Problems

Bard Math Circle
May 2013
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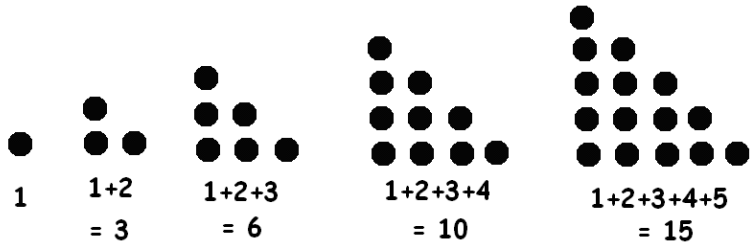
bardmathcircle.blogspot.com

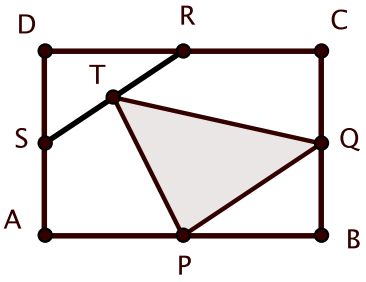
1. Compute 11^2, 11^3, and 11^4. Can you find these numbers hidden in Pascal's Triangle?

2. Compute the sum of each row of Pascal's Triangle. Do you see a pattern?

3. The Triangular Numbers are 1, 3, 6, 10, 15, ... Compute three more Triangular Numbers. Can you find them in Pascal's Triangle?



4. In rectangle ABCD, points P, Q, R, S are respectively the midpoints of sides AB, BC, CD, and DA. Let T be the midpoint of segment SR. What part of the area of rectangle ABCD is the area of triangle PQT?



Student Corner

Martha and Melly have the same birth mother, and were born on the same day, of the same month, of the same year. However, they're not twins! How can this be?

(Suggested by Katie.)

April Math People

Blaise Pascal June 19, 1623–August 19, 1662. A French mathematician, Pascal developed Projective Geometry and the Theory of Probability. Earlier in life, he developed the mechanical calculator. In 1653 he wrote about the binomial coefficients and his graphical representation is now called Pascal's Triangle, although it was known for hundreds of years before him.

`www.maths.tcd.ie/pub/HistMath/People/Pascal/RouseBall/RB_Pascal.html`

Waclaw Sierpinski March 14, 1882–October 21, 1969. A member of the Polish schools of mathematics, Sierpinski did foundational work in Set Theory, Point Set Topology and Functions of a Real Variable. Some interesting examples that he invented are the Sierpinski Curve, which passes through every point in a square, and has infinite length, the Sierpinski Carpet, which is recursively constructed by starting with a square, and then successively removing every middle ninth, and the Sierpinski Triangle, which is similarly defined.

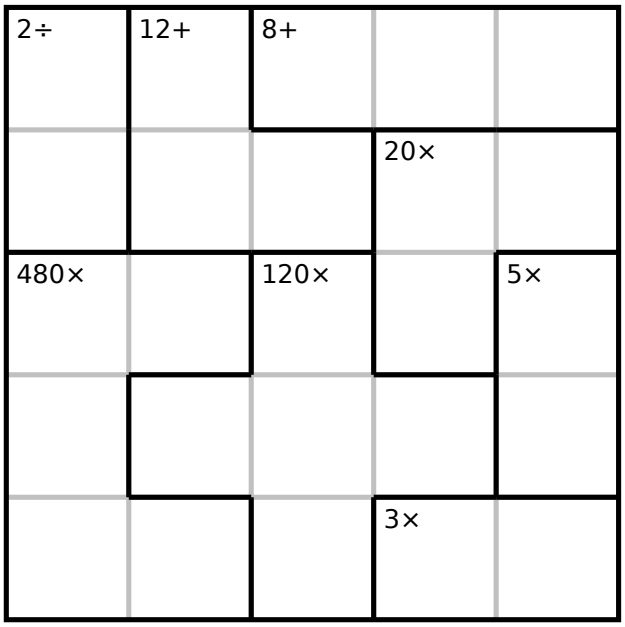
`www-history.mcs.st-andrews.ac.uk/Biographies/Sierpinski.html`

Benoit Mandelbrot November 20, 1924–October 14, 2010 Born in Poland, lived in France and then the USA. A pioneer in the use of computers to investigate fractals, especially Julia Sets and the Mandelbrot Set. Fractals are point sets that have self-similar structure, and fractional dimension.

