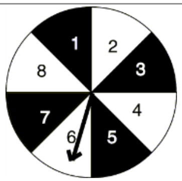
MBC 638

LIVE SESSION WEEK 3

Agenda

Topic	Time	Thursday Section	Sunday Section
Introduction	5 min	9:00 – 9:05	6:30-6:35
Highlights from Week 3 Video	50 min	9:05 - 10:00	7:35-7:30
Process Improvement Project	10 min	10:00 – 10:10	7:30-7:40
Review of Upcoming Assignments and Open Question	15 min	10:10 – 10:25	7:40-8:55

Highlights: Video Segment 3.3:Probability &CLT



What is probability? The likelihood of a future event.

Probability distributions help you describe the likelihood of an event.

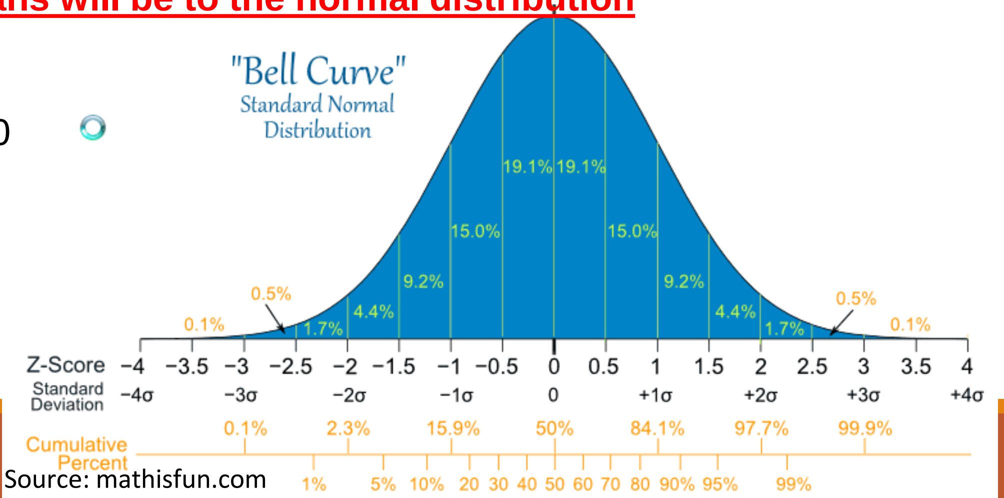
Key Distributions to Focus On

Discrete data – focusing on the Binomial distribution

Continuous data – focusing on the Normal distribution

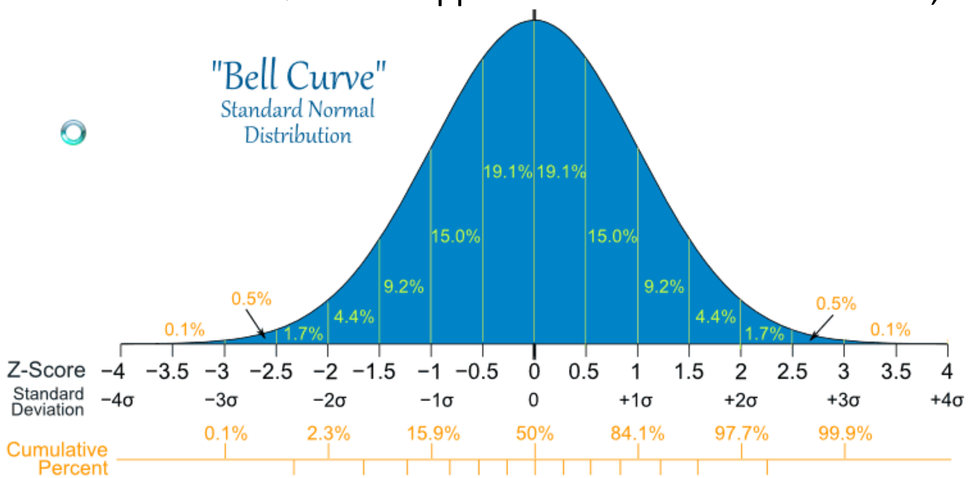
Central Limit Theorem – gives us permission to use the normal distribution – regardless of the type of distribution the population is from, the sample mean will be normally distributed, **the larger the sample that we take the closer the distribution of the sample means will be to the normal distribution**

