

Presented by Carolyn L. White

Rice University School Mathematics Project

Overview of Classroom Adventure

- Select the book for use in the class.
- Spread out chapters in the book from the first week of school to the week before high- stakes testing.
- Sometimes I read a chapter after I have taught the mathematical concept.
- Focus today on the mathematics taught throughout the school year.

Book Selection Number Devil Hans Magnus Enzensberger 1997 Publisher: Henry Holt & Company LLC Publishers 1997

Math is a Language

THE BORN LOSER



THE HANDOUT

- Math is a language
- Website with power point http://rusmp.rice.edu
- Email for Carolyn White clwhite@rice.edu

- On the first night the **Number Devil** enters Robert's dream. Robert dislikes numbers.
- The number one is the mother of all numbers
- Infinitely small and even smaller numbers between 0 and 1
- The adventure with a stick of gum-vertical pieces

Navigating Through Algebra NCTM Lessons Prk-2 and 3-5

- Patterns on the hundreds board to devise divisibility rules
- Calculator patterns with TI 15



- Roman Numerals-Letters (no need for zero)
- •Use minus numbers to arrive at zero 1+(-1)=0
- Making numbers "Hop"

$$5^1 = 5$$

$$5^2 = 25$$

Robert talked with Mom next morning. She gave Robert hot chocolate because he said strange things.

- Robert wakes up in a cave.
- Division Day brings on two kinds of numbers
- "Garden Variety"
- "Prima Donnas"

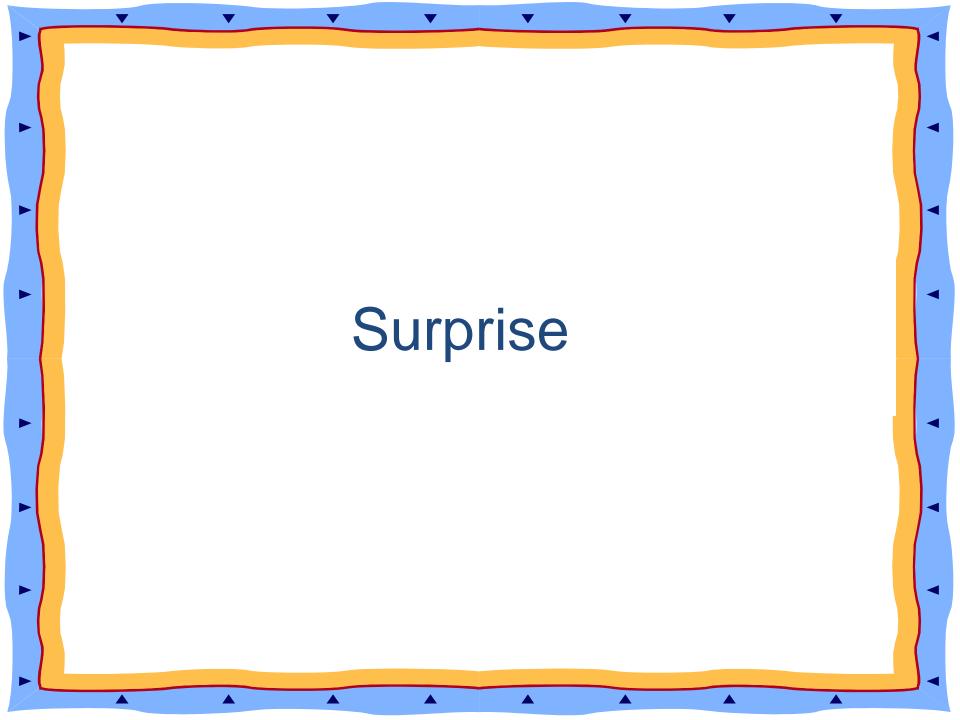
Test for "Prima Donnas"- Prime Numbers

<u>Sieve of Eratosthenes - National Library of Virtual</u> <u>Manipulatives (Utah State University)</u>

http://nlvm.usu.edu/en/nav/frames_asid_158_g_3_t_1.html

• Think of a number bigger than 5.

