This sine has threee errors.

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Order of Ops Bingo

- Write the word FREE in one space on the board.
- Choose numbers for the other 24 boxes. Choose numbers within the given range for each column.
- You are not allowed to repeat any numbers.

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Order of Ops Bingo

B (1-10)	I (11-20)	N (21-30)	G (31-40)	O (41-50)

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Order of Ops Bingo

- $6 \cdot 5 - 4 \cdot 3$
- $2 \times 3 \times (3 + 4)$
- $(5 \cdot 4 \cdot 4 - 4) \div 2$
- $2 \times 2 \times (3 + 4)$
- $2 \times 3 \times 4 - 6 - 7$
- $54 - 3 \times 2$
- $8 + 7 \times 6$
- $(3 + 3) \times 2 \times 3$
- $1 + 2 + 1 \times 2 + 1 + 2$
- $1 \times 2 + 3 \times 4$
- $3 \times 3 \times 3 + 4$
- $3 \times 3 \times 3 \div 3$
- $5 \times 4 \times 3 \div 5$
- $5 \times 6 + 7$
- $4 \times (3 \times 4 - 1)$
- $4 \times (3 \times 4) - 1$
- $9 \cdot 8 - 7 \cdot 6$
- $3 \cdot 2 - 1$
- $1 + (2 + 3) \times 4$
- $(5 \times 5) \div (5 \times 5)$
- $7 + 6 \cdot 5 - 4$
- $7 \times 6 - 5 \times 4$
- $8 + 8 + 8 \div 8$
- $7 \div 7 + 7 \div 7$
- $(1 + 4) \times (4 + 1)$
- $4 \times 4 + 4 \times 4$
- $(3 + 4 \cdot 5) + 6$

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Where Are You?

1. Multiply your age by 12.
2. Add your friend's age.
3. Divide by 7.
4. Divide by 11.
5. Divide by 13.
6. Add the first six digits after the decimal point.

   e.g., 0.123456 → 1 + 2 + 3 + 4 + 5 + 6 = 21
7. Finally, multiply by 7, then subtract 1…

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What'd You Get?

188

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Session 188

Whoa!

How does that work?

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Engaging and Free Online Resources for Teaching Operations and Fractions

October 12, 2012

G. Patrick Vennebush

pvennebush@nctm.org

NCTM ILLUMINATIONS Resources for Teaching Math

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Today's Agenda

- Good Problems
- Classroom Activities from Illuminations
- Demonstrate Good Teaching Practices for Using Illuminations Resources
- Wrap-Up and Q + A

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Problems

The solution of problems is one of the lowest forms of mathematical research. . . yet its educational value cannot be overestimated. It is the ladder by which the mind ascends into higher fields of original research and investigation. **Many dormant minds have been aroused into activity through the mastery of a single problem.**

– Benjamin Franklin Finkel
American Mathematical Monthly, Number 1

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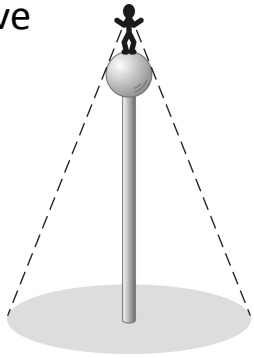
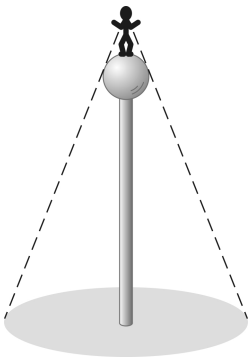
Problems

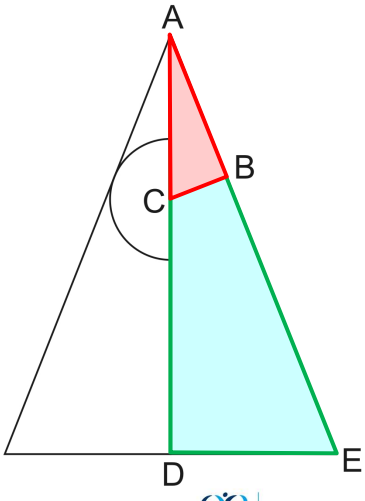
- There is a sphere 12 feet in diameter on top of a pole 60 feet high. On the sphere stands a man whose eye is six feet above the sphere. How much ground beneath the ball is invisible to him?



