

**NCTM**




# **Making Reasoning Integral to Instruction Focused on Number & Operations**

**Marilyn Burns**

**Thursday, April 10, 2014**

# First a math problem

$$99 + 17$$


$$99 + 17$$

Lauren

$$99 + 10 = 109$$

$$109 + 7 = 116$$



$$99 + 17$$

Lauren / Alessandra

$$99 + 10 = 109$$

$$109 + 7 = 116$$

Jake

9 plus any number  
is 1 less than the  
number you had.

$$(9 + 7 = 16)$$

6 is 1 less than  
the 7

The answer had to  
end in 6.

So I knew the  
answer had to be 116.

Shu  
Rug



GO





$$99 + 17$$

Lauren/Alessandra

$$99 + 10 = 109$$

$$109 + 7 = 116$$

Jake

9 plus any number  
is 1 less than the  
number you had.

$$(9 + 7 = 16)$$

6 is 1 less than  
the 7

The answer had to  
end in 6.

So I knew the  
answer had to be 116.



Eliane

$$9 + 7 = 16$$

$$90 + 10 = 100$$

$$16 + 100 = 116$$



aren/Alessandra

$$-10 = 109$$

$$+7 = 116$$

Jake

9 plus any number  
is 1 less than the  
number you had.

$$(9 + 7 = 16)$$

6 is 1 less than  
the 7

The answer had to  
end in 6.

So I knew the  
answer had to be 116.

Eliane

$$9 + 7 = 16$$

$$90 + 10 = 100$$

$$16 + 100 = 116$$

Lindsay



$$9 + 7 = 16$$

$$16 + 10 = 26$$

$$26 + 90 = 116$$



$$99 + 17$$

Lauren/Alessandra

$$99 + 10 = 109$$

$$109 + 7 = 116$$

Jake

9 plus any number  
is 1 less than the  
number you had.

$$(9 + 7 = 16)$$

6 is 1 less than  
the 7

The answer had to  
end in 6.

So I knew the  
answer had to be 116.

Eliane

$$9 + 7 = 16$$

$$90 + 10 = 100$$

$$16 + 100 = 116$$

Lindsay

$$9 + 7 = 16$$

$$16 + 10 = 26$$

$$90 + 26 = 116$$

①



Shun  
Rug



G



TEACHER



$$99 + 17$$

Lauren / Alessandra

$$99 + 10 = 109$$

$$109 + 7 = 116$$

Dylan

$$100 + 17 = 117$$

$$117 - 1 = 116$$

Jake

9 plus any number  
is 1 less than the  
number you had.

$$(9 + 7 = 16)$$

6 is 1 less than  
the 7

The answer had to  
end in 6.

So I knew the  
answer had to be 116.

Eliane

$$9 + 7 = 16$$

$$90 + 10 = 100$$

$$16 + 100 = 116$$

Lindsay

$$9 + 7 = 16$$

$$16 + 10 = 26$$

$$90 + 26 = 116$$

①

$$90 + 17 = 107$$

$$107 + 9 = 116$$

②





$$99 + 17$$

Lauren/Alessandra

$$99 + 10 = 109$$

$$109 + 7 = 116$$

Dylan

$$100 + 17 = 117$$

$$117 - 1 = 116$$

Caleb

99 is 1 less than 100.

$$17 - 1 = 16$$

$$99 + 1 = 100$$

$$100 + 16 = 116$$



Jake

9 plus any number  
is 1 less than the  
number you had.

$$(9 + 7 = 16)$$

6 is 1 less than  
the 7

The answer had to  
end in 6.

So I knew the  
answer had to be 116.

Eliane

$$9 + 7 = 16$$

$$90 + 10 = 100$$

$$16 + 100 = 116$$

Lindsay

$$9 + 7 = 16$$

$$16 + 10 = 26$$

$$90 + 26 = 116$$

①

②

$$90 + 17 = 107$$

$$107 + 9 = 116$$



# Common Core Connection

- Common Core Standards for Mathematical Practice
- Common Core Standards for Mathematical Content

# Common Core Recommendation:

... a “balanced combination of procedures and understanding.”

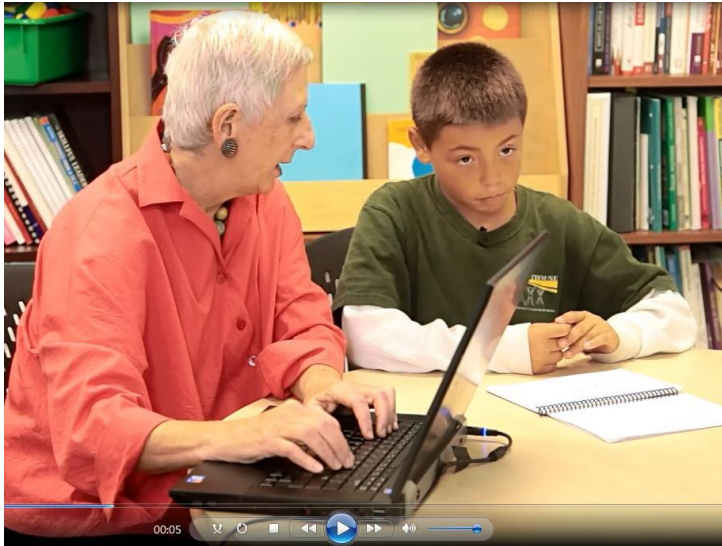
# Common Core Caution:

... “students who lack understanding of a topic may rely on procedures too heavily.”

# Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. **Construct viable arguments and critique the reasoning of others.**
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

$$99 + 17$$



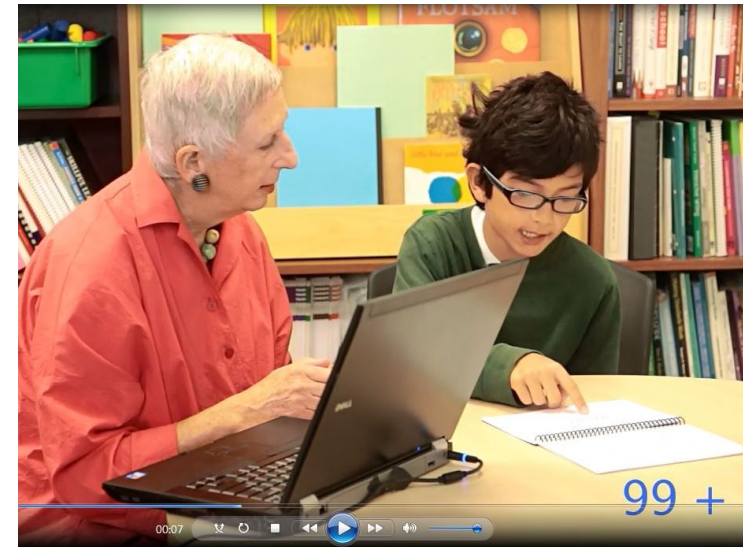
Alberto



Manuel



Dina



Amir

To view videos, go to  
[www.mathreasoninginventory.com](http://www.mathreasoninginventory.com)

# MRI

# Math Reasoning Inventory

Find out what students really  
understand about math

Funded by the Bill & Melinda Gates Foundation



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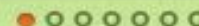
## Find out what your students really understand about math

- Focus on how students think and reason
- Uncover students' strategies, understandings, and misconceptions
- Learn how students respond to questions the Common Core expects all middle school students to answer successfully

Sign up for a **FREE** account and try it today!

[SIGN UP FOR FREE](#)
[LEARN MORE](#)

*Why is Marilyn Burns so excited about MRI?*



### The Assessments

Math Reasoning Inventory (MRI) is an online formative assessment tool designed to make teachers' classroom instruction more effective.

[Learn More](#)



### The Reports

MRI instant reports can be used to inform instruction, monitor progress, identify students who would benefit from intervention, and communicate with parents.

[Learn More](#)



### Reasoning Strategies

The MRI Interview reveals the strategies students use to reason with whole numbers, decimals, and fractions.

[Learn more](#)

*"In just a few minutes, I was able to gain valuable awareness about my math students and adjust my lessons accordingly."*

— Diana Jones  
Grade 6 Teacher  
SLCUSD, California

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## Video Library

The Video Library includes more than 80 video clips of students answering MRI Interview questions. These are placed throughout the website to provide examples of various MRI features. To locate specific video clips, search by Interview Question or by Student.

