Physics 421 / PCSE 503
Lecture 20

Experiments → collect data

(good design)

→ enough data (N)

→ $\boxed{\text{small uncertainties}}$

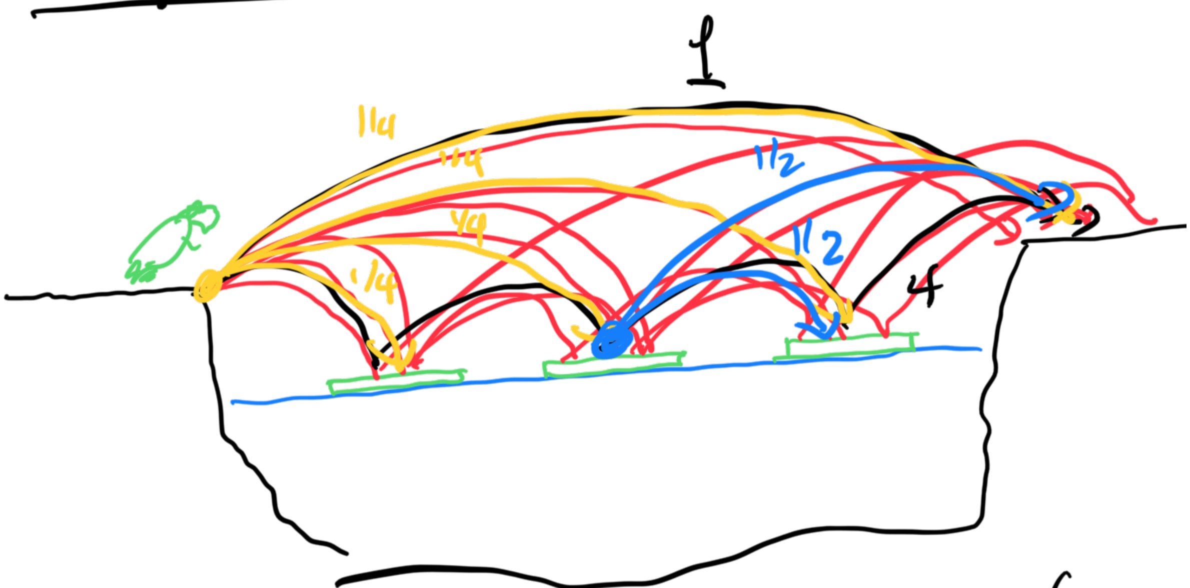
→ Analysis

→ numerical techniques.

(integration,
Fourier,
visualization
fitting)

→ $\boxed{\text{Simulation}}$

Frog - Lily Pad Problem.



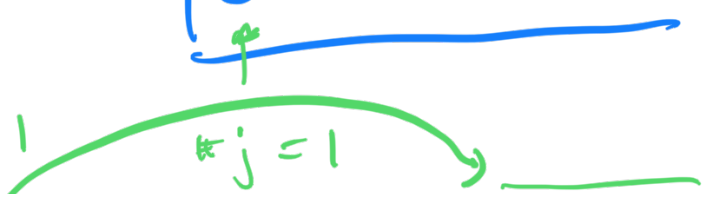
each possibility → total # of jumps. ((1-4

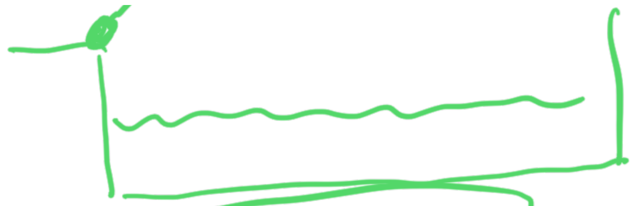
What is the average # of jumps for all possibilities?

assuming frog chooses randomly.

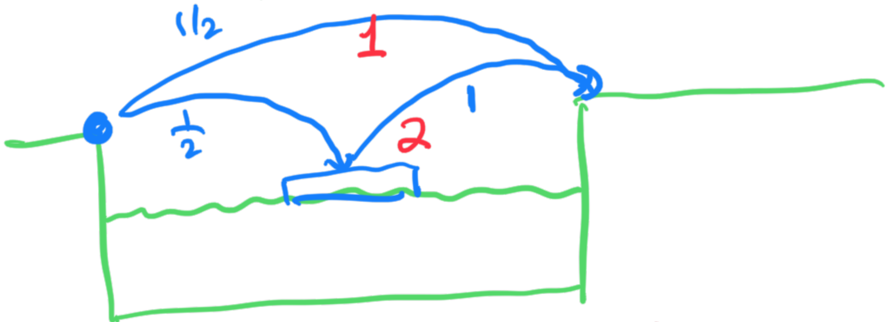
as a function of # of lily pads.

