Expected value of \( h(x) = E[h(x)] = \sum_{x_i} h(x_i) p(x_i) \) for discrete \( RV \).

\[ \text{mean} = \mu = E[X] = \int_{-\infty}^{+\infty} h(x) f(x) dx \] for continuous \( RV \).

Expected wages = $59,000

Can cover a number of different realities - either steady wages or a peak in wages.

Variance \( \sigma^2 = \text{Var}[X] = E[(X - E[X])^2] \)

Standard deviation, \( \sigma \)

\[ \sigma^2 = \sum_{x_i} (x_i - E[X])^2 p(x_i) \text{ discrete} \]

\[ = \int_{-\infty}^{+\infty} (x - E[X])^2 f(x) dx \text{ continuous} \]

\( RV \)

| 50\% | $2 |
| 50\% | $0.02 |

What are the expected earnings?

\[ \mu = \frac{1}{2} \times 2 + \frac{1}{2} \times 0.02 = 1.01 \]

\[ \sigma^2 = (2-1.01)^2 \times \frac{1}{2} + (0.02-1.01)^2 \times \frac{1}{2} = 0.9801 \]

\[ p_{\text{pmf}} = \frac{2}{2} = 0.02 \]

\[ \sigma = 0.99 \] std dev is same order of the mean.

So \( \mu \) is not very meaningful.
Compute $\mu$ and $\sigma$ of exponential w/ parameter $\lambda$.

$f(x) = \lambda e^{-\lambda x}$

$k$th

Moment of random variable $= E[X^k], k = 1, 2, \ldots$

Theorem:

If you know all moments of a RV then you know everything they define completely the RV.

CDF = the moments