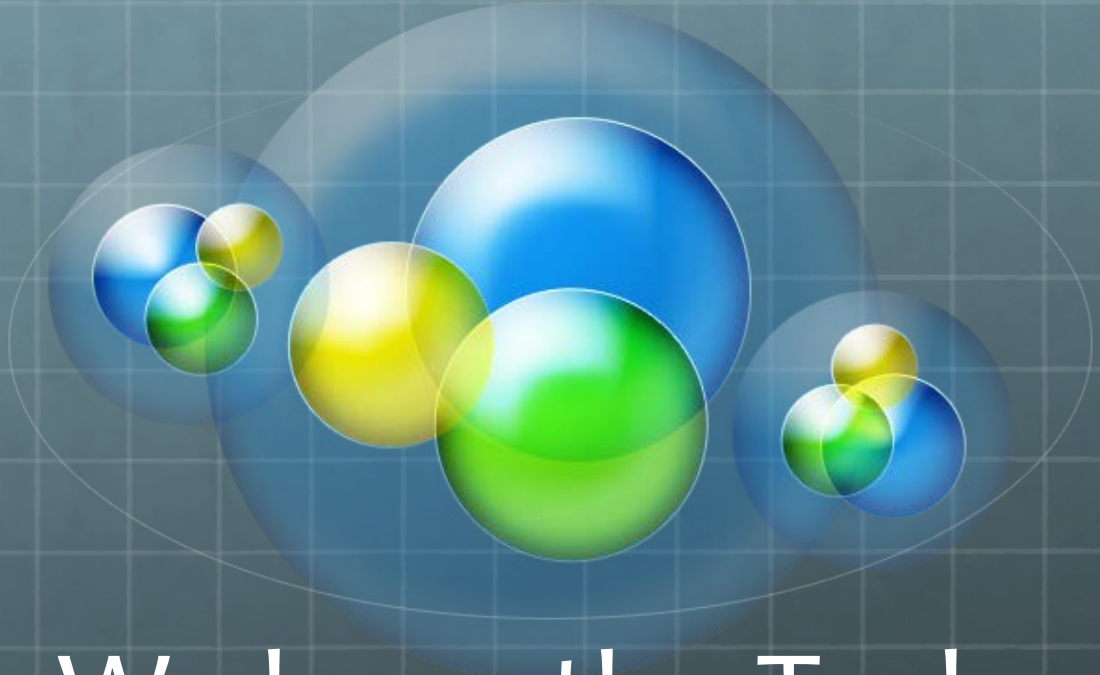
Making Things Possible Conference: All Things Tech. November 14, 2015



We have the Tech, but Math is still hard!

Instructional Adventures in
Aligning Tech with Student Need

Today's Goals

- Consider best practices in technology and mathematics
- Ensure that technology serves educational needs
- Explore a variety of tools and setting: apps, websites, smart board activities
- Challenge ourselves to avoid reducing math instruction to skill practice

Background

- The importance of Number Sense:
  - Number Sense is to Math Development what Phonemic Awareness is to Literacy Development (Gersten and Chard, 2001)

Components of Number Sense

- Math is about quantity, not numbers
- Numeration: place value and our number system
- Equality: equal value, not “the same as”
- Understanding Base 10
- Form of a Number: tally marks, bar graphs whole numbers, fractions, decimals
- Proportional Reasoning: comparing quantities
- Algebraic and Geometric Thinking

(Faulkner, 2009)

Additional Components of Number Sense

- Mental flexibility with numbers (Woodward and Gertsen-Chard)
- Application in real-world scenarios and word problems (Gertsen-Chard)

People with Number Sense are able to …

- Recognize Math Errors
- Recognize Benchmark Numbers
- Recognize Patterns
- Explain Mathematics Vocabulary
- Apply Learned Skills in Word Problems

Gersten and Chard, 2001

Keep in Mind: Define Your Needs

- To make the best decisions about technology, keep in mind the educational needs of your students. In my experience, technology works best when the specific need for it is made clear.
- For example, at Cotting, we have many students who struggle with both physically accessing and understanding traditional textbooks; we also have two computer labs teachers can reserve and use; Google Classroom is a good fit for our students and our hardware.

Keep in Mind Part II: Define Your Purpose

What do you need the technology to do?

- Give student a platform to demonstrate what you think they can do

  OR:

- Be an instructional tool for what you want them to be able to learn

Best Practices in Technology

- Alignment: the purpose of the technology
- Accessibility: students and staff
- Assessment: documenting student work
- Reinforcement: supplement, not replicate, teaching

(University of Pittsburgh)

Best Practices in Mathematics

- standards-based
- differentiated instruction
- inquiry/problem-solving
- use experience and prior knowledge
- cooperative learning
- real-world connections
- providing scaffolding to connect to processes, concepts, and understanding
- have students justify responses
- develop computational skills