No matter what the parent looks like the child will be normal especially by age 30 = if the sample size is 30 you can assume normality



Highlights: Video Segment 3.4: Normal(Continuous Data)

Total Area under the curve = 1 or 100% of the opportunities are under the curve, since they are probabilities



Source: mathisfun.com

For Normal, In order to solve for the probability for continuous data....

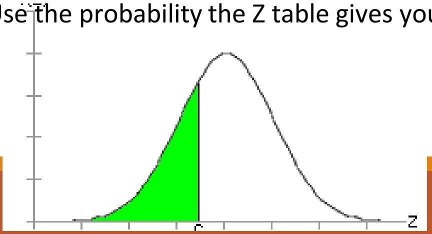
1. Calculate the standard value for Z in order to look up the probability

$z = \frac{x-\mu}{\sigma}$, μ = average of the sample, σ =standard deviation, x = the point you are interested in finding the probability for

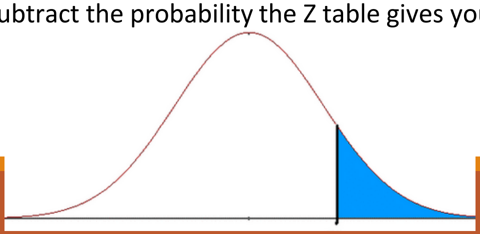
2. Solve for Z, then look it up in the table to convert to a probability.

Remember: The Z value is always for everything to left of the point you are looking for the probability of....

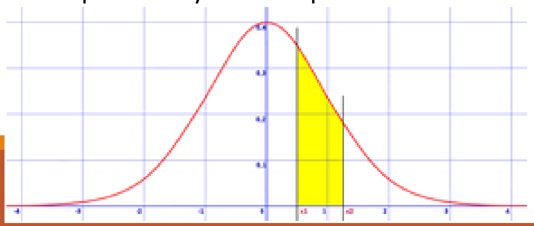
Use the probability the Z table gives you



Subtract the probability the Z table gives you from 1



Find the probability for each point and subtract them



Highlights: Video Segment 3.4: Normal(Continuous Data)

For Normal, In order to solve for the probability for continuous data….

1. Calculate the standard value for Z in order to look up the probability

$z = \frac{x-\mu}{\sigma}$, μ = average of the sample, σ =standard deviation, x = the point you are interested in finding the probability for

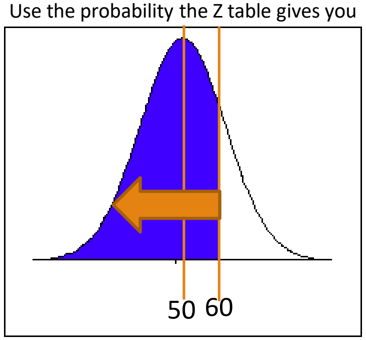
2. Solve for Z, then look it up in the table to convert to a probability.

Remember: The Z value is always for everything to left of the point you are looking for the probability of….

What is the probability of elementary students shorter than 5 feet?

- If the average height is 50, and the standard deviation is 5?

Use the probability the Z table gives you



- Use the Z-value to find the probability.

$$z = \frac{x-\mu}{\sigma}$$

- $Z = \frac{60-50}{5} = 2$

Z	0.00	0.01	0.02
⋮			
1.5	0.9332	0.9345	0.9357
1.6	0.9452	0.9463	0.9474
1.7	0.9554	0.9564	0.9573
1.8	0.9641	0.9649	0.9656
1.9	0.9713	0.9719	0.9726
2.0	0.9772	0.9778	0.9783
2.1	0.9821	0.9826	0.9830

Probability that a child will measure less than 60 inches is .9772, another way to state that is 97.72% of elementary students are less than 60 inches in height.

