

Lesson #11 Sect 4.2

Aim: What is expected value?

Do Now: A 28 year old man pays \$208 for one-year life insurance policy with coverage of \$110,000

Question?

A) What is the actual monetary benefit of the policy? $110,000 - 208 = \$109,792$

If the probability that he will live through the year is 0.9993. What is the expected value of the insurance policy for the insurance company?

B) What is the probability that he will live/die on that year?

live 0.9993

die $1 - 0.9993 = 0.0007$

I - Expected Value

1) Symbol "E"

2) It is a discrete random variable. It represents the average (mean) value of the outcome.

3) $\sum (x \cdot P(x)) = \text{mean}$

4) Prob. Distribution Table (from the Do Now)

Event	x	P(x)	x · P(x)
LIVE	+208	0.9993	207.85
DIE	-109792	0.0007	-76.85
			= $\sum +131$

Note: Data is based on the insurance co. favor

Explanation - insurance company will get \$131 if they keep selling many insurance policy (over the long run)

You bet \$0.50 on a GAME by selling a ticket with 3 digits between 000 and 999.
If you win you'll get \$275. What is your expected value?

Event	x	$P(x)$	$x \cdot P(x)$
WIN	+274.50	$\frac{1}{1000}$	$274.50 \times (\frac{1}{1000}) = 0.2745$
LOSE	-0.50	$1 - \frac{1}{1000} = \frac{999}{1000}$	$-0.50 \times (\frac{999}{1000}) = -0.4995$

$= \sum -0.225$
 APPROX.

$$E = \sum -\$0.23$$

Meaning \Rightarrow If you play over and over again your average lost will be 0.23 on every game.

15. Suppose you pay \$2 to play a game of chance, in which you toss a coin and roll a die. You are paid \$10 if your coin shows a tail and you roll at least a five on the die.

Let the random variable X be the profit of the game or the amount of money won or lost per roll. Negative profit corresponds to lost money.

Fill out the following probability distribution table

coin / die
tail 5,6

Event	X	P(X)	$X \cdot P(X)$
Win	\$8	2/12	1.33
lose	-\$2	10/12	-1.66

$E = \sum -0.33$

- a) Over the long term, what is your *expected* profit (or loss) per game? \uparrow # $100 \times -0.33 = -33$
- b) If you played this game 100 times, how much would you expect to win /lose? -33

