# Warm-up: Go Play!

Download the Pick-a-Path app from iTunes or Google Play.

Were you engaged? Did you learn something?
How could you use this to teach? Will you?

NCTM NATIONAL COUNCIL OF TEACHERS OF MATHEMATICS

# Welcome

| | | | |
|---|---|---|---|
| 7 | 8 | 3 | 2 |
| 8 | 9 | 4 | 3 |
| 17 | 18 | 13 | 12 |
| 14 | 15 | 10 | 9 |

NCTM NATIONAL COUNCIL OF TEACHERS OF MATHEMATICS

# Welcome

| | | | |
|---|---|---|---|
| 7 | 8 | 6 | 2 |
| 5 | 9 | 4 | 3 |
| 17 | 18 | 13 | 12 |
| 14 | 15 | 10 | 9 |

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# What'd You Get?

**38**

# Session 38

# Whoa!

How did that work?

Join NCTM's New Teacher Facebook group to find out.

Ready. Set. GO!

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# Get Up! Get Movin! Get Started!

- Who are you? Where are you from?

# Session #38

# New Teacher Workshop

October 17, 2013

Sarah DeLeeuw

sdeleeuw@nctm.org

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# illuminations.nctm.org

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# Welcome!

- Info cards - Fill out Front & Back
- NCTM is interested in knowing what new teachers and those in training want.
- Prizes will be drawn using info cards!

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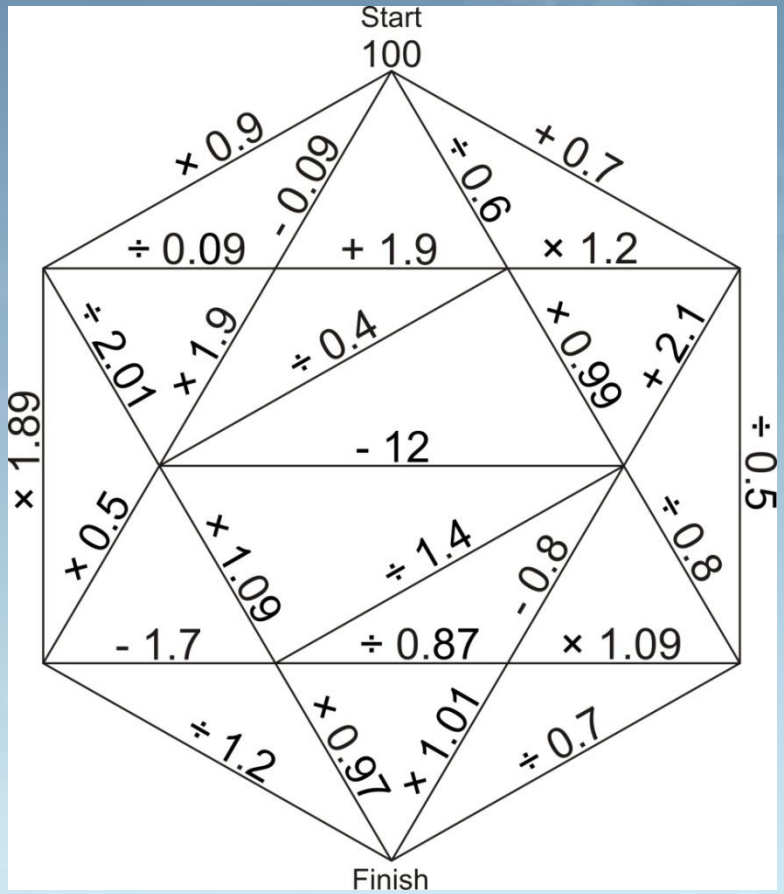
# Decimal Maze

- Begin with a value of 100.
- Move down or sideways from **Start** to **Finish**.
- As you cross a segment, perform the indicated operation.
- You may not go up. You may not cross a segment more than once.
- *What is the largest possible value when you reach **Finish**?*

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# Standards for Mathematical Practice

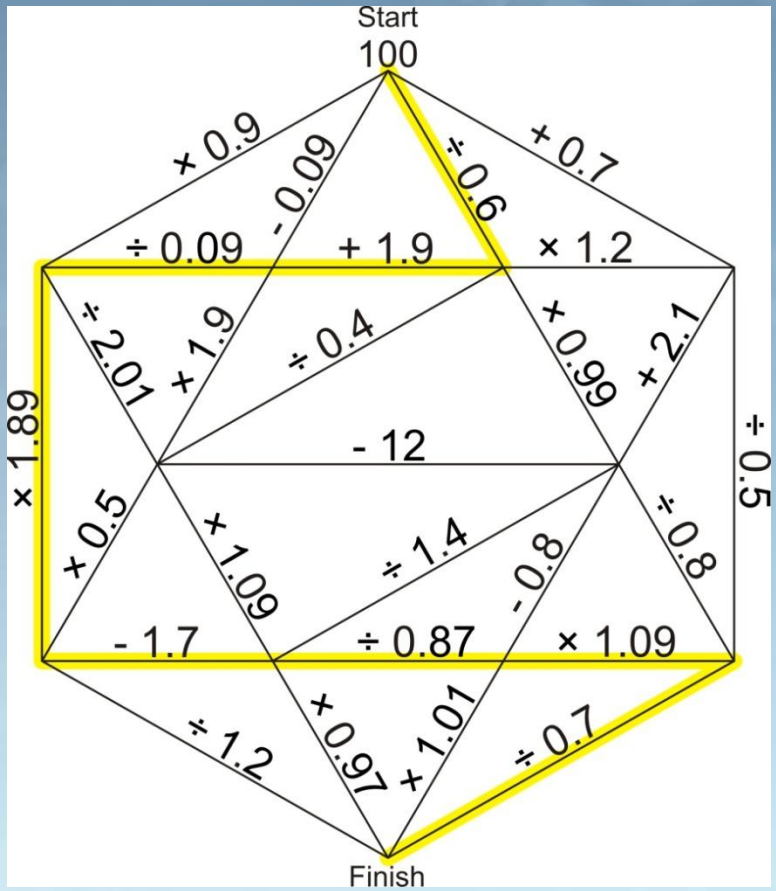
1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

# Reasoning and Sense Making

- It is very important for teachers to lead scholars into the habit of **attending to the process going on in their own minds** while solving questions, and of **explaining how they solve them**. […] It is next to impossible for a person to direct another's thoughts unless he knows the channel in which they are already flowing.
  - Warren Colburn, *Teaching Arithmetic in the Method of Pestalozzi*, **1830**

# Decimal Maze

- Maximum value: **6332**
- Minimum value?
- Finish value closest to 100?
- How many paths from Start to Finish?
- How else might you modify this activity?

