Math Leadership Network

NWESD

March 12, 2015

Financial Literacy

Three questions for you

1.Suppose you had $100 in a savings account and the interest rate was 2% per year. After five years, how much do you think you would have in the account if you left the money to grow?

(A) More than $102. (B) Exactly $102. (C) Less than $102.

2.Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After one year, how much would you be able to buy with the money in this account?

(A) More than today. (B) Exactly the same. (C) Less than today.

3.Please tell me whether this statement is true or false: Buying a single company's stock usually provides a safer return than a stock mutual fund.

Norms

1. Promoting a Spirit of Inquiry
2. Pausing
3. Paraphrasing
4. Probing
5. Putting Ideas on the Table
6. Paying Attention to self and Others
7. Presuming Positive Intentions

Topics for Today

- Growth Mindset
- Principals to Actions: Eight Teaching Practices
- Multiple Representations-Math Task
- Middle School Compressed Curriculum
- Math Tasks: Higher and lower levels of Cognitive Demands
- EdReports
- SBAC-Claims and DOK Levels-sample items

Lunch from 11:30-12:30

Learning Targets:

We will:

- increase our leadership capacity as we grow in our understanding of the the Washington State Learning Standards
- continue to deepen our mathematical understanding of mathematic teaching practices

Success Criteria:

- We will take back our enthusiasm around mathematics and share with our colleagues a mathematical practice in which we are deepening our understanding

Invisibilia-Expectations Growth Mindset

Growth Mindset

- How do expectations impact our work with students?
- With our colleagues?
- With our own belief system?

Post Test Spring after Significant Instruction

Considerati
for Teachi
20 minute

Post-Test Content Cluster Rubric Scores—Grade Level _____

Score	1	2	3	4
Number of Students				

SBAC Achievement Level Descriptors Rubric Score—Standard for Mathematical Practice #_____

Score	1	2	3	4
Number of Students				

Implications for Teaching

What patterns did you observe about your students' work as a whole?
Was there improvement in your students' scores? Why? Or Why not?

Grandma's Tug of War

The Acrobat task

In round 1 of a tug-of-war, four acrobats tied with five grandmas.
In round 2 of a tug-of-war, one dog (Ivan) tied with two grandmas and an acrobat.
In round 3 of a tug-of-war, if three grandmas and the dog pull against four acrobats, who will win?

Implementing Tasks

Middle School Compression

Everett School District

- Dick Sanders
- Kathy Stilwell

Teaching Practices that Support Common Core Implementation

- Establish Mathematics Goals to Focus Learning
- Implementing Tasks that Promote Reasoning and Problem Solving
- Use and Connect Mathematical Representations
- Facilitate Meaningful Mathematical Discourse
- Pose Purposeful Questions
- Build Procedural Fluency from Conceptual Understanding
- Support Productive Struggle in Learning Mathematics
- Elicit and Use Evidence of Student Thinking

Implementing Tasks to Promote Reasoning and Problem Solving

Consider the reading from Principals to Actions: pg 17-24

Individually jot down your thoughts on the following questions:

- What are the characteristics of a task that places a high-level cognitive demand on students?
- How could you take a low-level task and increase its cognitive demand?
- What types of questions could you ask, or what types of moves could you make, to support students who struggle to get started on a problem-solving task, without diminishing the cognitive demand of that task?

Implementing Tasks to Promote Reasoning and Problem Solving

In groups of 2-3 Partner/Group Share Out

- Take the first question from above and have a group go-around and repeat for each question.

Implementing Tasks to Promote Reasoning and Problem Solving

Review the "Beliefs about teaching and learning mathematics" chart (p. 11, Obstacles) Consider the following questions:

- What impact do those beliefs have on students' opportunities for reasoning and problem solving in the lesson?
- As a group of 2-3, be prepared to address the whole group with your thoughts on "What supports do our teachers need from us so that their mathematics' classrooms can support student reasoning and problem solving?"

