- Random variable - value is based on outcome of random event.
- discrete random variable: can only assume a countable # of values (whole #).
- continuous random variable: can assume any value [illegible] (decimal).
- $E(X)$ = expected value; μ; EV; mean.
- discrete uniform: $P(X=i) = \frac{1}{n}$ for each i.

Bernoulli Trials:

- only 2 possible outcomes for each trial (success/failure).
- probability of success is the same for each trial.
- trials are independent.

- Geometric Probability Model: how many trials it will take us to receive the first success (Geom(p)):

$P(X=x) = q^{x-1} \cdot p$

$E(X) = \frac{1}{p}$

$SD(X) = \sqrt{\frac{q}{p^2}}$

- Binomial Probability Model = concerned w/ the # of successes in a series of Bernoulli trials. (Binom(n,p)):

$\binom{n}{x} = {}_nC_x = \frac{n!}{x!(n-x)!}$ ($\binom{n}{x}$: # ways to get x successes in n trials)

$P(Y=x) = \binom{n}{x} p^x \cdot q^{n-x}$ (probability of exactly x successes in n trials)

$E(X) = np$

$Var(X) = npq$

$SD(X) = \sqrt{npq}$

} if $P(Y \le$ or $\ge x)$, use Abstract!

- Poisson Probability Model = concerned w/ the # of events that occur over a given interval of time or space:

$P(X=x) = \frac{e^{-\lambda} \cdot \lambda^x}{x!}$

$E(X) = \lambda$

$SD(X) = \sqrt{\lambda}$

- Continuous uniform density functions:

$P(c \le X \le d) = \frac{d-c}{b-a}$

$E(X) = \frac{a+b}{2}$

$Var(X) = \frac{(b-a)^2}{12}$

$SD(X) = \sqrt{\frac{(b-a)^2}{12}}$

- 68-95-99.7 Rule = 68% of values are within 1 SD of mean, 95% of values are within 2 SDs of mean, and 99.7% of values are within 3 SDs of mean. (Empirical Rule).
- Normal Probability Model:

Conditions

1.) Random/[illegible] random sample
2.) 10% Condition = $n \le 10\%$ of population
3.) Success/Failure Condition: $np \ge 10$, $nq \ge 10$

Standardizing

$z = \frac{x - E(X)}{SD(X)}$ = z-score

- Standard error = estimate of the SD of a sampling distribution.

One Proportion z-Test:

$z = \frac{(\hat{p} - p)}{SD(\hat{p})}$

$SD(\hat{p}) = \sqrt{\frac{pq}{n}}$

- Central Limit Theorem: sampling distribution of any mean becomes Normal as the sample size grows.

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- To cut ME in half, you must quadruple the sample size.
- Smaller ME = less confidence.
- Smaller sample (n) = larger ME.
- Best confidence statement:
"We are __% confident that between ___% and ___% of the pop. thought ....."
- $H_0: p = p_0$
- $H_a: p \ne p_0$ or $p < p_0$ or $p > p_0$
- α = alpha level / significance level
- Type I Error = H_0 is true, but we mistakenly reject it. (α)
- Type II Error = H_0 is false, but we mistakenly fail to reject it. (β)
- power = $1 - \beta$
- effect size = distance between p_0 and p. (power = [illegible] power).

- if $z \le z^*$, we reject H_0.
- if $z > z^*$, we fail to reject H_0.
- if P-value $\le \alpha$, we reject H_0.
- if P-value $> \alpha$, we fail to reject H_0.
- to reduce SD, increase sample size.
- to reduce SD by $\frac{1}{3}$, we must quadruple the sample size.
- to increase power, make SD smaller.
- fail to reject = there is not enough evidence to reject H_0.

Continuity Correction

* "at least 70" = 69.5
* "more than 70" = 70.5

ONLY FOR CONTINUOUS DATA.