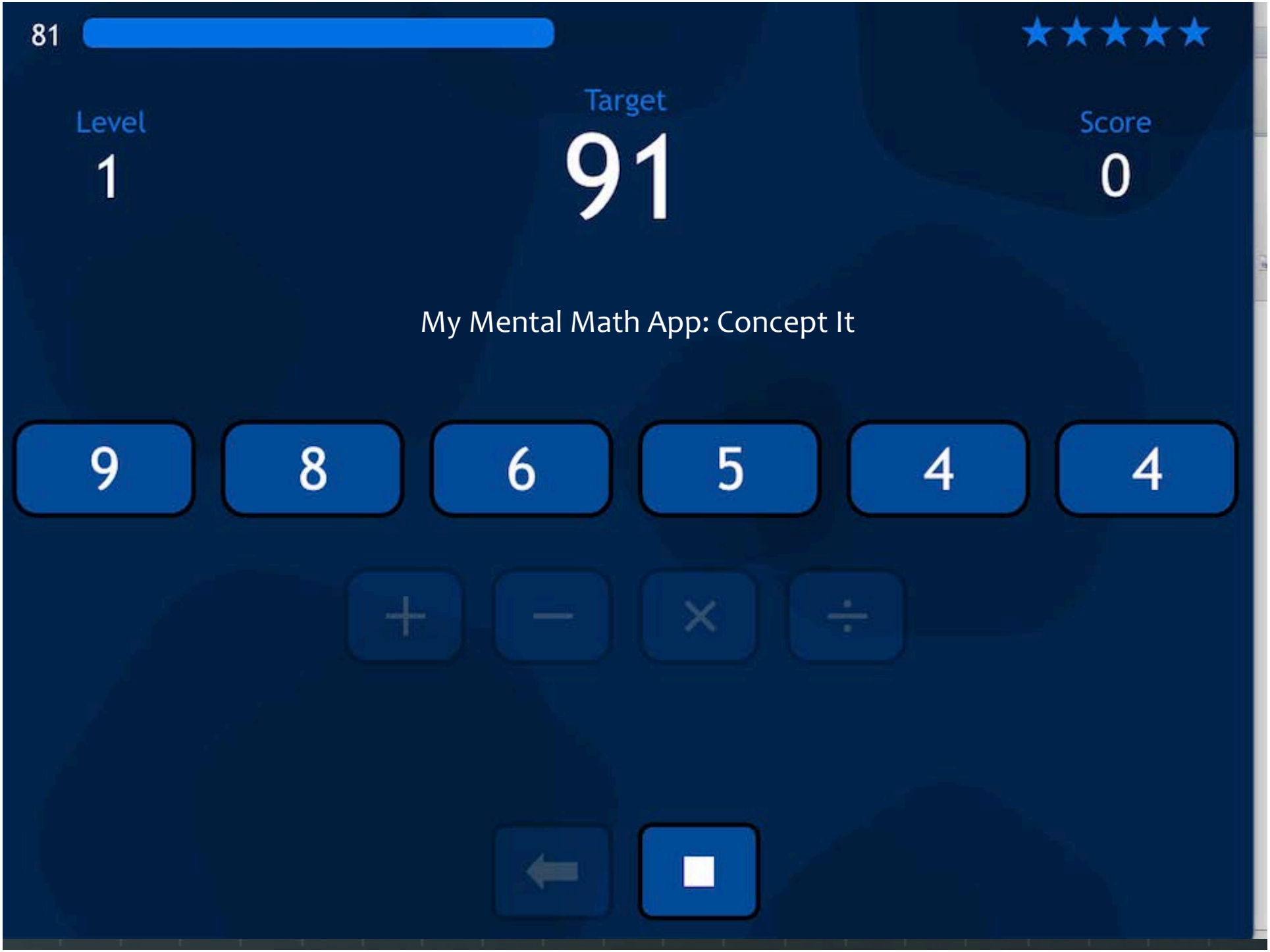
(Learning Alliance, 2006)

Activities and Ideas

- Components of Number Sense x (Best Practices in Tech. + Best Practices in Math) = Improved Understanding

