

Uncertainty and Expected Value Problems

#CMSC320

#probability_statistics

#M1

Uncertainty

Uncertainty and Expected Value

General

Question 1

How is certainty related to the outcome of some event?

Answer

The uncertainty related to an event is irrelevant to its outcome. We may predict a result of some event with 90% certainty. However, the unexpected result can still occur with the certainty measure still remaining the same.

Question 2

What does uncertainty quantify? What measures can be used to represent uncertainty?

Answer

Uncertainty is the error in predicted compared to observed values of some event. Certainty can be measured by confidence, standard deviation, IQR, etc.

Question 6

What can uncertainty tell us about our predictions?

Answer

Uncertainty measures tell us how confident we are in our predictions. We want our confidence measures to match our prediction accuracy because this indicates we have a good idea of how much we do and do not know. If there is a mismatch between confidence and accuracy, this might be an indication that some things need to be re-evaluated.

Problems

Question 1

Does this graph indicate overconfidence or underconfidence



Answer

Overconfidence since the confidence is higher than the accuracy.

Expected Value

Uncertainty and Expected Value

General

Question 1

What is the formula for expected value? Or how do you calculate expected value?

Answer

see [Uncertainty and Expected Value](#)

Problems

Question 1

A detective figures that he has a one in nine chance of recovering stolen property. His out-of-pocket expenses for each investigation are \$9,000. If he is paid his fee only if he recovers the stolen property, what should he charge clients in order to break even?

Answer

\$81,000

Question 2

You pay \$10 to play the following game of chance. There is a bag containing 12 balls, five are red, three are green and the rest are yellow. You are to draw one ball from the bag. You will win \$14 if you draw a red ball and you will win \$12 if you draw a yellow ball. How much do you expect to win or lose if you play this game 100 times?

Answer

-\$16.67

Question 3

Asif is playing the lottery in which he has to pick two numbers. If the ticket matches both numbers, he will win the grand prize, which is Rs10005. If only one number matches, he will win a small prize of Rs 1005 and the cost of a lottery ticket is Rs 5. Find the expected profit from the lottery ticket.

Answer

275.95

Question 4

Two friends are fishing in a pond that contains 10 trout and 10 sunfish. Each time they catch a fish, they release it back immediately. They made a bet. If the next three fishes friend A catches are all sunfish, then friend B will pay him Rs 100, otherwise, friend A will have to pay Rs 20 to B. Find the expected profit from the bet.

Answer

-5

Question 5

Vasu wants to buy a medical insurance plan, but he is confused between plan A and plan B. Plan A: This is a low deductible plan, he will have to pay the first 10,000 rupees of any medical costs. Additionally, to cover the plan, he will have to pay Rs80,000 per year. Plan B: This is a high deductible plan, he will have to pay the first 25,000 rupees of any medical costs. Additionally, to cover the plan, he will have to pay Rs 60,000 per year. Find the expected cost for both plans and help Vasu decide. A table is given which gives the stats about the probability of these medical expenses.

Medical Cost	Probability
Rs 0	30 %
Rs 10000	25 %
Rs 40,000	20 %
Rs 70,000	20 %
Rs 1,50,000	5 %

Answer

A - 8700. B - 1,05,000. should take plan A