



Mathematical Language Routines

Equity and Access for All

Vanessa Cerrahoglu
Orange County
Office of Education

Sadie Estrella
Illustrative
Mathematics

Craig Schneider, PhD
Santa Barbara
Unified



@IllustrateMath



Illustrative Mathematics

#LearnWithIM

Let's get to know each other!

Who teaches or works with teachers...

- PK - 2?
- 3 - 5?
- 6 - 8?
- 9 - 12?
- Post secondary?

Why are you here?



**Let's Do a Mathematical
Routine**

Mathematical Routine: Stronger and Clearer Each Time

1. Pre-write
2. Think time
3. Pair share
4. Repeat with new partners
5. Revise pre-write

Prompt

- What are mathematical routines?
- What are their purpose(s)?

What are the language demands in this task?

2.3: More Hanging Blocks

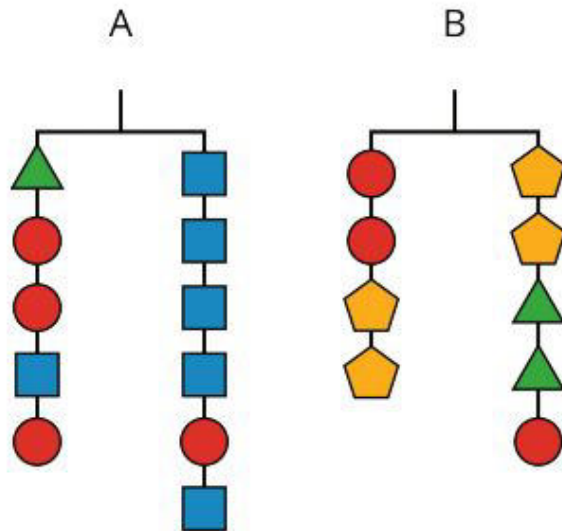
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A triangle weighs 3 grams and a circle weighs 6 grams.

1. Find the weight of a square in Hanger A and the weight of a pentagon in Hanger B.

2. Write an equation to represent each hanger.



Source: *Illustrative Mathematics 6-8 Math (Grade 8 Unit 4, Lesson 2)*

A Partnership



Design Principles

*To Promote
Mathematical Language
Use and Development
in Curriculum and
Instruction*

1. Support sense-making
2. Optimize output
3. Cultivate conversation
4. Maximize linguistic and cognitive meta-awareness

Mathematical Routine: Stronger and Clearer Each Time

1. Pre-write
2. Think time
3. Pair share
4. Repeat with new partners
5. Revise pre-write

2nd Grade

Prompt

David walked 13 more meters than Lucy.

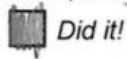
David walked 25 meters. How many meters did Lucy walk? Show how you know.