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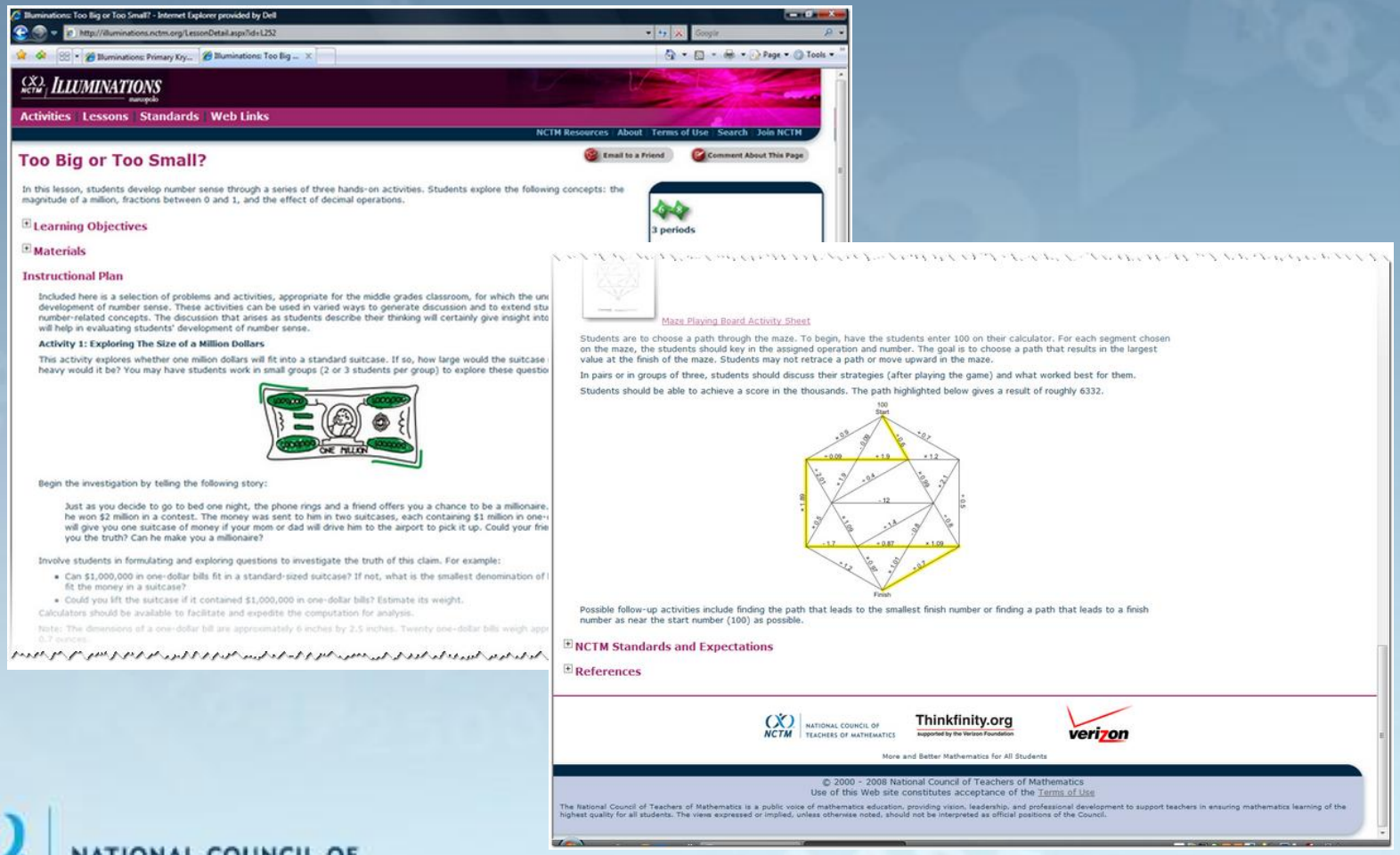
# Decimal Maze

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# Pick-a-Path

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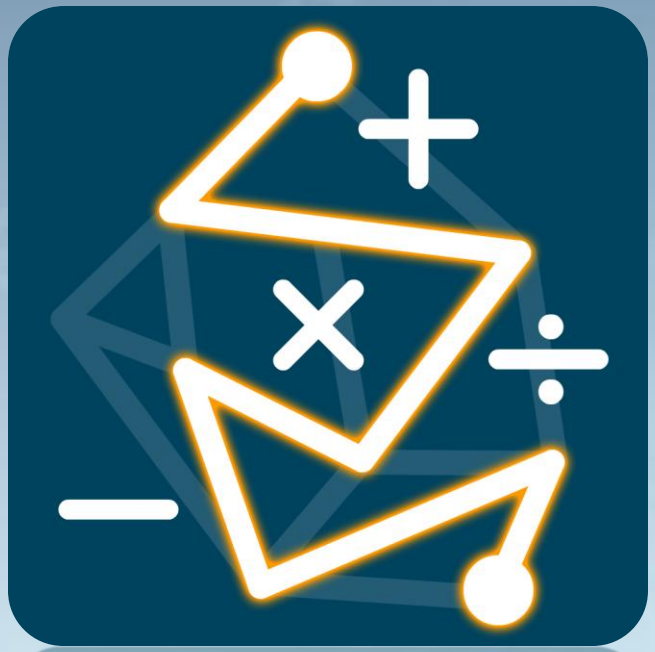
# Pick-a-Path

- http://illuminations.nctm.org/pickapath



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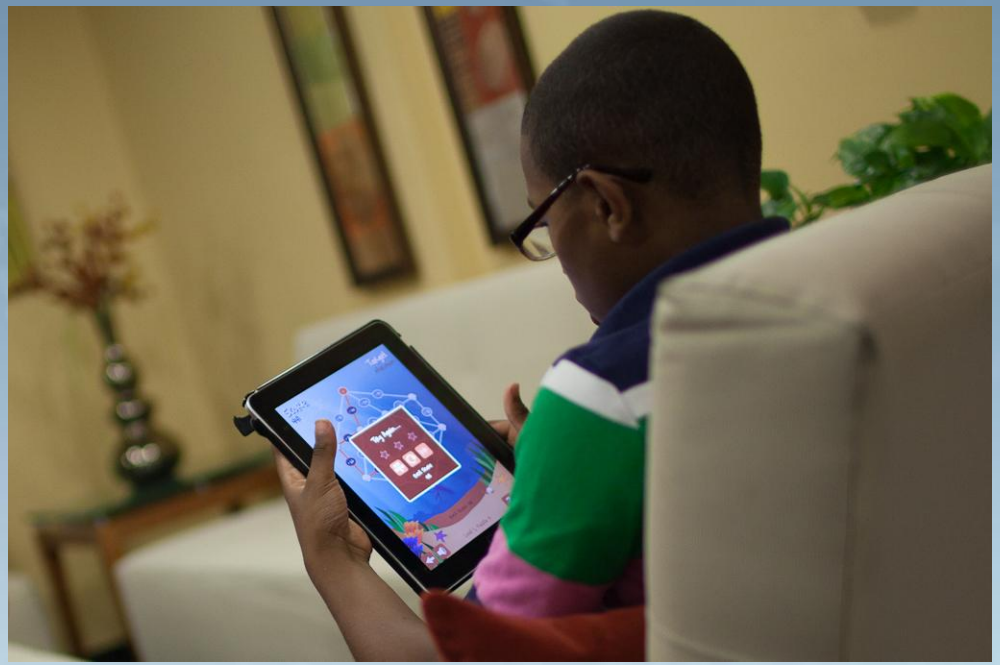
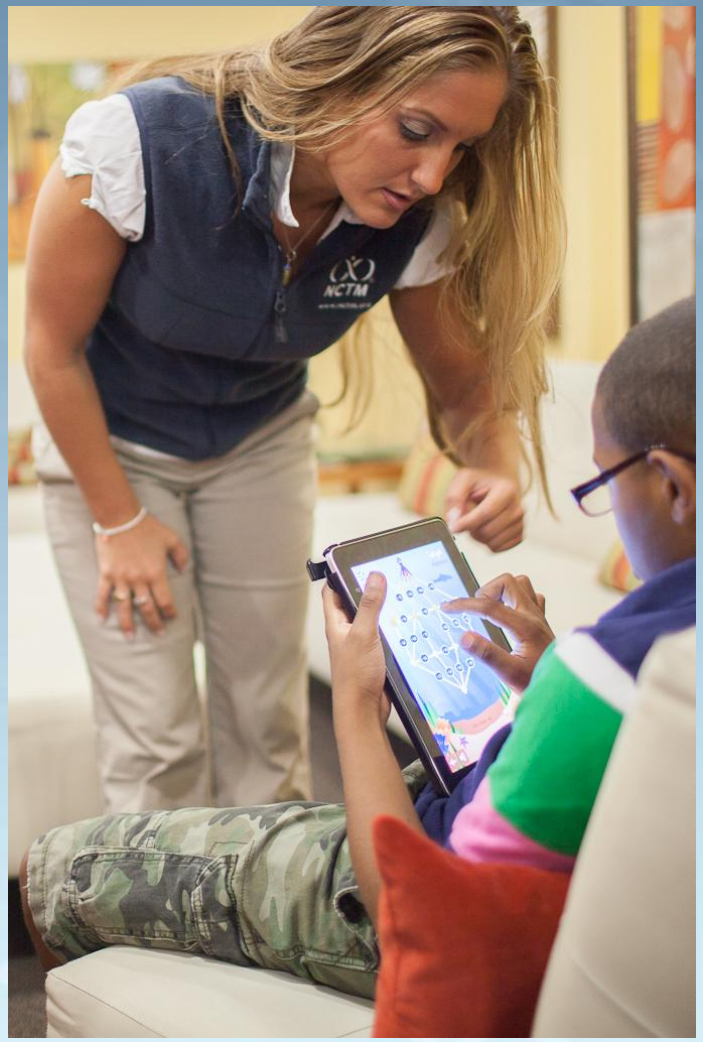
# Play Anywhere.
# Learn Everywhere.



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# Power Hour: A Familiar Concept?!

- It's 5 o'clock somewhere!

- Meet & Greet.
- Share & Learn.

- Ready, Set, Go!

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# Share and Learn

- Share: Offer an idea that has worked well for you with a colleague. Share your contact information too!

- Learn: Get an idea from a new friend. Fill in your blue sheets.