$\boxed{0 \to \infty}$

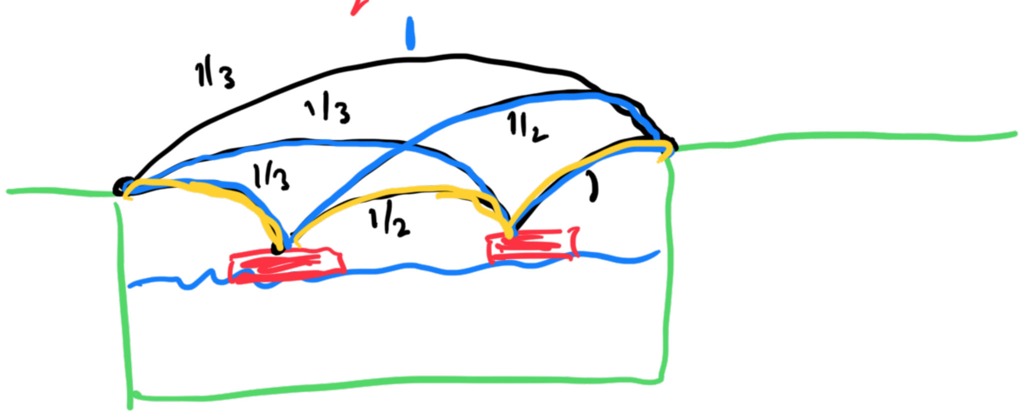




$$\bar{j} = \boxed{1}$$ ✓ 1



$$\bar{j} = \frac{1}{2}(1) + \frac{1}{2}(2)$$
$$= \frac{1}{2} + 1 = \boxed{1.5}$$ ✓ $\frac{3}{2}$



$$\bar{j} = \frac{1}{3}(1) + \frac{1}{3}(2) + \left(\frac{1}{3}\right)\left(\frac{1}{2}\right)2$$
$$+ \left(\frac{1}{3}\right)\left(\frac{1}{2}\right)3$$

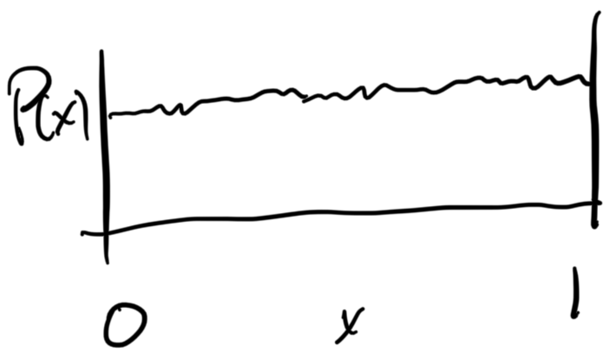
$$\bar{j} = \boxed{1.83\dot{3}}$$ ✓ $\frac{11}{6}$

?

$\boxed{\text{Simulate it!}}$

$\boxed{\text{Heart of Simulation}}$

→ $\boxed{\text{random \# generation}}$



OK

→ pseudo-random number generator.

