# A FOCUS ON STUDENT THINKING

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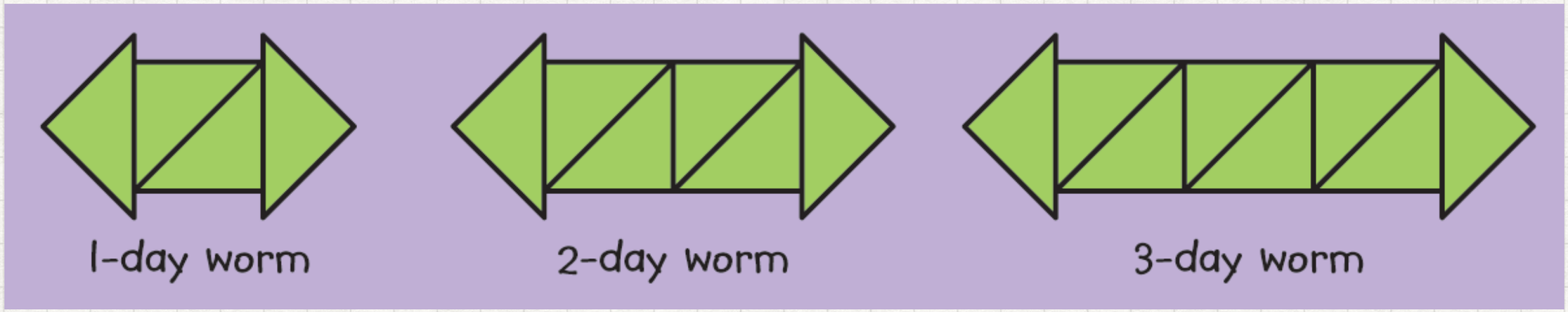
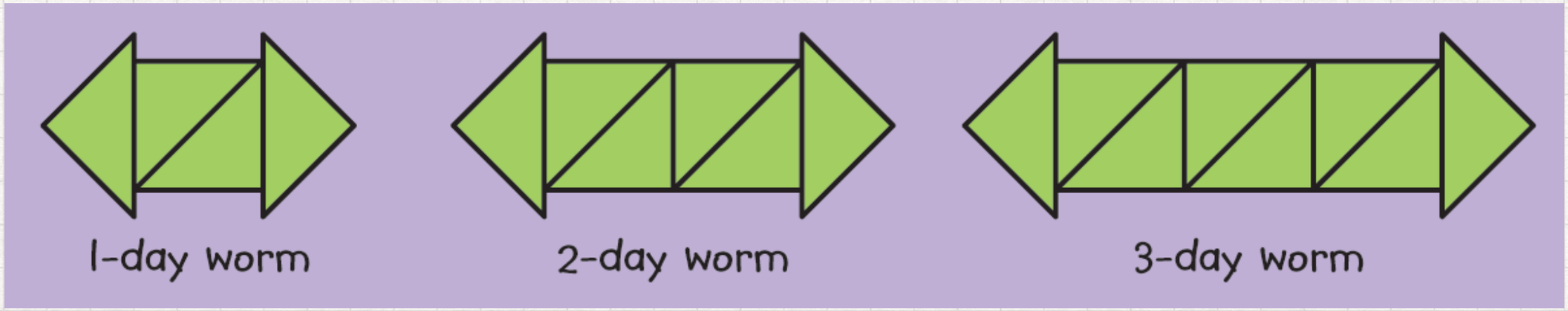
@MFAnnie

# GROWING WORMS



# GROWING WORMS




| I Notice | I Wonder |
| --- | --- |
| | |

## N

- made of triangles
- adding by one cube (square) each day
- like a growing flower
- growing sideways like a worm
- more like a zigzag
- each step all even numbers
- 4, 6, 8 ... counting by 2s
- body of the worm is growing each day
- each day it gets longer
- green + black
- diagonal line through each square
- 2d shapes
- labels below each
- arrows on each end
- every day there's one more square

## W

- is it a real worm?
- why is it going sideways instead of up
- what does this have to do with math?
- why is it made of triangles and not rectangles
- why isn't it 3D
- title growing worms?
- why are the shapes green?
- when it gets to 10 squares will it have a different shape
- when will the pattern stop
- why are arrows facing away?