Implementing Tasks to Promote Reasoning and Problem Solving

SBAC Practice Items

- In groups of 2 to 3, sort the SBAC practice items using the Levels of Demand on p. 18
- Discuss in your group what you notice or what you wonder
- As a larger group, list (on chart paper) what you see as implications for instruction in the classroom

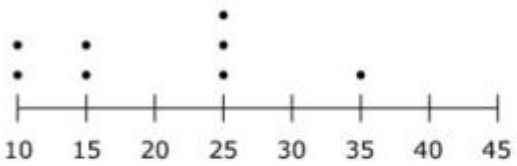
Implementing Tasks to Promote Reasoning and Problem Solving

- In groups of 2 to 3, sort the SBAC practice items using the Levels of Demand on p. 18
- Discuss in your group what you notice or what you wonder

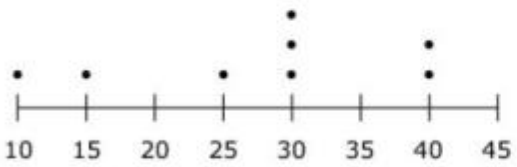
1880

Mr. Anthony wants to know how some student athletes are improving in the number of push-ups they can do.

These dot plots show the number of push-ups each student was able to do last month and this month.



Number of Push-ups Last Month



Number of Push-ups This Month

What is the increase in the mean number of push-ups from last month to this month?

Claims for the Mathematics Summative Assessment

Overall Claim for Grades 3-8	"Students can demonstrate progress toward college and career readiness in mathematics."
Overall Claim for Grade 11	"Students can demonstrate college and career readiness in mathematics."
Claim #1 - Concepts & Procedures	"Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency."
Claim #2 - Problem Solving	"Students can solve a range of complex well-posed problems in pure and applied mathematics, making productive use of knowledge and problem solving strategies."
Claim #3 - Communicating Reasoning	"Students can clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others."
Claim #4 - Modeling and Data Analysis	"Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems."

Claim 2

- Problems that include a layer of related concepts and standards
- Can be solved using different strategies
- Solution path is not immediately obvious