Problems

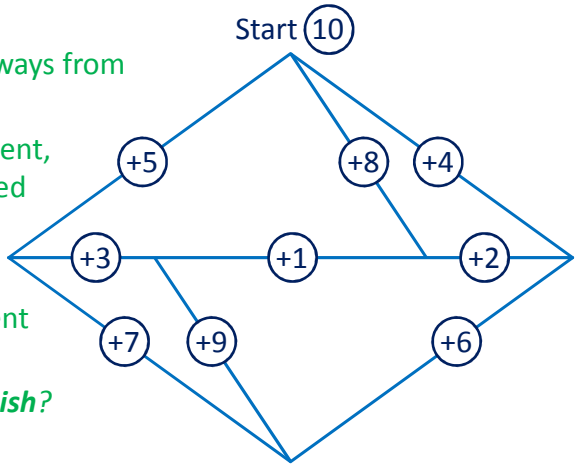


(Solution Strategy)



Number Maze

- Begin with 10.
- Move down or sideways from **Start** to **Finish**.
- As you cross a segment, perform the indicated operation.
- Don't go up.
- Don't cross a segment more than once.
- *Largest value by **Finish**?*



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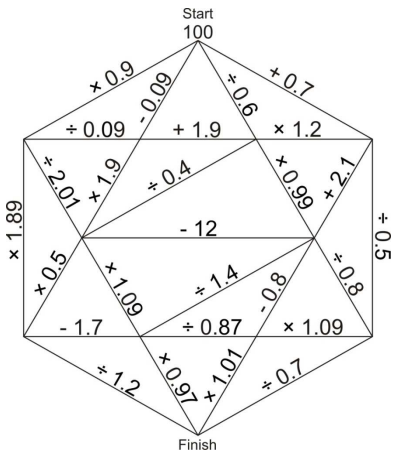
Decimal Maze

- 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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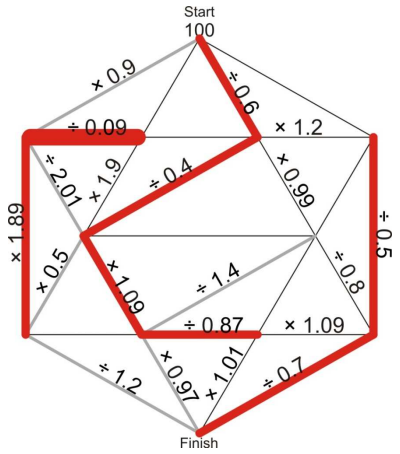
Decimal Maze

Here's some help:

- The **red lines** are beneficial.
- The **gray lines** are detrimental.
- Addition and subtraction are inconsequential.



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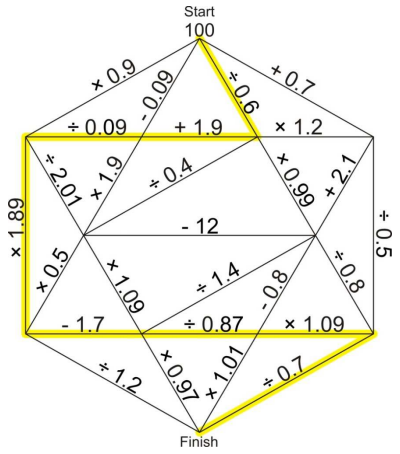
Decimal Maze

- Maximum value: **6332**
- Minimum value?
- Finish value closest to 100?
- How many paths from Start to Finish?



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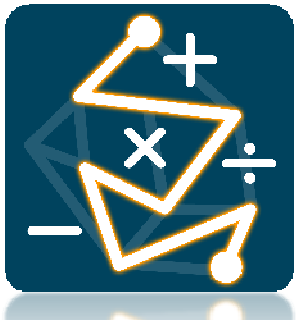
Pick-a-Path

