THREE STEPS TO CREATE A CLASSROOM WHERE STUDENTS ARE EXCITED TO LEARN MATHEMATICS

ROBERT KAPLINSKY

robert@robertkaplinsky.com

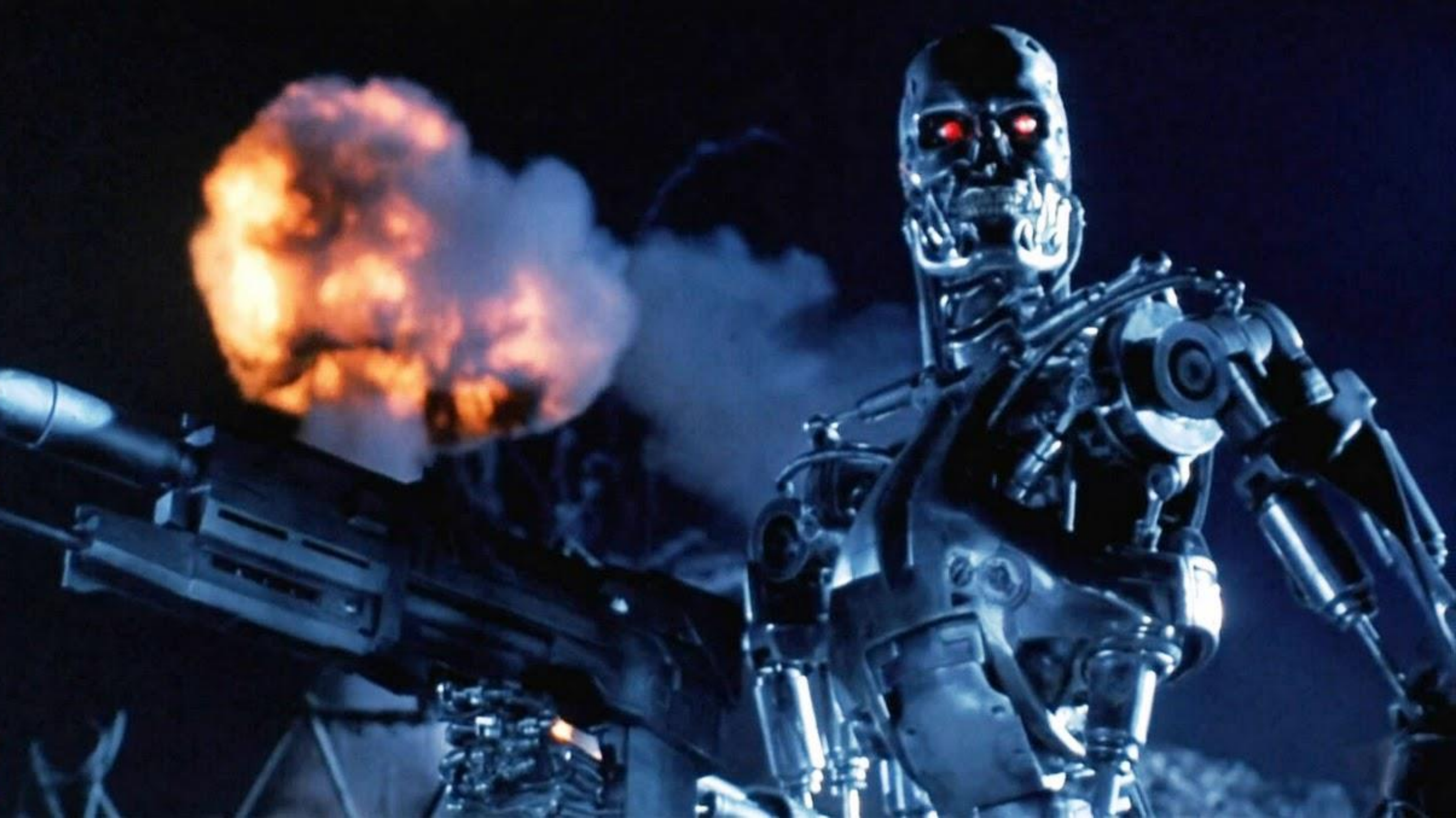
robertkaplinsky.com

@robertkaplinsky

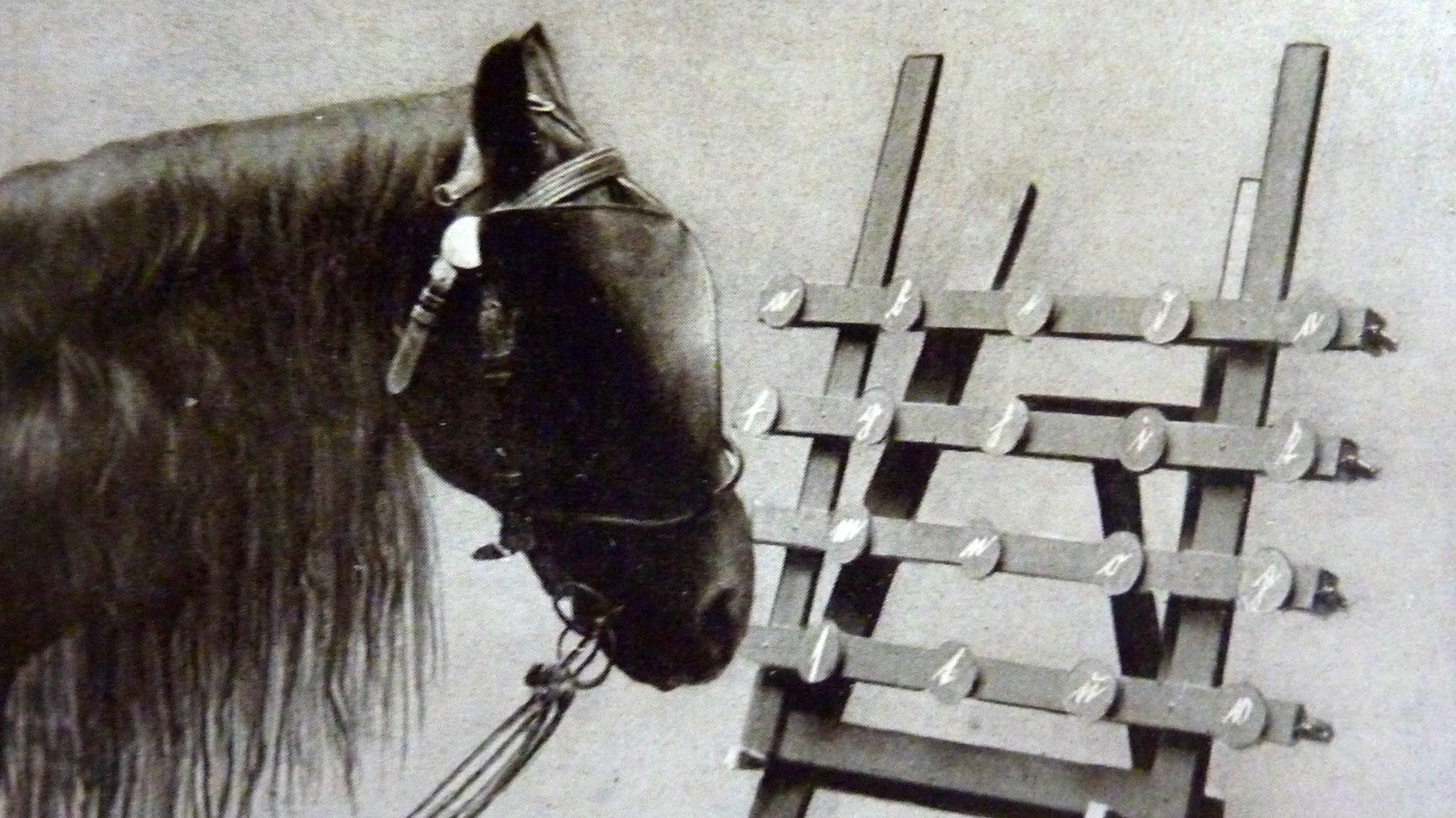
paradigm shift

GOALS

- ❑ CORRECT ANSWERS = UNDERSTANDING
- ❑ MAKE OUR LESSONS UNFORGETTABLE
- ❑ RECONSIDER USING WORD PROBLEMS



$\frac{2}{3} + \frac{3}{4} =$
26743 : 8 =
12986 × 3 =

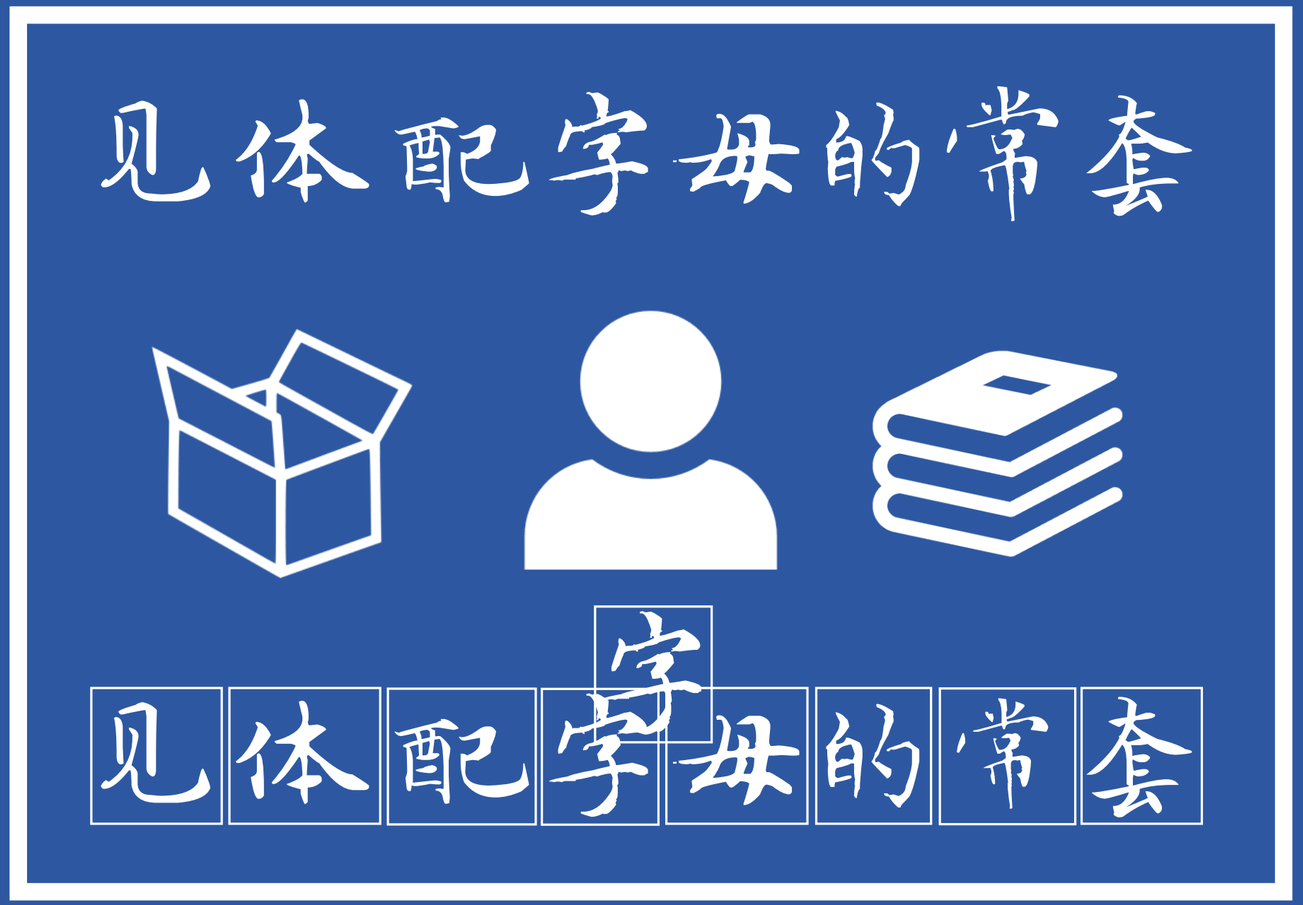


Yes… no… uh… yes… maybe?

MANY STUDENTS

TURING TEST

CHINESE ROOM



DISCUSSION TIME

- How is it possible for students to get correct answers yet not understand what they did?
- How can we tell if the problems we use are Chinese room and horse proof?

GOALS

- [x] CORRECT ANSWERS = UNDERSTANDING
- [ ] MAKE OUR LESSONS UNFORGETTABLE
- [ ] RECONSIDER USING WORD PROBLEMS

February 28 ·

If a theif forces you to take money out of an ATM, do not argue or resist. What you do is punch in your pin # backwards. EX: if its 1234, you'll type 4321. When you do that, the money will come out but will be stuck in the slot. The machine will immediately alert the local police without the robbers knowledge & begin taking photos of the suspect.
Every ATM has the feature. Stay safe.

Like Share

19

1,782 shares

3 Comments

Friend Requests See All
Confirm Friend

People You May Know See All
Add Friend

English (US) · Español · Português (Brasil) · Français (France) · Deutsch

Privacy · Terms · Advertising · Ad Choices · Cookies · More ·
Facebook © 2017

Will Entering Your PIN in Reverse at an ATM Summon the Police?

Entering your PIN in reverse at any ATM will not automatically send an alarm to local police -- the idea is nothing more than an old and unimplemented suggestion.

CLAIM

Entering your PIN in reverse at any ATM will automatically summon the police.
See Example(s)

RATING

FALSE

ORIGIN

Messages offering a seemingly helpful heads-up about how to deal with a situation in which one is forced to hand over money withdrawn from an ATM under duress began circulating on the Internet in September 2006:

Tell them what you're going to tell them. Tell it to them.

Then tell them what you told them.

UNKNOWN

NAME: _____ DATE: _____

Lesson 12 Skills Practice

Objective: Write PIN Backwards

Write backwards.

1. 0461
   1640

2. 3625
   5263

3. 9572
   2759

4. 8713
   3178

7. 6842
   2486

8. 7532
   2357

9. 1549
   94

13.

14

Presentation

- Tell them what you're going to tell them.
- Tell it to them.
- Then tell them what you told them.

Lesson

- State the lesson objectives.
- Teach the lesson.
- Review the lesson objectives.

The definition of insanity is doing the same thing over and over again but expecting different results.

UNKNOWN

Why Some Ideas Survive and Others Die...

MADE to STICK

Chip Heath & Dan Heath

- Understood
- Remembered
- Lasting impact

STICKY ATTRIBUTES

- ❑ SIMPLE
- ❑ UNEXPECTED
- ❑ CONCRETE
- ❑ CREDIBLE
- ❑ EMOTIONAL
- ❑ STORIES

Simplify.

$$(x^2 + 3)(2x^3 - 7x + 4)$$

Fig. 1.

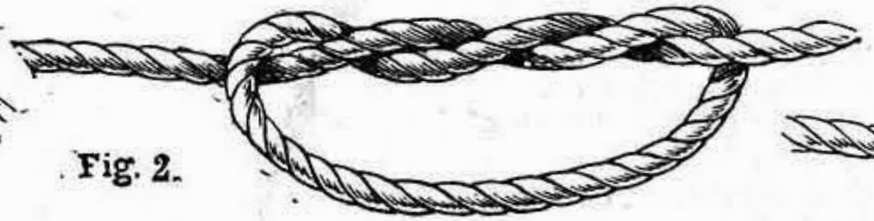


Fig. 2.

Fig. 2a.

Fig. 3.

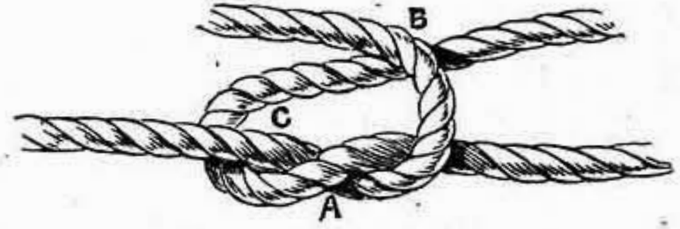


Fig. 5.

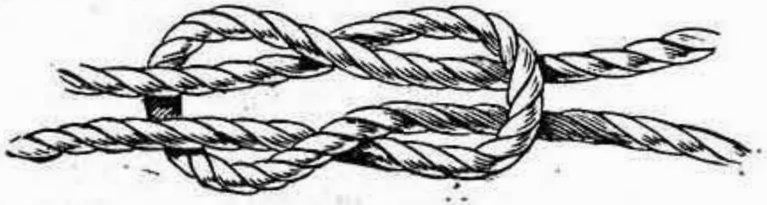


Fig. 4.

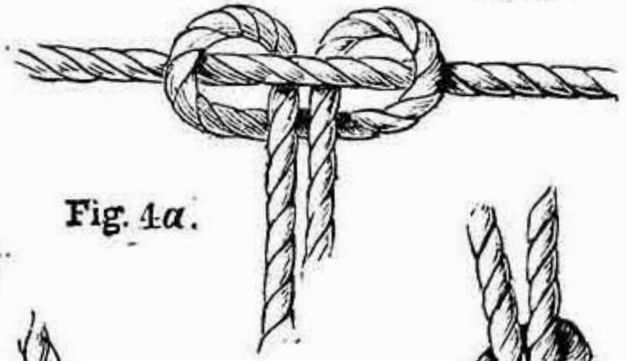


Fig. 4a.

Fig. 14.

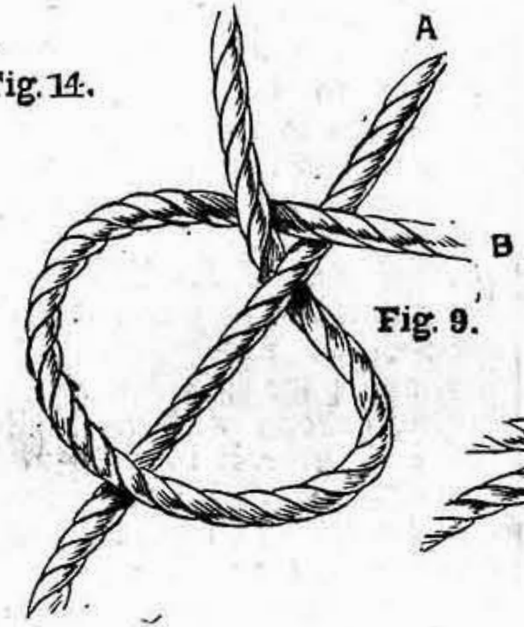


Fig. 9.

Fig. 6.

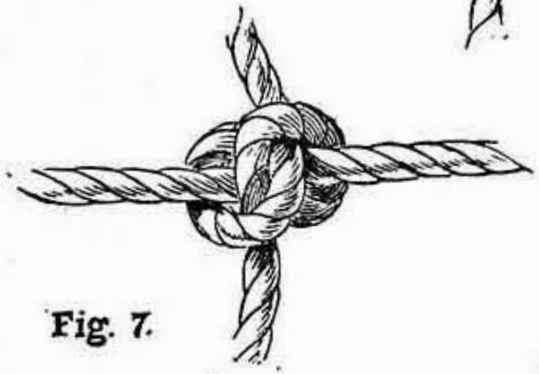


Fig. 7.

Fig. 8.

Fig. 10.

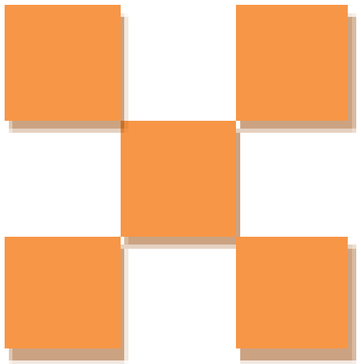
Fig. 11.

Fig. 13.

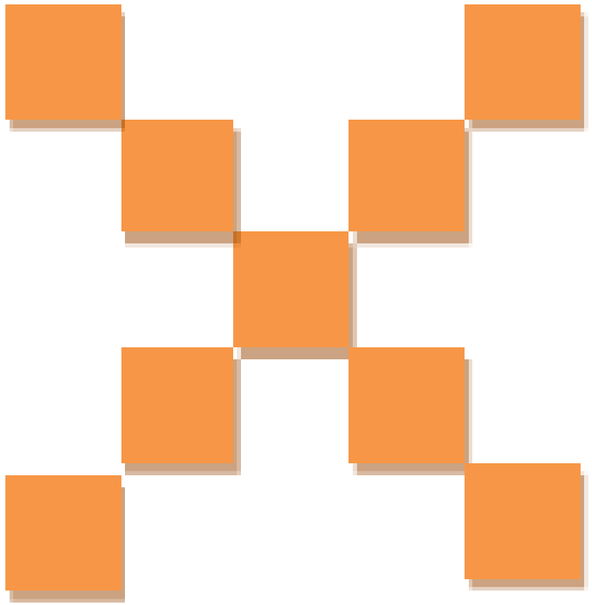
Fig. 12.

If math is the aspirin, then how do you create the headache?

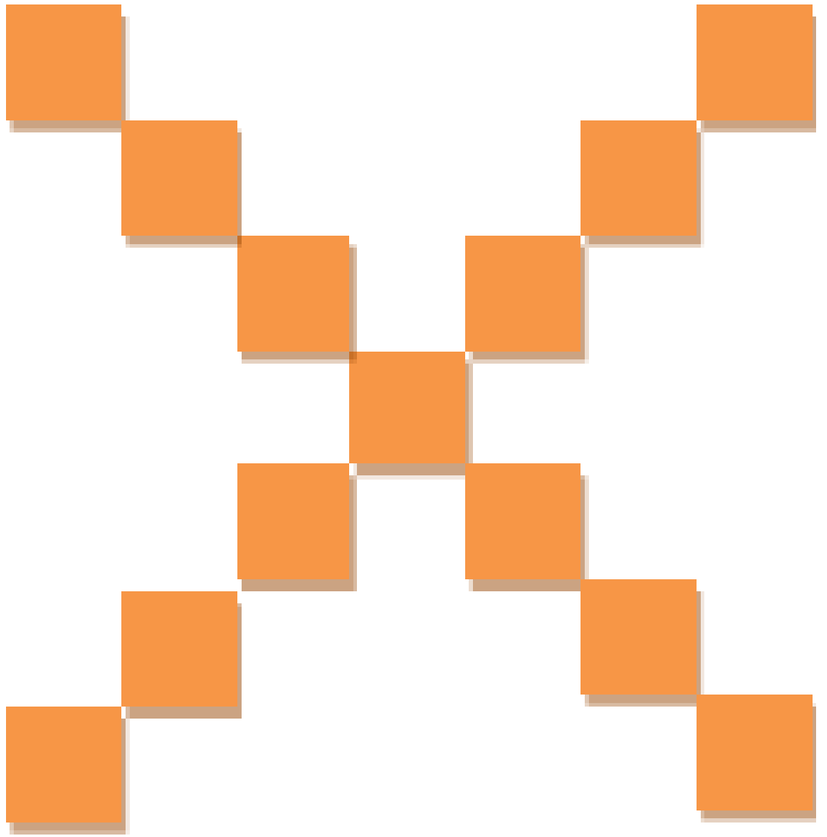
DAN MEYER



Step 1

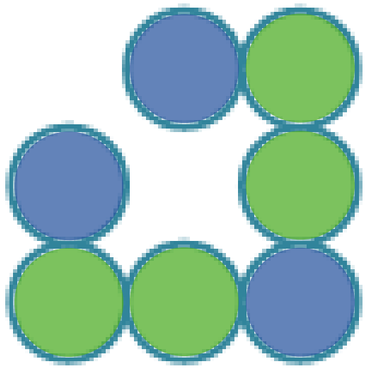


Step 2

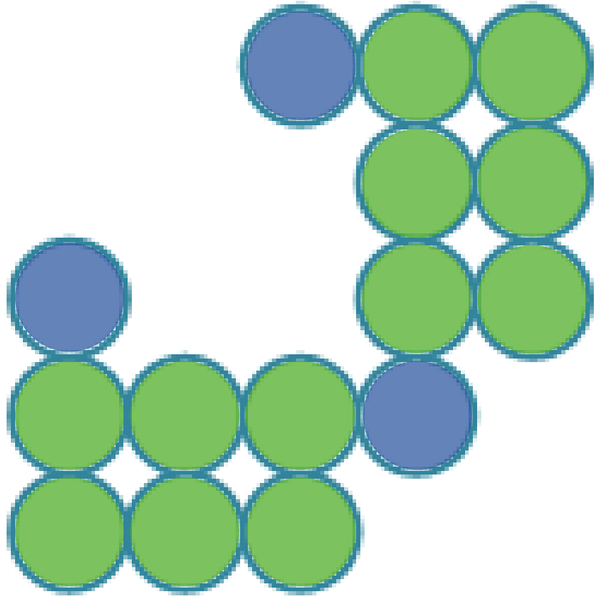


Step 3

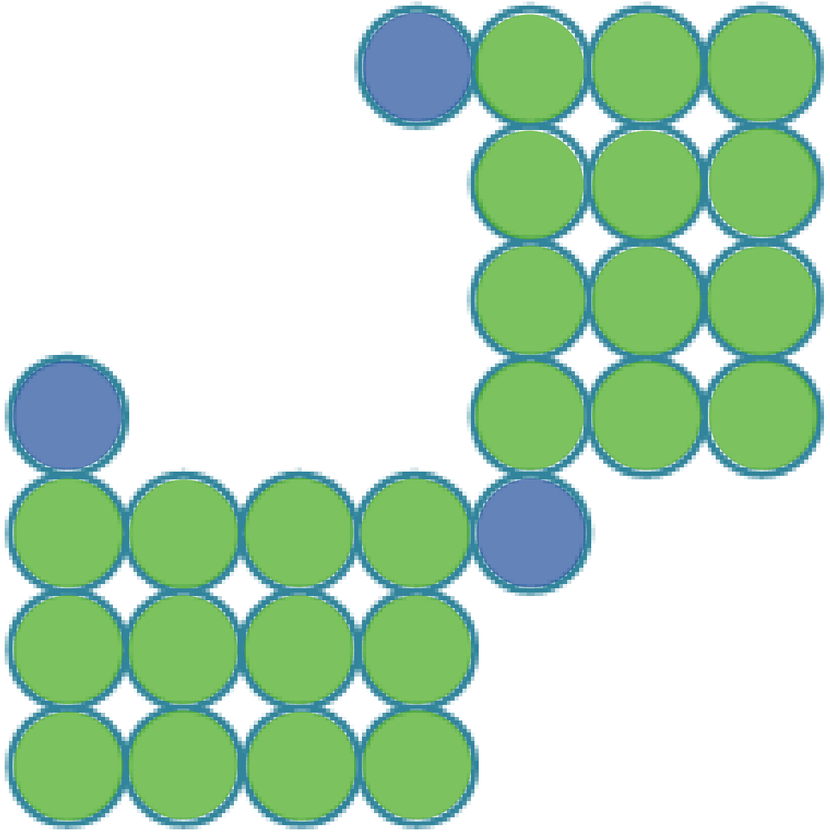
Source: visualpatterns.org



Step 1

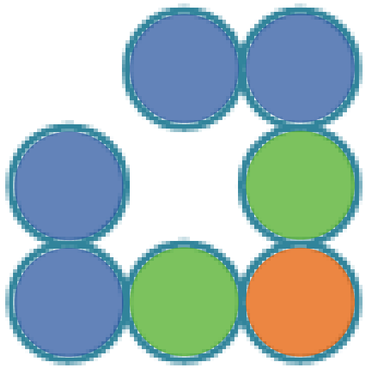


Step 2

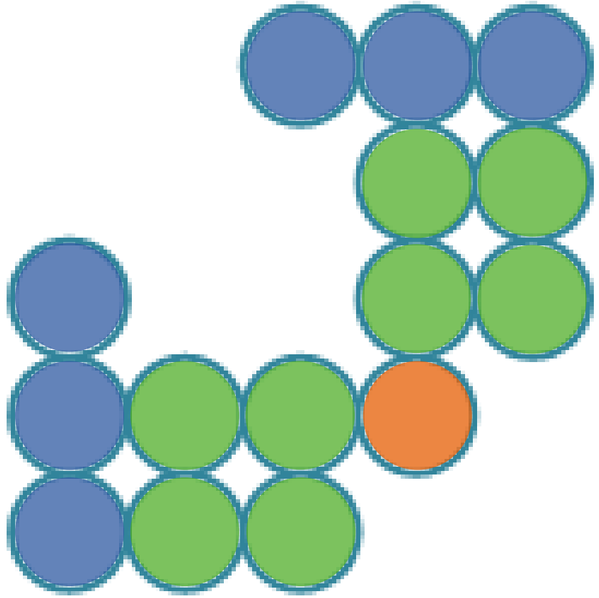


Step 3

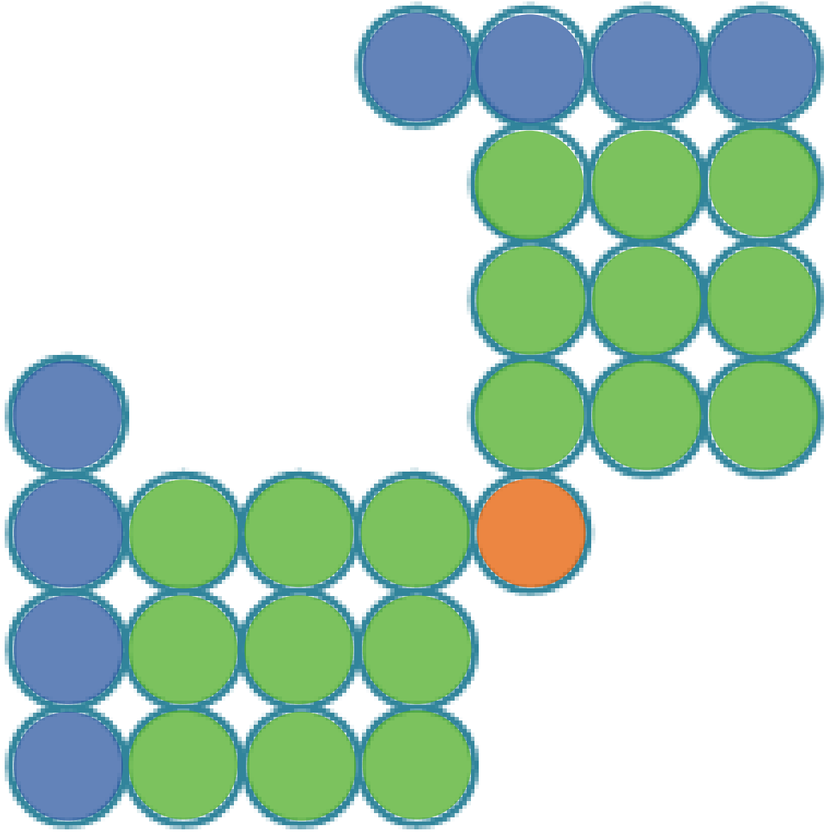
Source: visualpatterns.org



Step 1



Step 2



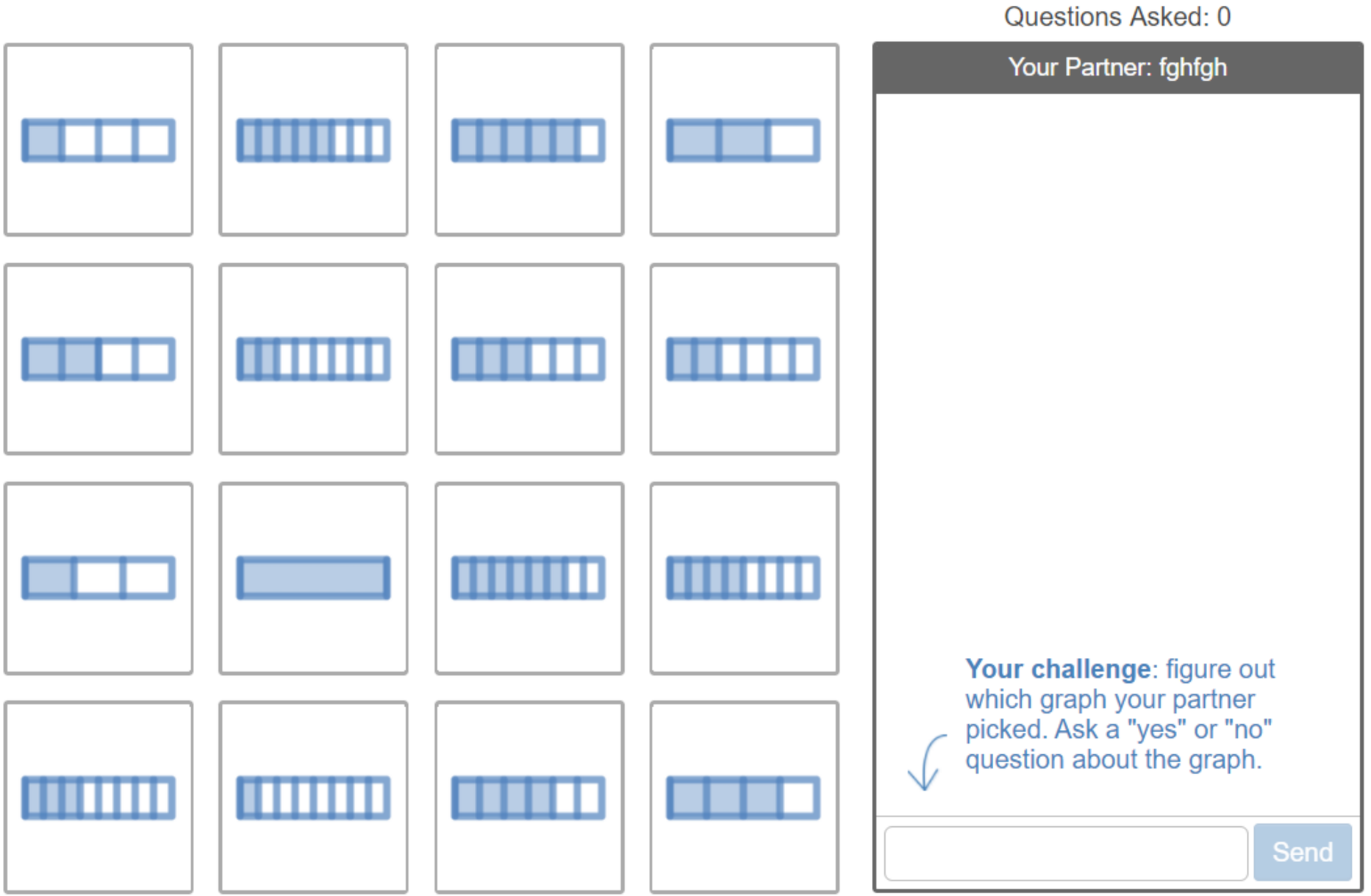
Step 3

Source: visualpatterns.org

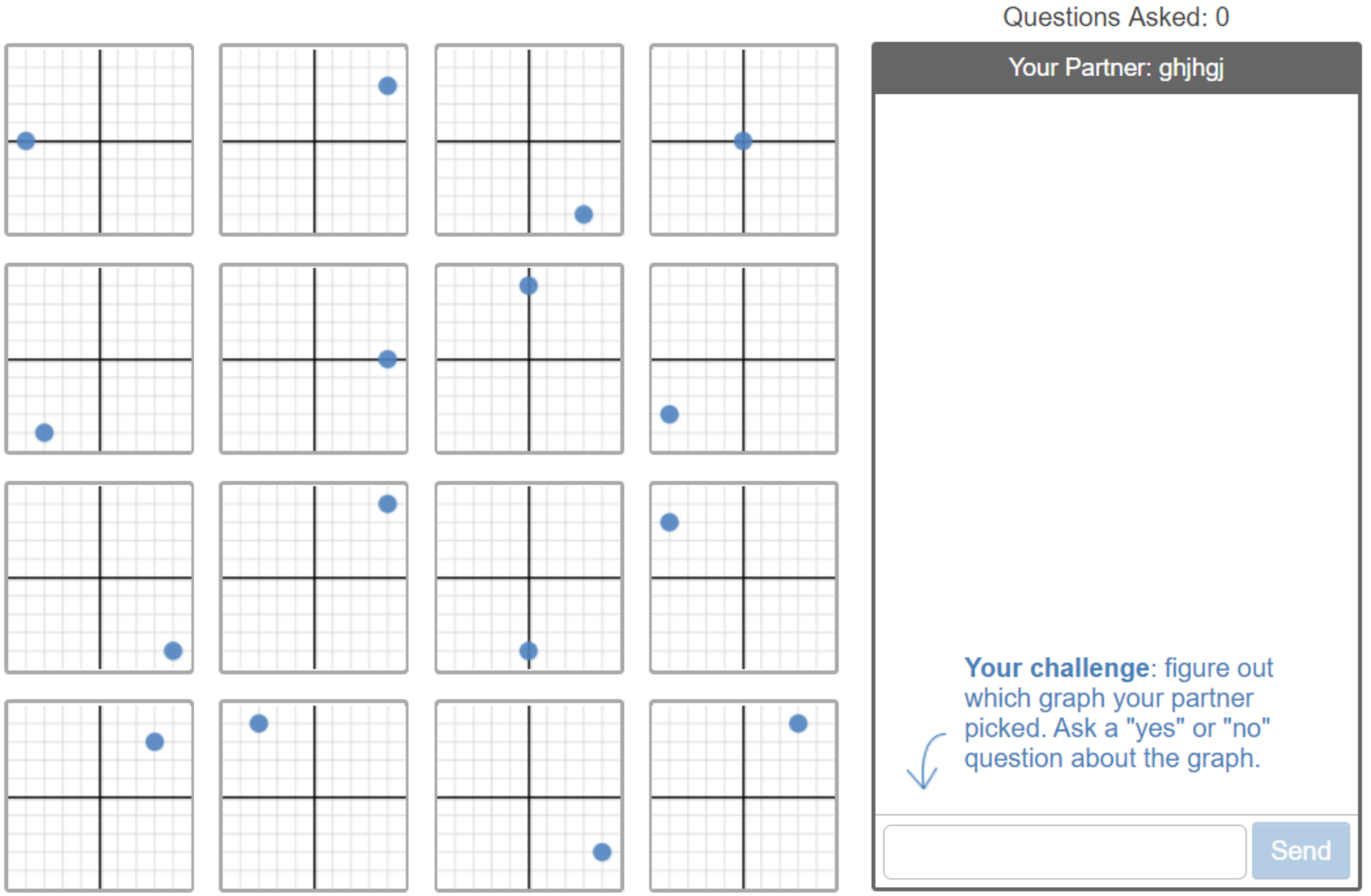
Select a person that's special to you for any reason. Next

Skip the practice round.