- Think of three "Prima Donnas" that will add up to be that number.
- Consider the number 25.
- Possible solution: ____ +___+
- Consider the number 55
- Possible solution: ____ +___+



- Robert wakes up on a beach
- Use a calculator to investigate.

```
1/3 ≈ 0.333

multiply 0.3333 x 3

multiply 0.3333...x3

What do you observe?

Will you ever get an answer larger than 1?
```

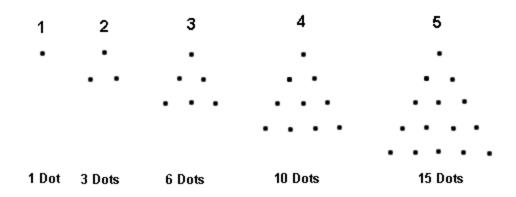
Review "hopping" numbers, $10^3 = 1000$

Hopping backwards is the "rutabaga" of a number.

The "rutabaga" of 100 is 10

What is the "rutabaga" of 225?

Robert wakes up in a desert very thirsty.
The Number Devil invites Robert up to the top of a palm tree to drink coconut milk.
Coconut numbers are:



Robert and the Number Devil are in a potato field. They start working on "Bonacci" Numbers.

- 0, 1, 1, 2, 3, 5, 8, 13, ... (add the last two to get the next)
- Make two adjourning "Bonacci" numbers hop, and you have another "Bonacci" number.
- "Bonacci"- Fibonacci Numbers in Nature

Fibonacci Numbers

Time for a nature walk to find leaves with sections representing numbers in the sequence:

1,2,3,5,8....

Fibonacci Numbers













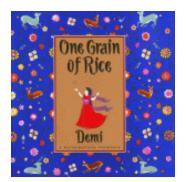
Fibonacci Numbers

Shasta daisy with 21 petals
What would happen when you say "She loves me, she loves me not?"

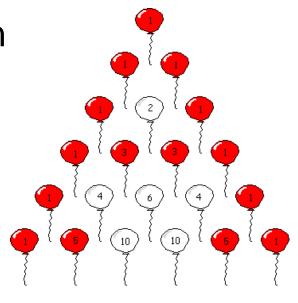


http://britton.disted.camosun.bc.ca/fibslide/jbfibslide.htm

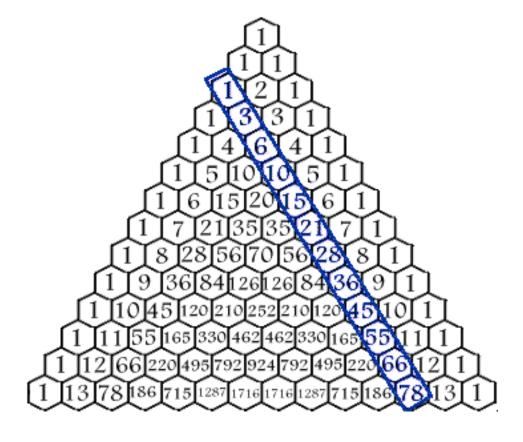
- The Number Devil and Robert use cubes to build the "number triangle" and observe patterns.
- Before reading chapter 7, read the book,
 One Grain of Rice by Demi.



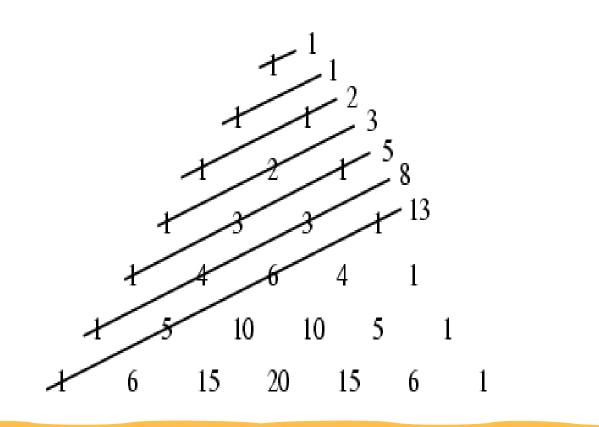
- The Number Devil and Robert use cubes to build the number triangle and observe patterns.
- Odd numbers and even numbers are colored different colors



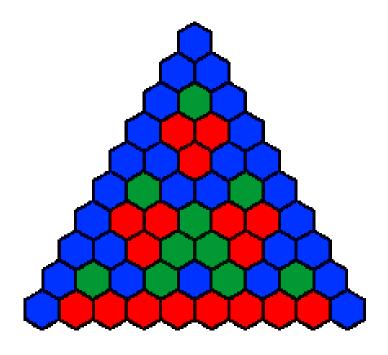
The triangular numbers are found in the third diagonal of Pascal's triangle:



The "shallow diagonals" of Pascal's triangle sum to Fibonacci numbers.



