

Chapter 4: Discrete Random Variables

random variable - a variable that can take on numeric values according to chance.

X = the sum obtained when rolling a die two times

X	$P(X=x)$
2	$\frac{2}{23}$
3	$\frac{1}{23}$
4	$\frac{1}{23}$
5	$\frac{1}{23}$
6	$\frac{2}{23}$
7	$\frac{3}{23}$
8	$\frac{7}{23}$
9	$\frac{7}{23}$
10	$\frac{2}{23}$
11	$\frac{2}{23}$
12	0

probability distribution function (pdf)

Law of Large Numbers

example: Toss a coin two times. X = the number of heads.

X	$P(X=x)$	$X \cdot P(X=x)$
0	$\frac{1}{4}$	0
1	$\frac{2}{4}$	$\frac{2}{4}$
2	$\frac{1}{4}$	$\frac{2}{4}$

$\mu = 1$

$S = \{HH, HT, TH, TT\}$

$\mu = \text{mean} = \text{long-term average if this experiment were carried out many times}$

0, 1, 1, 1, 0, 2, ...

$$\mu = \sum X \cdot P(X=x)$$

expected value = mean of a probability distribution function

example: A lottery offers three prizes: 1 \$1000 prize, 1 \$500 prize, and 5 \$100 prize. One thousand tickets are sold at \$3 each. What your expected net profit if you buy one ticket?

X	$P(X=x)$	$X \cdot P(X=x)$
997	$\frac{1}{1000}$	0.997
497	$\frac{1}{1000}$	0.497
97	$\frac{5}{1000}$	0.485
-3	$\frac{993}{1000}$	-2.979

$X = \text{net profit}$

$$\mu = -1$$

Chapter 4
Homework: Problems 1-6 (4.15)