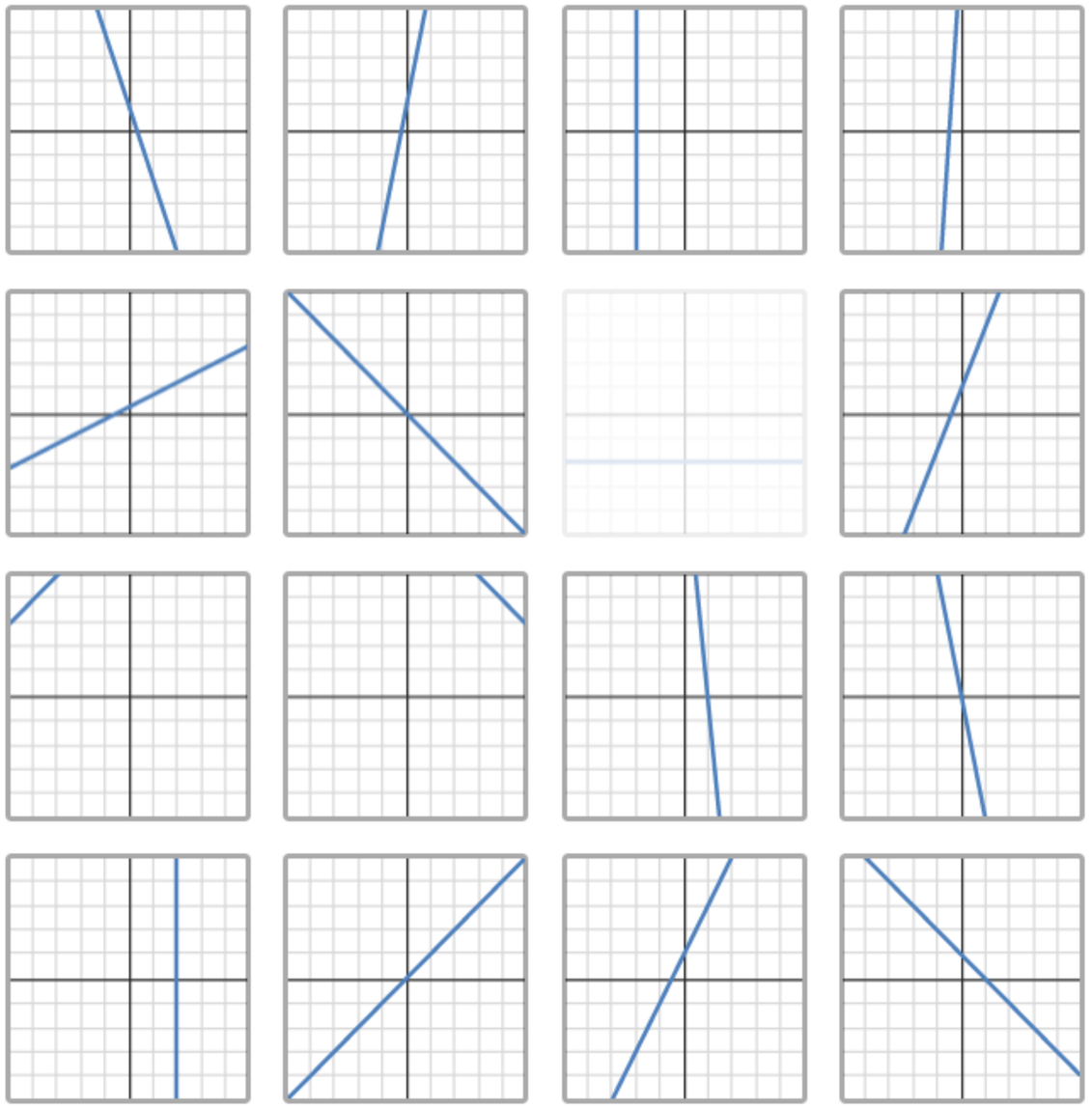
Source: teacher.desmos.com/polygraph



Source: teacher.desmos.com/polygraph



Source: teacher.desmos.com/polygraph



Questions Asked: 2

Your Partner: Lupita

YOU ASKED
Does your line go up and down?

YOUR PARTNER CHOSE
Yes

YOUR PARTNER ELIMINATED
×

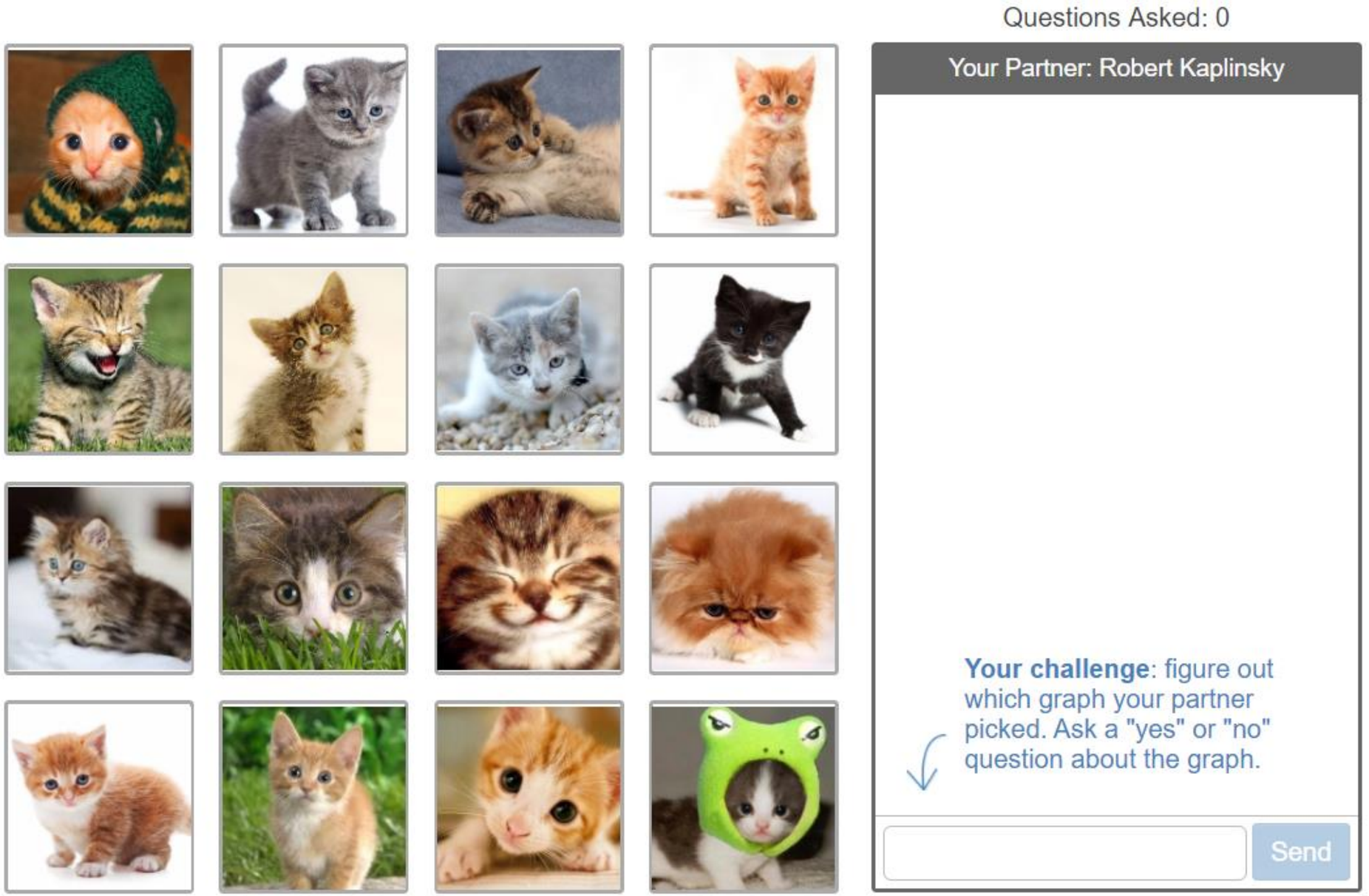
YOU ASKED
Is your line slanted?

YOUR PARTNER CHOSE
I Don't Know

Select lines to eliminate based on your partner's answer. Then press the button below.

Go on without Eliminating

Source: teacher.desmos.com/polygraph



Source: teacher.desmos.com/polygraph

STICKY ATTRIBUTES

- [x] SIMPLE
- [ ] UNEXPECTED
- [ ] CONCRETE
- [ ] CREDIBLE
- [ ] EMOTIONAL
- [ ] STORIES

RobertKaplinsky.com

Source: reasonandwonder.com

Source: reasonandwonder.com

Source: reasonandwonder.com

Source: reasonandwonder.com

Source: reasonandwonder.com

Source: reasonandwonder.com

Source: reasonandwonder.com

Source: reasonandwonder.com

Source: reasonandwonder.com

Source: reasonandwonder.com

THINKING TIME

RobertKaplinsky.com

Source: reasonandwonder.com

Source: reasonandwonder.com

Source: reasonandwonder.com

Source: reasonandwonder.com

Source: reasonandwonder.com

Source: reasonandwonder.com

Source: reasonandwonder.com

Source: reasonandwonder.com

Source: reasonandwonder.com

Source: reasonandwonder.com

Source: reasonandwonder.com

Source: reasonandwonder.com

Source: reasonandwonder.com

Source: reasonandwonder.com

Source: reasonandwonder.com

Source: reasonandwonder.com

Source: reasonandwonder.com

Source: reasonandwonder.com

Source: reasonandwonder.com

Source: reasonandwonder.com

Source: reasonandwonder.com

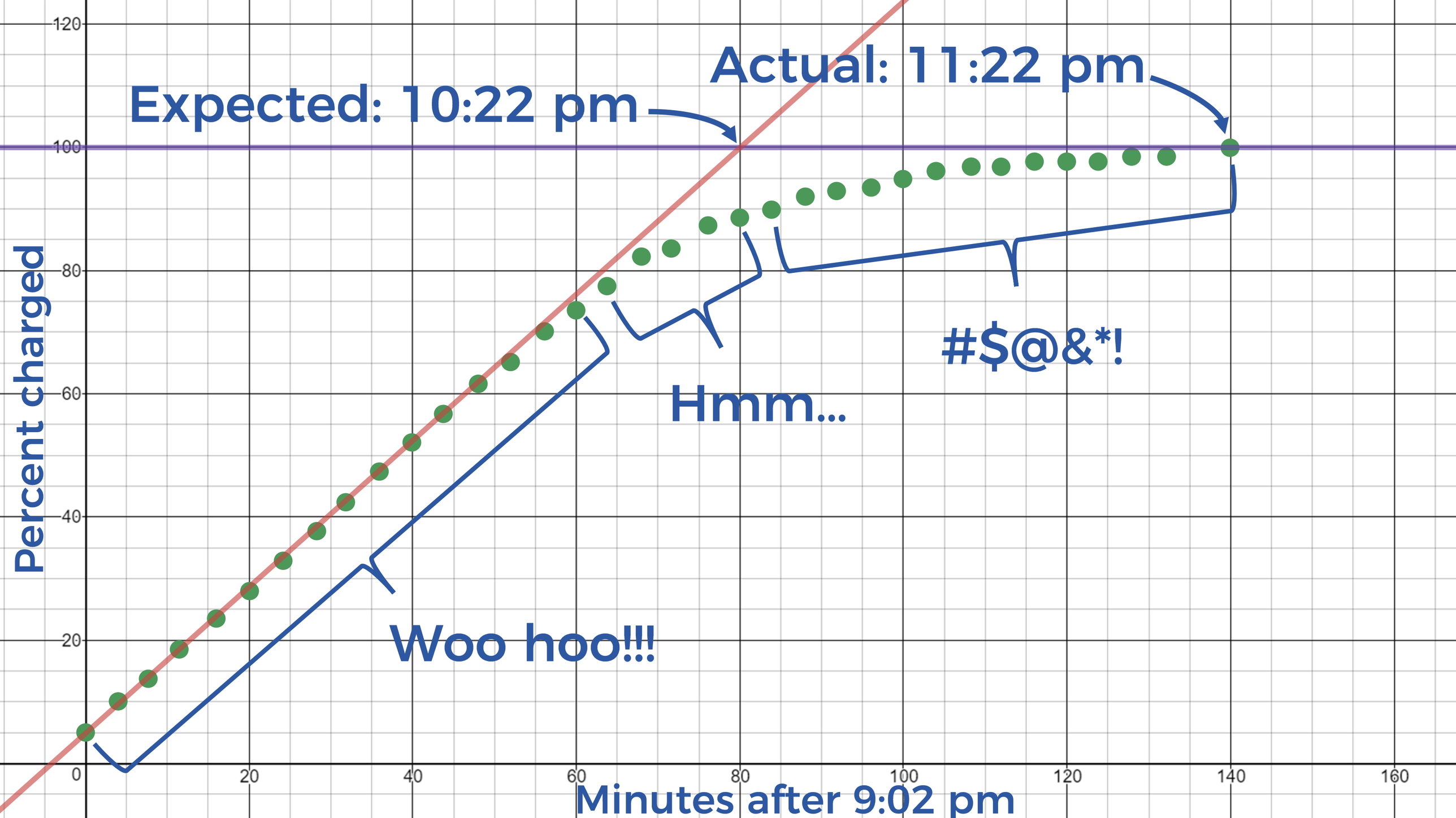
Source: reasonandwonder.com

Source: reasonandwonder.com

Source: reasonandwonder.com

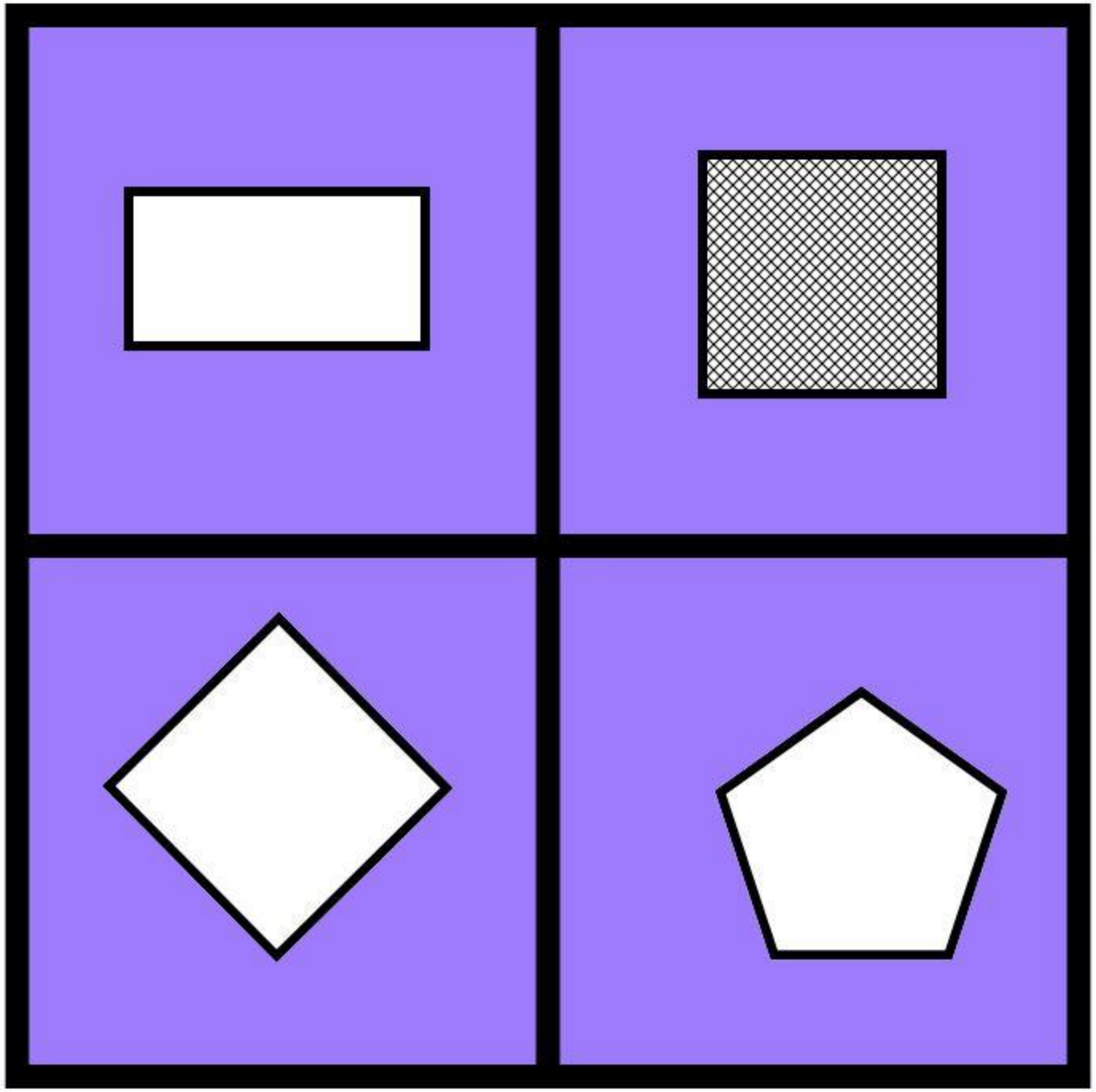
Source: reasonandwonder.com

Source: reasonandwonder.com


Actual: 11:22 pm
Expected: 10:22 pm
#$@&*!
Hmm...
Woo hoo!!!
Percent charged
Minutes after 9:02 pm
120
100
80
60
40
20
0
20
40
60
80
100
120
140
160

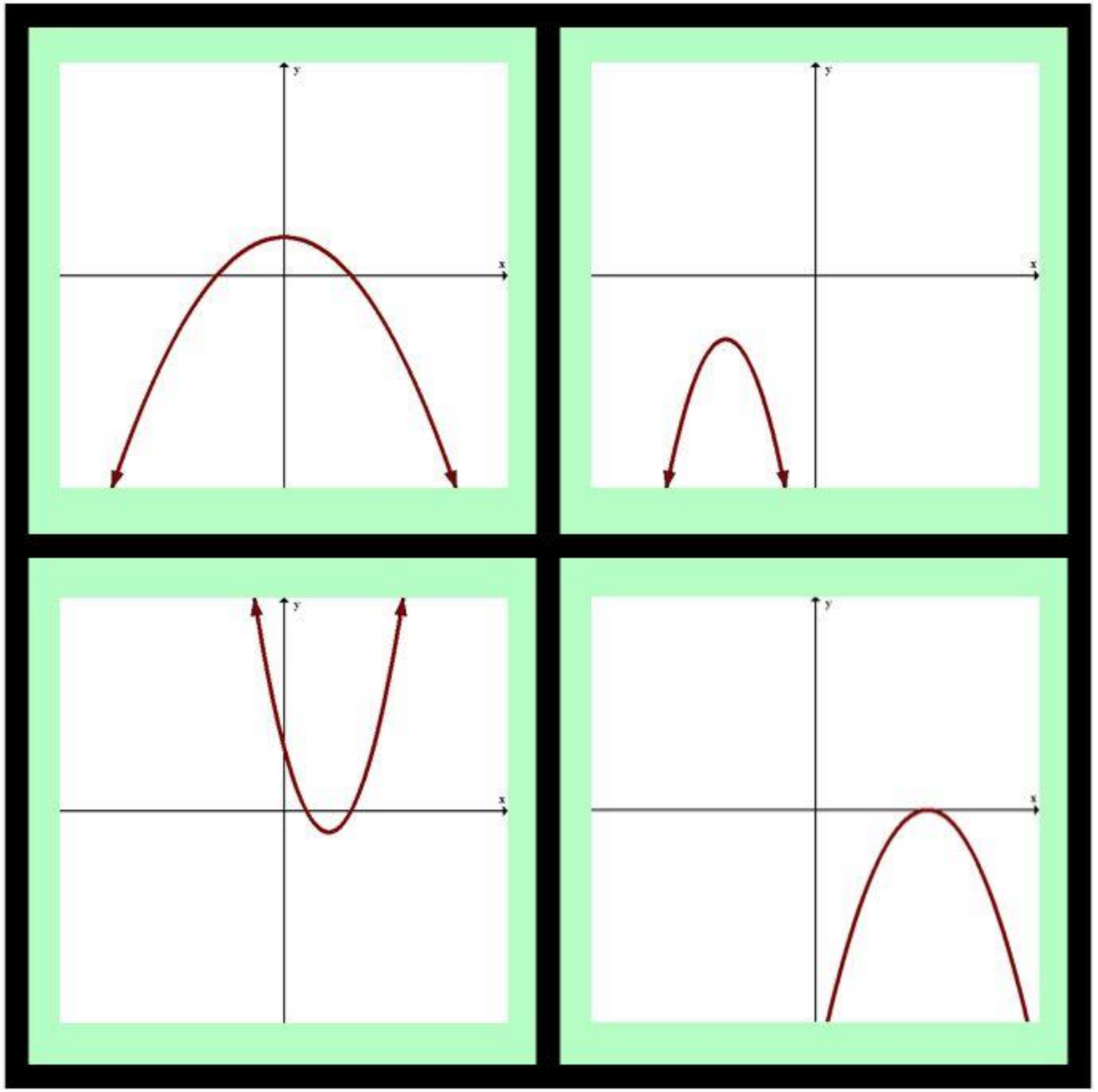
UNEXPECTED

- ❑ PATTERN BREAKING
- ❑ COUNTERINTUITIVE
- ❑ KNOWLEDGE GAPS
- ❑ OPEN MIDDLE



Source: wodb.ca

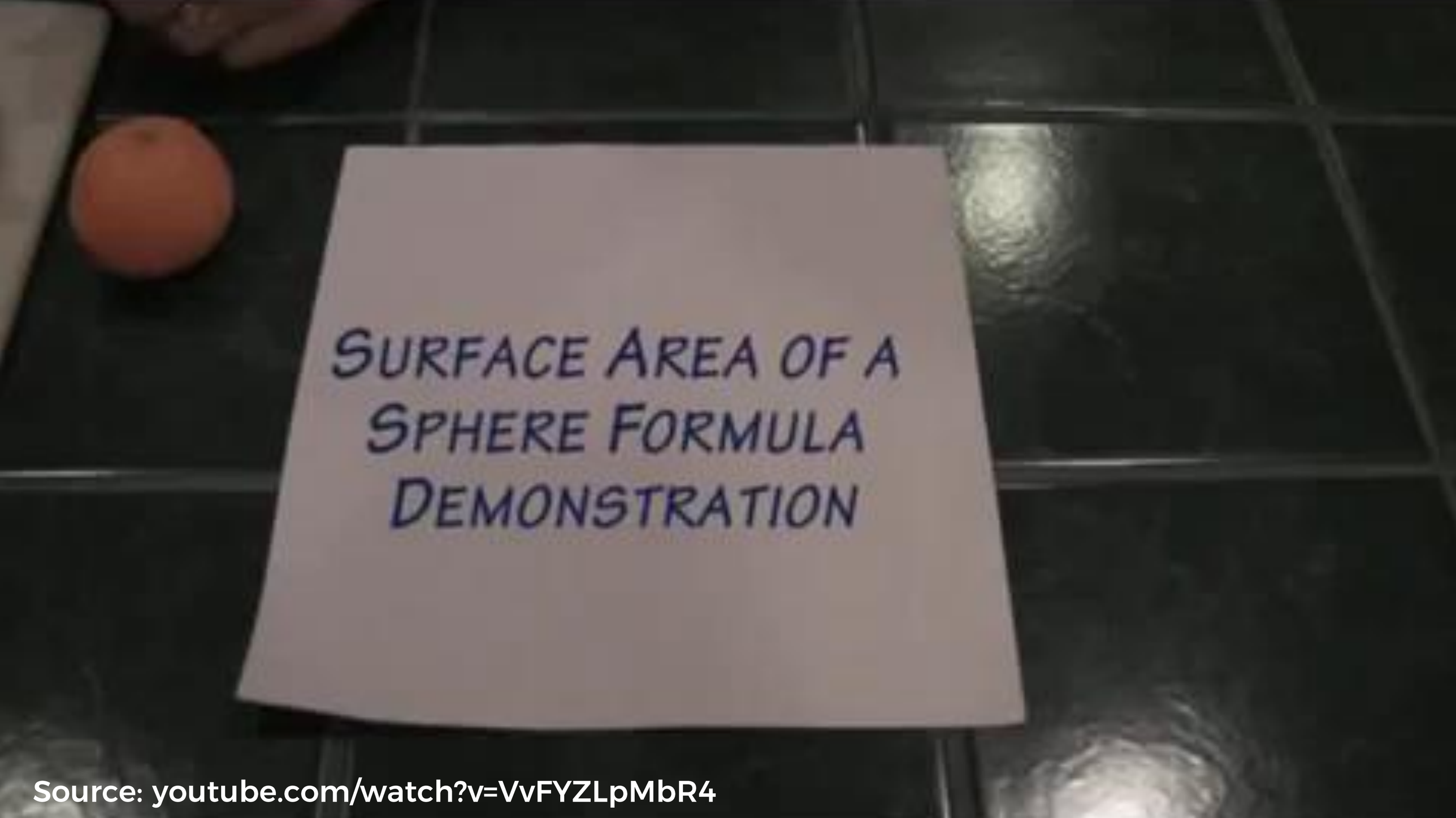
Source: wodb.ca



Source: wodb.ca

UNEXPECTED

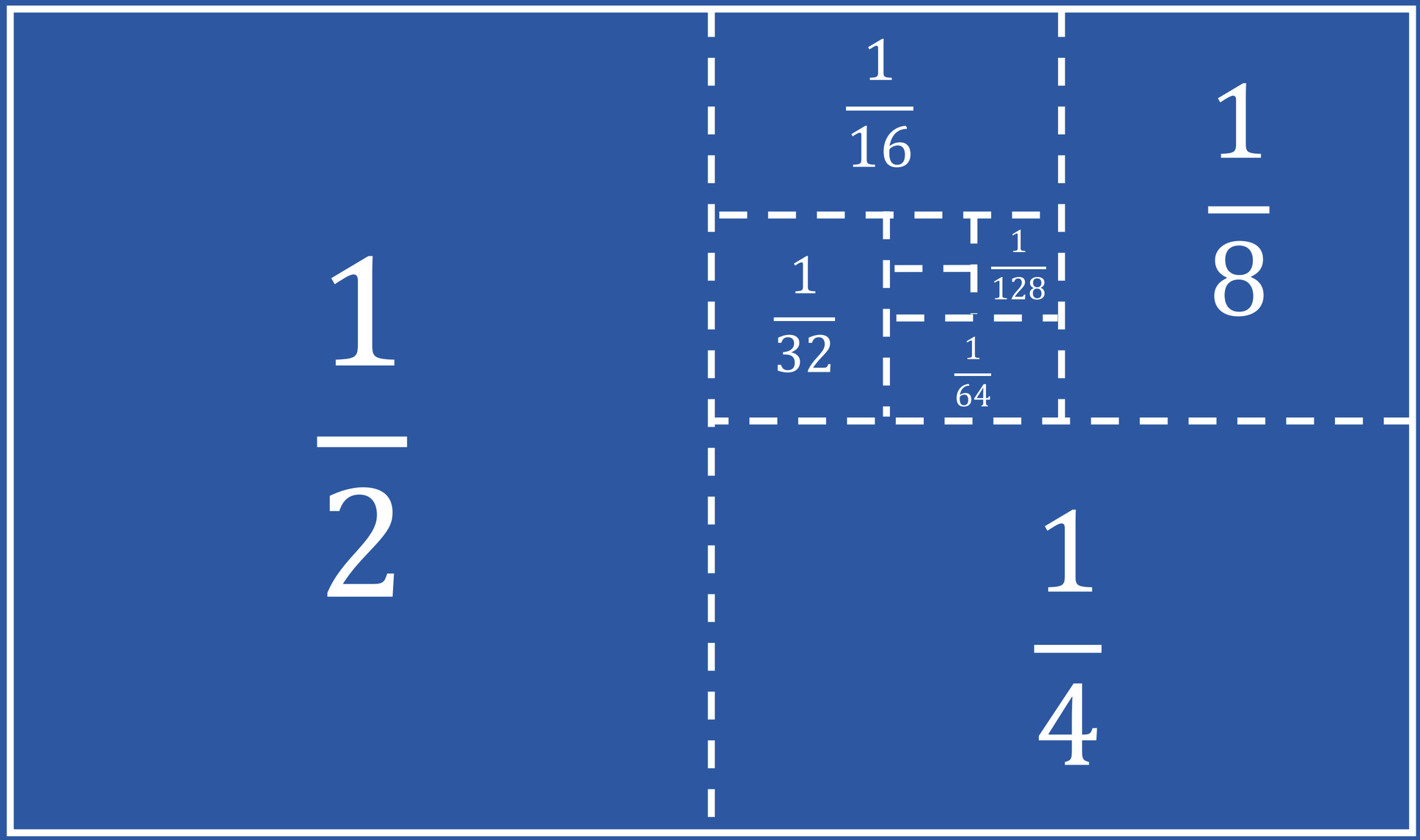
- [x] PATTERN BREAKING
- [ ] COUNTERINTUITIVE
- [ ] KNOWLEDGE GAPS
- [ ] OPEN MIDDLE



Source: youtube.com/watch?v=VvFYZLpMbR4

$$\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+\frac{1}{16}+\frac{1}{32}+\cdots$$

$$=1$$


$\frac{1}{2}$
$\frac{1}{16}$
$\frac{1}{8}$
$\frac{1}{32}$
$\frac{1}{128}$
$\frac{1}{64}$
$\frac{1}{4}$

Source: Kyle Pearce - youtube.com/watch?v=Yr53Ji4SZDg

UNEXPECTED

- [x] PATTERN BREAKING
- [x] COUNTERINTUITIVE
- [ ] KNOWLEDGE GAPS
- [ ] OPEN MIDDLE

Curiosity... arises from the perception of a gap in knowledge or understanding.

GEORGE LOEWENSTEIN

Source: robertkaplinsky.com/lessons

Source: robertkaplinsky.com/lessons

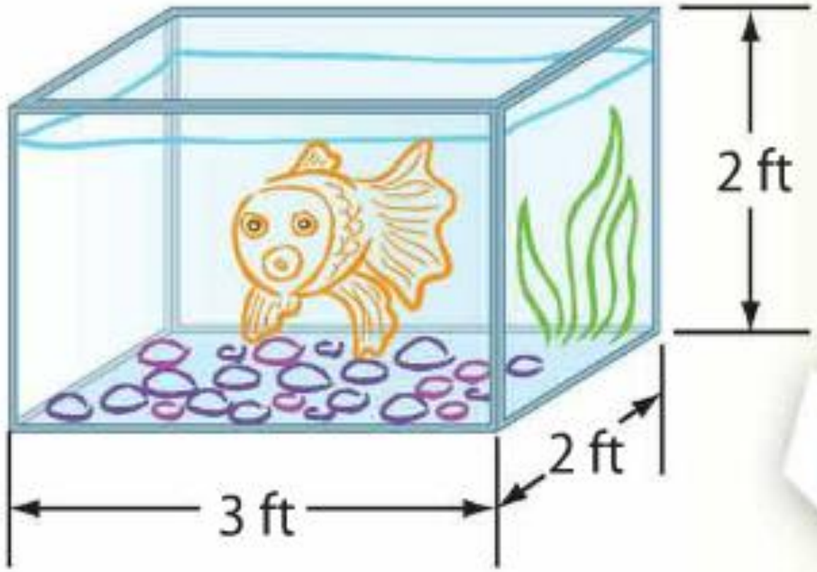
Source: robertkaplinsky.com/lessons

Source: robertkaplinsky.com/lessons

Real-World Link

Watch

Aquarium The dimensions of an aquarium are shown.



1. What is the area of the base of the aquarium? _____

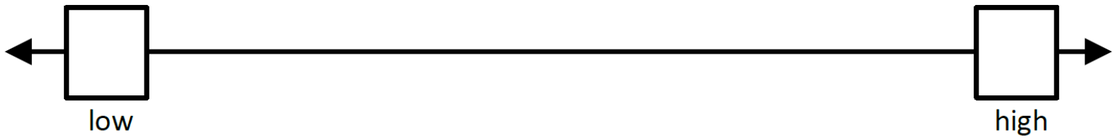
2. What is the height of the aquarium? _____

3. Fill in the blanks to find the volume.

_____ × _____ × _____ = 12 ft^3

What problem are you trying to figure out?

What estimates do you have?



Place your estimate on the number line.

What info do you already know about the problem?

What info do you need about the problem?

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

UNEXPECTED

- [x] PATTERN BREAKING
- [x] COUNTERINTUITIVE
- [x] KNOWLEDGE GAPS
- [ ] OPEN MIDDLE

N

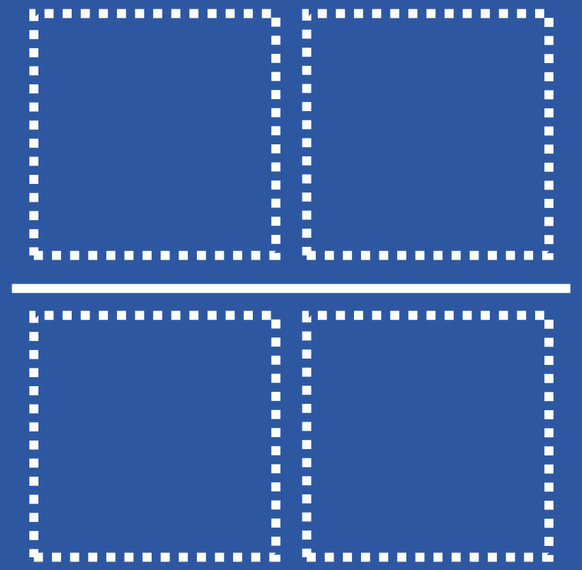
Google Maps My Village to Treasure Chest Travel 3621 miles, 21 days, 4 hours

Map data ©2017 Google 500 mi

My Village

	Treasure Map	Google Maps
Beginning	Closed	Closed
Middle	Open	Closed
End	Closed	Closed

Using the digits 1-9, at most one time each, fill in the boxes to create a fraction that is as close to one as possible.



Extension: How many ways can you prove that you are correct?

Source: Peter Morris on openmiddle.com

	Open Middle	Closed Middle
Beginning	Closed	Closed
Middle	Open	Closed
End	Closed	Closed

Name _____ My Homework _____

Independent Practice

Solve each syst

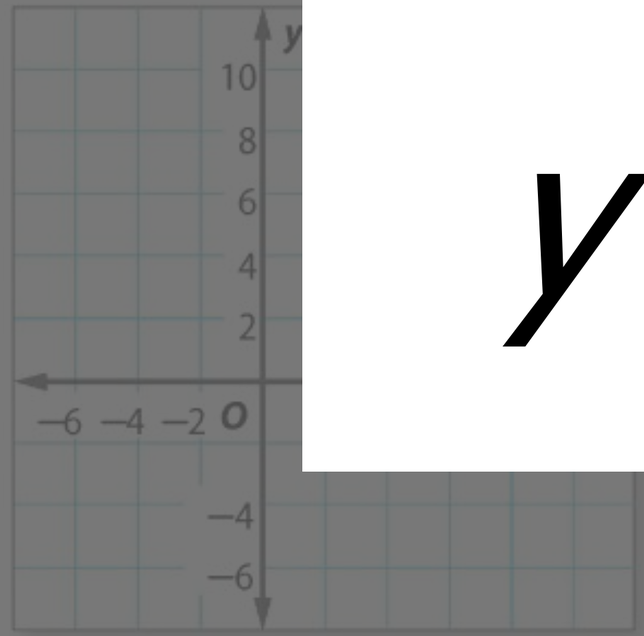
1. $y = x$
   $y = 2x - 4$

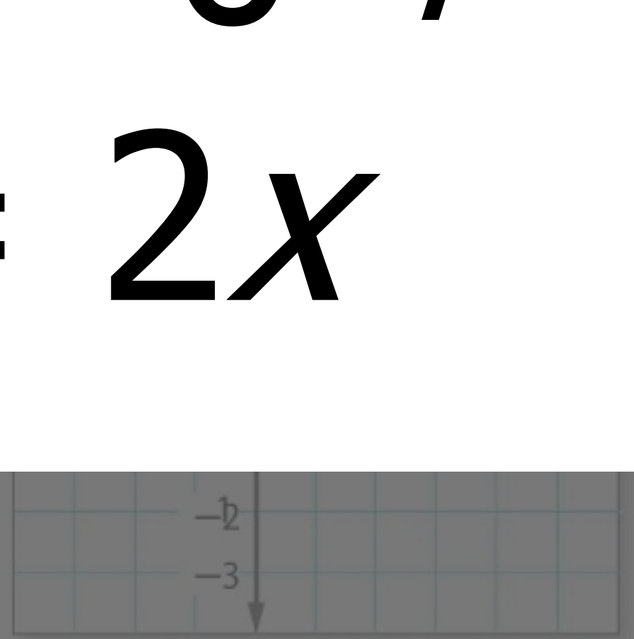
Show your work.

