I found a distribution that I was not previously familiar with, Irwin-Hall, and started plugging values of N (the number of draws) into the CDF. I came up with the formula:

$$P[N = n] = 1 - \left(\sum_{k=2}^{n-1} P[N = k] + \int_0^1 \frac{1}{(n-1)!} x^{n-1} dx \right),$$

which leads to

$$\begin{aligned} E[\text{Payout}] &= 100 + \sum_{n=3}^{\infty} 100n \left(\frac{1}{(n-1)!} - \frac{1}{n!} \right) \\ &= 100 \left(1 + \sum_{n=3}^{\infty} \frac{1}{(n-2)!} \right) \\ &= 100 \left(1 + e - 1 \right) \\ &= 100e \end{aligned}$$

$100e \approx 271.83$ so you should play the game at the \$250 entry fee.