MATHEMATICAL LITERACY

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MATHEMATICS AND LANGUAGE, LITERACY
INTEGRATION IN DUAL LANGUAGE SETTINGS

JOURNAL:
What do your students read/write in math?

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Reflect

- What do your students read/write in math? For what purpose?

- How do you facilitate reading and writing in math (activites, strategies, etc.)?

Share

Revise Definitions

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Mathematical Literacy

Attention to reading and writing in mathematics including discussions and interpretations of math texts and/or how to produce different types of math texts

READING AND WRITING IN MATH

Our Objective:

Develop our understanding of how reading and writing are involved in our mathematics standards, curriculum/assessments, and practice.

- Mathematics Standards
- Math Texts: Organization and Representation
- Video Study
- Consider planning for instruction and mentoring student teachers

Exploring Mathematics Standards 🔗

What standards include reading & writing in mathematics?
What are students expected to do?

Exploring Mathematics Standards

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Mathematical Practices #4:
Model with mathematics.

CCSS.MATH.CONTENT.4.NBT.A.2

Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.

CCSS.MATH.CONTENT.4.OA.A.3:
Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.

Mathematical Practices #3:

Construct viable arguments and critique the reasoning of others.

Exploring Math Texts: Organization and Representation

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How are students expected to make sense of, organize, and represent information in mathematics texts?

Exploring Math Texts: Organization and Representation

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Exploring Math Texts: Organization and Representation

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True or False:
Graphs are a form of reading and writing in math.

Exploring Math Texts: Organization and Representation

Test Question Examples (Smarter Balance)

CA Common Core Math

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How are students expected to make sense of, organize, and represent information in mathematics texts?

What are other examples?
How else might math texts be represented?

Math Texts:
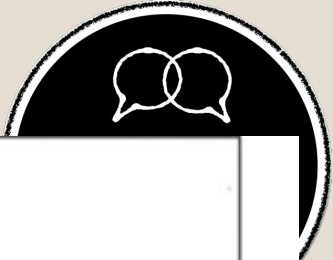
palch has 234 pumpkins, [illegible]
pumpkins. Estimate about how many total pumpkins there
are to the nearest 100.

STUDENT'S SOLUTION:
380 rounds up to 400 ✓
239 rounds up to 300 no
427 rounds up to 430 no

Answer: There are about 1,130 pumpkins total.

Error Analysis: Explain the student's mistakes and what they need to do to correctly solve this problem.

The student correctly rounded 380 up to 400. They incorrectly rounded 239 up to 300 and 427 to 430. 239 should be rounded down to 200 because that is closer than 300. 427 was rounded to the nearest 10, but the directions say to round to the nearest 100, so it should be 400. That means there are about 1,000 pumpkins in all.

books

Math—Writing

Writing about the activetys we do in math helps me because it is easyer to explane what I think and what I did. and it is easyer for the math teacher to understand what you think and what you do. If we just went up to the math teacher and told them what we think the math teacher nite not understand unlike writing in writing I can think and make it understandable.

Math Texts:
Organization and Representation

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What's in a mathematical text?

- Numeric symbols
- Non-numeric symbols
- Mathematics Tools
- Graphs
- Sidebars
- visual representations
- *etc.*

How is it different?

- Minimal repetition
- Different page organization
- Different reading patterns
- Texts might be above grade level
- Main idea at the end in the form of a question

Math Texts:
Organization and Representation

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What is important for your students (and PSTs) to know when reading mathematical texts?

How (is?) this different for bilingual students?

Dual Language Settings

How is reading and writing math different in a dual language setting?

What are some specific challenges you notice for your students?

What are some strategies you use to target mathematical bi **(tri?)** literacy?

Strategies for Literacy-Rich Mathematics Instruction

- Project Based Learning

- Interdisciplinary Lessons

- Multimedia and multimodal lessons

- Learning logs/Math Journals

- Shared writing on mathematical topics

- Bilingual class book with word problems

- Explicit instruction and consistent modeling

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Target Pedagogy: Literacy

Reading in mathematics can take on various forms, including but not limited to tables, graphs, equations, etc.

Writing in mathematics requires students to understand all the above forms of information, interpret the information, and express their problem solving process in written form.