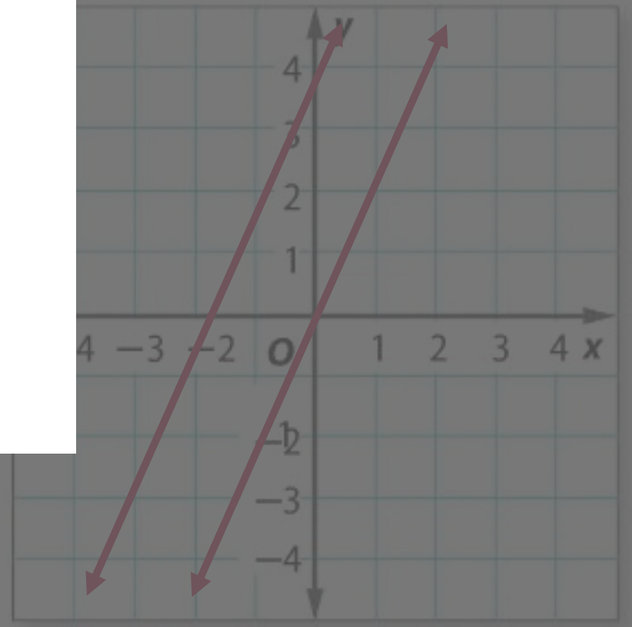
$0 \neq 4$

$y = 2x$

$y - 2x = 4$
$y = 2x$





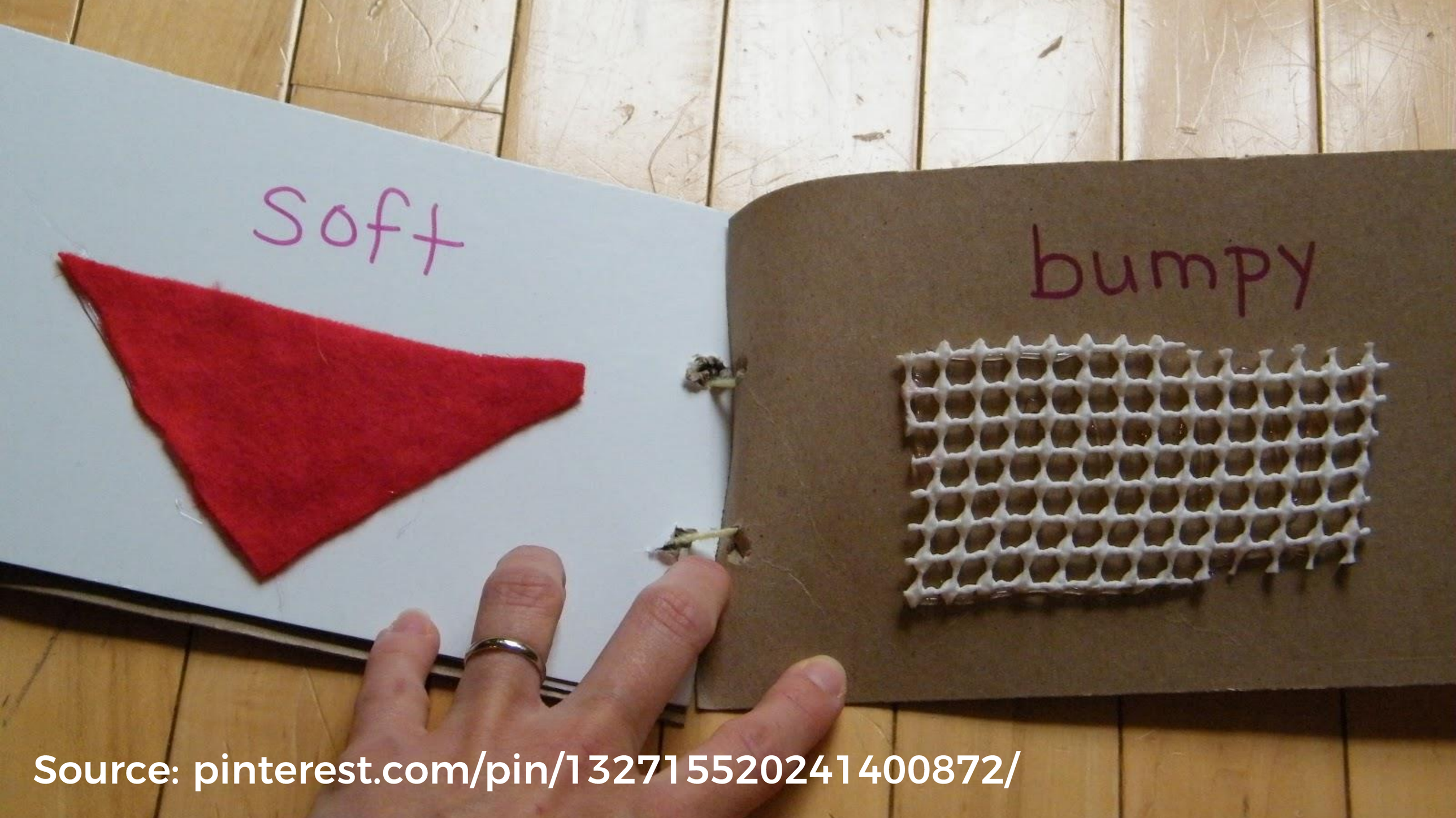


UNEXPECTED

- ☑ PATTERN BREAKING
- ☑ COUNTERINTUITIVE
- ☑ KNOWLEDGE GAPS
- ☑ OPEN MIDDLE

STICKY ATTRIBUTES

- [x] SIMPLE
- [x] UNEXPECTED
- [ ] CONCRETE
- [ ] CREDIBLE
- [ ] EMOTIONAL
- [ ] STORIES



Source: pinterest.com/pin/132715520241400872/

Source: Color Dog

HunterDouglas
HunterDouglas
WINDOW FASHIONS
VICTORIA
15553
PRESIDENT'S
MINI BRIE
19.6 OUNCES
5.99
4988
VALLEY SUN
SUN-DRIED TOMATOES
JULIENNE CUT 32 OUNCE
UNIT PRICE PER OUNCE
.234
SELL PRICE
7.49

NAME: _____ DATE: _____ PERIOD: _____

Lesson 7 Skills Practice

Objective: Divide Decimals by Decimals

Divide.

1. $4.86 \div 0.2$

2. $628.2 \div 34.9$

7. $2.25 \div 0.15$

8. $421.6 \div 0.4$

13. $7.52 \div 0.74$

14. $0.105 \div 0.6$

Fans stream Nelly to help him pay off $2.4 million debt

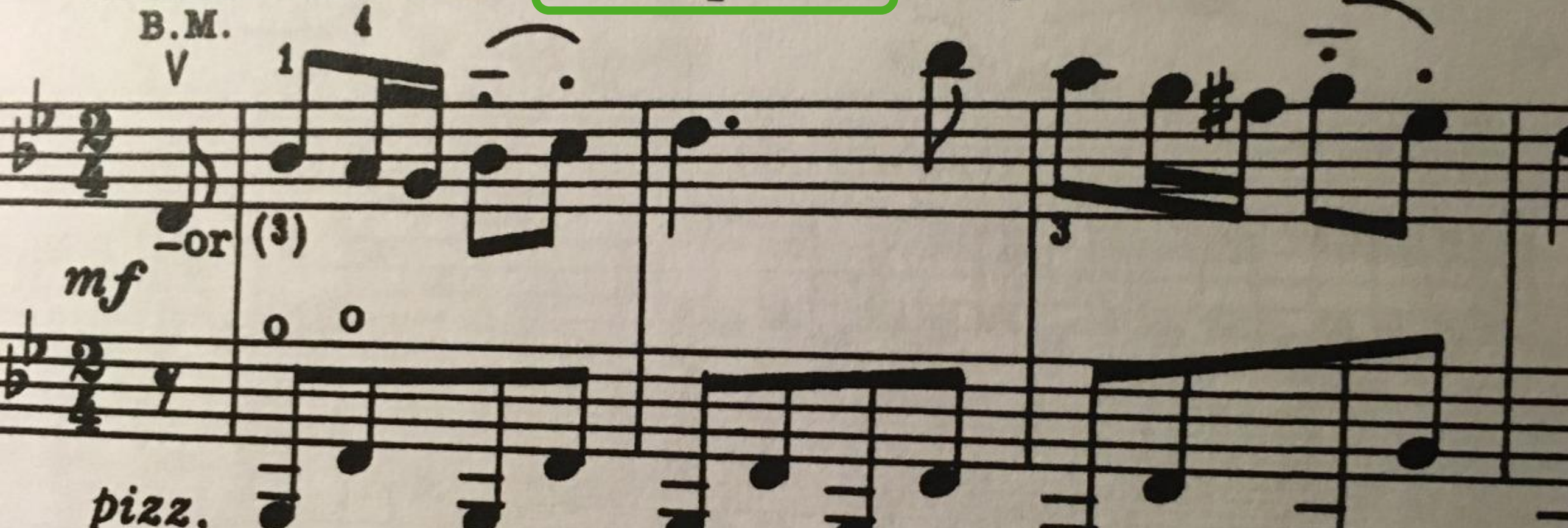
by Lisa Respers France @CNNMoney

September 13, 2016: 2:47 PM ET

- How many $0.006 are there in $2,400,000?
- How many 6 are there in 24?

9. Canzonett

In moderate time-with sparkle (Key of G minor)



LESSON 19-1

Stretching, Compressing, and Reflecting Sine and Cosine Graphs

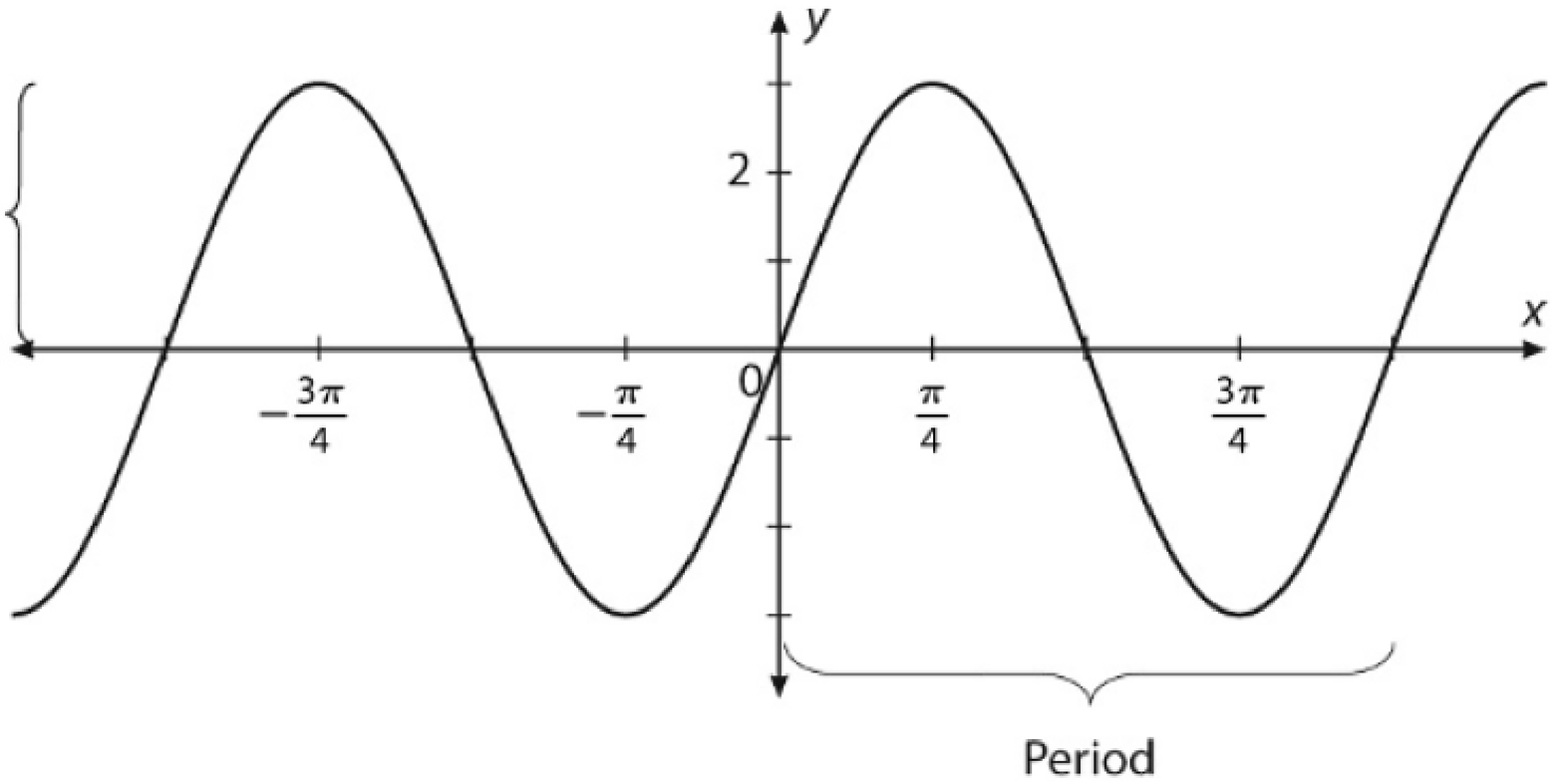
Reteach

For a sine function, $y = a\sin\left(\frac{1}{b}x\right)$.

Amplitude $= |a|$

Period $= 2\pi \cdot b$

If $a < 0$, the graph is reflected across the x-axis.

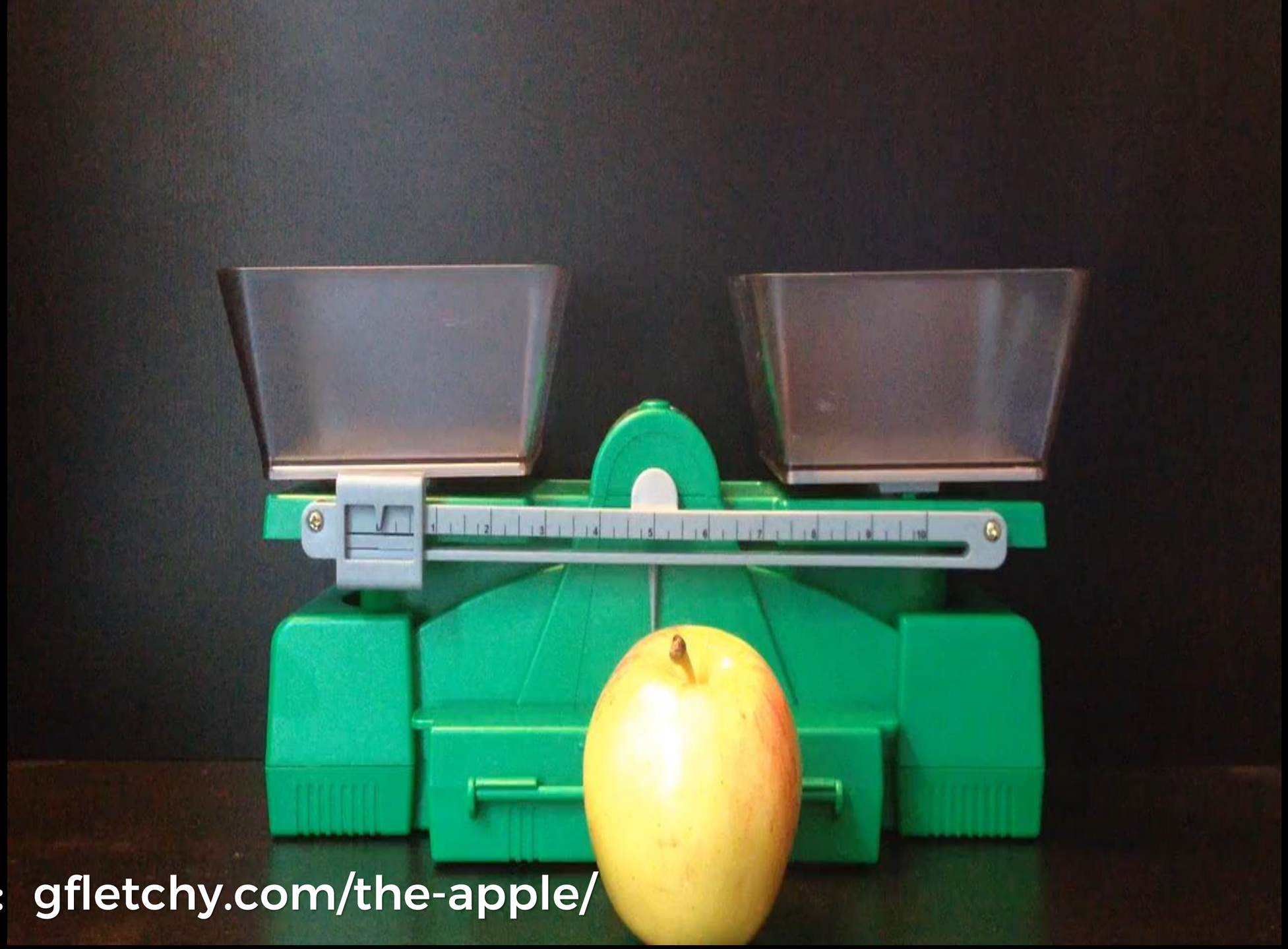


Example Write the function shown in the graph above.

Source: graphingstories.com

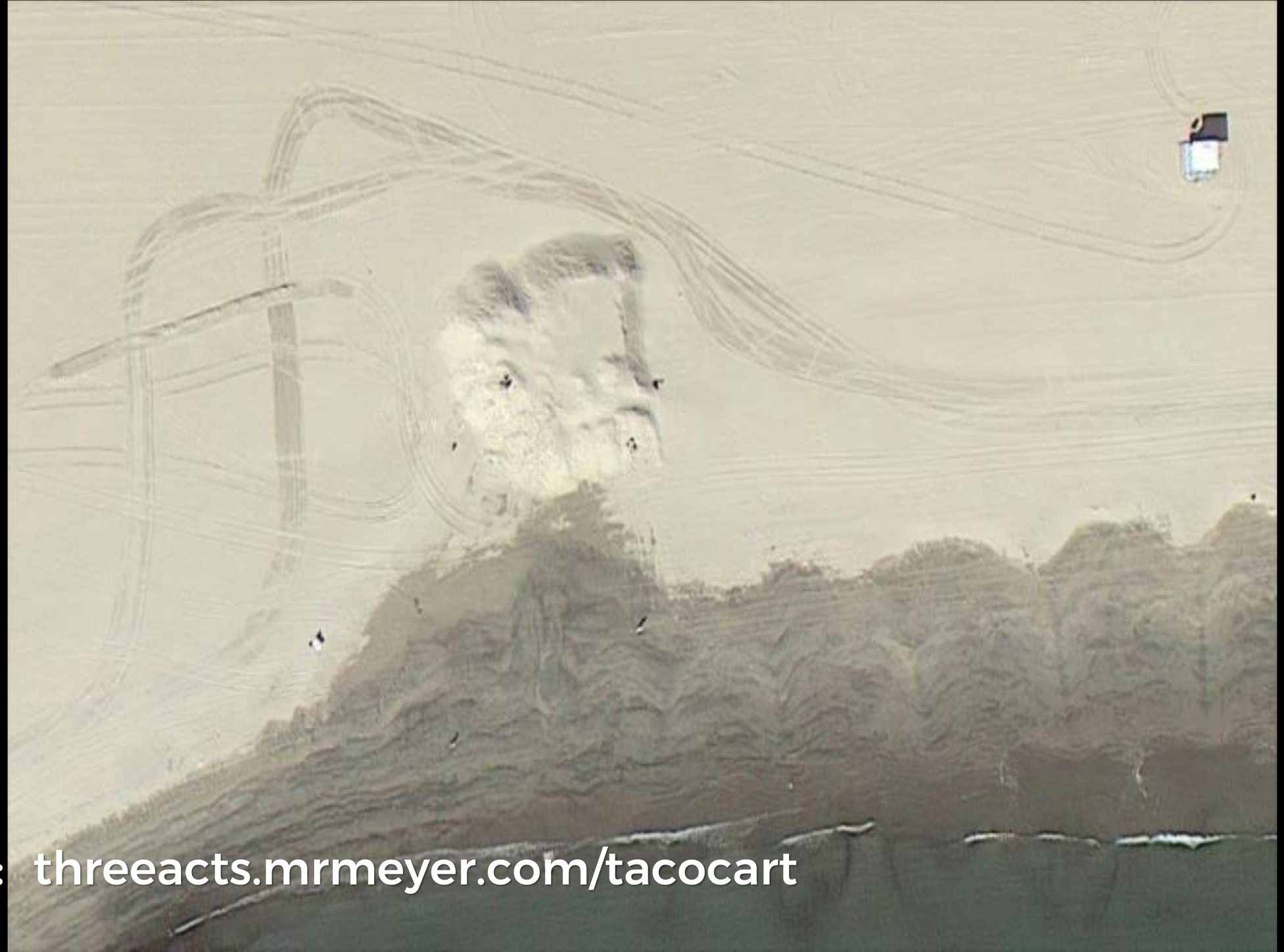
STICKY ATTRIBUTES

- [x] SIMPLE
- [x] UNEXPECTED
- [x] CONCRETE
- [ ] CREDIBLE
- [ ] EMOTIONAL
- [ ] STORIES

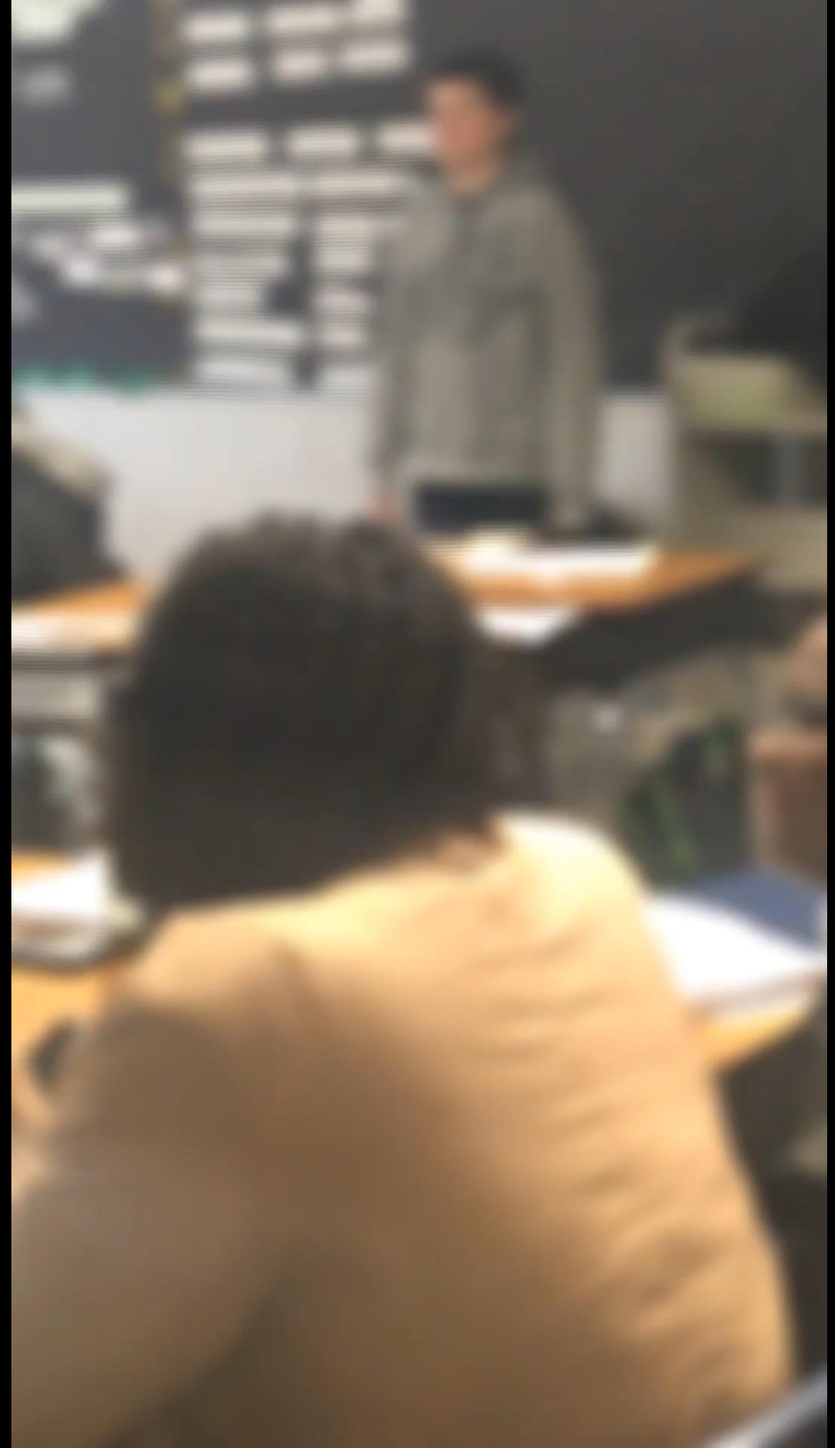


Source: gfletchy.com/the-apple/

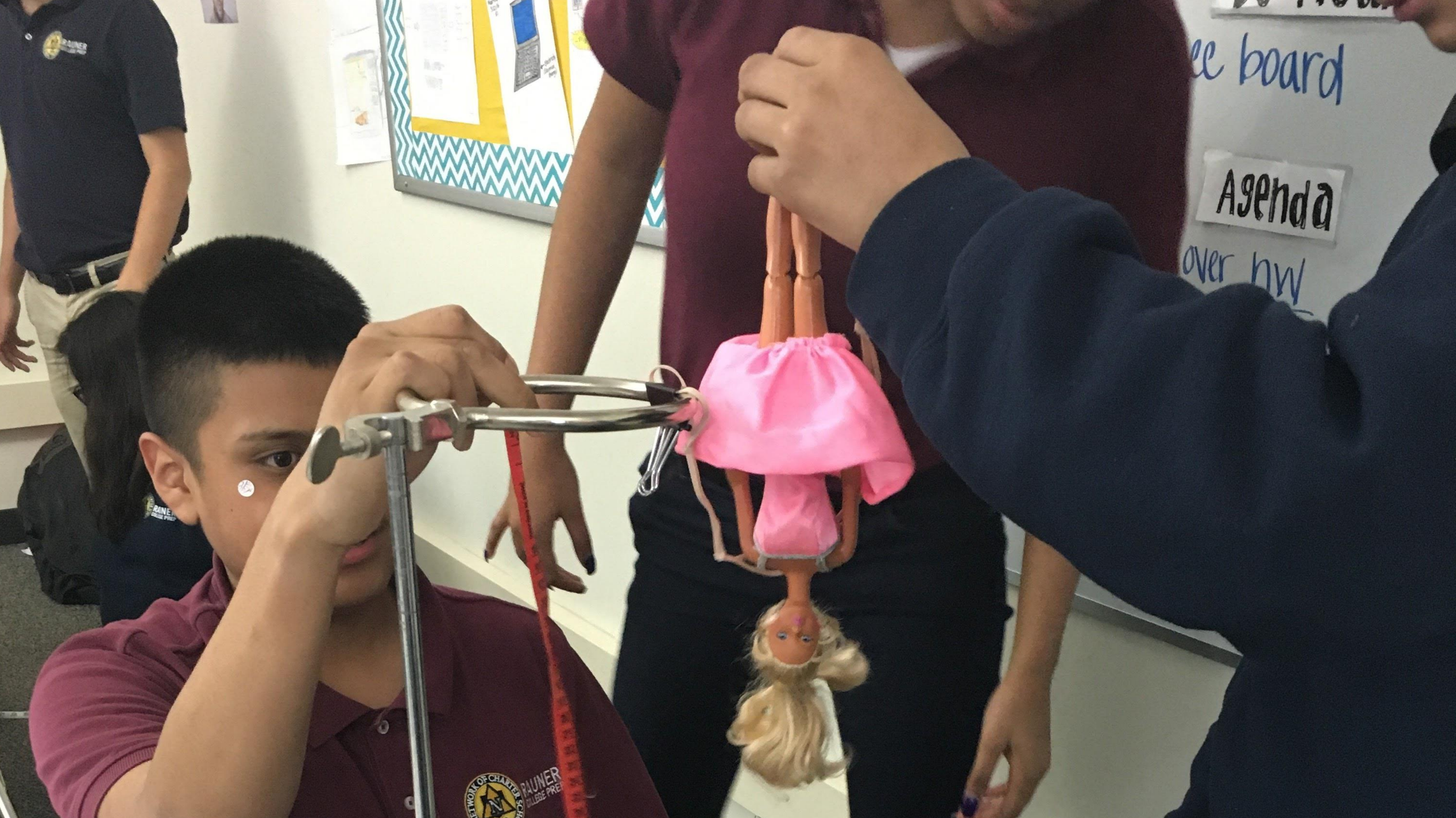
Source: JJ Martinez



Source: threeacts.mrmeyer.com/tacocart



Source:
Jenise Sexton


Agenda

Source:
Fawn Nguyen

Division
Pain Relief Fever Reduction
NSAID
200 Tablets 200 mg
Functions
Pain Reliever/ Fever Reducer
Caffeine-Free
200 tablets
325 mg each
Extra Strength
Perimeter
Pain Reliever/ Fever Reducer
200 Capsules 500 mg. each

Act 1 Engaging Opener

Act 2 Get Info. Solve Problem.

Act 3 Big Reveal

STICKY ATTRIBUTES

- [x] SIMPLE
- [x] UNEXPECTED
- [x] CONCRETE
- [x] CREDIBLE
- [ ] EMOTIONAL
- [ ] STORIES

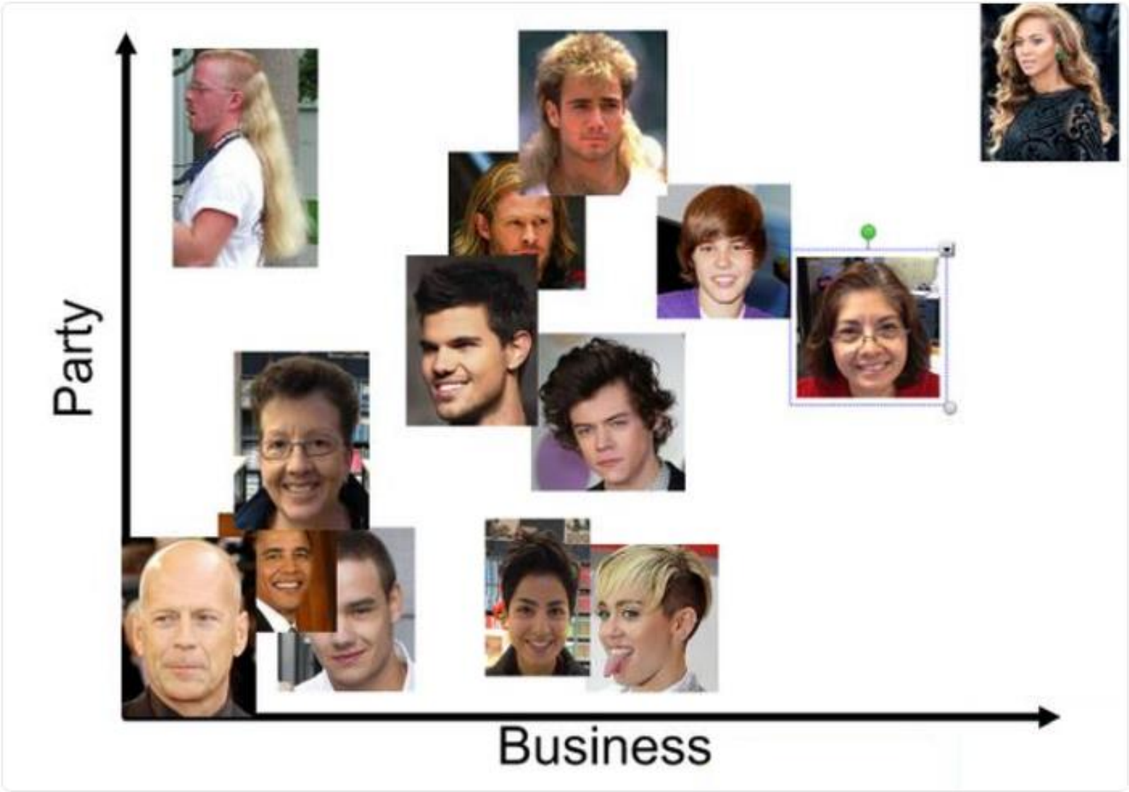
RobertKaplinsky.com

Source: mrvaudrey.com

Matt Vaudrey
@MrVaudrey

Following

Things I never thought I'd say: "So you're saying that Thor has less party than Justin Bieber, but more than Obama?"



RETWEETS 4 LIKES 7

STICKY ATTRIBUTES

- [x] SIMPLE
- [x] UNEXPECTED
- [x] CONCRETE
- [x] CREDIBLE
- [x] EMOTIONAL
- [ ] STORIES

Source: robertkaplinsky.com/lessons

20. Crime Two men used ropes made from sheets to escape from a tall prison in Chicago. If they needed to make a total of 150 feet of rope and each sheet made 6 feet of rope, how many sheets did they need?

Source: If You Hopped Like A Frog by David M. Schwartz

The Doorbell Rang

by Pat Hutchins

DO YOU SEE IT?