# Want Free Money?

- No, seriously.
- Learn more at www.nctm.org/met

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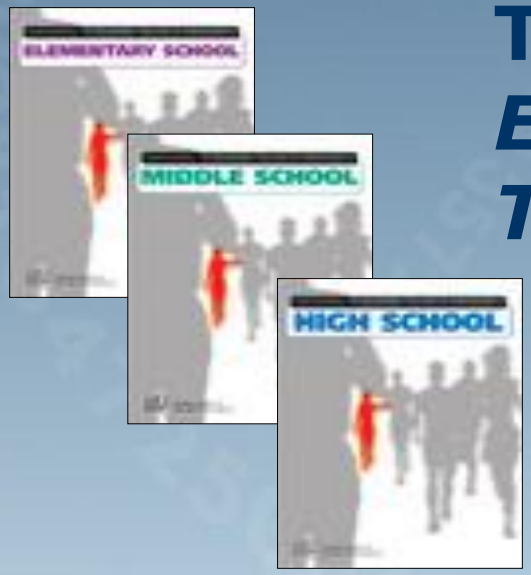
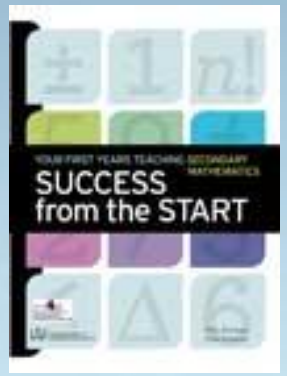
# Resources




## Tips from NCTM's *Empowering the Beginning Teacher of Mathematics* Series

***Success from the START: The Essential Guide to Navigating Your First Years of Teaching Secondary Mathematics***

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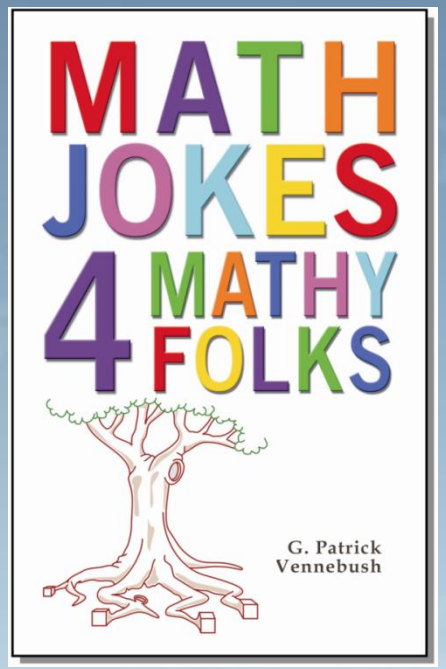
# Like what?!

- What do I do when students don't "get" the lesson?
- How can I help students who struggle with math that they supposedly learned in elementary school?
- How do I arrange for students who are absent to make up the work?
- Do I assign seating or let students choose their seats?
- Should I have students work in groups?
- How much homework should I assign—and how much should I grade?

# Simple and Oh So Fun




- Write a positive integer on a piece of paper.
- Show it to your neighbor.
- The winner is…

*Whoever wrote the smallest integer NOT written by anyone else.*

# What a constraint!

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# Another App from Under the Sea

- http://illuminations.nctm.org/deepseaduel

9 Card

Nice / Easy

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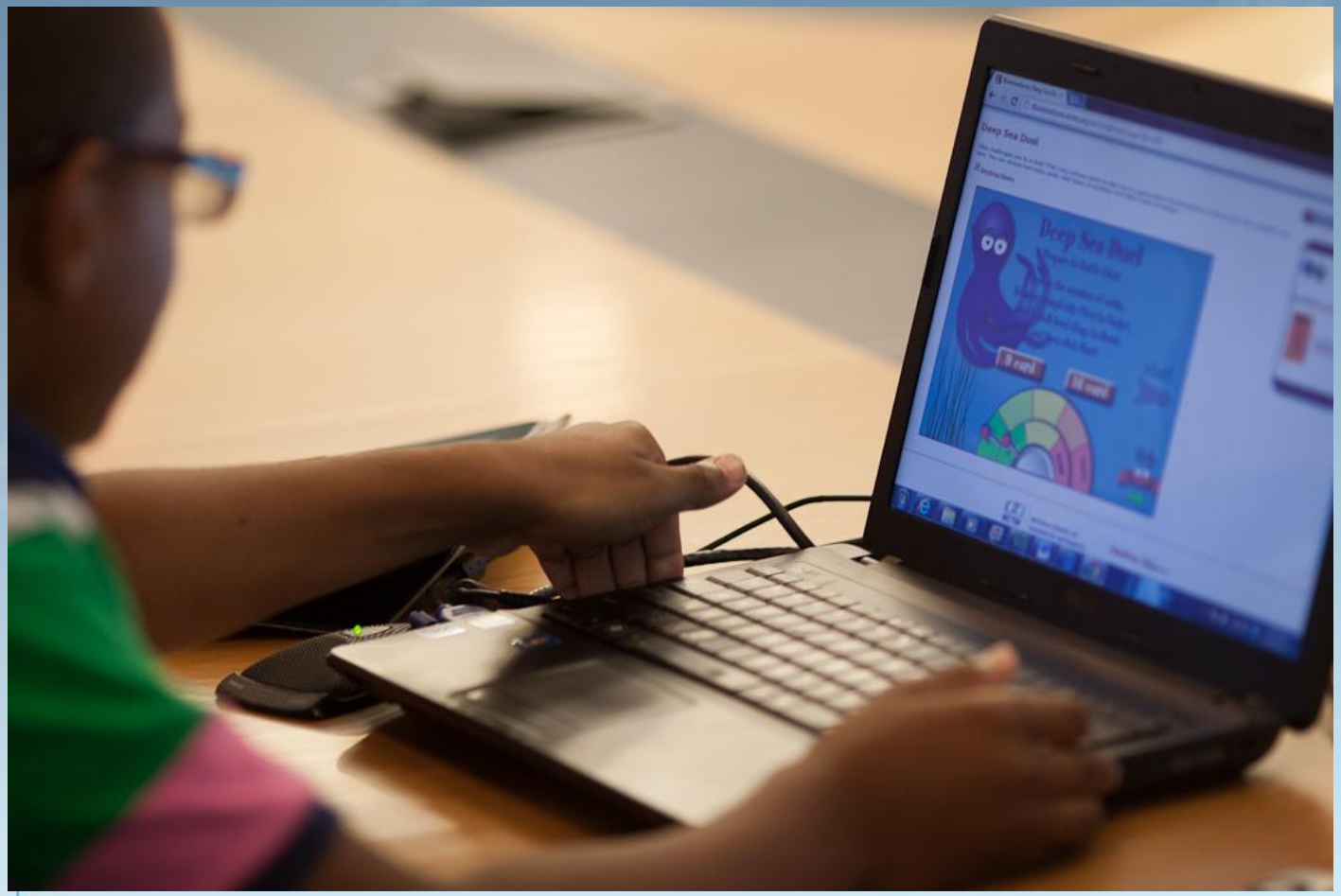
# Challenge Okta to Deep Sea Duel!

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# Options & Modifications in App

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# Learning is fun. Get addicted!

**Deep Sea Duel** is FREE online at Illuminations and Google Play and the App Store for phones and tablets.

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# 11Q – Q

sdeleeuw@nctm.org

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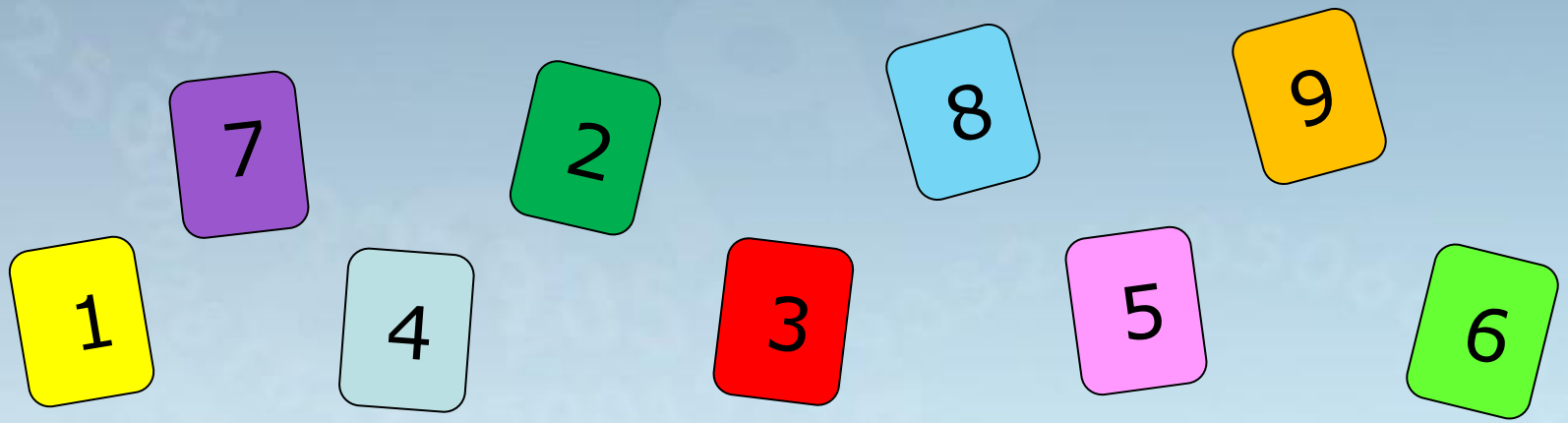
# Game of Nine Cards