Mental Flexibility and Fluidity

- 10 Frame Fill: Classroom Focused Software
- My Mental Math: Concept It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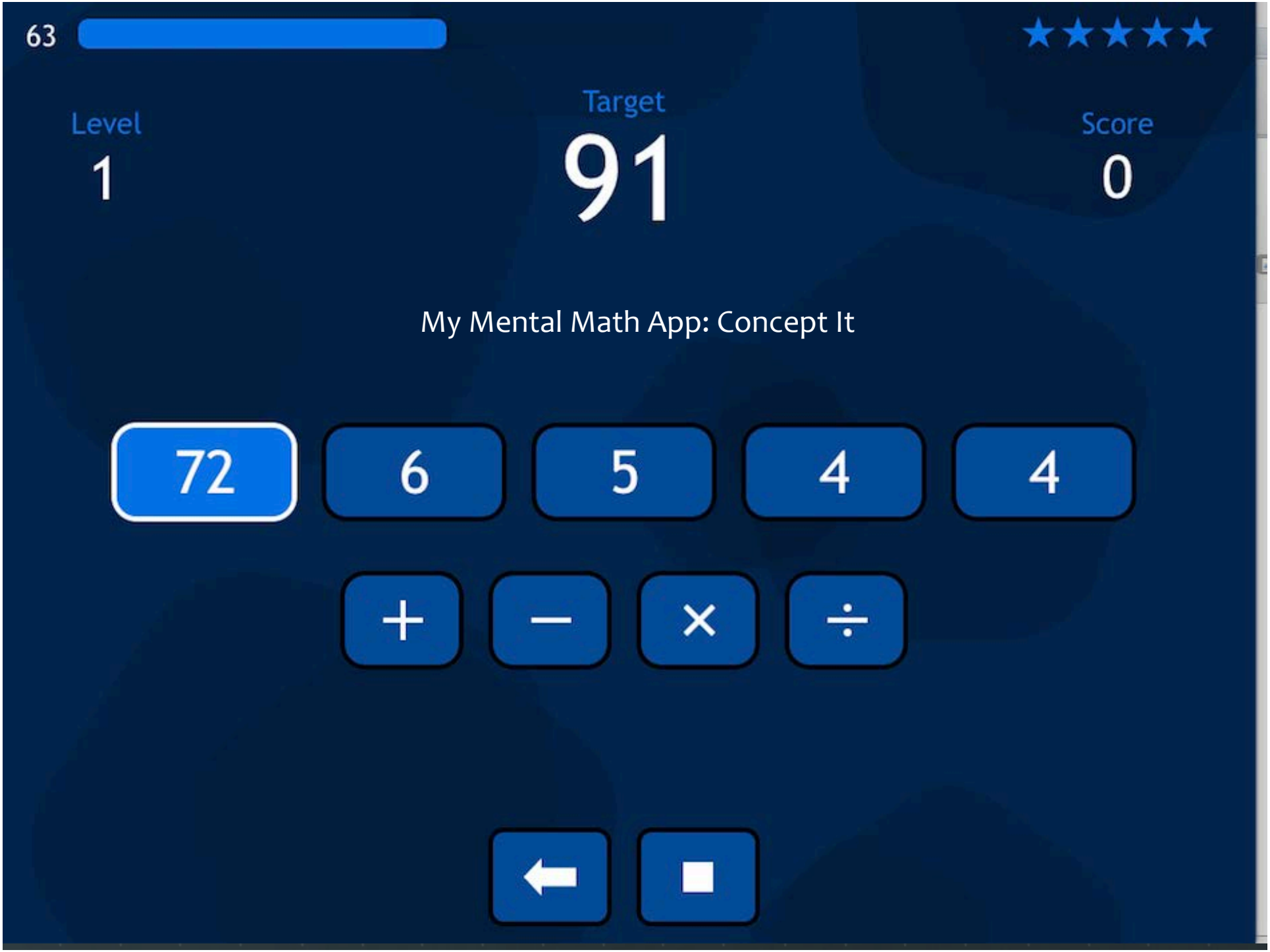
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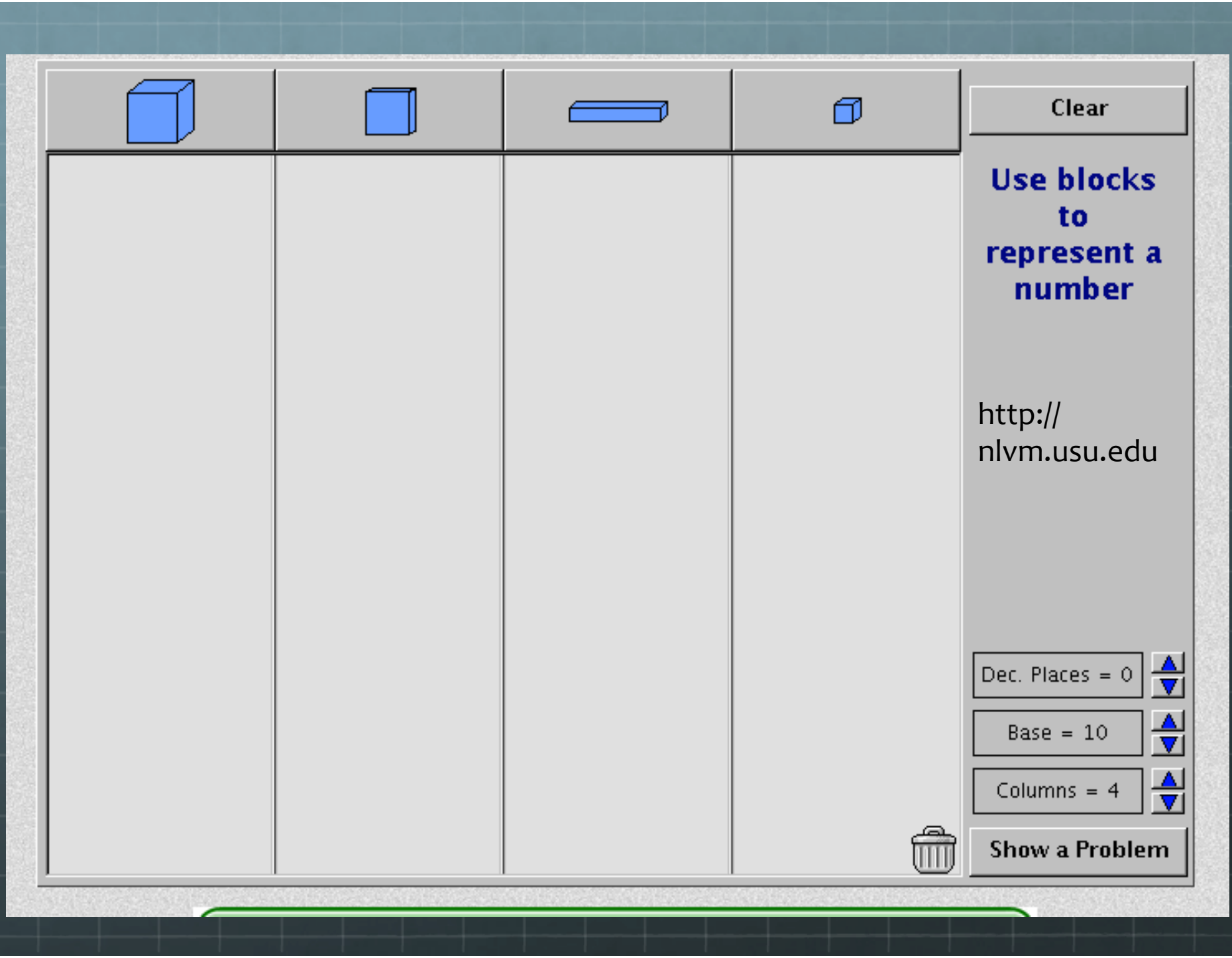
Representing Numbers in Different Formats

