Sample Proportion Sampling Distribution

Central Limit Theorem

If:

- Random variable W has mean μ_w and standard deviation σ_w.
- Random variable X is the sum of n instances of W.
- Random variable Y is the average of n instances of Y.

Then:

- The following formulas are exactly true:

$$\mu_x = n \cdot \mu_w \qquad \mu_y = \mu_w$$
$$\sigma_x = \sqrt{n} \cdot \sigma_w \qquad \sigma_y = \frac{\sigma_w}{\sqrt{n}}$$

- And X and Y are **approximately** normal (if n is large enough).

Example: Let W be Bernoulli with $p = 0.8$

w	$P(w)$	$w \cdot P(x)$	$w - \mu_w$	$(w - \mu_w)^2$	$(w - \mu_w)^2 \cdot P(w)$
0	0.2	0	-0.8	0.64	0.128
1	0.8	0.8	0.2	0.04	0.032
		$\mu_w = 0.8$			$\sigma_w^2 = 0.16$ $\sigma_w = 0.4$