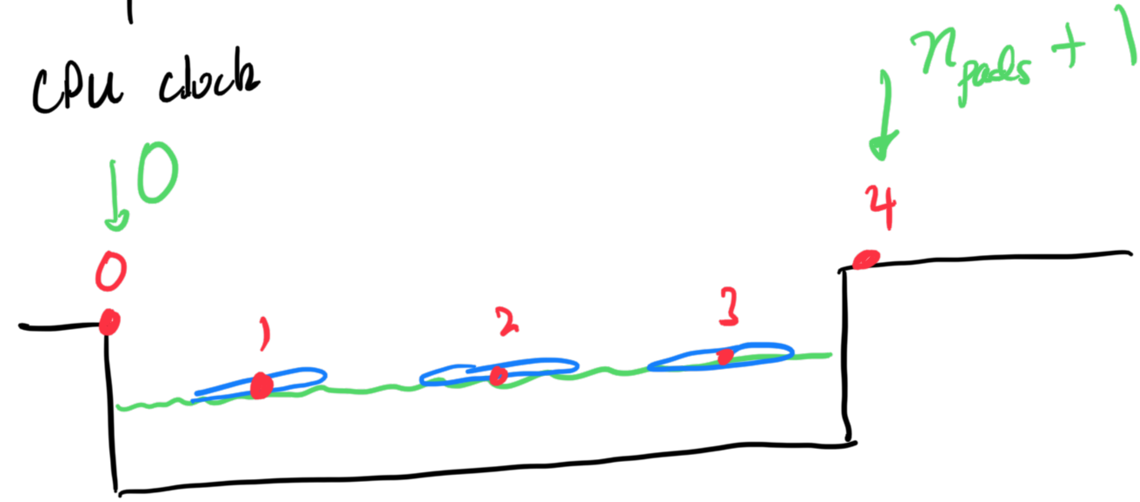
How often does the sequence repeat

$\boxed{\text{Mersenne - Twister}}$

Quantum Computing

"Seed" → sets the first # in the sequence.

↑ CPU clock



→ where is the frog?

total_jumps

200

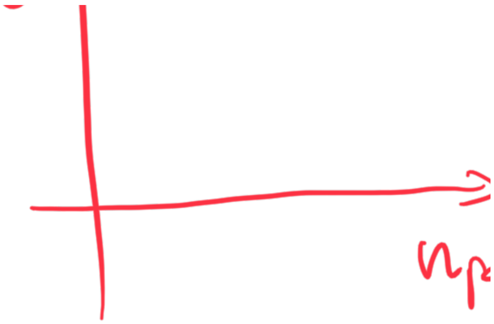
n_{pad} → 0 . . . . . .

start = 0

J

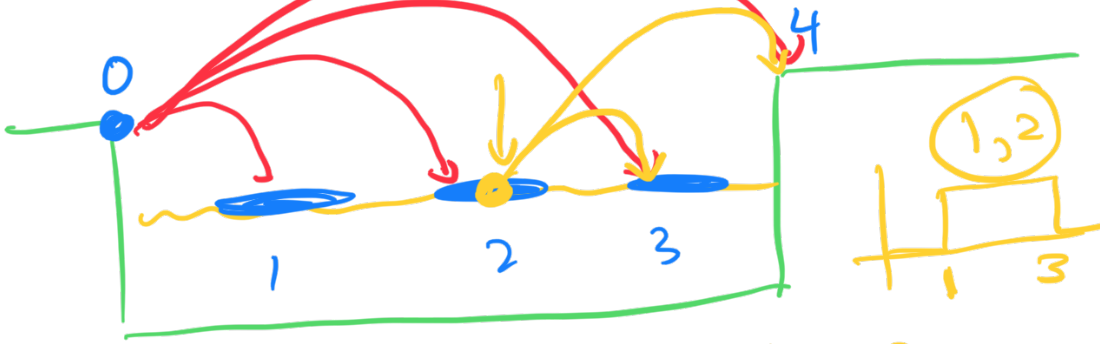
end = npad + 1

n [ ]



Start = 0

npad = 3



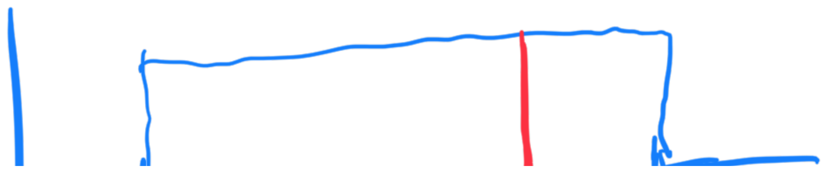
start = 2
end = 4
end - start + 1 = 3

start = 0

end = 4

end - start + 1 = 4 - 0 + 1 = $\boxed{5}$

random.uniform(1, 5)



