



# BetterLesson Professional Learning Webinar

Math Language Routines



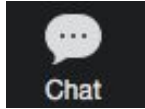
**Session 3: Promoting Language Use in Math: Cultivating Conversations**

**Ohio Department of Education & Workforce**

April 10, 2024

Padraic O'Donnell/ Megan Nagel

# Welcome!



Share in the chat:

**Where are you joining us from today**

**What is your current role?**

**Where were you during the great solar eclipse of 2024?**

# Aligned & Tailored for Ohio ESC Partnership



## Aligned

Our partnership is specifically designed to amplify the impact of other state-wide infrastructure and initiatives.

Our coaches will be familiar with key efforts, including:

- Materials Matter
- HQIM-related work streams with EdReports & Instruction Partners
- Ohio Standards for Math Practice



## Tailored

Our team has worked with leadership from the ESC of Central Ohio, OESCA, and the Department of Education to tailor our workshop, coaching, and learning walk content to the unique needs of ESC Math Specialists

# Your Hosts



**Padraic O'Donnell**

Instructional Coach



**Megan Nagel**

Instructional Coach



**Lisa Fik**

Instructional Coach  
(Tech Support)

## Let's Check In!

Which option represents your class in terms of who talks to who about the math concepts/procedures during class?

- More teacher to student to talk
- About equal
- More student to student talk

# Our Series: Math Language Routines



## Goal

Plan to use Mathematical Language Routines as practical ways to provide multiple opportunities to communicate their thinking while learning mathematics

**DEFINE**

**EXPLORE**

**BUILD**

**TRY, MEASURE, LEARN**

**Optimizing Output**

**Compare &  
Connect  
+  
Discussion  
Supports**

**A Plan for  
Implementation**

# What are the Math Language Routines?

“A ‘math language routine’ refers to a structured but adaptable format for **amplifying**, assessing, and **developing** students’ language.”

**Understanding Language/Scale**  
Stanford Graduate School of Education

# Promoting Language *and* Content Development

## SUPPORT SENSE-MAKING:

Scaffold tasks & amplify language so students can make their own meaning.

## OPTIMIZE OUTPUT:

Expand opportunities for students to describe their mathematical thinking to others orally, visually, & in writing.

## CULTIVATE CONVERSATION:

Increase constructive mathematical conversations (pairs, groups, & whole class).

## MAXIMIZE META-AWARENESS:

Help students reflect on their own math ideas, reasoning & language.



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# Why do students need to talk about math?

A well-designed math conversation can make it easier for all students—even those who rarely talk in class—to participate, experts say.

And by including all class members, a well-structured conversation can help students feel that their thoughts have value.

1. **Create a culture that welcomes “rough draft” thinking.**
2. **Highlight the way students’ thinking influenced the outcome.**
3. **Foster small-group conversation about word problems.**
4. **Teach students explicitly how to have math conversations.**

*“Getting Students to Talk About Math Helps Solve Problem”, EducationWeek Special Report*

# Cultivating Conversations Defined

“

Conversations are constructive when they engage in **actual discourse, building on each other's ideas and learning from the conversations.**

*Understanding Language/SCALE*

# Cultivating Conversations

Elements that influence quantity and quality of conversations:

Teacher role to support student engagement

How much responsibility students share for learning with peers and themselves

What questions are asked and by whom

Who provides what kinds of explanations

How mathematical representations are used

# Mathematical Language Routines (MLR's)

- 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

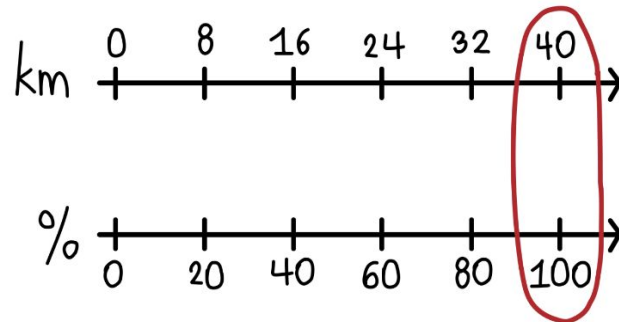
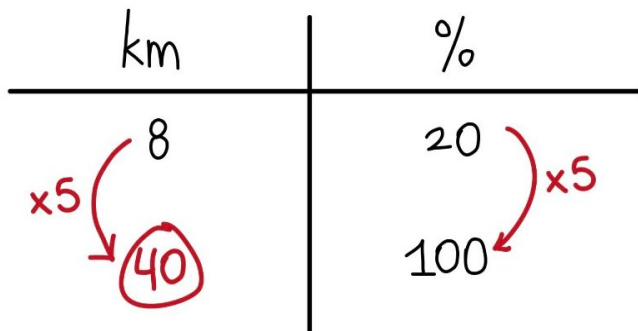


## MLR 7: Compare & Connect

**Purpose:** To foster students' meta-awareness as they identify, compare, and contrast different mathematical approaches, representations, concepts, examples, and language. Students should be prompted to **reflect on and linguistically respond** to these comparisons (e.g., **exploring why** or when one might do/say something a certain way, **identifying and explaining correspondences between different mathematical representations or methods**, wondering how an idea compares or **connects** to other ideas and/or language.) This routine supports metacognitive and metalinguistic awareness, and also supports mathematical conversation.

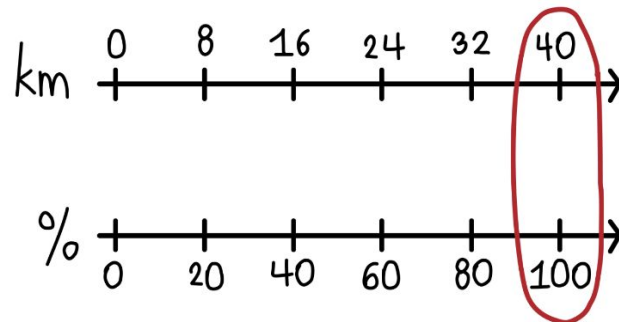
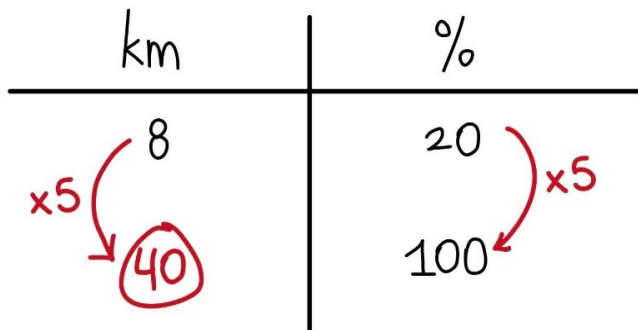
# Bicycle Goals

Callen's app says they biked 8 kilometers, which is 20% of their goal.  
What was their goal distance?



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Callen's app says they biked 8 kilometers, which is 20% of their goal.  
What was their goal distance?



Chat

Where do you see the relationship between 8 km and 20% in each approach?

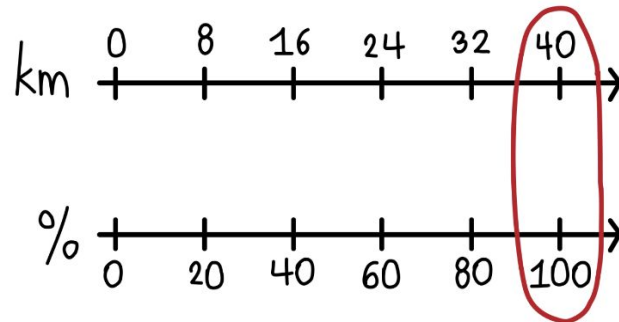


# Bicycle Goals

Callen's app says they biked 8 kilometers, which is 20% of their goal.  
What was their goal distance?

| km | %   |
|----|-----|
| 8  | 20  |
| 40 | 100 |

Handwritten annotations: A red arrow labeled "x5" points from 8 to 40. Another red arrow labeled "x5" points from 20 to 100.