**SEARCH VIDEOS**

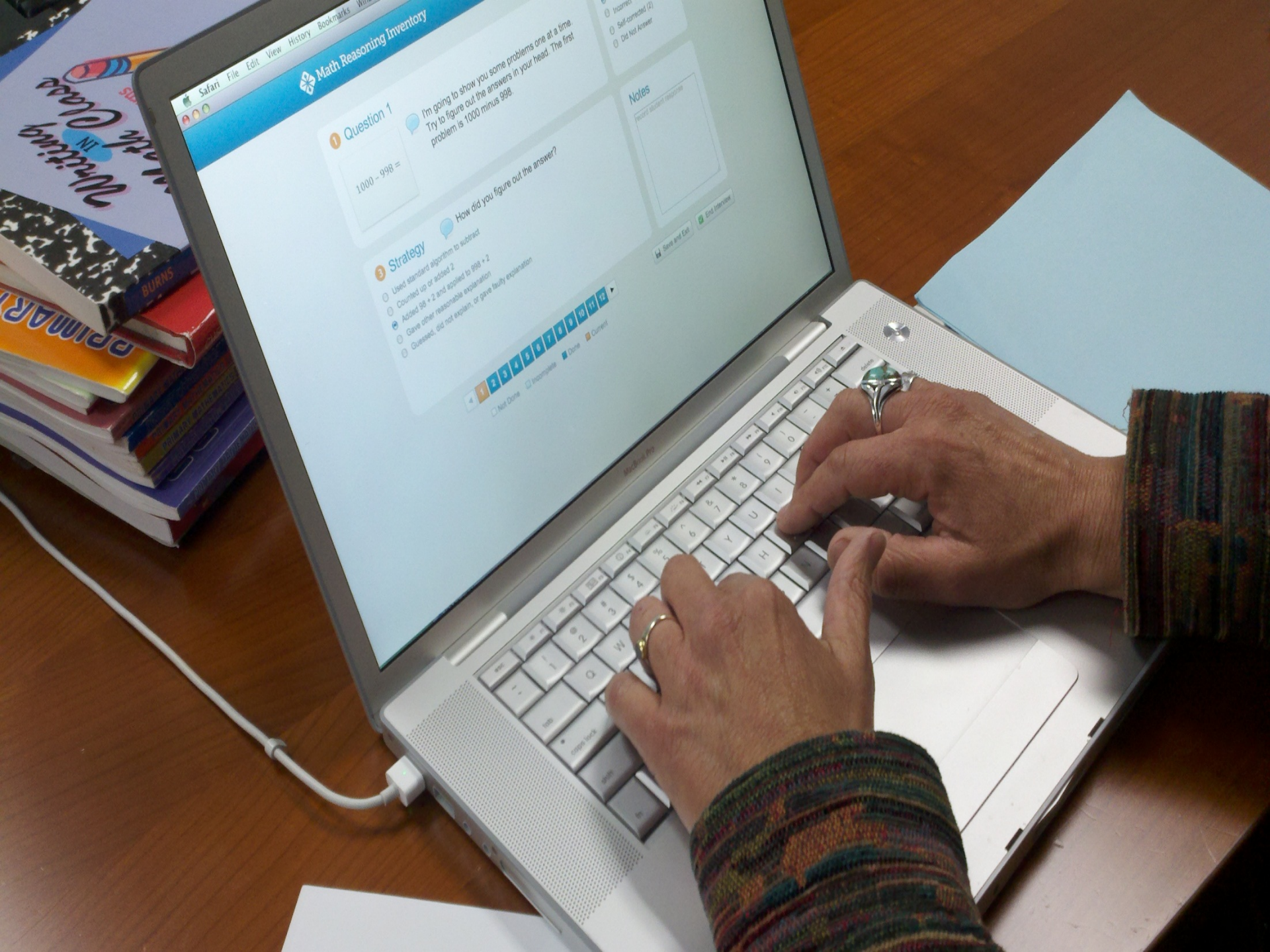
 Search by Interview Question 

 Search by Student 


Compare 3/8 and 5/6	00:24
Alberto	
Compare 3/8 and 5/6	00:37
Amir	
Compare 3/8 and 5/6	00:52
Dina	
Compare 3/8 and 5/6	00:28
Ernesto	
Compare 3/8 and 5/6	00:32
Malcolm	

MRI asks questions that the Common Core expects all students entering middle school to be able to answer successfully.





### 1 Question 1

1000 - 998 =

I'm going to show you some problems one at a time.  
Try to figure out the answers in your head. The first problem is 1000 minus 998.

### 2 Strategy

How did you figure out the answer?

- ☐ Used standard algorithm to subtract
- ☐ Counted up or added 2
- ☒ Added 98 + 2 and applied to 998 + 2
- ☐ Gave other reasonable explanation
- ☐ Guessed, did not explain, or gave faulty explanation

Progress bar showing 1 of 5 questions completed.

### Notes

Notes area for recording answers.

Save and Exit End Interview

***Reasoning*** is the heart of MRI.

The *Interview* is the core of MRI.



- We ask . . .
- We listen . . .
- We learn . . .

# **Practice Standard #3:**

## **Construct viable arguments and critique the reasoning of others.**

# Prompts for student writing.

## Grade 4:

It means . . .

Every students needs to learn . . .

17 12/14/13

# Common Core Practice Standard Number 3.

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What it means:

Every student needs to learn how to explain their thinking. It is more important to be able to explain. If you didn't explain your thinking you would not learn that much, if all you needed were answers you would use calculators and your brain would not learn.

CCS

12/4/13

## Practice standards #3

What it means  
It means that you defend your answer. It means  
to say your answer is right. Your answer has to  
make sense.

# Practice Standard #3

12/4/13

## Common Core (CCSS)

Every student needs to learn how to explain their thinking and have their answers make sense. Students also need to learn how to ask questions if something doesn't make sense to them. They need to learn how to be able to give other students feedback. I would explain my thinking for  $253 \times 7$  by doing this:

$$\begin{array}{r} 253 \\ \times 7 \\ \hline 1771 \end{array}$$

$$\begin{aligned} 3 \times 7 &= 21 \\ 50 \times 7 &= 350 \text{ add } 0 \\ 5 \times 7 &= 35 \\ 2 \times 7 &= 14 \\ 200 \times 7 &= 14,000 \\ &\text{add } 2 \\ &0s \end{aligned}$$



12-4-13

# Common Core CCSS

## Practice Standard #3

It means that you should do something that makes sense and you should be able to criticize and question what the person is doing

# CCSSP Practice Standard #3

12/4/13

What it means:

I mean to create viable arguments and critique the reasoning of others. Slow your thinking.

# Common Core Connection

## Grade 2

### Number & Operations in Base Ten

Use place value understanding and properties of operations to add and subtract.

**CCSS.Math.Content.2.NBT.B.5** Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.

**CCSS.Math.Content.2.NBT.9** Explain why addition and subtraction strategies work, using place value and the properties of operations.

# Common Core Connection

## Grade 2

### Operations & Algebraic Thinking

Represent and solve problems involving addition and subtraction.

**CCSS.Math.Content.2.OA.A.1** Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions.

There are \_\_\_ girls on the playground.  
There are \_\_\_ boys on the playground.  
There are \_\_\_ children in all.



There are 7 girls on the playground.  
There are 15 boys on the playground.  
There are      children in all.

There are 20 girls on the playground

There are 15 boys on the playground

There are 50 children in all.

120

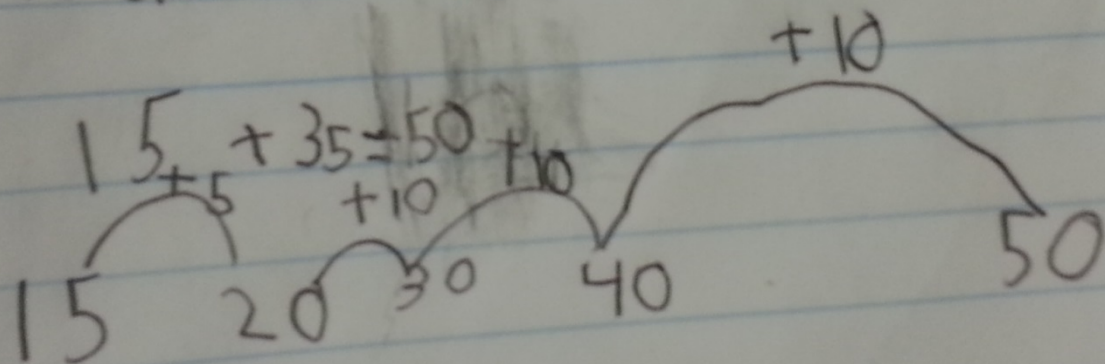
20 + 30 = 50

$$10 + \underline{50} = 60$$

There are 35 girls

There are 15 boys

There are 50 in all.