- **Materials:** Nine cards numbered 1–9
- **Object:** To have any three cards in your hand that add up to 15

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# Game of Nine Cards

- Sample Game:

Player 1

Player 2

**Player 1 Wins: 2 + 9 + 4 = 15**

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# Game of Nine Cards

## Now what?

# You Play!

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# The Basics…

- Who is more likely to win — the first player or the second player? Why?
- Will someone always win? Lose?
- What can you do to ensure that you don't lose?

- Is there a "best" card to choose?
- Why do we use a sum of 15?

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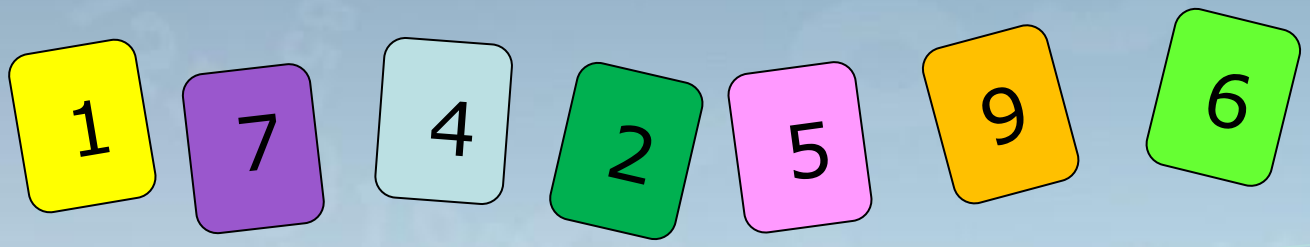
# A *Winning* Strategy?

- You play first, **pick 8**.
- Your opponent then **chooses 3**.
- What are the **three numbers** that you can choose to ensure a win?



Yours

His or Hers

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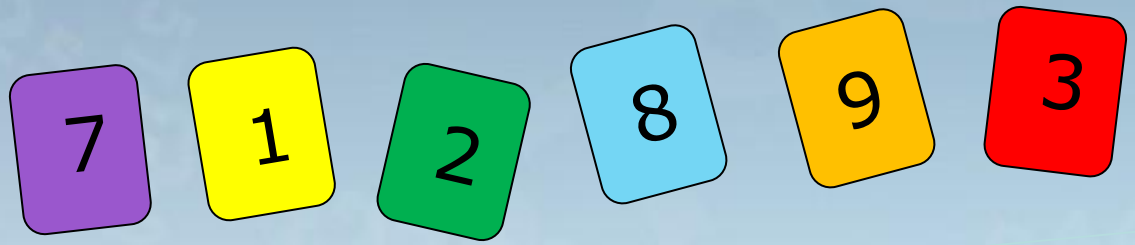
# A *Winning* Strategy?

- Your opponent plays first, **picks 6**.
- You **choose 5**.
- Your opponent **picks 4**.
- Which **two numbers** should you ***not*** pick?



Yours

His or Hers

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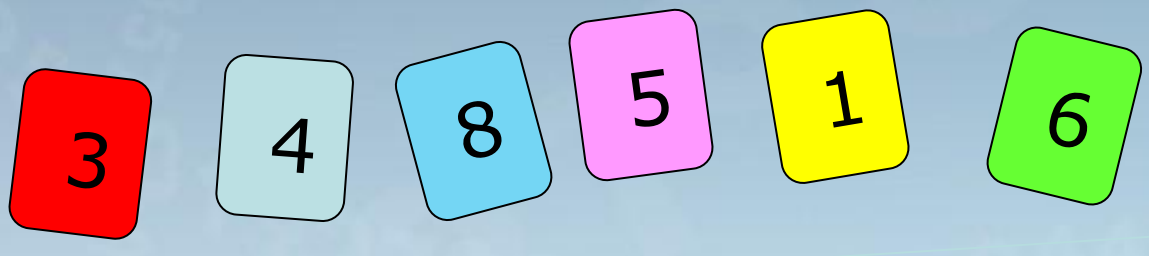
# A *Winning* Strategy?

- Your opponent plays first, **picks 7**.
- Then you **choose 2**.
- Your opponent **picks 9**.
- Which **three numbers** should you ***not*** pick?



Yours

His or Hers

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# More Sophisticated Yet?

- If your opponent plays first and picks an **even** number, what number should you choose to **avoid a loss**?

# Another App from Under the Sea

Deep Sea Duel

9 Card

Nice / Easy

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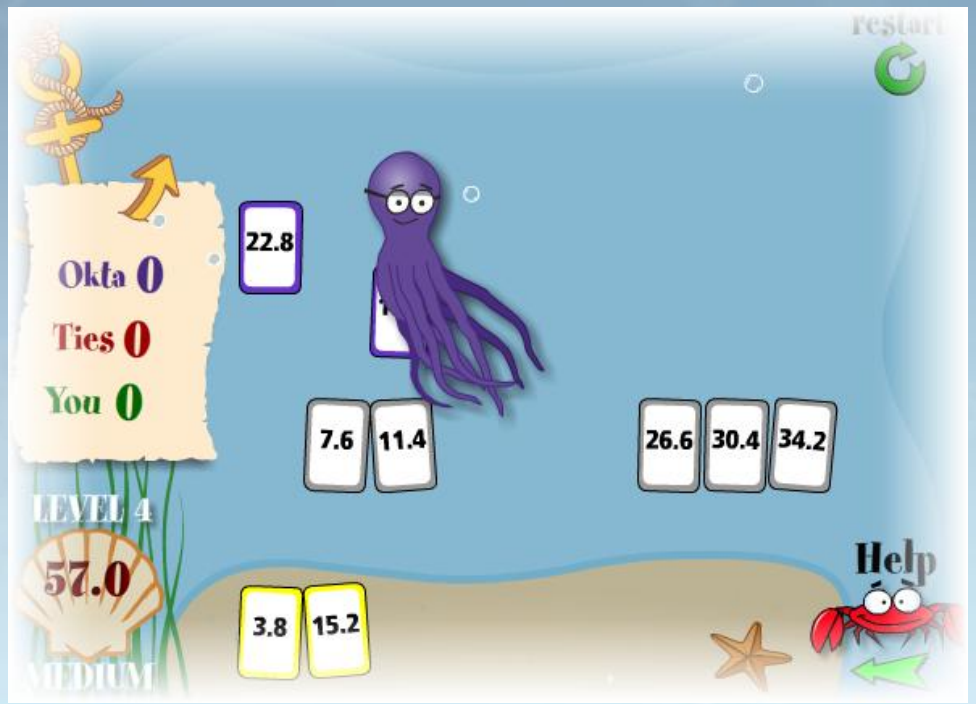
# Game of Nine Cards