Chat

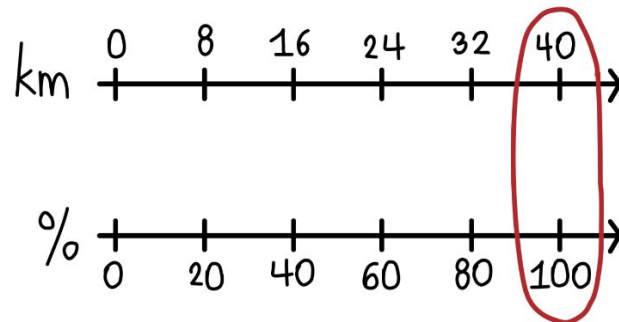
Where do we see the goal distance in the table?  
Where do we see it on the double number line?

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What was their goal distance?

| km | %   |
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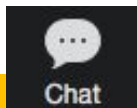
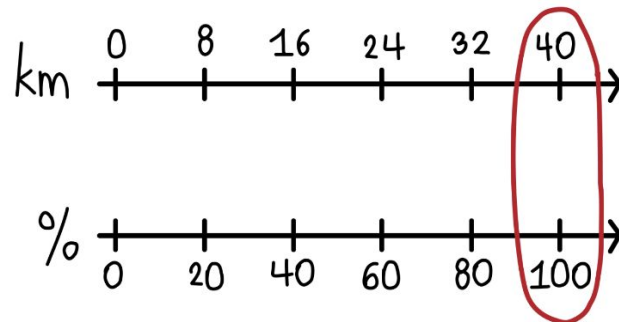
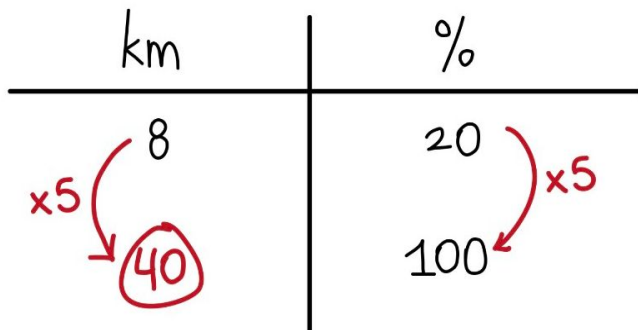


Chat

How can you use the table to figure out a goal?  
How can you use the double number line to figure out a goal?

# Bicycle Goals

Callen's app says they biked 8 kilometers, which is 20% of their goal.  
What was their goal distance?



When might a tape diagram be helpful for solving problems with percentages?

# Options: Compare & Connect

Whole Class or in Pairs/Groups

## At the beginning of an activity

Create fake student work  
Or use student work from a  
previous class

## In the Middle of an activity

Select student work they created  
during the class

## At the end of an activity

Select student work they created  
during the class

## Compare

How are these the same?

## Connect

How does this show \_\_\_ in  
a different way?

## Extend

What's another way we  
could show this same  
information?

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## MLR 8: Discussion Supports

**Purpose:** To support rich and inclusive discussions about mathematical ideas, representations, contexts, and strategies (Chapin, O'Connor, & Anderson, 2009). Rather than another structured format, the examples provided in this routine are **instructional moves** that can be combined and used together with any of the other routines. They include **multimodal strategies** for helping students **make sense of complex language, ideas, and classroom communication**. The examples can be used to invite and incentivize more student participation, conversation, and meta-awareness of language. Eventually, as teachers continue to demonstrate, students should begin using these strategies themselves to prompt each other to engage more deeply in discussions.

# MLR 8 Discussion Supports

Unlike the other routines, this MLR includes a collection of strategies and moves that can be combined and used to support discussion during almost any activity.