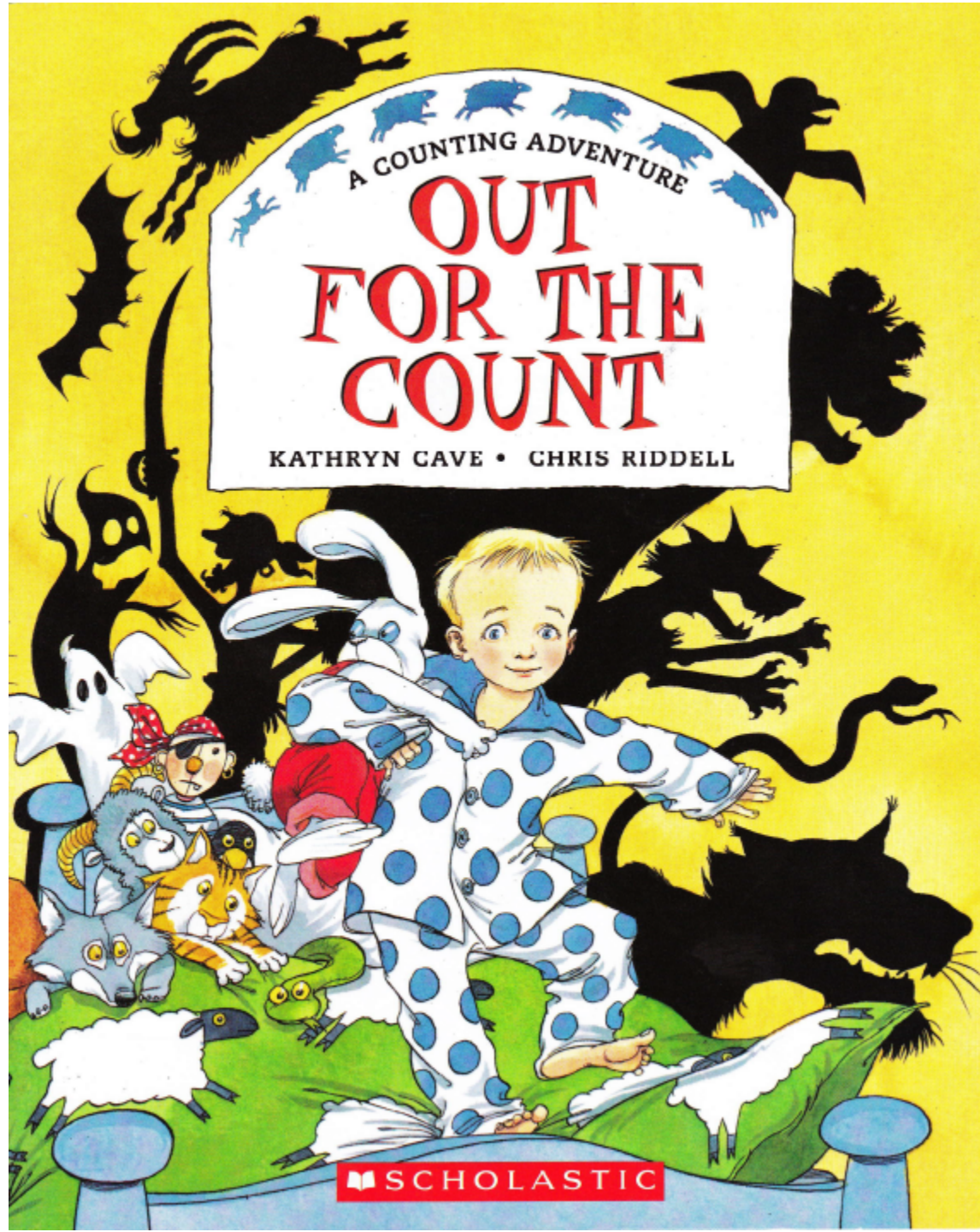




A COUNTING ADVENTURE

# OUT FOR THE COUNT

KATHRYN CAVE • CHRIS RIDDELL







Approaching from the east Tom saw  
a band of pirates armed for war,  
with pistols, cutlasses and axes,  
looking for some target practice.

No time to hide, no place to run,  
outnumbered 45 to one,  
Tom ducked beneath the gangplank fast  
and tripped them up as they went past.





## STUFFED ANIMALS

Penguin .....\$13

Sheep .....\$18

Ghost .....\$26

Python .....\$29

Goat .....\$34

Bear .....\$35

Wolf.....\$38

Pirate .....\$39

Tiger.....\$47

Rabbit.....\$49



# Buy Stuffed Animals

## DIRECTIONS

Isabella

1 Penguin \$13  
and  
Sheep \$18

$$13 + 18$$

Choose two stuffed animals.  
Write the problem.

$$\begin{array}{r} 10 + 10 = 20 \\ 3 + 8 = 11 \\ 20 + 11 = 31 \\ 13 + 18 = 31 \end{array}$$

Find the total price  
using equations.

$$\begin{array}{r} 13 \\ + 18 \\ \hline 20 \\ + 11 \\ \hline 31 \end{array}$$

Find the total  
price going down.

$$\begin{array}{r} +10 \quad +7 \quad +1 \\ 13 \quad 23 \quad 30 \quad 31 \end{array}$$

Add with an  
open number line.

## STUFFED ANIMALS

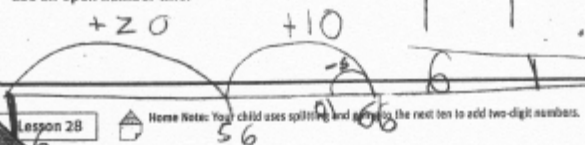
Penguin ..... \$13	Bear ..... \$35
Sheep ..... \$18	Wolf ..... \$38
Ghost ..... \$26	Pirate ..... \$39
Python ..... \$29	Tiger ..... \$47
Goat ..... \$34	Rabbit ..... \$49

① Stuffed animals: Ghost and Bear  
Problem  $25 + 26 = 61$

Use equations.

$$\begin{array}{r} 35 + 26 = \\ 20 + 30 = 50 \\ 5 + 6 = 11 \\ 50 + 11 = 61 \end{array}$$

Use an open number line.



Add going down.

$$\begin{array}{r} 25 \\ + 36 \\ \hline 50 \\ + 11 \\ \hline 61 \end{array}$$

② Stuffed animals: Wolf and Pangwen  
Problem  $36 + 13 = 49$

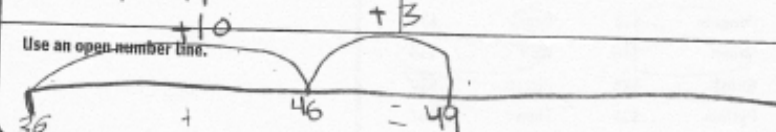
Use equations.

$$\begin{array}{r} 36 + 13 = 49 \\ 30 + 10 = 40 \\ 6 + 3 = 9 \\ 40 + 9 = 49 \end{array}$$

Add going down.

$$\begin{array}{r} 36 \\ + 13 \\ \hline 49 \end{array}$$

Use an open number line.



③ Stuffed animals: Pirate and Sheep  
Problem  $39 + 18 = 57$

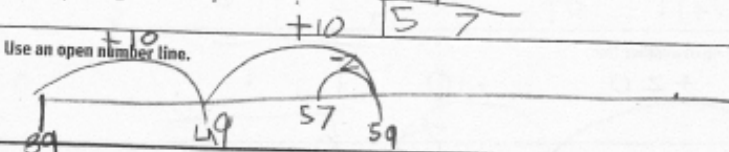
Use equations.

$$\begin{array}{r} 39 + 18 = 57 \\ 30 + 10 = 40 \\ 9 + 8 = 17 \\ 40 + 17 = 57 \end{array}$$

Add going down.

$$\begin{array}{r} 39 \\ + 18 \\ \hline 57 \end{array}$$

Use an open number line.



Home Note: Your child uses splitting and going to the next ten to add two-digit numbers.

Lesson 28

55

① Stuffed animals: Goat and Baer

Problem  $25 + 26 = 61$

Use equations.

$$\begin{aligned} 25 + 26 &= \\ 20 + 30 &= 50 \\ 5 + 6 &= 11 \\ 50 + 11 &= 61 \end{aligned}$$

Add going down.

2	5
+ 3	6
<hr/>	
5	0
<hr/>	
1	1
<hr/>	
6	1

Use an open number line.

+ 20

+ 10

- 5

56

66

Lesson 28



Home Note: Your child uses splitting and going to the next ten to add two-digit numbers.



# Buy Stuffed Animals

Dean

## DIRECTIONS

1 Penguin \$13  
and  
Sheep \$18

$$13 + 18$$

Choose two  
stuffed animals.  
Write the problem.

$$10 + 10 = 20$$

$$3 + 8 = 11$$

$$20 + 11 = 31$$

$$13 + 18 = 31$$

Find the total price  
using equations.

$$13$$

$$+18$$

$$\hline 20$$

$$+11$$

$$\hline 31$$

Find the total  
price going down.

$$\begin{array}{ccccccc} & +10 & & +7 & & +1 & \\ 13 & \rightarrow & 23 & \rightarrow & 30 & \rightarrow & 31 \end{array}$$

Add with an  
open number line.