Handout 2

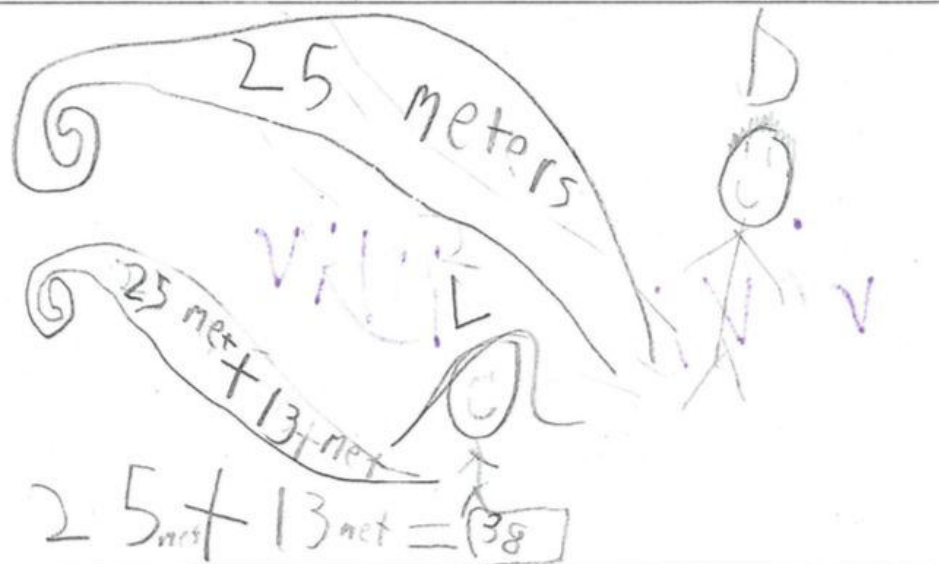
Initial Draft

First Draft
Thinking
Include diagrams, number sentences, words, etc.



Did it!

25 + 13 = 38



Share #1

Jot down 1 or 2 words
before you switch
partners



Did it!

He used 25
he used 13

Share #2

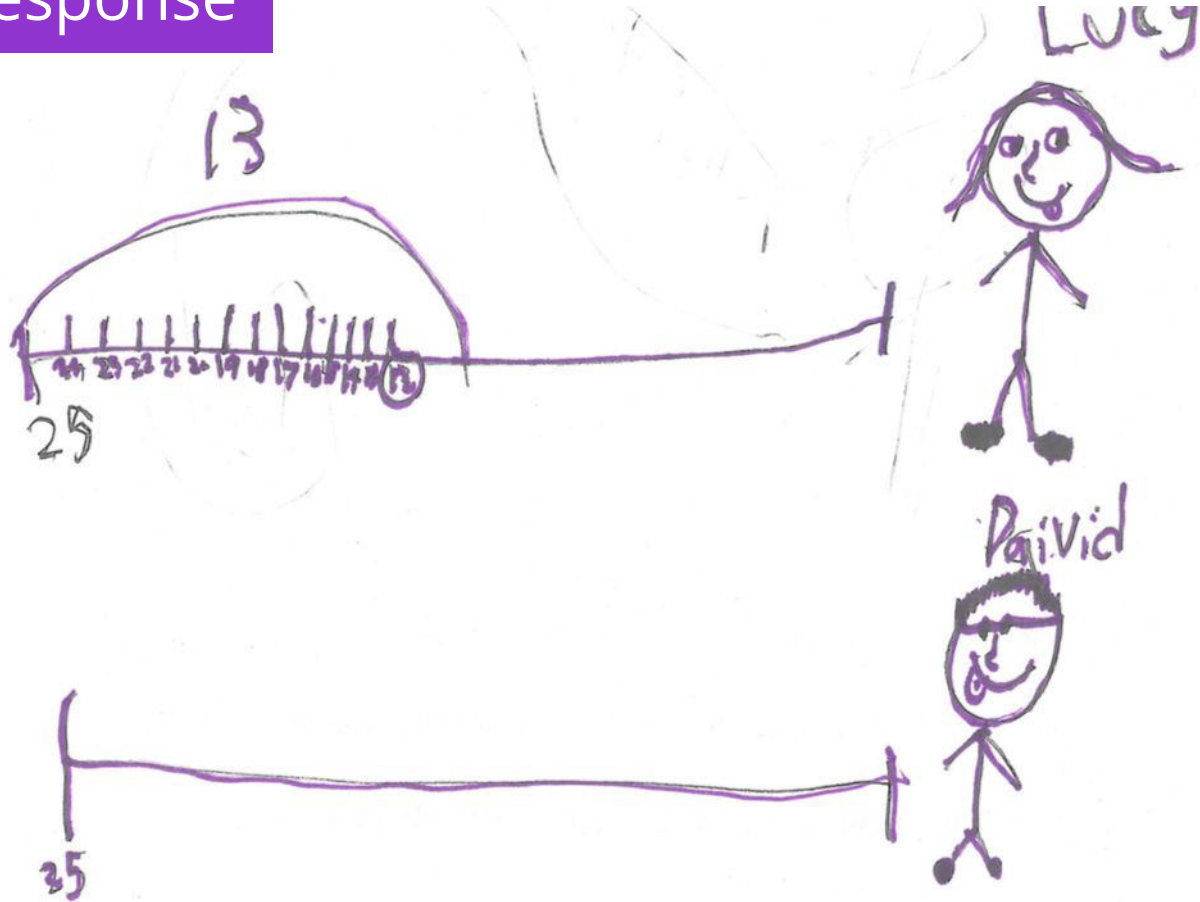
Say "because" to justify
your steps



Did it!