Effectively incorporating reading and writing activities in mathematics will both help students build up their problem solving skills and develop their oral and written abilities.

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Guiding Questions

1. How/where do you see writing in this lesson?
2. How/where do you see reading in this lesson?
3. How is the organization and representation of different information in mathematics texts (e.g. "reading" a graph) explicitly taught to students?
4. How does the teacher provide feedback and facilitate self-evaluation of mathematical literacy?
5. If used, how does technology support literacy in this lesson?

Possible Lesson Features

- Students are writing (sentences) and/or modeling with mathematics
  - Example: pictures, equations, manipulatives, math journals, word problems, etc.
- Sentence frames are available.
- Models are provided for how to "read" mathematical equations
  - Example: 1/2= "one half," not "one over two; tables; graphs; etc.
- Models are provided for the creation of tables, graphs, etc.
- Students are making meaning through a variety of forms (including graphs, texts, etc.) and applying these to articulate their problem solving process through written responses.

Lesson Study with Video: "We do"
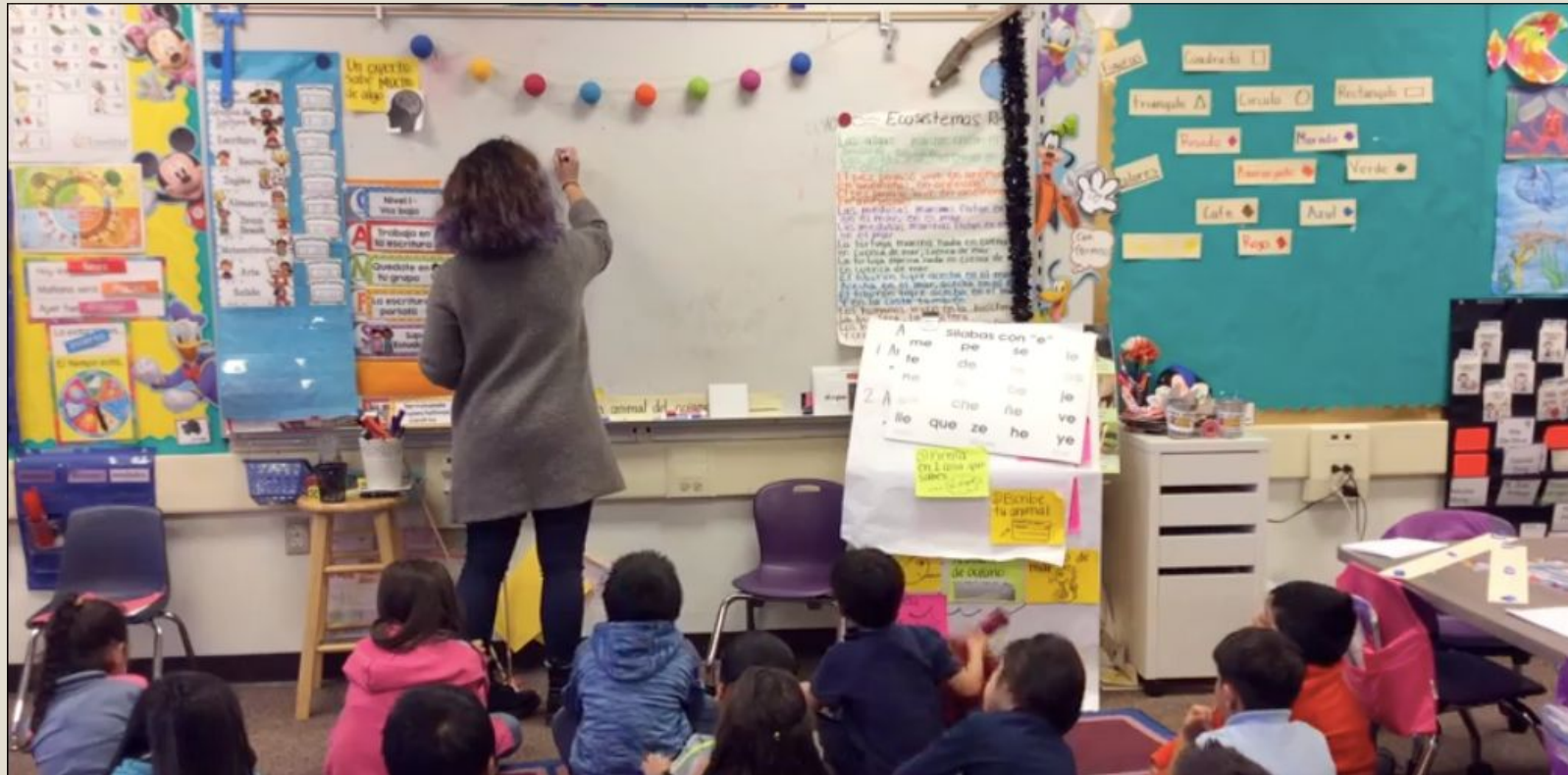
Use the guiding questions document and jot down your observations and questions. How might you adapt this lesson for your students/grade?