## STUFFED ANIMALS

Penguin ..... \$13  
Sheep ..... \$18  
Ghost ..... \$26  
Python ..... \$29  
Goat ..... \$34

Bear ..... \$35  
Wolf ..... \$38  
Pirate ..... \$39  
Tiger ..... \$47  
Rabbit ..... \$49

1 Stuffed animals: ghost and bear  
Problem  $\$26 + \$35$

Use equations.

$$26 + 35 = ?$$

$$20 + 30 = 50$$

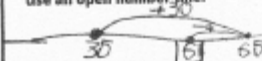
$$6 + 5 = 11$$

$$50 + 11 = 61$$

Add going down.

$$\begin{array}{r} 26 \\ +35 \\ \hline 50 \\ +11 \\ \hline =61 \end{array}$$

Use an open number line.



54

Lesson 28



Home Note: Your child uses splitting and going to the next ten to add two-digit numbers.

2 Stuffed animals: rabbit and tiger  
Problem  $47 + 49$

Use equations.

$$47 + 49 = ?$$

$$40 + 40 = 80$$

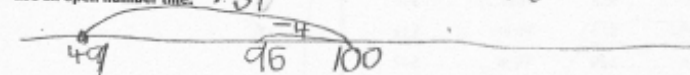
$$7 + 9 = 16$$

$$80 + 16 = 96$$

Add going down.

$$\begin{array}{r} 47 \\ +49 \\ \hline 80 \\ +16 \\ \hline 96 \end{array}$$

Use an open number line.



3 Stuffed animals: tiger and penguin and ghost and goat  
Problem  $47 + 13 + 26 + 34$

Use equations.

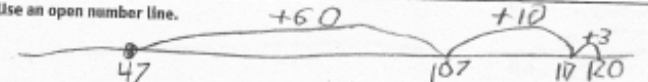
$$47 + 13 + 26 + 34$$

$$50 + 60 = 110$$

Add going down.

$$\begin{array}{r} 47 \\ +26 \\ +13 \\ +34 \\ \hline 100 \\ +20 \\ \hline 120 \end{array}$$

Use an open number line.



Home Note: Your child uses splitting and going to the next ten to add two-digit numbers.

Lesson 28

55



Math Solutions  
FOUNDED BY MARILYN BURNS



③ Stuffed animals: tiger and Penguin and ghost and goat

Problem  $47 + 13 + 26 + 34$

Use equations.

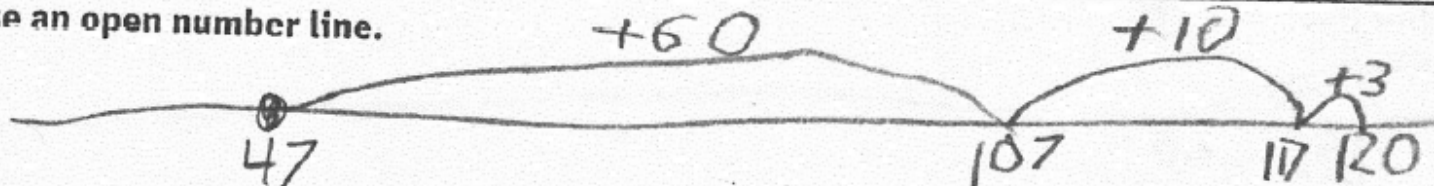
$$47 + 13 + 26 + 34$$

$$60 + 60 = 120$$

Add going down.

$$\begin{array}{r} 47 \\ + 26 \\ + 13 \\ + 34 \\ \hline 100 \\ 20 \\ \hline 120 \end{array}$$

Use an open number line.



SPECIAL SALE!

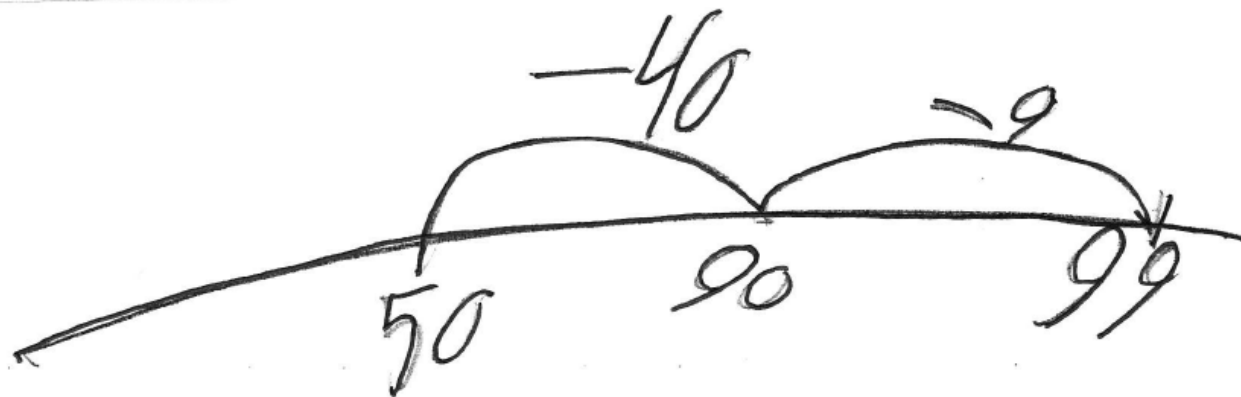
## STUFFED ANIMALS

Penguin .....	<del>\$13</del> \$6	Bear .....	<del>\$35</del> \$8
Sheep .....	<del>\$18</del> \$9	Wolf .....	<del>\$38</del> \$10
Ghost .....	<del>\$26</del> \$10	Pirate .....	<del>\$39</del> \$6
Python .....	<del>\$29</del> \$15	Tiger .....	<del>\$47</del> \$5
Goat .....	<del>\$34</del> \$12	Rabbit .....	<del>\$49</del> \$20

# Grade 2 Benchmark Assessment

The teacher had 99 stickers. She gave \_\_\_\_ stickers away. Then the teacher had 50 stickers. How many stickers did she give away?

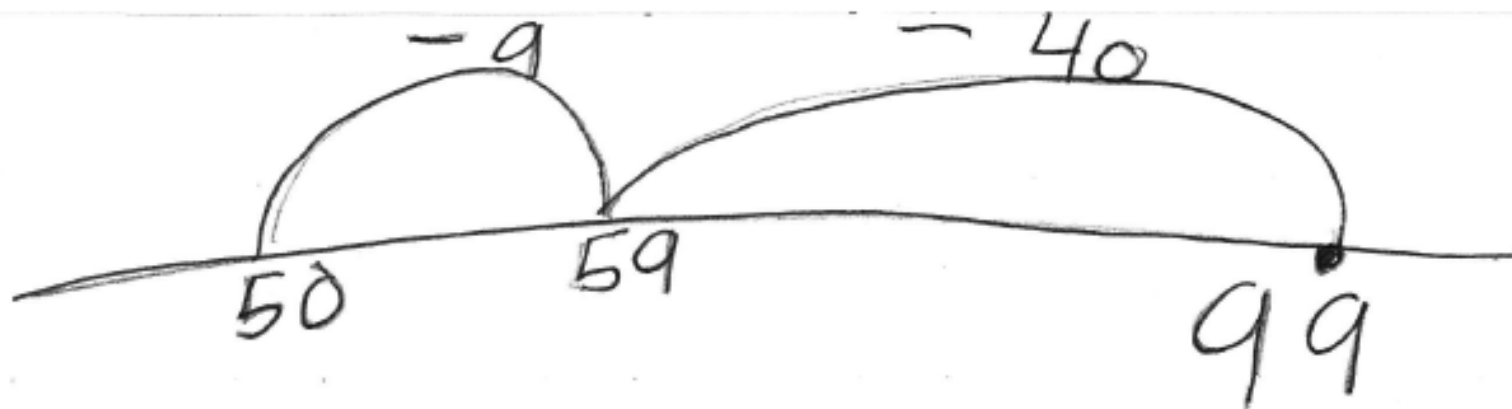
Solve with words, numbers, or pictures. Write an equation that represents the problem.