Via: Sara VanDerWerf

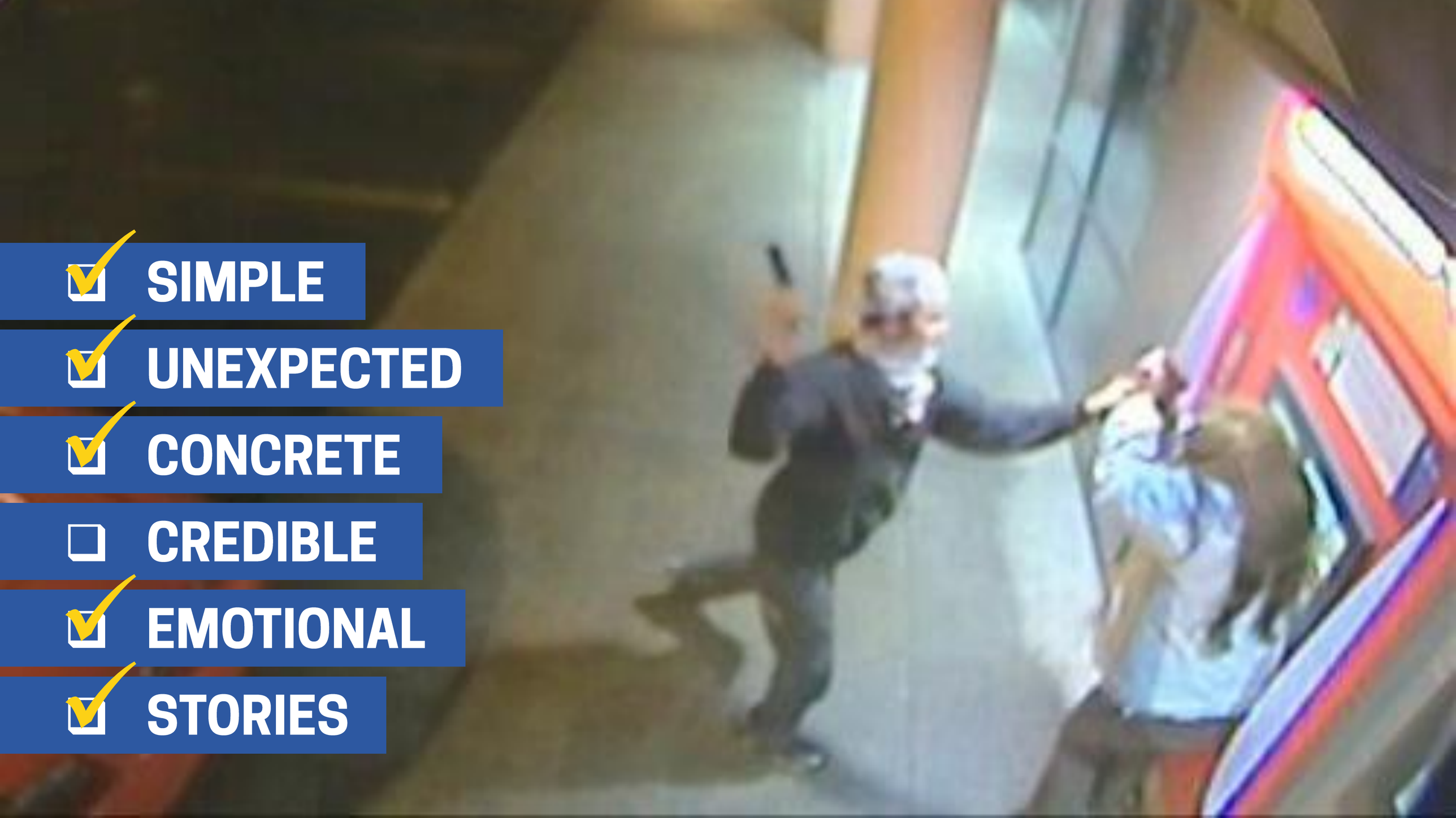
RobertKaplinsky.com

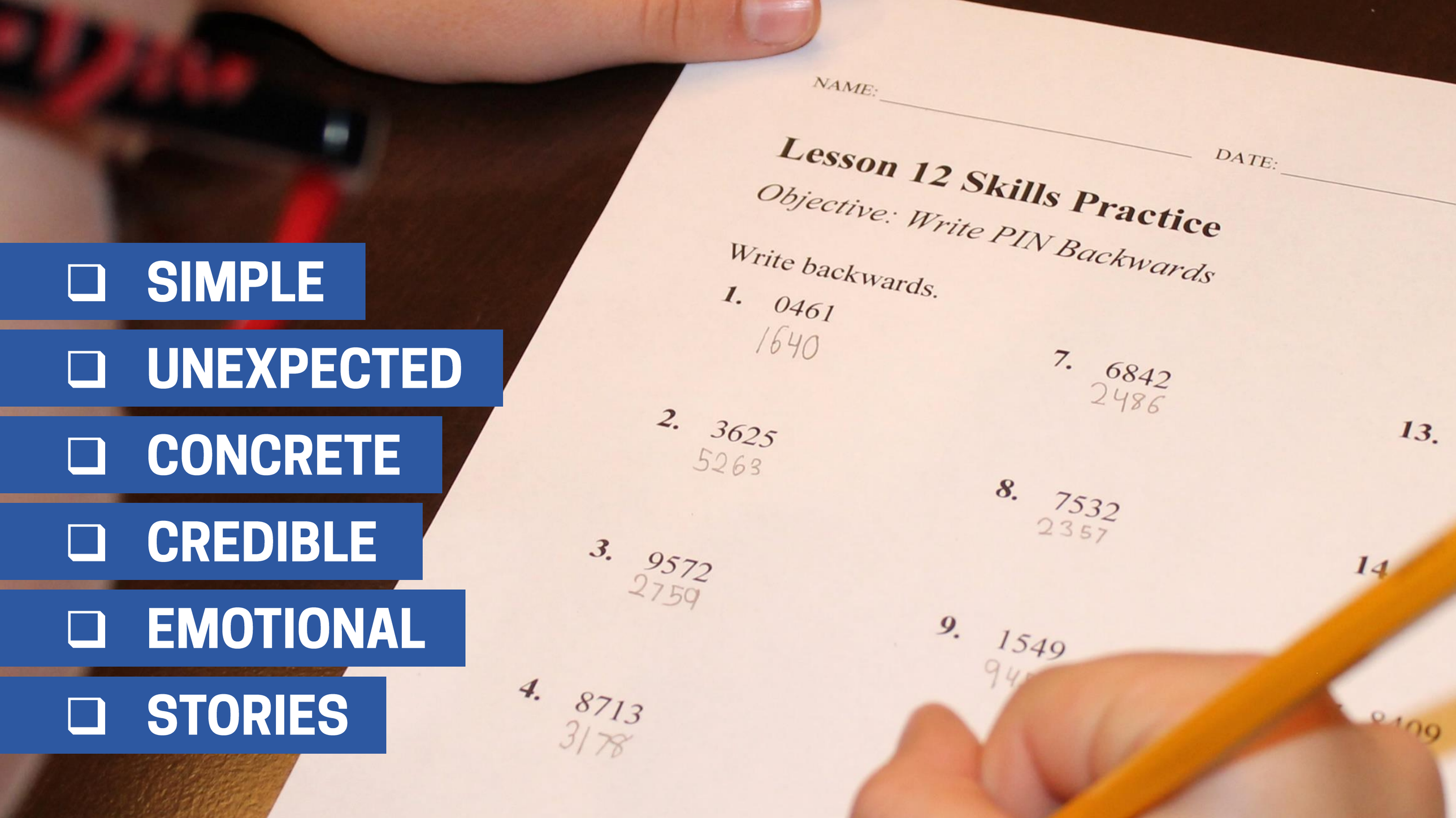
CURSE OF KNOWLEDGE

STICKY ATTRIBUTES

- ☑ SIMPLE
- ☑ UNEXPECTED
- ☑ CONCRETE
- ☑ CREDIBLE
- ☑ EMOTIONAL
- ☑ STORIES

RobertKaplinsky.com


SIMPLE
UNEXPECTED
CONCRETE
CREDIBLE
EMOTIONAL
STORIES



- ❑ SIMPLE
- ❑ UNEXPECTED
- ❑ CONCRETE
- ❑ CREDIBLE
- ❑ EMOTIONAL
- ❑ STORIES

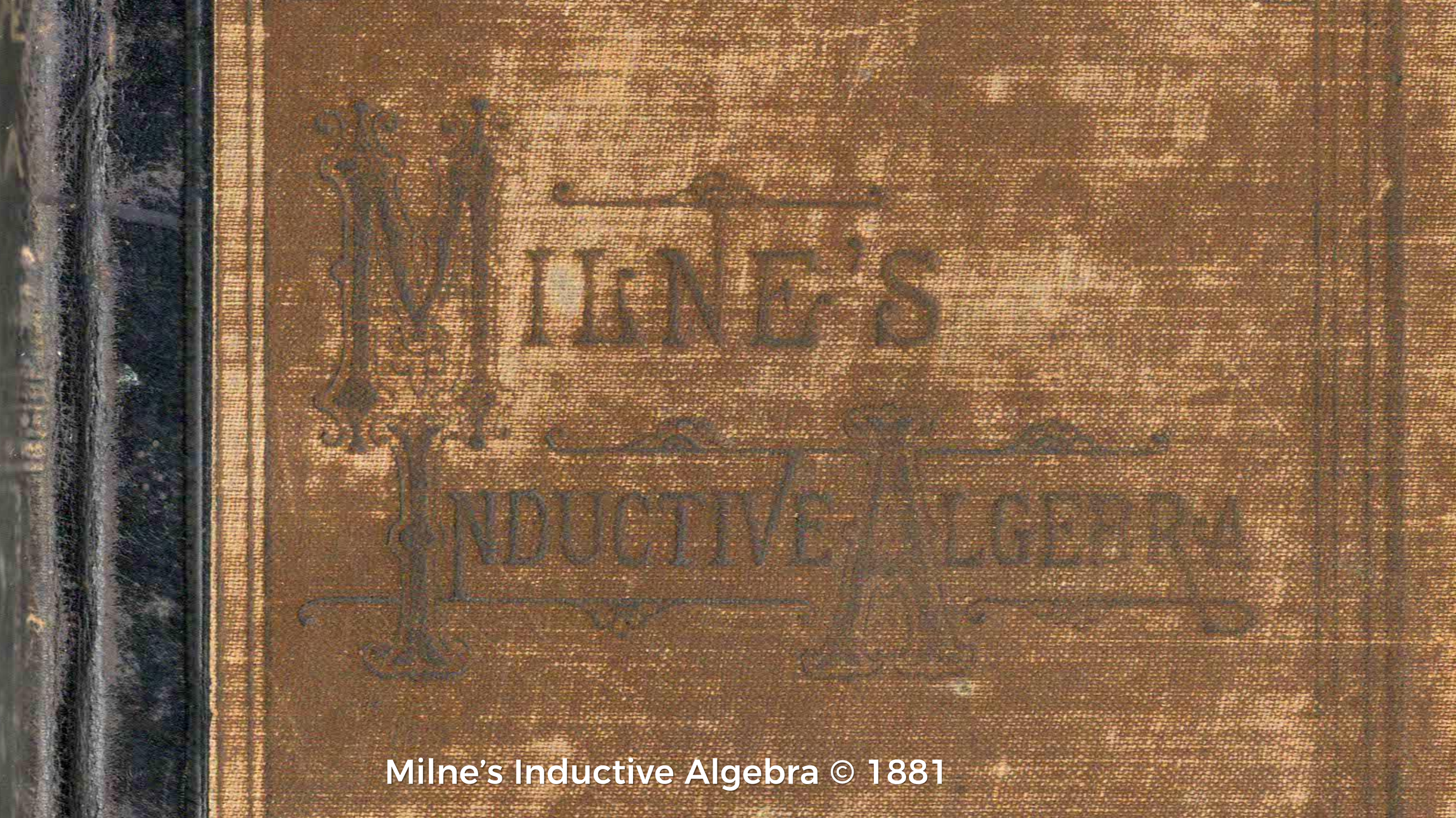
DISCUSSION TIME

- Why are urban legends so much easier to remember?
- How can we use that knowledge to make math easier to remember too?

GOALS

- ☑ CORRECT ANSWERS = UNDERSTANDING
- ☑ MAKE OUR LESSONS UNFORGETTABLE
- ☐ RECONSIDER USING WORD PROBLEMS

Why do we have word problems?



Milne's Inductive Algebra © 1881

183. DIRECTIONS FOR SOLVING.—*Represent one of the unknown quantities by x, and from the conditions of the problem find an expression for each of the other quantities given.*

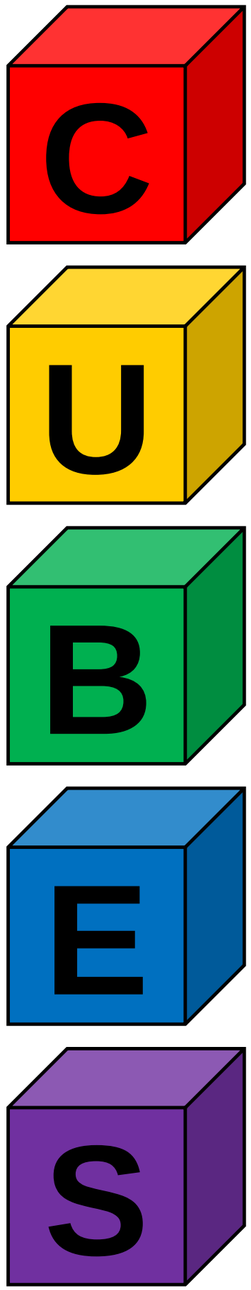
Find from the problem two expressions that are equal, and express them as an equation.

Solve the equation.

51. When the half of a certain number is added to the number, the sum is as much more than 60 as the number is less than 65. What is the number?

52. The difference between two numbers is 8, and the quotient arising from dividing the greater by the less is 3. What are the numbers?

53. A man left one-half of his property to his wife, one-sixth to his children, a twelfth to his brother, and the rest, which was $600, to charitable purposes. How much property had he?



CIRCLE the numbers

UNDERLINE the question

BOX the key words

~~ELIMINATE~~ info not needed

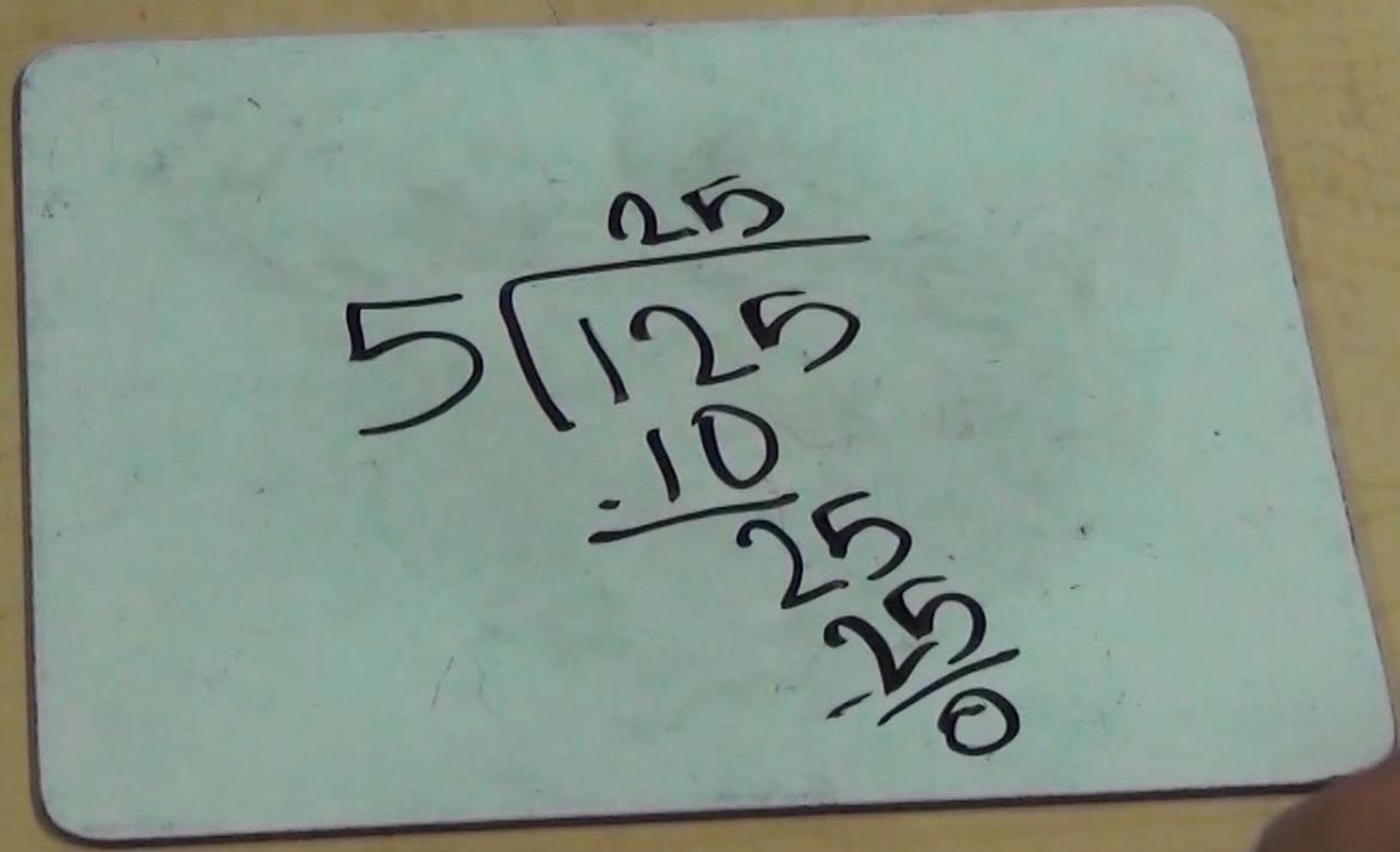
SOLVE and check ✓

Owen had 3 boxes of crayons. There are 10 crayons in each box. How many crayons are there altogether?

Source: Marilyn Burns

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

Making sense: 8
Not making sense: 24



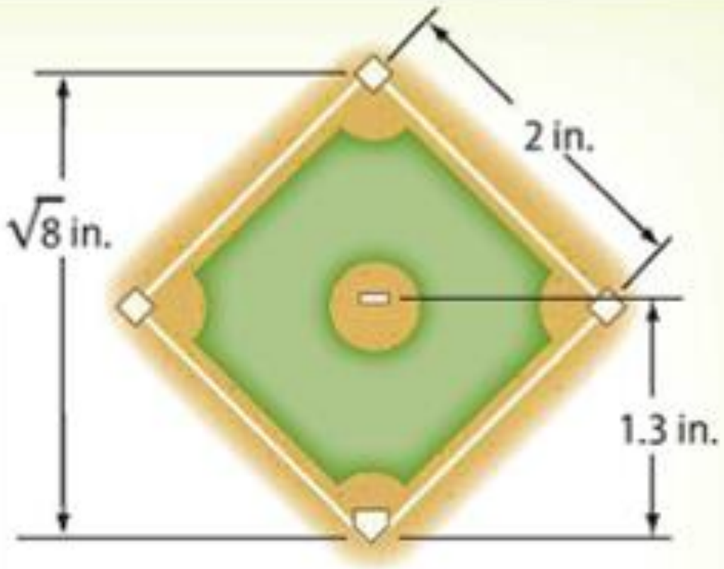
Real-World Link

Common Core State Standards

Content Standards
8.NS.1, 8.NS.2, 8.EE.2

Mathematical Practices
1, 3, 4, 6

Sports Major League baseball has rules for the dimensions of the baseball diamond. A model of the diamond is shown.



1. On the model, the distance from the pitching mound to home plate is 1.3 inches. Is 1.3 a rational number? Explain.

2. On the model, the distance from first base to second base is 2 inches. Is 2 a rational number? Explain.

3. The distance from home plate to second base is $\sqrt{8}$ inches. Using a calculator, find $\sqrt{8}$. Does it appear to terminate or repeat?

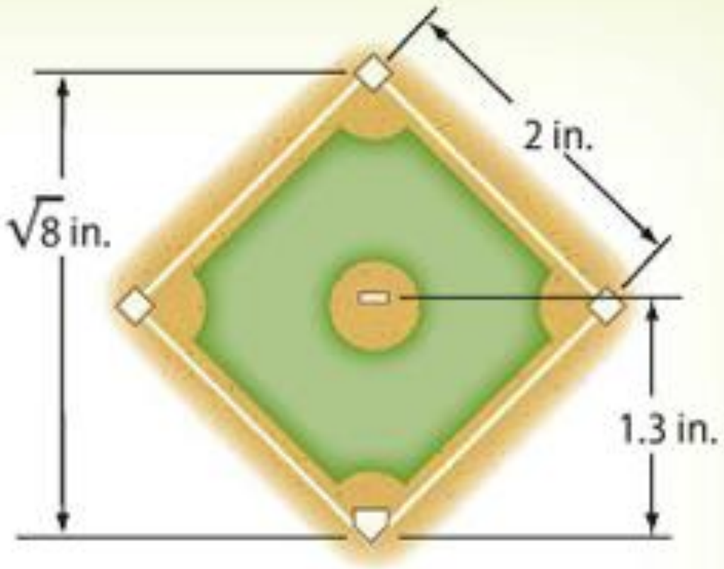
Real-World Link

Common Core State Standards

Content Standards
8.NS.1, 8.NS.2, 8.EE.2

Mathematical Practices
1, 3, 4, 6

Sports Major League baseball has rules for the dimensions of the baseball diamond. A model of the diamond is shown.



1. On the model, the distance from the pitching mound to home plate is 1.3 inches. Is 1.3 a rational number? Explain.

2. On the model, the distance from first base to second base is 2 inches. Is 2 a rational number? Explain.

3. The distance from home plate to second base is $\sqrt{8}$ inches. Using a calculator, find $\sqrt{8}$. Does it appear to terminate or repeat?

Doritos® & Cheetos® Mix

20 Singles

DORITOS® Nacho Cheese Flavored Tortilla Chips 1 OZ. EA. DORITOS® COOL RANCH® Flavored Tortilla Chips 1 OZ. EA. CHEETOS® Puffs Cheese Flavored Snacks 7/8 OZ. EA. CHEETOS® Crunchy Cheese Flavored Snacks 1 OZ. EA.

20 INDIVIDUAL BAGS: 7/8 OZ. EACH, 1 OZ. EACH, TOTAL NET WT. 19 5/8 OZ. (1 LB. 3 5/8 OZ.) 556.3 g

⚠ WARNING: PREVENT ENTANGLEMENT AND STRANGULATION. KEEP THIS BAG AWAY FROM YOUNG CHILDREN. IT IS NOT A TOY.

THINKING TIME

- Why did many of you expect there to be five of each?
- Why was it not five of each?
- How might they decide on this combination?

Classic Mix

20 Singles

LAY'S® Classic Potato Chips, DORITOS® Nacho Cheese Flavored Tortilla Chips, DORITOS® COOL RANCH® Flavored Tortilla Chips, CHEETOS® Crunchy Cheese Flavored Snacks, SUNCHIPS® Original Multigrain Snacks, FRITOS® Original Corn Chips (All 1 OZ. Each)

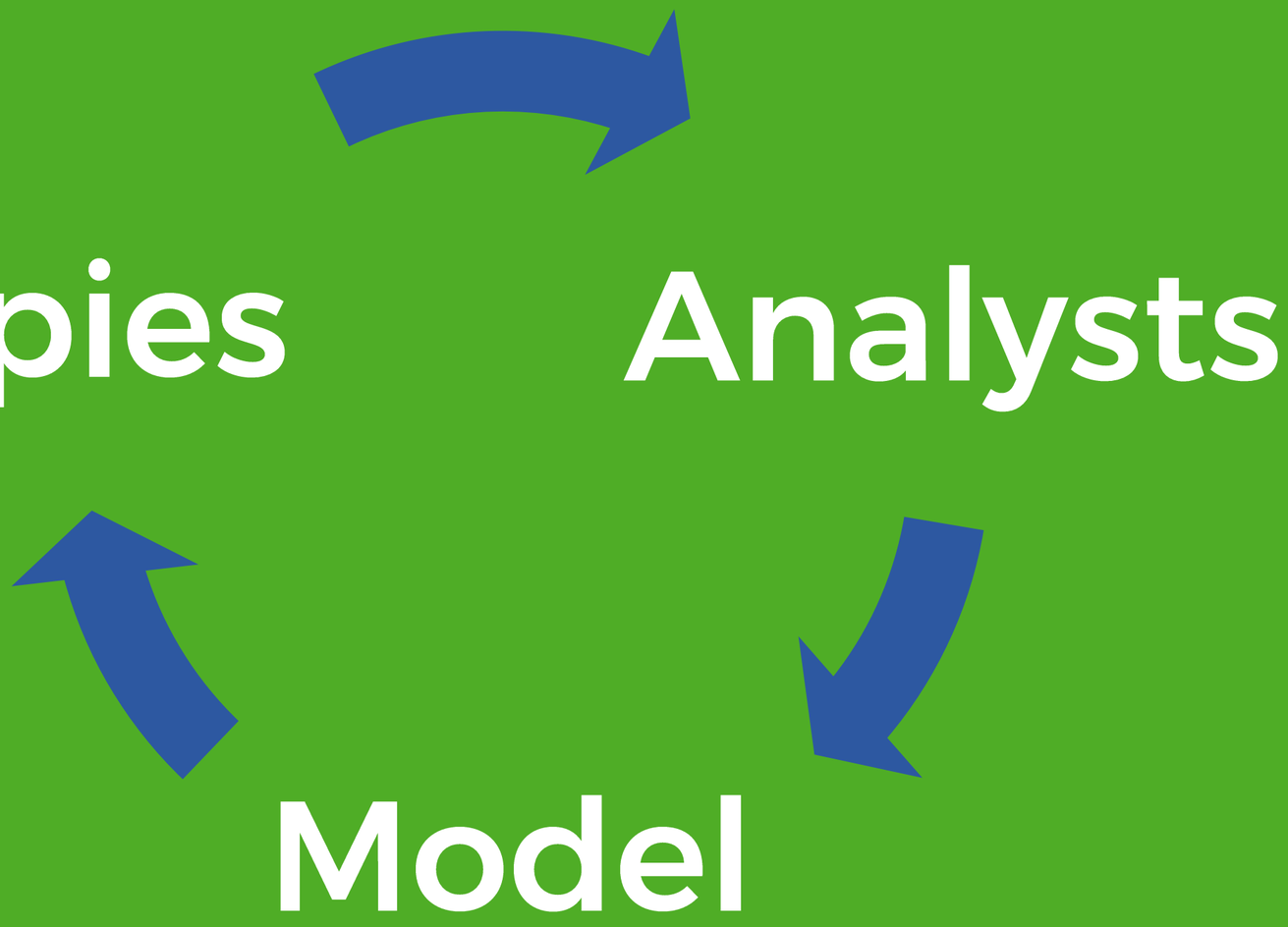
20 INDIVIDUAL BAGS: 1 OZ. EACH, TOTAL NET WT. 20 OZ. (1 LB. 4 OZ.) 567 g

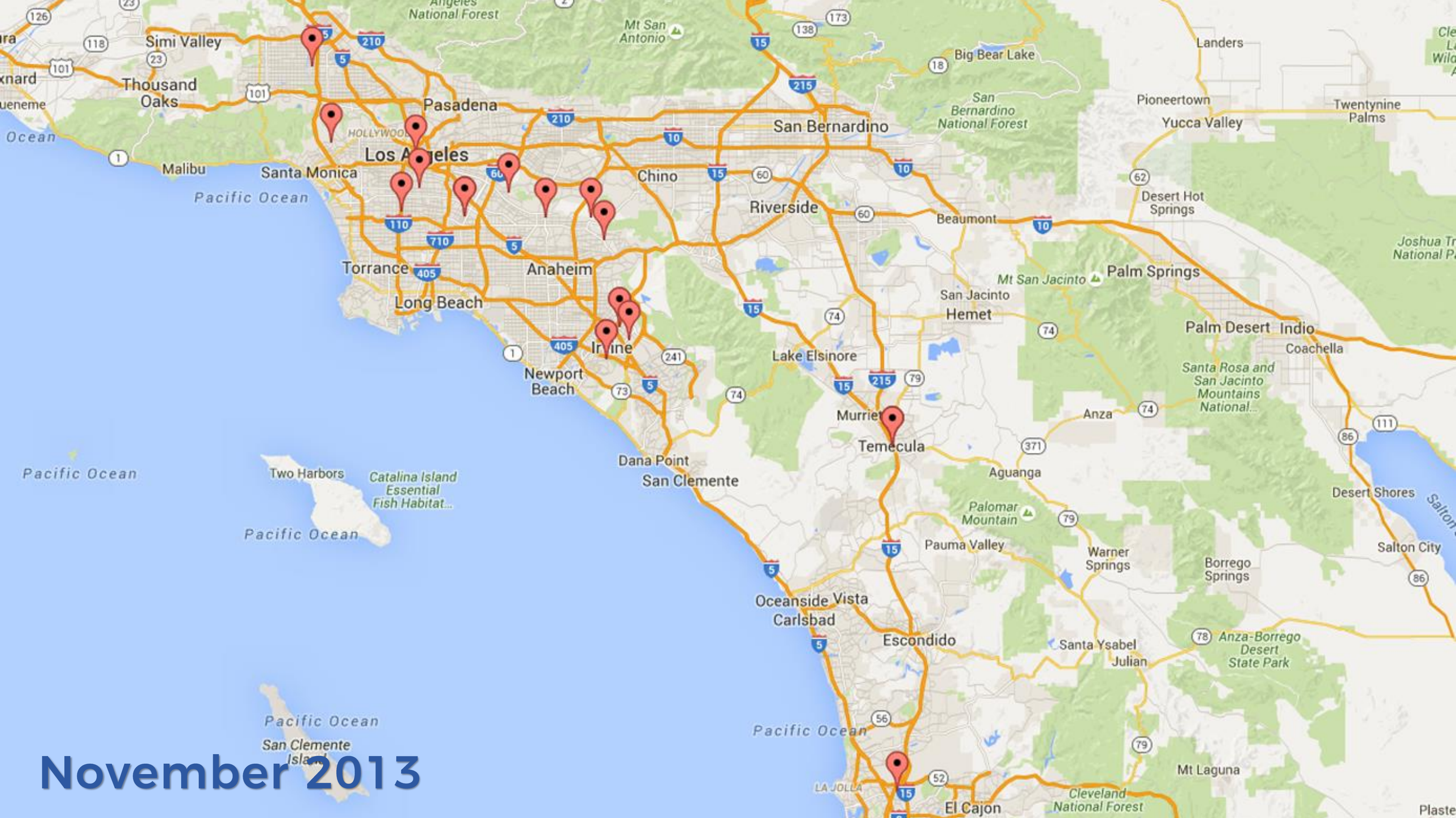
⚠ WARNING: PREVENT ENTANGLEMENT AND STRANGULATION. KEEP THIS BAG AWAY FROM YOUNG CHILDREN. IT IS NOT A TOY.

MATH MODELING

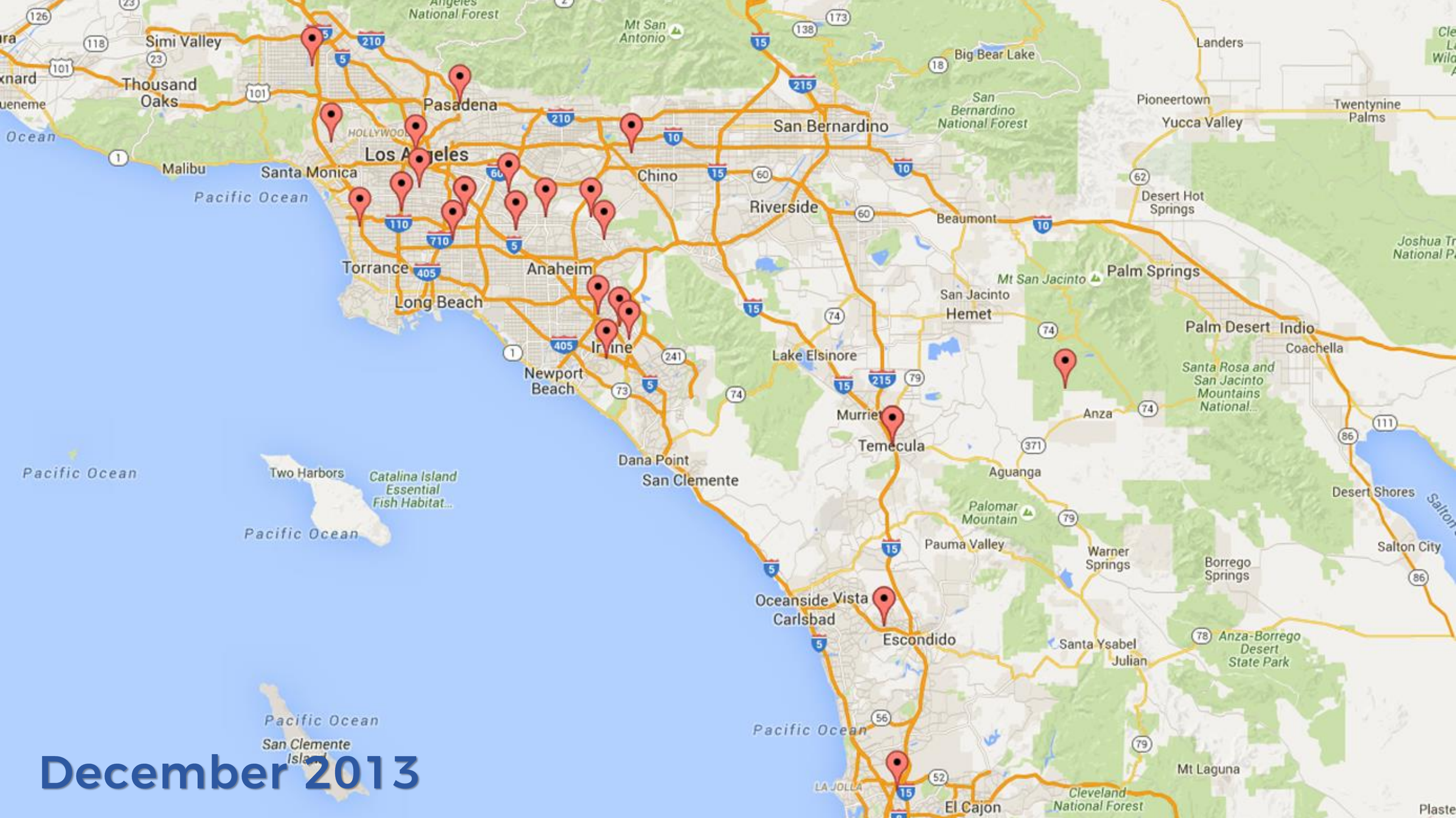
- ❑ HOW DO WE MAKE SENSE OF MATH MODELING?
- ❑ IS IT JUST ANSWERING QUESTIONS?
- ❑ HOW DO YOU PROFIT FROM MATH MODELING?
- ❑ HOW DO WE HELP OUR STUDENTS IMPROVE?