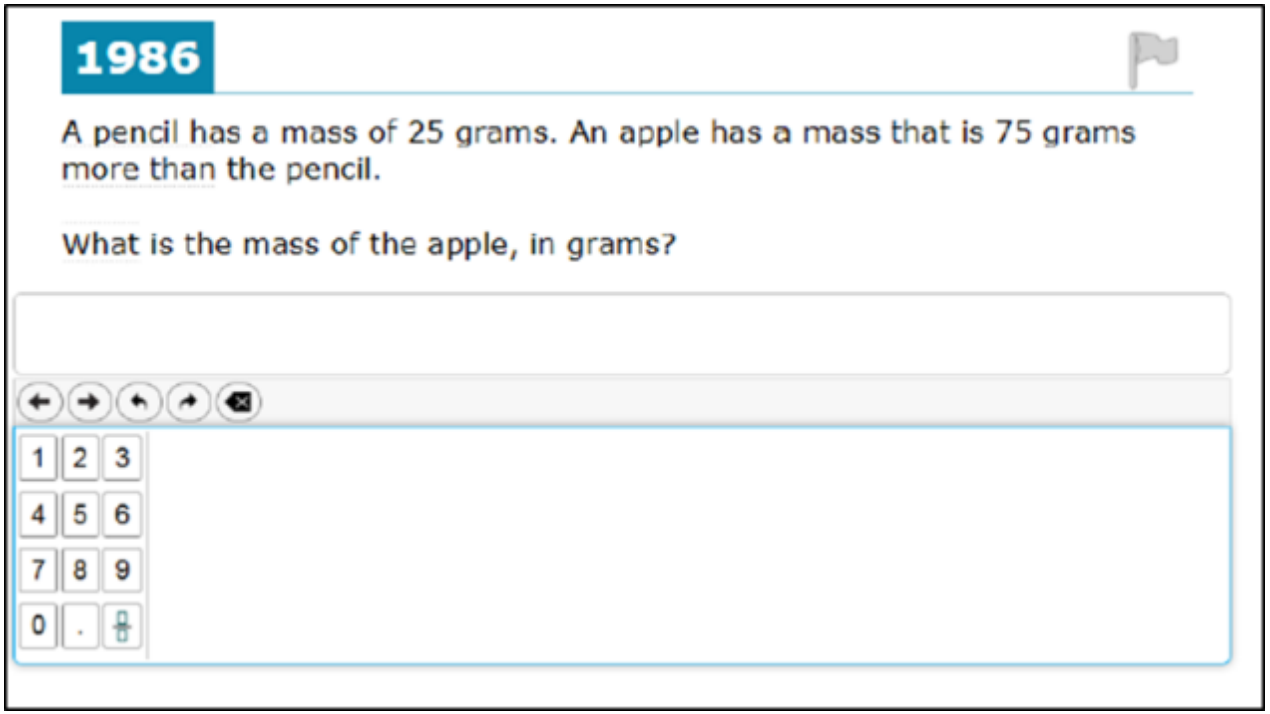
Claim 3

- Items will typically present a proposed solution to a problem or the beginning of a generalization and ask students to provide a justification, explanation or a counter-example

- Students will have to demonstrate proficiency and rigor in their reasoning (conceptual understanding, fluency, application)

Claim 4

- Application of mathematics in everyday life
- Modeling used to bridge school math with real world math
- Students formulate a model
- Assumptions are made
- Data is selected or estimated



Claim 1
Concepts and Procedures

Claim 2
Problem Solving

Claim 3
Communicating Reasoning

Claim 4
Modeling and Data Analysis

1988

Does replacing the unknown number with 7 make each equation true?

Select Yes or No for each equation.

	Yes	No
$6 \times \square = 36$	☐	☐
$8 \times \square = 64$	☐	☐
$49 \div \square = 7$	☐	☐
$54 \div \square = 6$	☐	☐

Claim 1
Concepts and Procedures

Claim 2
Problem Solving

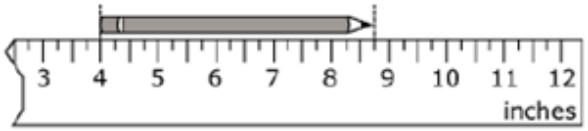
Claim 3
Communicating Reasoning

Claim 4
Modeling and Data Analysis

2024

Tracy has a broken ruler, but she can use it to measure the length of her pencil.

What is the length, in inches, of the pencil shown?