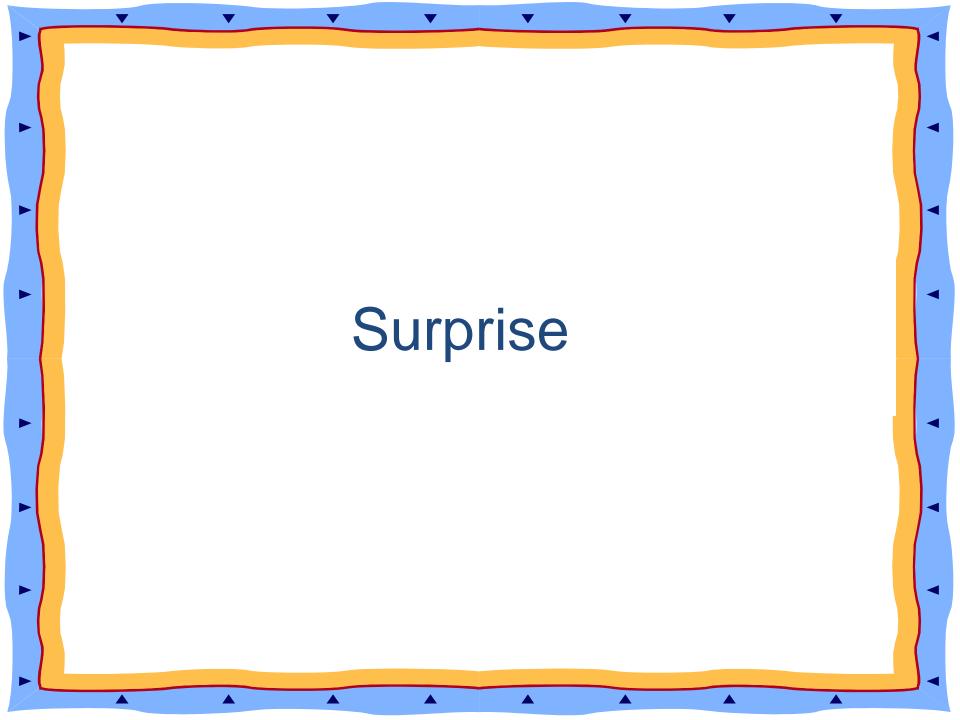
- One color for the cells that contain a multiple of 3.
- Second color for cells that contain numbers that are one less than a multiple of 3.
- Third color for cells that contain numbers that are two less than a multiple of 3.



http://mathforum.org/workshops/usi/pascal/pascal_handouts.html



Six identically colored triangles can be joined to form a hexagon. Look closely to find a floating cube.



Discuss combinations and permutations using 2,3 and 4 students in seating arrangements.

Shorter way of writing is 4!

Read as: four "vroom"

Children	Possibilities
1	1
2	1 x 2 = 2
3	$1 \times 2 \times 3 = 6$
4	$1 \times 2 \times 3 \times 4 = 24$

Chapter 8 Activity with the students: M & Ms on a Bench



Robert is in class with classmates Combinations using handshakes:

People	Handshakes
1	0
2	1
3	3
4	6

The Chapter begins with Robert sick in bed with the flu. The Number Devil decides that this will be a quiet evening. There is a review of numbers discussed:

- "Prima Donnas"
- "Garden Variety"
- "Hopping Numbers"
- "Coconuts"
- "Rutabaga of a Number"
- "Bonacci Numbers"
- "Vroom!"

Geometry Night

Pick's Formula provides an elegant formula for finding the area of a simple lattice polygon.

A lattice polygon is a polygon whose boundary consists of a sequence of connected nonintersecting straight-line segments.

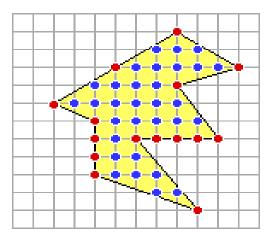
Geometry Night

Pick's Formula: Area = I + B/2 - 1 where

I = *number of interior lattice points* and

B = number of boundary lattice points.

