Random Variable: Rule assigning a number to each outcome of an experiment.

Example: Flip a coin twice.

Random Variable → X = # of heads

Outcome	X
HH	2
HT	1
TH	1
TT	0

Example: 15 question quiz.

X = # of questions a student gets correct

Values of X: $\{0, 1, 2, 3, \ldots, 14, 15\}$

Example: Select 3 people from group of 5 men, 4 women

X = # of women in 3-person group

X	Outcome	# Outcomes
0	Three men	$C(5,3) = 10$
1	One woman, two men	$4 \times C(5,2) = 40$
2	Two women, one man	$C(4,2) \times 5 = 30$
3	Three women	$C(4,3) = 4$

Bunch more examples:

Experiment	Random Variable
Survey of cars in lot	# of passengers
Roll pair of dice	Sum of values on dice
Sample of tires off assembly line	# of defective tires
Select student from class	Height
Sample of cereal boxes from factory	Weight

Discrete Variable

Continuous Variable

Discrete variable: Gaps in between values

$\{1, 2, 3, 4, 5\}$

Continuous variable: No gaps

Probability Distribution: An assignment of a probability to each value of X.

If X has values $x_1, x_2, \dots, x_n$, say $P(x_i)$ is the probability of getting x_i

Requirements:

i) $0 \leq P(x_i) \leq 1$

ii) $P(x_1) + P(x_2) + \dots + P(x_n) = 1$

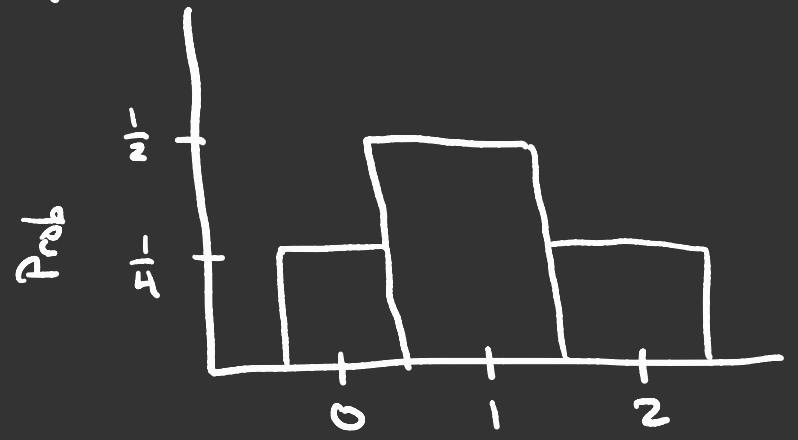
Example: Tossing coin twice. X = # heads

X	P(X)
0	1/4
1	1/2
2	1/4

$P(0) = P(TT) = \frac{1}{4}$

$P(1) = P(TH \text{ or } HT) = \frac{1}{2}$

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

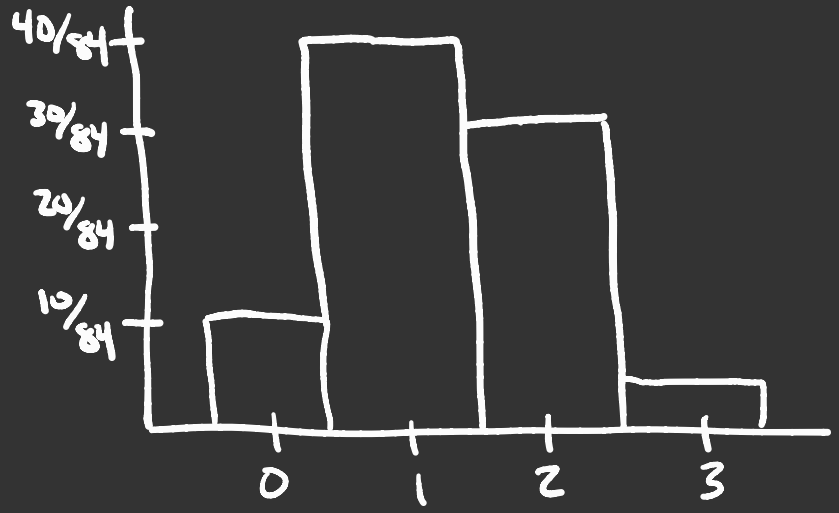


Example: Select 3 people from group of 5 men, 4 women

X = # of women

X	$P(X)$
0	$10/84$
1	$40/84$
2	$30/84$
3	$4/84$ +
	1

$$P(0) = \frac{C(5,3)}{C(9,3)} = \frac{10}{84}$$



Example: 5 red cards labeled 1-5
5 black cards labeled 1-5

Draw cards until we draw card matching color of first card. X = # of cards drawn

X	$P(X)$
2	$1 \times \frac{4}{9} = \frac{4}{9}$
3	$1 \times \frac{5}{9} \times \frac{4}{8} = \frac{5}{18}$
4	$1 \times \frac{5}{9} \times \frac{4}{8} \times \frac{4}{7} = 10/63$
5	
6	
7	