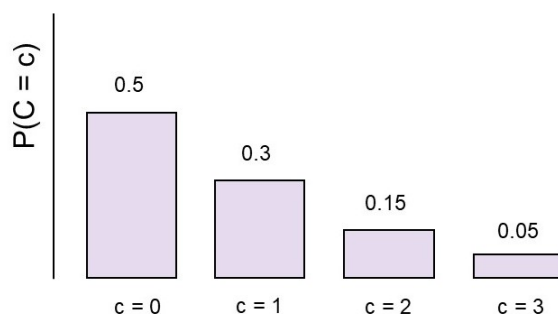


## Lab Module 4: Profitability of a Bet

**Question 1:** Visitors to a Skee-Ball booth attempt to roll a ball into a central target. Define the discrete random variable  $C$ : the number of times a customer rolls the ball into the central target in three attempts. The discrete random variable  $C$  reflects the customer's score. The PDF of  $C$  is as follows:



a) Sketch the CDF of  $C$ . What proportion of customers roll the ball into the central target at least twice in three attempts?

b) It costs \$2.00 to play a single game of Skee-Ball (three attempts) at this booth. Customer winnings ( $W$ ) are outlined in the table below, alongside the booth's profit ( $P = \$2.00 - W$ ) for each possible outcome of the customer's score ( $C$ ).

Customer Score ( $C$ )	Customer Winnings ( $W$ )	Booth's Profit ( $P$ )
0	\$0	+\$2.00
1	\$3.00	-\$1.00
2	\$5.00	-\$3.00
3	\$7.00	-\$5.00

Compute  $E(P)$ , the booth's expected profit for a single game of Skee-Ball. Can the booth expect to make a positive net profit "in the long run" with the current pricing strategy?

c) How much should the booth charge for a single game of Skee-Ball in order to achieve an expected profit of 40 cents per game "in the long run"? Assume customer winnings amounts remain the same, but the booth's profit ( $P$ ) will reflect the new price.

d) How can the booth achieve an expected profit of 40 cents per game "in the long run" by adjusting customer winnings amounts, while keeping the cost per game equal to \$2.00? **Note:** There is more than one correct answer.

**Question 2:** In the game show Deal or No Deal, suppose there are just five cases remaining on the board, in addition to the contestant's case. The collective monetary values for the six cases are: \$750,000, \$400,000, \$5,000, \$300, \$75 and \$0.01 as depicted below:

### Remaining Cases

Case 2	Case 8	Case 15	Case 19	Case 22
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### Remaining Values

\$0.01	\$300	\$400,000
\$75	\$5,000	\$750,000

### Contestant's Case

Case 3
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The bank offers \$150,000 to purchase the contestant's case. Let the discrete random variable  $P$  represent the bank's profit.

- Sketch the CDF of  $P$ . What is the probability that the bank achieves a positive profit for a **single** offer of \$150,000?
- What is the bank's **expected** profit for the offer of \$150,000?
- How much should the bank offer so that its **expected** profit equals \$75,000?
- Sketch the new CDF of  $P$  for the new offer amount determined in (c). Has the probability that the bank achieves a positive profit for a **single** offer changed?