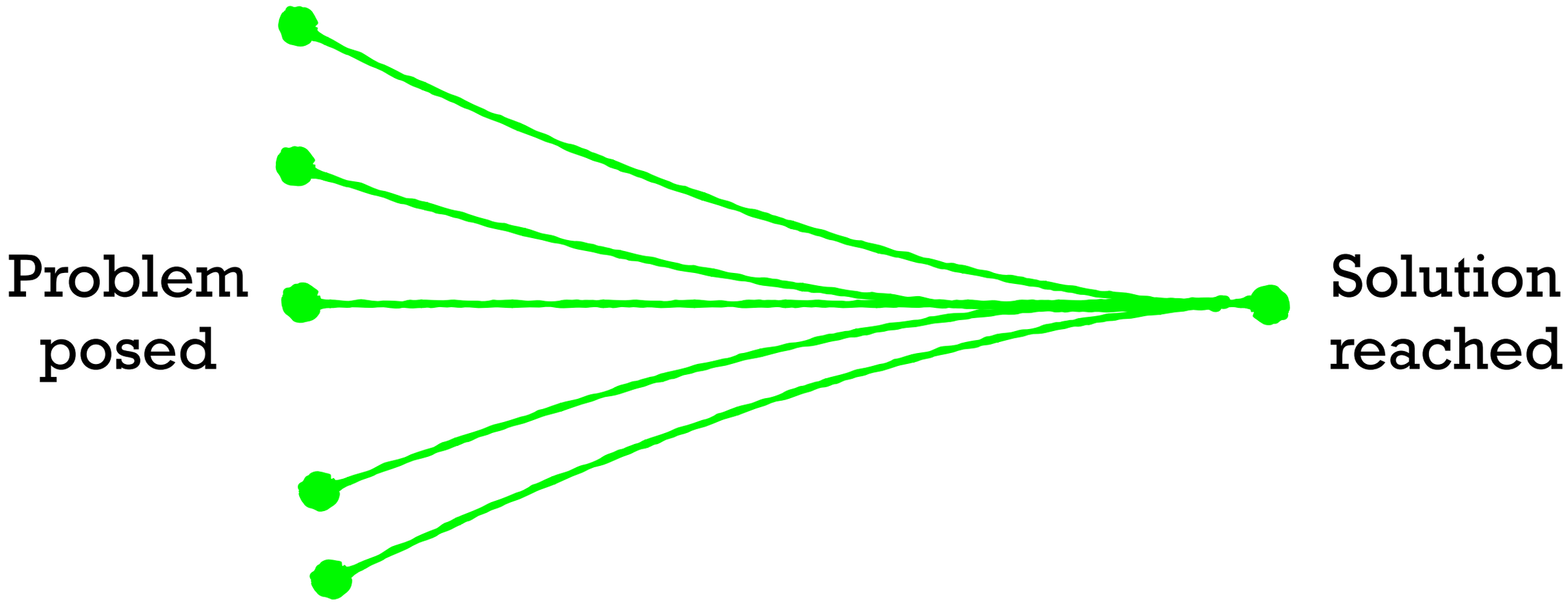
The actual content that they're learning

