From Expectation to Probability

Problem. A lottery ticket costs $\$10$. A 40% of the lottery budget goes to prizes. Show that the chances to win $\$500$ or more are less than 1%.

Assume the contrary: the probability to win at least $\$500$ is at least 0.01. Let us denote the number of tickets sold by n. Then the budget of the lottery is $10n$ dollars. The amount spent on the prizes is $10n \cdot 0.4 = 4n$ dollars. By our assumption, at least $\frac{n}{100}$ tickets win at least $\$500$. In total, these tickets win $\frac{n}{100} \cdot 500 = 5n$ dollars. But this amount exceeds the budget $4n$ dollars spent on the prizes! We arrive at the contradiction, hence our assumption was wrong.