

## Section 8.3: Discrete Random Variables

Thursday, April 2, 2020 11:56 AM

a **variable**  $X$  is a random variable if the value it assumes in the outcome of an experiment is a chance or random event

examples of random events:

- result of a coin flip  
note: coin does not have to be fair
- **the sum of two dice when rolled**
- the first <sup>card</sup> dealt in a card game

**discrete** random variable

- quantitative (it has a numerical value)

- can only take on certain values

- two 6-sided dice can have a sum of 3 or 4 but not 3.75

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probability distribution:

example: when you roll a **fair** 6-sided die,

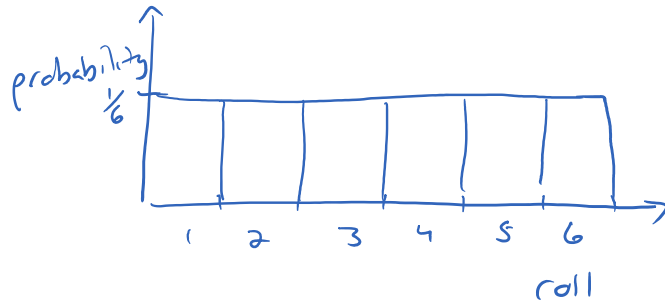
what is the probability of each roll?

table

roll	probability
1	$\frac{1}{6}$
2	$\frac{1}{6}$
3	$\frac{1}{6}$
4	$\frac{1}{6}$
5	$\frac{1}{6}$
6	$\frac{1}{6}$

Sum = 1

graph

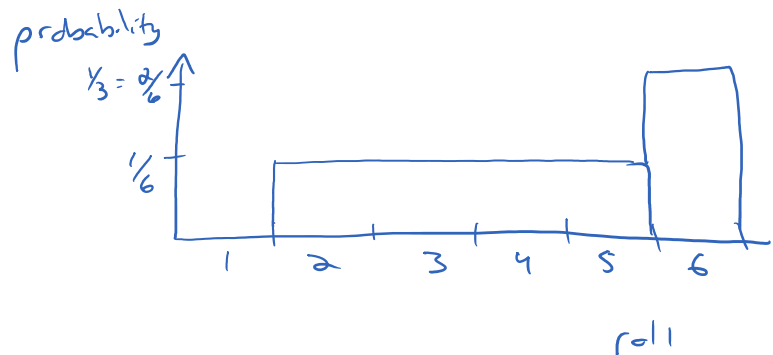


example: what is the probability of each outcome for rolling an unfair six-sided die if the probability of rolling a 2, 3, 4, or 5 is still  $\frac{1}{6}$  but the probability of rolling a 1 is zero?

table

roll	$p(\text{roll})$
1	0
2	$\frac{1}{6}$
3	$\frac{1}{6}$
4	$\frac{1}{6}$
5	$\frac{1}{6}$
6	$\frac{2}{6} = \frac{1}{3}$
sum = 1	

so sum is still one



probability distribution for a discrete random variable is a formula, table, or graph that gives the possible outcomes of  $x$  and their associated probabilities  $p(x)$ .

note: the sum of the probabilities must equal one

$$\sum p(x) = 1$$

example: complete the following probability distribution

$x$	$p(x)$
0	$\frac{1}{10}$
1	$\frac{3}{5}$
2	$\frac{3}{10}$

Sum = 1

← fill in the missing value  
 $= 1 - \frac{1}{10} - \frac{3}{10}$   
 $= \frac{6}{10} = \frac{3}{5}$