- Arc length

What

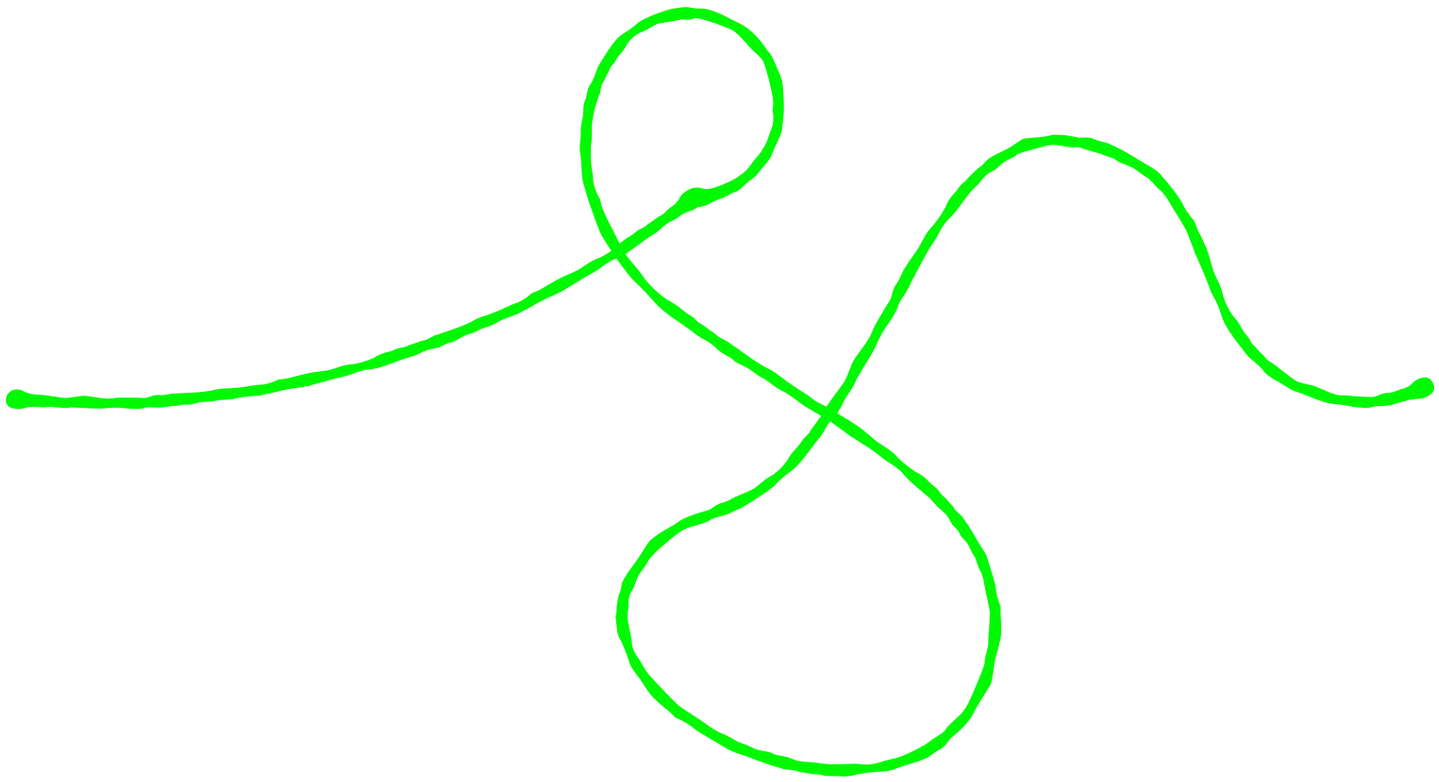
Adapting

A linear, “closed” problem



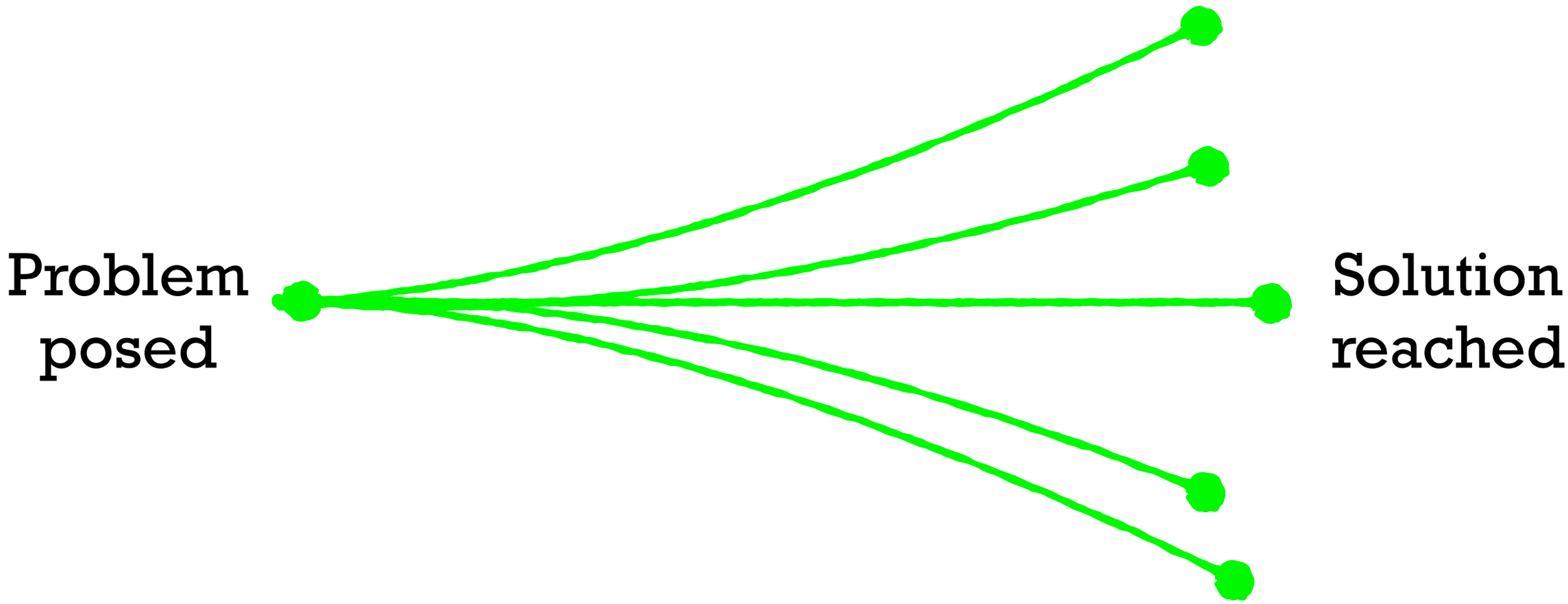
Open beginning

Problem posed



Solution reached

Open Middle



Open End

Problem

Solution

Problem

Solution

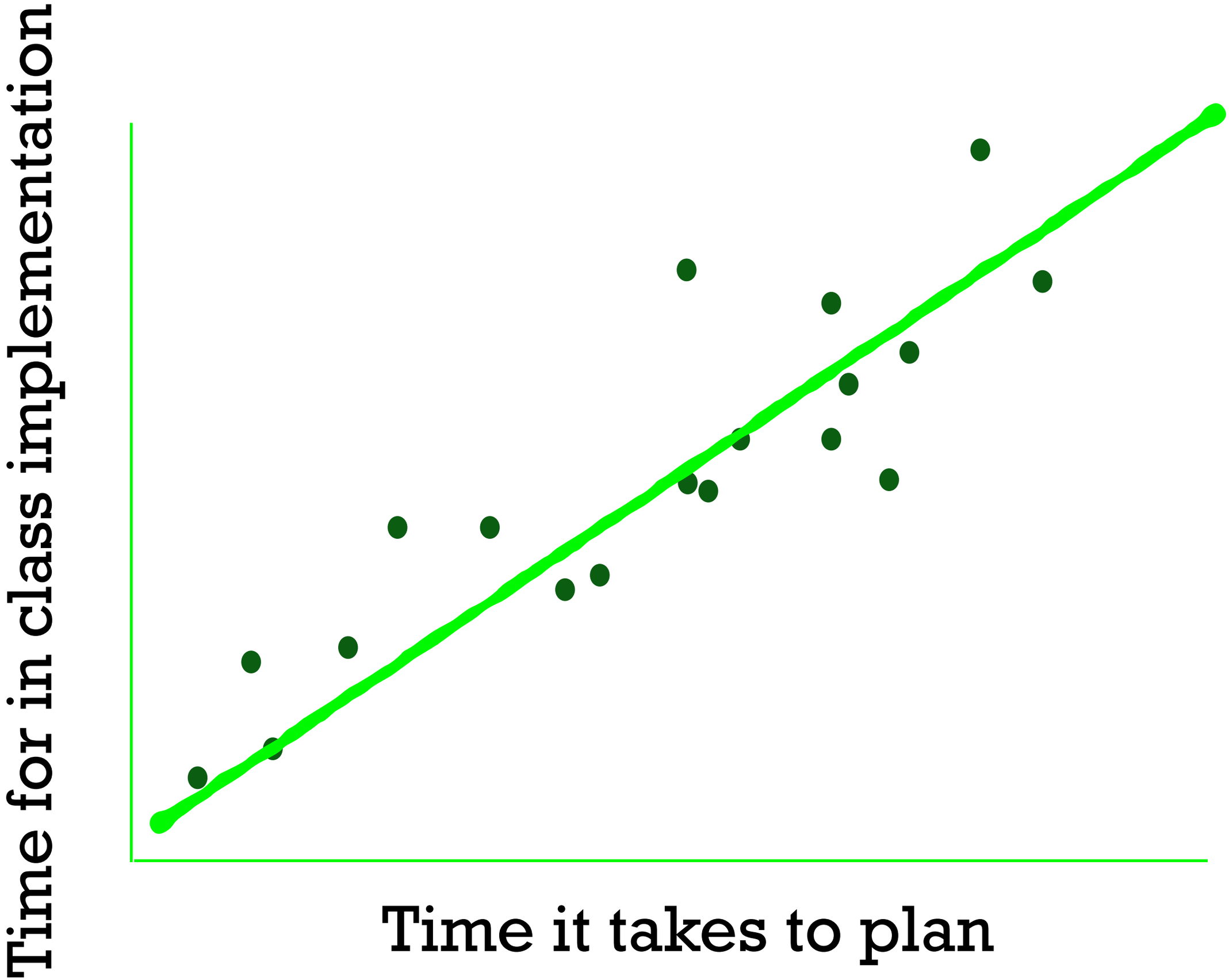
Problem
posed

Solution
reached

Opening up the…

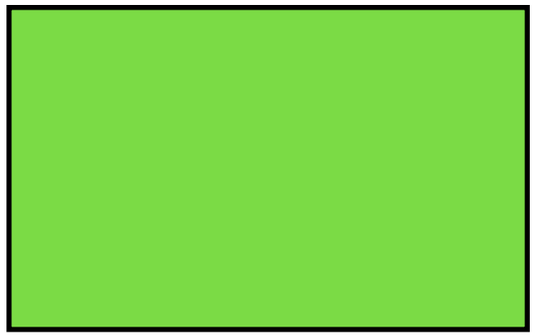
Time to spend…

	Beginning	Middle	End
15 minutes			
1-2 hours			
1 day			


Time for in class implementation
Time it takes to plan

	Beginning	Middle	End
15 minutes	Start with the answer		
1-2 hours			
1 day			

Find the area of this rectangle.



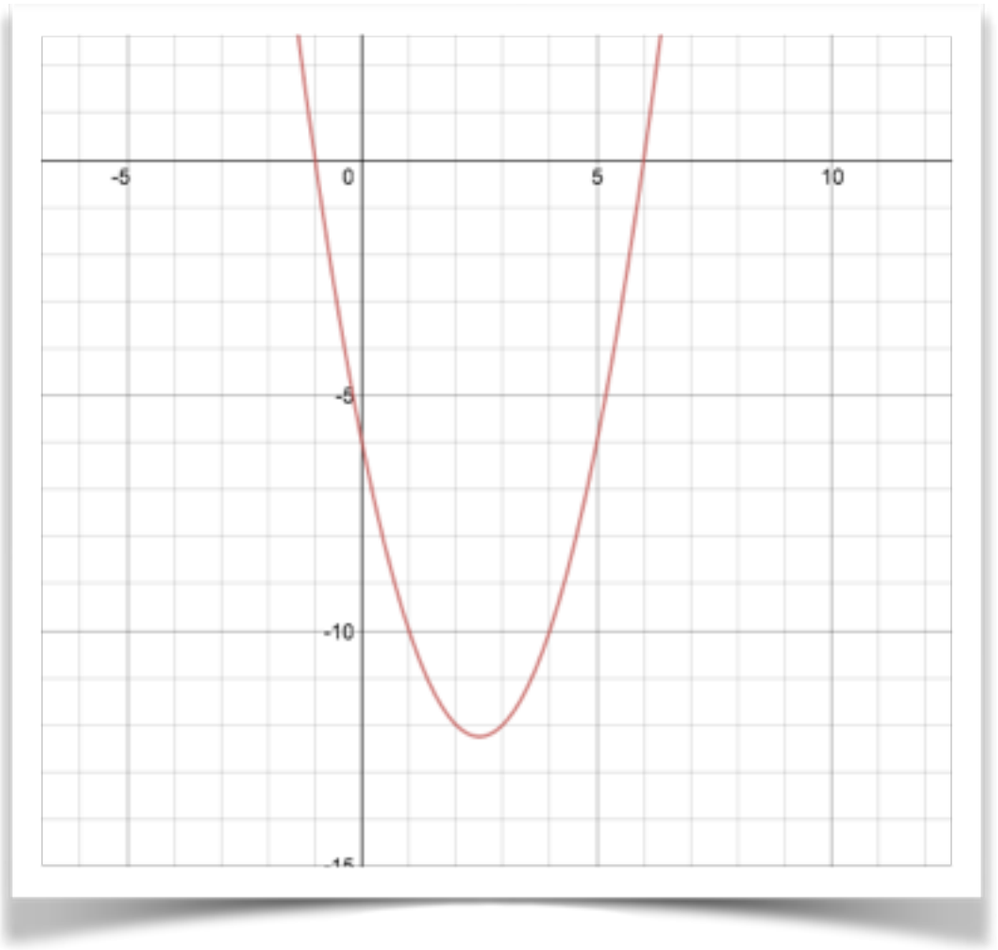
becomes

Sketch a diagram of two rectangles with an area of 24 cm^2.

Find the roots of the following equation:

$$y=x^2-5x-6$$

becomes



Write two quadratic equations with roots at x=6 and x=-1.

	Beginning	Middle	End
15 minutes	Start with the answer	WYR-ize the problem	
1-2 hours			
1 day			

wyrmath.wordpress.com

Would You Rather...

Buy a 5 pound jug of honey for $15.35
OR
Three 1 pound 8 ounce bottles of honey for $14.39

wyrmath.wordpress.com

Would you rather...

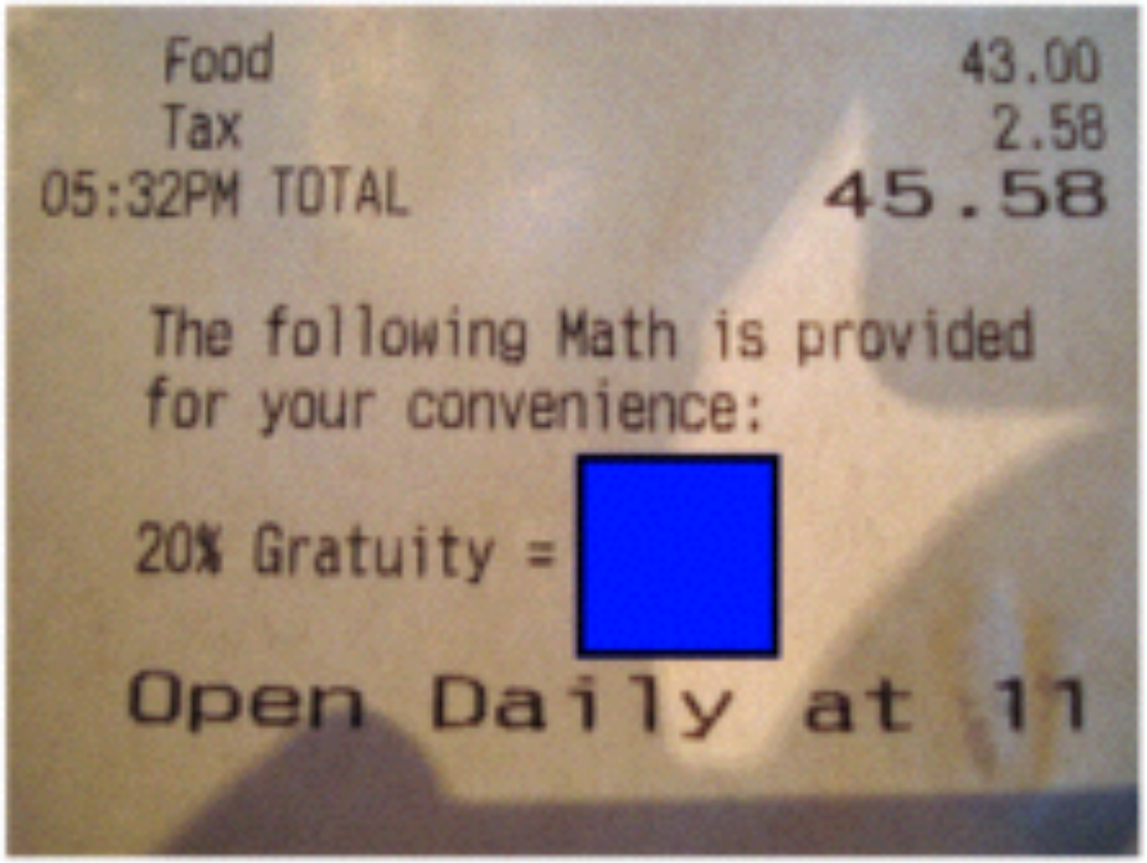
receive tip A or tip B?