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



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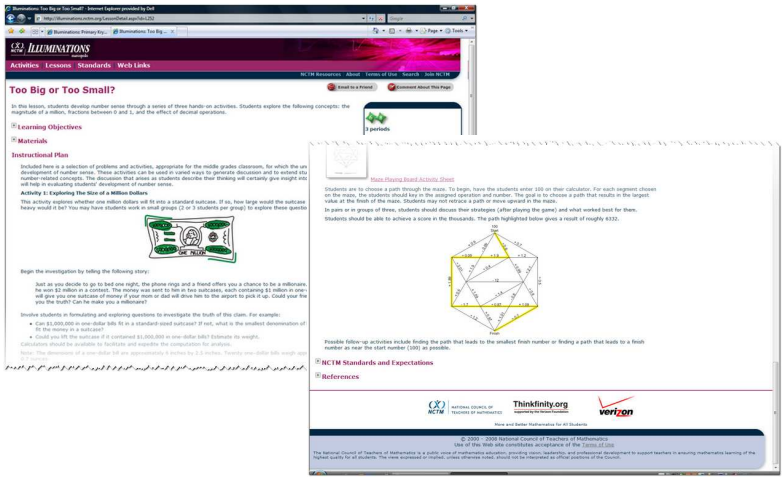
Decimal Maze



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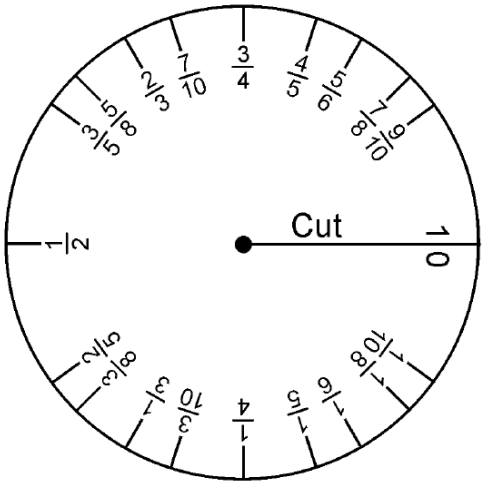
Fraction Circle



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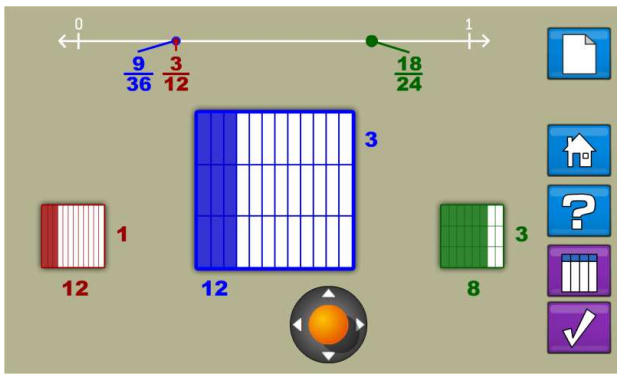
Equivalent Fractions

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

Video Tutorial



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Krypto

Combine the five numbers below…

…using the four operations (+, –, ×, ÷) to create the following target number:

7

*You **must** use all five numbers,*
but you don't have to use all four operations.

Krypto

The rules of **Krypto** are really simple.

- You are dealt five cards.
- A sixth card—the "target card"—is pulled from the deck.
- You must **use all five of your cards** and the four arithmetic operations (+, –, ×, ÷) to get the value on the target card.

Krypto

Now that you know the rules, try another…

Your five cards:

target: **1**

Solutions:

$(8 - 7) \times ((4 + 2) \div 6)$

$8 \div 4 \div 2 \times 7 - 6$

$6 + 7 - (8 \times 2) + 4$

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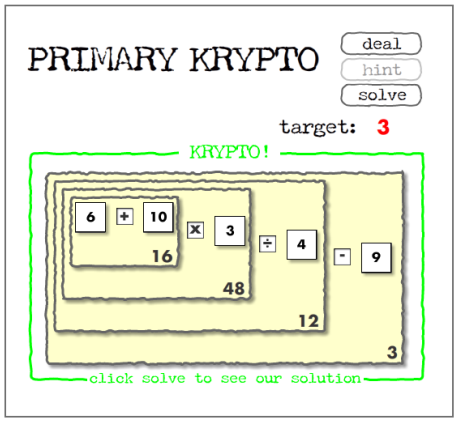
Krypto

http://illuminations.nctm.org/ActivityDetail.aspx?ID=173



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Krypto

What are some useful strategies for this game?

- Can you get 1?
- Can you get 0?
- Can you use only addition and subtraction?
- Solve a simpler problem—e.g., if one of the numbers is 2, can you get half or double the target number?

