

Mathematics Language Index

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Overview

Rigorous Tasks

There is little argument that students need to learn to persevere. Where the struggle exists is in determining the pathway to this important outcome. It begins with a good task. Good tasks are rigorous. Providing rigorous tasks sets the stage for students to engage in worthwhile activity around learning mathematics. Good tasks have “low floors” and “high ceilings” so that students have access to the content regardless of their prior achievement. A rigorous task is one that supports students to do the sense-making. A goal might be to make connections between concepts and procedures, or possibly to determine a solution process when a procedure for the solution has not yet been introduced. Students are expected to explain and justify their thinking. Rigorous tasks afford students the opportunities to develop productive habits of mind around mathematical problem solving.

Just-in-Time Scaffolding

All too often, with best intentions, teachers or resources undermine the value of a good task by providing scaffolding too early. It is tempting to provide scaffolding to students at the first sign of struggle or even in anticipation of student struggle. However, if the struggle is productive, this scaffolding should be withheld. Instead of providing scaffolding just in case students might need it, scaffolding should be offered just in time, when there is evidence that a student’s struggle is no longer productive. While the opportunity to develop perseverance is reliant on access to good tasks, it is supported during instruction by effective teaching. For students to develop perseverance, they must engage in productive struggle. This means that scaffolding, on the student page or from the teacher, needs to be managed in a way that supports students to do the sense-making. Scaffolding should be provided when students’ engagement with the task is no longer productive or when the students’ work is not leading to the learning objective. A key to effective teaching is to know when to provide the scaffolding and when to step aside to allow students to persevere.

Language Development

Language development and the development of mathematical understanding are interdependent. All students must be able to listen, speak, read, write, and converse to meet the rigorous expectations of standards and become proficient problem solvers.

B How can you write an equation to solve the problem?

Equation: _____

C The shop has _____ sunglasses.


Connect to Vocabulary

equations:

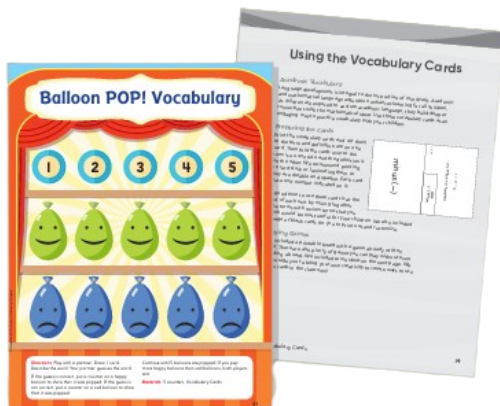
$80 - 50 = 30$

$9 = 6 + 3$

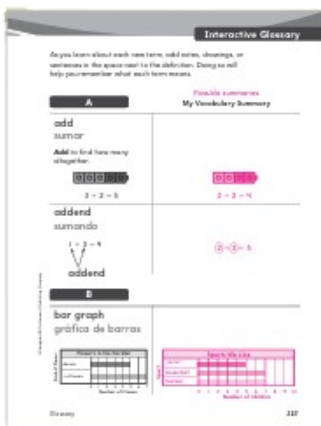
$90 = 60 + 30$

 **Turn and Talk** Does your answer make sense? How do you know?

Before teaching new vocabulary, Into Math ensures that students have an opportunity to first build a foundation of conceptual understanding. Vocabulary emerges once students have the conceptual foundation on which to build meaning.



Vocabulary cards can be used with vocabulary games. The eGlossary includes vocabulary terms and definitions translated into ten different languages.



The Interactive Glossary provides space for students to make graphic organizers or drawings for each new vocabulary term.

1 Support Sense-Making

Scaffold tasks when needed, being sure to amplify (instead of simplify) language for students.

2 Optimize Output

Help students describe their mathematical reasoning and understanding.

3 Cultivate Conversation

Facilitate mathematical conversations among students.

4 Maximize Linguistic and Cognitive Meta-Awareness

Help students evaluate their use of language and see how mathematical ideas, reasoning, and language are connected.

“We must explicitly teach the language of mathematics in order to give students—especially English learners— access to mathematics.”

Math is a second language for ALL students. Into Math is built on four design principles from the **Stanford Center for Assessment, Learning, and Equity (SCALE)**. These four design principles promote the use and development of language as an integral part of instruction.

The Language Routines as well as new and review vocabulary words are summarized on the Language Development page at the beginning of each module.

LANGUAGE DEVELOPMENT • Planning for Instruction



By giving all children regular exposure to language routines in context, you will provide opportunities for children to **listen for**, **speak**, **read**, and **write** about mathematical situations. You will also give children the opportunity to develop understanding of both mathematical language and concepts.

Using Language Routines to Develop Understanding

Use the Professional Learning Cards for the following routines to plan for effective instruction.

Three Reads Lessons 2.1, 2.3

Children read a problem or the teacher reads the problem three times with a specific focus each time.

1st Read What is the problem about?

2nd Read What do each of the numbers describe?

3rd Read What math questions could you ask about the problem?

Stronger and Clearer Each Time Lessons 2.3, 2.4, 2.5

Children write their reasoning about a problem, share that reasoning, explain it, listen to feedback, respond to feedback, and then refine their reasoning by writing again.

Compare and Connect Lessons 2.1, 2.2, 2.4

Children listen to a partner's solution strategy, identify it, and then compare it to and contrast it with their own.

Critique, Correct, and Clarify

Children connect the work in a flawed explanation, argument, or solution method; share with a partner; and refine the sample work.

Linguistic Note

Many classroom commands use words that are familiar in isolation, but as phrases may be misunderstood. To help English Language Learners be successful with the lesson, provide additional assistance with phrases such as *make pairs*, *count by twos*, and *equal groups*.



