Lecture 33, class activity. Expected Value.

1. Let X be a random variable that takes values:

$$\mathbb{P}(X = 2) = p, \quad \mathbb{P}(X = 0) = 1 - p.$$

Compute:

(a) $\mathbb{E}[X]$; (b) $\mathbb{E}[X^2]$; (c) $\mathbb{E}[X^k]$; (d) $\mathbb{E}[t^X]$.

2. Consider the following game.

(a) In the first round, we roll a single six-sided die to obtain the value X.

(b) In the second round, we roll X dice and add their values to obtain the score Y.
(For example, if the first roll is a four, then in the second round we roll four dice and add them up.)
Compute $\mathbb{E}[Y]$.

(c) **(Tricky.)** If we wanted to explicitly write down an Ω to model this, how big would Ω have to be?