CENTRAL INTELLIGENCE AGENCY
UNITED STATES OF AMERICA

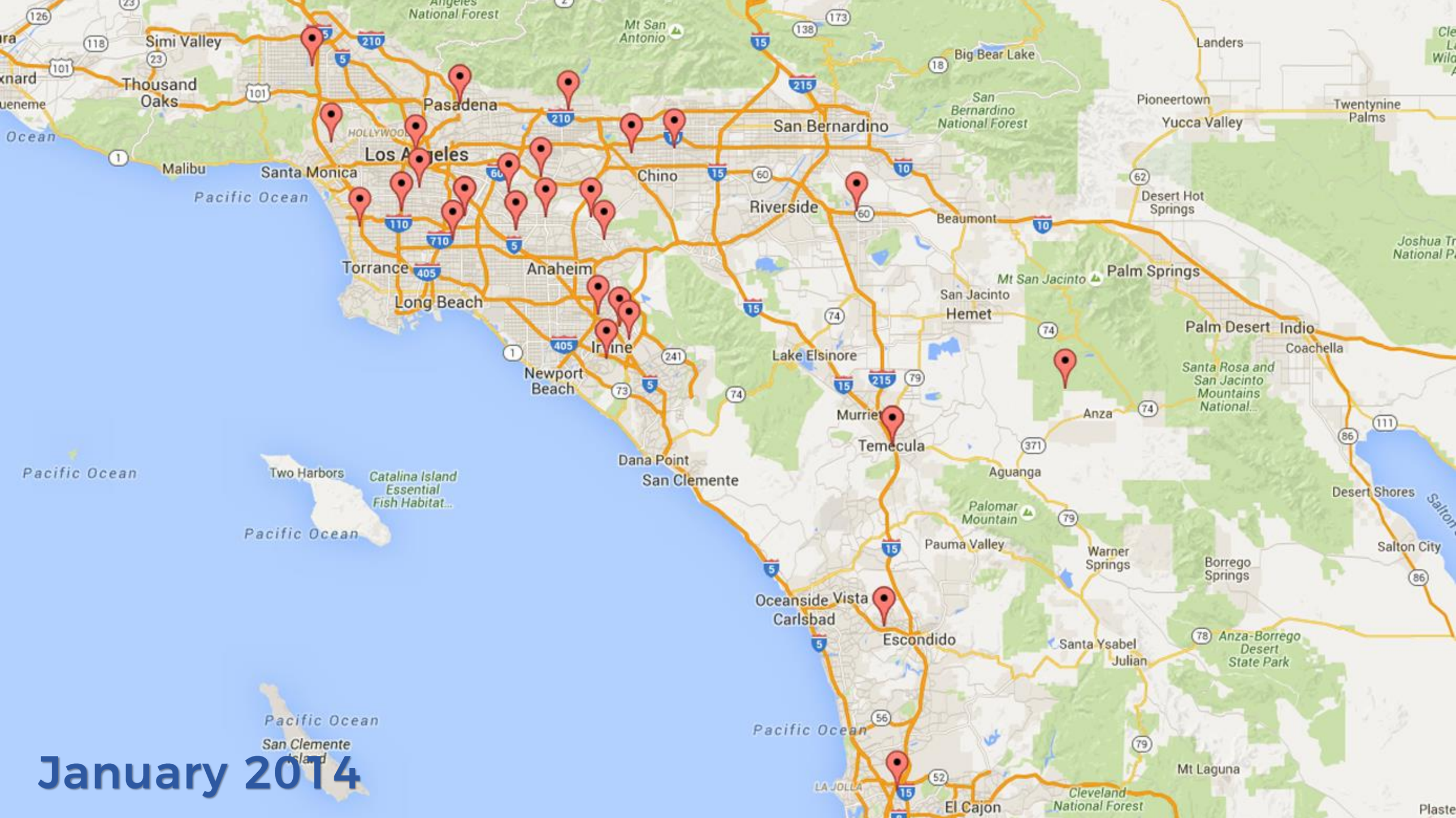

Spies
Analysts
Model



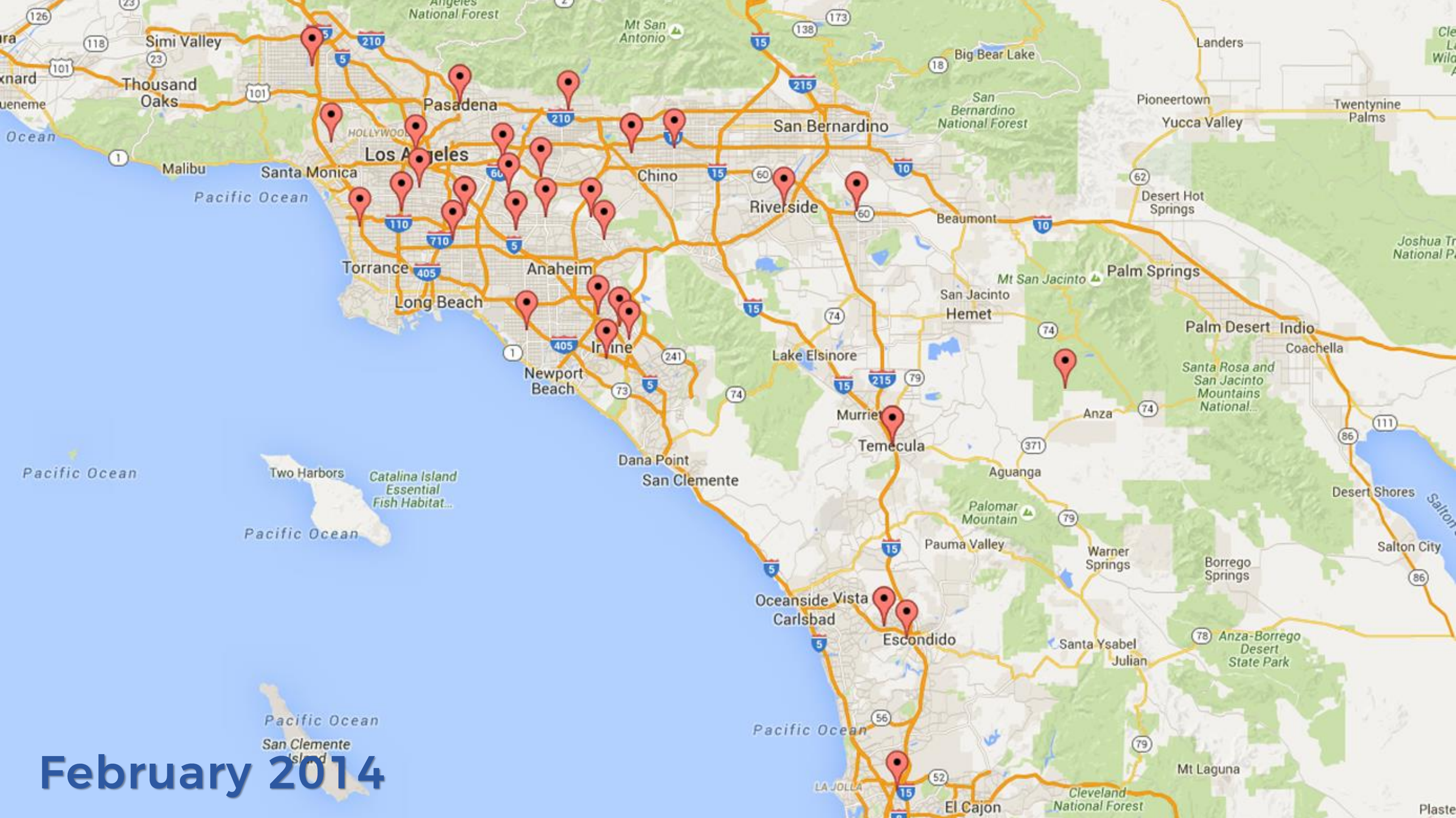
November 2013



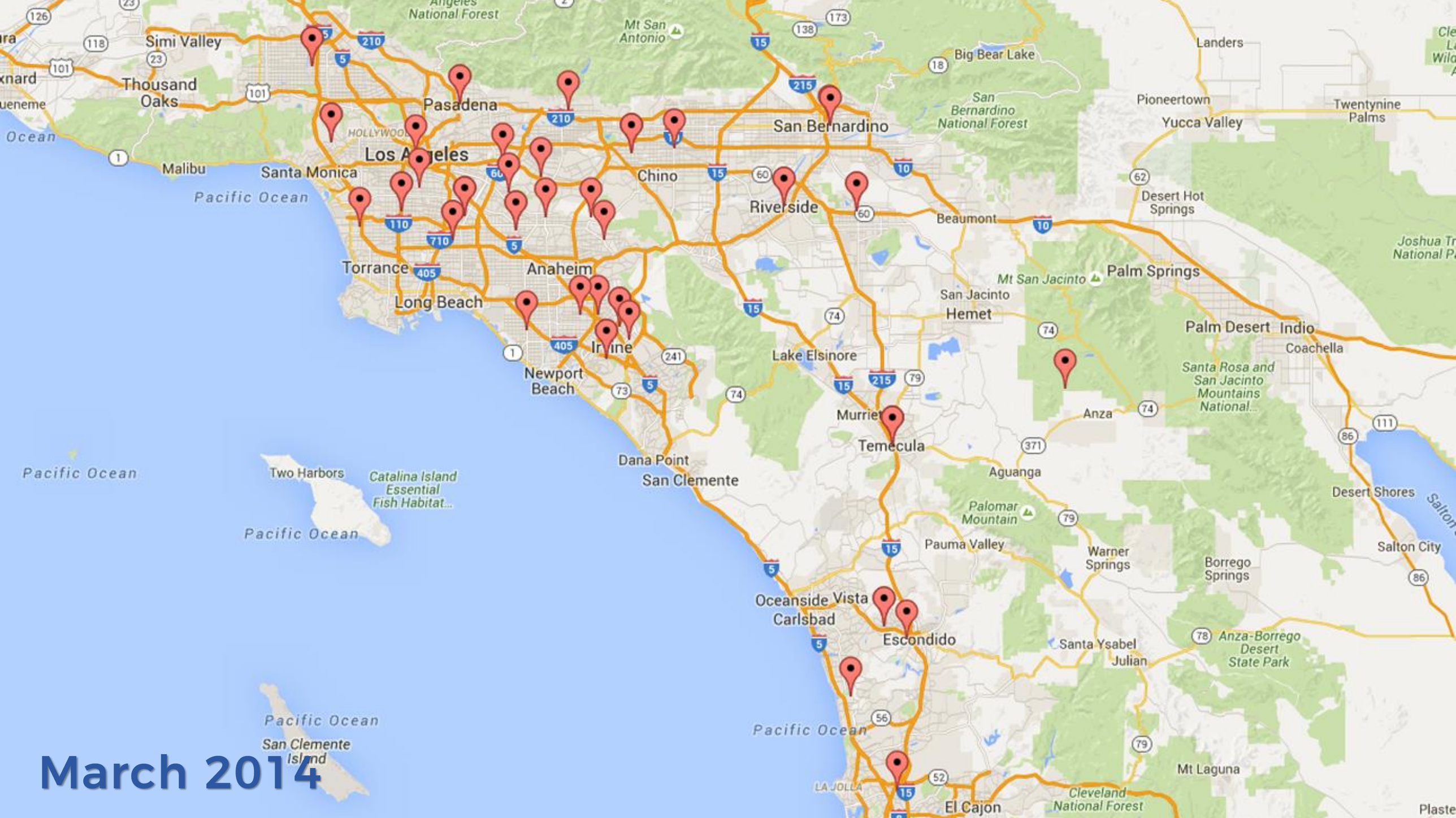
December 2013



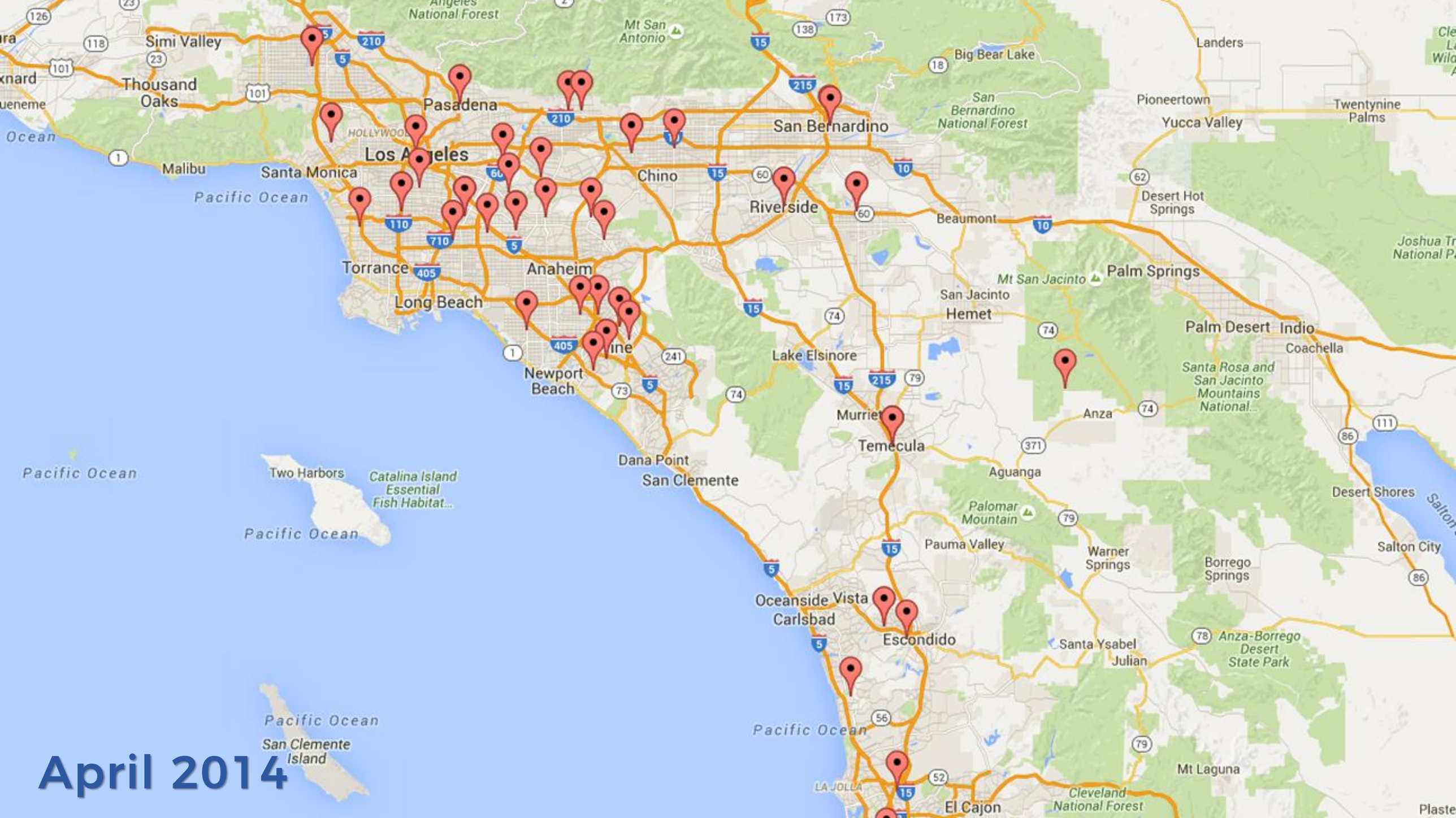
January 2014



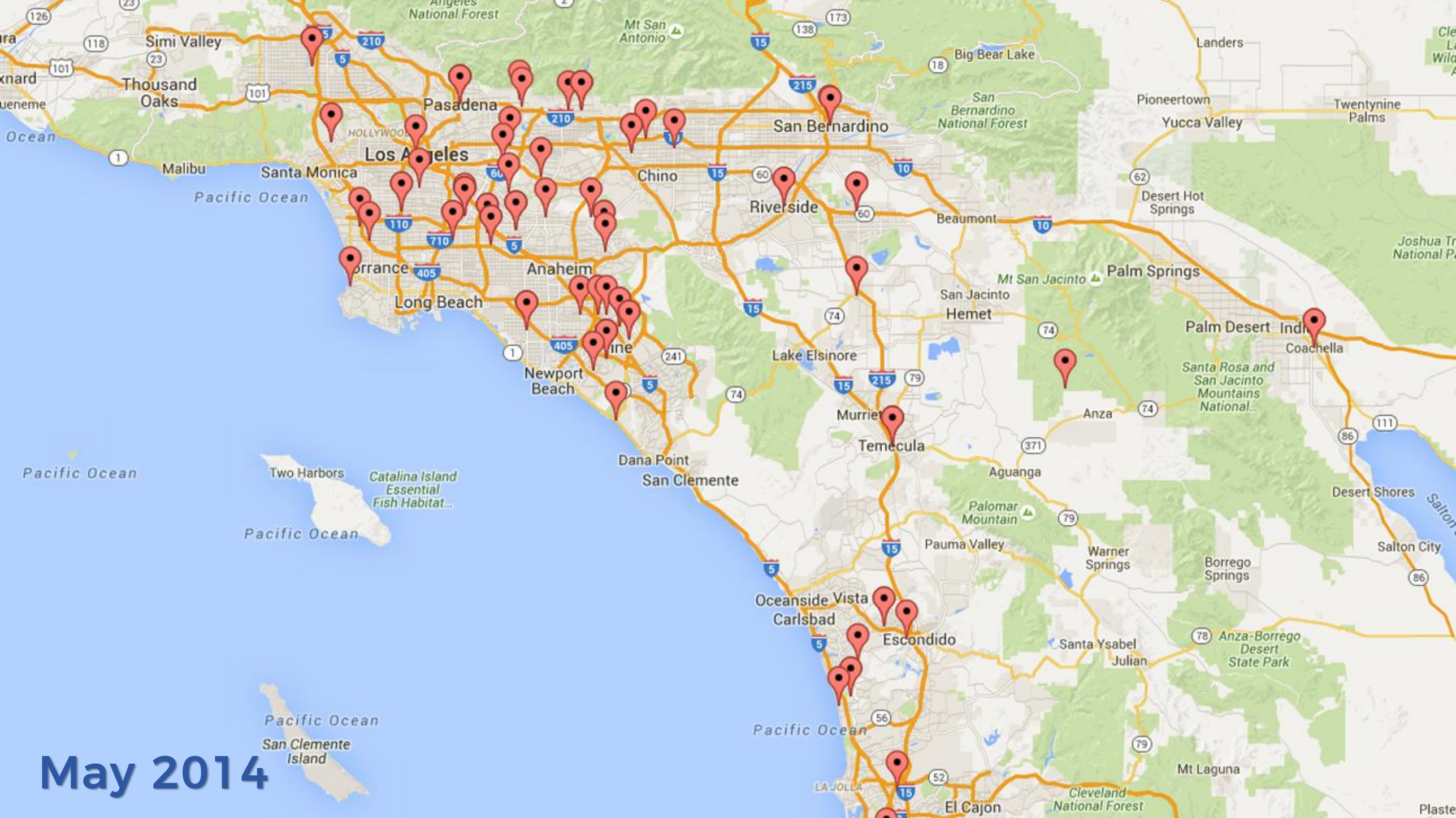
February 2014


Simi Valley
Thousand Oaks
Pasadena
Los Angeles
Malibu
Santa Monica
Pacific Ocean
Chino
San Bernardino
Riverside
Big Bear Lake
Landers
Pioneertown
Yucca Valley
Twentynine Palms
Desert Hot Springs
Beaumont
Palm Springs
Mt San Jacinto
San Jacinto
Hemet
Palm Desert
Indio
Coachella
Torrance
Anaheim
Long Beach
Irvine
Newport Beach
Lake Elsinore
Murrieta
Temecula
Anza
Aguanga
Dana Point
San Clemente
Two Harbors
Catalina Island Essential Fish Habitat...
Oceanside
Vista
Carlsbad
Escondido
Pauma Valley
Warner Springs
Borrego Springs
Salton City
Desert Shores
Santa Ysabel
Julian
Anza-Borrego Desert State Park
Mt Laguna
El Cajon
Cleveland National Forest
LA JOLLA
San Clemente Island

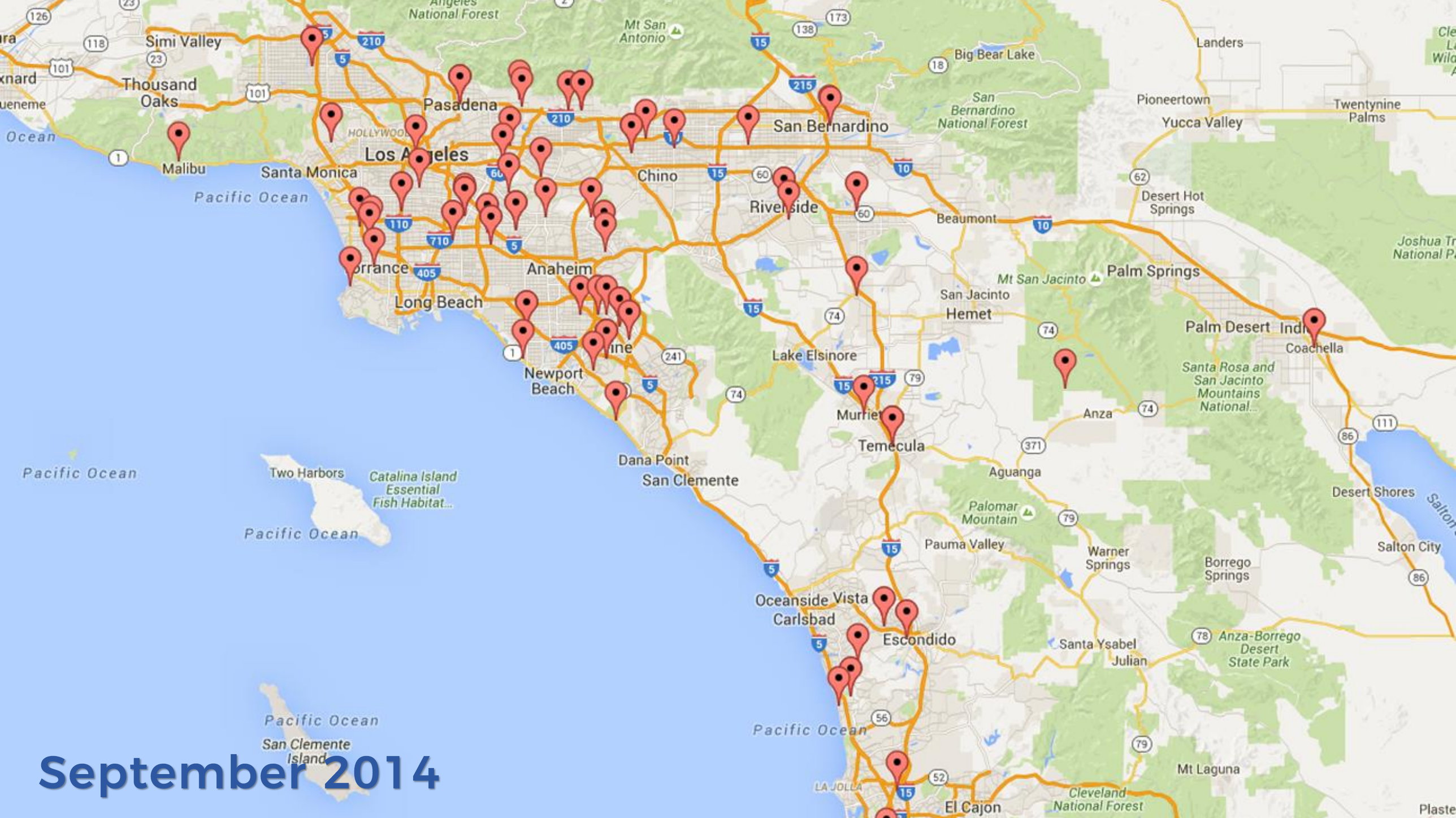
March 2014


Simi Valley
Thousand Oaks
Pasadena
Los Angeles
Malibu
Santa Monica
Pacific Ocean
Torrance
Long Beach
Anaheim
Chino
San Bernardino
Riverside
Big Bear Lake
Landers
Pioneertown
Yucca Valley
Twentynine Palms
Desert Hot Springs
Beaumont
Palm Springs
Mt San Jacinto
San Jacinto
Hemet
Palm Desert
Indio
Coachella
Lake Elsinore
Murrieta
Temecula
Anza
Aguanga
Dana Point
San Clemente
Newport Beach
Two Harbors
Catalina Island Essential Fish Habitat...
Oceanside
Vista
Carlsbad
Escondido
Pauma Valley
Warner Springs
Borrego Springs
Salton City
Desert Shores
Santa Ysabel
Julian
Anza-Borrego Desert State Park
Palomar Mountain
Mt Laguna
El Cajon
Cleveland National Forest
San Clemente Island
LA JOLLA

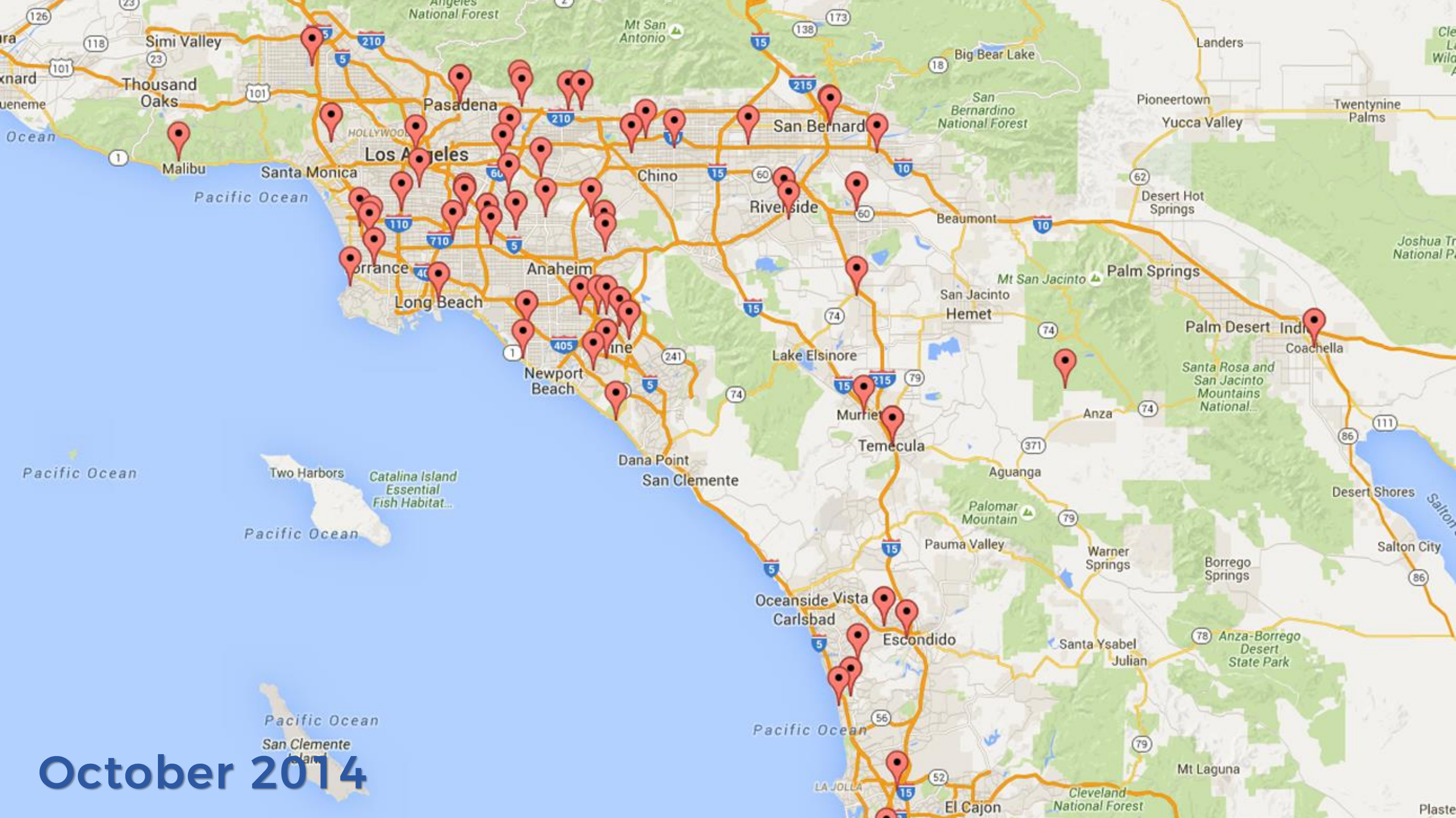
April 2014


Simi Valley
Thousand Oaks
Pasadena
Los Angeles
Santa Monica
Malibu
Pacific Ocean
Chino
San Bernardino
Riverside
Big Bear Lake
San Bernardino National Forest
Landers
Pioneertown
Yucca Valley
Twentynine Palms
Desert Hot Springs
Beaumont
Palm Springs
Mt San Jacinto
San Jacinto
Hemet
Palm Desert
Coachella
Anaheim
Long Beach
Newport Beach
Lake Elsinore
Murrieta
Temecula
Anza
Santa Rosa and San Jacinto Mountains National...
Dana Point
San Clemente
Aguanga
Two Harbors
Catalina Island Essential Fish Habitat...
Palomar Mountain
Pauma Valley
Warner Springs
Borrego Springs
Desert Shores
Salton City
Oceanside
Vista
Carlsbad
Escondido
Santa Ysabel
Julian
Anza-Borrego Desert State Park
San Clemente Island
Mt Laguna
El Cajon
Cleveland National Forest
LA JOLLA