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Krypto

Back to the example…

Your five cards:

target: 1

Sum of five cards is **odd**.

Target is **odd**.

- There is *likely* to be a solution using only addition and subtraction.

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illuminations.nctm.org

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Illuminations

The web site currently contains…
- 607 Lessons
- 108 Interactive Tools

On average, 325,000 visitors per month
- August 2004 – 93,371
- March 2012 – 632,910

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Illuminations

New in 2012…

- 1 new game for Calculation Nation®
- 10 new lessons, based on Calc Nation games
- 1 web app
- 3 mobile apps

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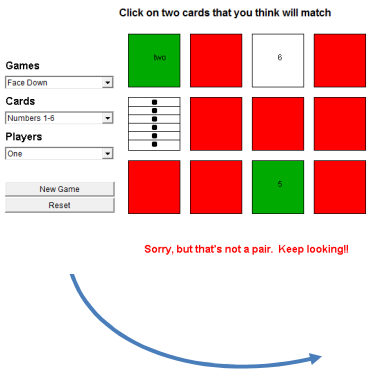
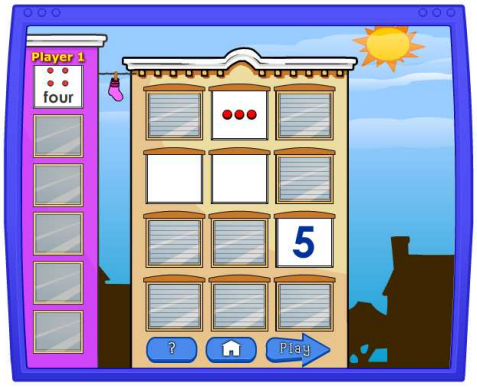
Illuminations





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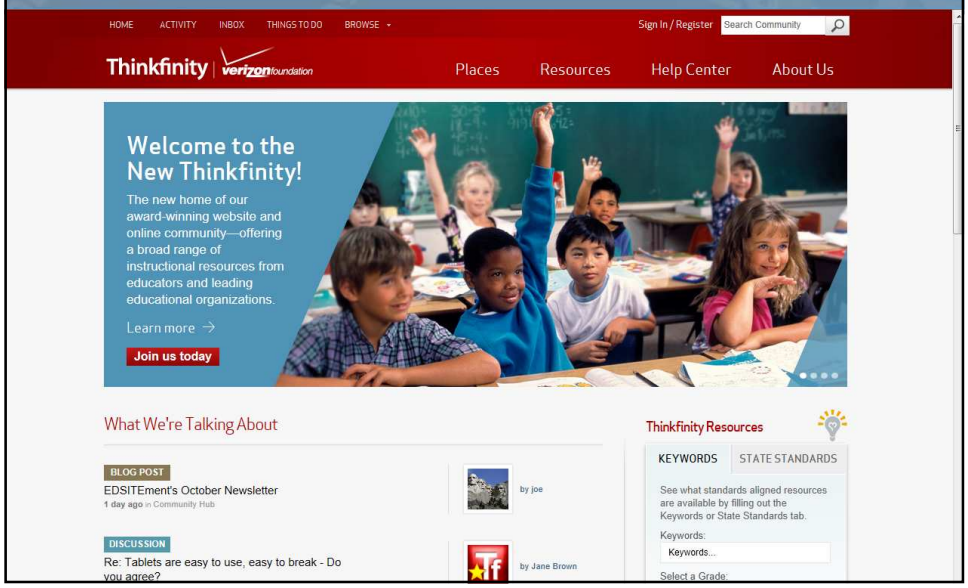
www.thinkfinity.org



Thinkfinity

- Provides standards-based content and professional development for K–12 teachers
- Supported by the Verizon Foundation
  - NCTM received a three-year, $1.4M grant for Illuminations
- Consortium of content partners across all disciplines
  - science, arts, humanities, geography, economics, language arts, math, and history

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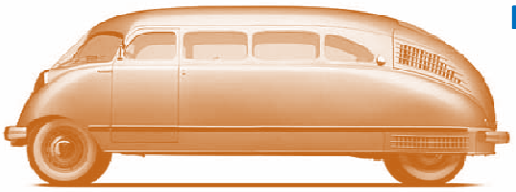
Julia Problem

When Julia's family travels, her father always drives, and her mother always sits in the front passenger seat. Julia and her siblings sit in the middle and back rows of the vehicle.

