Lesson 18 — Expected value

Problem 1

A fair die is thrown once, and your monetary gain from betting on each outcome (1, 2, 3, 4, 5, 6) are as follows:

Outcome:	**1**	**2**	**3**	**4**	**5**	**6**
How much you win or lose:	-$1	-$1	-$1	$1	$2	-$1

Would you play this game? Why or why not?

Problem 2

A fair coin is tossed twice. You gain $2 if both are heads. You lose $1 otherwise.

Would you play this game? Why or why not?

Problem 3

Suppose that you roll a single die. If an odd number (1, 3, or 5) comes up, you win the amount of your roll ($1, $3, or $5, respectively). If an even number (2, 4, or 6) comes up, you have to pay the house the amount of your roll ($2, $4, or $6, respectively)

(a) Find the expected payoff for this game.
(b) Is this a fair game? Explain.

Problem 4

On an American roulette wheel, there are 38 numbers: $00, 0, 1, 2, 3, \ldots, 35, 36$. If you bet $\$N$ on any one number—say, for example, on 10—you win $\$36N$ if 10 comes up (i.e., you get $\$37N$ back—your original bet plus your $\$36N$ profit); if any other number comes up, you lose your $\$N$ bet. Find the expected payoff of a $1 bet on 10 (or any other number).

Problem 5

Suppose that you roll a pair of honest dice. If you roll a total of 7, you win $18; if you roll a total of 11, you win $54; if you roll any other total, you lose $9. Find the expected payoff for this game.

Problem 6

A box contains twenty $1 bills, ten $5 bills, five $10 bills, four $20 bills, and one $100 bill. You blindly reach into the box and draw a bill at random. What is the expected value of your draw?