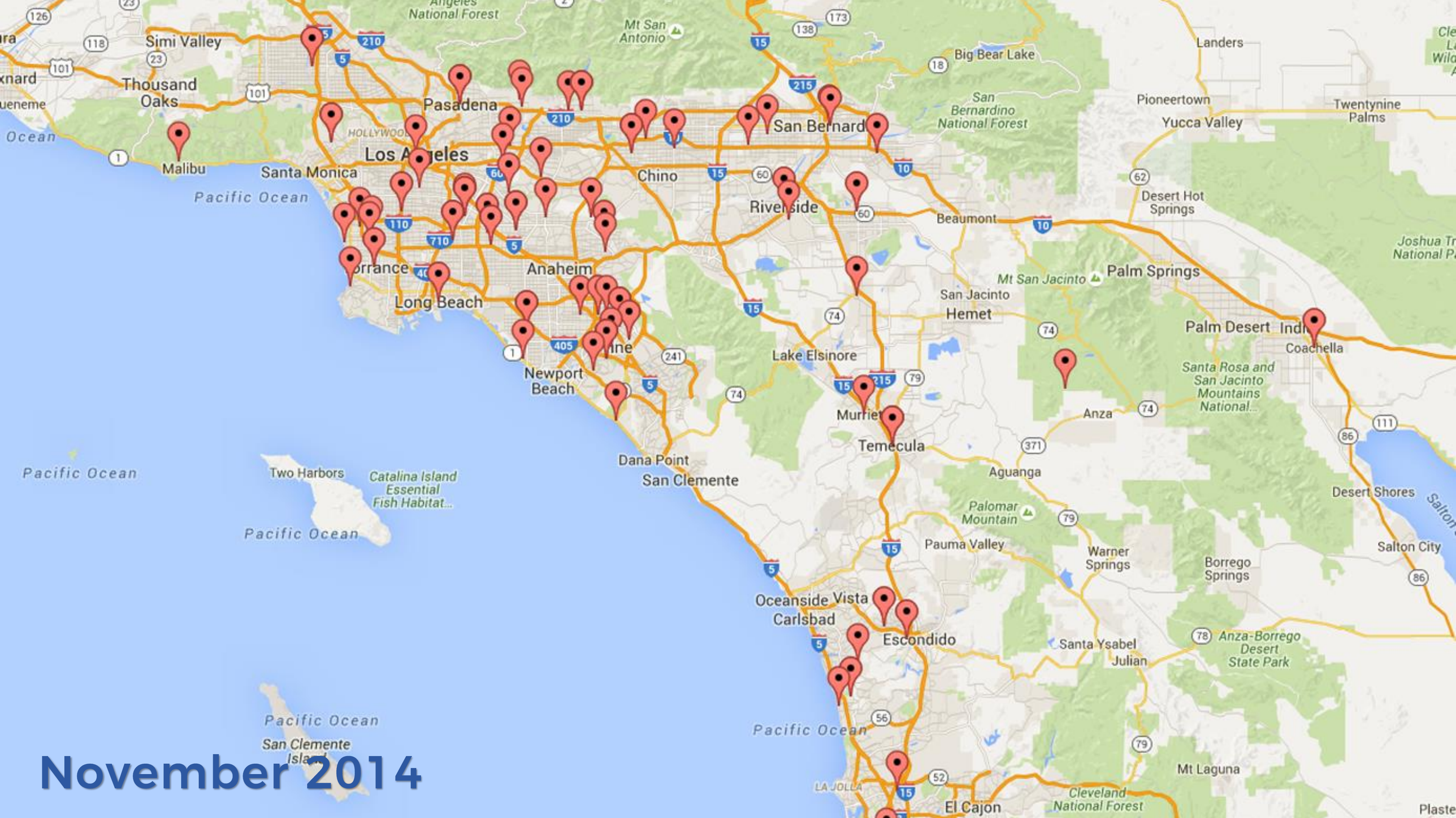
May 2014



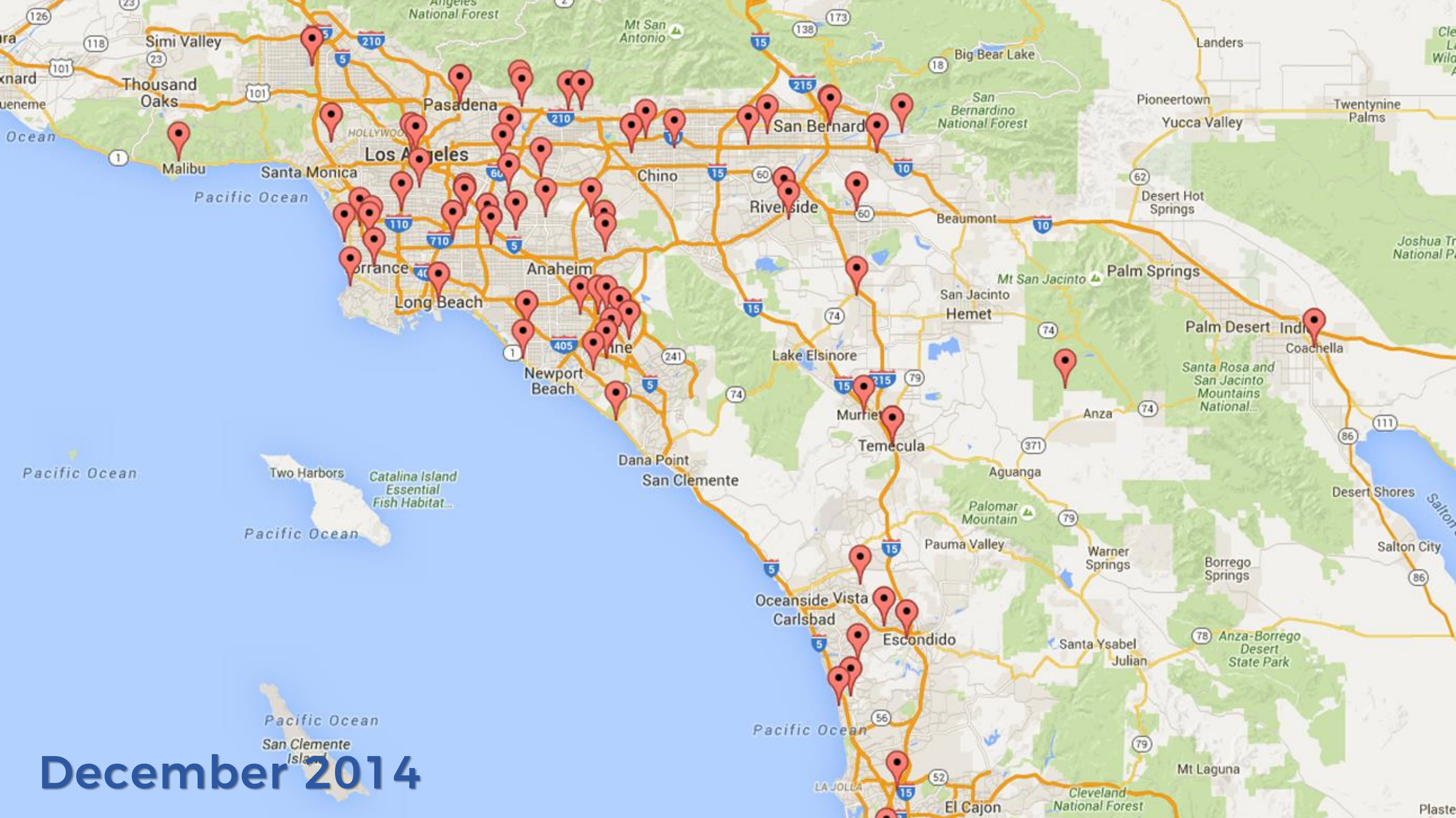
September 2014



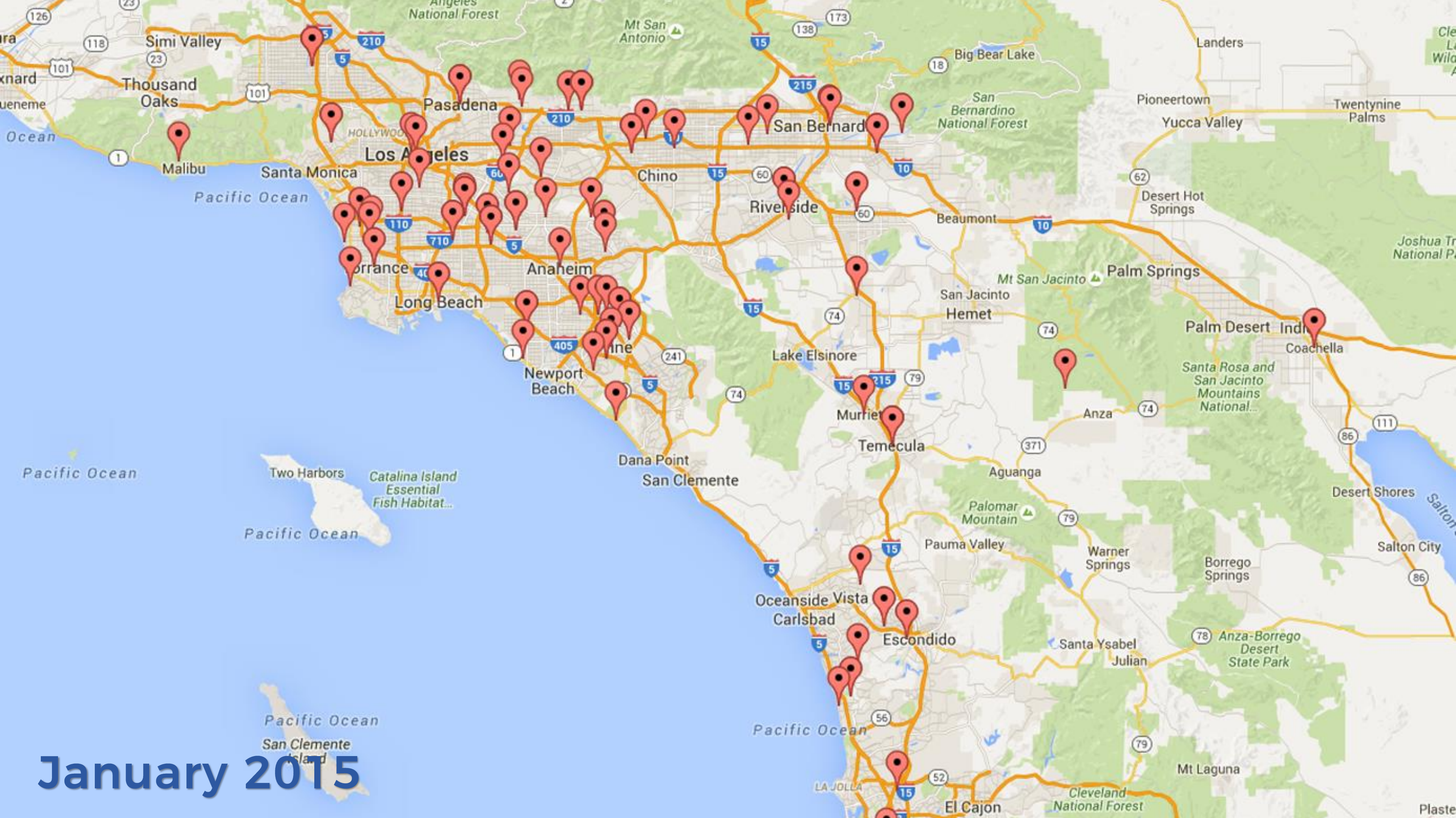
October 2014



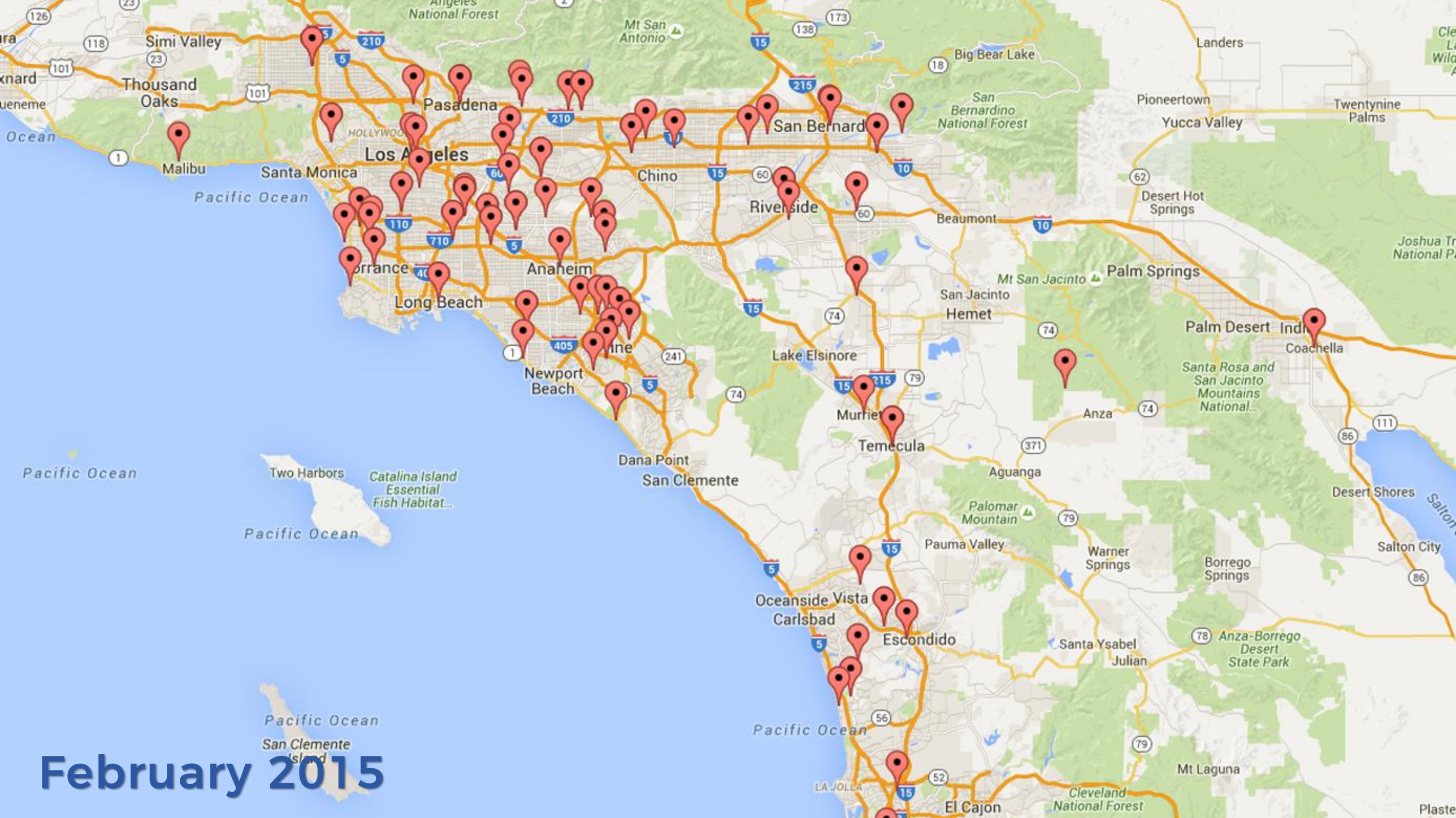
November 2014



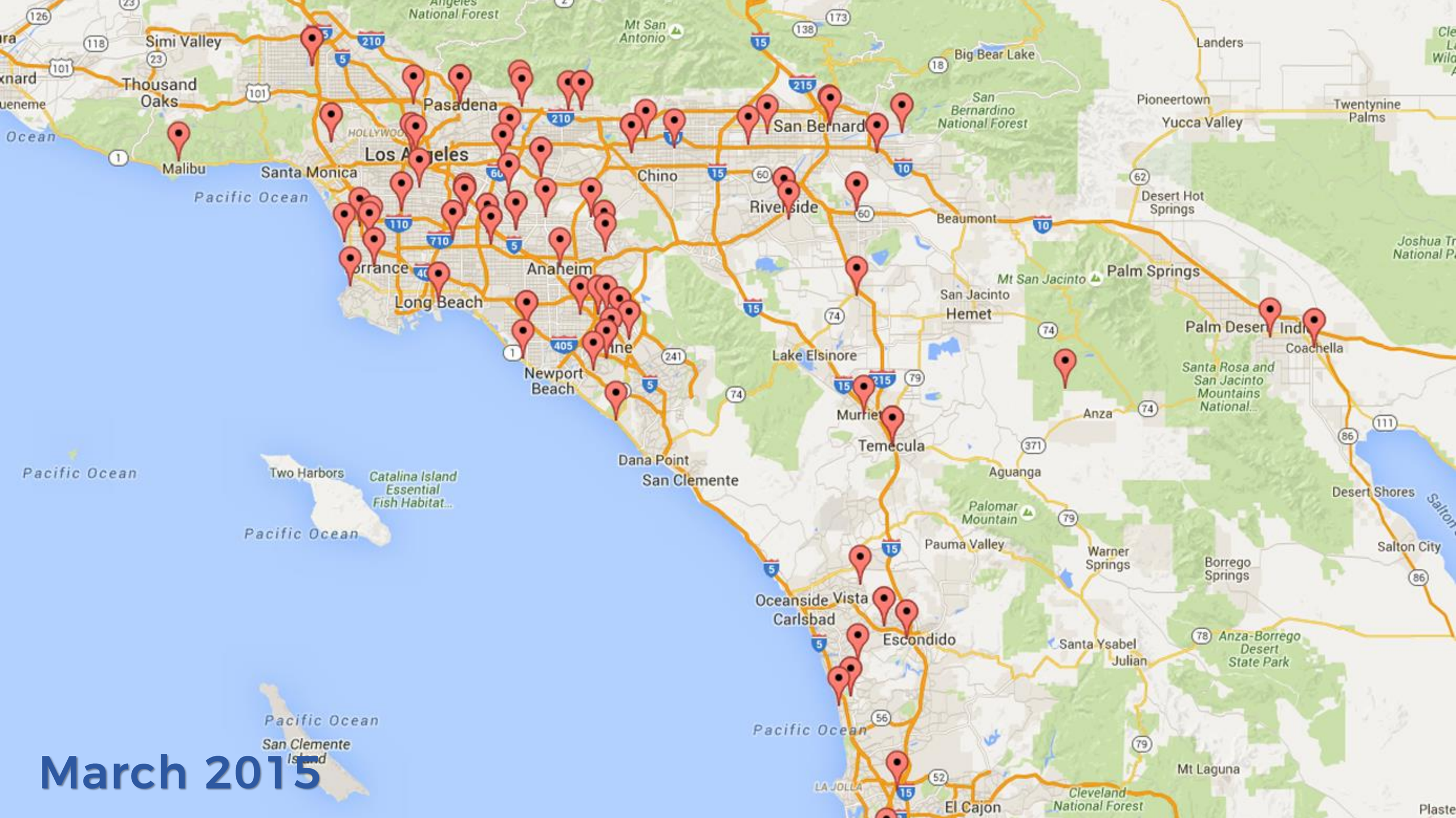
December 2014



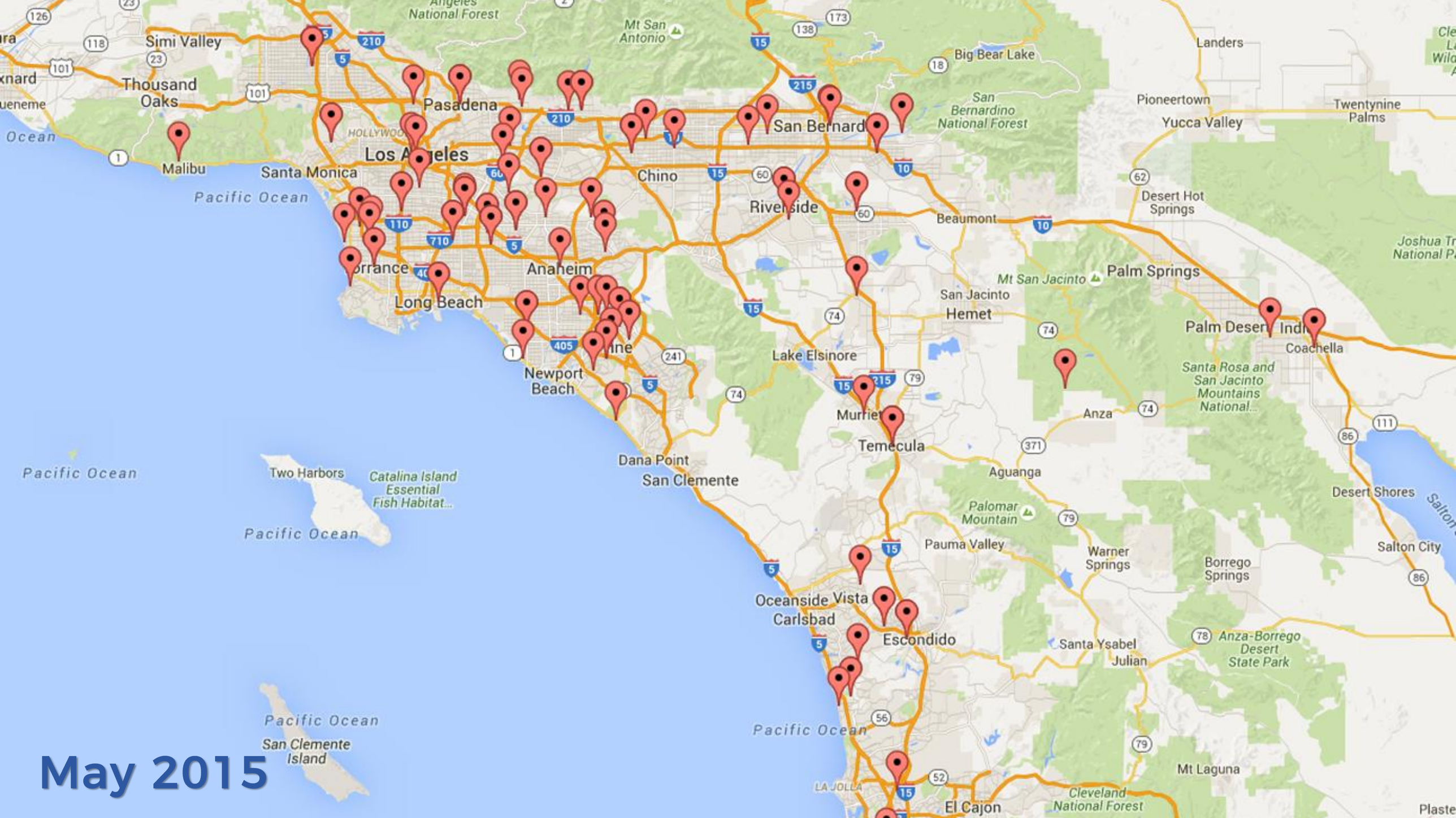
January 2015



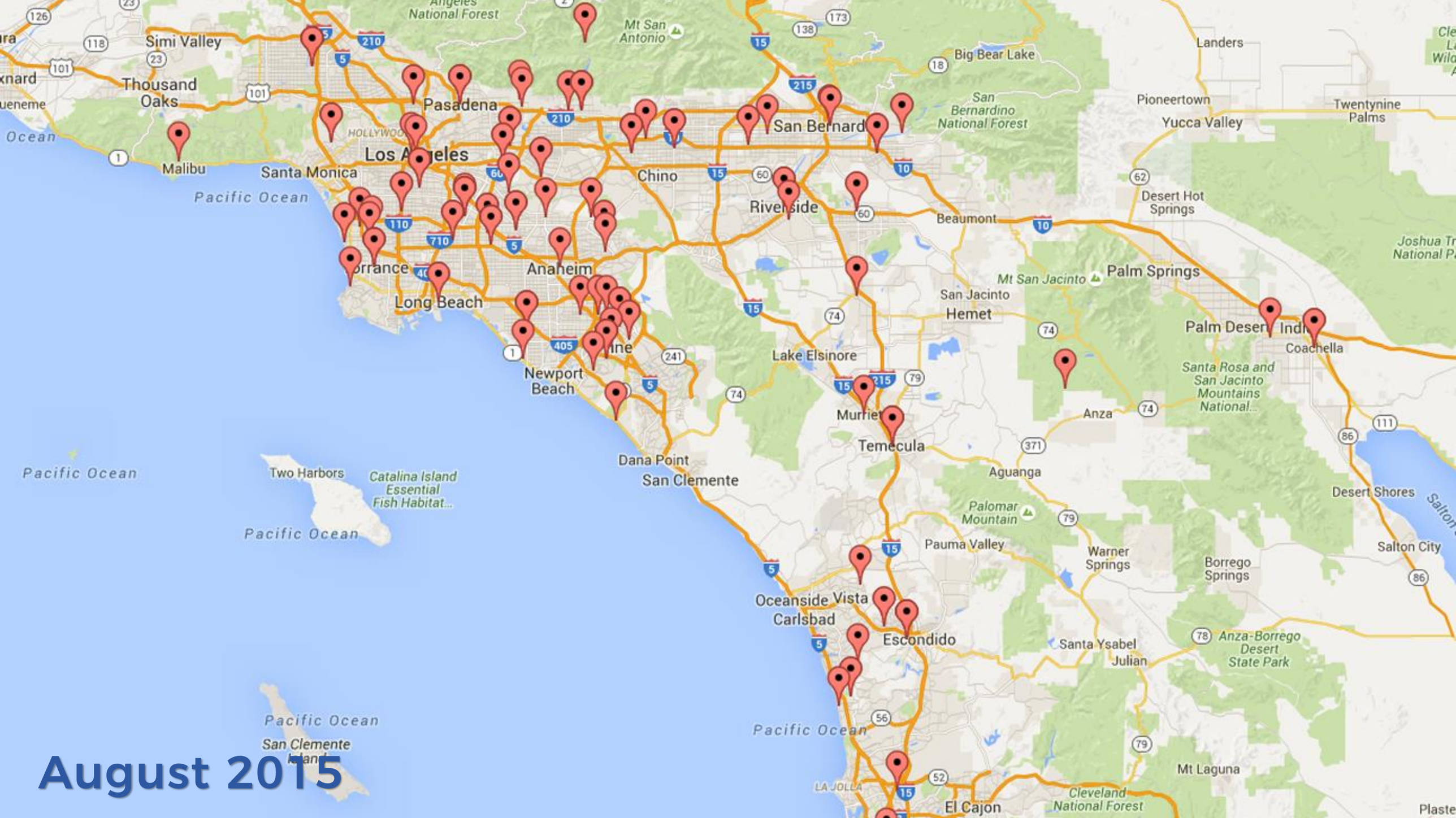
February 2015


Simi Valley
Thousand Oaks
Malibu
Santa Monica
Pasadena
Los Angeles
Chino
San Bernardino
Big Bear Lake
Landers
Pioneertown
Yucca Valley
Twentynine Palms
Riverside
Beaumont
Desert Hot Springs
Palm Springs
San Jacinto
Hemet
Lake Elsinore
Anaheim
Long Beach
Newport Beach
Dana Point
San Clemente
Temecula
Murrieta
Anza
Aguanga
Coachella
Desert Shores
Salton City
Pauma Valley
Warner Springs
Borrego Springs
Oceanside
Vista
Carlsbad
Escondido
Santa Ysabel
Julian
Mt Laguna
El Cajon
Cleveland National Forest
Anza-Borrego Desert State Park
Santa Rosa and San Jacinto Mountains National...
Palomar Mountain
Mt San Jacinto
Mt San Antonio
Angeles National Forest
San Bernardino National Forest
Pacific Ocean
Two Harbors
Catalina Island Essential Fish Habitat...
San Clemente Island
LA JOLLA

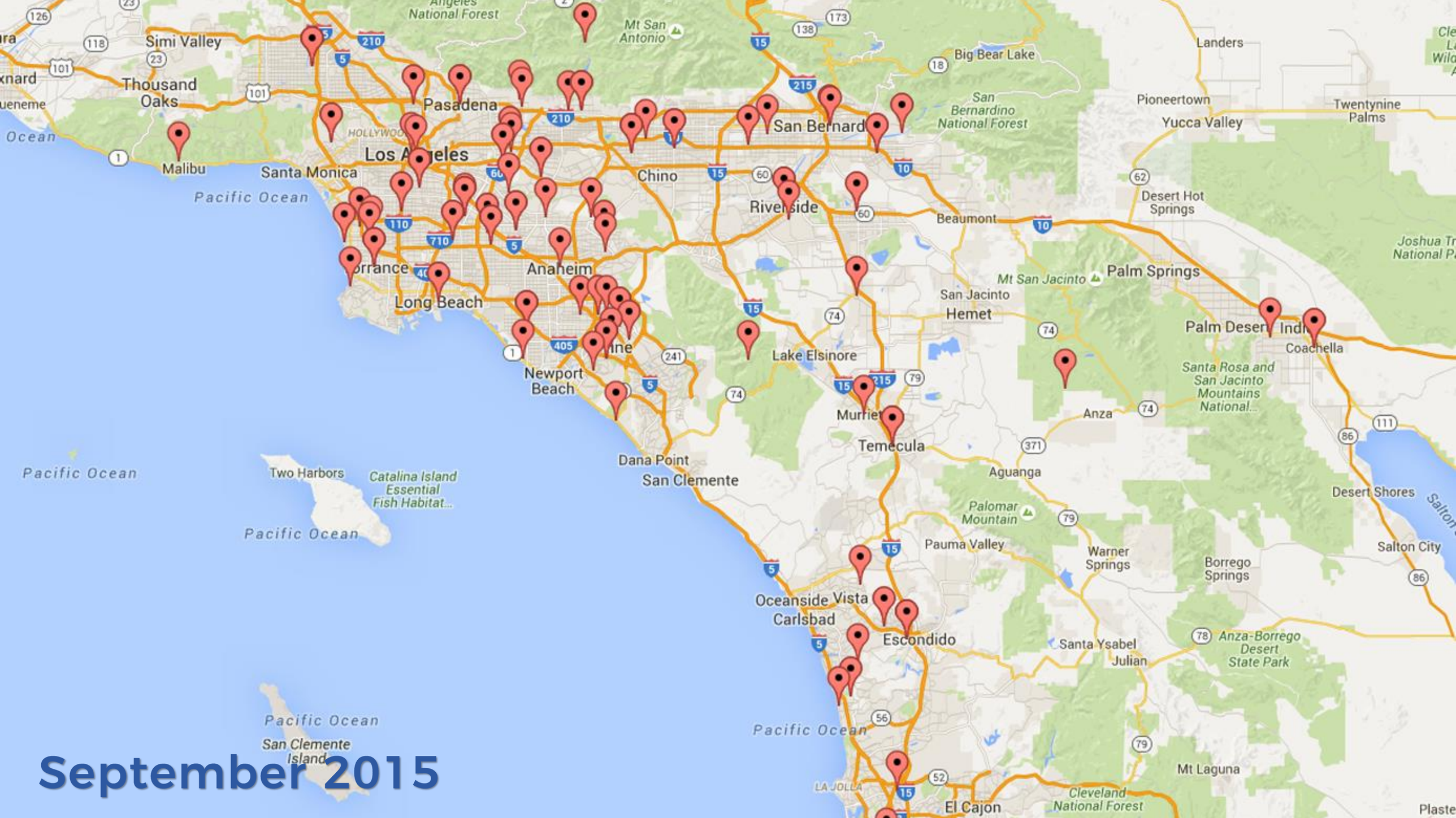
March 2015


Simi Valley
Thousand Oaks
Malibu
Santa Monica
Pasadena
Los Angeles
Chino
San Bernardino
Riverside
Beaumont
Big Bear Lake
San Bernardino National Forest
Landers
Pioneertown
Yucca Valley
Twentynine Palms
Desert Hot Springs
Palm Springs
Mt San Jacinto
San Jacinto
Hemet
Palm Desert
Coachella
Santa Rosa and San Jacinto Mountains National...
Anza
Aguanga
Temecula
Murrieta
Lake Elsinore
Anaheim
Long Beach
Newport Beach
Dana Point
San Clemente
Pacific Ocean
Two Harbors
Catalina Island Essential Fish Habitat...
Palomar Mountain
Pauma Valley
Warner Springs
Borrego Springs
Desert Shores
Salton City
Oceanside
Vista
Carlsbad
Escondido
Santa Ysabel
Julian
Anza-Borrego Desert State Park
San Clemente Island
Mt Laguna
El Cajon
Cleveland National Forest
LA JOLLA

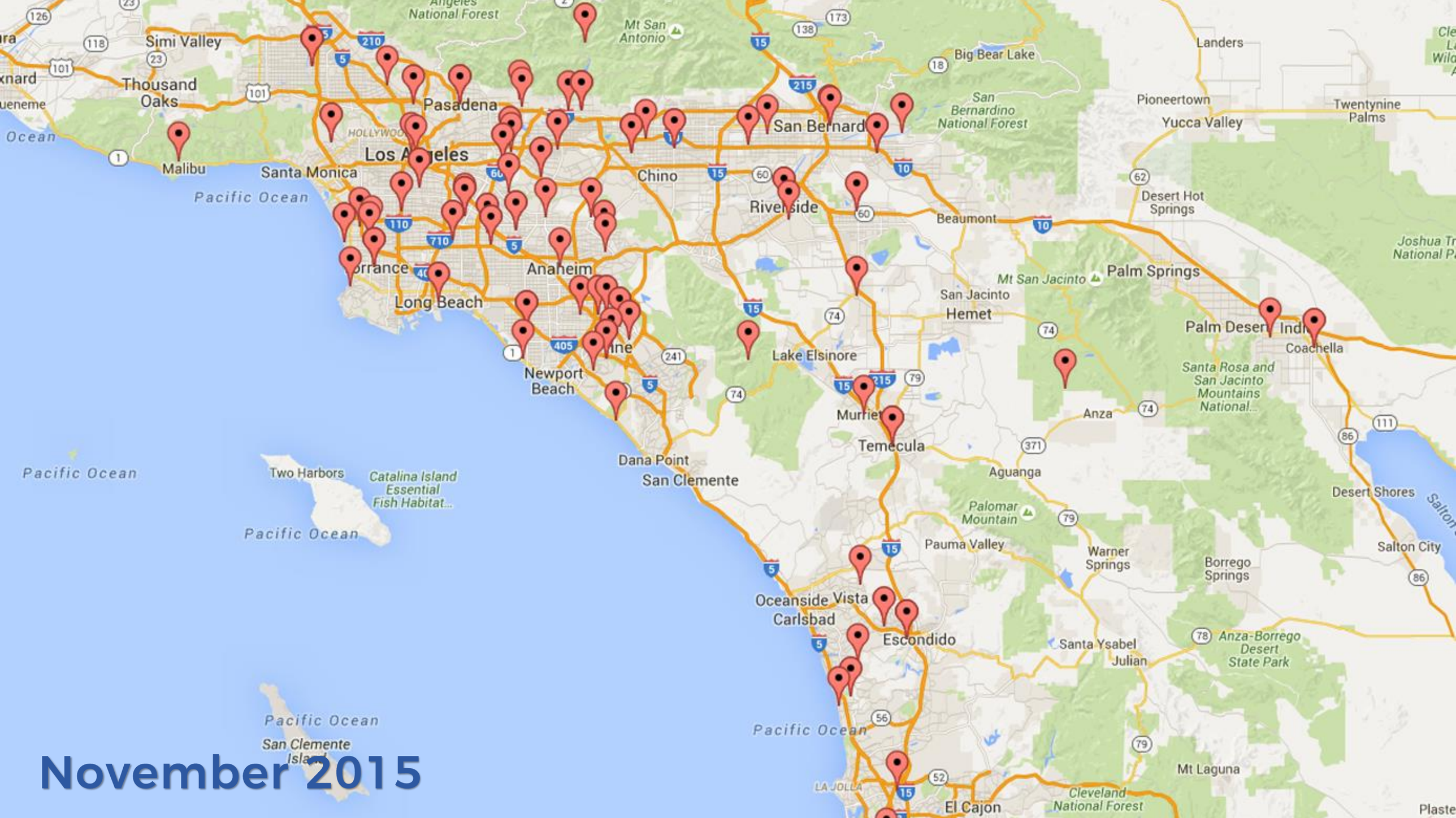
May 2015


Simi Valley
Thousand Oaks
Malibu
Pasadena
Santa Monica
Los Angeles
Pacific Ocean
Chino
San Bernardino
Big Bear Lake
Landers
Pioneertown
Yucca Valley
Twentynine Palms
Riverside
Beaumont
Desert Hot Springs
Palm Springs
Mt San Jacinto
San Jacinto
Hemet
Lake Elsinore
Anaheim
Long Beach
Newport Beach
Dana Point
San Clemente
Two Harbors
Catalina Island Essential Fish Habitat...
Temecula
Murrieta
Anza
Aguanga
Palomar Mountain
Pauma Valley
Warner Springs
Borrego Springs
Santa Rosa and San Jacinto Mountains National...
Coachella
Desert Shores
Salton City
Oceanside
Vista
Carlsbad
Escondido
Santa Ysabel
Julian
Anza-Borrego Desert State Park
Mt Laguna
Cleveland National Forest
El Cajon
LA JOLLA