Julia told her brothers and sisters, "Of all the ways that two of us can sit in the middle row, I'm involved in one-third of those pairs."



How many siblings does Julia have?

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Julia Problem

Siblings	Fraction of Pairs that Include Julia
1	1/1
2	2/3
3	3/6
4	4/10
5	5/15
6	6/21
7	7/28

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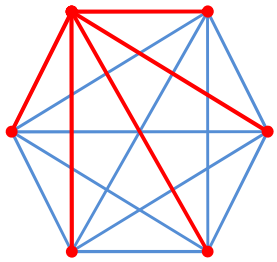
Julia Problem

- List:

J1	12	23	34	45
J2	13	24	35	
J3	14	25		
J4	15			
J5				

Geometry:



- Algebra: $\dfrac{n}{\frac{1}{2}n(n+1)} = \dfrac{1}{3}$

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Probability

- Write a really big number on your paper.
  (Use lots of digits. And it should be sufficiently ugly… that is, not some nice round number like 25 or 7,000,000,000.)
- How many people do you think wrote a number that has a 3 in it?
- What's the probability that a randomly chosen number has 3 as one of its digit?

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Probability

Numbers	Fraction that Contain a 3
0 – 9	1/10
0 – 99	19/100
0 – 999	271/1,000
0 – 9,999	3,439/10,000
0 – 99,999	40,951/100,000
0 – 999,999	468,559/1,000,000
0 – 9,999,999	5,217,031/10,000,000

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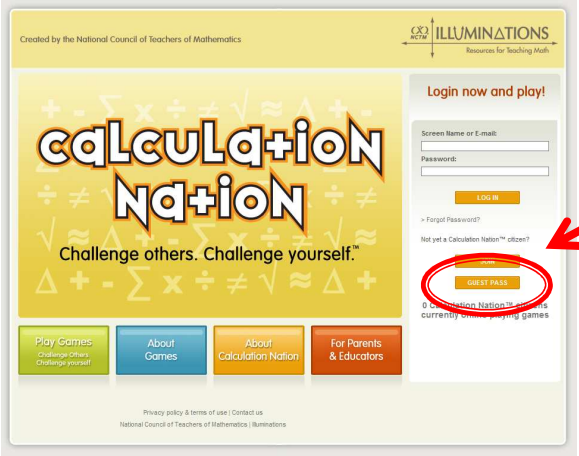
http://calculationnation.nctm.org



Click here:
"Guest Pass"

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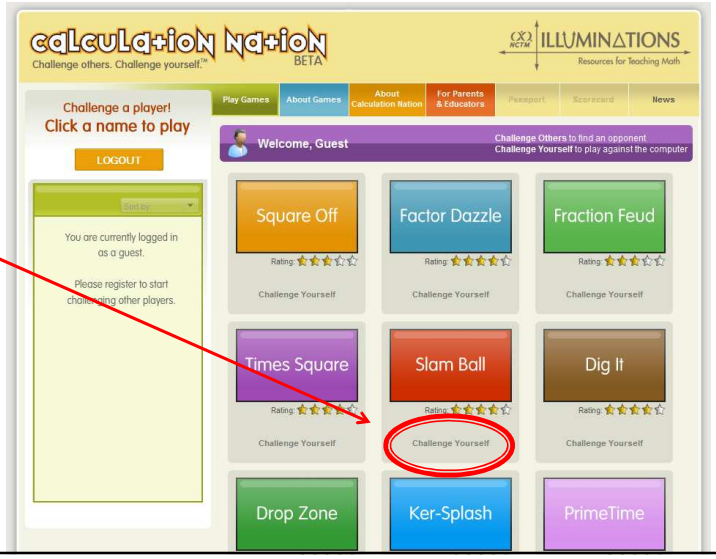
Play a Game!

Click here: "Challenge Yourself"



Dig It

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Dig It

- What are the best numbers to try to get?
- What number(s) are easiest to get?
- Which points on the number line can be created in the least number of ways?
- How many fractions can be created with a value less than 1?
- Which digit is the best to get?