Write an equation that represents this problem.

$$99 - 49 = 50$$





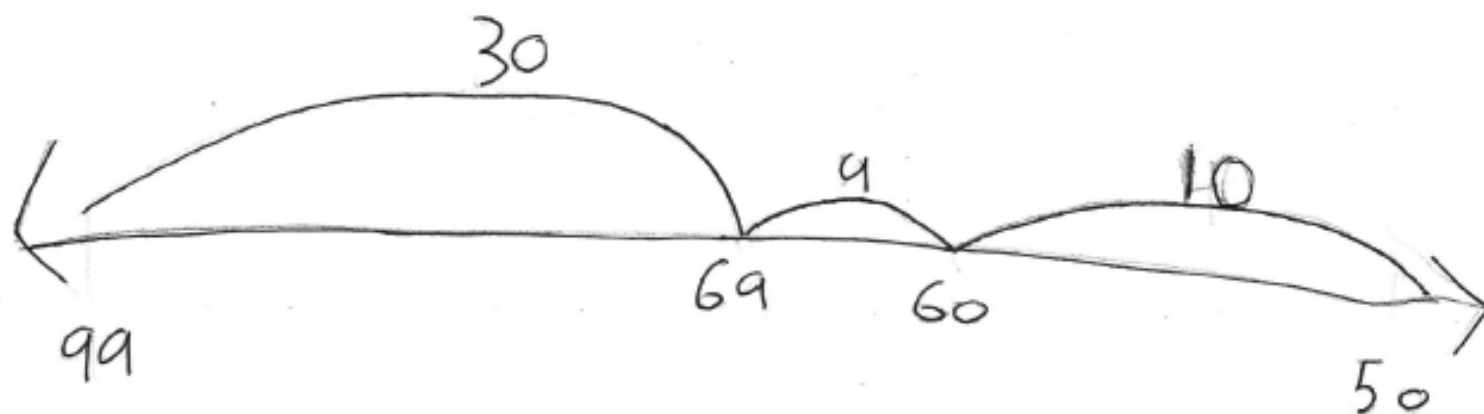
Write an equation that represents this problem.

$$99 - 49 = 50$$

$$\begin{array}{r}
 99 - 9 = 90 \\
 80 \ 1 \\
 70 \ 2 \\
 60 \ 3 \\
 50 \ 4 \\
 49
 \end{array}$$

Write an equation that represents this problem.

$$99 - 49 = 50$$



Write an equation that represents this problem.

$$99 - 30 = 69 - 9 = 60 - 10 = 50$$

A diamond-shaped diagram with the numbers 39 and 49 at its bottom vertices. Lines connect the bottom-left vertex (39) to the first and second subtraction steps of the equation above. Lines connect the bottom-right vertex (49) to the second and third subtraction steps of the equation above.

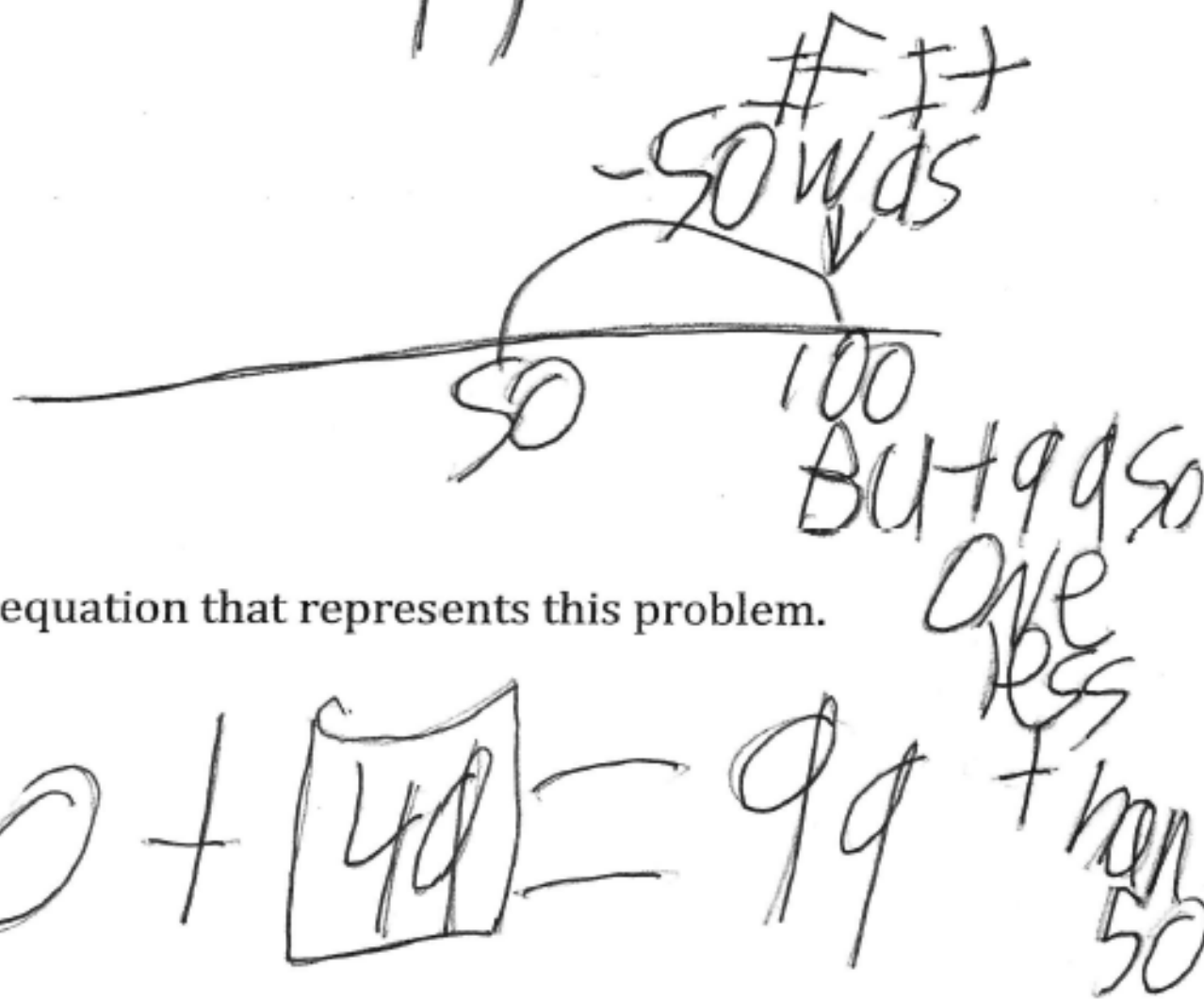
If it was  
100 it would be 50. — 1-99-49

Write an equation that represents this problem.

$$99 - 49 = 50$$



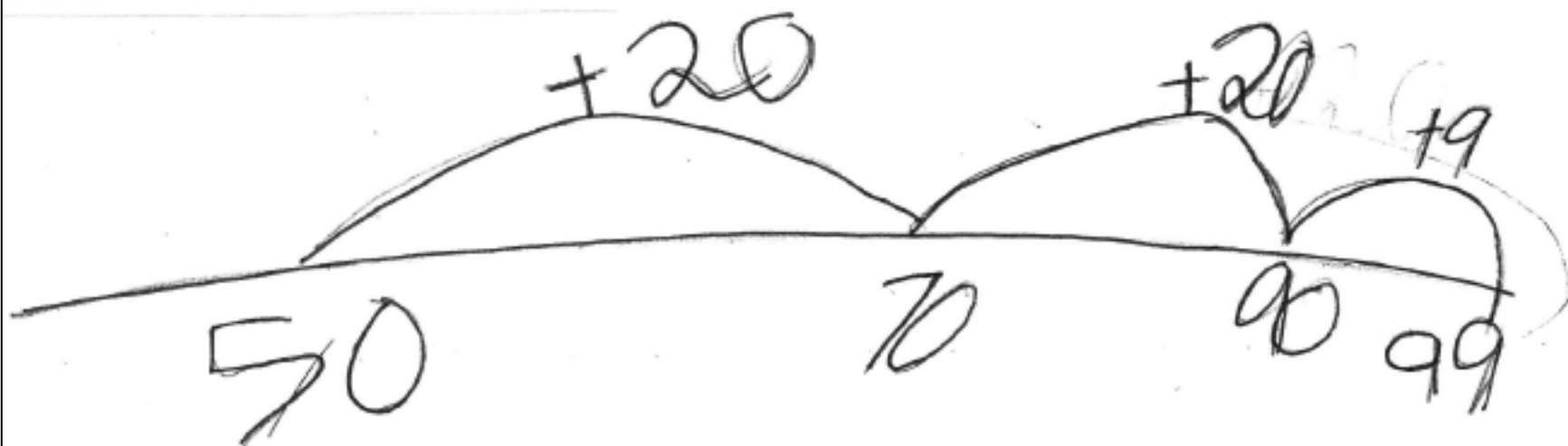
49



Write an equation that represents this problem.