RESTAURANT RECEIPT

HOUSE RED 1/2 CARAFE	$ 7.95
CAESAR SALAD	$ 4.95
FRENCH ONION SOUP	$ 4.95
VEAL PARMESAN	$12.95
NEW YORK SIRLOIN	$15.95
Tax	$ 2.35
Amount	$49.10
TIP	8—
TOTAL	57.10

Thank you.
We appreciate your business.

A



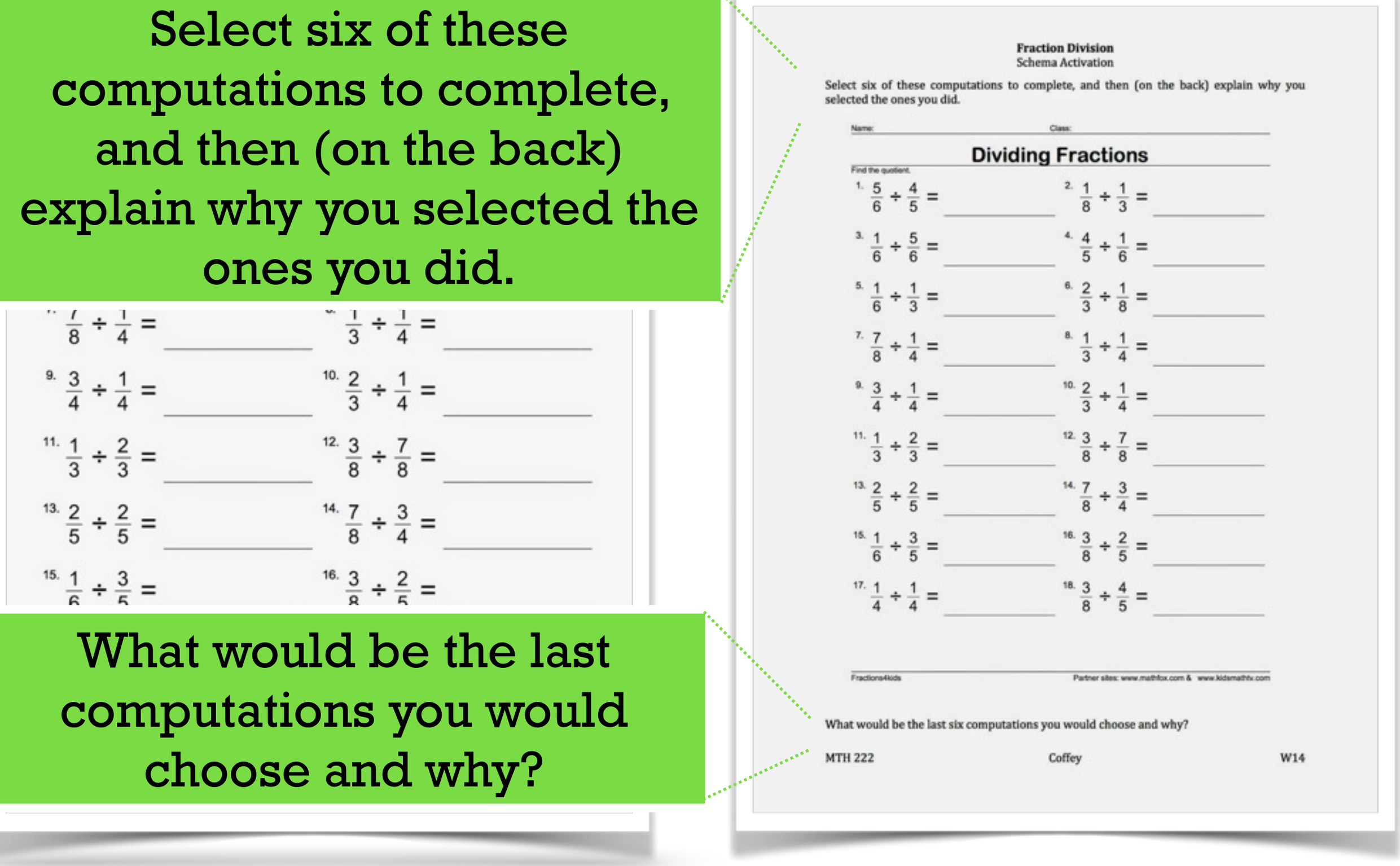
B

wyrmath.wordpress.com

	Beginning	Middle	End
15 minutes	Start with the answer	WYR-ize the problem	Choose your own problem
1-2 hours			
1 day			

Select six of these computations to complete, and then (on the back) explain why you selected the ones you did.

What would be the last computations you would choose and why?



Fraction Division
Schema Activation

Select six of these computations to complete, and then (on the back) explain why you selected the ones you did.

Name: Class:

Dividing Fractions

Find the quotient.

1. $\frac{5}{6} \div \frac{4}{5} =$ _____
2. $\frac{1}{8} \div \frac{1}{3} =$ _____
3. $\frac{1}{6} \div \frac{5}{6} =$ _____
4. $\frac{4}{5} \div \frac{1}{6} =$ _____
5. $\frac{1}{6} \div \frac{1}{3} =$ _____
6. $\frac{2}{3} \div \frac{1}{8} =$ _____
7. $\frac{7}{8} \div \frac{1}{4} =$ _____
8. $\frac{1}{3} \div \frac{1}{4} =$ _____
9. $\frac{3}{4} \div \frac{1}{4} =$ _____
10. $\frac{2}{3} \div \frac{1}{4} =$ _____
11. $\frac{1}{3} \div \frac{2}{3} =$ _____
12. $\frac{3}{8} \div \frac{7}{8} =$ _____
13. $\frac{2}{5} \div \frac{2}{5} =$ _____
14. $\frac{7}{8} \div \frac{3}{4} =$ _____
15. $\frac{1}{6} \div \frac{3}{5} =$ _____
16. $\frac{3}{8} \div \frac{2}{5} =$ _____
17. $\frac{1}{4} \div \frac{1}{4} =$ _____
18. $\frac{3}{8} \div \frac{4}{5} =$ _____

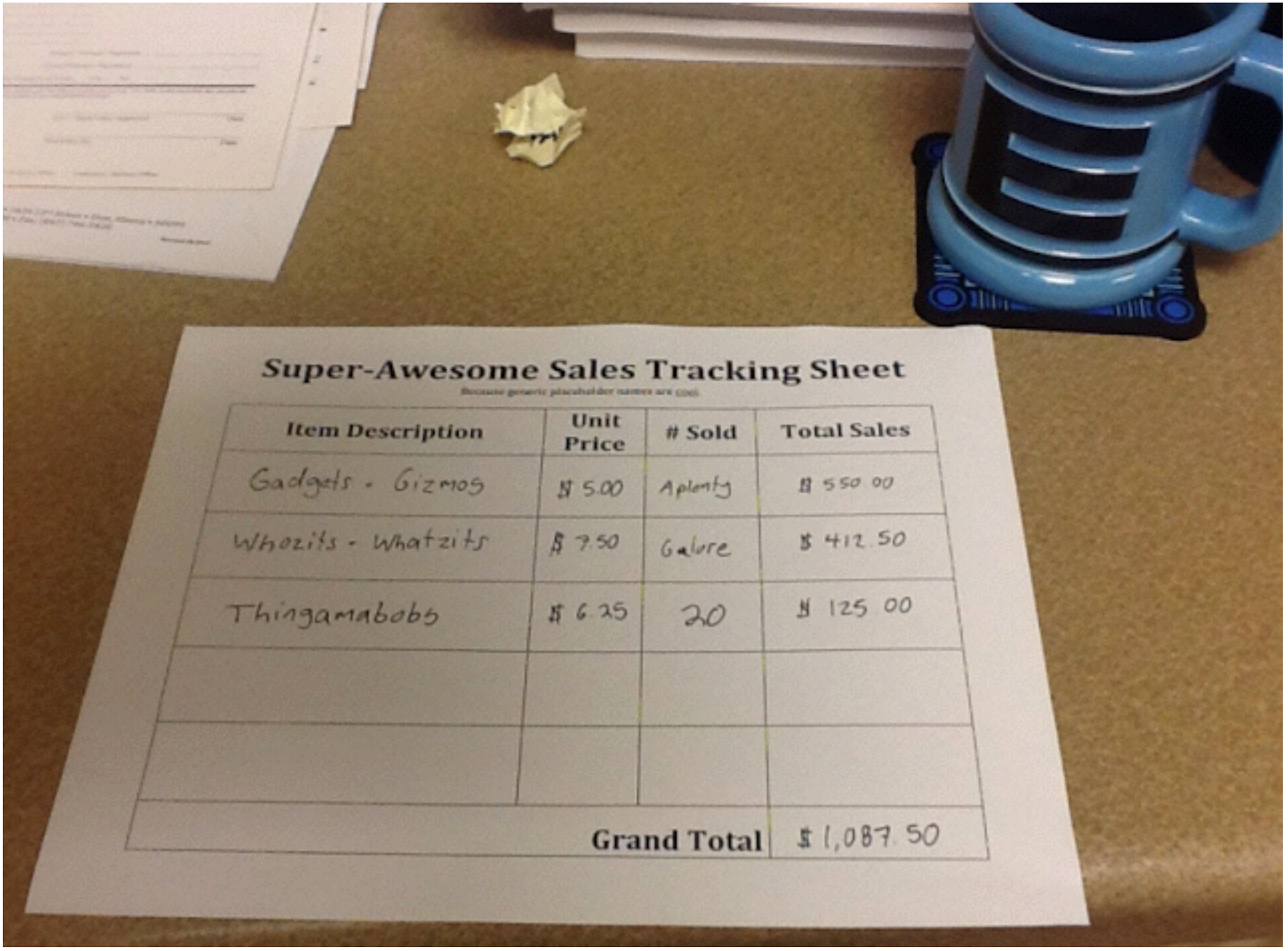
Fractions4kids Partner sites: www.mathfox.com & www.kidsmathtv.com

What would be the last six computations you would choose and why?

