

Example: Johnny plays little league

Chance of getting a hit each at-bat = 0.2

Deal with dad: For each hit, Johnny gets \$2.

How much should Johnny's dad expect to pay if Johnny bats 2 times in a game?

X = amount Johnny's dad pays out

X	$P(X)$
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0	$(0.8)^2 = 0.64$
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2	$(0.2)(0.8) + (0.8)(0.2) = 0.32$
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4	$(0.2)^2 = 0.04$
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6	0
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$$E(X) = 0.64(0) + 0.32(2) + 0.04(4) + 0(6) = 0.8$$

Example: Championship. 3 games, first to 2 wins
 What is the expected number and standard deviation of games played?
 $X = \#$ of games played

a) Team A has 1.0 chance of winning each game
 B has 0 chance

AA: $(1)(1) = 1$
 BB: $(0)(0) = 0$
 ABA: $(1)(0)(1) = 0$
 BAA: 0
 BAB: 0
 ABB: 0

X	P(X)
2	1
3	0

$$E(X) = 2(1) + 3(0) = 2$$

$$\sigma^2(X) = 1(2-2)^2 + 0(3-2)^2$$

$$= 0$$

$$\sigma(X) = 0$$

b) Team A 0.5 chance of winning each game

B 0.5 chance

AA : 0.25
BB : 0.25
ABA : 0.125
BAA : 0.125
BAB : 0.125
ABB : 0.125

X	P(X)
2	0.5
3	0.5

$$E(X) = 0.5(2) + 0.5(3) = 2.5$$

$$\begin{aligned}\sigma^2(X) &= 0.5(2-2.5)^2 + 0.5(3-2.5)^2 \\ &= 0.5(0.25) + 0.5(0.25) \\ &= 0.25\end{aligned}$$

$$\sigma(X) = 0.5$$

c) Team A 0.6 chance of winning each game
B 0.4 chance

AA: 0.36
BB: 0.16
ABA: 0.144
BAA: 0.144
BAB: 0.096
ABB: 0.096

X	P(X)
2	0.52
3	0.48

$$E(X) = 0.52(2) + 0.48(3) \\ = 2.48$$

$$\sigma^2(X) = 0.52(2 - 2.48)^2 + 0.48(3 - 2.48)^2 \\ = 0.2496$$

$$\sigma(X) = 0.499$$