Connecting Language to Understanding Equal Groups

Watch for children's use of review and new terms listed below as they explain their reasoning and make connections with new concepts.

Key Academic Vocabulary

Current Development • Review and New Vocabulary

addends The numbers added together to find the sum

addition equation Number sentence that uses the equal sign and plus sign to show two amounts are equal

even Numbers show pairs with no objects left over

odd Numbers show pairs with 1 object left over

Lesson Language Objective

Learning Objective

Classify numbers up to 20 as even or odd.

Language Objective

- Explain what even and odd numbers are.
- Tell how even numbers and odd numbers are different.

Vocabulary

New: **even**, **odd**

Lesson Materials: counters, connecting cubes

Each lesson has a language objective.

The 5 Routines for Language Development help teachers promote the design principles during instruction with routines that are structured, but adaptable, in a format for amplifying, assessing, and developing students' language. These Routines provide opportunities for students to listen, speak, and write about mathematical situations with practices that are appropriate and effective for **all language proficiency levels**.

1 **Three Reads** – To ensure understanding of mathematical questions, students read a problem three times with a specific focus each time.

EL SUPPORT SENSE-MAKING • Three Reads

Read the problem stem three times and prompt the children with a different question each time.

- What is the problem about?
Meg has some toy rings. She has some and then she gets some more.
- What do each of the numbers describe?
20 is the number of toy rings she gets and 50 is the number of toy rings she has at the end.
- What math questions could you ask about the problem?
Possible questions: How many more rings does she get? How many does she have in all? How many did she start with?

2 **Stronger and Clearer Each Time** – Students use structure to write their reasoning behind a problem, share and explain their reasoning, listen to and respond to feedback, and then write again to refine their reasoning.

EL CULTIVATE CONVERSATION
Stronger and Clearer

Have children share their work. Remind children to ask questions of each other that focus on how they can write equations to solve this problem. Did they use addition or subtraction to write the equation? Then, have them refine their answers.

3 **Compare and Connect** – Meta-awareness is strengthened as students listen to a partner's solution strategy and then identify, compare, and contrast this mathematical strategy.

EL CONNECT MATH IDEAS, REASONING, AND LANGUAGE **Compare and Connect**

Point out to children each cube train has 10 cubes. Before beginning the task, have children count forward and back by tens to 100. Have partners share their work and then compare and contrast.

4 **Critique, Correct, and Clarify** – Students correct sample work having a flawed explanation, argument, or solution method and share with a partner to reflect on and then refine the sample work.

EL OPTIMIZE OUTPUT
Critique, Correct, and Clarify

Encourage children to question the thinking of their partner. Discuss how to solve the problem. Children should refine their responses.

5 **Collect and Display** – Students capture oral words and phrases learned and build a collective reference containing illustrations connected to mathematical concepts and terms within each module.

ANCHOR-CHART OPTION

As you progress through the module, build and display an anchor chart.

EL CONNECT MATH IDEAS, REASONING, AND LANGUAGE **Collect and Display**



Have children build their own anchor chart in their Practice and Homework Journal. A completed chart for the module is shown here.

Write Numbers as Tens and Ones

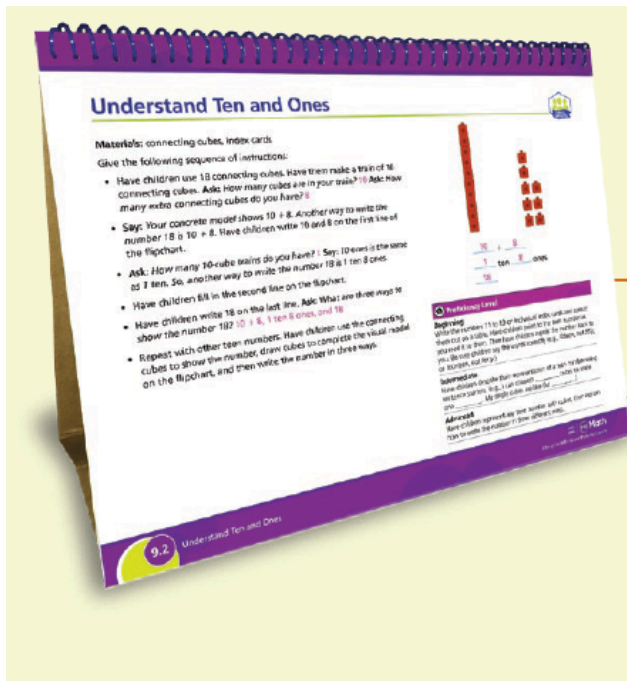
36

1 ten & ones
30 + 6
36 ones

Quick Picture

36 =  60 = 

Teacher Tabletop Flipcharts, designed for reteaching and reinforcing each lesson's content with small groups, contain leveled scaffolding and support for English learners. These scaffolding suggestions ensure teachers will maintain the rigor and cognitive complexity level required for mathematical reasoning when supporting English learners.



Three proficiency levels

Proficiency Level

Beginning

Write the numbers 11 to 19 on individual index cards and spread them out on a table. Have children point to the teen number as you read it to them. Then have children repeat the number back to you. Be sure children say the words correctly (e.g., *fifteen*, not *fifty*, or *fourteen*, not *forty*.)

Intermediate

Have children describe their representation of a teen number using sentence starters. (e.g., I can connect _____ cubes to make one _____. My single cubes are like the _____.)

Advanced

Have children represent any teen number with cubes, then explain how to write the number in three different ways.

School Home Letters are available in English, Spanish, Haitian-Creole, and Portuguese.

