

Expectation

- Let F be the (random) number of flips, let X be the total payoff.
- We have (from LTE):

$$\mathbb{E}[X] = \sum_{n=1}^{\infty} \mathbb{E}[X|F = n] \mathbb{P}(F = n) = \sum_{n=1}^{\infty} 2^n 2^{-n} = \sum_{n=1}^{\infty} 1 = \infty$$

- From the point-of-view of expectation, we should be willing to pay any amount to play!

But....

- Let's say we pay \$20 to play.
- If the game ends in four or fewer flips (prob: $31/32$), we lose money
- There's a small chance we make money — but we can make a lot of money!