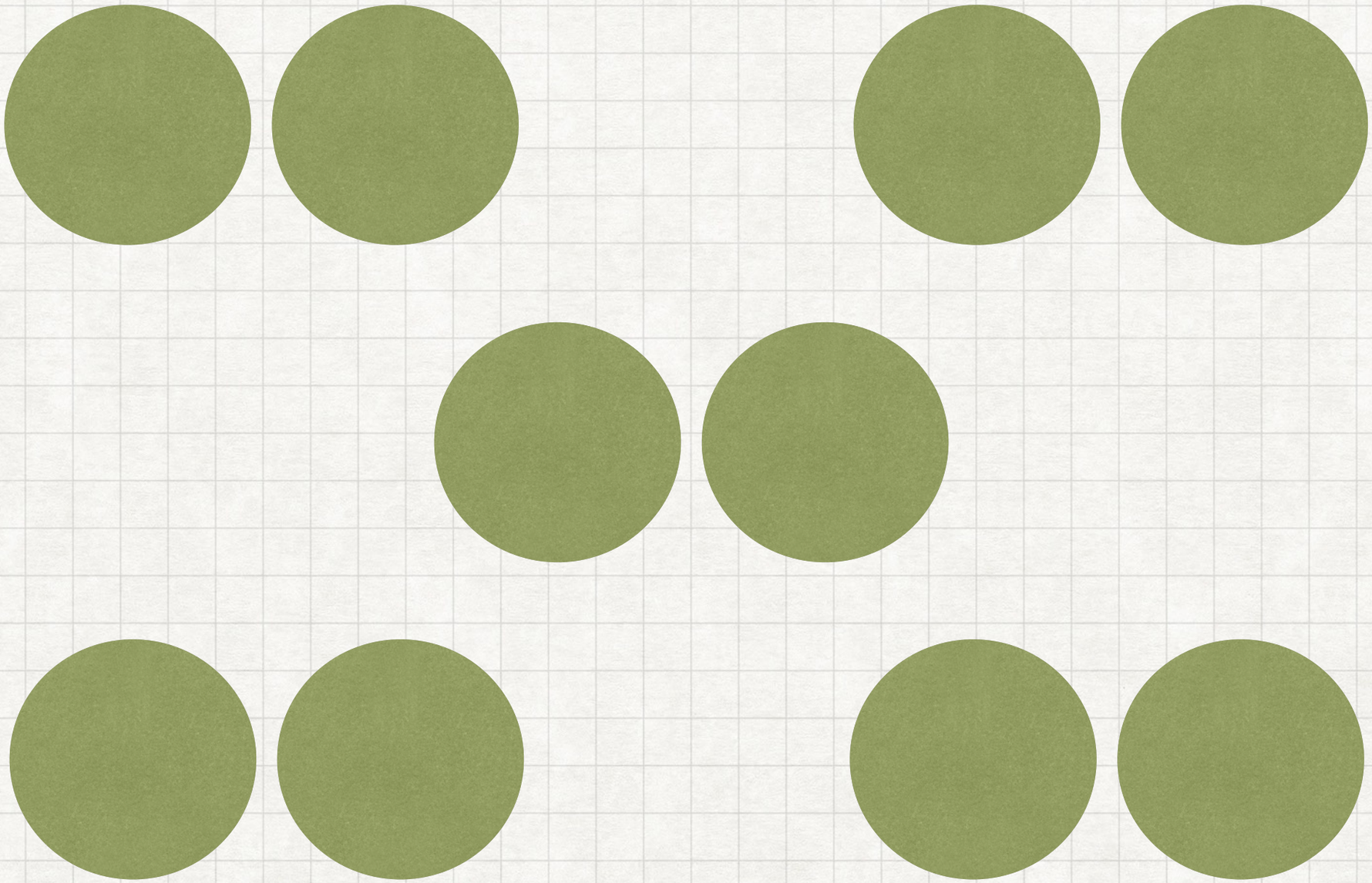
## Notice

- that we made 3 worms and they are all different sizes
- we used different shapes
  - triangles and squares, too
- the worm gets bigger when we add a square
- everytime we made a new worm we added 1 square
- there was a pattern - 2 triangles, 3 squares
- it grew when we added a square
- triangle, square, triangle pattern

## Wonder

- what the next worm will look like?
- if I could make
  - 1 million day
  - 5 day
  - 100 day
  - infinity
- if the worm can keep growing?
- if the worms could be a pet or if you could take it out to dinner with you?
- how cars are made?
- how triangles and squares are made?
- what would happen if the pattern would continue?

# DOT TALKS



# 26 + 49

# 14 X 19

"Once I do it my own way, it's REALLY hard to think about someone else's."

*—A "Basic Support" teacher doing Dot Talks*

# SMP3: CONSTRUCT VIABLE ARGUMENTS AND CRITIQUE THE REASONING OF OTHERS.

I used to think my job was to teach students to see what I see. I no longer believe this. My job is to teach students to see; and to recognize that no matter what the problem is, we don't all see things the same way. But when we examine our different ways of seeing, and look for the relationships involved, everyone sees more clearly; everyone understands more deeply.