- Base Ten Math: Tap Fun
- Math Stretch: SAS Institute Inc
- Fractions: Braining Camp
- Native Numbers: Native Brain
- National Library of Virtual Manipulatives: Base Blocks (lots of choices) http://nlvm.usu.edu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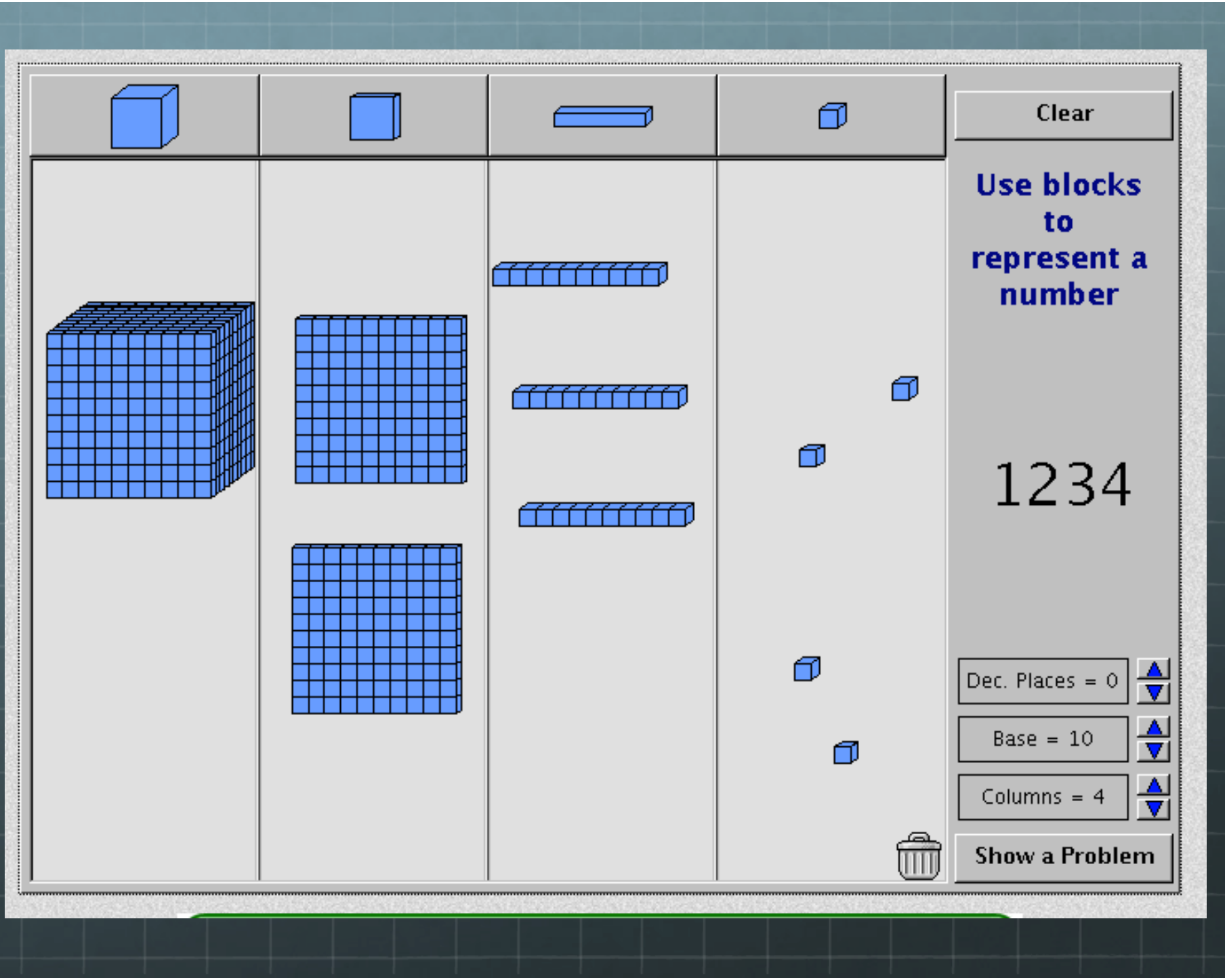
Use blocks to represent a number
http:// nlvm.usu.edu
Dec. Places = 0
Base = 10
Columns = 4
Show a Problem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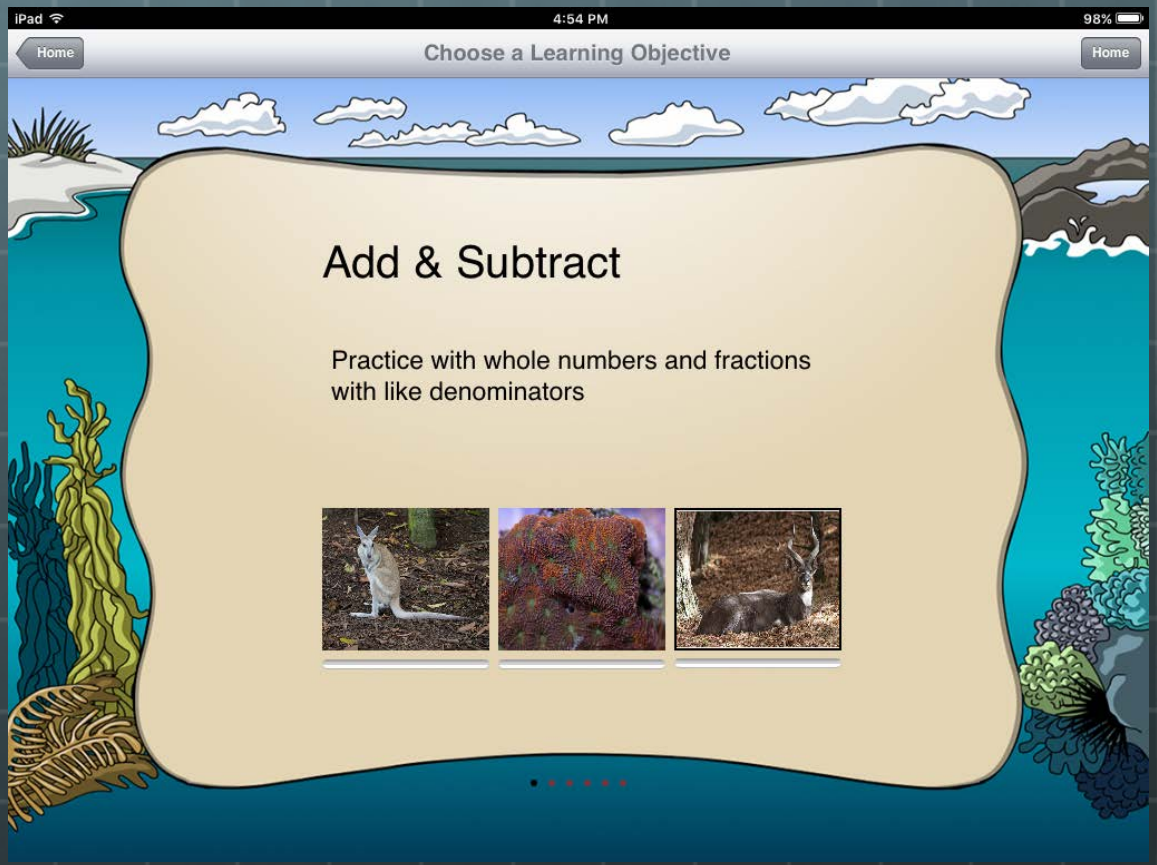
Dec. Places = 0
Base = 10
Columns = 4
Show a Problem

