

Expected value

1)

Hugo plans to buy packs of baseball cards until he gets the card of his favorite player, but he only has enough money to buy at most 4 packs. Suppose that each pack has probability 0.2 of containing the card Hugo is hoping for.

Let the random variable X be the number of packs of cards Hugo buys. Here is the probability distribution for X :

$X = \# \text{ of packs}$	1	2	3	4
$P(X)$	0.2	0.16	0.128	?

Find the indicated probability.

$$P(X \geq 2) = \boxed{}$$

2)

A certain lottery ticket costs \$2, and the back of the ticket says, "The overall odds of winning a prize with this ticket are 1 : 50, and the expected return for this ticket is \$0.95."

Which interpretations of the expected value are correct?

Choose all answers that apply:

- A The probability that one of these tickets wins a prize is 0.95, on average.
- B Someone who buys this ticket is most likely to win \$0.95.
- C If we looked at many of these tickets, the average return would be about \$0.95 per ticket.
- D If 1,000 people each bought one of these tickets, they'd expect a net gain of about \$950 in total.

3)

A construction company is considering submitting bids for two contracts. It will cost the company \$10,000 to prepare and submit the bids, and if won, each bid would produce \$50,000 of income to the company. The company estimates that it has a 10% chance of winning any given bid.

Here is the probability distribution of $X =$ the number of bids the company wins, and $M =$ the amount of money the company profits from the bids.

$X =$ the number of bids won	0	1	2
$M =$ profit			
Probability			

Calculate the mean of M .

4)



A "Pick 4" lottery game involves drawing 4 numbered balls from separate bins each containing balls labeled from 0 to 9. So there are 10,000 possible selections in total: 0000, 0001, 0002, . . . , 9998, 9999.

Players can choose to play a "straight" bet, where the player wins if they match all 4 digits in the correct order. The lottery pays \$4,500 on a successful \$1 straight bet.

Let X represent a player's net gain on a \$1 straight bet.

Calculate the expected net gain $E(X)$.

Hint: The expected net gain can be negative.



5)

An electronics store gives customers the option of purchasing a protection plan when customers buy a new television. The customer pays \$80 for the plan, and if their television is damaged or stops working, the store will replace it for no additional charge. The store knows that 2% of customers who buy this plan end up needing a replacement that costs the store \$1,200 each.

Here is a table that summarizes the possible outcomes from the store's perspective:

Replacement?	Cost	Net gain (X)
Yes	\$1,200	-\$1,120
No	\$0	\$80

Let X represent the store's net gain from one of these plans.

Calculate the expected net gain $E(X)$.