- **Deep Sea Duel** is online!
  - http://illuminations.nctm.org/deepseaduel

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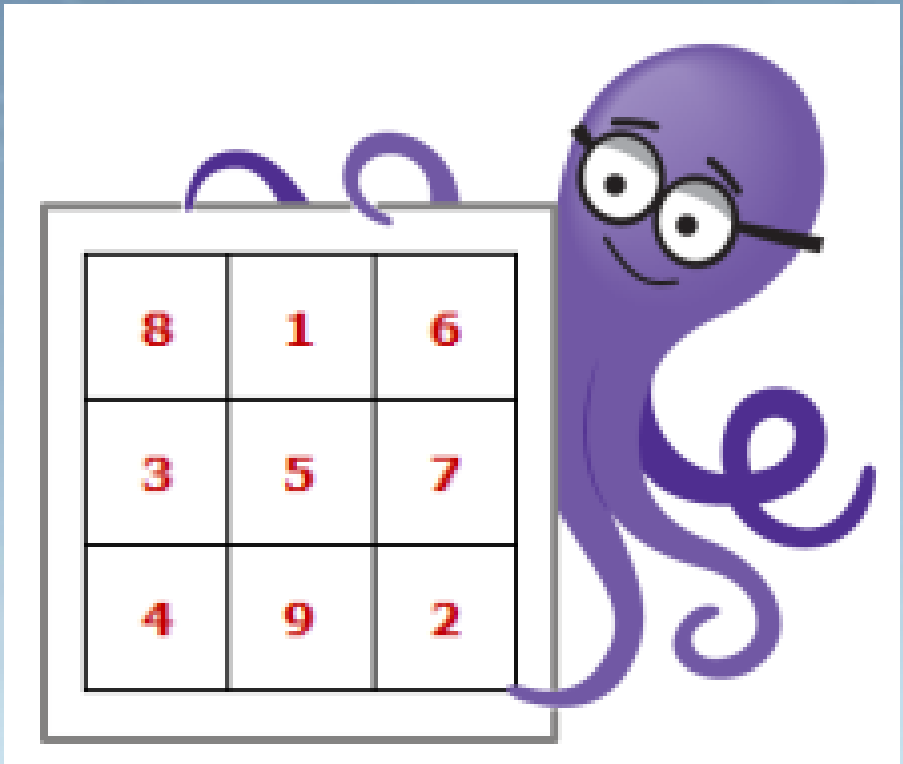
# A Hint from Under the Sea



# Modifying the Game of Nine Cards

- Label the nine cards as follows:

  **5, 12, 19, 26, 33, 40, 47, 54, 61**

  The winner must get three cards that total 99.

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Mahoney, John. What Is the Name of This Game? *Mathematics Teaching in the Middle School,* October 2005.

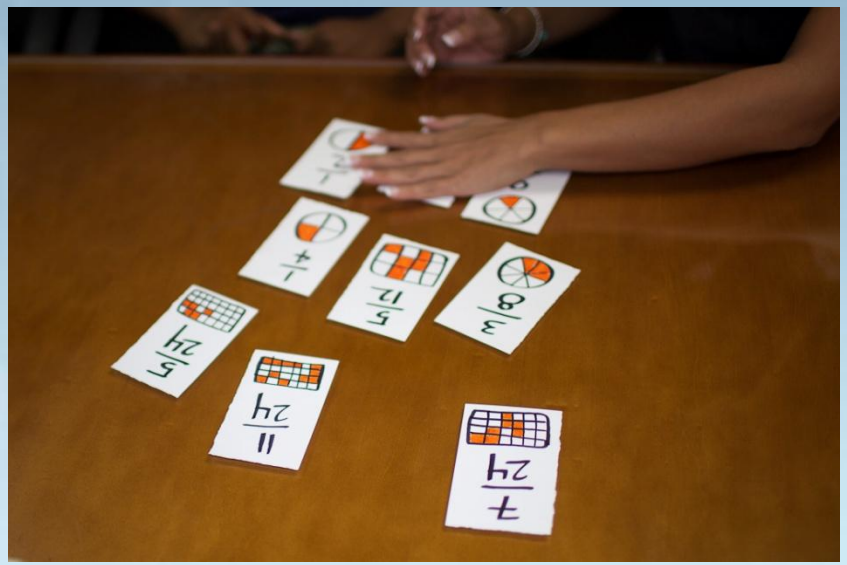
# Modifying the Game of Nine Cards

- Label your nine cards with fractions:

**1/6, 5/24, 1/4, 7/24, 1/3, 3/8,**

**5/12, 11/12, 1/2**

The winner must get three cards that total 1.



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Mahoney, John. What Is the Name of This Game?
*Mathematics Teaching in the Middle School,* October 2005.

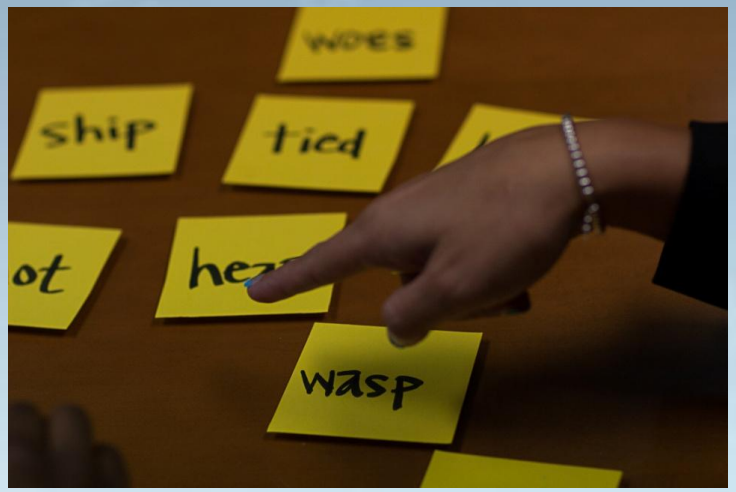
# Modifying the Game of Nine Cards

- Use words! Label the cards as follows:

***TIED, HOT, HEAR, TANK, WASP,***

***WOES, SHIP, HORN, BRIM***

The winner must get three cards that bear the same letter.



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Mahoney, John. What Is the Name of This Game?
*Mathematics Teaching in the Middle School,* October 2005.

# Modifying the Game of Nine Cards

- Use exponents!
- Label the nine cards as follows:

$$x,\ x^2,\ x^3,\ \ldots,\ x^9$$

The winner must the *product* get $x^{15}$.

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Mahoney, John. What Is the Name of This Game? *Mathematics Teaching in the Middle School,* October 2005.

# You tell me!

**What sum should the winner need to win?**

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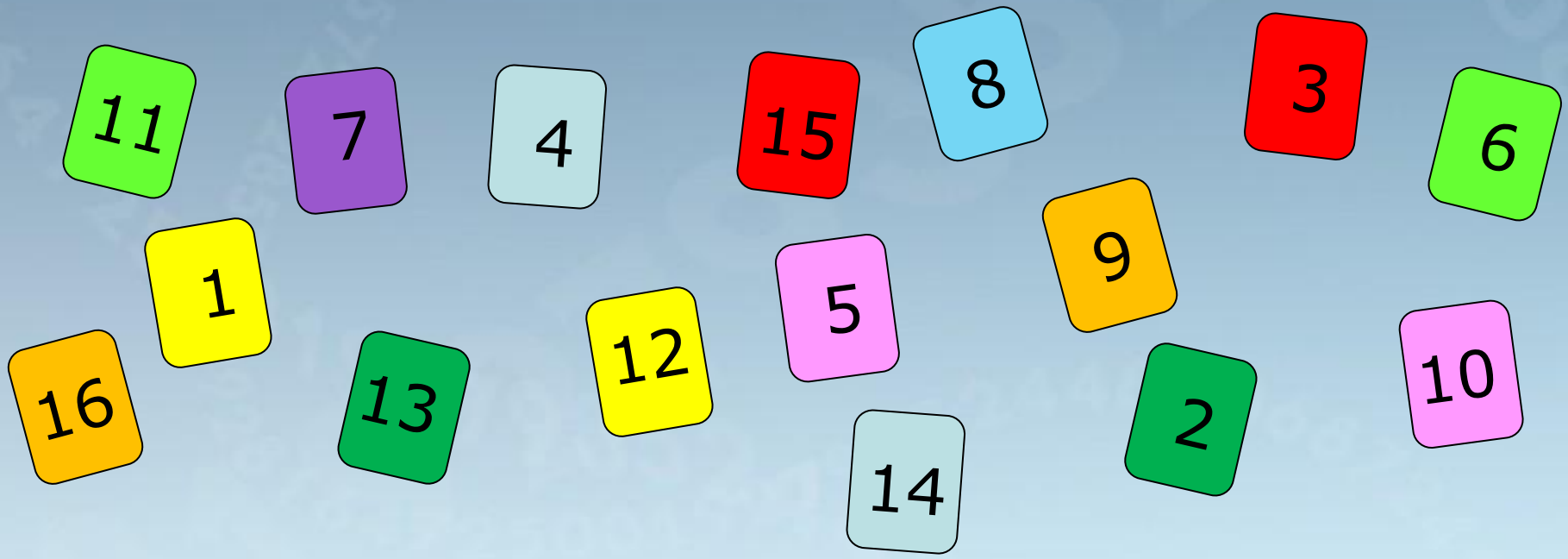
# From NINE to SIXTEEN

The winner would use the sum of *four* cards to win.