*—Ruth Parker*

*Author, Making Number Talk Matter*

# NOTICING & WONDERING

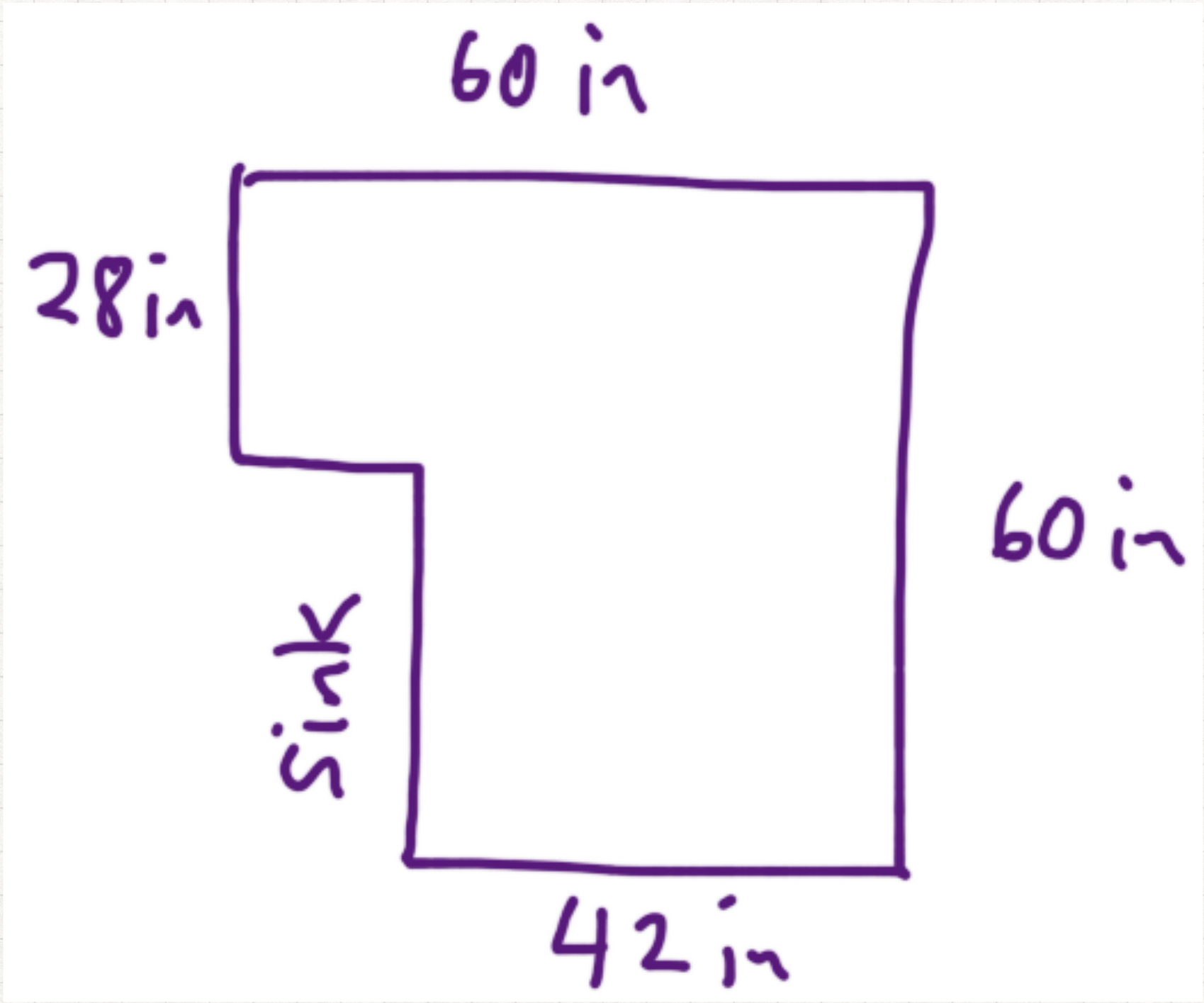
# RUTH PARKER

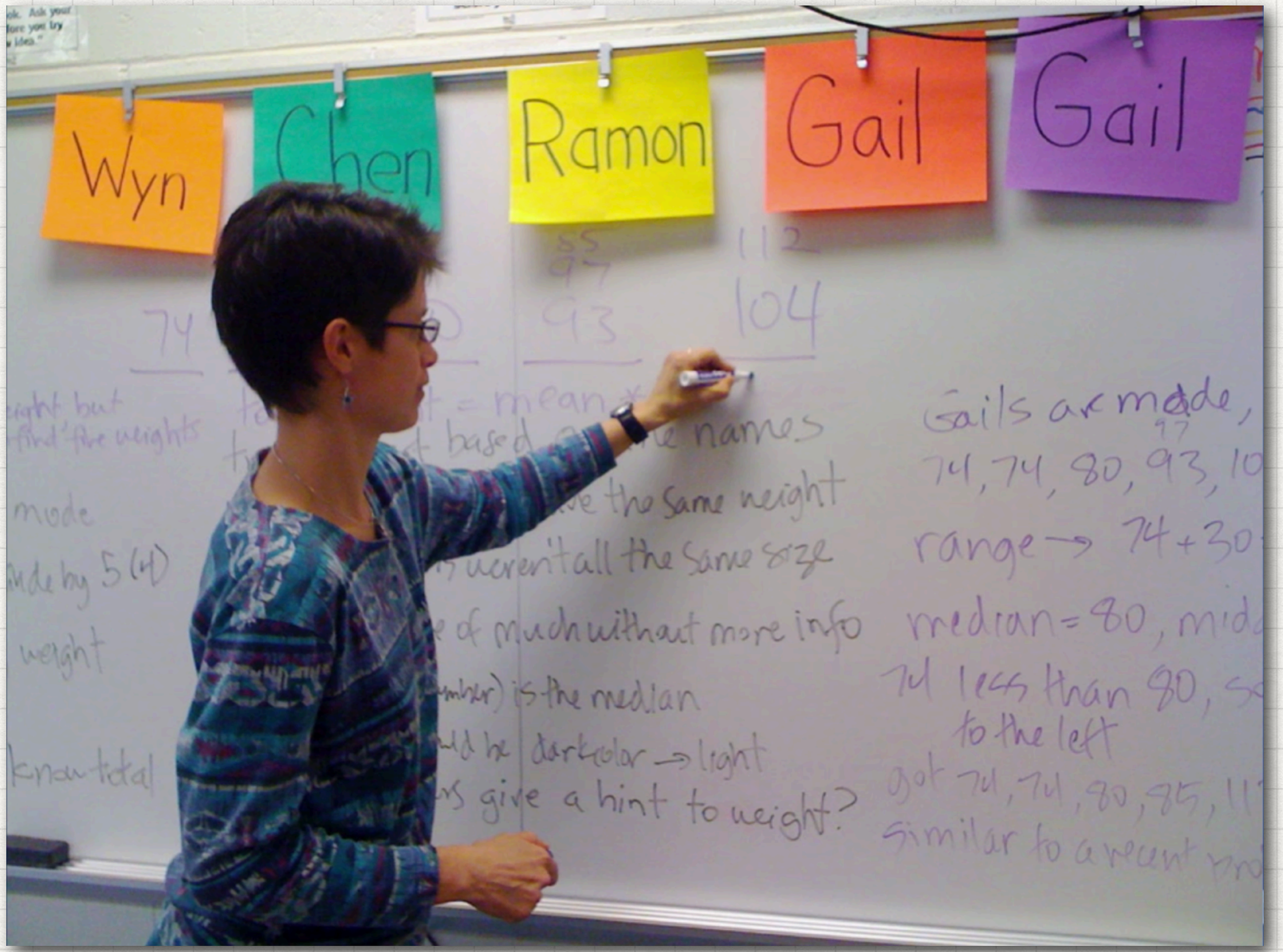
"[One big factor is] our own teachers' belief who can and who cannot do math."

*—David Foster, in Lizzy's Q&A this morning*

“These are our lowest eight graders, so don’t expect too much.”

*—an 8th grade teacher*


60 in
28in
60 in
sink
42 in


Wyn
Chen
Ramon
Gail
Gail
74
93
104
mode
weight
74, 74, 80, 93, 10
range → 74+30
median = 80, mid
74 less than 80,
to the left
similar to a recent pro

"I had no idea they knew so much math! I haven't taught it to them yet."

*—a 7th grade teacher*

"[One big factor is] everyone's beliefs about who can and who cannot do math."

*—me adding to David's statement*

# “Can you four join me up front?”

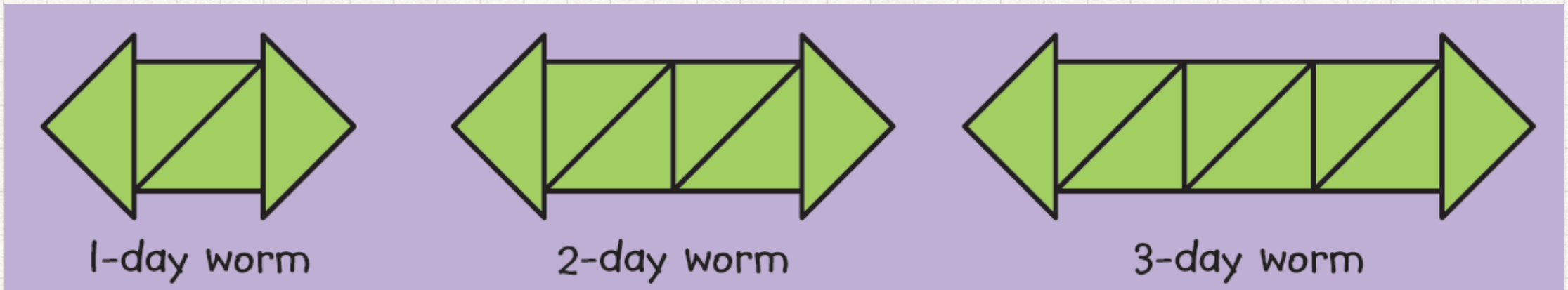
—*Me*

"She doesn't so math with us. She goes out."

*—a 3rd grade teacher*

# FROM ANSWER-GETTING TO SENSE-MAKING

1. GET RID OF THE QUESTION.



## Relate Pictures to Tens and Ones MATH TALK

**MP.1 Make Sense of Problems** Analyze the Problem Discuss the pictures in Exercises 1 and 2. Count the number of cars in the first row. 10 cars Explain that drivers may be directed to fill a row before parking in the next row of a parking lot. In the same way, people may be asked to fill a row of seats before sitting in the next row at a theater.

- How can a filled row help you count the number of cars or the number of people? Possible response: A filled row shows ten, so I can use the picture to count tens and extras.
- How do the cars in Exercise 1 show tens and ones? 2 filled rows show tens and 3 extra cars show ones.
- How do the people in Exercise 2 show tens and ones? There are 4 rows of ten with 6 extra ones. This time the ones are at the top and the tens are shown below.



