

- Simple - Counting

Countably infinite sample space

$$S = \{1, 2, 3, \dots, \infty\}$$

$$|S| = ?$$

$$a + ar + ar^2 + ar^3 + \dots = k < \infty$$

$$-kr < 1$$

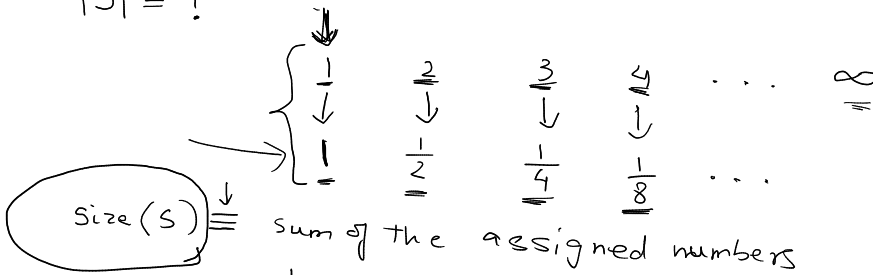
$$S = \{ \overset{\#_1}{\uparrow}, \overset{\#_2}{\uparrow}, \overset{\#_3}{\uparrow}, \dots \}$$

$$\text{size}(S) = \sum (\#_i)$$

$$\text{size}(A) = \sum (\#_i \text{ assigned to elements of } A)$$

Trick:

Assign sizes.



$$a=1$$

$$r=\frac{1}{2}$$

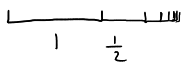
$$= 1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \dots$$

$$= \frac{1}{1-\frac{1}{2}} = 2$$

geometric series

$$a=1$$

$$r=\frac{1}{2}$$



$$\frac{1}{2}$$

$$\frac{1}{2}$$

$$\frac{1}{2}$$

$a + ar + ar^2 + ar^3 + ar^4 + \dots$

If $-1 < r < 1$, the geometric series converges.

$$\text{Sum} = \frac{a}{1-r}$$

Consider any subset A of S

$$\text{sum}(A) \leq 2$$

probability

$$A \subseteq S$$

$$\text{sum}(A) \leq \text{sum}(S)$$

$$0-1$$

$$P(A) = \frac{\text{size}(A)}{\text{size}(S)} = \frac{\text{sum}(A)}{\text{sum}(S)}$$

Q: Is S equilikely?

$$-P(\{1\}) = \frac{1}{2}$$

$$-P(\{2\}) = \frac{1}{2} = \frac{1}{4}$$

Not equilikely.

$$-A = \{2, 5\}$$

$$\text{size}(A) = \text{sum}(\frac{1}{2}, \frac{1}{16})$$

$$= \frac{1}{2} + \frac{1}{16}$$

$$A \subseteq S$$

$$\text{sum}$$

$$\text{sum}$$

$$P(A) = \frac{\frac{1}{2} + \frac{1}{16}}{2}$$

$$1 + 1 + \dots + 1 = 1/\text{ac}$$

$$r=2$$

$$\infty$$

$$1 + 2 + 4 + 8 + 16 + \dots + \infty = \infty$$

$$\rightarrow 1 + 1 + 1 + \dots = \infty$$

$$1 + 1 = 2$$

$$1 + 1 + 1 = 3$$

$$1 + 1 + 1 + 1 = 4$$

$$\frac{1+1+1+\dots}{2 \ 4 \ 8}$$

$$r=\frac{1}{2}$$

approaching zero

$$-kr < 1$$