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Mahoney, John. What Is the Name of This Game?
*Mathematics Teaching in the Middle School,* October 2005.

# Another Extension

- The winner is the first player to obtain the sum of exactly 15 from any **TWO OR MORE** cards.

- Does your strategy change? How so?

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Yeo, Joseph. [Title removed in order to not give away punch line of strategy.] *Mathematics Teacher,* August 2012.

# Reminder: What is the Goal?

- How does your strategy from the first version of the game of 9 cards compare to the strategy for these modifications?

- REFLECT: *How* did I come up with these other versions for the game of 9 cards?

# Another App from Under the Sea

- http://illuminations.nctm.org/deepseaduel

9 Card

Nice / Easy

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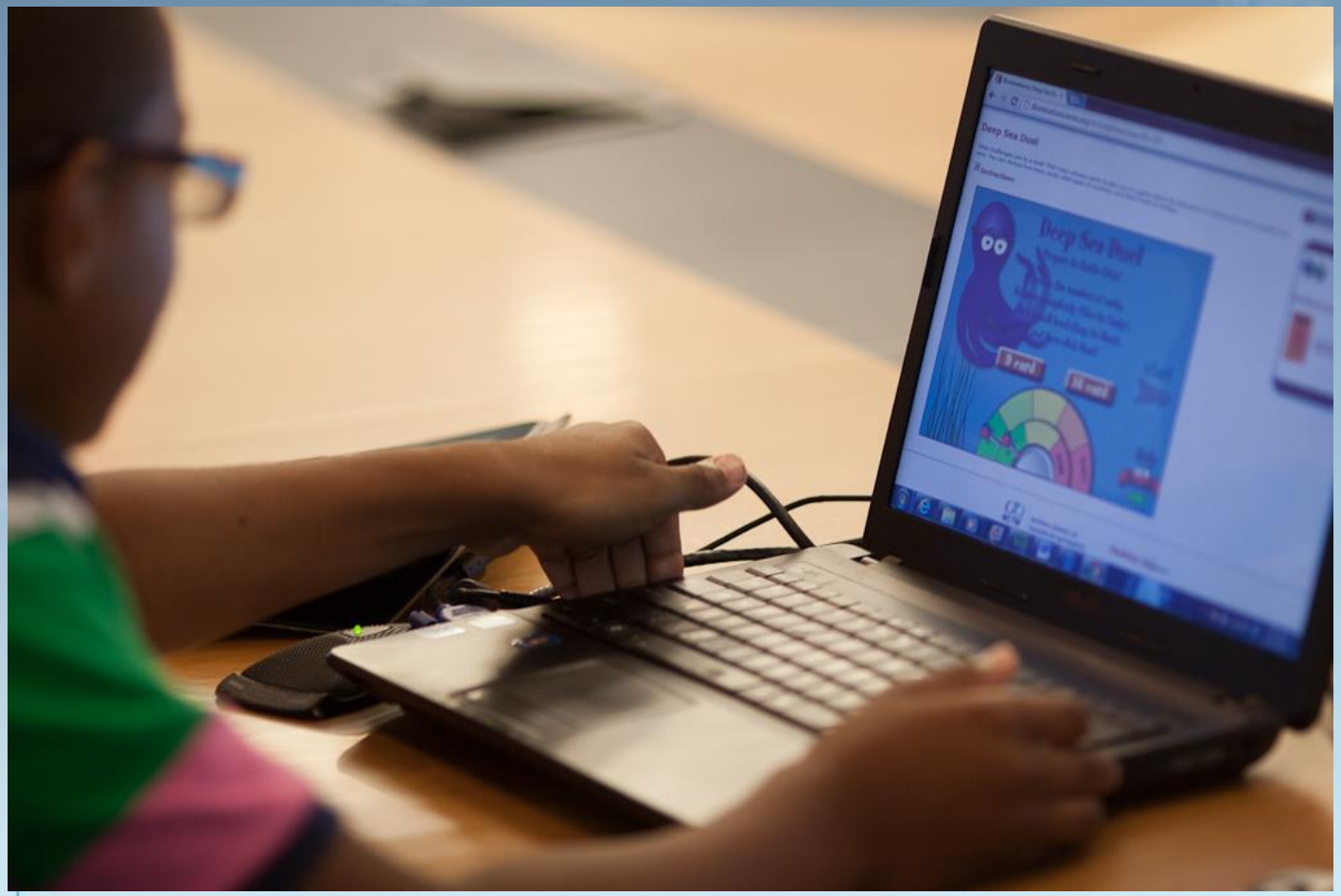
# Challenge Okta to Deep Sea Duel on the web.

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# Options & Modifications in App

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# Learning is fun. Get addicted!

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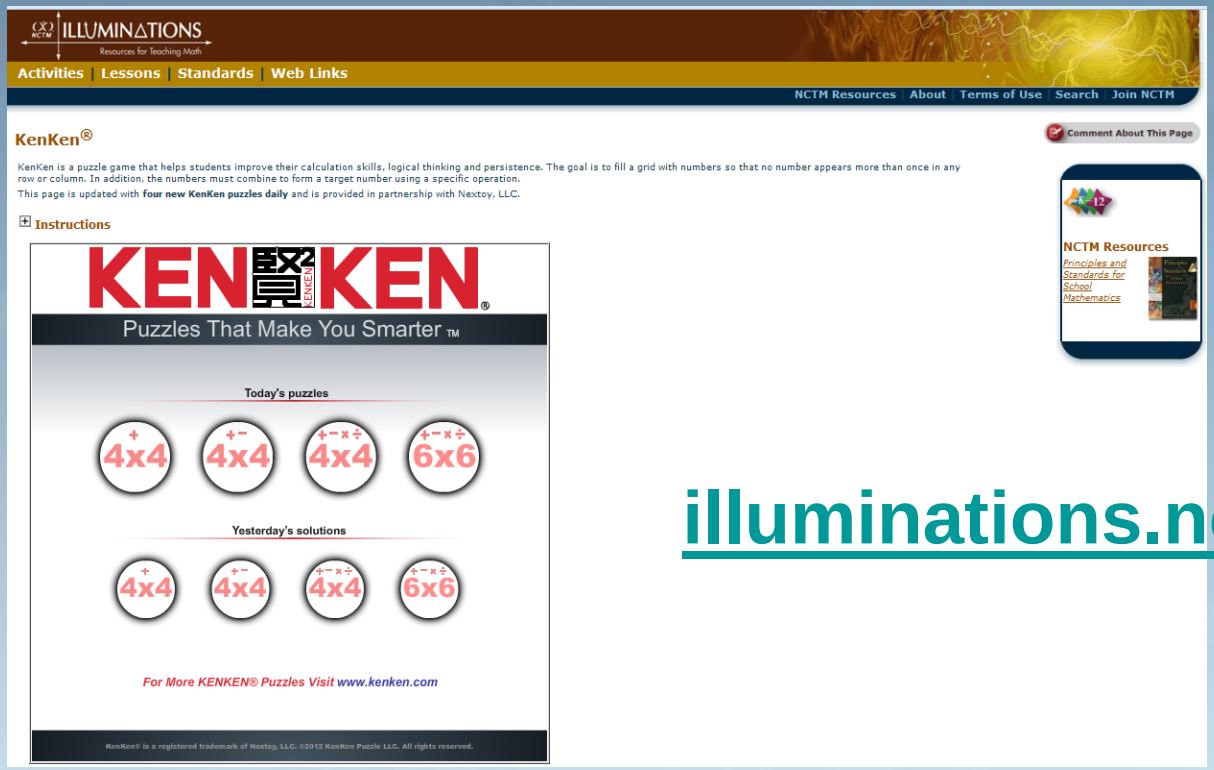
# KenKen®




[illuminations.nctm.org/kenken](illuminations.nctm.org/kenken)