4-18
Class Activity

Name _____

### Math and the Community Theater

Linda and her family go to a show.

1. 10 cars can park in each row.

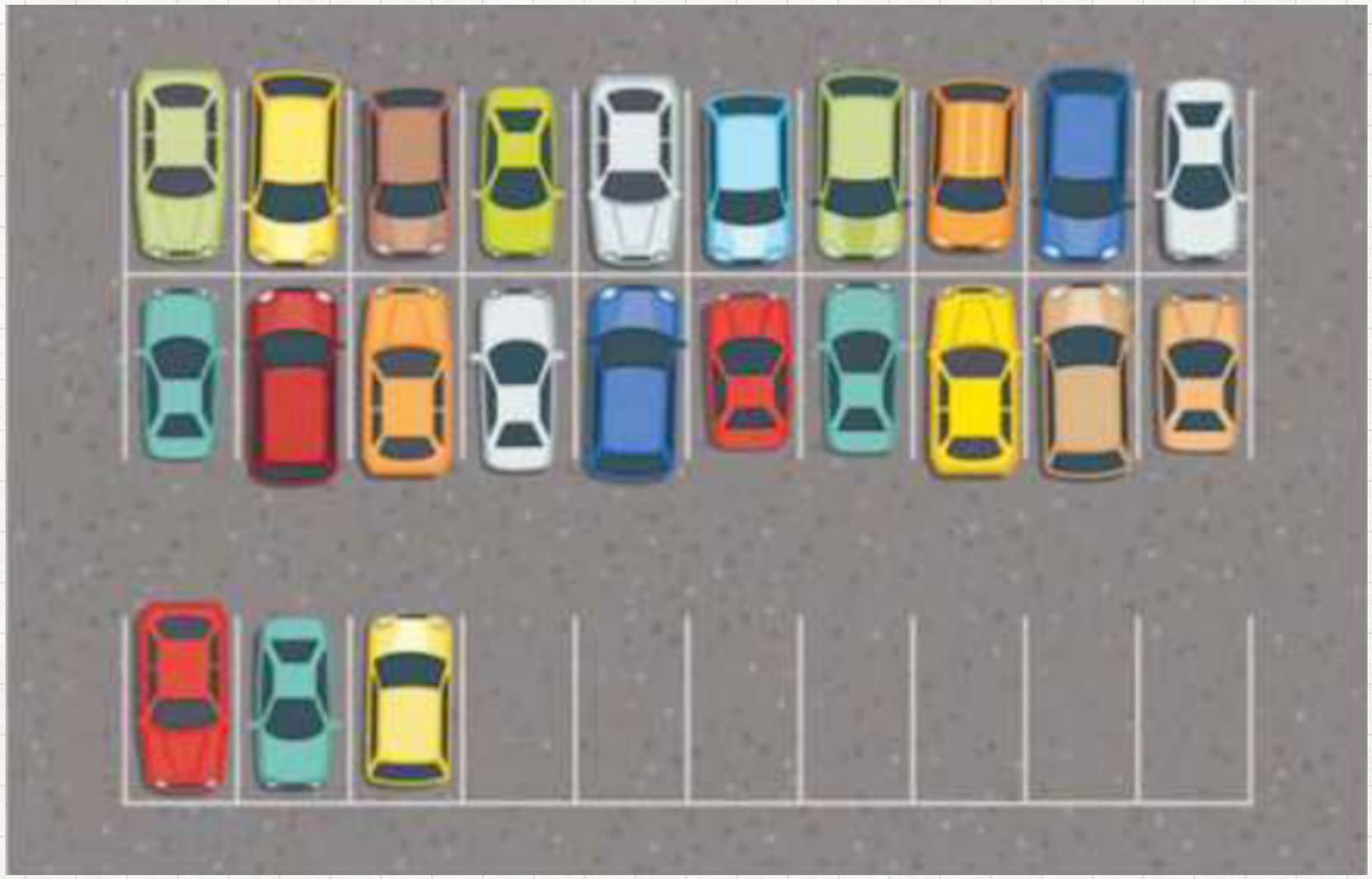
How many cars are there?

_____ tens _____ ones = _____ cars

2. 10 people can sit in each row.

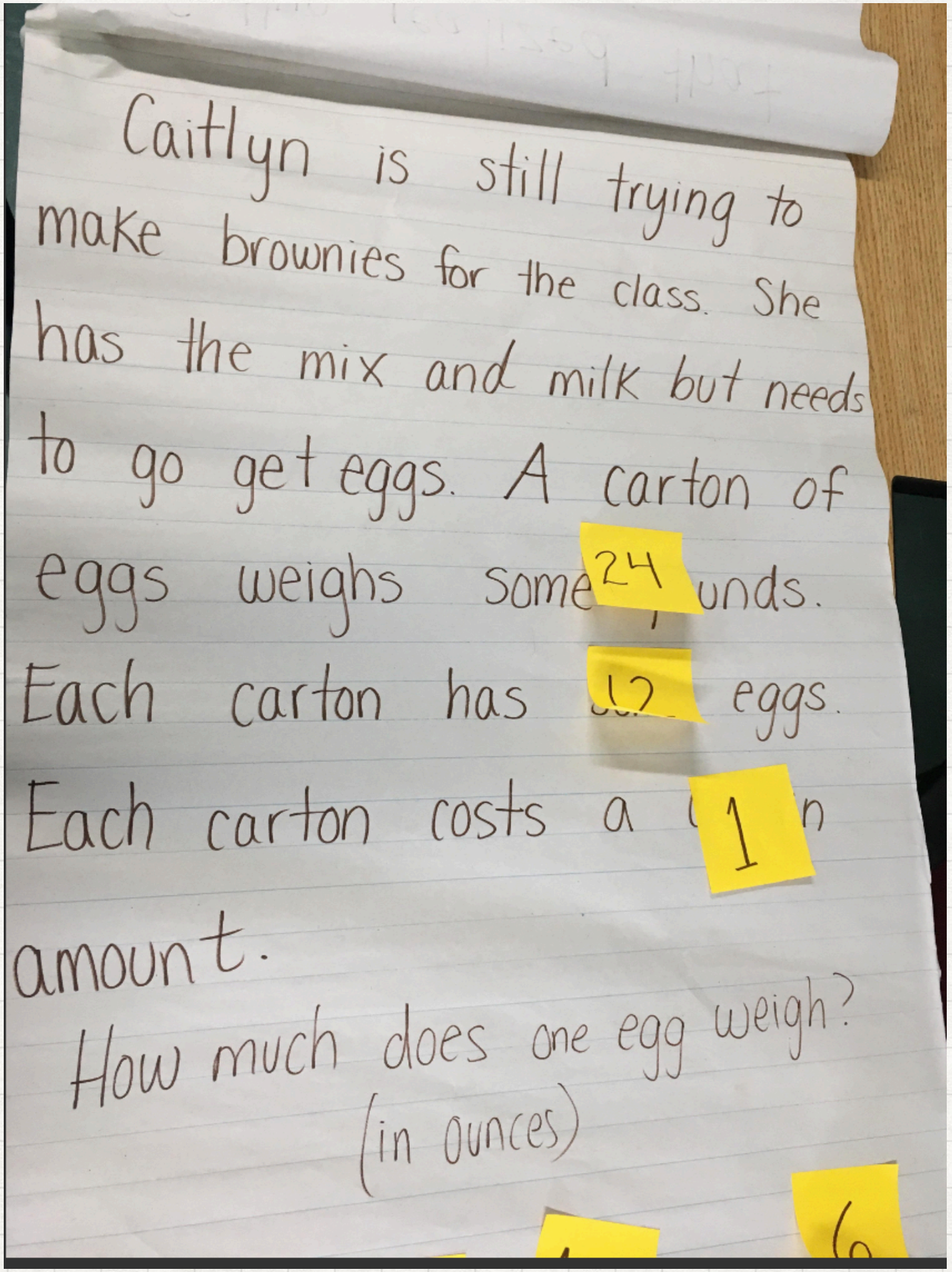
How many people are there?

