Note Title 12/12/2014

Flip a coin 10 times. (unif dist)

Prob first 2 flips are H or the last 2 flips are H.

$S = \{T,H\}^{10}$ $\quad |S| = 2^{10}$

$\Rightarrow F = HH \cdot \{T,H\}^{8}$ $\quad HH * * * * * * * *$

$L = * * \cdots * HH.$

$$\Pr[F \cup L] = \frac{|F \cup L|}{|S|} = \frac{|F| + |L| - |F \cap L|}{|S|}$$

$$= p[F] + p[L] - p[F \cap L]$$

$$= \frac{|F|}{|S|} + \frac{|L|}{|S|} - \frac{|F \cap L|}{|S|}$$

$$= \frac{2^8}{2^{10}} + \frac{2^8}{2^{10}} - \frac{2^6}{2^{10}} = \frac{1}{2^2} + \frac{1}{2^2} - \frac{1}{2^4}$$

$$= \frac{1}{4} + \frac{1}{4} - \frac{1}{16}$$

$F \cap L$: $HH * * * * * * HH$

$|F \cap L| = 2^6$

$$= \frac{7}{16}.$$

Recursive Alg a^n $a \in \mathbb{R}$
$n \in \mathbb{N}$.

Power(a, n)
{
  if (n=0)
    Return(1) $a^0 = 1$

  y = Power(a, n-1) $y = a^{n-1}$
  Return(a · y) $\downarrow$
} a^n

Recursive Alg compute n^2 $n \in \mathbb{N}$.

No loops No mult.

Square (n)
{
  If (n=0)
    Return (0);

  y = Square (n-1).
  Return (y + n + n - 1)
}

Have.
$\downarrow$
$y = (n-1)^2$
$= n^2 - 2n + 1$
$\downarrow$
Return.

$y = \underbrace{n^2} - 2n + 1$

$y + 2n - 1 = n^2$
$y + n + n - 1 = n^2$

10 - digit $\{0, 1, 2\}$

3 1's.

$\underset{4}{\overset{0/2}{\_}}$ $\underset{4}{\overset{1}{\_}}$ $\underset{4}{\overset{1}{\_}}$ $\overset{0/2}{\_}$ $\overset{0/2}{\_}$ _ _ _ $\underset{4}{\overset{1}{\_}}$ $\overset{0/2}{\_}$

2 2 2

$$\binom{10}{3} 2^7$$

2, 4, 6

T : Set of perms w/ 1 next to 2.

F : " 4.

X : 6.

$$|T \cup F \cup X| = |T| + |F| + |X|$$

$$- |T \cap F| - |T \cap X| - |F \cap X|$$

$$+ \cancel{|T \cap F \cap X|}$$

$$= 3|T| - 3|T \cap F|$$

$$(3 \cdot 2 \cdot 6! - 3 \cdot 2 \cdot 5!)$$

12
21

214
412

[214] 3 5 6

113 21 8 5 3 2 1

115 25 15 10 5

$5 = 15 - 10$

$10 = 25 - 15 \cdot 1 \rightarrow 1 = 25 \text{ DIV } 15$

$15 = 115 - 25 \cdot 4 \rightarrow (115 \text{ DIV } 25)$

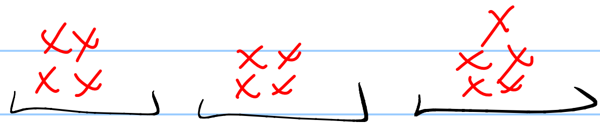
$$\begin{aligned}
5 &= 15 - 10 \\
&= 15 - (25 - 15) = 2 \cdot 15 - 25 \\
&= 2(115 - 25 \cdot 4) - 25 \\
&= 2 \cdot 115 - 9 \cdot 25 = 5
\end{aligned}$$

$-8 \cdot 25 \quad -1 \cdot 25$

17 oranges
∞ kiwi $\rightsquigarrow 1 + x + x^2 + x^3 + \cdots$

$$= \frac{1}{1-x}$$

$$\frac{1 - x^{18}}{1-x} \cdot \frac{1}{(1-x)} = \frac{1 - x^{18}}{(1-x)^2}$$



Type

$3\cdot(5-1)+1$

Types

desired.

What is the mult inv of 15 mod 53?

$$y \cdot 15 \bmod 53 = 1.$$

53 15 8 7 1.

$$s\cdot 53 + t\cdot 15 = 1.$$

$$t\cdot 15 = 1 - \cancel{s\cdot 53}^{\,0}$$

$$\boxed{t \bmod 53} \to \{0,\dots,52\}.$$