Real-World Comparisons

- Animal Watch: University of Arizona



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Home Choose a Learning Objective Home

Integers Part 2

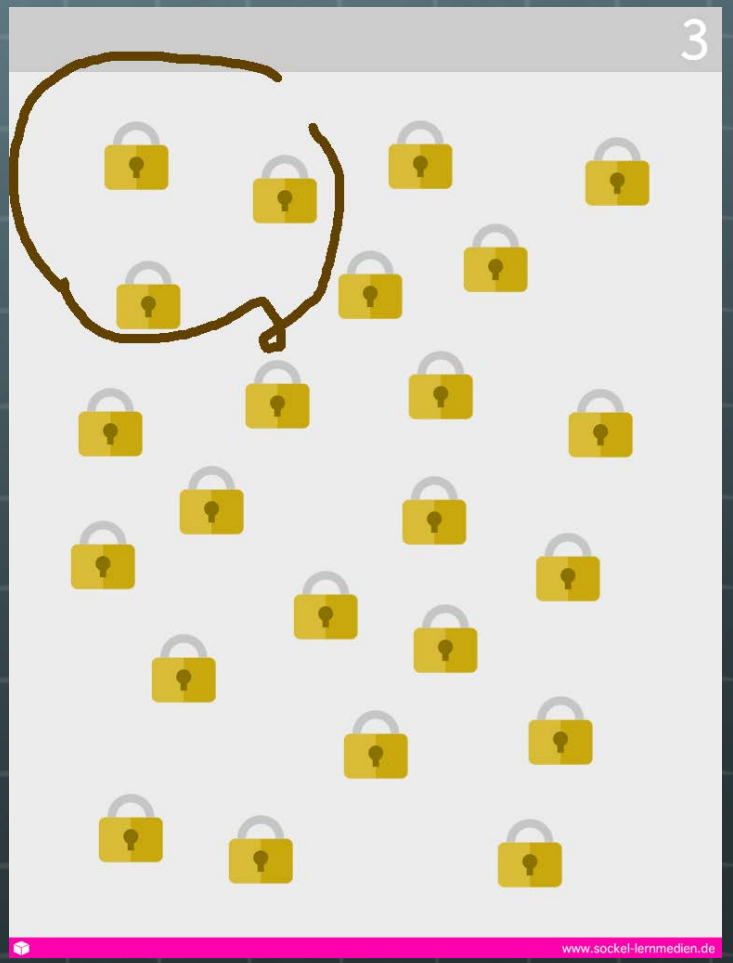
Multiplication and division with positive and negative integers