(A) 8 inches

(B) $7\frac{3}{4}$ inches

(C) 5 inches

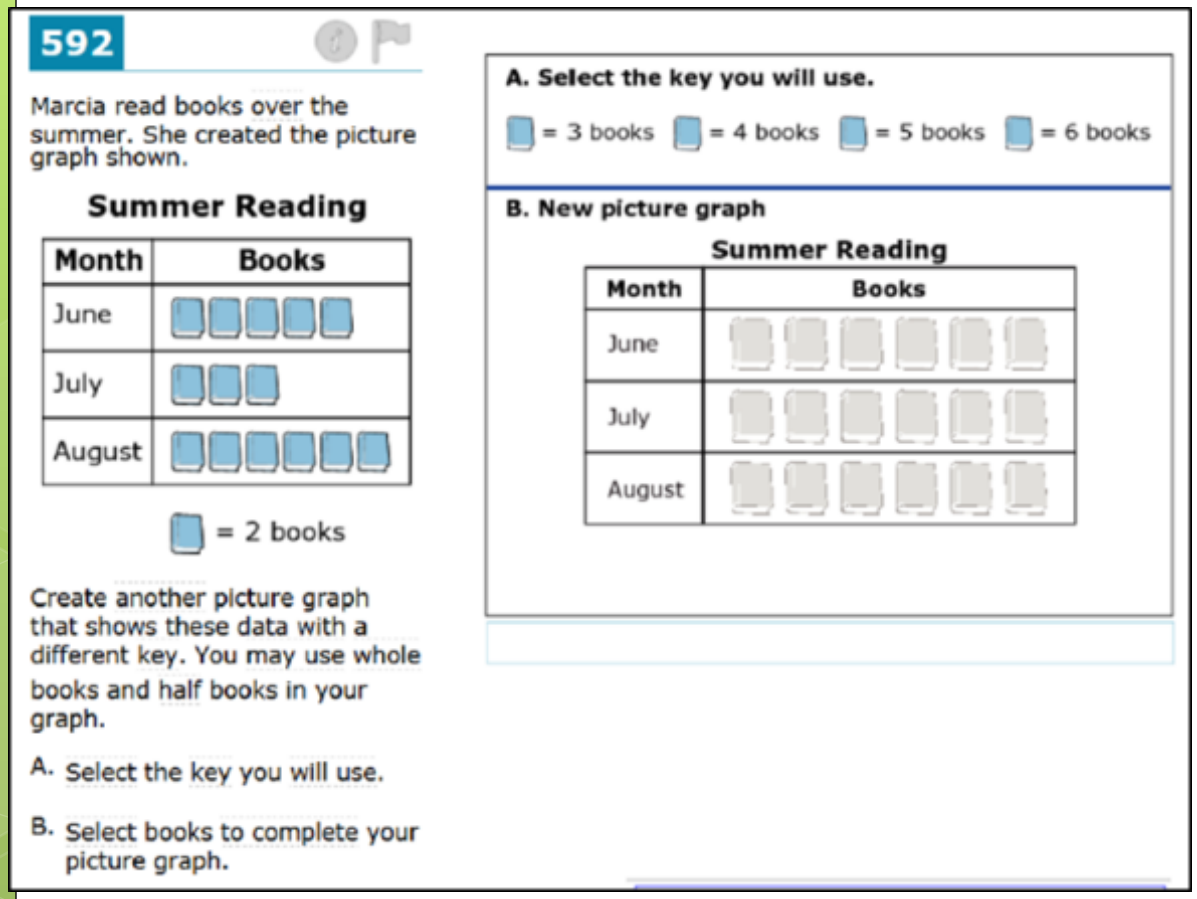
(D) $4\frac{3}{4}$ inches

Claim 1
Concepts and Procedures

Claim 2
Problem Solving

Claim 3
Communicating Reasoning

Claim 4
Modeling and Data Analysis



Claim 1
Concepts and Procedures

Claim 2
Problem Solving

Claim 3
Communicating Reasoning

Claim 4
Modeling and Data Analysis

Hess' Cognitive Rigor Matrix & Curricular Examples: Applying Webb's Depth-of-Knowledge Levels to Bloom's Cognitive Process Dimensions – *M-Sci*