## 1 Student Sentence Frames

- Structure to communicate about a topic.
- Open-ended to amplify language

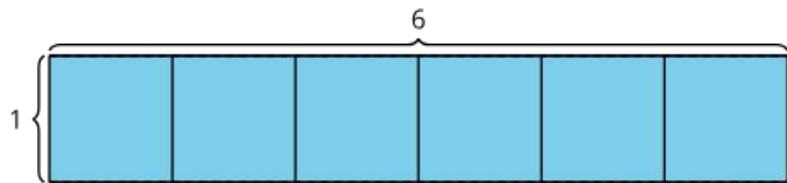
## 2 Teacher Discourse Moves

- Purposeful responses to student thinking as questions or statements
- Demonstrate that all students' responses are valuable to learning

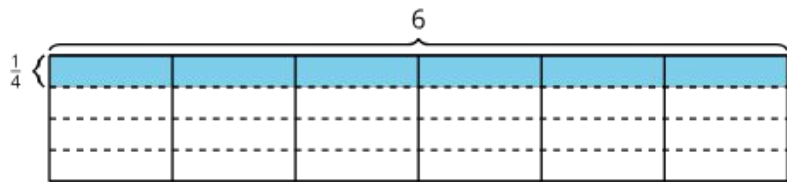


# The problem

Find the area of the shaded region.  
Explain or show your reasoning.



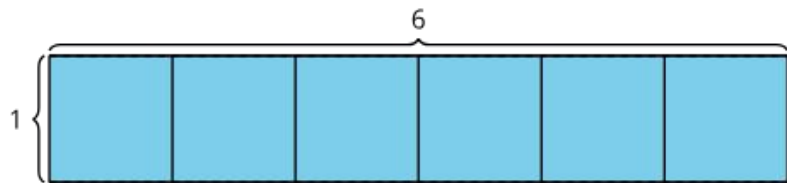
$$6 \quad 6 \times 1$$



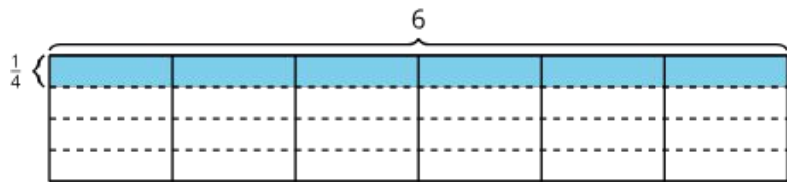
$$1 \frac{1}{2} \quad \frac{6}{4} \quad 6 \times \frac{1}{4}$$

# Student Sentence Frames

Find the area of the shaded region.  
Explain or show your reasoning.



$$6 \quad 6 \times 1$$



$$1 \frac{1}{2} \quad \frac{6}{4} \quad 6 \times \frac{1}{4}$$

**“Convince your partner that your answer makes sense.”**

**Starting the conversation:**

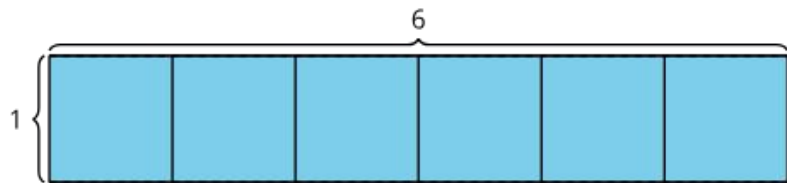
I know my answer is correct because...  
The first thing I did to solve the problem was...

**Continuing the conversation:**

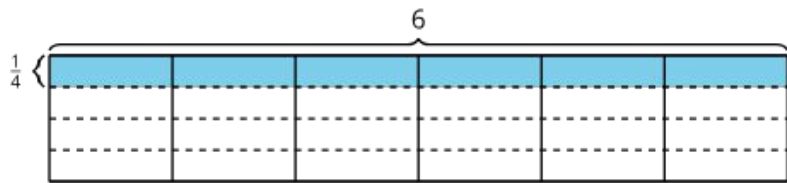
I agree/disagree with you because...  
Can you tell me how you knew...  
Can you explain how/why you...

# Student Sentence Frames

Find the area of the shaded region.  
Explain or show your reasoning.



$$6 \quad 6 \times 1$$



$$1 \frac{1}{2} \quad \frac{6}{4} \quad 6 \times \frac{1}{4}$$

**“What is the same and different about the 1st and 2nd problem?”**

**Starting the conversation:**

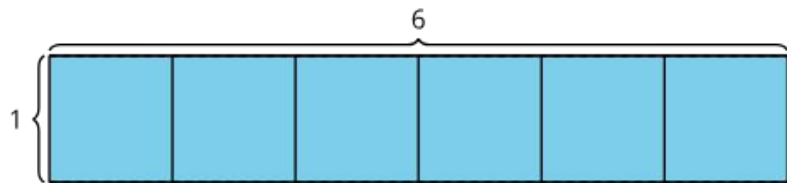
\_\_\_\_\_ are similar because \_\_\_\_\_.  
\_\_\_\_\_ are different because \_\_\_\_\_.