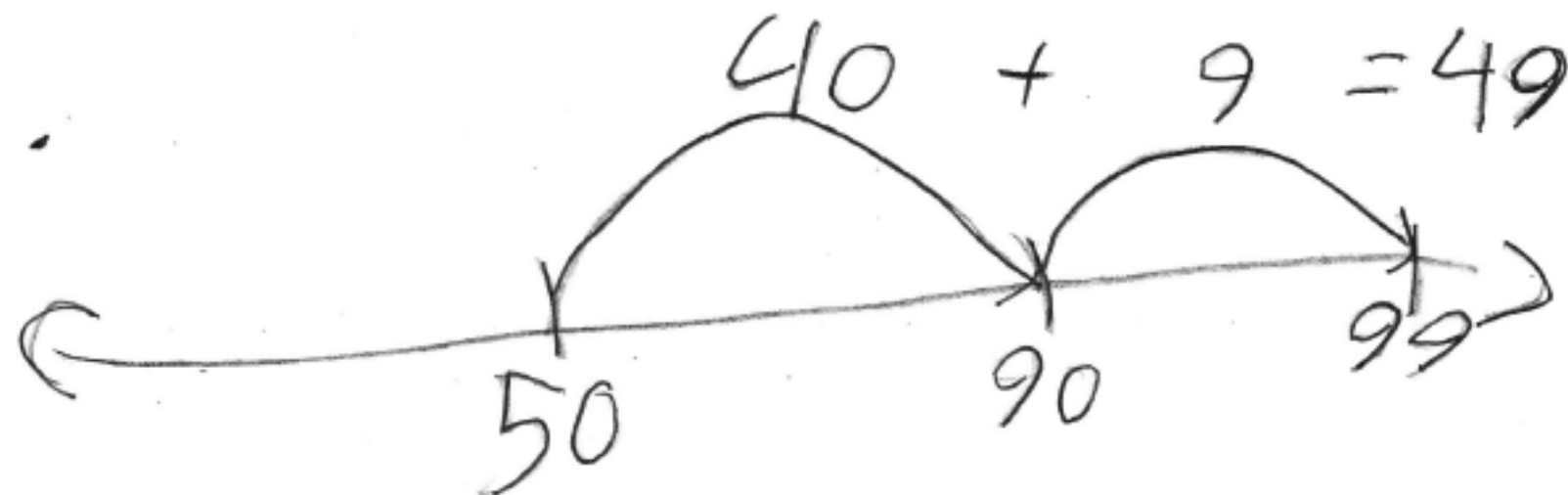
$$50 + \boxed{49} = 99$$

one less than 50



Write an equation that represents this problem.

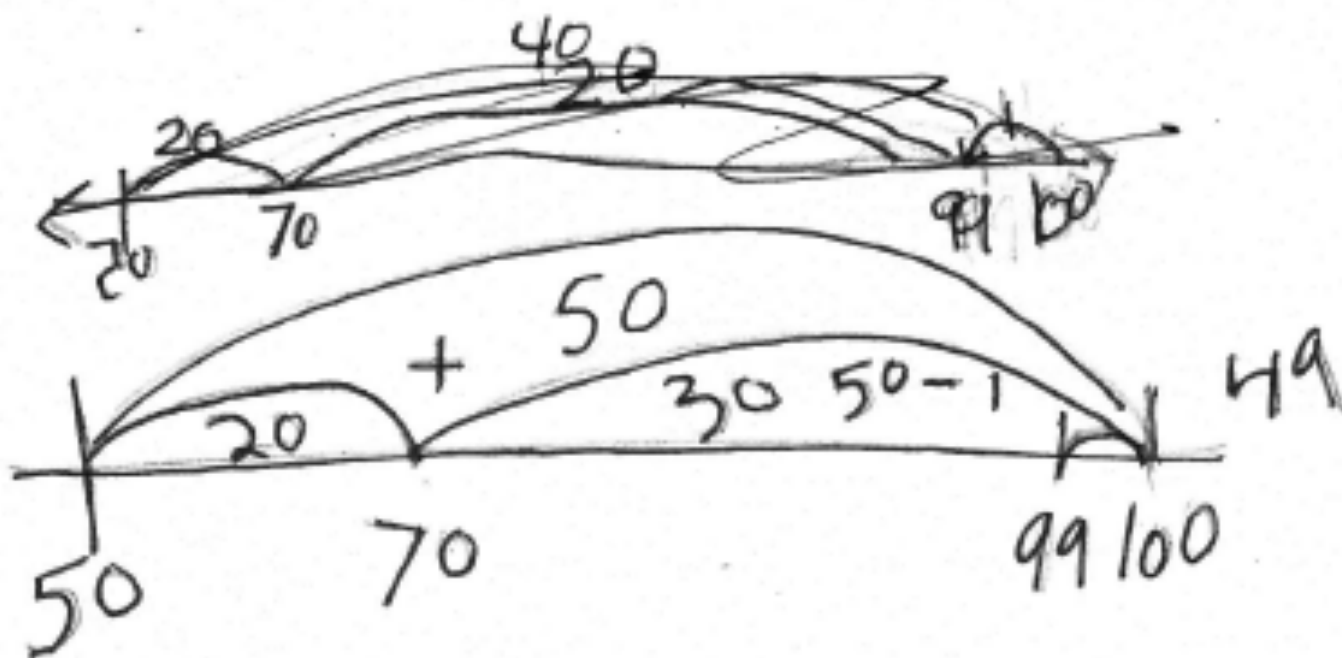
$$50 + 49 = 99$$



Write an equation that represents this problem.

$$99 - \underline{49} = 50$$



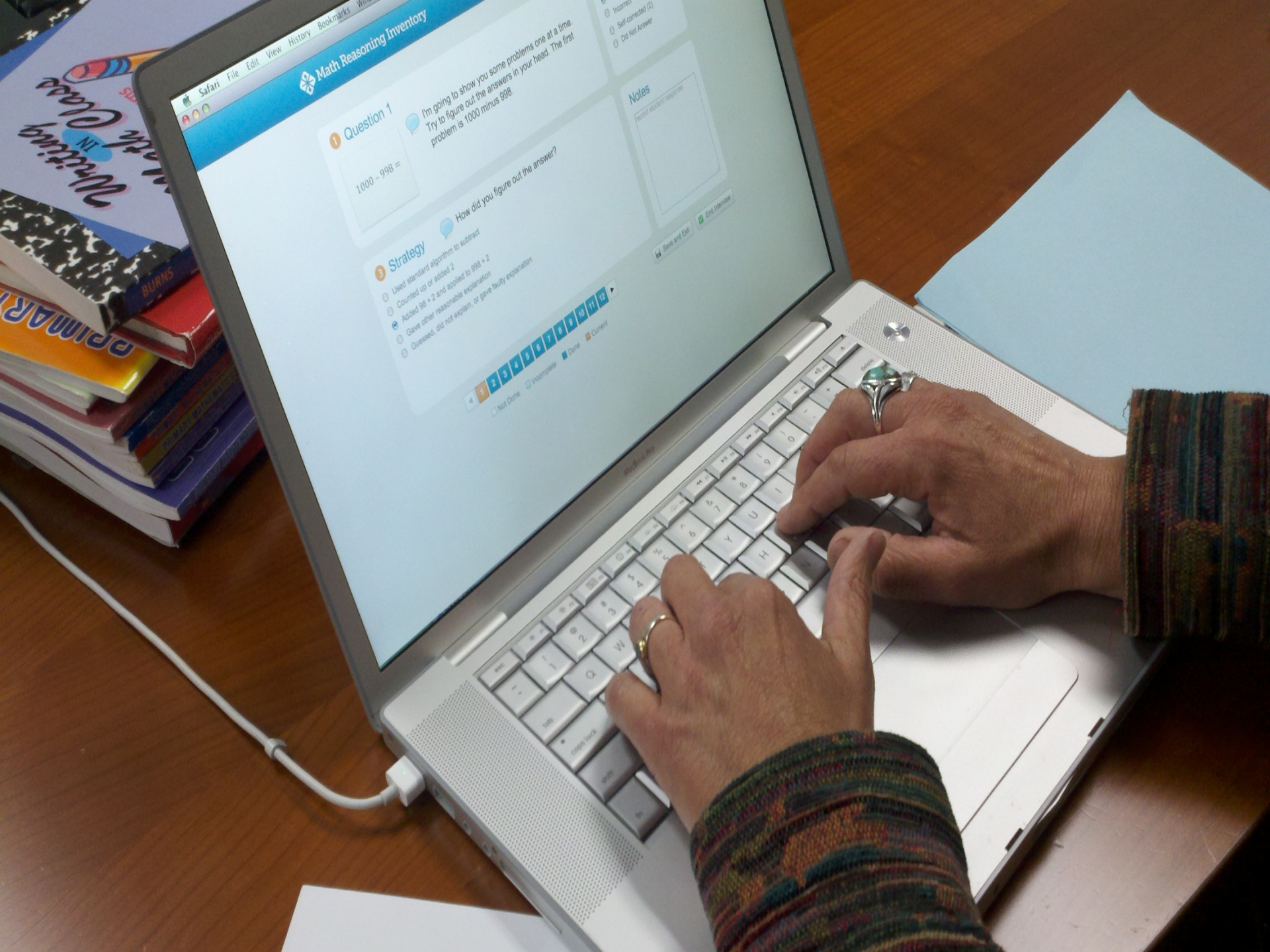


Write an equation that represents this problem.

$$\begin{array}{r} 99 \\ - 50 \\ \hline 49 \end{array}$$

Write an equation that represents this problem.

$$99 - 50 = 49$$



## 1 Question 1

1000 - 998 =

I'm going to show you some problems one at a time. Try to figure out the answers in your head. The first problem is 1000 minus 998.

