Chebyshev's Theorem: The proportion of any set of data lying within K standard deviations of the mean is always at least $1-\frac{1}{K^2}$, where K > 1.

Expected Value(mean of a probability distribution)

-**Key Words:** Find the Expected Value

-**Formulas:** $E(X)=\mu=\sum x\cdot P(x)$ (see table below)

x	$P(x)$	$x\cdot P(x)$
$\vdots$	$\vdots$	$\vdots$
		$\sum x\cdot P(x)$

For Problems Dealing With the Normal Distribution (they say normally distributed in the directions…)

There are three cases

1. Directions say: Find the probability of randomly selecting a …
- Draw the bell curve, label the mean, and standard deviation
- Put a Z number line and an X number line at the bottom of the curve
- Shade the desired area that you are looking for
- Convert your x – score into a z-score using $Z=\frac{X-\mu}{\sigma}$
- Look your z-score up on the table from the book (that is the area from your z-score to the mean on the curve)
- If necessary perform the arithmetic needed to get your desired area

2. Directions say: Find the probability of randomly selecting n …that have an average …
- Draw the bell curve, label the mean, and standard deviation **do not forget that for this problem the stan. dev. becomes $\sigma_{\overline{X}}=\frac{\sigma}{\sqrt{n}}$
- Put a Z number line and an $\overline{X}$ number line at the bottom of the curve
- Shade the desired area that you are looking for
- Convert your $\overline{X}$ – score into a z-score using $Z=\frac{\overline{X}-\mu}{\sigma_{\overline{X}}}$
- Look your z-score up on the table from the book (that is the area from your z-score to the mean on the curve)
- If necessary perform the arithmetic needed to get your desired area

3. Directions say: Find the score (height, weight, …) that separates the bottom…
- Draw the bell curve, label the mean, and standard deviation **Do not forget that for this problem we will be putting an area associated with a given percentile (using the normal table in reverse)
- Put a Z number line and an X number line at the bottom of the curve
- Look up the necessary area to get your z – score on the Z table (watch your sign on the z-score)
- Convert your z– score into an X-score using $X=Z\sigma+\mu$

Confidence Interval

Steps to Create a Confidence Interval for the mean (Large Sample)

1. List all given sample data from the problem including sample size and C-level
2. Find $z_{\alpha/2}$
3. Calculate the margin of error, $E = z_{\alpha/2}\left(\frac{\sigma}{\sqrt{n}}\right)$
4. Calculate $\left[\overline{x}-E, \overline{x}+E\right]$

Steps to Create a Confidence Interval for the mean (Small Sample)

1. List all given sample data from the problem including sample size and C-level
2. Find $t_{\alpha/2}$
3. Calculate the margin of error, $E = t_{\alpha/2}\left(\frac{s}{\sqrt{n}}\right)$
4. Calculate $\left[\overline{x}-E, \overline{x}+E\right]$

Steps to test a hypothesis:

1. Express the original claim symbolically
2. Identify the Null and Alternative hypothesis
3. Record the data from the problem
4. Calculate the test statistic using either $z = \frac{\overline{x}-\mu_0}{\frac{\sigma}{\sqrt{n}}}$ or $t = \frac{\overline{x}-\mu_0}{\frac{s}{\sqrt{n}}}$ or $\rho = \frac{\hat{p}-\rho_0}{\sqrt{\frac{p_0 q_0}{n}}}$
5. Determine your rejection region (or find your p-value).
6. Find the initial conclusion
7. Word your final conclusion

<u>Steps</u> to creating a **Confidence Interval for a population proportion**:

1. Gather sample data: x (or $\hat{p}$), n, and C-level, calculate $\hat{p} = \frac{x}{n}$ & (1 - $\hat{p}$) = $\hat{q}$
2. Find $Z_{\alpha/2}$
3. Calculate the Margin of Error, E = $Z_{\alpha/2}\sqrt{\frac{\hat{p}\hat{q}}{n}}$
4. Finally, form $\left[\hat{p}-E, \hat{p}+E\right]$

Sample Size for Estimating the Mean:

$$n = \left[\frac{z_{\alpha/2}\sigma}{E}\right]^2$$