Highlights: Video Segment 3.4: Normal(Continuous Data)

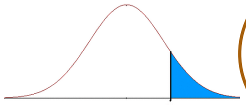
Using Excel to solve for probabilities and Z values using the normal distribution

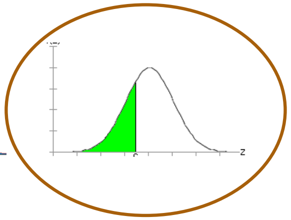
1 – If you didn't calculate a Z value first

=norm.dist(60,50,5,True) = .97725 or 97.725%

Means give me the probability if I want to know what probability there is a child measures shorter than 60 inches, if the average is 50, and the standard deviation is 5, true means I want everything to the left of the curve.

DRAW the PICTURE – so you know what probability you are looking for.





2 – If you already have or calculated the Z value

=norm.s.dist(2,true) = .97725 or 97.725%

Means give me the probability for a Z test statistic of 2, and true means that I want everything to the left of the curve.

3 – If you have a probability and want a z value

=norm.s.inv(.97725)

Means give me the Z value associated with the probability of .97725.

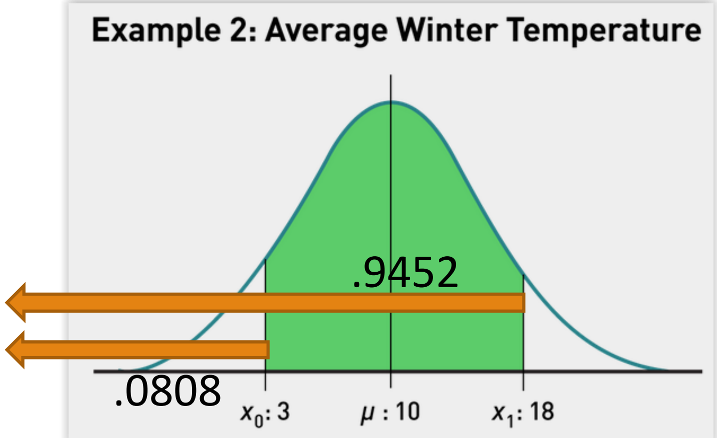
Highlights: Video Segment 3.4: Normal(Continuous Data)

Example 2: Average Winter Temperature

- Average winter temperature: 10°
- Standard deviation: 5°

What's the probability of a temperature between 3° and 18°?

- The area under the curve between 3° and 18°



- $Z = \frac{x-\mu}{\sigma}$
- $Z_0 = \frac{3-10}{5} = -1.4$
- Probability left of Z_0 (3°): 0.0808

- $Z_1 = \frac{18-10}{5} = 1.6$
- Probability left of Z_1 (18°): 0.9452

.9452 - .0808 = .8644 or 86.44%

0.8644, or 86.44%.

86.44% probability the temperature will be between 3 and 18 degrees

Highlights: Video Segment 3.5: Binomial(Discrete Data)

No set shape
Mean: μ=np, n = number of trials, p=probability of success
Variance: σ^2= n x p(1-p)

<u>A binomial experiment is an experiment which satisfies these four conditions:</u>
A fixed number of trials
Each trial is independent of the others
There are only two outcomes
The probability of each outcome remains constant from trial to trial.

You're taking a quiz with five true/false questions. You didn't study and plan to guess. What's the probability you get three questions correct?

Find P(X = 3), the probability that the number of successes is equal to three.