## 2 Strategy

How did you figure out the answer?

- ☐ Used standard algorithm to subtract
- ☐ Counted up or added 2
- ☒ Added 98 + 2 and applied to 998 + 2
- ☐ Gave other reasonable explanation
- ☐ Quessed, did not explain, or gave faulty explanation

Progress bar showing 5 selected options (1-5) and 1 unselected option (6). Buttons: Not Done, Incomplete, Done, Current.

## Notes

Notes area for recording answers.

Save and Exit End Interview



## 1 Question 7

$$15 \times 12 =$$



What is 15 times 12?

## 2 Answer

- ☐ Correct (180)  
☐ Incorrect   
☐ Self-corrected (180)  
☐ Did Not Answer

## 3 Explanation How did you figure out the answer?


- ☐ Used standard algorithm to multiply  
☐ Broke 15 and/or 12 into parts and then multiplied (e.g.,  $15 \times 10$  and then  $15 \times 2$ )  
☐ Changed to an easier problem,  $30 \times 6$ , by doubling and halving  
☐ Gave other reasonable explanation  
☐ Guessed, did not explain, or gave faulty explanation

## Notes

record student response



☐ Not Done  
 ☐ Incomplete  
 ☒ Done  
 ☐ Current

 Save and Exit

☒ End Interview

$$15 \times 12$$

# Common Core Connection

## Grade 4

### Number and Operations in Base Ten

Use place value understanding and properties of operations to perform multi-digit arithmetic.

CCSS.Math.Content.4.NBT.B.5 Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations.



# Common Core Connection

## Grade 5

### Operations & Algebraic Thinking

Write and interpret numerical expressions.

CCSS.Math.Content.5.OA.A.1 Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.

CCSS.Math.Content.5.OA.A.2 Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. *For example, express the calculation “add 8 and 7, then multiply by 2” as  $2 \times (8 + 7)$ . Recognize that  $3 \times (18932 + 921)$  is three times as large as  $18932 + 921$ , without having to calculate the indicated sum or product.*

# Common Core Connection

## Grade 6

### Expressions & Equations

Apply and extend previous understandings of arithmetic to algebraic expressions.

CCSS.Math.Content.6.EE.A.3 Apply the properties of operations to generate equivalent expressions. *For example, apply the distributive property to the expression  $3(2 + x)$  to produce the equivalent expression  $6 + 3x$ ; apply the distributive property to the expression  $24x + 18y$  to produce the equivalent expression  $6(4x + 3y)$ ; apply properties of operations to  $y + y + y$  to produce the equivalent expression  $3y$ .*

# 15 x 12

15		15
<u>x 12</u>		<u>x 12</u>
30		10
<u>150</u>		20
180		50
		<u>100</u>
		180

The diagram illustrates the distributive property of multiplication. It shows two equivalent ways to calculate 15 x 12. On the left, 15 is decomposed into 10 and 5, and each is multiplied by 12. On the right, 12 is decomposed into 10 and 2, and each is multiplied by 15. The final result, 180, is the same in both cases.

# Distributive Property of Multiplication over Addition



# 15 x 12

Monica



Malcolm



Alberto



To view videos, go to  
[www.mathreasoninginventory.co  
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# Monica: $15 \times 12$

*"I did 15 times 10 and it was 150.  
And then I did 15 times 2 which is 30.  
And it was . . . um . . . 180."*

$$12 = 10 + 2$$

$$15 \times 10 = 150$$

$$15 \times 2 = 30$$

$$150 + 30 = 180$$

# Malcolm: $15 \times 12$

*"I broke apart the 15 and did 10 plus 5.*

*And then I did 10 times 12 which equals 120.*

*And then I did 12 times 5 which equals 60*

*And then I added it all together and I got 180."*

$$15 = 10 + 5$$

$$10 \times 12 = 120$$

$$12 \times 5 = 60$$

$$120 + 60 = 180$$



# Alberto: $15 \times 12$

*"I did 12 times 12 is 144*

*And then I did 3 times 12 and I got 36*

*And then I did 144 plus 36."*

$$15 = 12 + 3$$

$$12 \times 12 = 144$$

$$3 \times 12 = 36$$

$$144 + 36 = 180$$

# 15 x 12

Monica



$$(15 \times 10) + (15 \times 2) = 180$$

Malcolm



$$(10 \times 12) + (12 \times 5) = 180$$

Alberto



$$(12 \times 12) + (3 \times 12) = 180$$

**1** Question 11

Molly ran 1.5 miles each day for 20 days. How many miles did she run altogether?

Rectangular Snip



Molly ran 1.5 miles each day for 20 days. How many miles did she run altogether?

**2** Answer

- ☐ Correct (30)
- ☐ Incorrect
- ☐ Self-corrected (30)
- ☐ Did Not Answer

**3** Explanation How did you figure out the answer?

- ☐ Used standard algorithm to multiply
- ☐ Multiplied  $20 \times 1$  and then  $20 \times 0.5$
- ☐ Multiplied  $1.5 \times 2$  and then  $3 \times 10$
- ☐ Multiplied  $1.5 \times 10$  and then  $15 \times 2$
- ☐ Multiplied  $15 \times 2$  and then adjusted the decimal point
- ☐ Gave other reasonable explanation
- ☐ Guessed, did not explain, or gave faulty explanation

## Notes

record student response

◀ 1 2 3 4 5 6 7 8 9 10 **11** ▶



Save and Exit



End Interview

☐ Not Done ☐ Incomplete ☒ Done ☐ Current

# Molly Problem

Molly ran 1.5 miles each day for 20 days. How many miles did she run altogether?



# Common Core Connection

## Grade 5

### Number and Operations in Base Ten

Perform operations with multi-digit whole numbers and with decimals to hundredths.

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

# Molly Problem

Molly ran 1.5 miles each day for 20 days. How many miles did she run altogether?

$$20 \times 1.5 = \underline{\hspace{2cm}}$$

# Distributive Property of Multiplication over Addition

# Sergio: Molly problem, $20 \times 1.5$

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*“I know that 20 times 1 is 20, so I put the 20 aside. And 20 times 5 is 100, and bloop it by one is just zero . . . 10.0. So 20 plus 10 is 30.”*