I used 25 + 13 = 38
she used 25 + 13 = 38

Revised Response



Unpack the Routine

- What is the teacher doing? students doing?
- How does “Stronger and Clearer Each Time”...
 - Support mathematical sense making?
 - Support mathematical and English language output?
 - Support collaboration?



Mathematical Language Routine: Stronger and Clearer Each Time

Purpose: To provide a structured and interactive opportunity for students to revise and refine both their ideas and their verbal and written output (Zwiers, 2014). Pairs borrow and use the language, ideas, and justifications each time. Responses become:

- Stronger (often longer) with better justifications and examples,
- Clearer with more precise terms and linked, organized, complete sentences.



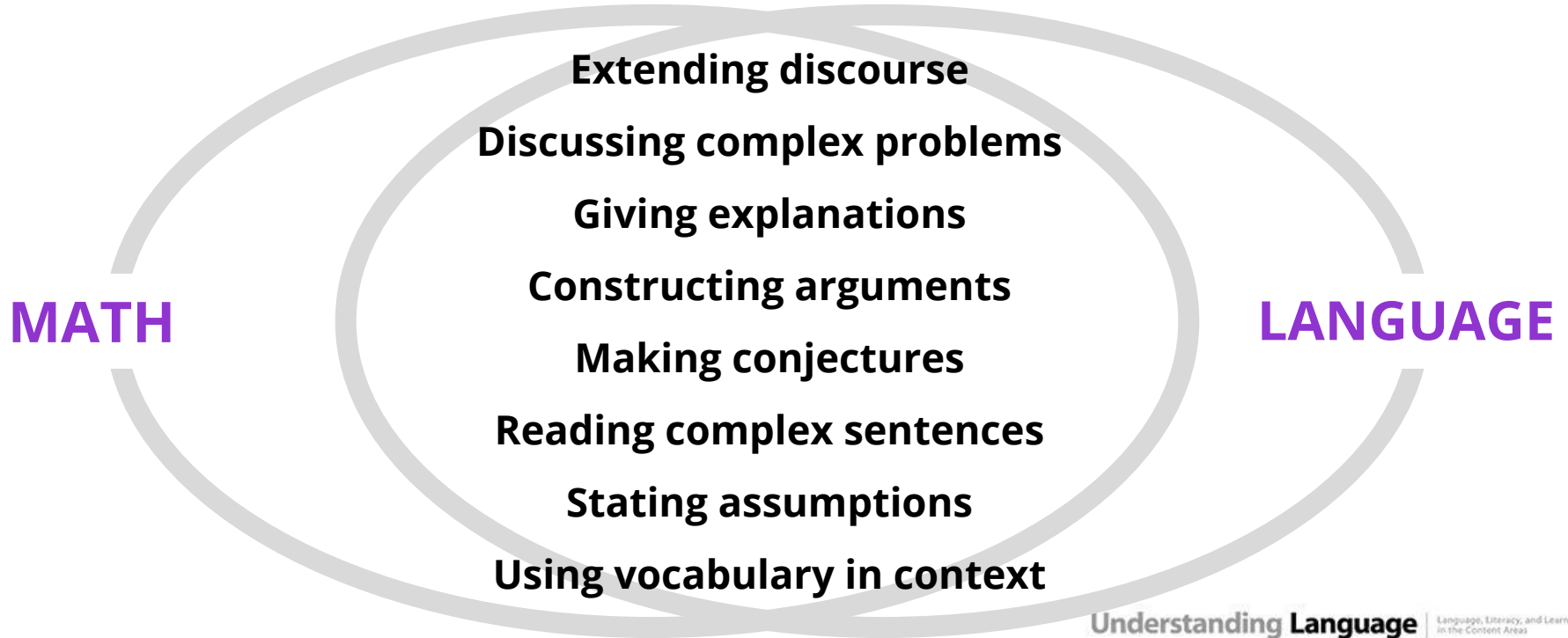
Routines in the Mathematics Lessons Support Students'...