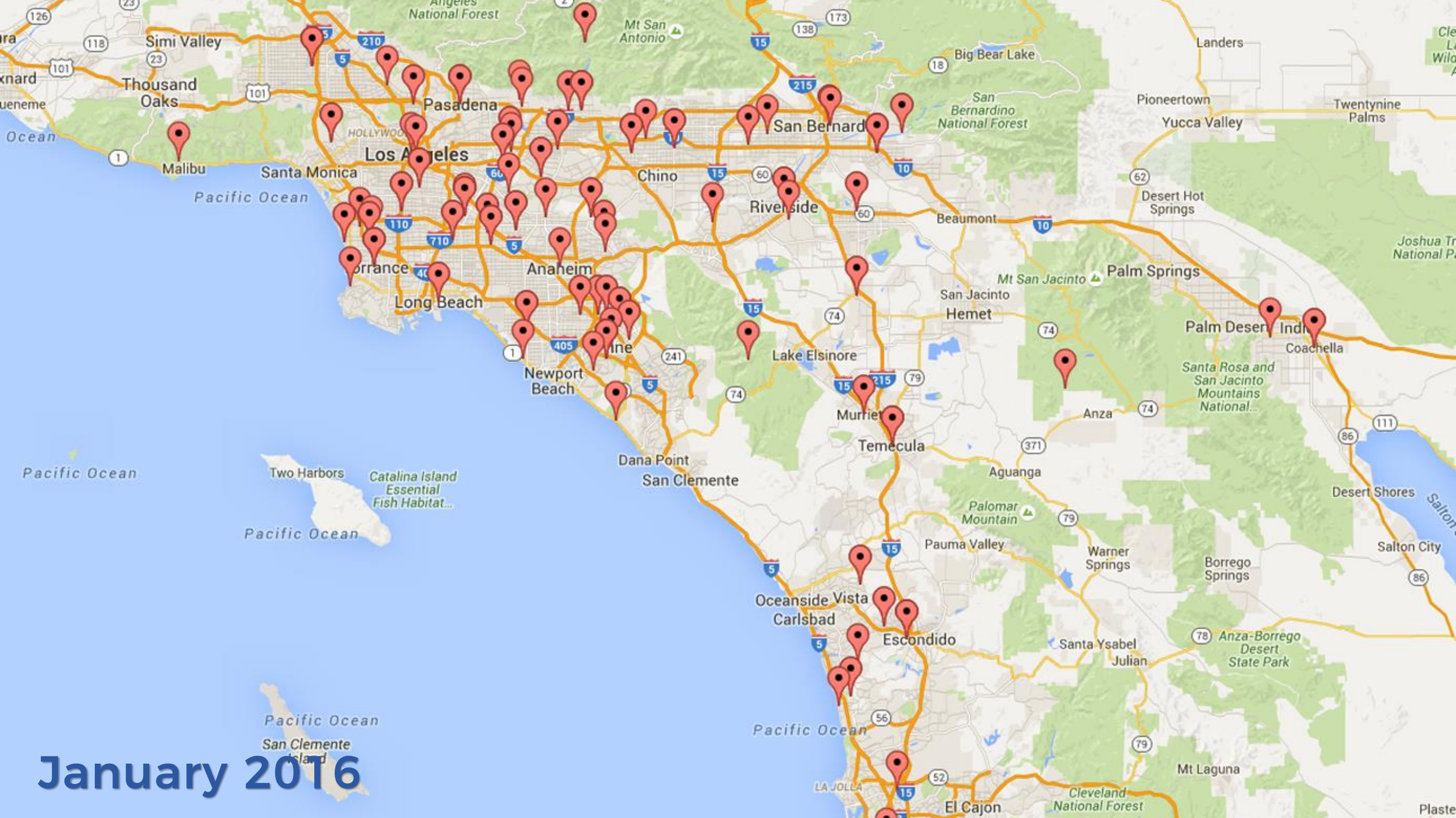
August 2015



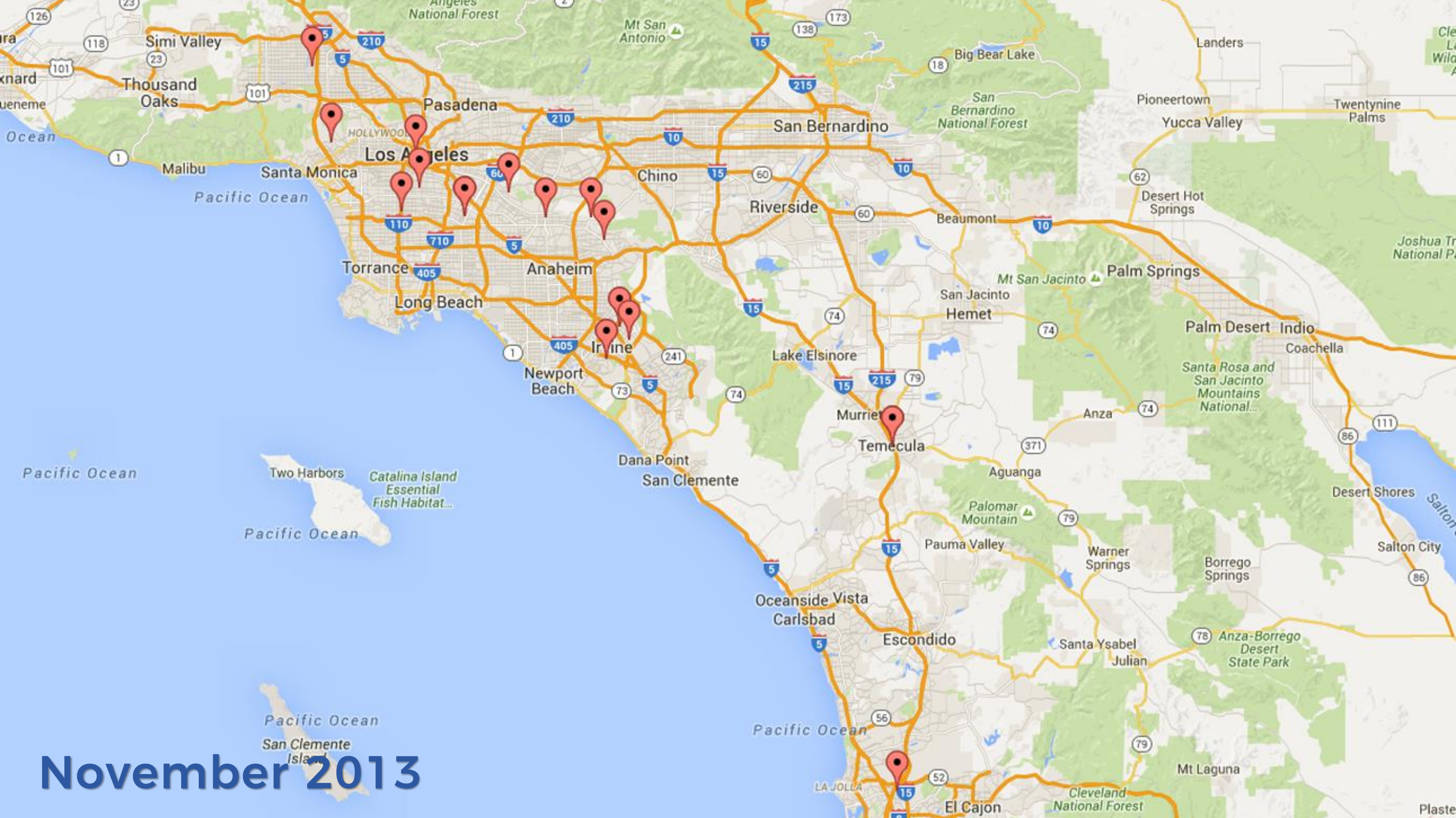
September 2015



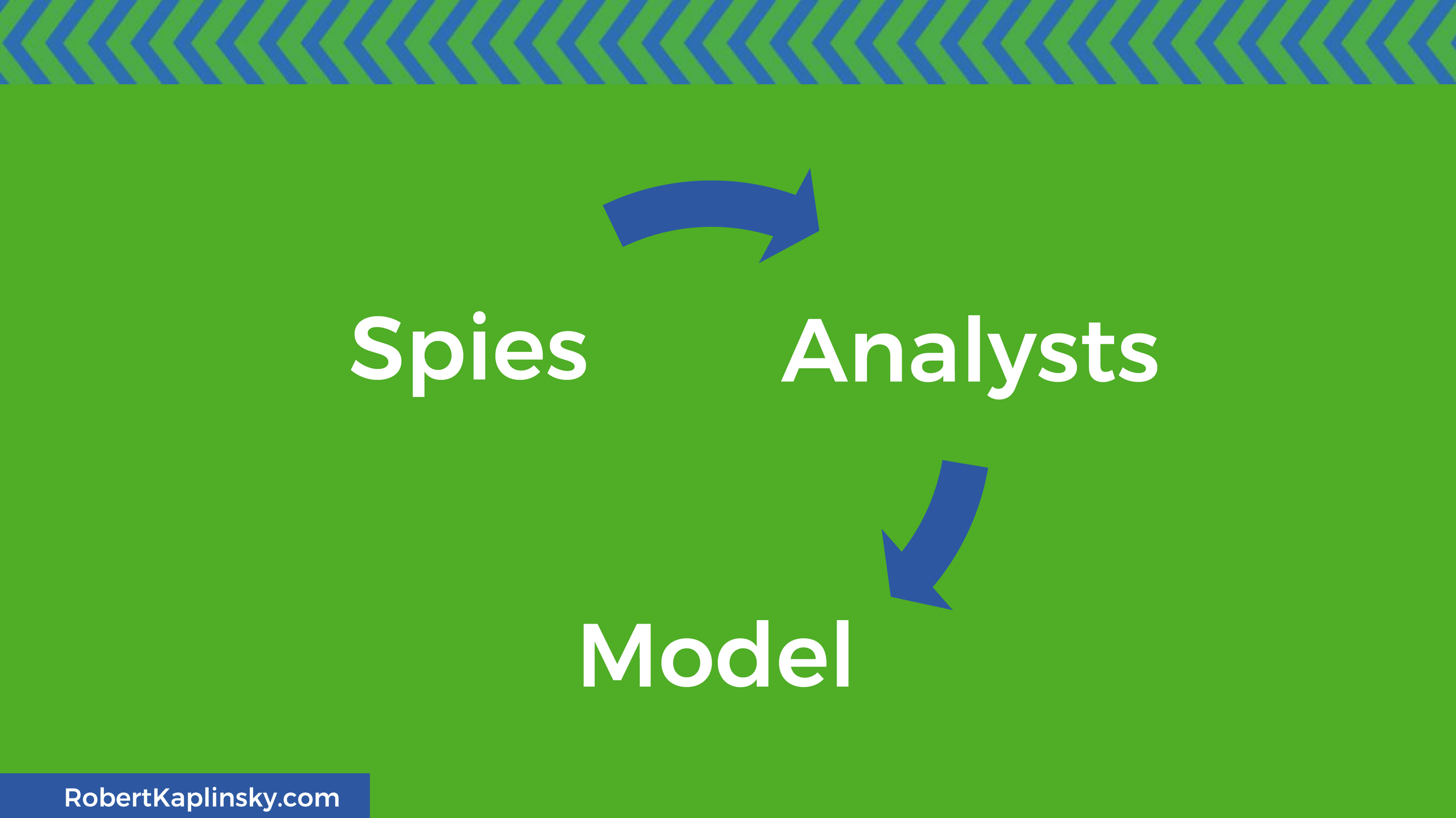
November 2015

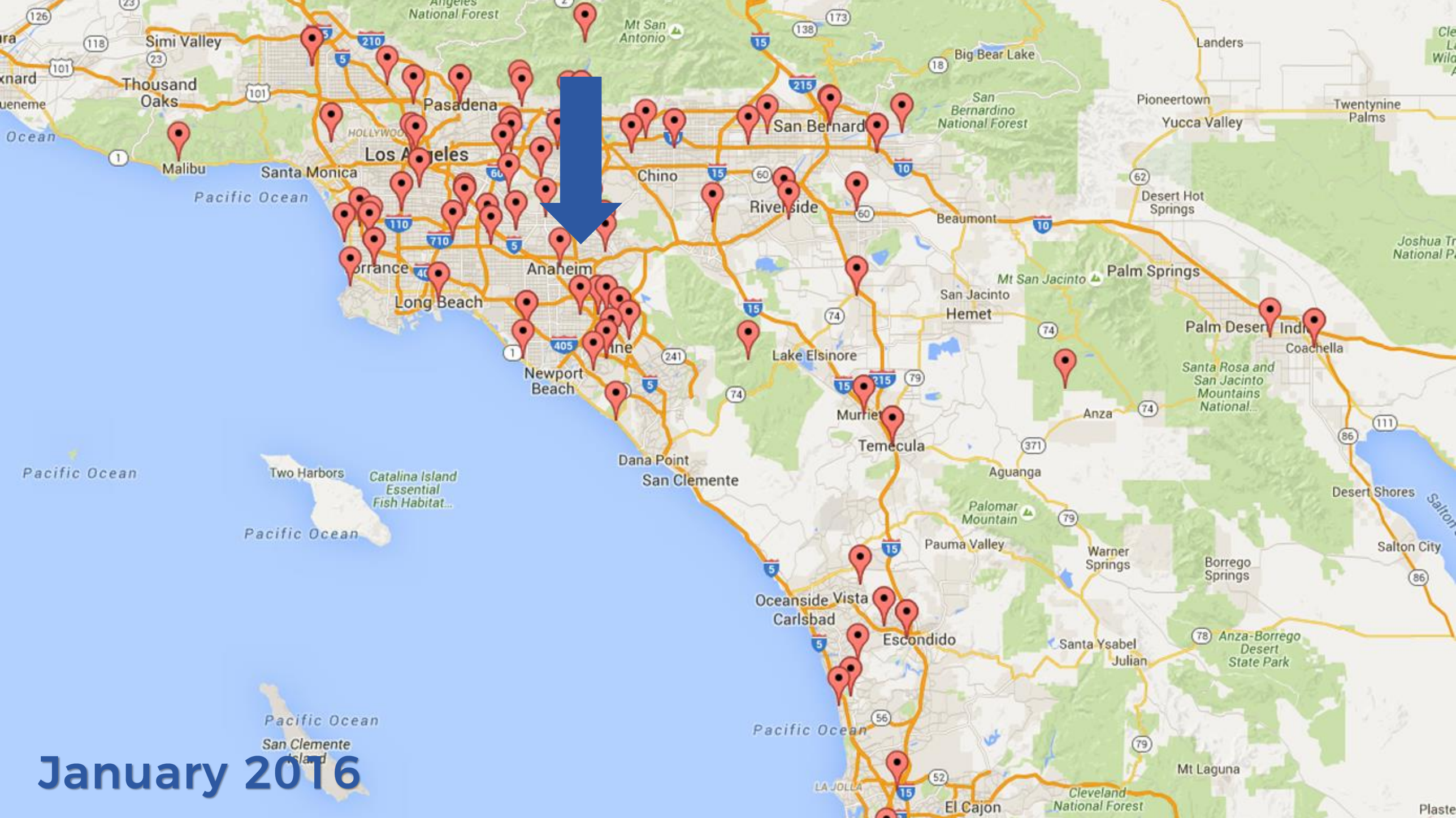


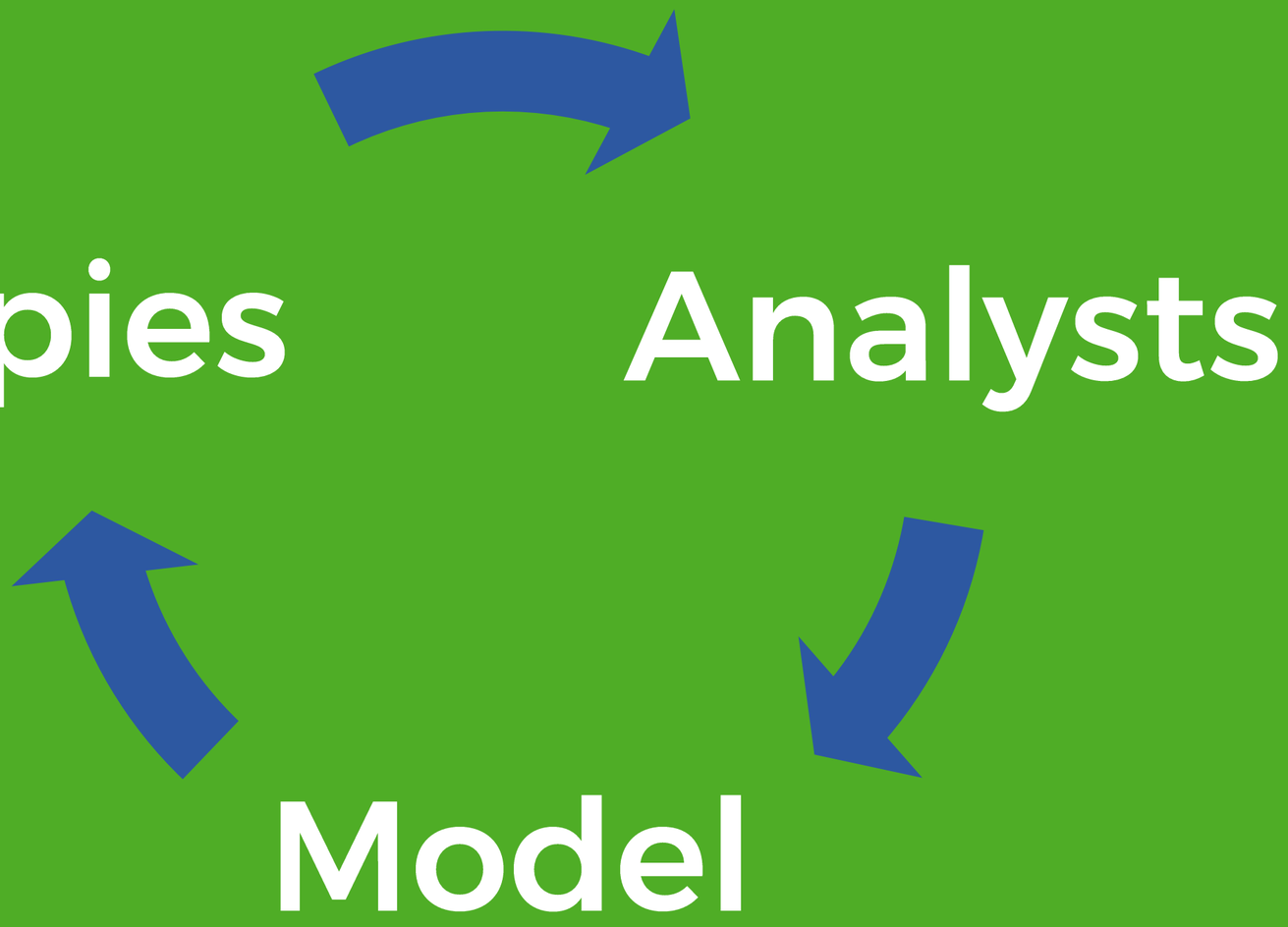
January 2016

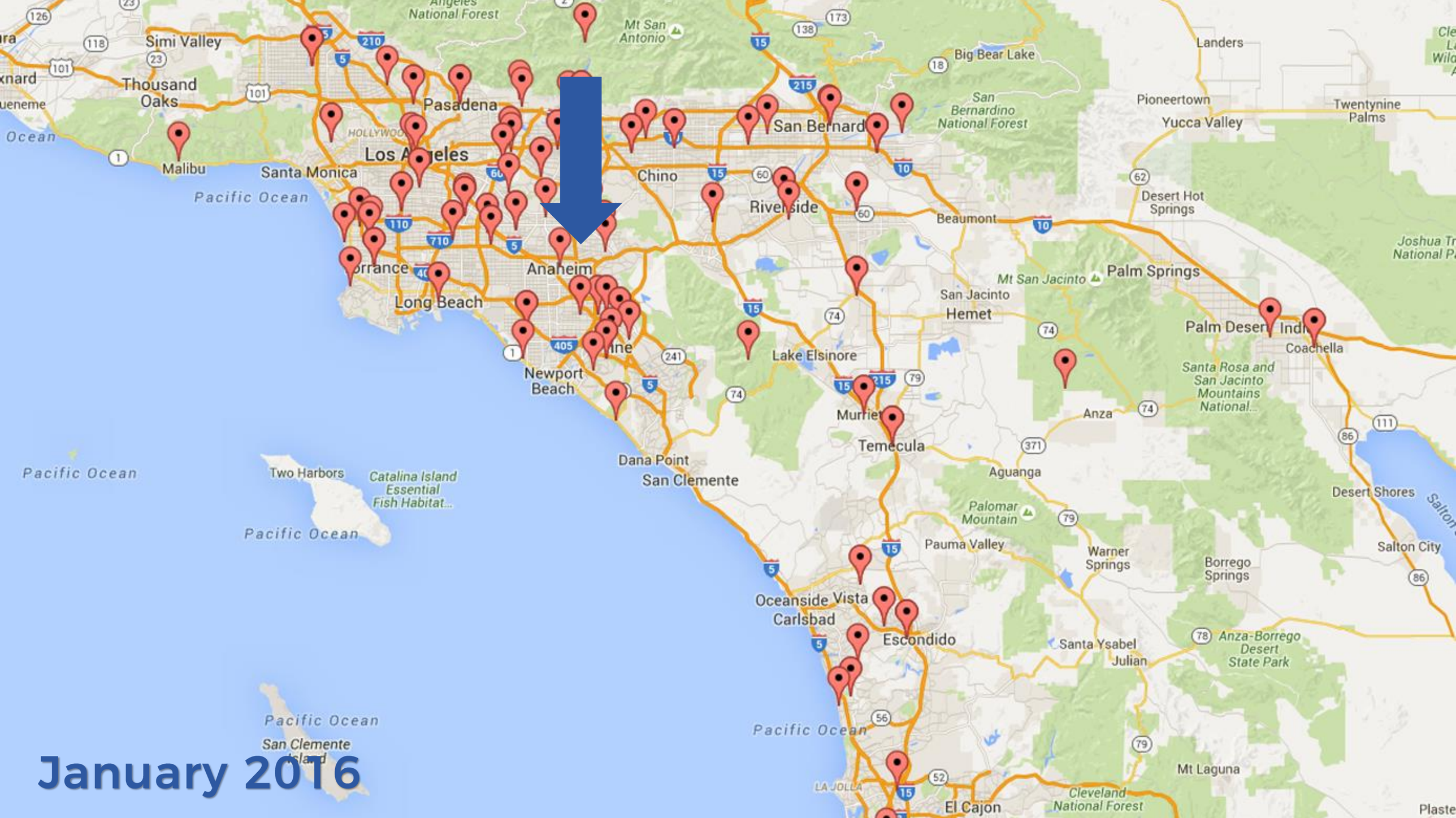


November 2013


Spies
Analysts
Model


January 2016
Simi Valley
Thousand Oaks
Malibu
Santa Monica
Pasadena
Los Angeles
Anaheim
Long Beach
Newport Beach
Chino
San Bernardino
Riverside
Beaumont
Big Bear Lake
Landers
Yucca Valley
Pioneertown
Twentynine Palms
Desert Hot Springs
Palm Springs
Mt San Jacinto
San Jacinto
Hemet
Lake Elsinore
Murrieta
Temecula
Anza
Aguanga
Palomar Mountain
Pauma Valley
Warner Springs
Borrego Springs
Julian
Santa Ysabel
Anza-Borrego Desert State Park
Coachella
Desert Shores
Salton City
Oceanside
Vista
Carlsbad
Escondido
Dana Point
San Clemente
Two Harbors
Catalina Island Essential Fish Habitat...
Mt Laguna
El Cajon
Cleveland National Forest
Pacific Ocean


Spies
Analysts
Model


January 2016
Simi Valley
Thousand Oaks
Malibu
Santa Monica
Pasadena
Los Angeles
Anaheim
Long Beach
Newport Beach
Chino
San Bernardino
Riverside
Beaumont
Big Bear Lake
Landers
Yucca Valley
Pioneertown
Twentynine Palms
Desert Hot Springs
Palm Springs
Mt San Jacinto
San Jacinto
Hemet
Lake Elsinore
Murrieta
Temecula
Anza
Aguanga
Palomar Mountain
Pauma Valley
Warner Springs
Borrego Springs
Julian
Santa Ysabel
Anza-Borrego Desert State Park
Coachella
Desert Shores
Salton City
Oceanside
Vista
Carlsbad
Escondido
Dana Point
San Clemente
Two Harbors
Catalina Island Essential Fish Habitat...
Mt Laguna
El Cajon
Cleveland National Forest
Pacific Ocean

All models are wrong, but some are useful.

GEORGE E. P. BOX

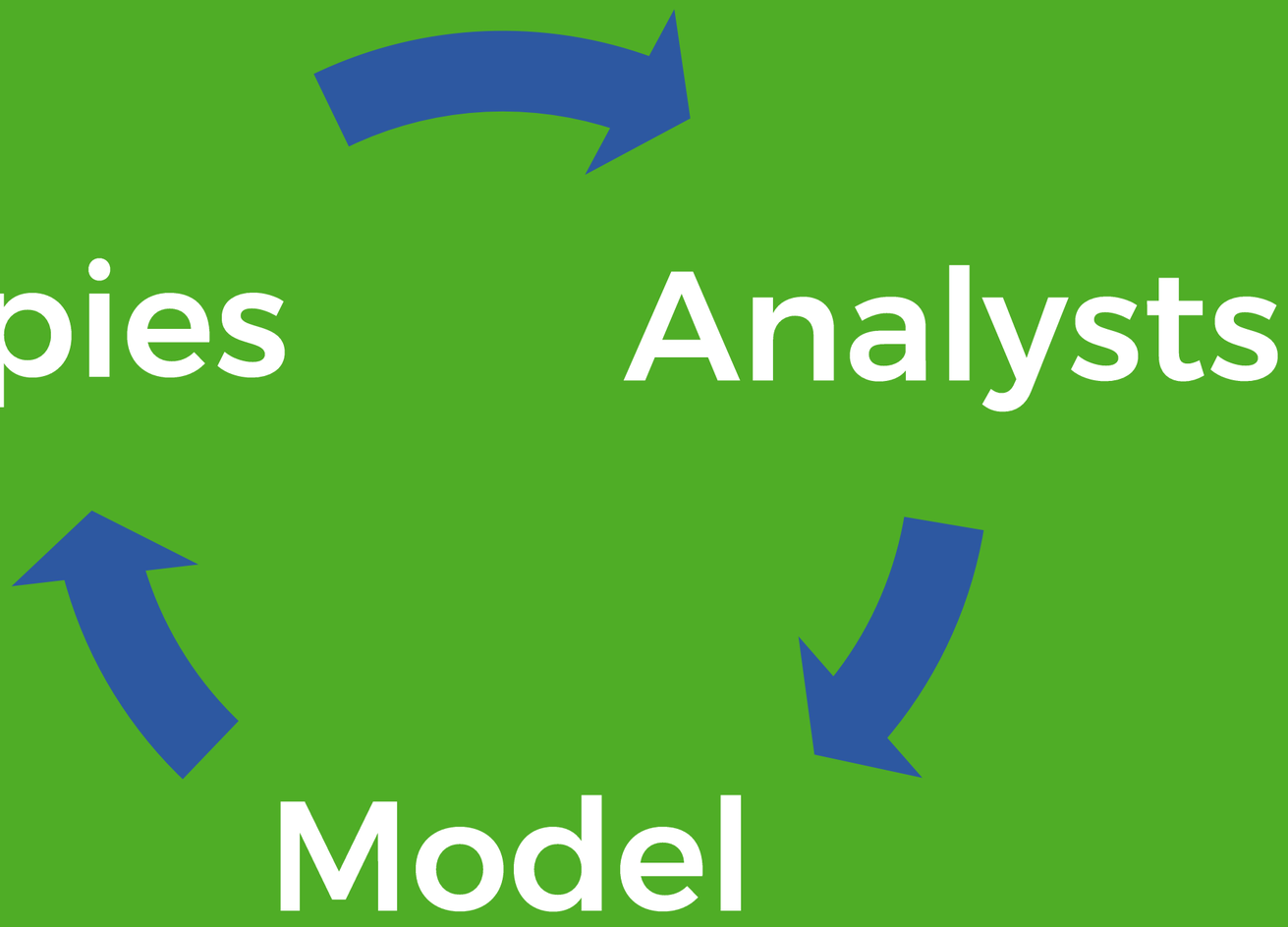
Classic Mix

20 Singles

LAY'S® Classic Potato Chips, DORITOS® Nacho Cheese Flavored Tortilla Chips, DORITOS® COOL RANCH® Flavored Tortilla Chips, CHEETOS® Crunchy Cheese Flavored Snacks, SUNCHIPS® Original Multigrain Snacks, FRITOS® Original Corn Chips (All 1 OZ. Each)

20 INDIVIDUAL BAGS: 1 OZ. EACH, TOTAL NET WT. 20 OZ. (1 LB. 4 OZ.) 567 g

⚠ WARNING: PREVENT ENTANGLEMENT AND STRANGULATION. KEEP THIS BAG AWAY FROM YOUNG CHILDREN. IT IS NOT A TOY.


Spies
Analysts
Model

THINKING TIME

RobertKaplinsky.com

Robert Kaplinsky
@robertkaplinsky

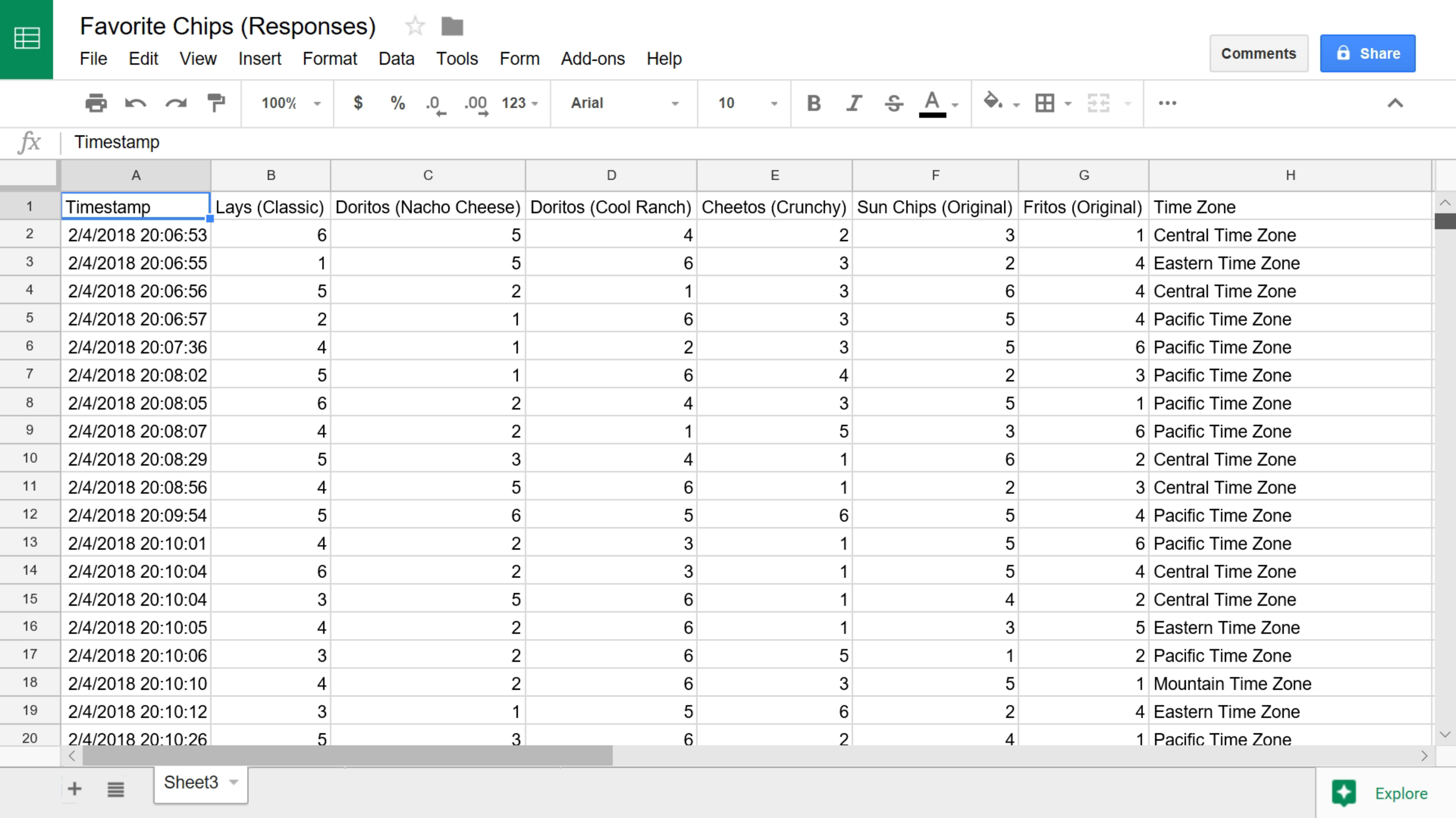
Hey #MTBoS, can you do me a favor and complete this 3 question anonymous survey about your favorite chips? I need data for a presentation. Please RT.
goo.gl/forms/etPtujII… #iteachmath

Favorite Chips
Please complete this anonymous survey. I'll be using this data in a presentation.
docs.google.com

8:05 PM - 4 Feb 2018

63 Retweets **45** Likes

18 63 45



	A	B	C	D	E	F	G	H
1	Timestamp	Lays (Classic)	Doritos (Nacho Cheese)	Doritos (Cool Ranch)	Cheetos (Crunchy)	Sun Chips (Original)	Fritos (Original)	Time Zone
2	2/4/2018 20:06:53	6	5	4	2	3	1	Central Time Zone
3	2/4/2018 20:06:55	1	5	6	3	2	4	Eastern Time Zone
4	2/4/2018 20:06:56	5	2	1	3	6	4	Central Time Zone
5	2/4/2018 20:06:57	2	1	6	3	5	4	Pacific Time Zone
6	2/4/2018 20:07:36	4	1	2	3	5	6	Pacific Time Zone
7	2/4/2018 20:08:02	5	1	6	4	2	3	Pacific Time Zone
8	2/4/2018 20:08:05	6	2	4	3	5	1	Pacific Time Zone
9	2/4/2018 20:08:07	4	2	1	5	3	6	Pacific Time Zone
10	2/4/2018 20:08:29	5	3	4	1	6	2	Central Time Zone
11	2/4/2018 20:08:56	4	5	6	1	2	3	Central Time Zone
12	2/4/2018 20:09:54	5	6	5	6	5	4	Pacific Time Zone
13	2/4/2018 20:10:01	4	2	3	1	5	6	Pacific Time Zone
14	2/4/2018 20:10:04	6	2	3	1	5	4	Central Time Zone
15	2/4/2018 20:10:04	3	5	6	1	4	2	Central Time Zone
16	2/4/2018 20:10:05	4	2	6	1	3	5	Eastern Time Zone
17	2/4/2018 20:10:06	3	2	6	5	1	2	Pacific Time Zone
18	2/4/2018 20:10:10	4	2	6	3	5	1	Mountain Time Zone
19	2/4/2018 20:10:12	3	1	5	6	2	4	Eastern Time Zone
20	2/4/2018 20:10:26	5	3	6	2	4	1	Pacific Time Zone

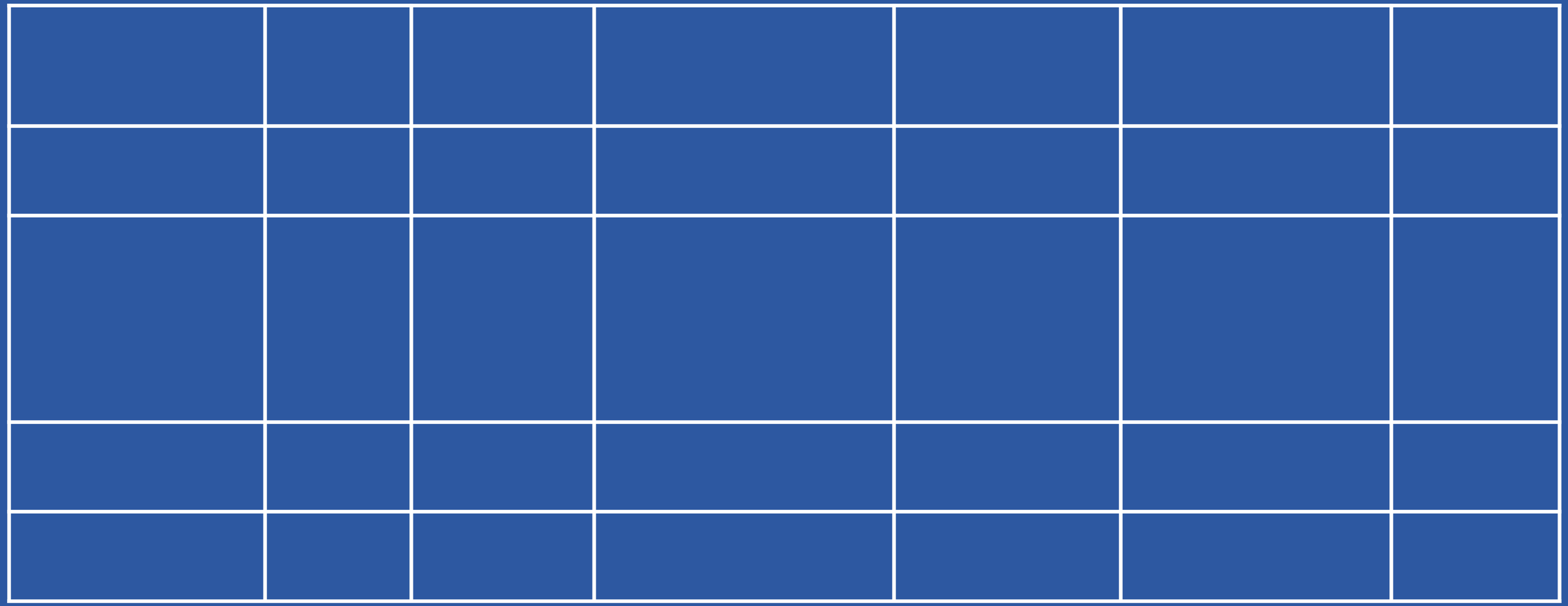
THINKING TIME

- The available data includes:
  - Lays, Nacho Cheese Doritos, Cool Ranch Doritos, Cheetos, Sun Chips, and Fritos ranked from 1 to 6
  - Geographic region: West, Central, or Eastern

ANALYSTS' JOB FOR THE TOP 1

1. Count all the first place votes for each chip type.
2. Divide the total first place votes for each chip type by the total number of votes.
3. Multiply that fraction by 20 to find how many bags there would be in a twenty pack, rounding as necessary.

ANALYSTS' EXAMPLE

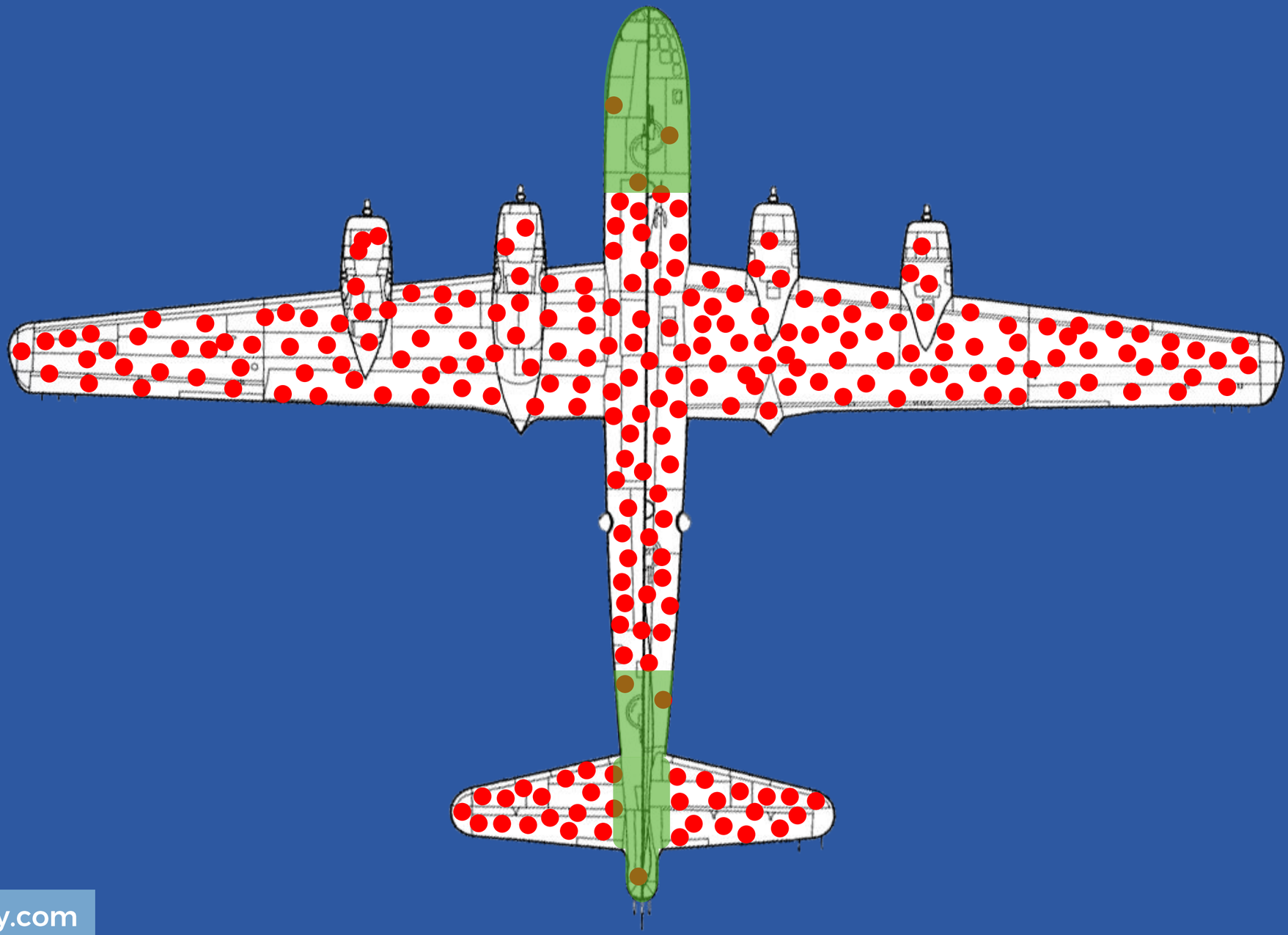


CHIP BAG RESULTS

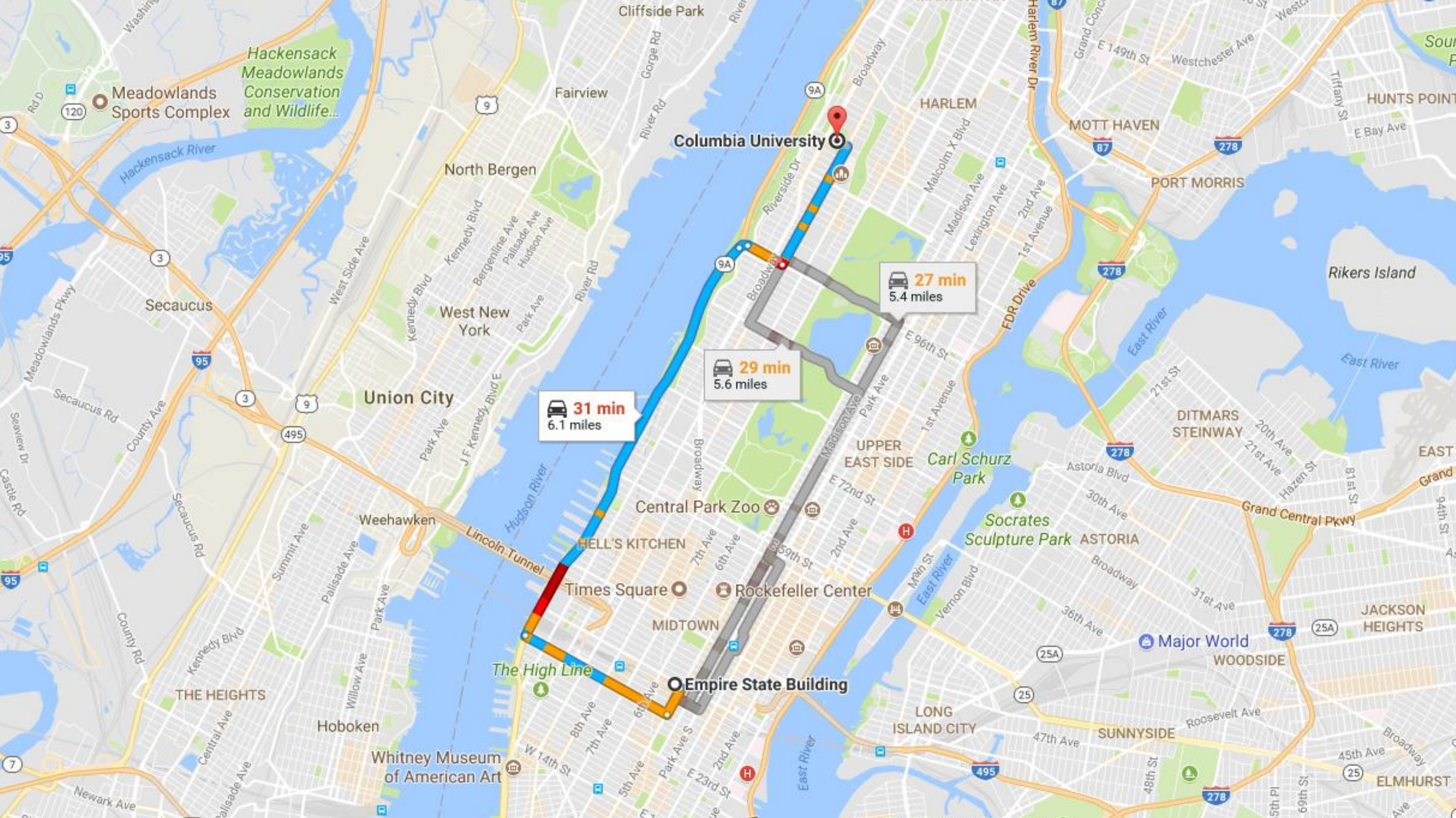
MATH MODELING

- [x] HOW DO WE MAKE SENSE OF MATH MODELING?
- [ ] IS IT JUST ANSWERING QUESTIONS?
- [ ] HOW DO YOU PROFIT FROM MATH MODELING?
- [ ] HOW DO WE HELP OUR STUDENTS IMPROVE?

224612



- ~~How do we protect our planes?~~
- ~~Which parts of the plane are being hit by the most bullets?~~
- Which parts of the plane are the most critical to protect?



Columbia University
27 min
5.4 miles
29 min
5.6 miles
31 min
6.1 miles
Empire State Building
Cliffside Park
Fairview
North Bergen
Hackensack Meadowlands Conservation and Wildlife...
Meadowlands Sports Complex
Hackensack River
Secaucus
West New York
Union City
Weehawken
Lincoln Tunnel
Hudson River
HELL'S KITCHEN
Central Park Zoo
Times Square
Rockefeller Center
MIDTOWN
The High Line
THE HEIGHTS
Hoboken
Whitney Museum of American Art
HARLEM
MOTT HAVEN
PORT MORRIS
Rikers Island
East River
UPPER EAST SIDE
Carl Schurz Park
Socrates Sculpture Park
ASTORIA
DITMARS STEINWAY
Major World
WOODSIDE
JACKSON HEIGHTS
LONG ISLAND CITY
SUNNYSIDE
ELMHURST
HUNTS POINT
FDR Drive
Harlem River Dr
Grand Central Pkwy

- ~~How do we find the fastest route for each customer?~~
- How do we find the fastest route for each customer without impacting our other customers?

Classic Mix

20 Singles

4 LAY'S® Classic Potato Chips, 4 DORITOS® Nacho Cheese Flavored Tortilla Chips, 2 DORITOS® COOL RANCH® Flavored Tortilla Chips, 4 CHEETOS® Crunchy Cheese Flavored Snacks, 2 SUNCHIPS® Original Multigrain Snacks, 4 FRITOS® Original Corn Chips (All 1 OZ. Each)

20 INDIVIDUAL BAGS: 1 OZ. EACH, TOTAL NET WT. 20 OZ. (1 LB. 4 OZ.) 567 g

⚠ WARNING: PREVENT ENTANGLEMENT AND STRANGULATION. KEEP THIS BAG AWAY FROM YOUNG CHILDREN. IT IS NOT A TOY.

- ~~How many of each flavor should we put in a package?~~
- ~~How many of each flavor should we put in a package for each region?~~
- How can we determine if the extra cost of creating different packages will make us more money?

Apply mathematics to problems arising in everyday life, society, and the workplace.

TEKS PROCESS STANDARDS

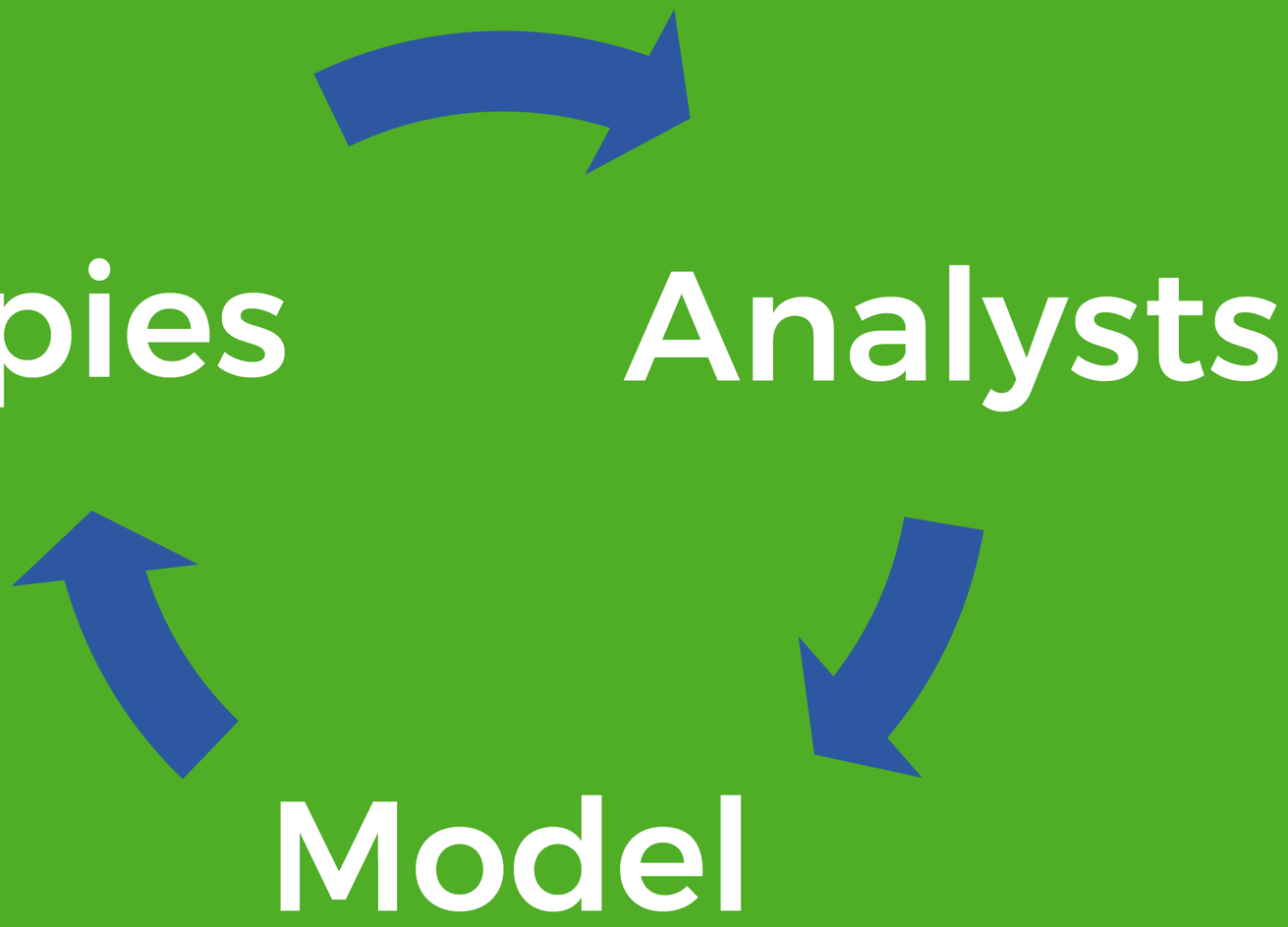
Use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution.

TEKS PROCESS STANDARDS

MATH MODELING

- [x] HOW DO WE MAKE SENSE OF MATH MODELING?
- [x] IS IT JUST ANSWERING QUESTIONS?
- [ ] HOW DO YOU PROFIT FROM MATH MODELING?
- [ ] HOW DO WE HELP OUR STUDENTS IMPROVE?

TARGET
TARGET PARKING


Spies
Analysts
Model

THINKING TIME

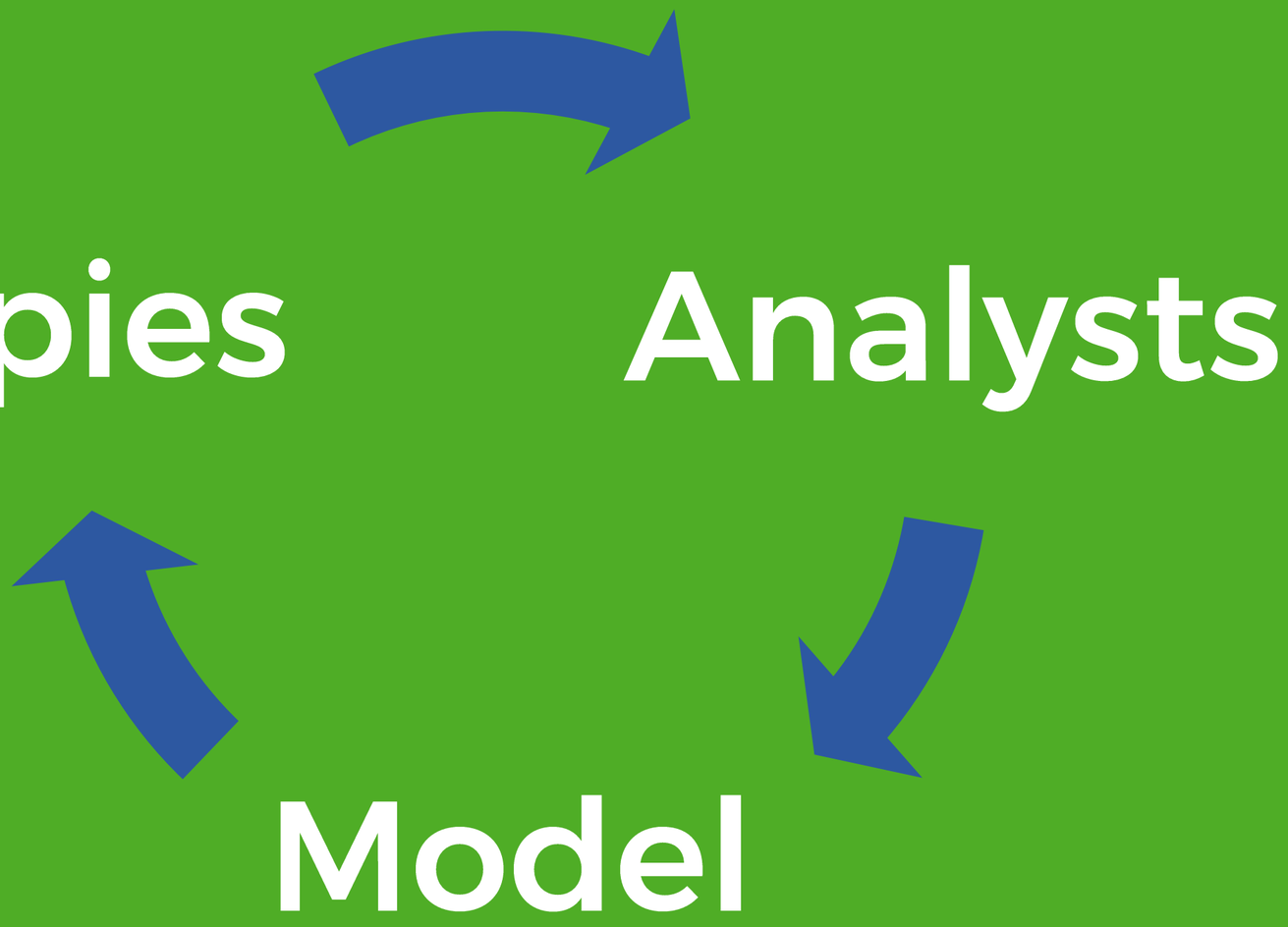
RobertKaplinsky.com

They used 25 products for a pregnancy prediction' score including:

- unscented lotion
- mineral supplements
- cotton balls

Source: New York Times

UNITED


Spies
Analysts
Model

THINKING TIME

RobertKaplinsky.com

Priority is determined by:

- passenger's fare class
- itinerary
- frequent flyer program membership
- check-in time

Source: United Airlines

Search

Robert | Home

Robert Kaplinsky

- News Feed
- Messenger
- Watch
- Marketplace

Explore

- Pages
- Events
- Groups
- Friend Lists
- On This Day 3
- Insights
- Games 7
- Fundraisers
- Live Video
- Pokes
- See More...