MTH 222 Coffey W14

From David Coffey (@delta_dc) http://deltascape.blogspot.com/

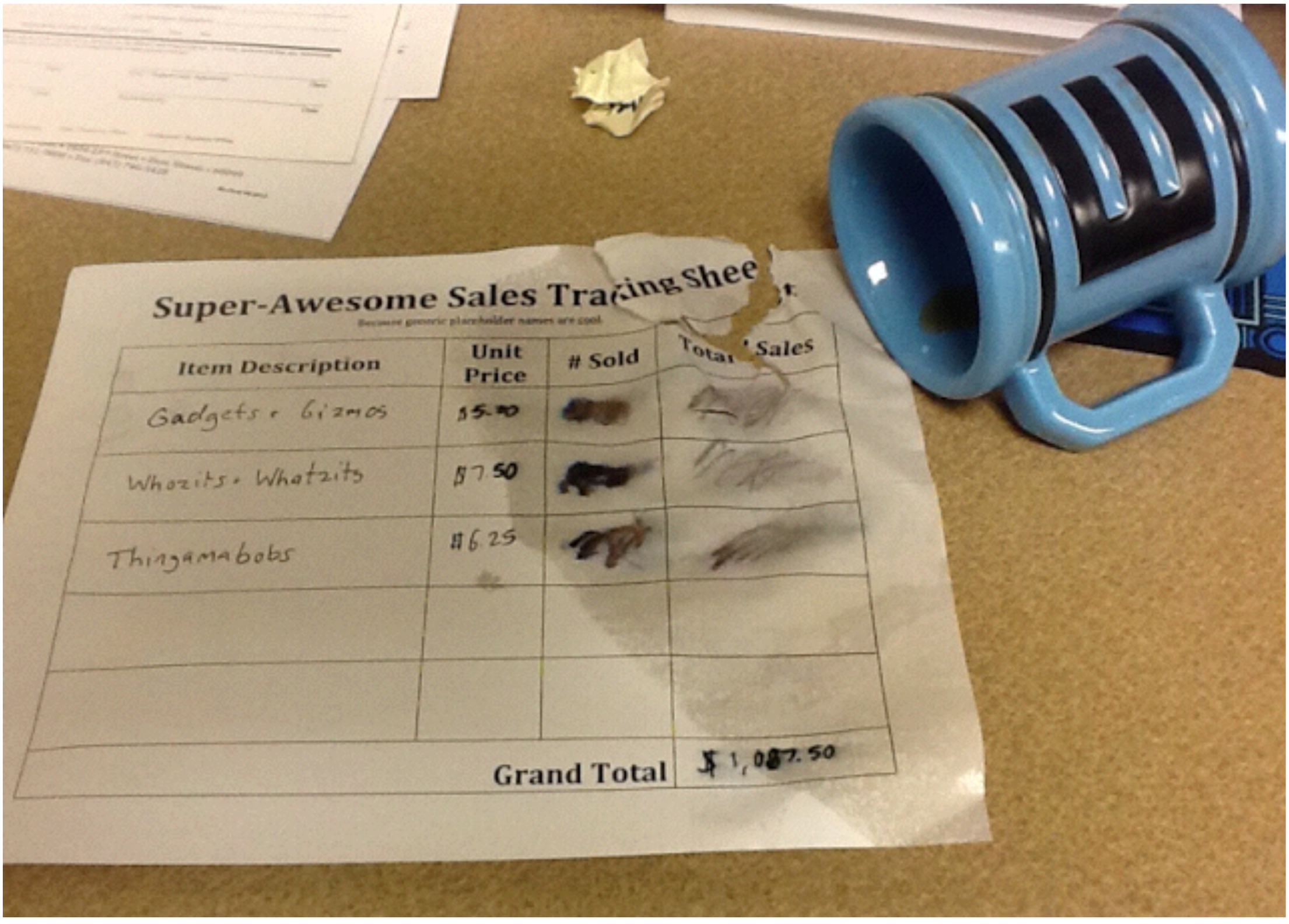
	Beginning	Middle	End
15 minutes	Start with the answer	WYR-ize the problem	Choose your own problem
1-2 hours	Blurs and Bleeps		
1 day			



Super-Awesome Sales Tracking Sheet

Because generic placeholder names are cool.

Item Description	Unit Price	# Sold	Total Sales
Gadgets - Gizmos	$ 5.00	Aplenty	$ 550.00
Whozits - Whatzits	$ 7.50	Galore	$ 412.50
Thingamabobs	$ 6.25	20	$ 125.00
		Grand Total	$ 1,087.50


Super-Awesome Sales Tracking Sheet
Because generic placeholder names are cool.
Item Description
Unit Price
Sold
Total Sales
Gadgets & Gizmos
$5.00
Whozits & Whatzits
$7.50
Thingamabobs
$6.25
Grand Total
$1,087.50


Coca-Cola
7.5 FL OZ
(222 mL)
140
CALORIES
PER CAN
12 FL OZ
(355 mL)

	Beginning	Middle	End
15 minutes	Start with the answer	WYR-ize the problem	Choose your own problem
1-2 hours	Blurs and Bleeps	Remove the Steps	
1 day			

But don't throw 'em away!

S-CP The Titanic 1

Task

On April 15, 1912, the Titanic struck an iceberg and rapidly sank with only 710 of her 2,204 passengers and crew surviving. Data on survival of passengers are summarized in the table below. (Data source: http://www.encyclopedia-titanica.org/titanic-statistics.html)

	Survived	Did not survive	Total
First class passengers	201	123	324
Second class passengers	118	166	284
Third class passengers	181	528	709
Total passengers	500	817	1317

a. Calculate the following probabilities. Round your answers to three decimal places.

i. If one of the passengers is randomly selected, what is the probability that this passenger was in first class?

ii. If one of the passengers is randomly selected, what is the probability that this passenger survived?

iii. If one of the passengers is randomly selected, what is the probability that this passenger was in first class and survived?

iv. If one of the passengers is randomly selected from the first class passengers, what is the probability that this passenger survived? (That is, what is the probability that the passenger survived, given that this passenger was in first class?)

v. If one of the passengers who survived is randomly selected, what is the probability that this passenger was in first class?

vi. If one of the passengers who survived is randomly selected, what is the probability that this passenger was in third class?

b. Why is the answer to part (a.iv) larger than the answer to part (a.iii)?

c. Why is the answer to part (a.v) larger than the answer to part (a.vi)?

d. What other questions can you ask and answer using information in the given table? List at least three.

Surviving the Titanic

On April 15, 1912, the Titanic struck an iceberg and rapidly sank with only 710 of her 2,204 passengers and crew surviving. Data on survival of passengers are summarized in the table below.

	Survived	Did not survive	Total
First class passengers	202	123	325
Second class passengers	118	167	285
Third class passengers	178	528	706
Total passengers	498	818	1316

What class of passengers had the best chances of surviving the sinking of the Titanic? Who had the worst? Support your answer using two methods and showing all relevant work. Then explain what your answer means and the process you used to get there mathematically.

Surviving the Titanic
On April 15, 1912, the Titanic struck an iceberg and rapidly sank with only 710 of her 2,204 passengers and crew surviving. Data on survival of passengers are summarized in the table below.

	Survived	Did not survive	Total
First class passengers	202	123	325
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Total passengers	498	818	1316

What do you notice?

What do you wonder?

A Wonderland Lost

The Amazon rain forest is gradually being destroyed by pollution and agricultural and industrial development. For simplicity, suppose that each year, 10% of the remaining forest is destroyed. Assume, also for simplicity, that the present area of the Amazon rain forest is 1,200,000 square miles.

1. **a.** What will the area of the forest be after 1 year of this destruction process?
   b. What will the area of the forest be after 2 years of this destruction process?
2. Make a graph showing your results from Question 1 and continuing through 5 years of the destruction process. Include the present situation as a point on your graph.
3. Find a rule for how much rain forest will remain after X years. That is, express the area of the rain forest as a function of X.

"Find a rule…"

1. **a.** What will the area of the forest be after 1 year of this destruction process?
   b. What will the area of the forest be after 2 years of this destruction process?
2. Make a graph showing your results from Question 1 and continuing through 5 years of the destruction process. Include the present situation as a point on your graph.
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Hint Cards

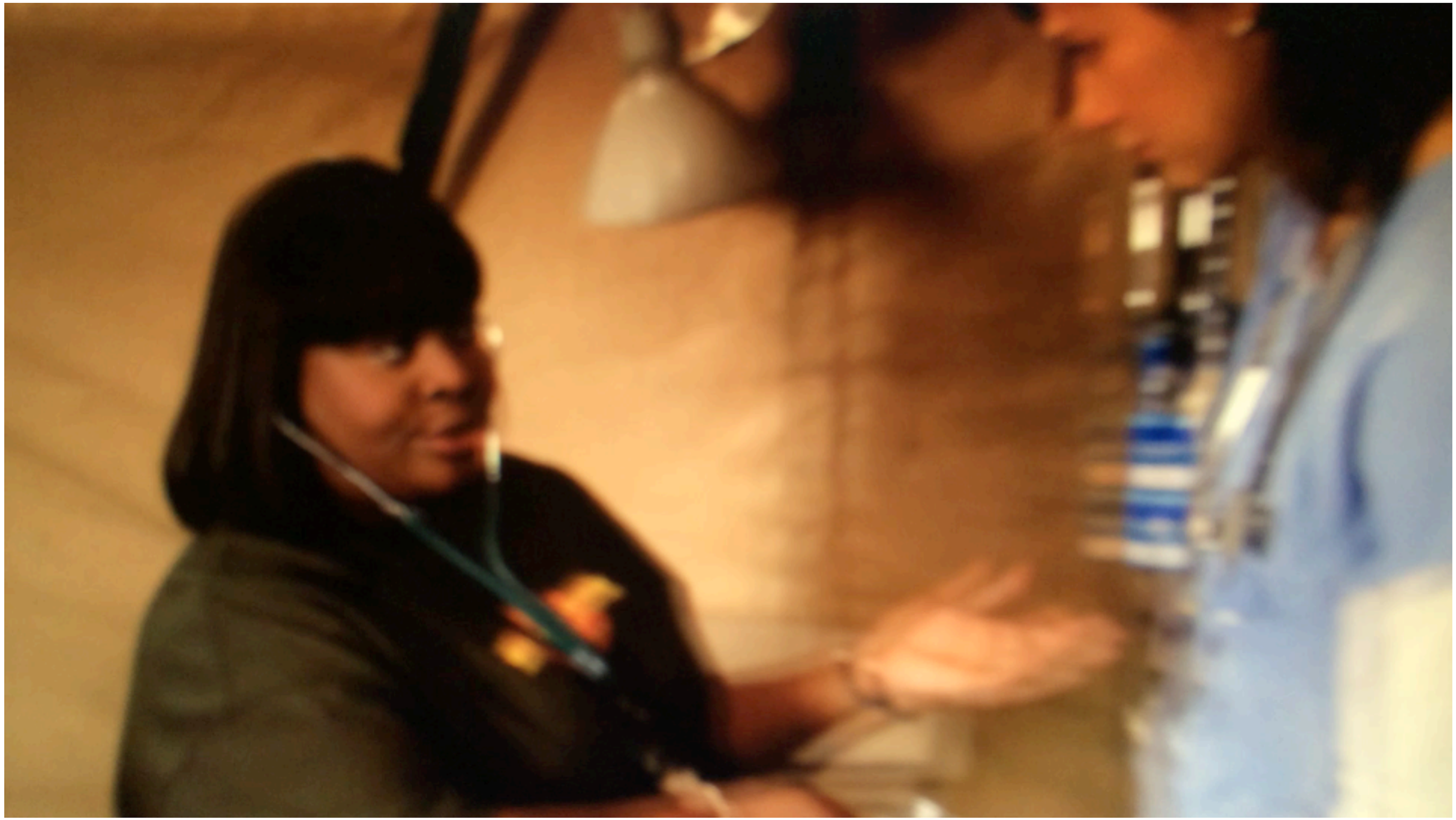
What will the area of the forest be after year 1?

