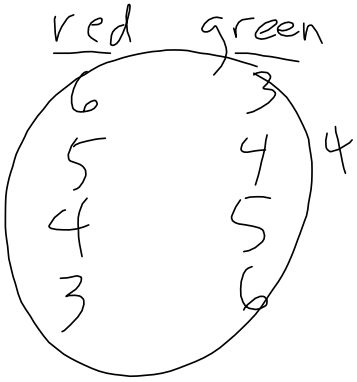
A set of dice, one green and one red, are rolled. What is the probability that the sum of the numbers on the die is nine?

$$\frac{4}{36} = \frac{1}{9}$$



$6 \cdot 6 = 6^2$ possibilities

green \ red	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

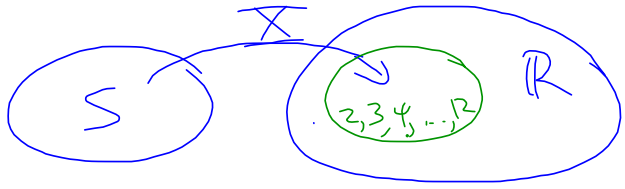
Experiment: roll dice as described

$S = \{(1,1),(1,2),\ldots,(1,6),(2,1),\ldots (6,6)\}$

$X : S \to \mathbb{R}$ Defined to be sum of 2 die.

$P(X=9) = \frac{4}{36}$ What is prob the sum is 9?

$P(5 \le X \le 9) = \frac{24}{36}$



$Ran(X) = \{2, 3, \dots, 12\}$

$f(5) = P(X = 5) = \frac{4}{36}$

Define

$f: Ran(X) \to [0, 1]$

$f(x) = P(X = x)$

$\in Ran(X)$

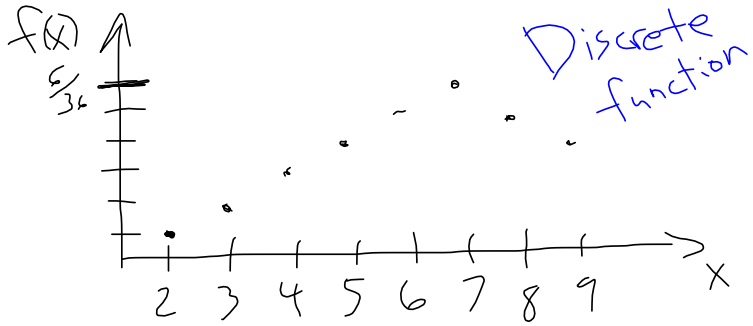
$$F(-1) = \sum_{t \le -1} f(t) = 0$$

$$F(1.999) = \sum_{t \le 1.999} f(t) = 0$$

$$F(2) = \sum_{t \le 2} f(t) = \frac{1}{36} = F(2.1) = F(e)$$

$$F(3) = \sum_{t \le 3} f(t) = f(2) + f(3) = \frac{1}{36} + \frac{2}{36} = \frac{3}{36}$$

x	$f(x)$
2	$1/36$
3	$2/36$
4	$3/36$
5	$4/36$
6	$5/36$
7	$6/36$
8	$5/36$
9	$4/36$
10	$3/36$
11	$2/36$
⋮	⋮

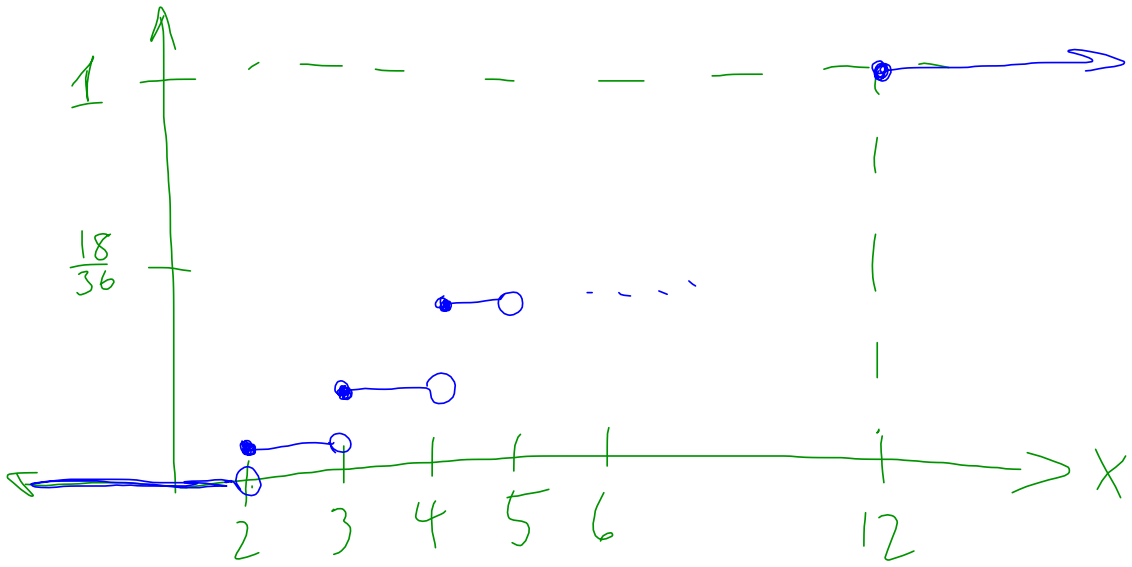


Discrete function

$$F : \mathbb{R} \to [0,1]$$

$$F(x) = \sum_{t \le x} f(t)$$

$$F(x) = \begin{cases} 0 & \text{for } x < 2 \\ 1/36 & \text{for } 2 \le x < 3 \\ 3/36 & \text{for } 3 \le x < 4 \\ 6/36 & \text{for } 4 \le x < 5 \\ \vdots & \\ 1 & \text{for } 12 \le x \end{cases}$$


1
18/36
X
2
3
4
5
6
12

$$P(5 \le X \le 9) = f(5) + f(6) + \dots + f(9)$$

$$= \sum_{t=5}^{9} f(t) - \int_5^9 f(x)\,dx$$

$$= F(9) - F(4)$$

$$P(X \ge 8) = 1 - F(7)$$

Draw 2 tiles from tub w/ w/o repl
3 red, 5 yellow. X is # of red

$S = \{RR, RY, YR, YY\}$ $X(RR) = 2$

Tree
- $\frac{3}{8}$ R
  - $\frac{2}{7}$ R $P(RR) = \frac{6}{56}$
  - $\frac{5}{7}$ Y $P(RY) = \frac{15}{56} = P(YR)$
- $\frac{5}{8}$ Y
  - $\frac{3}{7}$ R
  - $\frac{4}{7}$ Y $P(YY) = \frac{20}{56}$

$$Ran(X) = \{0, 1, 2\}$$

x	$f(x)$
0	$20/56$
1	$30/56$
2	$6/56$

$$F(x) = \begin{cases} 0 & \text{if } x < 0 \\ 20/56 & \text{if } 0 \le x < 1 \\ 50/56 & \text{if } 1 \le x < 2 \\ 1 & \text{if } 2 \le x \end{cases}$$

Office Tuesday
11-12, 1-2 other if asked
by e-mail