$$20 \times 1 = 20$$

$$20 \times 5 = 100, \text{ so } 20 \times .5 \text{ is } 10.0$$

$$20 + 10 = 30$$

$$20 \times 1.5 = (20 \times 1) + (20 \times .5)$$



# Common Core Connection

## Grade 2

### Measurement & Data

#### Measure and estimate lengths in standard units.

**CCSS.Math.Content.2MD.A.1** Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes .

#### Relate addition and subtraction to length.

**CCSS.Math.Content.2MD.B.5.** Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units,.

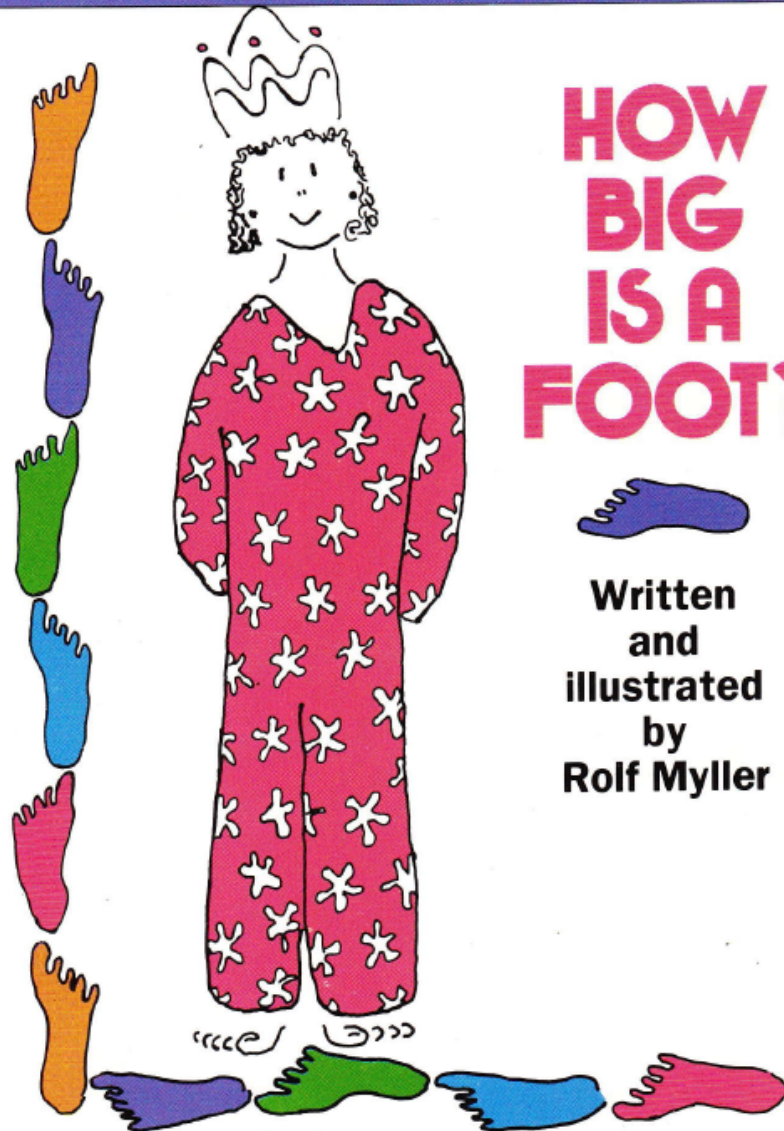
A DELL YOUNG YEARLING



# HOW BIG IS A FOOT?



Written  
and  
illustrated  
by  
Rolf Myller

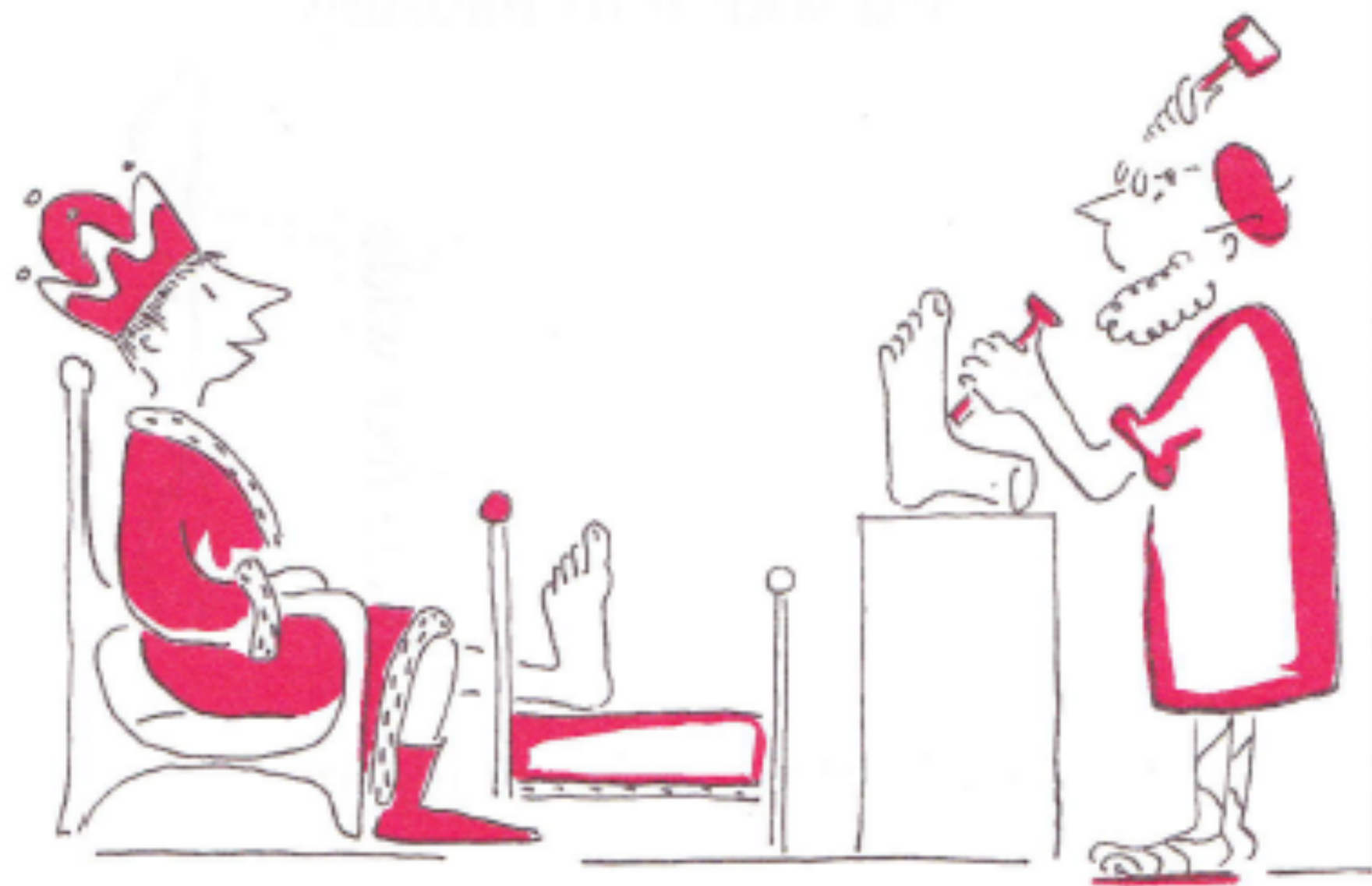


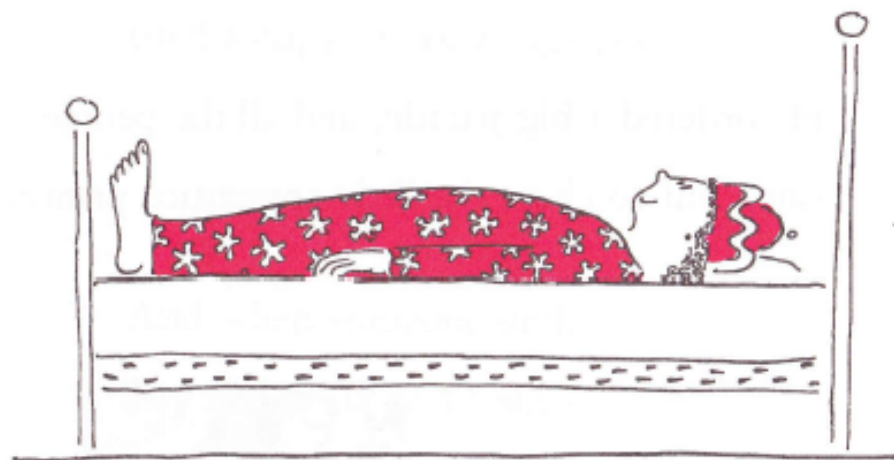












marker 12 centimeters |  $4\frac{1}{2}$  inches  
12 cm |  $4\frac{1}{2}$  in.  
 $4\frac{1}{2}$ "

Name

### Measuring Things

What I measure	inches	centimeters
1.		
2.		
3.		
4.		
5.		



Maya

# Measuring Things

What I measure	inches	centimeters
1. Scissors	1.5 $\frac{1}{2}$ "	1. 14 cm.
2. Crayon	2.3 $\frac{1}{2}$ "	2. 9 cm.
3. Pencil	3.7"	3. 19 cm
4. Pencil sharpener	4. 2 $\frac{1}{2}$ "	4.
5.	5.	5.

# Measuring things

## Things I measure

1. Pencil
2. Crayon
3. Scissors
4. Glue stick
5. Eraser

inches	cent
$6\frac{1}{2}$	16 cm
$3\frac{1}{2}$	9 cm
5 in	12 cm
3 in	8 cm
$1\frac{1}{2}$	2 cm

Cara

Water Bottle  
10 inc  
25cm

Pickle Cotner 2 inc  
Pickle cotner 12cm

hair clip 2cm

hair clip a half a inc

Shapener 8 inc

Shapener 6cm

Si Ser 12 inc

Si Zens 12cm

PENSOL <sup>1</sup>/<sub>2</sub> \* M ES CUBES

5 <sup>1</sup>/<sub>2</sub>

4 <sup>1</sup>/<sub>2</sub> SPEEDS  
+ \* NK 90

CRAYOLA <sup>1</sup>/<sub>2</sub>

BOOK <sup>1</sup>/<sub>2</sub>

7 <sup>1</sup>/<sub>2</sub>

BODOL

+ V <sup>1</sup>/<sub>2</sub>

10 <sup>1</sup>/<sub>2</sub>

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# Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. **Construct viable arguments and critique the reasoning of others.**
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.



**Math Solutions.**

FOUNDED BY MARILYN BURNS

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