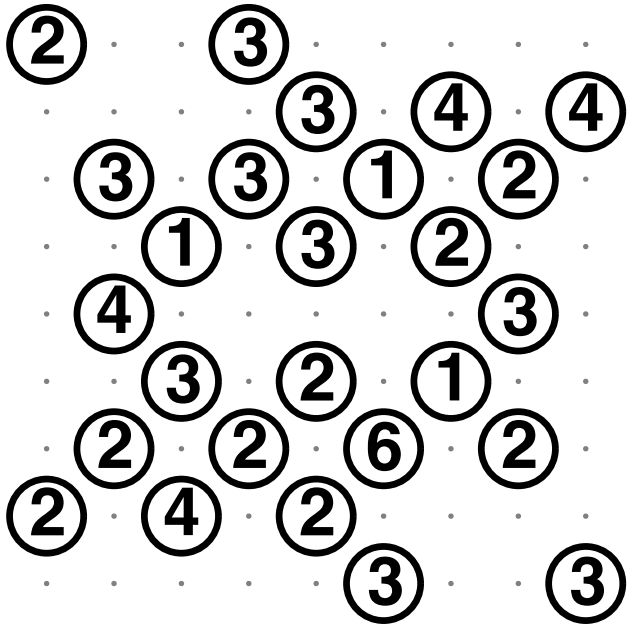
`en.wikipedia.org/wiki/Benoit_Mandelbrot`

Puzzles

KenKen: Place the numbers 1, 2, 3, 4 and 5 in the grid below, so that each appears once in each row and column. The numbers in each cage, when combined with the operation given, must result in the target number shown. `lavoz.bard.edu`



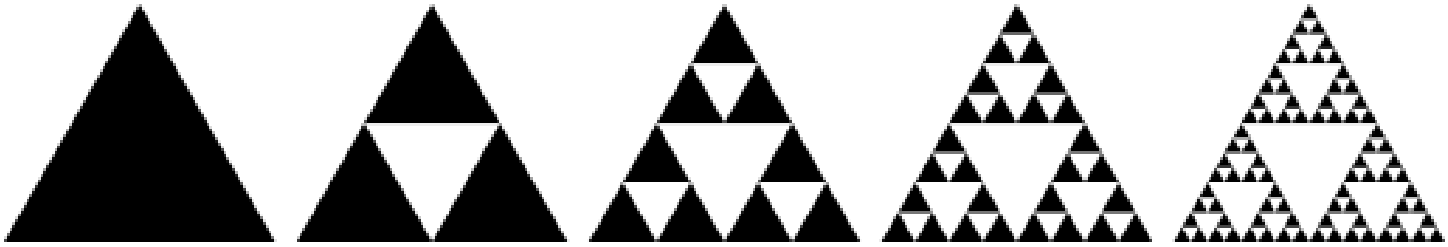
Bridges: Connect islands with single and double bridges. All bridges must be vertical or horizontal, and the numbers indicate exactly how many bridges leave the island. Bridges may not cross, and the result is *simply* connected. `krazydad.com`



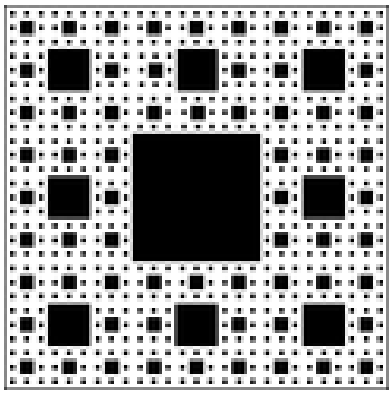
Kingston Library Chalk Walk

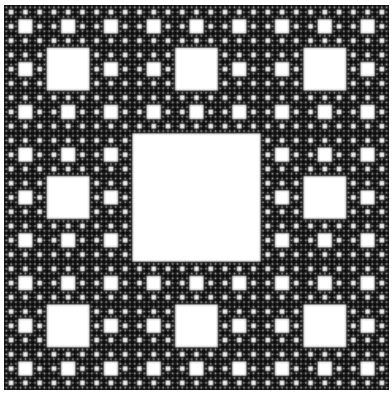
We'll head outside today to participate in the chalk walk. Consider drawing one of the following fractals in chalk, or Pascal's Triangle.