$\cancel{1.0000}$

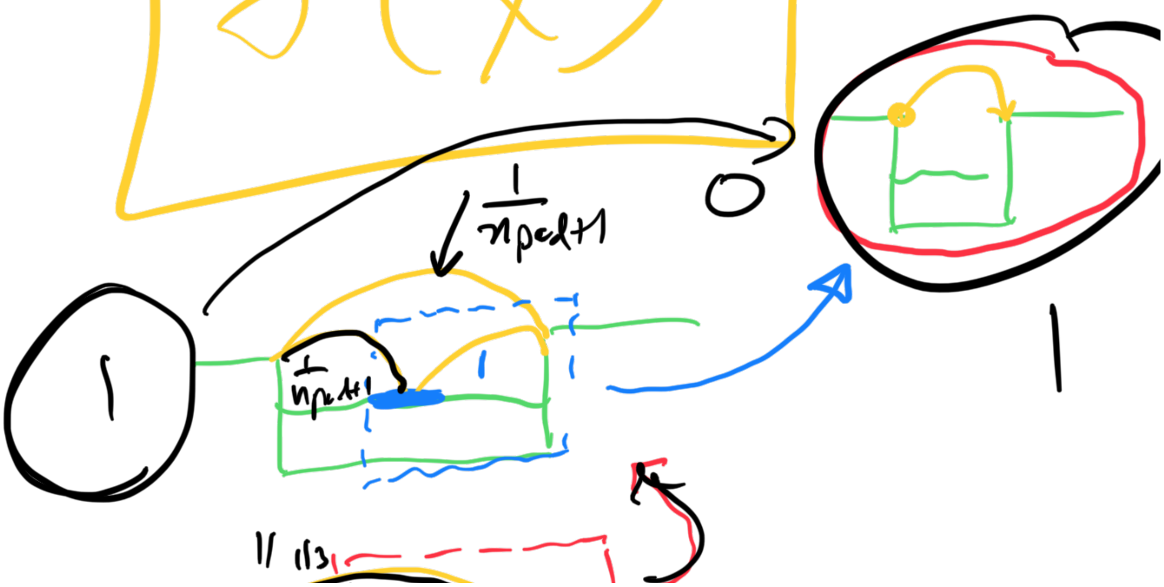
$\cancel{4.999999}\ldots$

$\boxed{1,2,3,4}$

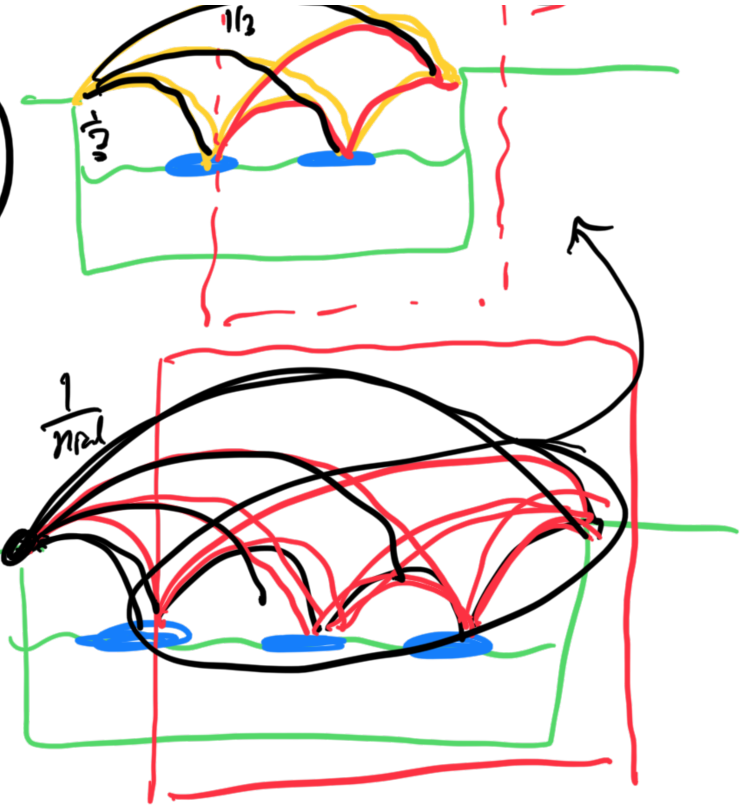
ejump(___ , ___ , ___ , ___ ,

n (0 , 1 , 2 , 3 ...

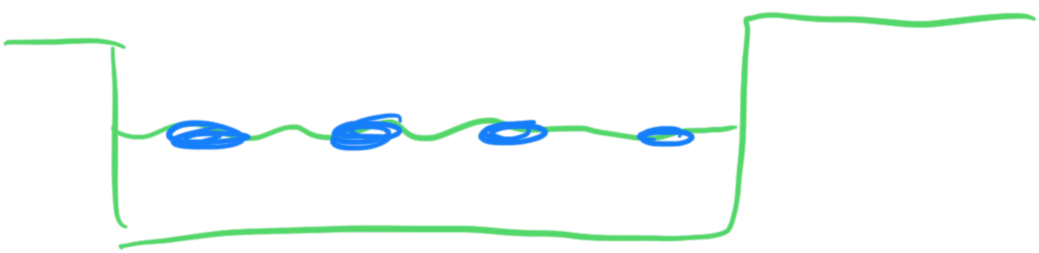
$\boxed{f(x)}$



2



→ 3



$$\underline{\frac{1}{n_{pad}}}\left(1 + \underline{e[\text{pauses}]}\right)$$

↑ jumps and

the
way
across