_____ tens _____ ones = _____ people



# FROM ANSWER-GETTING TO SENSE-MAKING

1. GET RID OF THE QUESTION.
2. GET RID OF THE QUESTION AND THE NUMBERS.


Caitlyn is still trying to make brownies for the class. She has the mix and milk but needs to go get eggs. A carton of eggs weighs some pounds.
24
Each carton has 12 eggs.
Each carton costs a 1
amount.
How much does one egg weigh?
(in ounces)
6

A store has the floor plan shown. The area of the women's department is [illegible]

# FROM ANSWER-GETTING TO SENSE-MAKING

1. GET RID OF THE QUESTION.
2. GET RID OF THE QUESTION AND THE NUMBERS.
3. GIVE THE ANSWER(S).

# 14 X 19 = 266

Rachel bakes cookies and delivers them to her friends.

- It takes 8 minutes to mix the batter.
- The cookies bake for 9 minutes.
- For 6 minutes they cool.

**If the answer is 23 minutes, what is the question?**

**If the answer is 3 minutes, what is the question?**

**If the answer is bake, what is the question?**

# FROM ANSWER-GETTING TO SENSE-MAKING

1. GET RID OF THE QUESTION.
2. GET RID OF THE QUESTION AND THE NUMBERS.
3. GIVE THE ANSWER(S).
4. ASK ABOUT IDEAS.

"Tell me something about number 7."
instead of
"What's the answer to number 7?"

Why?

How do you know?

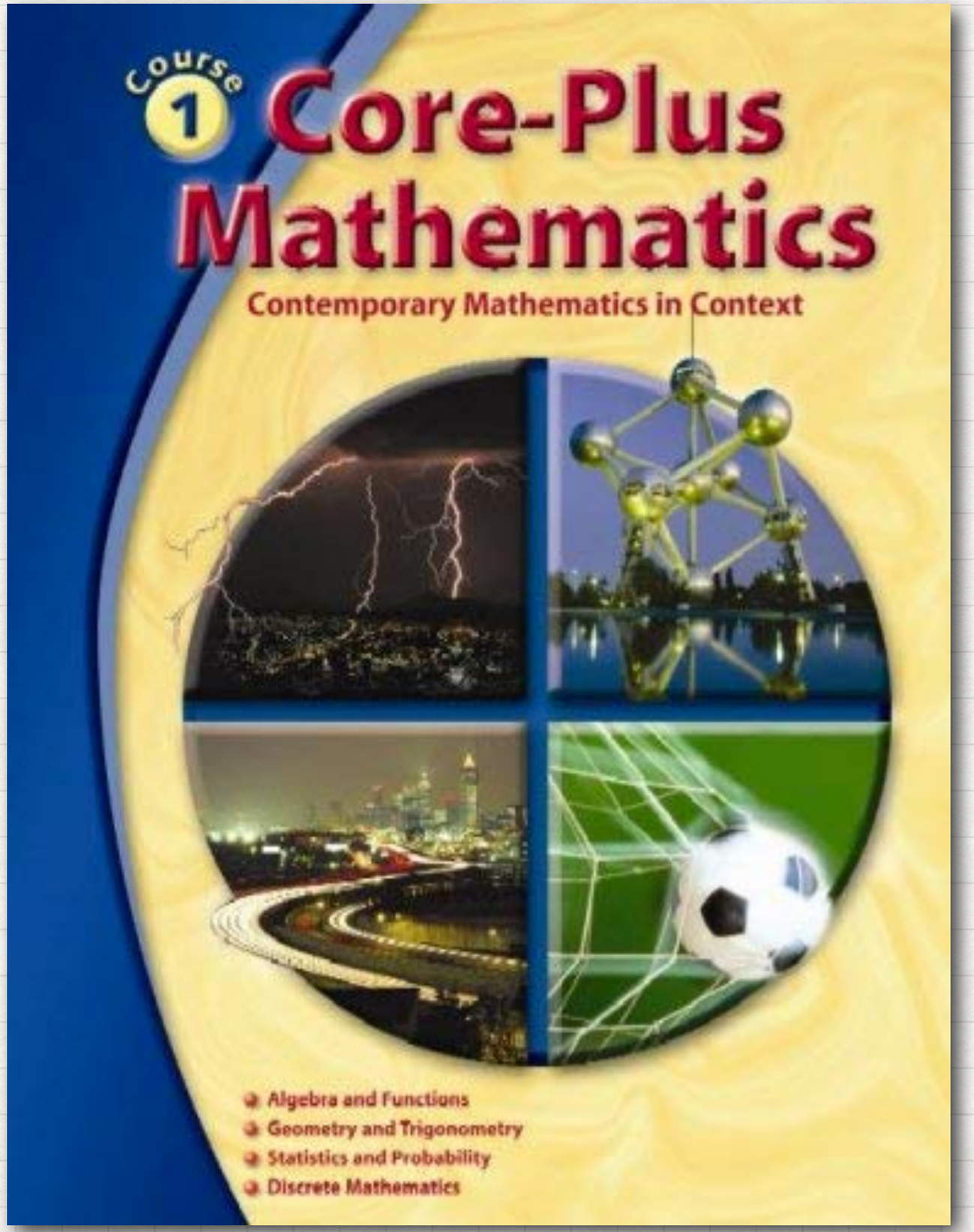
How did you decide?

Tell me more about that.