Draw Sierpinski's Triangle in chalk. The first several phases are as follows:

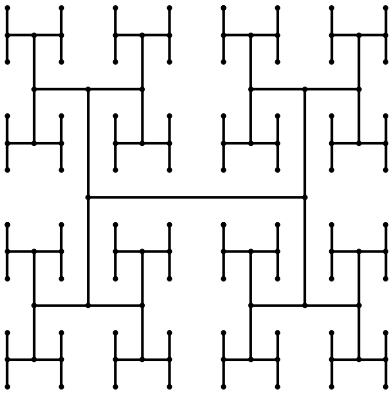


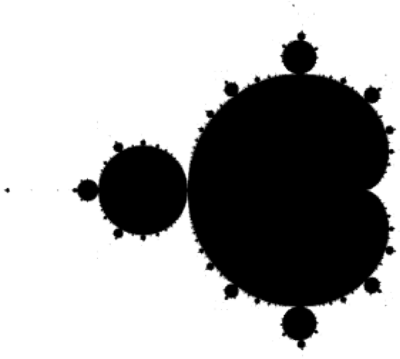
Two views of Sierpinski's Carpet:



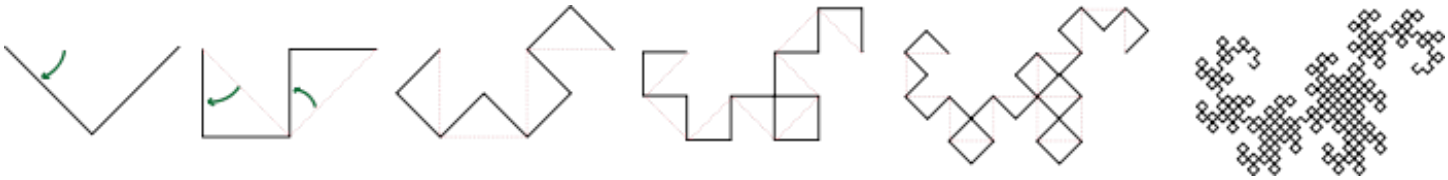


An H Fractal and the Mandelbrot Set:

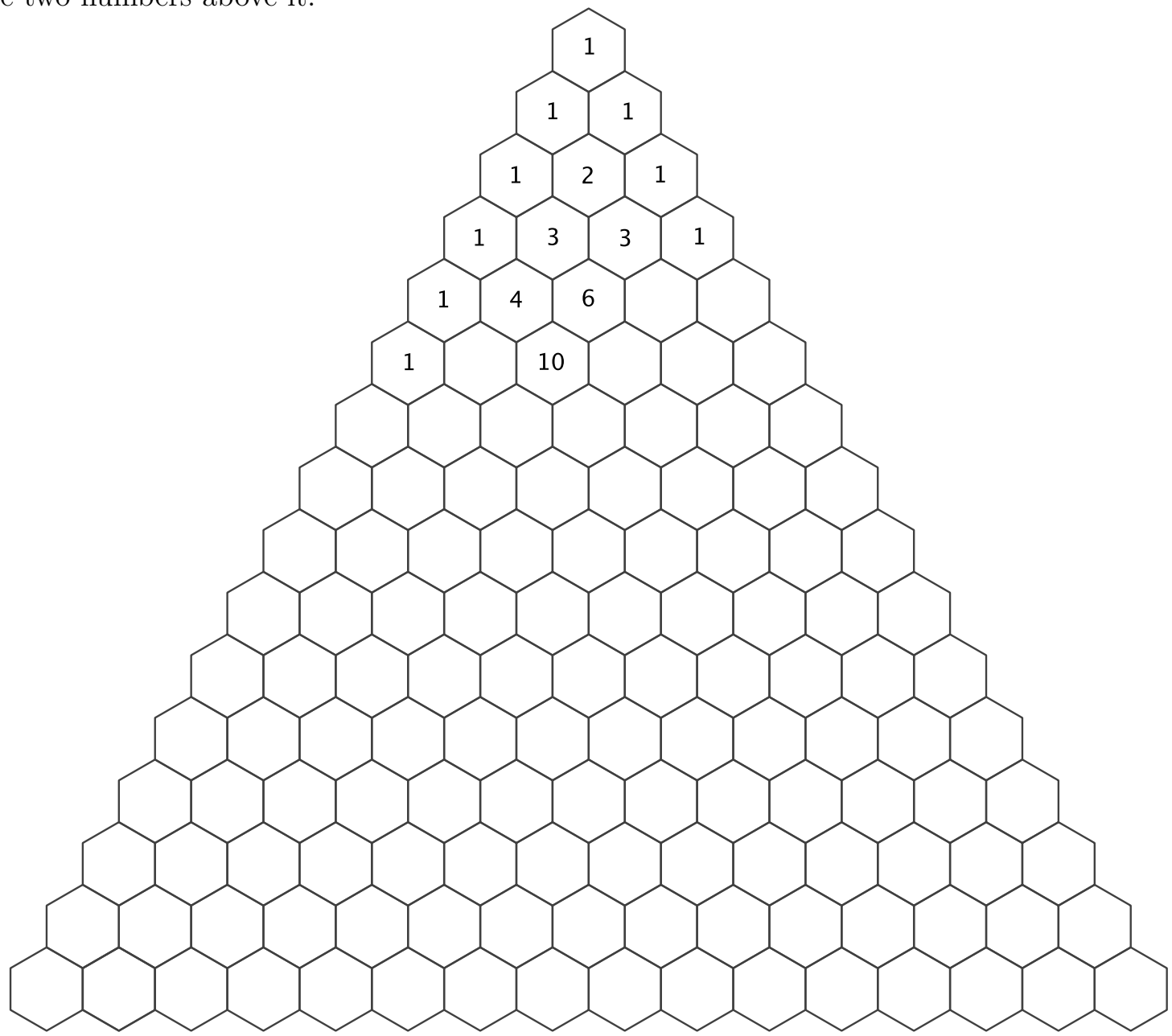




The Dragon Curve, step-by-step:



Fill in this portion of Pascal's Triangle: The number in each cell is the sum of the two numbers above it.

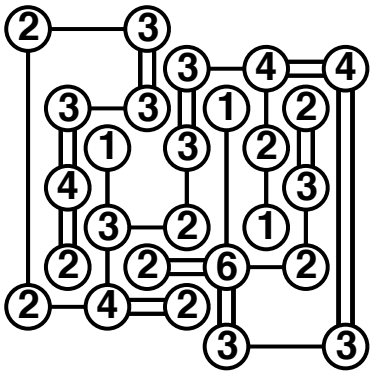


Now select two colors. Color each odd number with one color and each even number with the other color. Have you ever seen this pattern before?

Answers (Not the same as solutions!)

121, 1331, 14641. Look at the rows.
The sums are 1, 2, 4, 8, 16, ... These are powers of 2.
The Triangular Numbers continue as 21, 28, 36, ... They appear in a diagonal column of Pascal's Triangle.
1/4.
They're triplets!

2÷ 2	12+ 5	8+ 1	3	4
1	3	4	20× 5	2
480× 5	4	120× 3	2	5× 1
3	1	2	4	5
4	2	5	3× 1	3



Upcoming Events

Kingston: Saturday, May 11th (Chalk Walk)
New Paltz: Monday, May 20th (Math Teachers' Circle)
Kingston: Saturday, June 8th (Kingston Library)
Info: `bardmathcircle.blogspot.com`.

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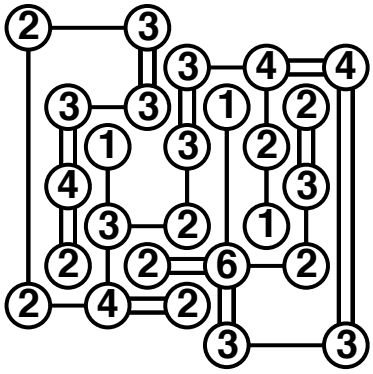

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