- $n = 5$
- $p = 0.5$

Example: Binomial Table

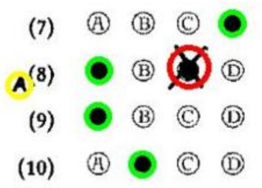
		p (probability of a success)						
n	*X*	**0.10**	**0.15**	**0.20**	…	**0.40**	**0.45**	**0.50**
⋮	⋮				…			
4	0	0.6561	0.5220	0.4096		0.1296	0.0915	0.0625
	1	0.2916	0.3685	0.4096		0.3456	0.2995	0.2500
	2	0.0486	0.0975	0.1536		0.3456	0.3675	0.3750
	3	0.0036	0.0115	0.0256		0.1536	0.2005	0.2500
	4	0.0001	0.0005	0.0016		0.0256	0.0410	0.0625
5	0	0.5905	0.4437	0.3277	…	0.0778	0.0503	0.0312
	1	0.3280	0.3915	0.4096		0.2592	0.2059	0.1562
	2	0.0729	0.1382	0.2048		0.3456	0.3369	0.3125
	3	0.0081	0.0244	0.0512		0.2304	0.2757	0.3125

Use the tables in the back of the book or Excel to calculate probabilities for a binomial distribution for discrete data or use Excel: =binom.dist(3,5,.5,False) = .3125

Means give me the probability that I get 3 successes, out of 5 trials, when each has a probability of success of .5, and False means exactly 3 successes(True would mean all those probabilities up to and including 3 successes:1,2,3 successes all added together)

Highlights: Video Segment 3.5: Binomial(Discrete Data)

Another Example:



For a multiple choice test that you are guessing on, you want to know the probability you get at least 3 correct, on a test that has 5 multiple choice questions, and each has 4 choices.

n=5 test questions, p=.25(chance of answering correctly on each problem(1/4)), x>=3

=BINOM.DIST(3,5,0.25,FALSE)

This formula means, the probability that I get 3 questions correct, with 5 questions on the test, and 4 answers for each question so a ¼=.25 chance of getting each correct, and false means I don't want the cumulative percent because I won't pass the test if I get 1 or 2 correct. This will give me probability of getting exactly 3 correct, then I would do the same with the probability at 4 and 5 correct and add the three probabilities together – because I want to know the probably of getting at least 3 correct, which means 3 or more correct.

=BINOM.DIST(3,5,0.25,FALSE)= .088
=BINOM.DIST(4,5,0.25,FALSE)= .015
=BINOM.DIST(5,5,0.25,FALSE)= <u>.0010</u>
.104 or 10.4% probability that you get at least 3 correct

Or =BINOM.DIST(2,5,0.25,TRUE) means probability I get 1 or 2 correct, then subtract from 1 to get probability of 3,4,5 correct

=.896, so 1-.896=.1035 or .104, so 10.4% probability that you get at least 3 correct

Highlights: Video Segment 3.7: Hypothesis Testing

Use sample data from a population to confirm or reject a statement that we make about the population.

Hypothesis Statements can tell us if two sets of data are really different from each other, or from a standard value.

Also provides the probability of being right or wrong and the risk of making the wrong decision.

Only pertains to population parameters – mean and standard deviation.

Uses of Hypothesis Testing

- Hypothesis testing can tell us:
  - If two sets of data are really different
  - If population parameter varies from a standard
  - Probability of being right or wrong
  - Risk of making an incorrect decision

Null hypothesis	Alternative hypothesis
H_0: μ or σ = (or ≤, or ≥) a number	H_a: μ or σ ≠ (or <, or >) a number
Captures "other" results	Captures results of interest
Locus of equality condition	$H_a: \mu \neq 10$
$H_0: \mu = 10$	$H_a: \mu > 10$
There is *no* difference!	There *is* a difference!

The alternative:
Is what you want the result to be….we want to have improved our process, reduced the cycle time, made it lower.

Highlights: Video Segment 3.7: Hypothesis Testing

How could you apply to your project? Think about how we applied it to Hank's process.

Ho: Average current cycle time is <= average new cycle time
Ha: Average current cycle time is > average new cycle time

We want to have improved Hank's cycle time – to reduce his time to payment, so we want it to be less than the current cycle time.

Hank the Handyman's Process

Did we really improve Hank's job ticket process?