# FROM ANSWER-GETTING TO SENSE-MAKING

1. GET RID OF THE QUESTION.
2. GET RID OF THE QUESTION AND THE NUMBERS.
3. GIVE THE ANSWER(S).
4. ASK ABOUT IDEAS.

# IMPROVING TEXTBOOKS/CURRICULA

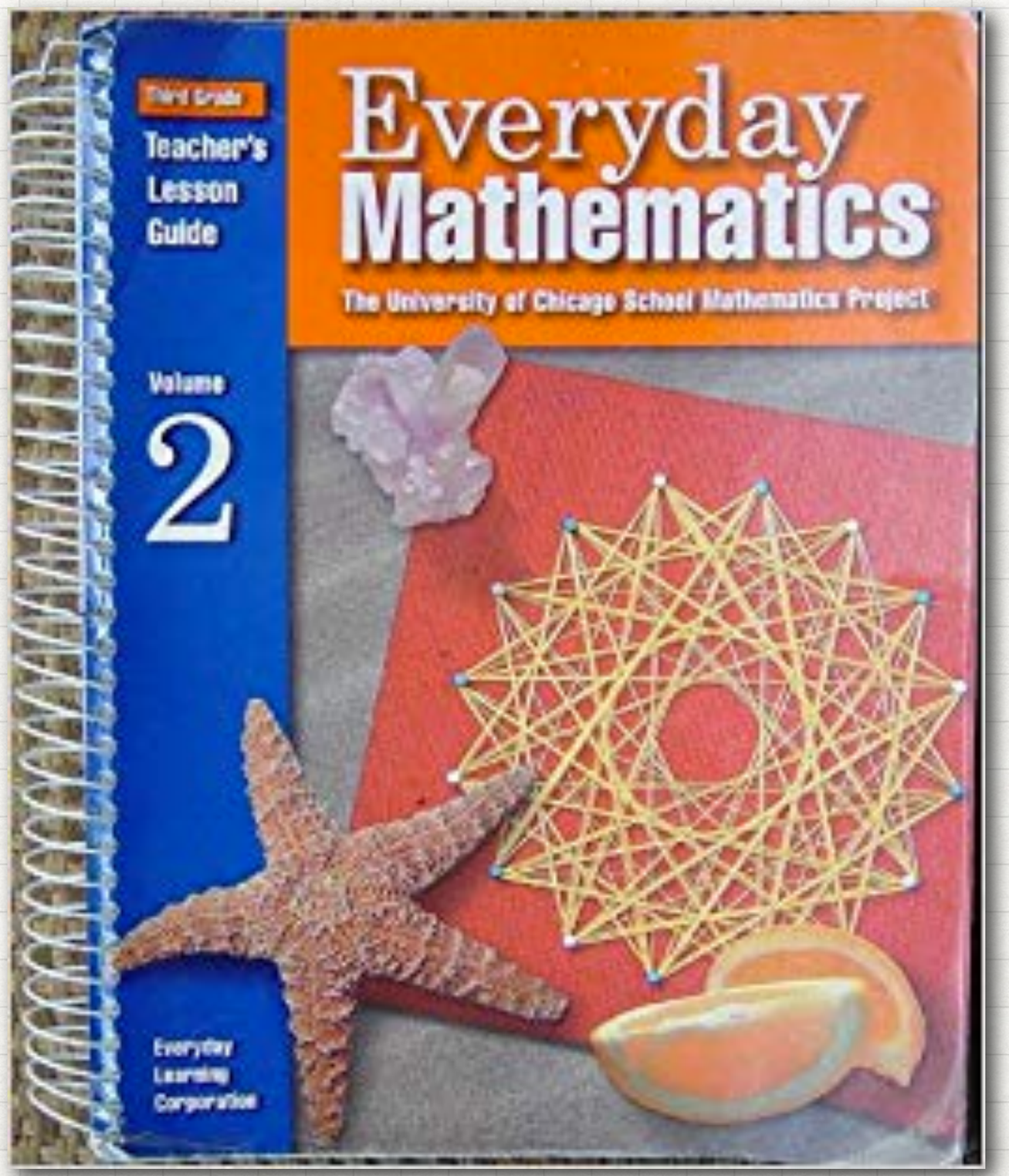

Course 1
Core-Plus Mathematics
Contemporary Mathematics in Context
Algebra and Functions
Geometry and Trigonometry
Statistics and Probability
Discrete Mathematics

"They don't get the geometry unit. We have to rewrite it."

*—a 9th grade teacher*

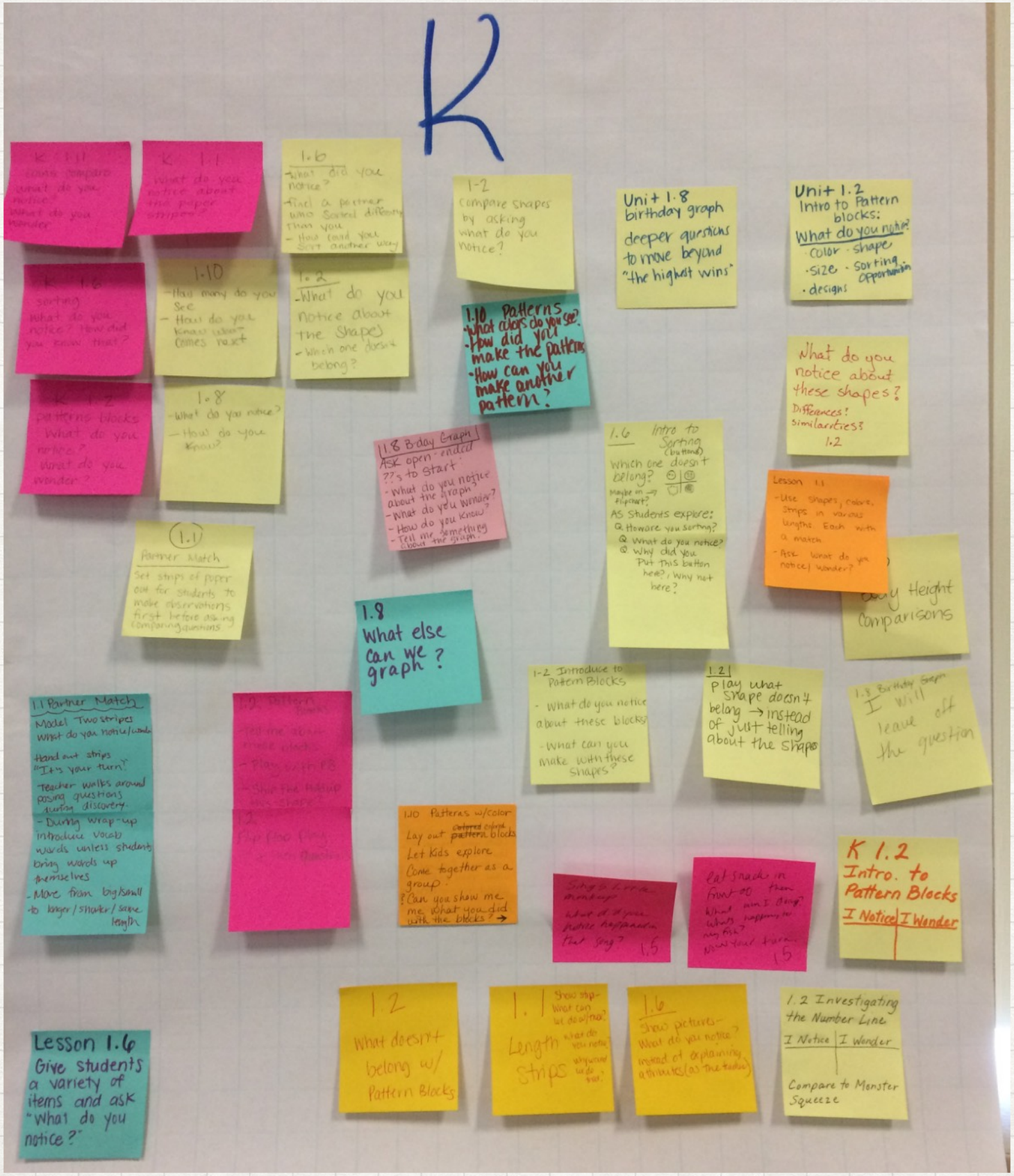
# “I don’t know.”