What will the area of the forest be after year 2?

Make a graph showing your results continuing through 5 years.

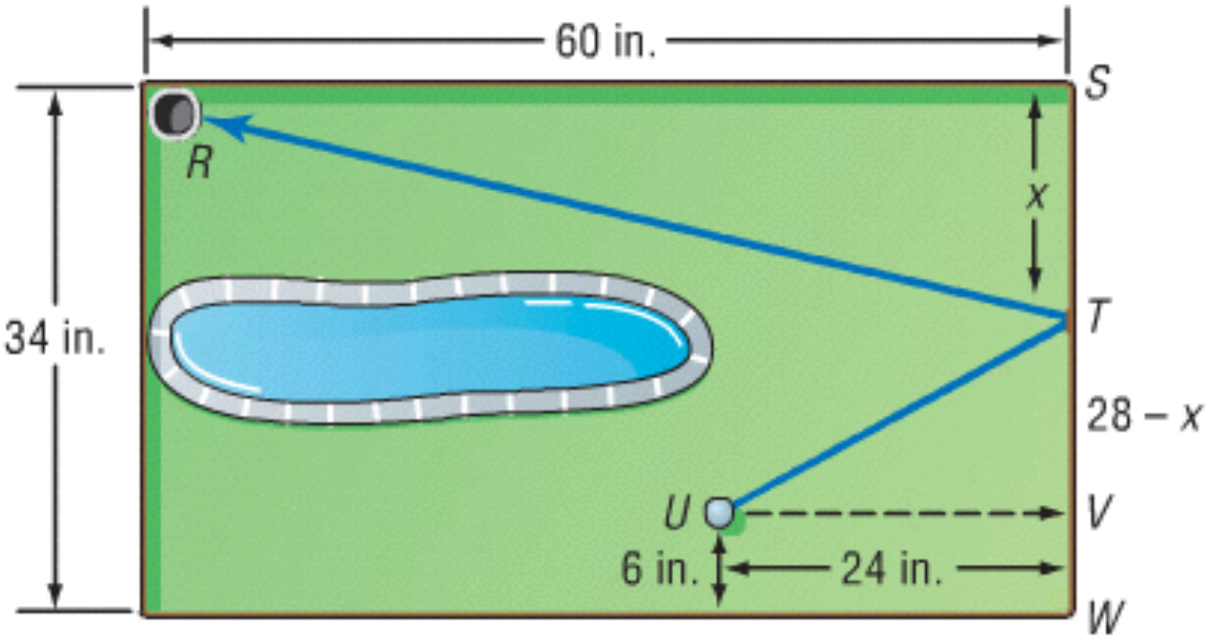
Small group workshops

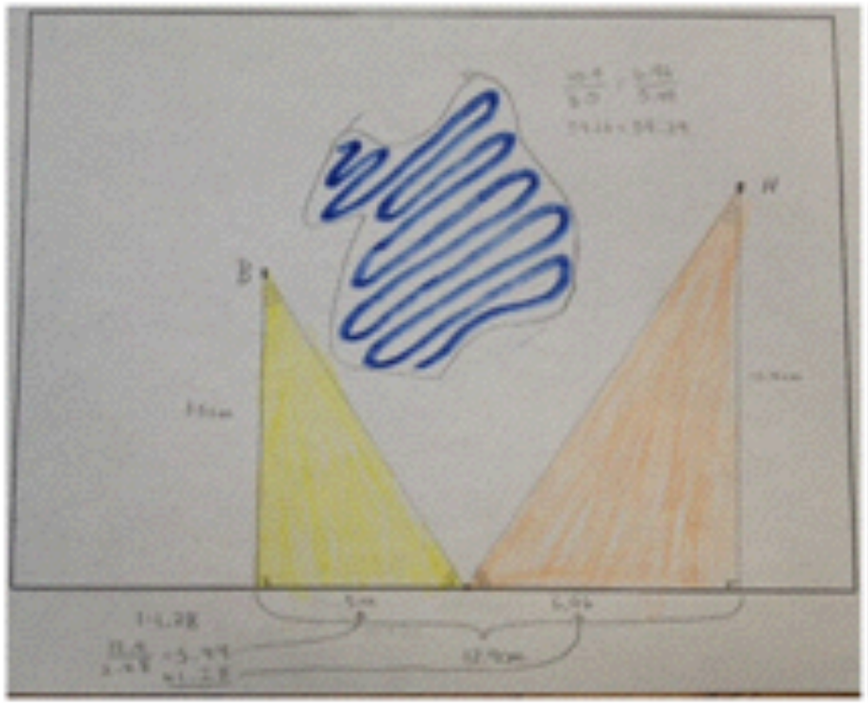
Debrief Questions

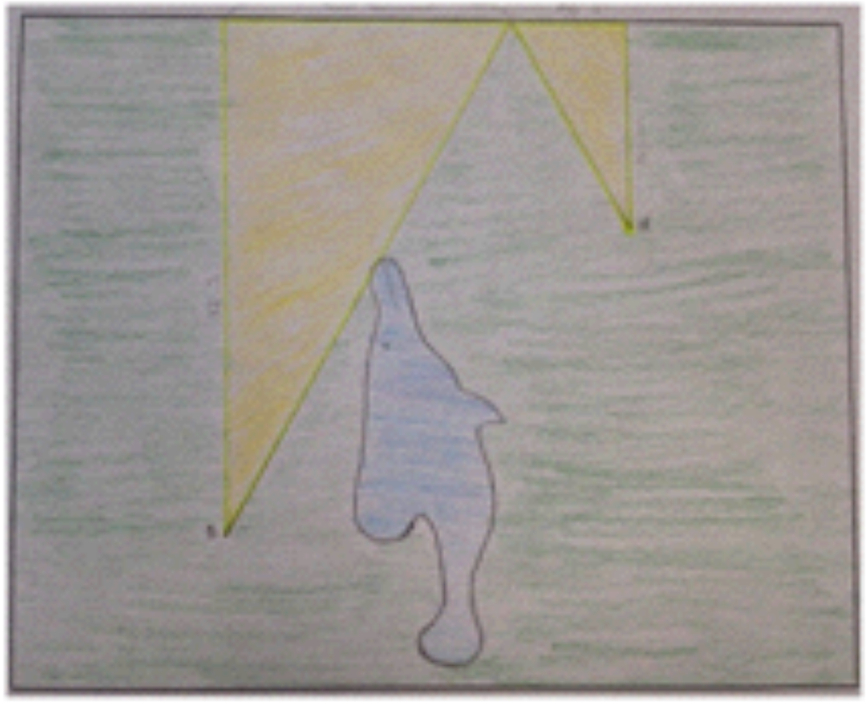


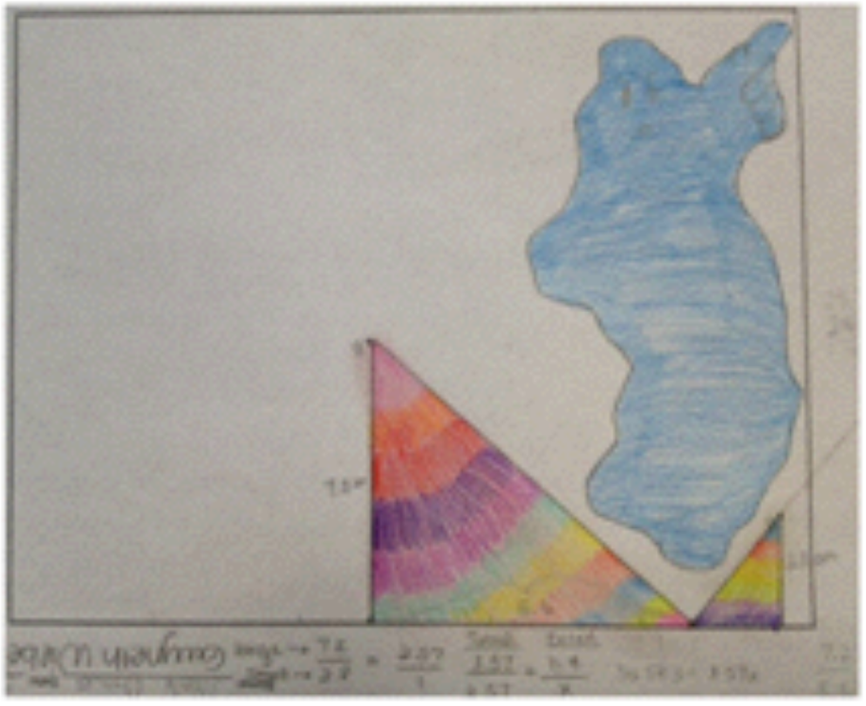
	Beginning	Middle	End
15 minutes	Start with the answer	WYR-ize the problem	Choose your own problem
1-2 hours	Blurs and Bleeps	Remove/Use the Steps	Do the dang thing
1 day			

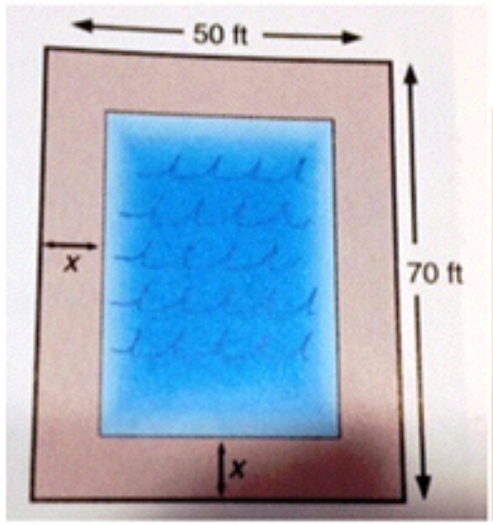
24. GOLF Jessica is playing miniature golf on a hole like the one shown at the right. She wants to putt her ball U so that it will bank at T and travel into the hole at R. Use similar triangles to find where Jessica's ball should strike the wall.