- H_0: $\mu_1 \leq \mu_2$
- H_a: $\mu_1 > \mu_2$

Old avg cycle time <= new avg cycle time

Old avg cycle time > new avg cycle time

We want to reject HO.

Set up hypothesis statements for the following scenario: According to research, it takes 18 seconds for a mouse to find its way through a particular maze. A researcher thinks that a loud noise will cause the mice to complete the maze faster (this means less time). She measures how long each of 10 mice takes with a noise as stimulus.

1) $H_o : \mu \geq 18$

$H_a : \mu < 18$ We want a noise to make the time less than 18.

Set up hypothesis statements for the following scenario: A researcher believes that the mean weight of competitive runners is about 140 pounds. A sample of 24 elite distance runners has a mean weight of 136 pounds and a standard deviation of 11 pounds. Is there convincing evidence that the weight of the elite distance runners is less than 140 pounds?

2) $H_o : \mu \geq 140$

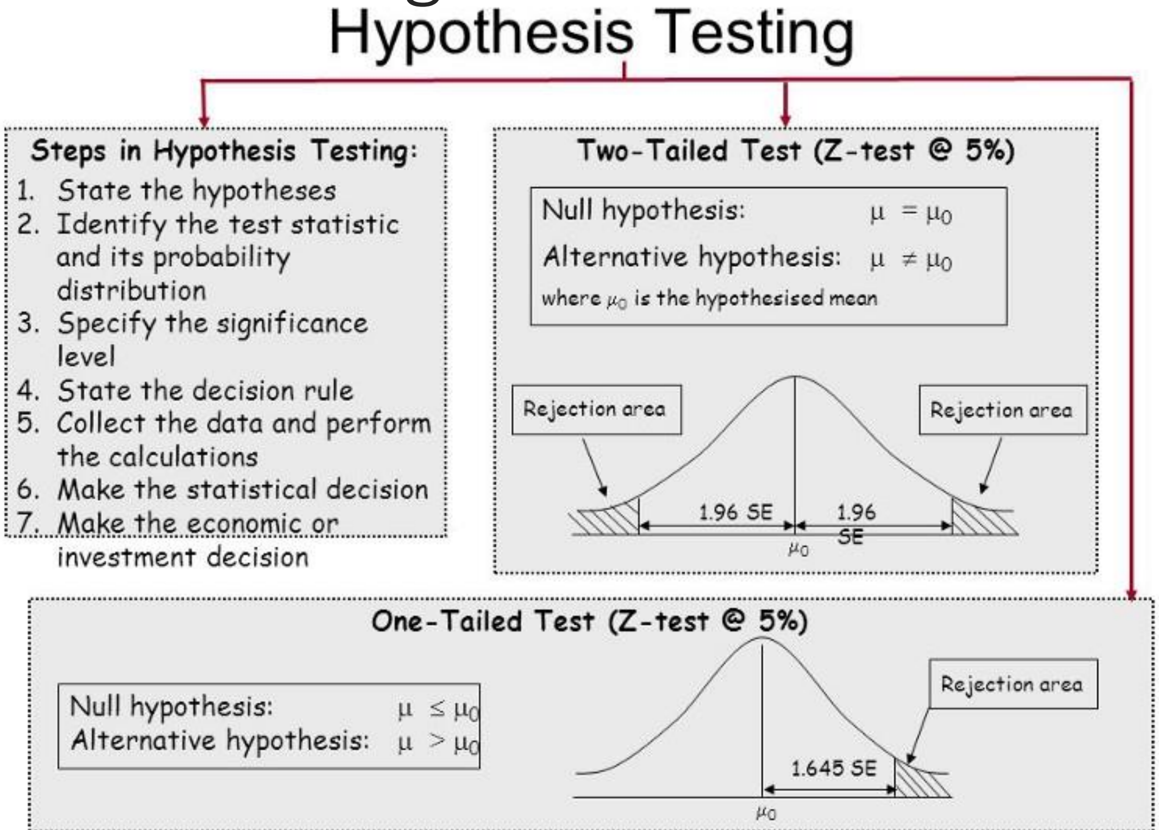
$H_a : \mu < 140$ We want to prove the runners are < 140 lbs.