Animal Watch App: University of Arizona

Math is Quantity, Not Numbers

- Math Base –

Quantity Lasso: Marc Sockel



Proportional Reasoning

- Thinking Blocks Ratios: Math Playground
- Math Stretch by SAS Institute Inc.

Word Problem: The ratio of pop tunes to country tunes on Nicole's mp3 player is 3:2. If Nicole has 6 country tunes, how many pop tunes does she have?

Thinking Blocks

Build a model that represents the ratio in the story problem.

Thinking Blocks: Math Playground

pop tunes

country tunes

Check

Feedback
You have all the blocks needed to solve this problem.

Missing Quantity

Word Problem: The ratio of pop tunes to country tunes on Nicole's mp3 player is 3:2. If Nicole has 6 country tunes, how many pop tunes does she have?

Thinking Blocks

Build a model that represents the ratio in the story problem.

pop tunes

country tunes

Check

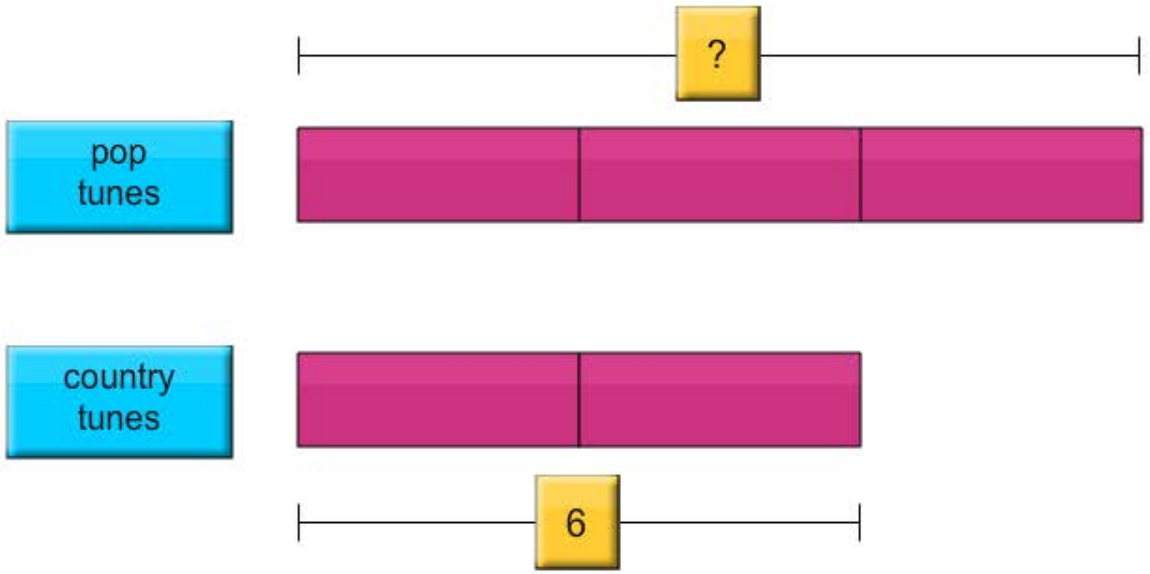
Feedback
You have all the blocks needed to solve this problem.

Missing Quantity

Word Problem: The ratio of pop tunes to country tunes on Nicole's mp3 player is 3:2. If Nicole has 6 country tunes, how many pop tunes does she have?

Thinking Blocks

Add numbers to your model. Use a ? to show the missing number.



Check

Feedback
Excellent work! Blocks and labels have been placed correctly. Now you can add numbers to the model.