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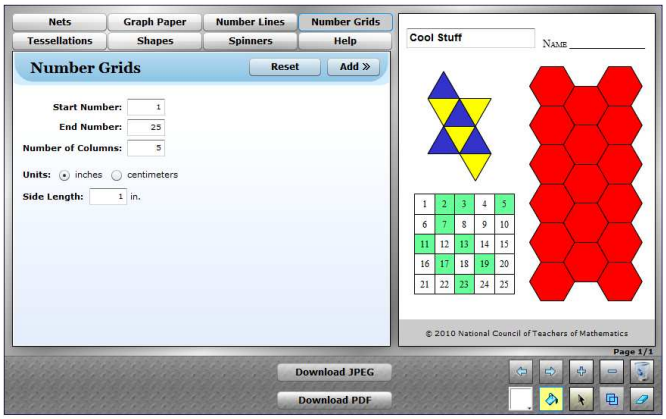
Dynamic Paper

- To make nets — and other things!



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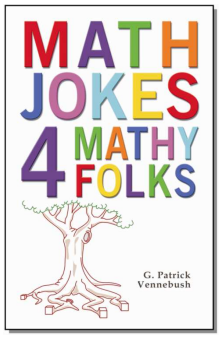
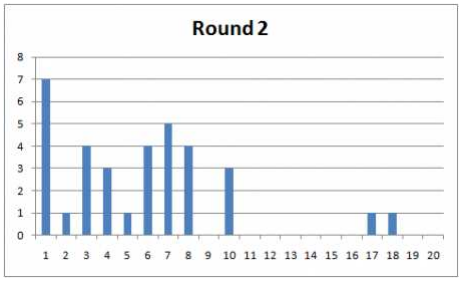
My Favorite Game…



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

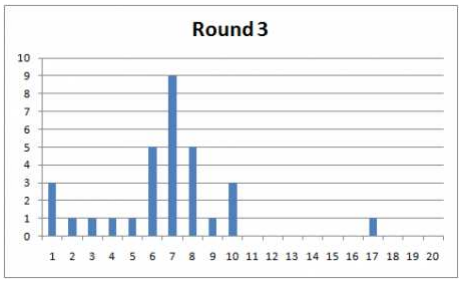
Whoever wrote the smallest integer NOT written by anyone else.

My Favorite Game



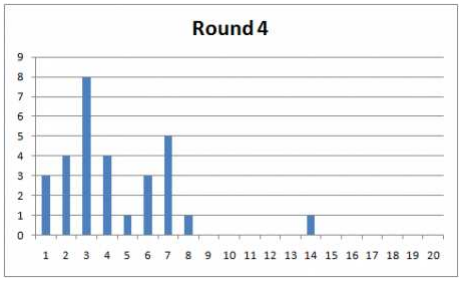
- Min: 1
- Max: 18
- Mode: 1
- Average: 8.5

My Favorite Game



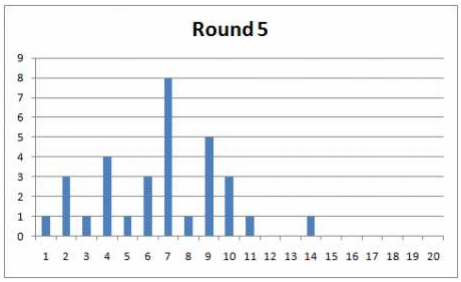
- Min: 1
- Max: 17
- Mode: 7
- Average: 7.5

My Favorite Game



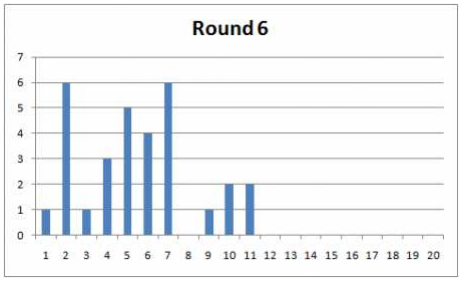
- Min: 1
- Max: 14
- Mode: 3
- Average: 5.3

My Favorite Game



- Min: 1
- Max: 14
- Mode: 7
- Average: 7.7

My Favorite Game



- Min: 1
- Max: 11
- Mode(s): 2, 7
- Average: 6.4

11Q – Q

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Wrap-Up

- Questions?
- Comments?
- Compliments?

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Wrap-Up

- What is $11q - q$?

Thank You!

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NCTM ILLUMINATIONS Resources for Teaching Math

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