Set up hypothesis statements for the following scenario: Do middle-aged male executives have different (higher or lower) blood pressure than the general population? The mean systolic blood pressure for the general population of males is 127 and the standard deviation is 7. The medical director looks at the medical records of 72 male executives and finds the mean systolic blood pressure in this sample is equal to 126.1 Is this evidence that male executives have significantly different blood pressure than the national average?

3) $H_o : \mu = 127$

$H_a : \mu \neq 127$ We want to see the populations are different.

Highlights: Video Segment 3.9: Overview



https://blog.vbweb.in/importance-of-hypothesis-testing-in-quality-management-1bb4e86c2e6e

One-Tailed and Two-Tailed Tests

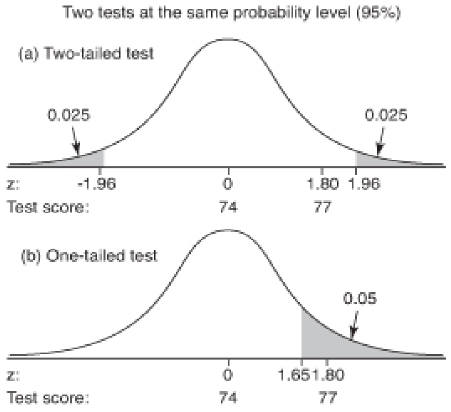
A test of a statistical hypothesis, where the region of rejection is on only one side of the sampling distribution, is called a one-tailed test. For example, suppose the null hypothesis states that the mean is less than or equal to 10.The alternative hypothesis would be that the mean is greater than 10. The region of rejection would consist of a range of numbers located on the right side of sampling distribution; that is, a set of numbers greater than 10.

A test of a statistical hypothesis, where the region of rejection is on both sides of the sampling distribution, is called a two-tailed test. For example, suppose the null hypothesis states that the mean is equal to 10. The alternative hypothesis would be that the mean is less than 10 or greater than 10. The region of rejection would consist of a range of numbers located on both sides of sampling distribution; that is, the region of rejection would consist partly of numbers that were less than 10 and partly of numbers that were greater than 10.

http://stattrek.com/hypothesis-test/hypothesis-testing.aspx

Highlights: Video Segment 3.9: Types of Tests

Solving for the probability that we are right, that we improved the process at a certain alpha level. An alpha level of .05 means we want to be 95% sure we are correct in our conclusion.



http://www.cliffsnotes.com/math/statistics/principles-of-testing/one-and-twotailed-tests

How to use the colored charts to solve for your p value…..

Continuous

Purple – your process mean vs an external standard

Green – Before and after, you have 2 process means

Discrete

Orange – 1 sample test, your proportion vs an external standard

Pink – 2 sample proportions compared, before and after

Then using the p value what conclusion can you make…..If P is low, Ho must go – if P is lower than your alpha, then we reject the null hypothesis and accept the alternative as true.

Order of operations: PEMDAS, Please Excuse My Dear Aunt Sally – Parenthesis, Exponents (Powers and Square Roots), Multiplication(from left to right), Division (from left to right), Addition(from left to right), Subtraction(from left to right)

One-Sample Hypothesis Tests for Continuous Data (Purple)

Select:	Two-tail test	One-tail test	
	Two-tail	Lower/left-tail	Upper/right-tail
	$H_o: \mu = \mu_o$	$H_o: \mu \geq \mu_o$	$H_o: \mu \leq \mu_o$
	$H_a: \mu \neq \mu_o$	$H_a: \mu < \mu_o$	$H_a: \mu > \mu_o$
Choose:	**Sample size**		
	Large	Small	
	$n \geq 30$	$n < 30$	
	(or σ known)	(or σ unknown)	
Calculate:	**Test statistic**		
	$Z = \dfrac{\bar{x} - \mu_0}{\frac{s}{\sqrt{n}}}$	$t = \dfrac{\bar{x} - \mu_0}{\frac{s}{\sqrt{n}}}$	
	Can replace s with σ if known	$df = n - 1$	
Identify:	***p*-value**		
	Two-tail	Lower/left-tail	Upper/right-tail
	$p = 2 \times$ area past Z or t	$p =$ area left of Z or t	$p =$ area right of Z or t