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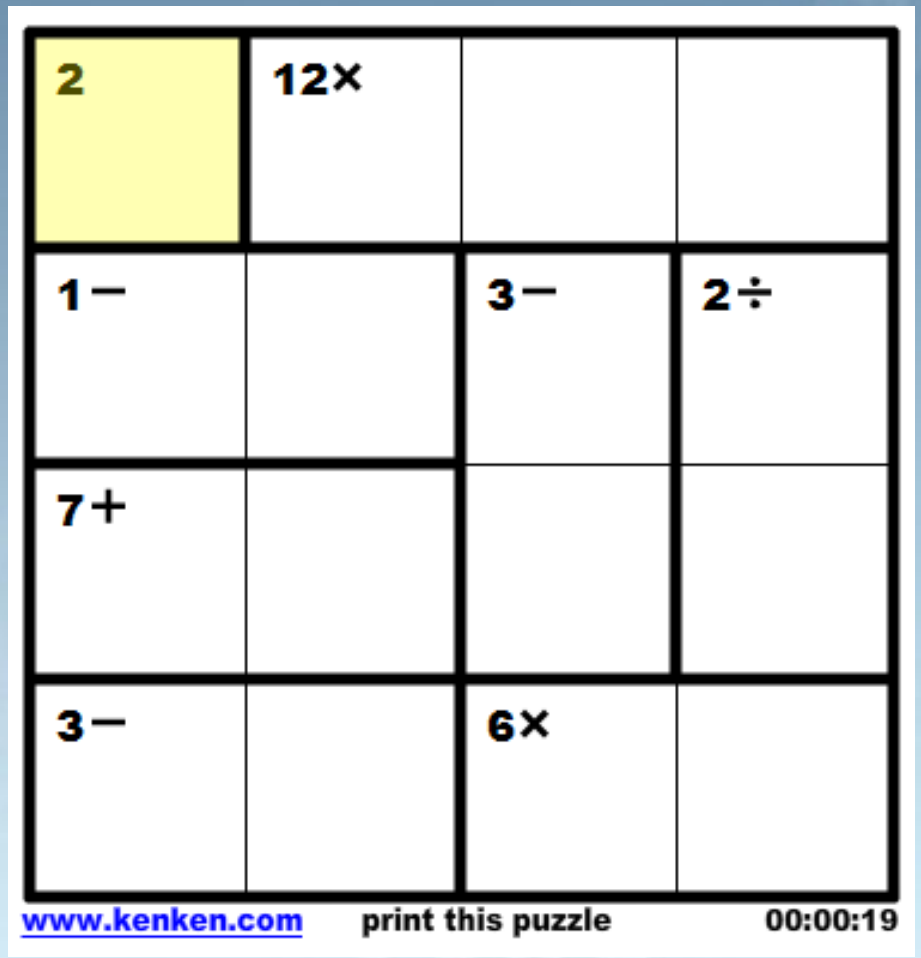
# An Example

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# 11Q – Q

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# 11Q – Q

- Thank you for attending the session and for all you'll do as a teacher.
- This is the best job on earth!
- Stand up straight!
  Hold your head high!
  Look people in the eye and announce proudly,
  "I am a teacher!"

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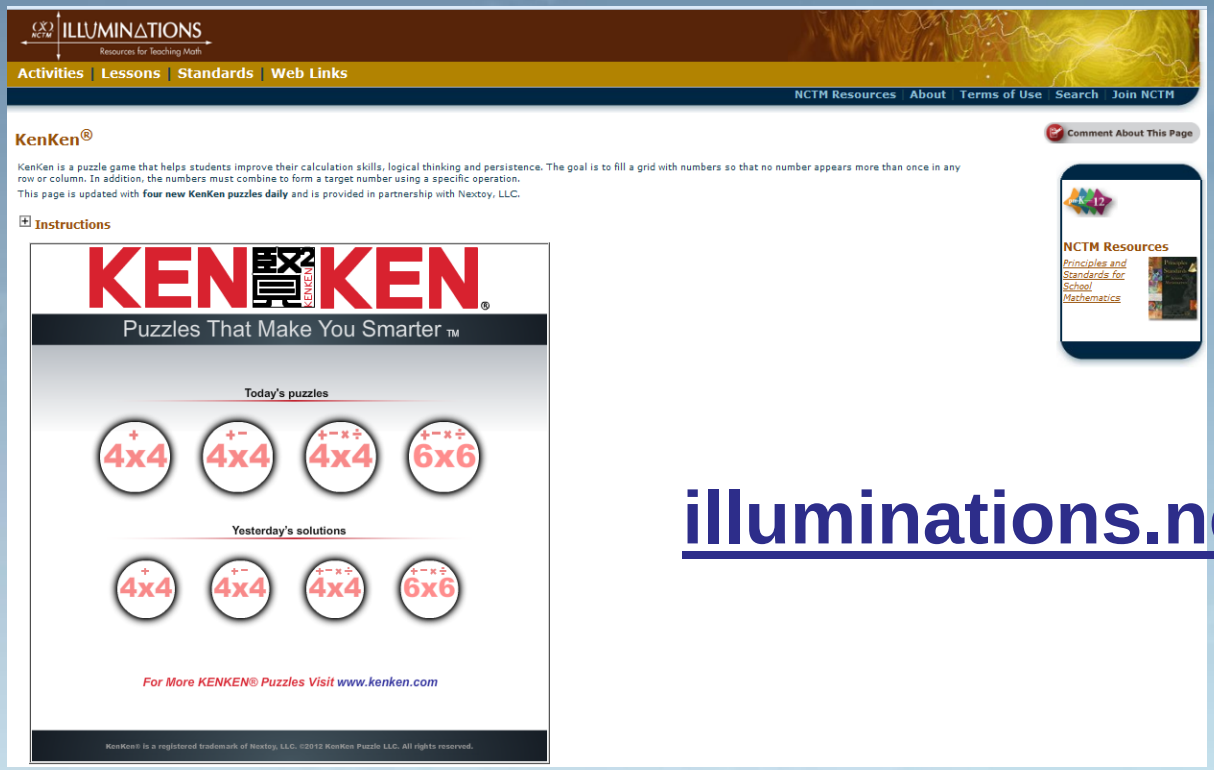
# KenKen®




[illuminations.nctm.org/kenken](illuminations.nctm.org/kenken)

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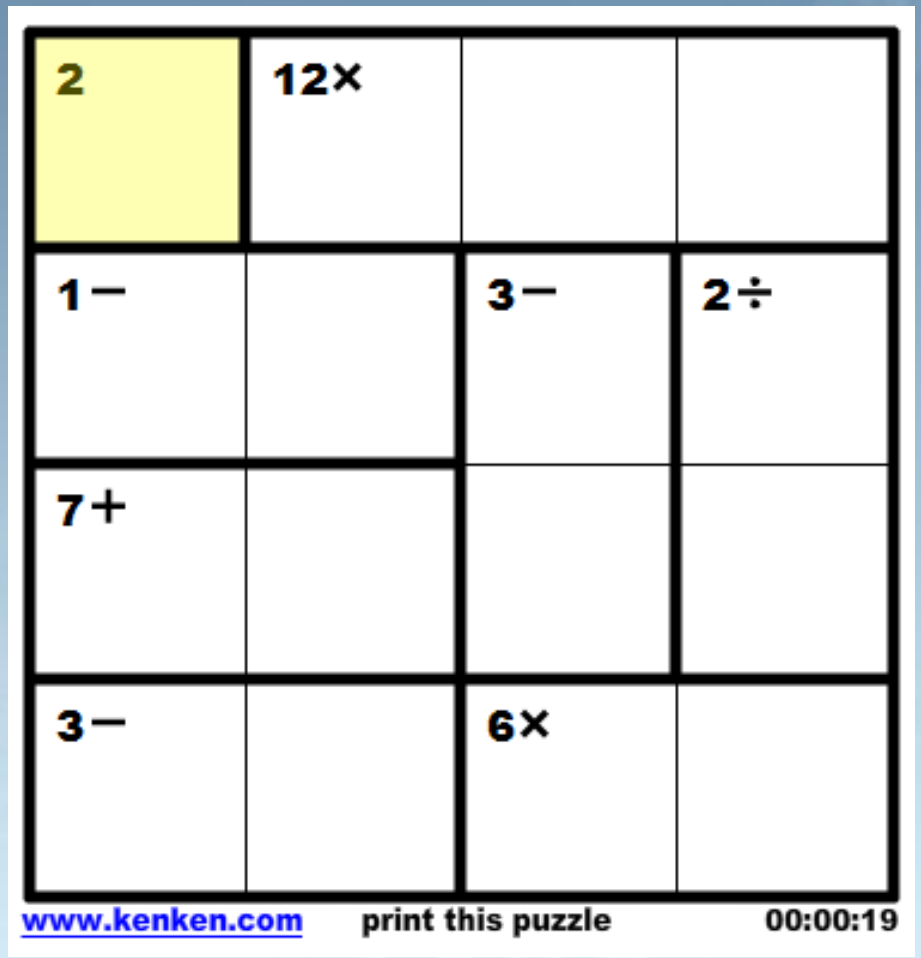
# An Example

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# Discussion Topics

- Planning
- Instruction
- Assessment
- Classroom Organization
- Classroom Management
- Homework
- Questioning Techniques
- Using Technology
- Online Resources
- Motivating Students
- Problem Solving
- Group Work
- Parents and Family
- Keeping Your Sanity

# Planning

- Questions to ask:
  - What do I want? – Be Specific!
  - Do you have a hook?
  - How do you engage?
  - Is there another way?