Revised Bloom's Taxonomy	Webb's DOK Level 1 Recall & Reproduction	Webb's DOK Level 2 Skills & Concepts	Webb's DOK Level 3 Strategic Thinking/ Reasoning	Webb's DOK Level 4 Extended Thinking
Remember Retrieve knowledge from long-term memory, recognize, recall, locate, identify	○ Recall, observe, & recognize facts, principles, properties ○ Recall/ identify conversions among representations or numbers (e.g., customary and metric measures)			
Understand Construct meaning, clarify, paraphrase, represent, translate, illustrate, give examples, classify, categorize, summarize, generalize, infer a logical conclusion (such as from examples given), predict, compare/contrast, match like ideas, explain, construct models	○ Evaluate an expression ○ Locate points on a grid or number on number line ○ Solve a one-step problem ○ Represent math relationships in words, pictures, or symbols ○ Read, write, compare decimals in scientific notation	○ Specify and explain relationships (e.g., non-examples/examples; cause-effect) ○ Make and record observations ○ Explain steps followed ○ Summarize results or concepts ○ Make basic inferences or logical predictions from data/observations ○ Use models /diagrams to represent or explain mathematical concepts ○ Make and explain estimates	○ Use concepts to solve non-routine problems ○ Explain, generalize, or connect ideas using supporting evidence ○ Make and justify conjectures ○ Explain thinking when more than one response is possible ○ Explain phenomena in terms of concepts	○ Relate mathematical or scientific concepts to other content areas, other domains, or other concepts ○ Develop generalizations of the results obtained and the strategies used (from investigation or readings) and apply them to new problem situations
Apply Carry out or use a procedure in a given situation; carry out (apply to a familiar task), or use (apply) to an unfamiliar task	○ Follow simple procedures (recipe-type directions) ○ Calculate, measure, apply a rule (e.g., rounding) ○ Apply algorithm or formula (e.g., area, perimeter) ○ Solve linear equations ○ Make conversions among representations or numbers, or within and between customary and metric measures	○ Select a procedure according to criteria and perform it ○ Solve routine problem applying multiple concepts or decision points ○ Retrieve information from a table, graph, or figure and use it solve a problem requiring multiple steps ○ Translate between tables, graphs, words, and symbolic notations (e.g., graph data from a table) ○ Construct models given criteria	○ Design investigation for a specific purpose or research question ○ Conduct a designed investigation ○ Use concepts to solve non-routine problems ○ Use & show reasoning, planning, and evidence ○ Translate between problem & symbolic notation when not a direct translation	○ Select or devise approach among many alternatives to solve a problem ○ Conduct a project that specifies a problem, identifies solution paths, solves the problem, and reports results
Analyze Break into constituent parts, determine how parts relate, differentiate between relevant-irrelevant, distinguish, focus, select, organize, outline, find coherence, deconstruct	○ Retrieve information from a table or graph to answer a question ○ Identify whether specific information is contained in graphic representations (e.g., table, graph, T-chart, diagram) ○ Identify a pattern/trend	○ Categorize, classify materials, data, figures based on characteristics ○ Organize or order data ○ Compare/ contrast figures or data ○ Select appropriate graph and organize & display data ○ Interpret data from a simple graph ○ Extend a pattern	○ Compare information within or across data sets or texts ○ Analyze and draw conclusions from data, citing evidence ○ Generalize a pattern ○ Interpret data from complex graph ○ Analyze similarities/differences between procedures or solutions	○ Analyze multiple sources of evidence ○ analyze complex/abstract themes ○ Gather, analyze, and evaluate information

2025

A teacher gives 6 students some cards to play a game. She has 52 cards total. The teacher gives each student 1 card until all 52 cards are gone.

How many students get exactly 9 cards?

Ⓐ 2

Ⓑ 4

Ⓒ 5

Ⓓ 6

DOK 1
Recall and Reproduction

DOK 2
Skills and Concepts

DOK 3
Strategic Thinking and Reasoning

DOK 4
Extended Thinking

2045

A bottle holds $\frac{3}{5}$ liter of water. Sam needs 8 full bottles of water to fill his fish tank. How many liters of water does Sam need to fill the fish tank?

(A) $2\frac{1}{5}$

(B) $4\frac{4}{5}$

(C) $7\frac{2}{5}$

(D) $8\frac{3}{5}$

DOK 1
Recall and Reproduction

DOK 2
Skills and Concepts

DOK 3
Strategic Thinking and Reasoning

DOK 4
Extended Thinking

1891

Which fraction model best represents $4 \times \frac{2}{3}$?

Ⓐ 

Ⓑ 

Ⓒ 

Ⓓ 

DOK 1
Recall and Reproduction

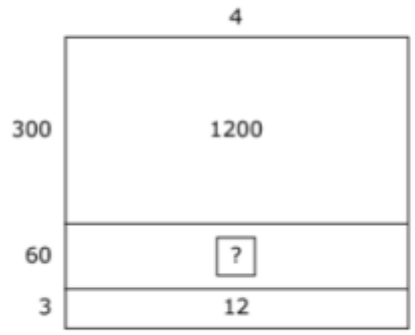
DOK 2
Skills and Concepts

DOK 3
Strategic Thinking and Reasoning

DOK 4
Extended Thinking

1890

Jasmine solves the equation ☐ ÷ 4 = 363 using this area model.



Which statement explains how Jasmine should solve for the missing number in the model?

Ⓐ Jasmine should divide 60 by 4.

Ⓑ Jasmine should divide 1200 by 12.

