Theorem

If $Y = f(X)$, then

$$\mathbb{E}[Y] = \sum_{\omega} f(X(\omega))p(\omega) = \sum_{k} f(k)\mathbb{P}(X = k).$$

- Sometimes written

$$\mathbb{E}[f(X)] = \sum_{k} f(x)\mathbb{P}(X = k)$$

- This maybe looks too good to be true, but it is true!
- For proof, just look at last slide and replace each k with $f(k)$...