



Problem of the Week

Problem C and Solution

Lucky Ducks

Problem

For a school fundraiser, Percy bought a big box of rubber ducks and wrote prize amounts, in dollars, on the bottom of each rubber duck. The prize amounts were \$5, \$10, \$20, \$50, and \$100. The number of ducks with each prize amount varied so that the total value for all the ducks with each prize amount was always \$500.

Percy then put all the rubber ducks in his school's swimming pool. At the fundraiser, participants used a long net to catch a duck from the pool. They won the amount written on the bottom of the rubber duck, and then they threw the duck back into the pool before the next person's turn. Since the ducks were returned to the pool after they were caught, the chances of winning any particular amount remained the same.

Amir paid \$15 to play the game once. If we assume he randomly selected a duck, what is the probability that Amir won more money than he paid to play the game?

Solution

In order to determine the probability, we need to know the total number of ducks with each prize amount written on the bottom. These are calculated in the table below.

Prize Amount	Total Value of All Prizes with this Amount	Number of Ducks with this Prize Amount
\$5	\$500	$\$500 \div \$5 = 100$
\$10	\$500	$\$500 \div \$10 = 50$
\$20	\$500	$\$500 \div \$20 = 25$
\$50	\$500	$\$500 \div \$50 = 10$
\$100	\$500	$\$500 \div \$100 = 5$

The total number of ducks is $100 + 50 + 25 + 10 + 5 = 190$.

The total number of ducks containing a prize amount greater than \$15 is $25 + 10 + 5 = 40$.

Therefore, the probability that Amir won more than \$15 is:

$$\frac{\text{number of ducks containing a prize amount greater than \$15}}{\text{total number of ducks}} = \frac{40}{190} = \frac{4}{19}$$

That is, the probability that Amir won more than \$15 is $\frac{4}{19}$.

So Amir has approximately a 21% chance of winning more than he paid.