Ⓒ Jasmine should multiply 3 times 60.

Ⓓ Jasmine should multiply 4 times 60.

DOK 1
Recall and Reproduction

DOK 2
Skills and Concepts

DOK 3
Strategic Thinking and Reasoning

DOK 4
Extended Thinking

Use and Connect Mathematical Representations

In groups of 2-4:

- Skim/Scan section on Principles to Actions on pg 24 - 29

- Pick a phrase or a sentence that captures an important idea for you in this section

Discussion Protocol

A round consists of:

One person – the "original speaker" – uses up to 1 minute to:

- Read aloud the passage selected
- Original speaker says what he/she thinks about the passage (interpretation, connection or implication to our work)

Group participants respond to what has been said for up to 3 minutes

- The original speaker has 1 minute for the final word: either summarizing what was said or describing new thinking based on group discussion
- Repeat process so all participants share their passage

Use and Connect Mathematical Representations

Revisit a task from the task sort

- Individually, show how students might solve each problem by using different representations.
- Discuss the relationships among all the representations generated for each problem with members of your group

Use and Connect Mathematical Representations

- Review the “Beliefs about teaching and learning mathematics” chart (p. 11, Obstacles)

- How do those beliefs support students in making connections among different representations of the problem?

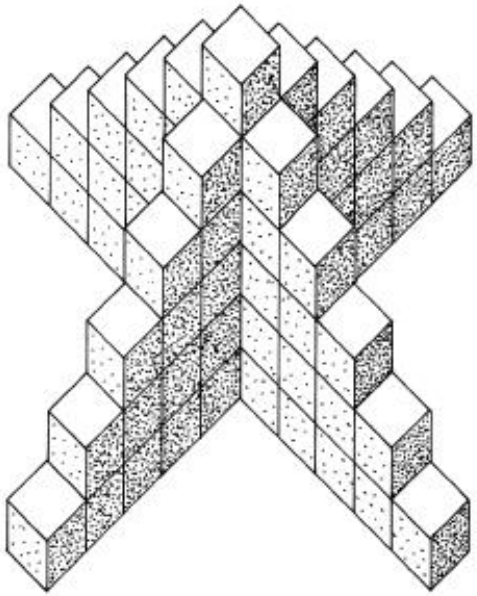
EdReports

Jennie Beltramini

Big Take Aways:

- Instructional Materials are being reviewed with Focus and Coherence as the first gateway out of three gateways
- No curriculum provides a magic bullet
- EdReport will continue to evaluate curriculum
- Other organizations are creating tools to review instructional materials

Skeleton Tower



1. How many cubes are needed to build this tower?
   Show your calculations _____

2. How many cubes are needed to build a tower like this, but 12 cubes high?
   Explain how you figure out your answer. _____

_____

Model

Rule

Symbolic Expression

$$L = 0 + 1 + 2 + 3 + \ldots + (n-1)$$

$$L = \frac{(n-1)n}{2}$$

Recursive Equations

$$L_1 = 0$$

$$L_n = L_{n-1} + n - 1$$

Functions

Graph

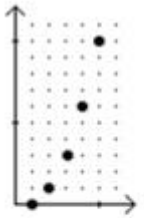


Table of Numerical Values

n = # of points	L = # of line segments
1	0
2	1
3	3
4	6
5	10

Context

Real World Connections and Stories

If n points drawn on a circle, what is the maximum number of line segments L that connects them?

Number Talks

$134 - 68$

26×12

For Next Time…

- Principals to Actions: (p. 29-41) Facilitate Meaningful Mathematical Discourse and Pose Purposeful Questions
- Administer and score tasks (same as baseline)

Learning Targets:

We will:

- Increase our leadership capacity as we grow in our understanding of the the Washington State Learning Standards
- Continue to deepen our mathematical understanding of mathematic teaching practices

Success Criteria:

- We will take back our enthusiasm around mathematics and share with our colleagues a mathematical practice in which we are deepening our understanding

NWESD MSP SURVEY

http://bit.ly/nwesd_msp