*—that 9th grade teacher*


Third Grade
Teacher's Lesson Guide
Volume
2
Everyday Mathematics
The University of Chicago School Mathematics Project
Everyday Learning Corporation

"We can't possibly do this for every lesson!"

*—a 3rd grade teacher*


K
1.6
What did you notice?
-Find a partner who sorted different than you
- How could you sort another way
1-2
Compare shapes by asking what do you notice?
Unit 1.8 birthday graph
deeper questions to move beyond "the highest wins"
Unit 1.2 Intro to Pattern blocks:
What do you notice?
· Color · Shape
· Size · Sorting Opportunities
· designs
1.10
-How many do you see
- How do you know what comes next
1.0 2
-What do you notice about the shapes
- which one doesn't belong?
1.10 Patterns
-what colors do you see?
-How did you make the pattern?
-How can you make another pattern?
1.8
-What do you notice?
- How do you know?
What do you notice about these shapes?
Differences?
Similarities?
1.2
1.8 B-day Graph
Ask open-ended ??s to start
- What do you notice about the graph
- What do you wonder?
- How do you know?
- Tell me something about the graph
1.6 Intro to Sorting (buttons)
Which one doesn't belong?
Maybe on flipchart?
As students explore:
Q How are you sorting?
Q What do you notice?
Q Why did you put this button here? Why not here?
Lesson 1.1
- Use shapes, colors, strips in various lengths. Each with a match
- Ask What do you notice/ wonder?
1.1
Partner Match
Set strips of paper out for students to make observations first before asking/comparing questions
1.8
What else can we graph?
Body Height Comparisons
1.1 Partner Match
Model Two stripes
What do you notice/wonder
Hand out strips
"It's your turn"
Teacher walks around posing questions during discovery.
- During Wrap-up introduce vocab words unless students bring words up themselves
- Move from big/small to longer/shorter/same length
1-2 Introduce to Pattern Blocks
- What do you notice about these blocks?
- What can you make with these shapes?
1.2
Play what shape doesn't belong → instead of just telling about the shape
1.8 Birthday Graph
I will leave off the question
1.10 Patterns w/color
Lay out colored pattern blocks
Let kids explore
Come together as a group.
Can you show me what you did with the blocks?
1.5
Eat snacks in front of them
1.5
K 1.2
Intro. to Pattern Blocks
I Notice | I Wonder
Lesson 1.6
Give students a variety of items and ask "What do you notice?"
1.2
What doesn't belong w/ Pattern Blocks
1.1
Length Strips
1.6
Show pictures—
What do you notice?
Instead of explaining attributes (as the teacher)
1.2 Investigating the Number Line
I Notice | I Wonder
Compare to Monster Squeeze

K 1.11
counts compare
what do you
notice?
what do you
wonder

K 1.1
what do you
notice about
the paper
strips?

1.6
-What did you
notice?
-find a partner
who sorted differently
than you
- How could you
sort another way

1-2
compare shapes
by asking
what do you
notice?

K 1.6
sorting
What do you
notice? How did
you know that?

1.10
-How many do you
See
- How do you
know what
comes next

1.2
-What do you
notice about
the shapes
- Which one doesn't
belong?

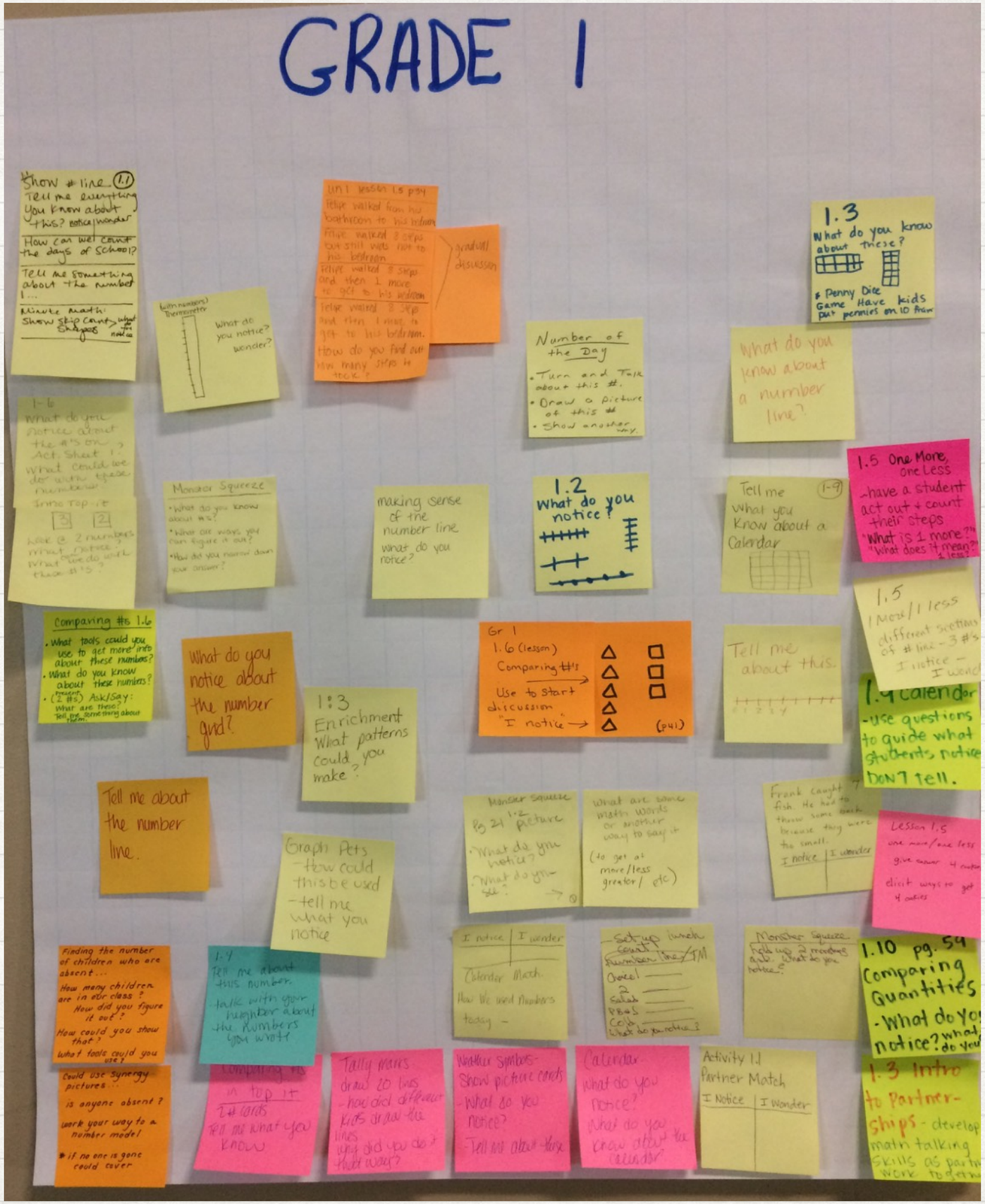
1.10 Patterns
-What colors do you see?
-How did you
make the pattern
-How can you
make another
pattern?