**Continuing the conversation:**

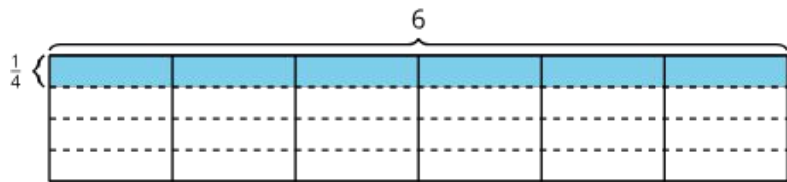
How did you reach that conclusion?  
Can you explain \_\_\_\_\_ more specifically?  
What is the relationship between \_\_\_\_\_ and \_\_\_\_\_?

# Teacher Discourse Moves

Find the area of the shaded region.  
Explain or show your reasoning.



$$6 \quad 6 \times 1$$



$$1 \frac{1}{2} \quad \frac{6}{4} \quad 6 \times \frac{1}{4}$$

“How does the expression  $6 \times \frac{1}{4}$  represent the shaded area in square units?”

**Student 1:**

I see a 6 at the top and a  $\frac{1}{4}$  on the left side.

**Teacher Discourse Move:**

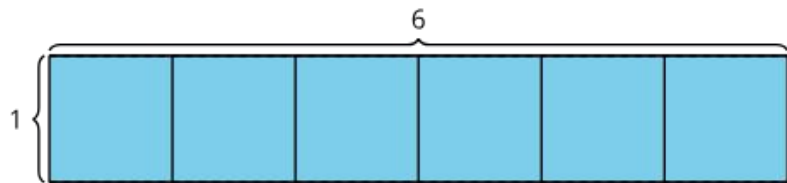
Tell us more.

**Student 1:**

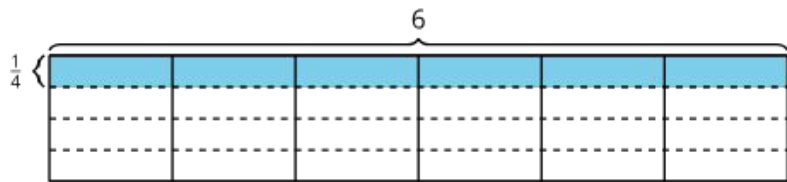
Well, the 6 columns are shaded but only  $\frac{1}{4}$  of each of those columns are shaded.

# Teacher Discourse Moves

Find the area of the shaded region.  
Explain or show your reasoning.



$$6 \quad 6 \times 1$$



$$1 \frac{1}{2} \quad \frac{6}{4} \quad 6 \times \frac{1}{4}$$

**“What strategy did you use to solve the problem?”**

**Student 2:**

I counted the fourths.

**Teacher Discourse Move:**

Can someone else build on Student 1’s strategy?

**Student 3:**

You can move the shaded parts to fill the whole unit squares to see the whole and parts.

## Options - Discussion Supports

1

### Student Sentence Frames

**During** or **after**  
students attempt the problem

Whole Group or Think, Pair, Share

2

### Teacher Discourse Moves

**Before, during, or after**  
students attempt the problem

Whole Group



# Build

How can we make this work actionable?

# Let's Explore: Strategy Choice Board

Choose any of the sections below and explore the related BL resources & strategies.

**MLR Deep Dive:**

**Compare and  
Connect**

**MLR Deep Dive:**

**Discussion  
Supports**

**Questions That  
Foster  
Discussion**

**100 Math  
Questions**



## Q & A

**What questions do you have about our conversation today?**





**We value your feedback!**

**Your input is important to us, please take a moment to complete our survey using the link in the chat.**

# Thank you!