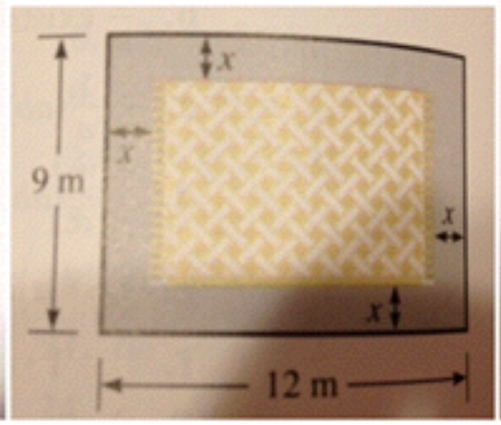


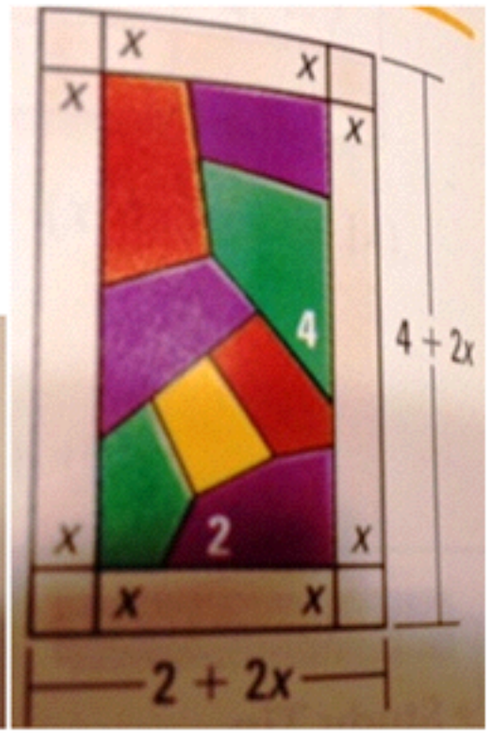

B
W

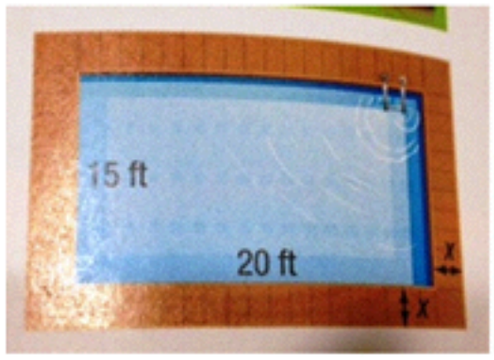






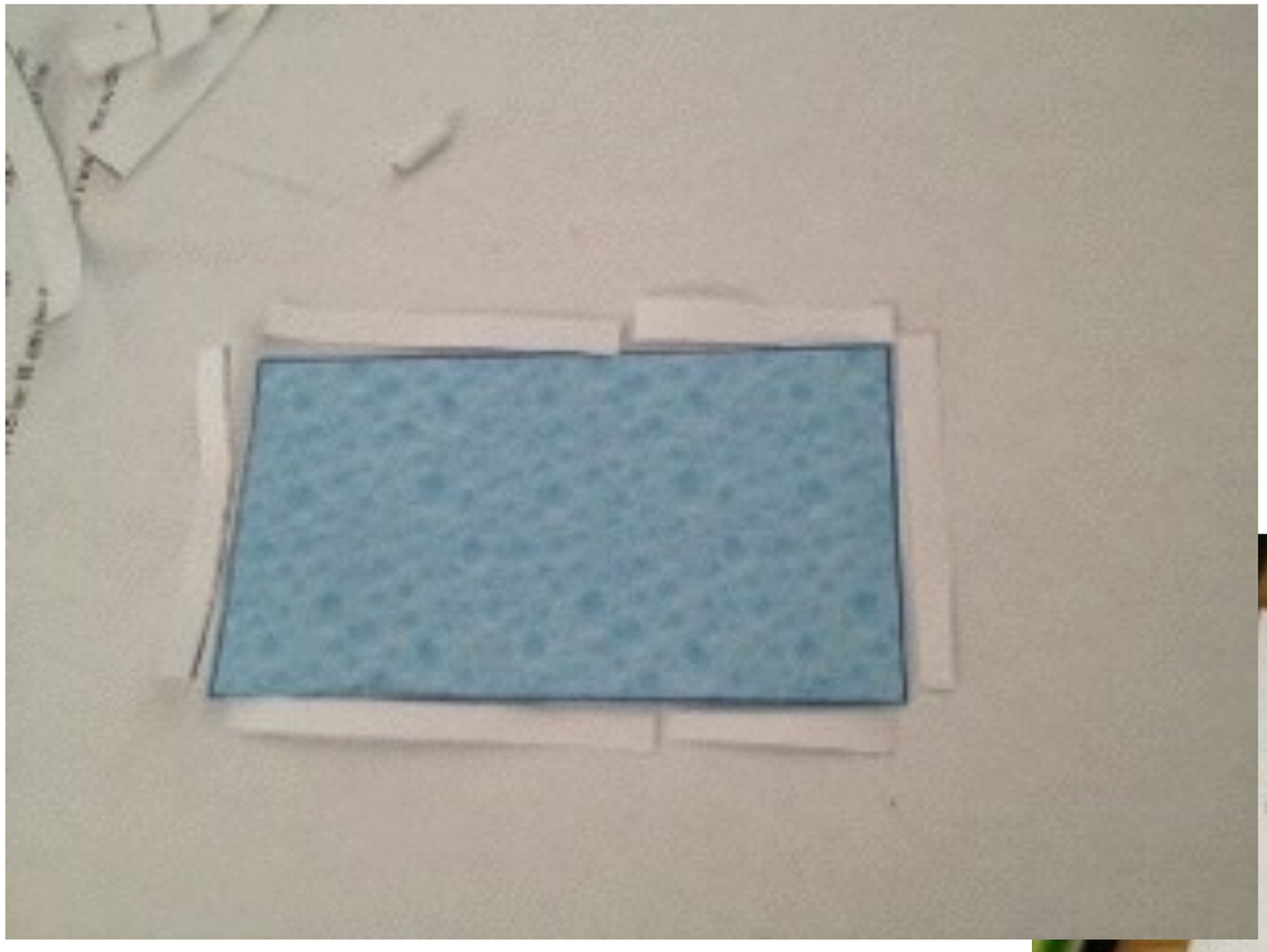


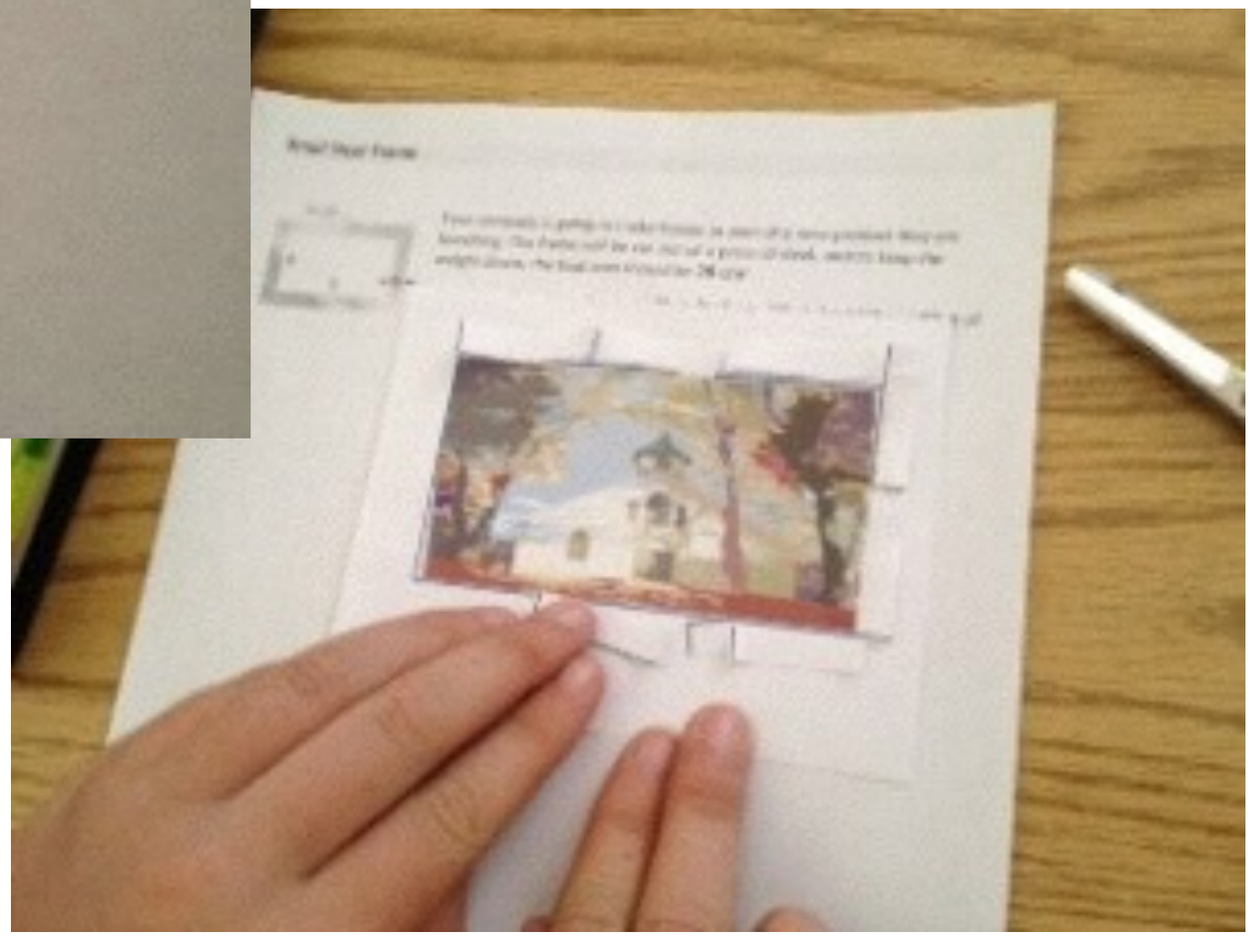




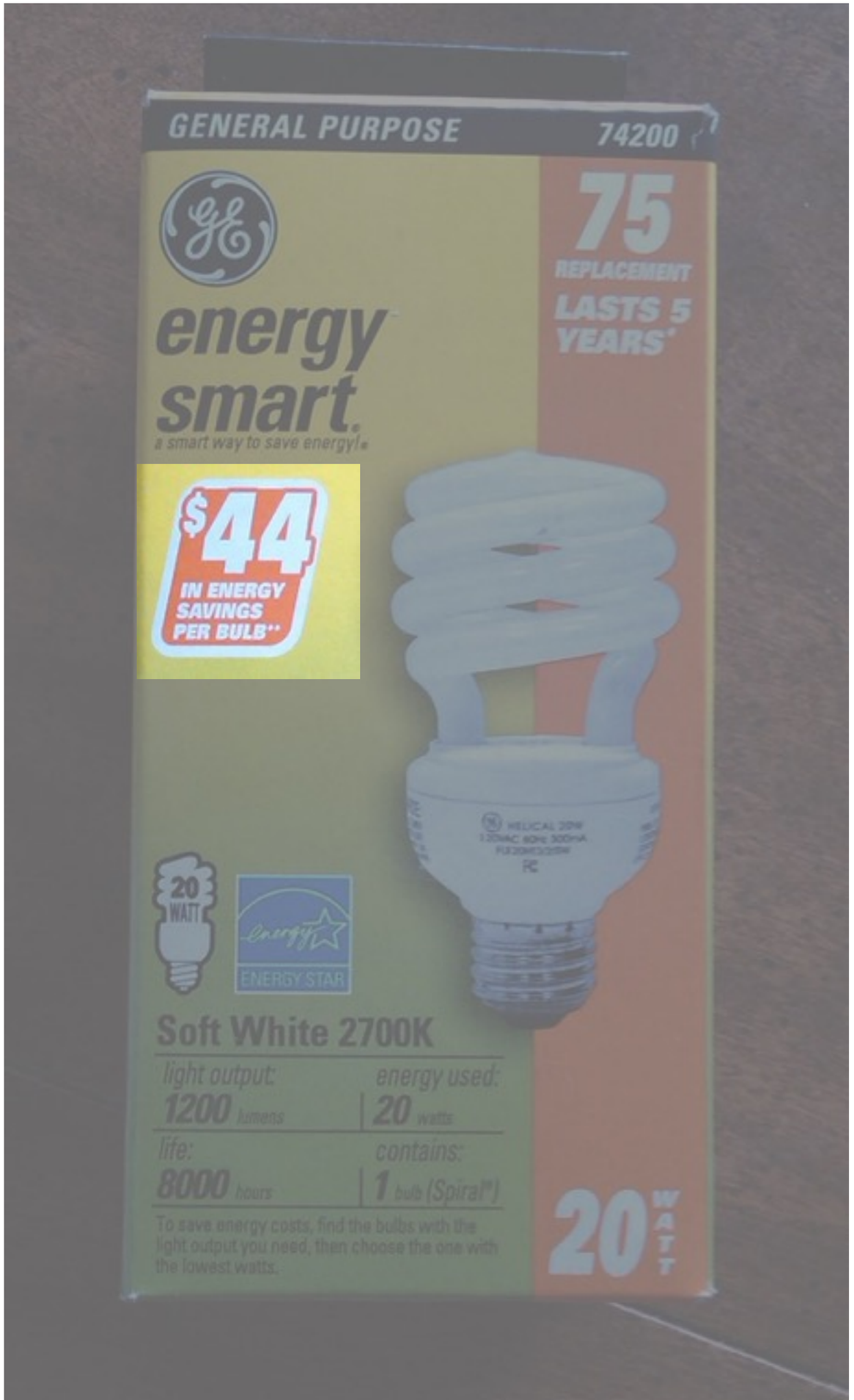
4 A rectangular portrait measures 50 cm by 70 cm. It is surrounded by a rectangular frame of uniform width. If the area of the frame is the same as the area of the portrait, what is the approximate width of the frame?

59. A rectangular pool with dimensions of 25 by 40 ft is surrounded by a walk with a uniform width. If the area of the walk is 504 sq ft, find the width of the walk.





	Beginning	Middle	End
15 minutes	Start with the answer	WYR-ize the problem	Choose your own problem
1-2 hours	Blurs and Bleeps	Remove/Use the Steps	Do the dang thing
1 day	Ask: “Why is this important?”		


GENERAL PURPOSE
74200
75
REPLACEMENT
LASTS 5 YEARS*
energy smart
a smart way to save energy!
$44
IN ENERGY SAVINGS PER BULB**
20 WATT
ENERGY STAR
Soft White 2700K
light output:
1200 lumens
energy used:
20 watts
life:
8000 hours
contains:
1 bulb (Spiral*)
To save energy costs, find the bulbs with the light output you need, then choose the one with the lowest watts.