*Mathematical
Sense
Making*

*Mathematical
Language
Development*

Simultaneously

Students are Engaged in Mathematical Language Development When...



A Double Challenge for English Learners

“(The English learner must) learn how to effectively employ a new language in an academic setting, while learning through that language the knowledge and skills in multiple disciplines.”

(UL/SCALE 2014)



**Let's Do Another
Mathematical Routine**

Mathematical Routine: Info Gap

- Read your card
- Engage in a back and forth conversation:
 - Ask for data
 - Ask for rationale
 - Listen to make sense
 - Ask clarifying questions
- Solve the problem
- Compare solutions and solution path

The purpose of Info Gap is to create a **need for students to communicate**. This routine allows teachers to **facilitate meaningful interactions** by giving partners or team members different pieces of necessary information that must be used together to solve a problem or play a game.

Info Gap: Biking and Rain

Problem Card 1

Mai and Noah each leave their houses at the same time and ride their bikes to the park.

1. For each person, write an equation that relates the distance they travel and the time.
2. Who will arrive at the park first?

Source: *Illustrative Mathematics 6-8 Math (Grade 7 Unit 2, lesson 9)*

Data Card Student

Silently read the data card.

What specific information do you need?

Why do you need to know... (that piece of information)?

Listen to partner's reasoning and ask clarifying questions.

Problem Card Student

Silently read the problem card.

Can you tell me... (a piece of information I need)?

I need that piece of information because...

Solve the problem and explain reasoning to your partner.

After both rounds, discuss differences in the problems and strategies.



Characteristics of an Info Gap Scenario

- Two students solve similar problems in two rounds.
- One student has the problem card, one has the data card.
- Each student only has some of the necessary information.
- Students gain information through a back-and-forth conversation.
- Students solve a problem individually.
- Students share and listen to one another's reasoning.
- Students discuss differences and ask clarifying questions.

Your turn!

- Work in pairs
- Work through 2 rounds

**Problem
Card 1**

Data Card 1

**Problem
Card 2**

Data Card 2

Unpack the Routine

- What is the teacher doing? students doing?
- How does “Info Gap”...
 - Support mathematical sense making?
 - Support mathematical and English language output?
 - Support collaboration?





Language Routines in General

After experiencing both routines:

- Think about what are Ss doing? What are Ts doing?
- What stays the same? What changes?
- What is being attending to?
- What language demands are being asked of students? How are these routines empowering students to take on those demands?

UL/SCALE: Mathematical Language Routines

1. Stronger and Clearer Each Time 
2. Collect and Display
3. Critique, Correct, and Clarify
4. Information Gap 
5. Co-Craft Questions and Problems
6. Three Reads
7. Compare and Connect
8. Discussion Supports

MLRs are structured but adaptable formats for amplifying, assessing, and developing students' language.



Understanding Language | Language, Literacy, and Learning
in the Content Areas
Stanford | GRADUATE SCHOOL OF
EDUCATION

SCALE
Stanford Center for Assessment, Learning, & Equity

Using Mathematical Language Routines

How do these math routines provide equity and access for all students?

Which of these routines will you try?

- Stronger and Clearer Each Time
- Info Gap

THANK YOU

For Exploring
Mathematical Language Routines



Stay Connected with us

Vanessa Cerrahoglu

Orange County Office of Education

vcerrahoglu@ocde.us

Sadie Estrella

Illustrative Mathematics

sestrella@illustrativemathematics.org

Craig Schneider, PhD

Santa Barbara Unified

cschneider@sbunified.org

Now there are two great places to access our materials.



6 – 8 Math



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