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Debrief

- Where/how did you see literacy in this lesson?

- How does the teacher provide feedback/facilitate mathematical literacy in this lesson?

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Next Steps

- What are three "action steps" that the teacher might take in future lessons?

- How might the literacy instruction in this lesson generalize to other mathematical concepts and topics?

Exit Ticket:
A strategy to try Monday

What did you learn about reading and writing in math today that will change your teaching and/or mentoring?

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Break Time!

Thank you!

TEXAS ESSENTIAL KNOWLEDGE AND SKILLS (TEKS)

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Mathematical Process Standards

A) apply mathematics to problems arising in everyday life, society, and the workplace;

B) use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;

(D) communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;

(E) create and use representations to organize, record, and communicate mathematical ideas;

(G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

CALIFORNIA CCSS

Mathematical Practice Standards (the same at each grade level):

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reading 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.

Mathematical Content Standards (different at each grade level:

- skills and knowledge—what students need to know and be able to do.
- built on progressions of topics across grade levels,
- Eg: Number Operations 4.2: 2. Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi- digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.

TEXAS ESSENTIAL KNOWLEDGE AND SKILLS (TEKS)

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Examples in Each Strand:

Grade 3 Number and operations

A: compose and decompose numbers up to 100,000 ...using objects, pictorial models, and numbers, including expanded notation as appropriate;

Grade Algebraic Reasoning

A: represent multi-step problems involving the four operations with whole numbers using strip diagrams and equations with a letter standing for the unknown quantity;

Grade 5 Data Analysis Data Analysis

(A) represent categorical data with bar graphs or frequency tables and numerical data, including data sets of measurements in fractions or decimals, with dot plots or stem-and-leaf plots;

STATE OF TEXAS ASSESSMENTS OF ACADEMIC READINESS (STAAR)

Fourth Grade Release Test Question 11.

It took Ian three years to collect 25,413 aluminum cans to recycle. In the first year he collected 8,917 cans, and in the second year he collected 7,639 cans. Which equation can be used to find x, the number of cans Ian collected in the third year?

A x = 25,413 8,917 7,639

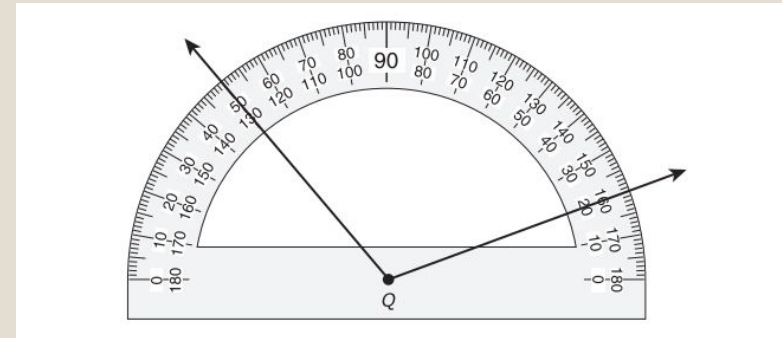B x = 25,413 + 8,917 + 7,639

C x = 8,917 + 7,639

D x = 8,917 7,639 4

Fourth Grade Released Test Question 25.

Angle Q is shown on this protractor.

What is the measure of angle Q to the nearest degree?
A 70°, because 50° plus 20° equals 70°
B 150°, because 130° plus 20° equals 150°
C 30°, because 160° minus 130° equals 30°
D 110°, because 160° minus 50° equals 110°