20 WATT

	Beginning	Middle	End
15 minutes	Start with the answer	WYR-ize the problem	Choose your own problem
1-2 hours	Blurs and Bleeps	Remove/Use the Steps	Do the dang thing
1 day	Ask: "Why is this important?"	Do the research	

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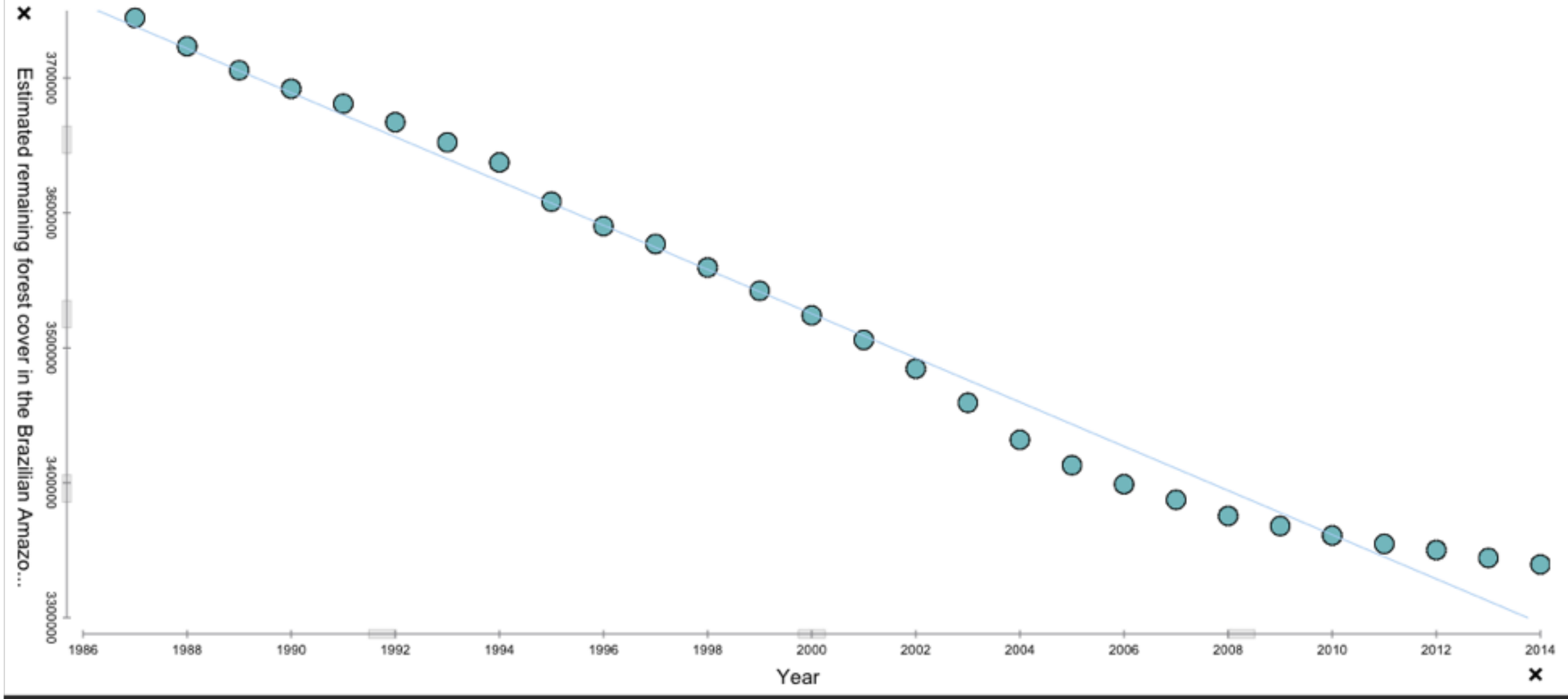
The Amazon rain forest is gradually being destroyed by pollution and agricultural and industrial development. For simplicity, suppose that each year, 10% of the remaining forest is destroyed. Assume, also for simplicity, that the present area of the Amazon rain forest is 1,200,000 square miles.

1. **a.** What will the area of the forest be after 1 year of this destruction process?
   b. What will the area of the forest be after 2 years of this destruction process?
2. Make a graph showing your results from Question 1 and continuing through 5 years of the destruction process. Include the present situation as a point on your graph.
3. Find a rule for how much rain forest will remain after X years. That is, express the area of the rain forest as a function of X.
4. Explain how this situation and graph relate to Alice's situation.

