

1. We throw a die. If the number rolled is even, we pay \$4. If the number rolled is odd, we receive as many dollars as the number on the dice shows. For example, if we roll the number 5, we receive \$5. Find the expected value of this game.

$$\text{Solution: } \frac{3}{6}(-4) + \frac{1}{6}(1 + 3 + 5) = -\frac{1}{2}$$

2. We throw a die. If the number rolled is odd, we pay \$2. If the number rolled is even, we receive as many dollars as the number on the dice shows. For example, if we roll the number 4, we receive \$4. Find the expected value of this game.

$$\text{Solution: } \frac{3}{6}(-2) + \frac{1}{6}(2 + 4 + 6) = 1$$

3. There are 6 marbles in a bag: 3 red, 2 blue, and 1 green. We pull a marble. If it is red, we pay \$2. If it is blue, we receive \$3. If it is green, we receive \$4. Find the expected value of this game.

$$\frac{3}{6}(-2) + \frac{2}{6}(3) + \frac{1}{6}(4) = \frac{2}{3}$$

4. We randomly pull a card from a standard deck of 52. If the card is an ace, we receive \$20. If it is a king, we receive \$10. If it is a queen or a jack, we receive \$5. In every other case, we pay \$3. Find the expected value for this game. 1

5. We roll two dice. If the numbers rolled are different, we pay \$3. If the numbers rolled are the same, we receive as many dollars as the product of the numbers shown on the dice. For example, if we roll the number 5 and 5, we receive \$25. Find the expected value of this game. $\frac{1}{36}$

6. We have 10 marbles in a bag: 5 red, 3 blue, and 2 yellow. We randomly pull two marbles, without replacement. If we pull two yellow marbles, we receive \$20. If we pull two blue marbles, we receive \$10. If we pull two red marbles, we receive \$5. If we pull two marbles of different colors, we pay \$4. Find the expected value of this game. $-\frac{8}{15} = -0.5\bar{3}$

7. There are 6 marbles in a bag: 3 red, 2 blue, and 1 green. We pull two marbles. If the two marbles pulled are of the same color, we receive \$5. Otherwise, we pay \$2. Find the expected value of this game, assuming

(a) replacement $\frac{7}{18}(5) + \frac{11}{18}(-2) = \frac{13}{18}$

$$P(\text{same}) = \left(\frac{3}{6}\right)^2 + \left(\frac{2}{6}\right)^2 + \left(\frac{1}{6}\right)^2 = \frac{7}{18}$$

(b) no replacement $\frac{4}{15}(5) + \frac{11}{15}(-2) = -\frac{2}{15} = -0.133\bar{3}$

$$P(\text{same}) = \left(\frac{3}{6}\right)\left(\frac{2}{5}\right) + \left(\frac{2}{6}\right)\left(\frac{1}{5}\right) = \frac{4}{15}$$