

Section 8.3: Discrete Random Variables

Wednesday, March 27, 2024 10:52 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 event:

- result of a coin flip

note: coin does not have to be fair

- the sum of two dice when rolled

- the first card dealt in a card game

discrete random variable:

- quantitative (it has a numerical value)

- discrete means it can only take on certain values

- two 6-sided dice can have a sum of 2, 3, 4, ..., 12

but cannot have a sum of 3.75

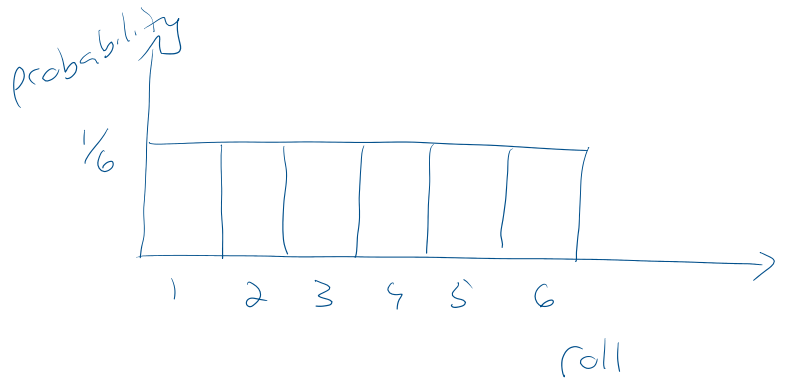
probability distribution:

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



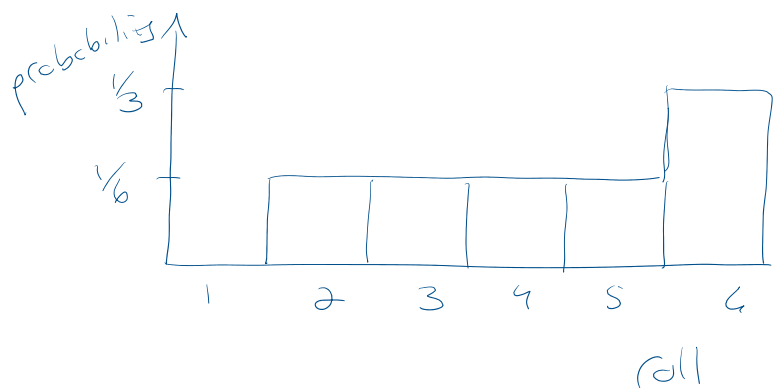
example: what is the probability of each outcome for rolling a unfair six-sided die if the probability of rolling a 2, 3, 4, or 5 is still $\frac{1}{6}$, but the probability of rolling a 1 is zero?

table

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

so that sum is still one

Sum = 1



6 | $\frac{16}{13}$ so that sum is still one
Sum = 1

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	$\frac{3}{10}$
	<hr/> Sum = 1

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