Period[22]	Estimated remaining forest cover in the Brazilian Amazon (km²)	Annual forest loss (km²)	Percent of 1970 cover remaining	Total forest loss since 1970 (km²)
Pre–1970	4,100,000	—	—	—
1977	3,955,870	21,130	96.5%	144,130
1978–1987	3,744,570	21,130	91.3%	355,430
1988	3,723,520	21,050	90.8%	376,480
1989	3,705,750	17,770	90.4%	394,250
1990	3,692,020	13,730	90.0%	407,980
1991	3,680,990	11,030	89.8%	419,010
1992	3,667,204	13,786	89.4%	432,796
1993	3,652,308	14,896	89.1%	447,692
1994	3,637,412	14,896	88.7%	462,588
1995	3,608,353	29,059	88.0%	491,647
1996	3,590,192	18,161	87.6%	509,808
1997	3,576,965	13,227	87.2%	523,035
1998	3,559,582	17,383	86.8%	540,418
1999	3,542,323	17,259	86.4%	557,677
2000	3,524,097	18,226	86.0%	575,903
2001	3,505,932	18,165	85.5%	594,068
2002	3,484,538	21,394	85.0%	615,462
2003	3,459,291	25,247	84.4%	640,709
2004	3,431,868	27,423	83.7%	668,132
2005	3,413,022	18,846	83.2%	686,978

Amazon Rainforest Coverage

Estimated remaining forest cover in the Brazilian Amazon (kmÂ²) = (-16382.15873) Year + 36289620.54 | R^2 = 0.9841



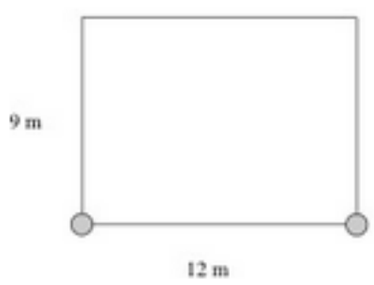
tuvalabs.com

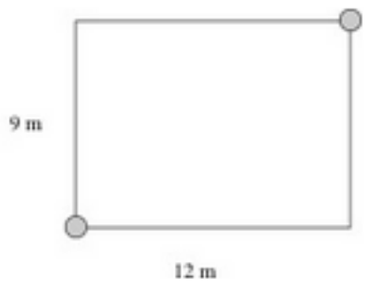
SOURCE: http://en.wikipedia.org/wiki/Deforestation_of_the_Amazon_rainforest#cite_note-22

	Beginning	Middle	End
15 minutes	Start with the answer	WYR-ize the problem	Choose your own problem
1-2 hours	Blurs and Bleeps	Remove/Use the Steps	Do the dang thing
1 day	Ask: “Why is this important?”	Do the research	No really, DO THE DANG THING

Selina has a 9 meter by 12 meter lawn that she wants to water. She has two sprinklers, each of which can water grass within an 8.4-meter radius. Selina wants to set up the two sprinklers so that they are on corners of the lawn. She would like for the sprinklers to water as much of the lawn as possible, because she will have to manually water the part of the lawn that is not covered by the sprinklers.

a. Selina considers two different strategies for placing the sprinklers. One strategy is to put the sprinklers at opposite ends of a 12-meter side of the lawn. The other is to put the sprinklers at opposite corners of the lawn. (See the figures below.) Which strategy appears to be best? Justify your answer.





b. If Selina chooses the better of these two strategies, what percentage of the lawn will she be able to water with the sprinklers?

c. If Selina is allowed to put sprinklers in the interior of her lawn, how many sprinklers does she need to water the entire lawn?

Nat Banting | musingmathematically.blogspot.com

Desert Bighorn Sheep

Among the many species that have been endangered at one time or another is the desert bighorn sheep. The desert bighorn sheep is important to preserve because it is sensitive to human-induced problems in the environment and is a good indicator of land health.

Desert Bighorn Ram
Courtesy of Jeff Heinatz, Photographer. www.llnet.net/~heinatz

It is estimated that in the 1600s, there were about 1.75 million bighorn sheep in North America. By 1960, the bighorn sheep population had dropped to about 17,000.

Wildlife biologists have data showing that in 1880, there were around 1,500 bighorn sheep in west Texas. By 1955, the population had dwindled to 25.

Efforts to reintroduce desert bighorn sheep in Texas began around 1957. By 1993, there were about 400 desert bighorn sheep roaming free or in captivity.

1. Assume that, from 1880 to 1955, the annual percentage decrease in the bighorn sheep population was fairly constant. Model the population with an exponential function, $P = ab^t$, where t is the number of years since 1880, a is the population of the bighorn sheep in west Texas in 1880, and P is the annual population in west Texas.

2. Assume that, starting in 1957 when reintroduction began, the annual percentage increase in the bighorn sheep population was fairly constant.

Desert Bighorn Sheep

Texas Parks and Wildlife Magazine
www.tpwd.state.tx.us

To the students of New Tech High:

Throughout the ecological history of Texas, the plight of the Desert Bighorn Sheep has been publicized and, we think, partially solved. However, we need you to evaluate whether or not the species has become robust enough to allow its hunting again.

Among the many species that have been endangered at one time or another is the desert bighorn sheep. The desert bighorn sheep is important to preserve because it is sensitive to human-induced problems in the environment and is a good indicator of land health.

We have data on the Desert Bighorn going back to the 1800's. We noticed that the population had significantly dwindled almost to the point of extinction in 1950. The cause looked lost for the Desert Bighorn.

Efforts to Repopulate the Species

Efforts to reintroduce desert bighorn sheep in Texas began around 1957. By 1993, there were about 400 desert bighorn sheep roaming free or in captivity.

Issuing of Hunting Licenses

Authorities are beginning to issue licenses to hunt Desert Bighorns in Texas (see article here). It is your task to write an article examining the data from desert bighorns in Texas, comparing them to other species that have undergone successful repopulation efforts, and offering suggestions whether or not it is safe again to issue hunting licenses without the threat of extinction for the Desert Bighorns.

What we would like you to do is analyze the existing data leading up to 1957 and the data after 1957. This analysis is critical in evaluating our efforts of repopulating the species in Texas.

In the end, we would like you to write an article for *Texas Parks and Wildlife* Magazine, detailing both your analysis and your conclusions as to the reissuing of hunting permits.

Sincerely,
Texas Parks and Wildlife Magazine

	Beginning	Middle	End
15 minutes	Start with the answer	WYR-ize the problem	Choose your own problem
1-2 hours	Blurs and Bleeps	Remove/Use the Steps	Do the dang thing
1 day	Ask: “Why is this important?”	Do the research	No really, DO THE DANG THING

WHY HOW WHAT

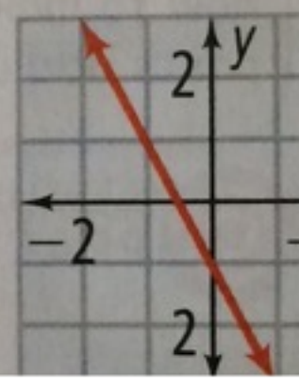
Adapting tasks from existing curricula

55. **Online Video Games** Angie and Kenny play online video games. A package costs $20. If their total Kenny buys 1 softwar

many games did

47 Two car-rental companies are advertising special rates for a midsize car. Wendell's Motor Rentals is advertising a rate of $35 a day plus $0.20 per mile traveled, tax included. Marina's Car Rentals is advertising a rate of $25 a day plus $0.40 per mile traveled, tax included. Which graph correctly compares the cost of renting a midsize car for one day from each company?

61. Which equation represents the line that passes through (5, −8) and is parallel to the line at the right?



F $y = 2x + 2$

G $y + 2x = 2$

H $y = -2x$

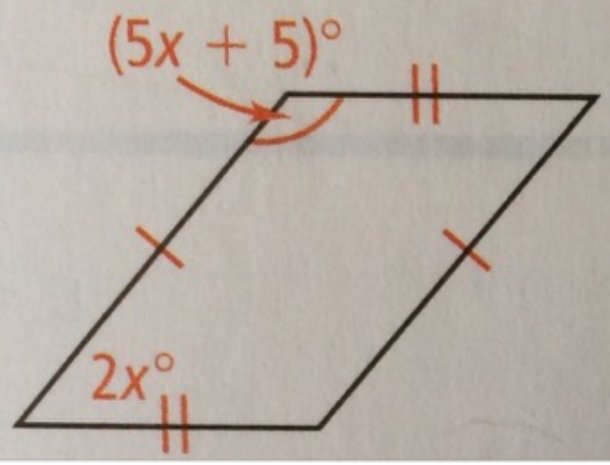
I $y - 2x = 2$

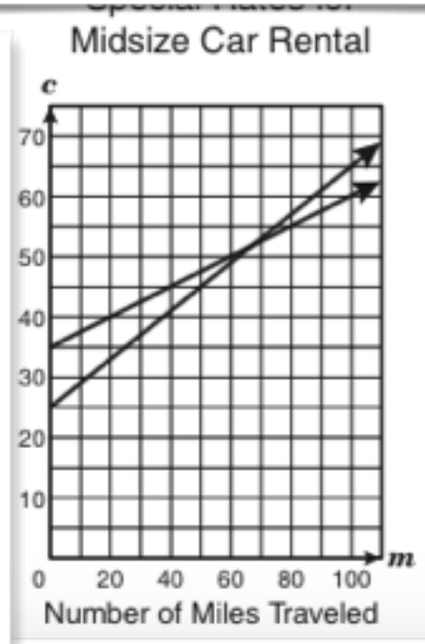
62. What are the factors of the expression $x^3 - 4x$?

A $x^3, -4x$ B $x, x^2 - 4$ C $x - 2, x + 2$ D $x, x - 2, x + 2$

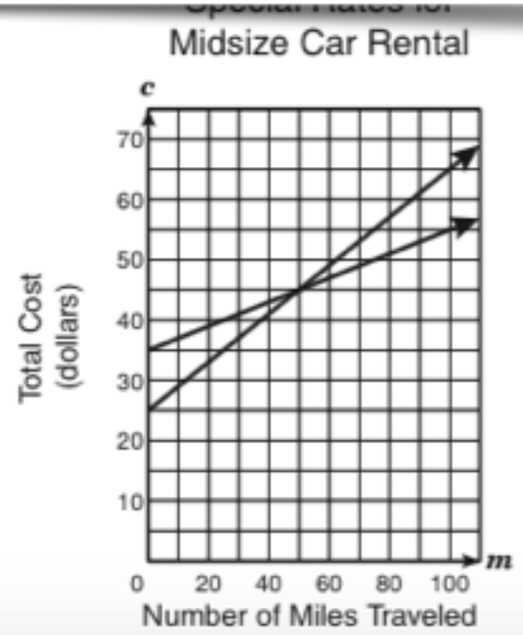
Geometry Find the value of x.

61.





D



Next Steps

Where can I go to practice my adaptation chops?

Makeover Mondays
blog.mrmeyer.com

Twitter #mathchat
#MTBoS #probchat

emergentmath.com/
nctm_adaptation

Adaptation.

Geoff Krall | @emergentmath | emergentmath.com