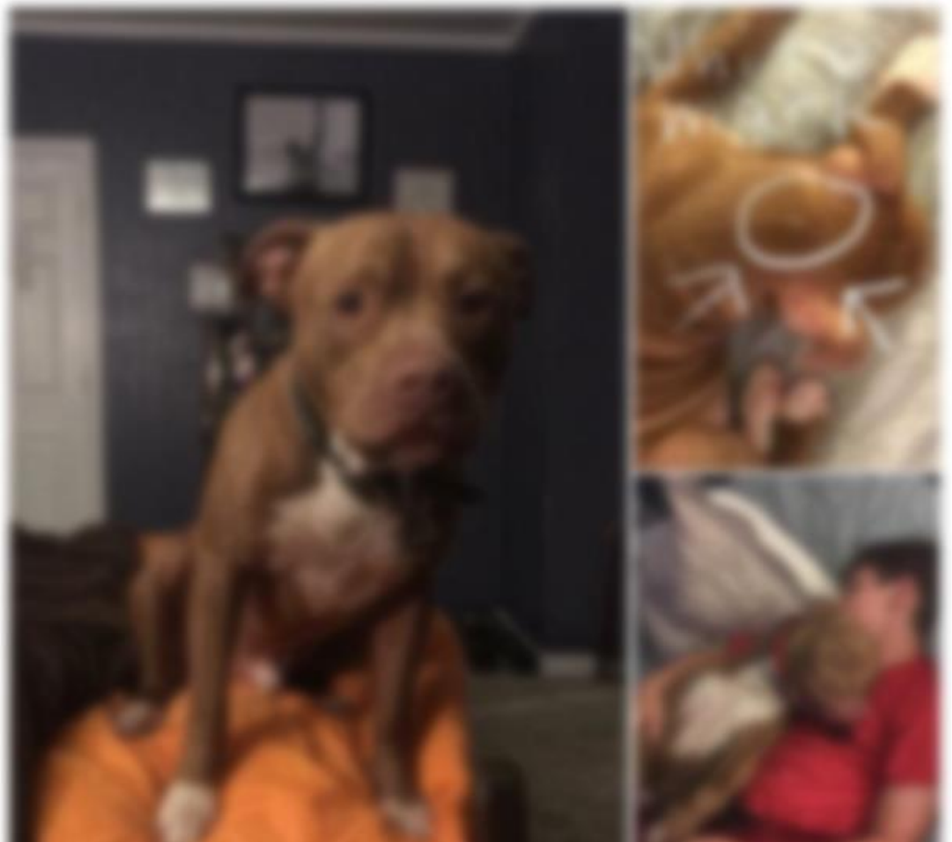
Create

Ad · Page · Group · Event · Fundraiser

Make Post | Photo/Video Album | Live Video

What's on your mind, Robert?

Photo/Video | Feeling/Activity | ...

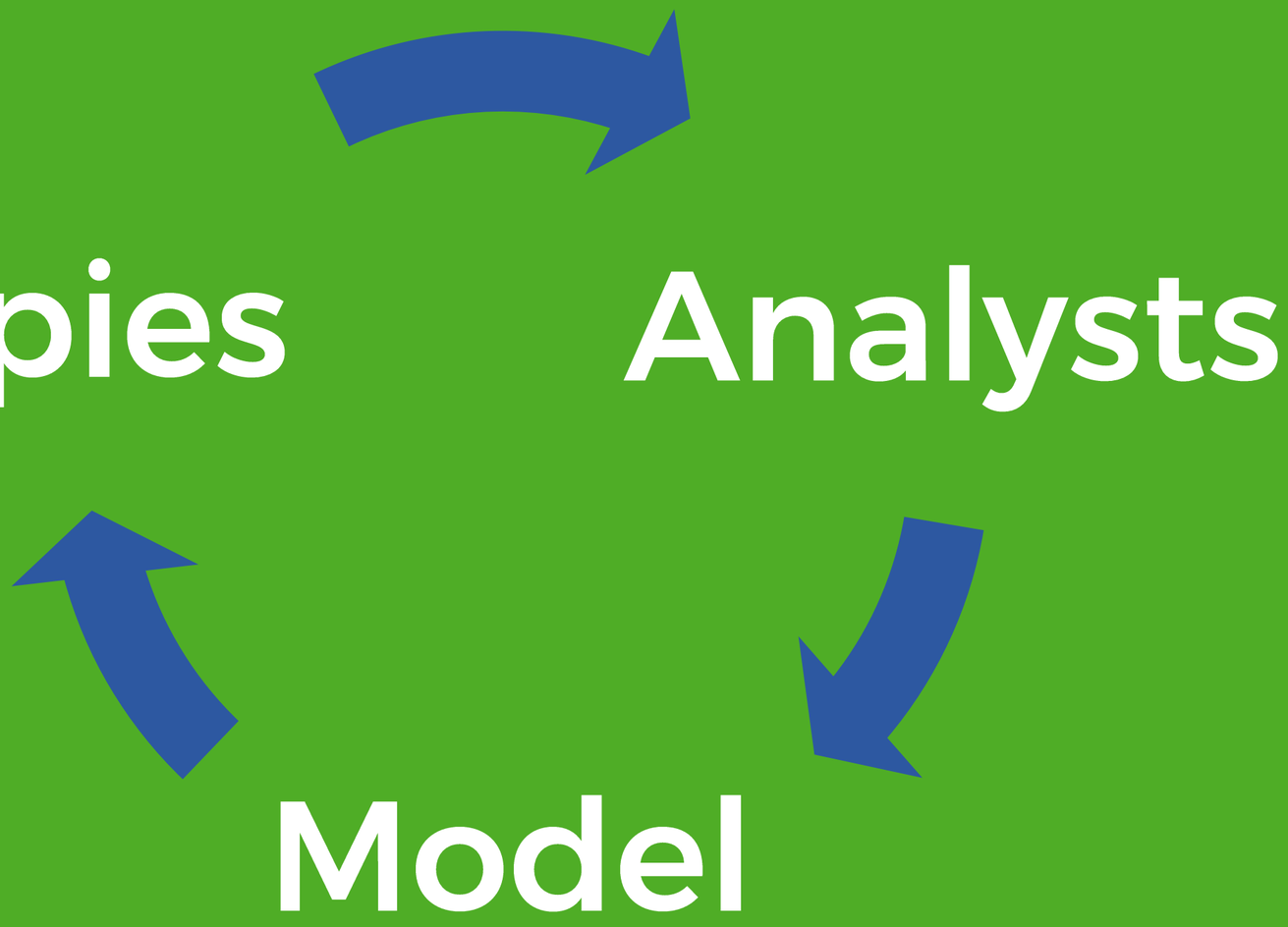


Trending

Watchlist: Latest Episodes

See All

Sponsored Create Ad


Spies
Analysts
Model

THINKING TIME

RobertKaplinsky.com

The stories that show in your News Feed are influenced by:

- friends you interact with the most
- the number of comments and likes a post receives
- what kind of story it is (ex: photo, video, status update)

Source: Facebook

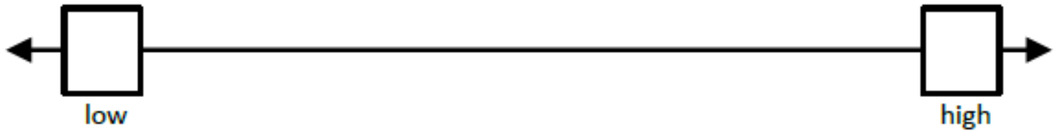
MORE EXAMPLES

- How does US News and World Reports rank colleges?
- How does Google know which results to show?
- How do sports teams know who to draft?
- How does Amazon know what products to recommend?
- How does Zillow estimate home prices?
- How does Pandora know what music to play?
- How does eHarmony know which people to show you?
- How do they figure out who should speak at a conference?

MATH MODELING

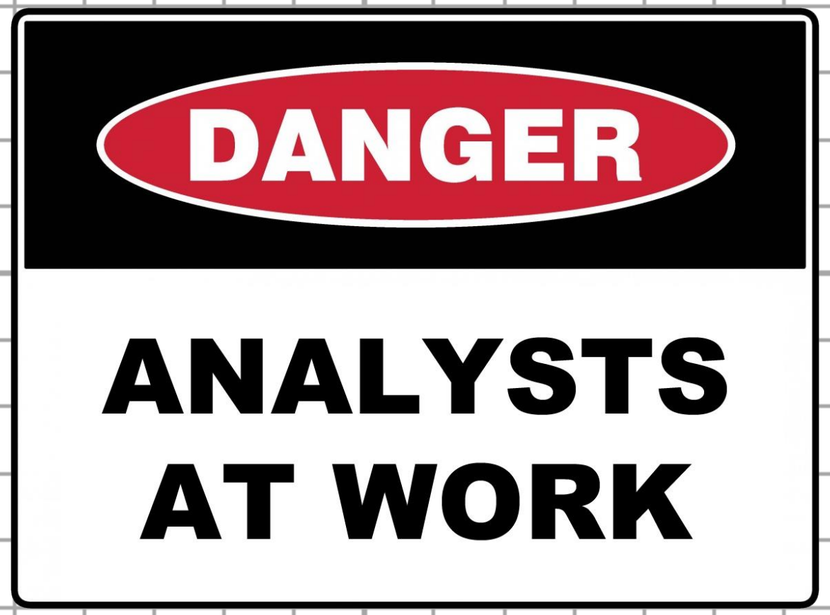
- [x] HOW DO WE MAKE SENSE OF MATH MODELING?
- [x] IS IT JUST ANSWERING QUESTIONS?
- [x] HOW DO YOU PROFIT FROM MATH MODELING?
- [ ] HOW DO WE HELP OUR STUDENTS IMPROVE?

Name: _____ Period: _____ Date: _____

What problem are you trying to figure out?	What estimates do you have?
	 Place your estimate on the number line.
What info do you already know about the problem?	What info do you need about the problem?
What is your conclusion? How did you reach that conclusion?	

TOP SECRET! SPIES ONLY

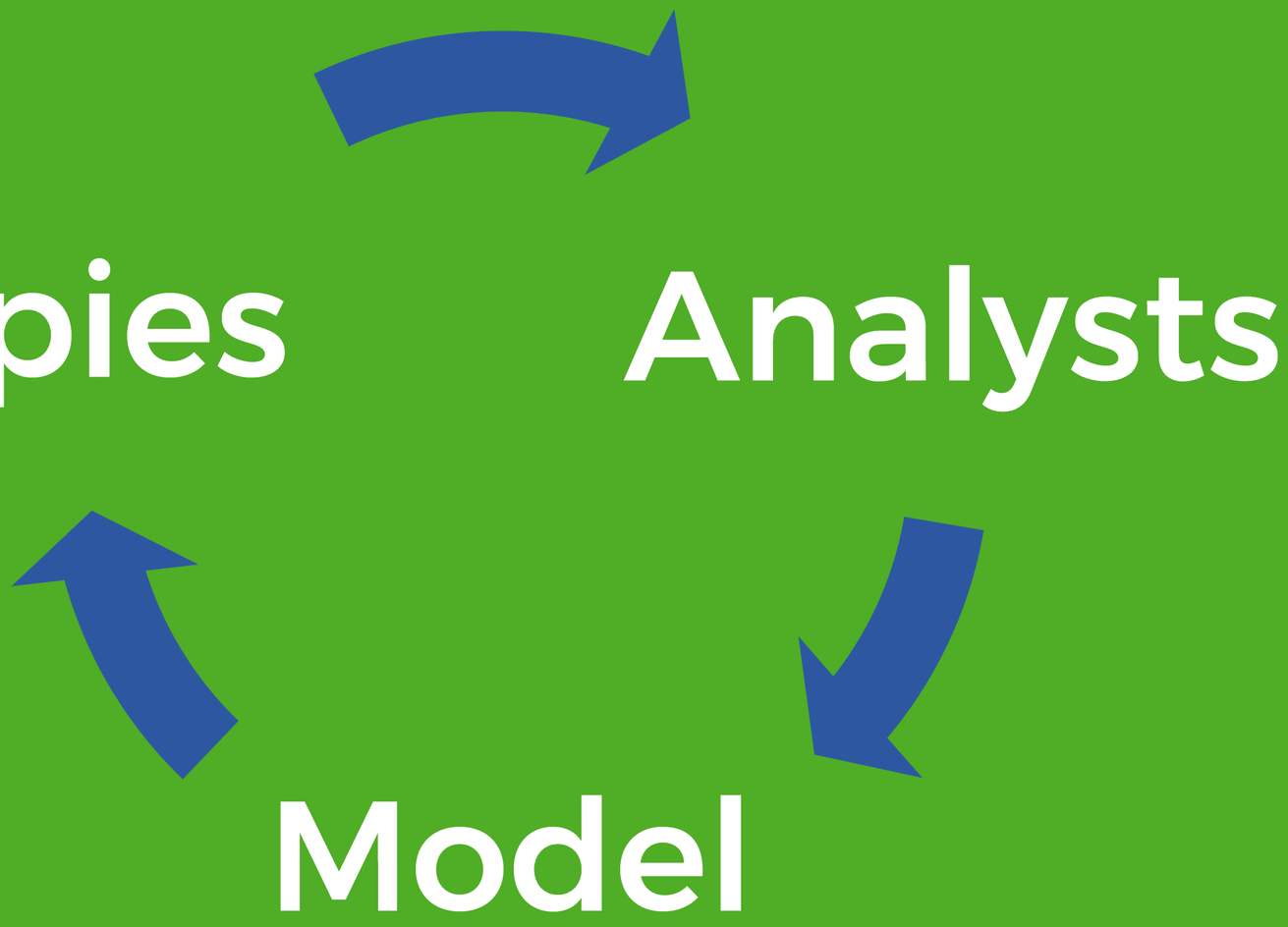
Your work



MODELING EXAMPLES

- ❑ ELEMENTARY SCHOOL
- ❑ MIDDLE SCHOOL

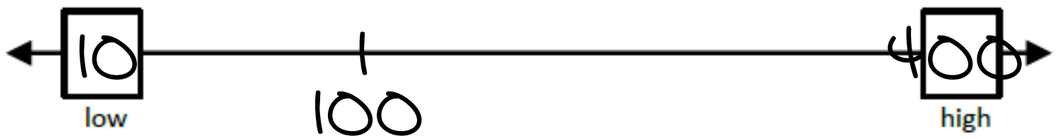
WYFF4.COM
Coca-Cola


Spies
Analysts
Model

THINKING TIME

RobertKaplinsky.com

Name: _____ Period: _____ Date: _____

What problem are you trying to figure out?	What estimates do you have?
How many beverage choices are there?	 Place your estimate on the number line.
What info do you already know about the problem?	**What info do you need about the problem?**
• There are main flavors and added flavors. • Lemonade is yummy.	• How many main flavors are there? • How many added flavors are there? • Can we mix them all together?
What is your conclusion? How did you reach that conclusion?	

COUNT ALL

1
8
16
24
27
32
40
46
no caffeine
25
no caffeine
26
low/no calories
54
62
69
76
84
92
95
103
111
117
125
no caffeine
93
no caffeine
94

COUNT GROUPS

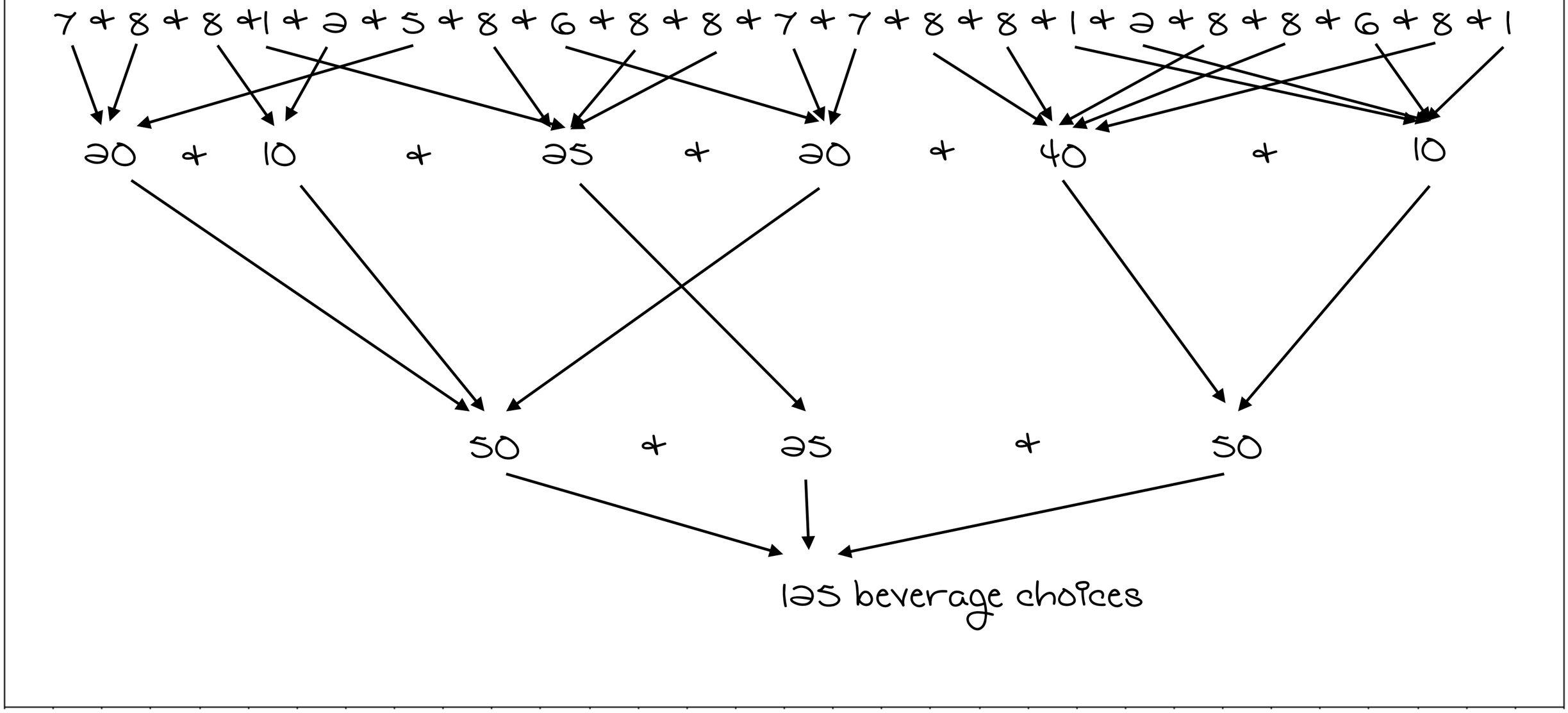
INVENTED STRATEGY

8 8 8 7 7 7 8

low/no calories

8 8 8 8 8 8 8 8 8 8

RobertKaplinsky.com


7 + 8 + 8 + 1 + 2 + 5 + 8 + 6 + 8 + 8 + 7 + 7 + 8 + 8 + 1 + 2 + 8 + 8 + 6 + 8 + 1
20 + 10 + 25 + 20 + 40 + 10
50 + 25 + 50
135 beverage choices

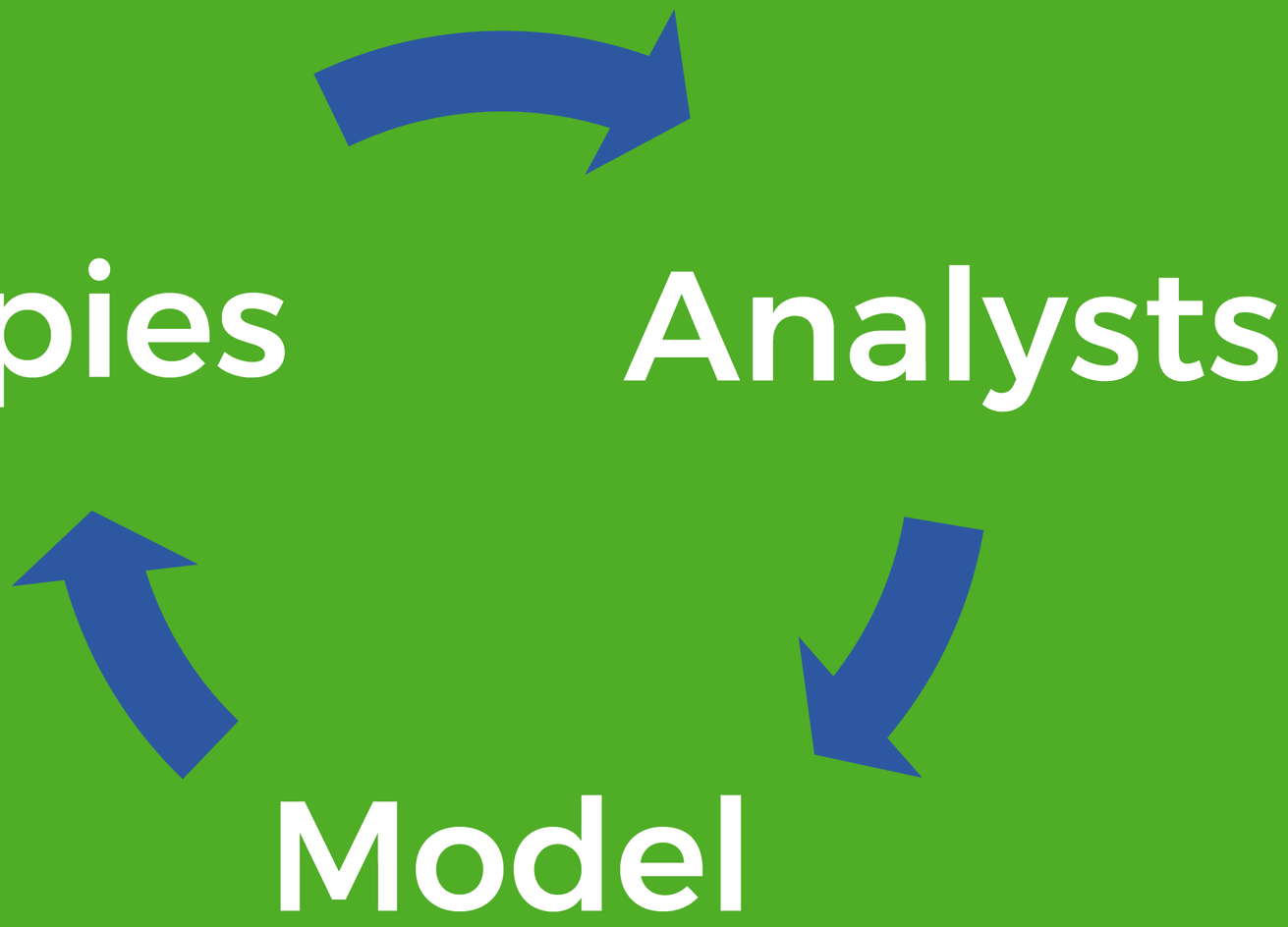
The main attraction for a busload of Dover fifth-graders was supposed to be the Museum of Fine Arts, but that all changed when they stopped by Kelly's Roast Beef and got a glimpse of their soda-drinking future.

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

MODELING EXAMPLES

- [x] ELEMENTARY SCHOOL
- [ ] MIDDLE SCHOOL

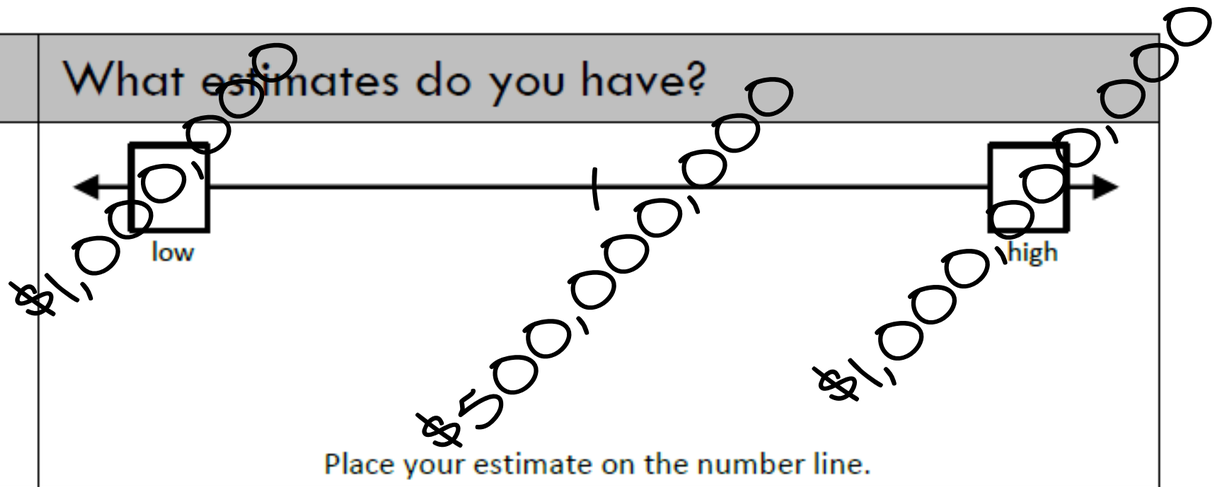
IVE
FOX NEWS
Junction


Spies
Analysts
Model

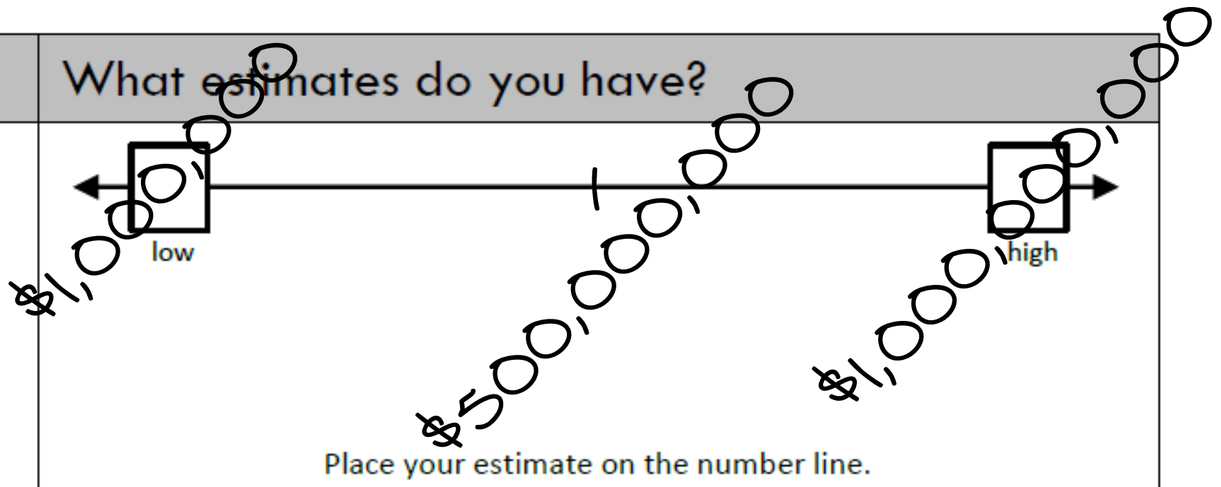
THINKING TIME

RobertKaplinsky.com

Name: _____ Period: _____ Date: _____

What problem are you trying to figure out?	What estimates do you have?
How much money was that?	 Place your estimate on the number line.
What info do you already know about the problem?	**What info do you need about the problem?**
• There is a lot of money. • It is in a pile. • It is in bundles.	• Is it all the same denomination? • ~~How much does one bill weigh?~~ • ~~How much does all the money weigh?~~
What is your conclusion? How did you reach that conclusion?	

Name: _____ Period: _____ Date: _____

What problem are you trying to figure out?	What estimates do you have?
How much money was that?	 Place your estimate on the number line.
What info do you already know about the problem?	**What info do you need about the problem?**
• There is a lot of money. • It is in a pile. • It is in bundles.	• Is it all the same denomination? • How many rows and columns are there? • How many bills are in one stack?
What is your conclusion? How did you reach that conclusion?	

PGR
SIEDO

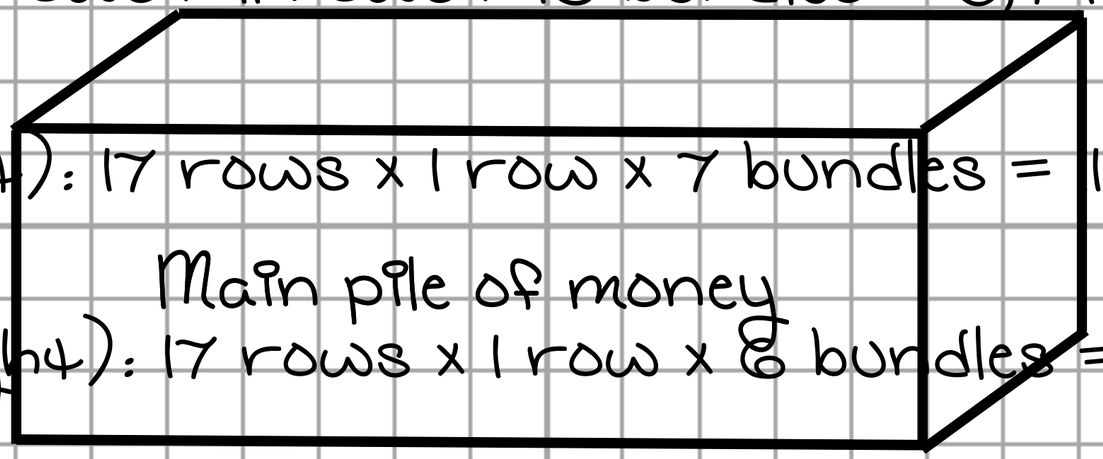
PGR
SIEDO
PGR
SIEDO

Your work

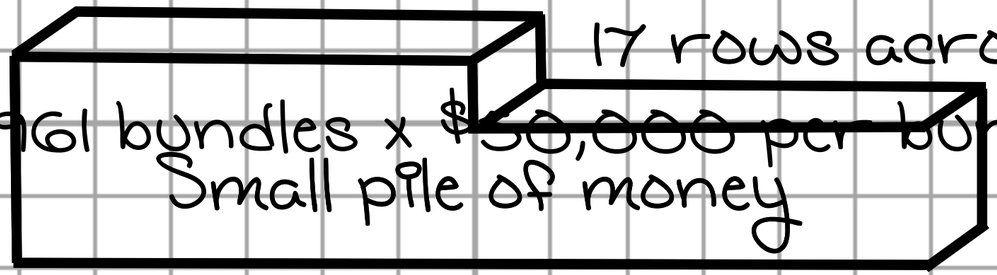
Main pile: 34 rows x 11 rows across x 10 bundles = 3,740 bundles

Small pile (left): 17 rows x 1 row x 7 bundles = 119 bundles

Small pile (right): 17 rows x 1 row x 8 bundles = 136 bundles



Total bundles: 3,740 + 119 + 136 = 3,961 bundles



Total money: 3,961 bundles x $50,000 per bundle = $198,050,000

FOX
FOX NEWS

MODELING EXAMPLES

- [x] ELEMENTARY SCHOOL
- [x] MIDDLE SCHOOL

MATH MODELING

- ☑ HOW DO WE MAKE SENSE OF MATH MODELING?
- ☑ IS IT JUST ANSWERING QUESTIONS?
- ☑ HOW DO YOU PROFIT FROM MATH MODELING?
- ☑ HOW DO WE HELP OUR STUDENTS IMPROVE?

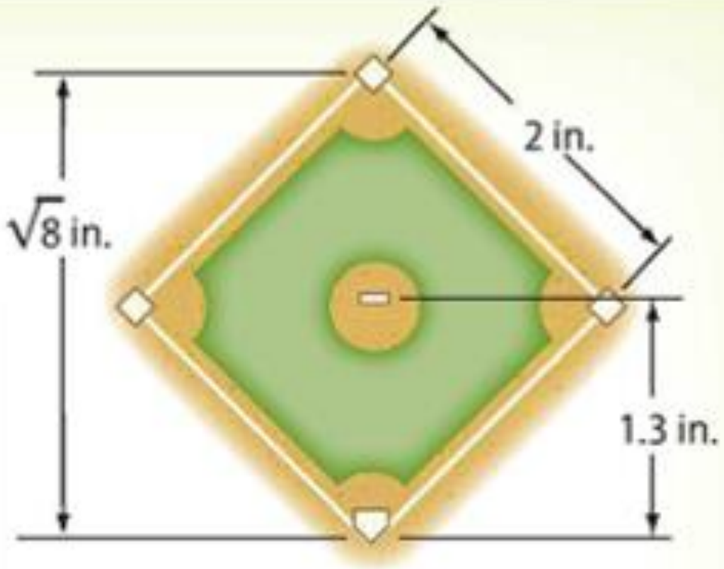
Real-World Link

Common Core State Standards

Content Standards
8.NS.1, 8.NS.2, 8.EE.2

Mathematical Practices
1, 3, 4, 6

Sports Major League baseball has rules for the dimensions of the baseball diamond. A model of the diamond is shown.



1. On the model, the distance from the pitching mound to home plate is 1.3 inches. Is 1.3 a rational number? Explain.

2. On the model, the distance from first base to second base is 2 inches. Is 2 a rational number? Explain.

3. The distance from home plate to second base is $\sqrt{8}$ inches. Using a calculator, find $\sqrt{8}$. Does it appear to terminate or repeat?

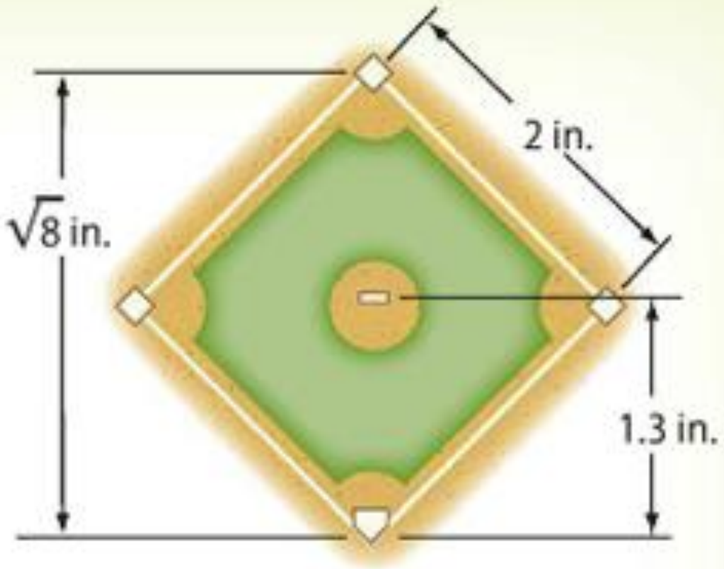
Real-World Link

Common Core State Standards

Content Standards
8.NS.1, 8.NS.2, 8.EE.2

Mathematical Practices
1, 3, 4, 6

Sports Major League baseball has rules for the dimensions of the baseball diamond. A model of the diamond is shown.



1. On the model, the distance from the pitching mound to home plate is 1.3 inches. Is 1.3 a rational number? Explain.

2. On the model, the distance from first base to second base is 2 inches. Is 2 a rational number? Explain.

3. The distance from home plate to second base is $\sqrt{8}$ inches. Using a calculator, find $\sqrt{8}$. Does it appear to terminate or repeat?

DISCUSSION TIME

- Why should we reconsider using word problems?
- What should we be doing instead of word problems?

GOALS

- ☑ CORRECT ANSWERS = UNDERSTANDING
- ☑ MAKE OUR LESSONS UNFORGETTABLE
- ☑ RECONSIDER USING WORD PROBLEMS

Scary & Dangerous

THE FOUR STEPS TO CREATE A CLASSROOM WHERE STUDENTS ARE EXCITED TO LEARN MATHEMATICS

ROBERT KAPLINSKY

robert@robertkaplinsky.com

robertkaplinsky.com/fortbend

@robertkaplinsky