# Planning

- Write it Down!
  - Jot down ideas/notes in your book
  - Recalling a good teaching suggestion from a previous year may be difficult
- Ask, Listen, Decide!

# Instruction

- Door Problems!
  - Quick problem when they hit the door
  - Always have an assignment
- Know your content
- Know your audience
- Strategies for learning

# Instruction

- If a lesson is going badly
  - –STOP
    - – Regroup with a new approach, or Do something else
    - – Examine what went wrong
    - – Make plans for the next day

# Assessment

- Help students learn to explain their reasoning
- Ask "Why?" and questions such as:
  - What did you do first?
  - How could I show that?
  - Then what did you do? Why?
  - I don't understand how you did that. Can you tell me more?

# Assessment - Scoring

- Valuing the Process and the Answer
  - Avoid all-or-nothing grading schemes
  - Insist on detailed explanations
  - Reward reasonable efforts and different approaches
  - Use “+2 out of 4” instead of “-2 out of 4”

# Classroom Organization

- Help students (and parents) to track their own progress
  - Create assignment sheet for students' notebooks
  - Make class folders where absent students find missed assignments/handouts.

# Classroom Management

- Have a seating chart – Day 1!
- Establish and enforce your classroom rules **consistently**
- Create engaging mathematics activities
- Create extensions of your activities to challenge your students

# Homework

- How much homework to assign?
  - What do you expect from the assignment?
  - What information will it provide you?
  - How many problems to assign?  Will 5 work?
  - How long did it take you?
- Homework quizzes

# Questioning Techniques

- Use class-centered prompts
  "Think about how you would …?"
- No yes/no or single number questions.
- Students justify answers - "Explain to us how you found your solution"
- Ask "Why?" a lot!

# Using Technology

- Technology is not **the** answer
- Use technology as a tool to make the learning of mathematics richer and better
- Scaffold an investigation with a handout of specific questions versus “Explore”
- Resist having students work individually

# Which Gray Matter?

- Hexagonal  Prism?
- Hard?
- Soft?

# Which Gray Matter? Quiz

- (14.26 * 2.7 * 4.5 * 0) + 27 = ?
- 1/3 + 3/8 + 2/10 = ?
- Square Root of 27 = ?

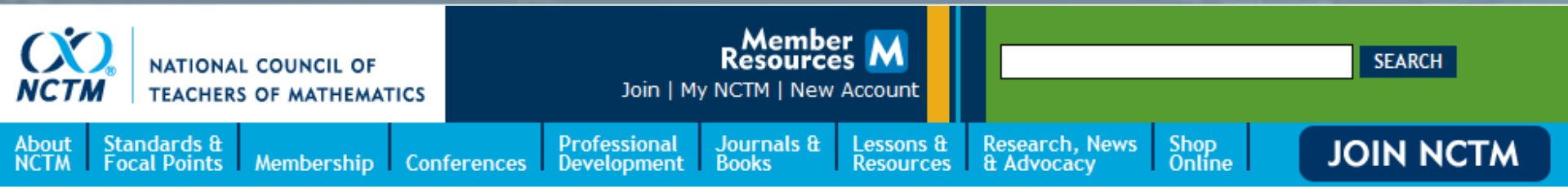
# Online Resources

- The NCTM Web site—www.nctm.org
  - Organized by elementary, middle, and high school
- NCTM Member's Only—www.nctm.org/members
  - Access to current and archived journals, On-Math, Student Math Notes, and more
- NCTM Standards—standards.nctm.org
  - Full text of *Principles and Standards for School Mathematics*, electronic examples for each grade band

# Online Resources

- Illuminations Web site—illuminations.nctm.org
  - Lesson plans for teachers, interactive applets for students, reviewed Web resources
- Reflections Web site—www.nctm.org/reflections
  - Reflect on instructional practices through video clips, lesson plans, and student work
- Figure This! Web site—www.figurethis.org
  - Math challenges for middle school students, information to help families get involved

# Elementary School @ nctm.org




★e-Examples

TEACHING CHILDREN Mathematics

★Article Downloads

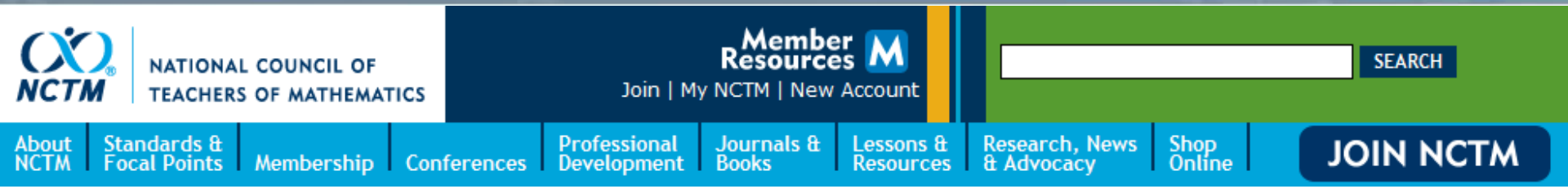
★Problem Database

Student Explorations in Mathematics

★Elementary School

➢Investigations

# Middle School @ nctm.org




★e-Examples

mathematics teaching in the MIDDLE SCHOOL

★Article Downloads

★Problem Database

Student Explorations in Mathematics

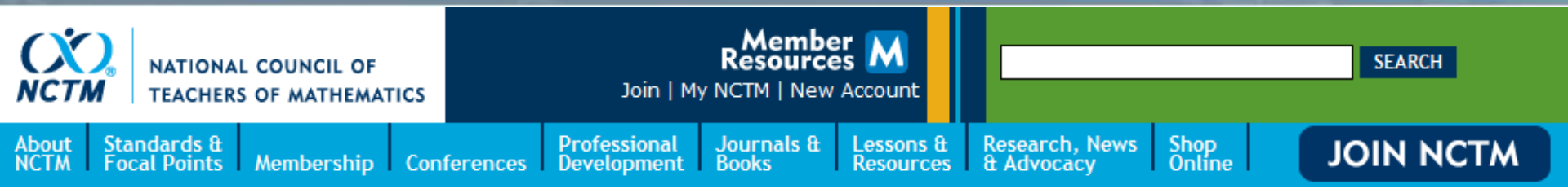
★Figure This

★Math Here & Now

★Middle School

➢Math Roots

# High School @ nctm.org




★e-Examples

MATHEMATICS teacher

★Article Downloads

★Calendar Problems

Student Explorations in Mathematics

★Math Here & Now

★High School

➢Activities for Students

# Motivating Students

- If you want magic in your students… look for it and find it in them!
  - Include them
  - Ask them what they think
  - Ask them what they see
  - Ask them to share their ideas, opinions, and reactions

# Problem Solving

- Don’t make Problem Solving the first thing to go
- Give time to struggle
- Give specific hints
- Celebrate elegant and unique solutions
- Engage Parents! – Parent – Teacher Night – Weekly problems to work on

# Problem Solving

## Non-problem solving mode

1. 14 + 29
2. 8 + 35
3. 15 + 29

## Problem-solving mode

1. Find two consecutive numbers whose sum is 43.
2. Find two counting numbers whose sum is 43 and whose ones digit differs by 3.
3. Find two numbers whose sum is 44 and one of whose addends is 14 more than the other.

# Group Work

- Find the right task – Complex enough to need working together
- Identify and teach roles to students
- Hold all students accountable for the work of the group
- Watch, listen and then interact with groups as they work

# Parents and Families

- Build Parents as Allies
  - Brag to parents within the first 4 weeks.
  - Ask them to work with you
  - Keep in touch

# Parents and Families

- Parents can learn!
  Don't just tell parents, show them!
  - Help students to engage their parents
  - Family math night where parents and students work on math together
  - Give parents ways to help their children

# Keeping Your Sanity

- Do not work alone – communicate with colleagues, interact with others online, attend meetings
- Find a mentor
- Learn to say “No”
- Make a mistake?
  - Apologize if you need to.  Move on.
  - Don’t beat yourself up.

# Keeping Your Sanity

Laugh

&

Enjoy