K 1.2
patterns blocks
What do you
notice?
What do you
wonder?

1.8
-What do you notice?
- How do you
know?

1.8 B-day Graph
ASK open-ended
??'s to start:
- What do you notice
about the graph?
- What do you wonder?
- How do you know?
- Tell me something
about the graph.

1.1


GRADE 1
Show # line 1.1
Tell me everything you know about this? notice/wonder
How can we count the days of school?
Tell me something about the number 1...
Minute math: Show skip count
What do you notice? Wonder?
Unit lesson 1.5 pg 54
Felipe walked from his bathroom to his bedroom
Felipe walked 8 steps but still was not to his bedroom
Felipe walked 8 steps and then 1 more to get to his bedroom
Felipe walked 8 steps and then 1 more to get to his bedroom. How do you find out how many steps it took?
gradual discussion
Number of the Day
• Turn and Talk about this #.
• Draw a picture of this #
• Show another way.
1.3
What do you know about these?
• Penny Dice Game Have kids put pennies on 10 frame
What do you know about a number line?
1.5 One More, One Less
-have a student act out + count their steps
"What is 1 more?"
"What does it mean?"
1-6
What do you notice about the #'s on Act. Sheet 1
What could we do with these numbers?
Trino Top-It
How @ 2 numbers what do notice? What can we do with these #'s?
Monster Squeeze
• What do you know about #s?
• What are ways you can figure it out?
• How did you narrow down your answer?
making sense of the number line
what do you notice?
1.2
What do you notice?
Tell me
What you know about a Calendar
1-9
Comparing #s 1.6
• What tools could you use to get more info about these numbers?
• What do you know about these numbers?
• (greater, less #s) Ask/Say: What are these? Tell me something about them.
What do you notice about the number grid?
1:3 Enrichment
What patterns could you make?
Gr 1
1.6 (lesson)
Comparing #'s
Use to start discussion
"I notice →"
(p41)
Tell me about this.
1.4 Calendar
-use questions to guide what students notice
DON'T tell.
Tell me about the number line.
Graph Pets
-how could this be used
-tell me what you notice
Monster Squeeze
pg 21 1:2 picture
• What do you notice?
• What do you see?
What are some math words or another way to say it
(to get at more/less greater/ etc)
Frank caught 7 fish. He had to throw some back because they were too small.
I notice | I wonder
Lesson 1.5
one more/one less
give answer 4 ways
elicit ways to get 4 answers
Finding the number of children who are absent...
How many children are in our class?
How did you figure it out?
How could you show that?
What tools could you use?
1:4
Tell me about this number.
-talk with your neighbor about the numbers you wrote
I notice | I wonder
Calendar Math
How We used Numbers today -
Set up (with Equal Number Line) TM
Cheese
Salad
Peas
Corn
What do you notice?
Monster Squeeze
with up 2 numbers ask: What do you notice?
1.10 pg. 54
Comparing Quantities
-What do you notice? what
1.3 Intro to Partnerships - develop math talking skills as part
Could use Synergy pictures...
is anyone absent?
work your way to a number model
* if no one is gone could cover
Comparing #s
in Top It
2 #cards
Tell me what you know
Tally marks
draw 20 lines
-how did different kids draw the lines
-why did you do it that way?
Weather Symbols
Show picture cards
-What do you notice?
-Tell me other things
Calendar
What do you notice?
What do you know after the calendar
Activity 1.1
Partner Match
I Notice | I Wonder

Show # line. (1.1)
Tell me everything you know about this? notice/wonder

How can we count the days of school?

Tell me something about the number 1...

Minute math:
Show skip count > what do you notice
Shapes

(with numbers)
Thermometer

What do you notice?
wonder?

Unit lesson 1.5 p34

Felipe walked from his bathroom to his bedroom

Felipe walked 8 steps but still was not to his bedroom

Felipe walked 8 steps and then 1 more to get to his bedroom

Felipe walked 8 steps and then 1 more to get to his bedroom. How do you find out how many steps he took?

gradual discussion

Number of the Day

- Turn and Talk about this #.
- Draw a picture of this #
- Show another way.

1-6
What do you notice about the #'s on Act. Sheet 1?
What could we do with these numbers?
Intro Top-it

[3] [2]

Look @ 2 numbers
What notice?
What can we do with these #'s?

Monster Squeeze

- What do you know about #'s?
- What are ways you can figure it out?
- How did you narrow down your answer?

making sense of the number line
what do you notice?

1.2
What do you notice?

"School reform often happens TO teachers, not WITH teachers."

*—Kathleen, in her Lesson Study 101 session this morning*

"I don't need your help. I've been doing this four years, and I've figured it out."

*— a fourth year teacher we could have worked with*

# LESSON STUDY TREATS TEACHERS AS PROFESSIONALS AND TREATS TEACHING AS A PROFESSION.

# HOW DO WE TREAT OUR STUDENTS AS MATHEMATICIANS IN THE SAME WAY?