For example, the area of the simple lattice polygon in the figure is 31 + 15/2 - 1 = 37.5



http://math.nyu.edu/~crorres/Archimedes/Stomachion/Pick.html

Euler's Formula

$$V - E + F = 2$$

V = number of vertices

E = number of edges

F = number of faces

For example in a Cube

$$V = 8$$

$$E = 12$$

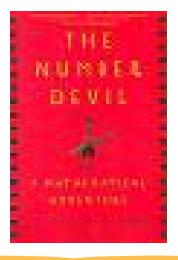
$$F = 6$$

$$8 - 12 + 6 = 2$$

The Ending

In the last dream, the **Number Devil** gives an invitation to **Robert** to attend a dinner.

A special surprise is given to Robert.



The Ending

Robert is identified as an apprentice and bestowed the recognition of being in the "Order of Pythagoras, Fifth Class"

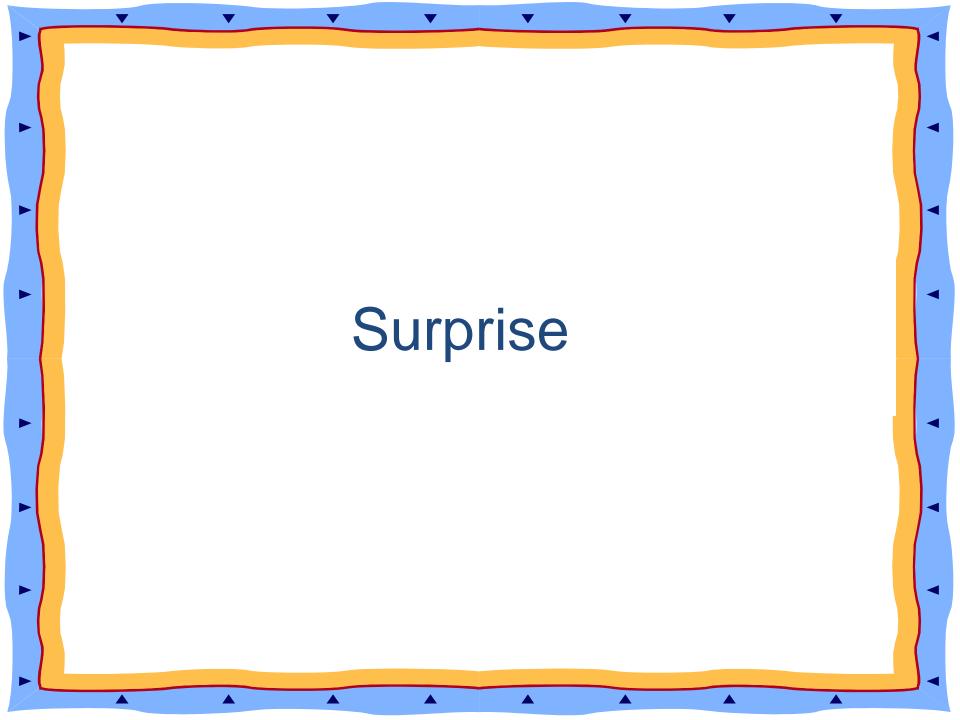
And receives a gold star around his neck.



Students

- Read the last chapter of the week before high-stakes testing.
- Students receive a gold star/coin.





BIBLIOGRAPHY

Number Patterns

http://forum.swarthmore.edu/workshops/usi/pascal/pascalnumberpatterns.html

Pascal Unit

http://forum.swarthmore.edu/workshops/usi/pascal/index.html

Coloring Sheet for Multiples and 3D Box

http://forum.swarthmore.edu/workshops/usi/pascal/mid.color pascal.html

Enzensberger ,Hans Magnus. <u>The Number Devil</u> A Mathematical Adventure. Henry Holt and Company,INC.:1998 ISBN 0-8050-5770-6

BIBLIOGRAPHY

Demi. One Grain of Rice, A Mathematical Folktale. Scholastic Press: 1997 ISBN 0-590-93998-X

<u>Sieve of Eratosthenes - National Library of Virtual</u> <u>Manipulatives (Utah State University)</u>

http://nlvm.usu.edu/en/nav/frames_asid_158_g_3_t_1.html