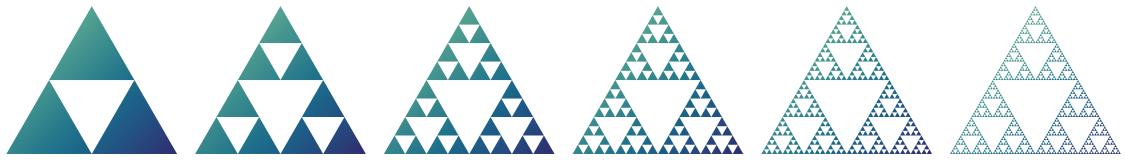


Sierpinski Triangle (L-system)



Sierpinski Triangle (cetz)

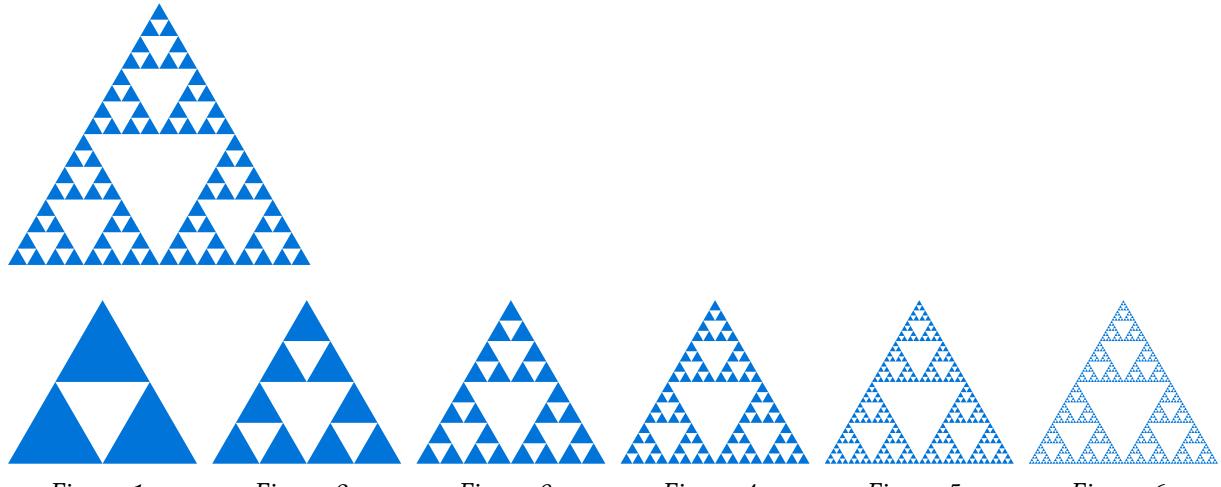


Figure 1:

Figure 2:

Figure 3:

Figure 4:

Figure 5:

Figure 6:

Sierpinski Triangle (Harlow's method)

$$k(i, j) = {}^i C_{\left(\frac{1-j}{2}\right)}$$

k is odd \rightarrow black

k is even \rightarrow white

Figure 7: Point test

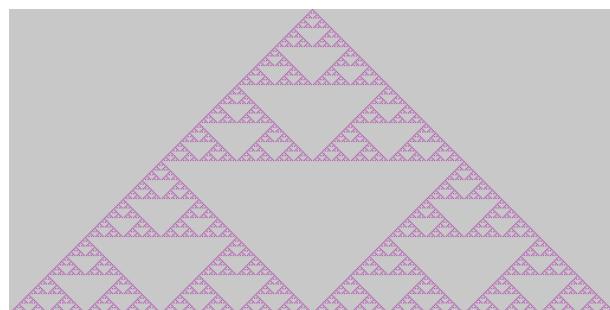


Figure 8: Harlow's method

Optimization

A binomial coefficient is odd iff it has no factor of 2

The exponent of 2 in ${}^n C_r$ equals the number of carries when adding $r + (n - r)$ in binary

No carries \iff coefficient is odd

So:

Any carry \rightarrow even

No carry \rightarrow odd

The point test in Figure 7 can be greatly simplified to

$$\text{odd} = ((r \& (n - r)) == 0);$$

Figure 9: Point test (fast)