Missing Quantity

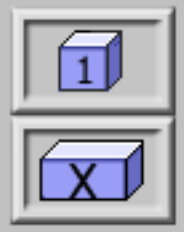
Algebraic Thinking

- National Library of Virtual Manipulatives

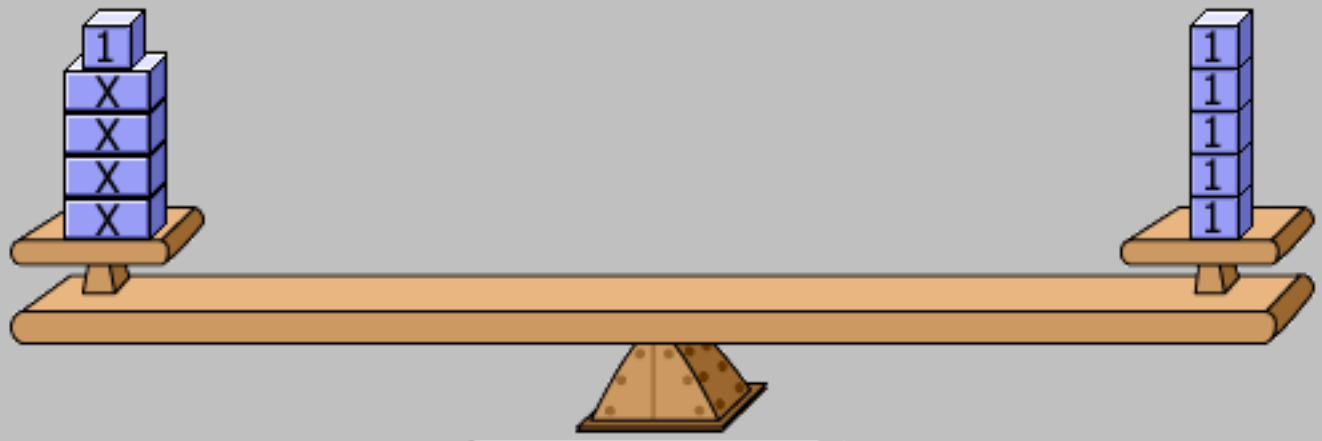
http://nlvm.usu.edu/en/nav/topic_t_2.html

Click and drag quantities from bins to balance beam pans to represent the equation.

$$4x + 1 = 5$$



http://nlvm.usu.edu/en/nav/frames_asid_201_g_3_t_2.html?open=instructions&from=topic_t_2.html



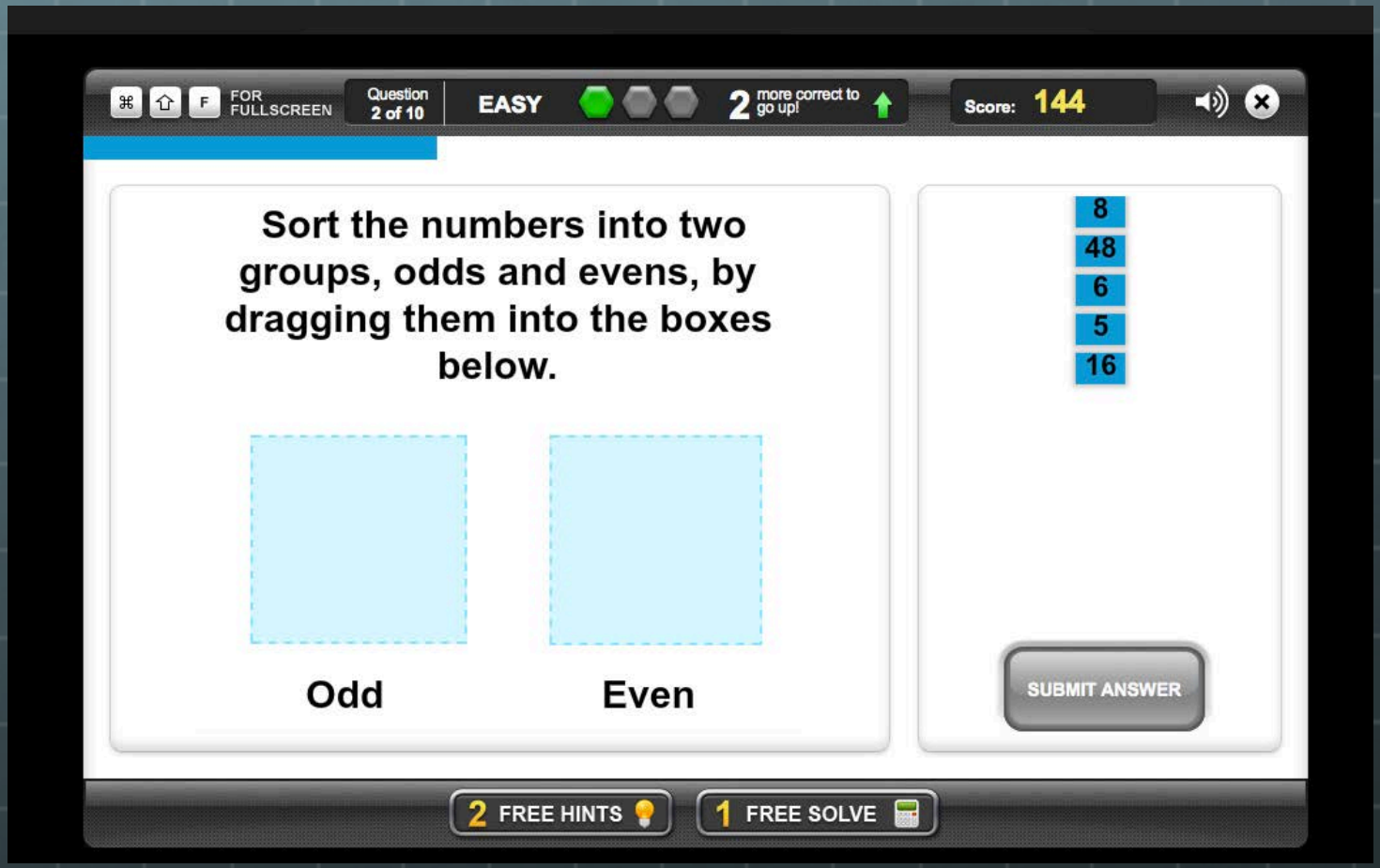
Continue

Clear | Create Problem | New Problem

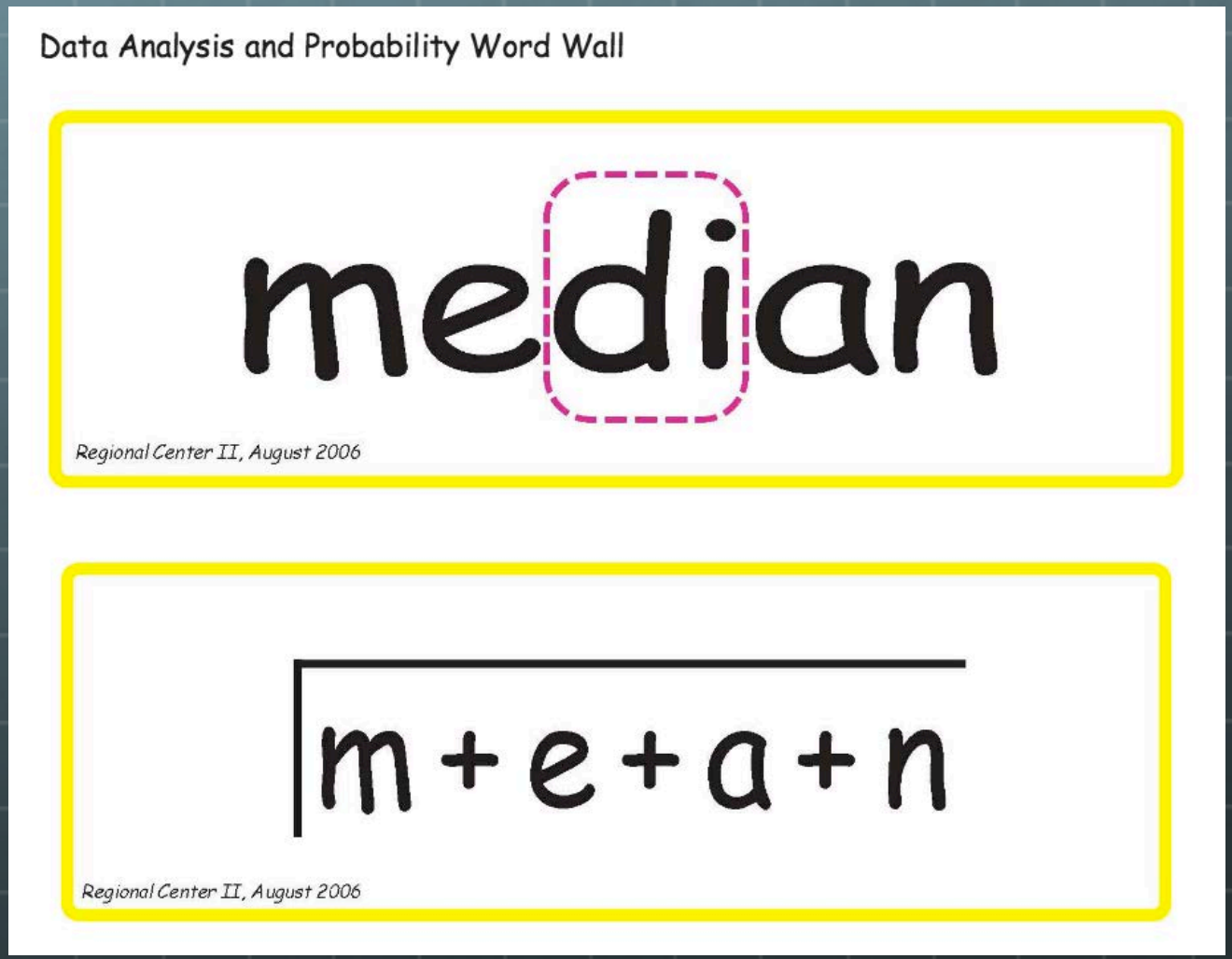
Students with Number Sense are able to …

- Recognize mistakes:
  - http://mathmistakes.org/
  - http://www.basic-mathematics.com/common-mistakes-in-math.html

- Recognize benchmark numbers and patterns:
  - https://www.mangahigh.com/en-us/math_games/algebra/algebra_and_sequences/recognize_number_patterns_and_relationships (timed)



- Explain Vocabulary:
  - www.broward.k12.fl.us/studentsupport/ese/PDF/MathWordWall.pdf



- Apply Learned Skills in Word Problems:
  - Drill Math Word Problems - Banana Math: Power Math Apps
  - Math 4 Adults - Word Problems Every Grown Up Should Know
  - Thinking Blocks Addition, Multiplication, Fractions: Math Playground
  - Math Shake: Top Storey
  - Math Word Problems Step by Step app (Janine Tool)

References

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- 2. Gertsen, R. & Chard, D. (2001). Number Sense: Rethinking Arithmetic Instruction for Students with Mathematical Difficulties. Retrieved from http://www.ldonline.org/article/5838/
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