Two-Sample Hypothesis Tests for Continuous Data (Green)

Select:	Two-tail test	One-tail test	
	Two-tail	Lower/left-tail	Upper/right-tail
	H_0: $\mu_1 = \mu_2$	H_0: $\mu_1 \geq \mu_2$	H_0: $\mu_1 \leq \mu_2$
	H_a: $\mu_1 \neq \mu_2$	H_a: $\mu_1 < \mu_2$	H_a: $\mu_1 > \mu_2$

Choose:	Sample size	
	Large	Small
	$n_1 + n_2 \geq 30$	$n_1 + n_2 < 30$
	(or σ known)	(or σ unknown)

Calculate:	Test statistic	
	$Z = \dfrac{\bar{x}_1 - \bar{x}_2}{\sqrt{\dfrac{s_1^2}{n_1} + \dfrac{s_2^2}{n_2}}}$	$t = \dfrac{\bar{x}_1 - \bar{x}_2}{\sqrt{\dfrac{s_1^2}{n_1} + \dfrac{s_2^2}{n_2}}}$
		$df = n_1 + n_2 - 2$

Identify:	*p*-value		
	Two-tail	Lower/left-tail	Upper/right-tail
	$p = 2 \times$ area past Z or t	$p =$ area left of Z or t	$p =$ area right of Z or t

One-Sample Hypothesis Tests for Discrete Data (Orange)

Select:	Two-tail test	One-tail test	
	Two-tail	Lower/left-tail	Upper/right-tail
	$H_o: p = p_o$	$H_o: p \geq p_o$	$H_o: p \leq p_o$
	$H_a: p \neq p_o$	$H_a: p < p_o$	$H_a: p > p_o$
Choose:	**Sample size**		
	Must have $np \geq 5$ $n(1-p) \geq 5$ $n \geq 30$	Where $p = \dfrac{X}{n}$ X = no. of items of interest in sample	
Calculate:	**Test statistic**		
	$Z = \dfrac{p - p_0}{\sqrt{\dfrac{p_0(1-p_0)}{n}}}$		
Identify:	***p*-value**		
	Two-tail	Lower/left-tail	Upper/right-tail
	$p = 2 \times$ area past Z	p = area left of Z	p = area right of Z

Two-Sample Hypothesis Tests for Discrete Data (Pink)

Select:	Two-tail test	One-tail test	
	Two-tail	Lower/left-tail	Upper/right-tail
	$H_0: p_1 = p_2$	$H_0: p_1 \geq p_2$	$H_0: p_1 \leq p_2$
	$H_a: p_1 \neq p_2$	$H_a: p_1 < p_2$	$H_a: p_1 > p_2$
Choose:	Sample size		
	Must have	Where	
	$n_1 + n_2 \geq 30$	$p_1 = \frac{X_1}{n_1}$ and $p_2 = \frac{X_2}{n_2}$ X = no. of items of interest in sample	
Calculate:	Test statistic		
	$Z = \dfrac{p_1 - p_2}{\sqrt{\frac{x_1+x_2}{n_1+n_2}\left[1-\frac{x_1+x_2}{n_1+n_2}\right]\left[\frac{1}{n_1}+\frac{1}{n_2}\right]}}$		
Identify:	p-value		
	Two-tail	Lower/left-tail	Upper/right-tail
	$p_1 = 2 \times$ area past Z	p_1 = area left of Z	p_1 = area right of Z

Highlights: Video Segment 3.9: Hank

Hank's Hypothesis Statements:

$H_0: \mu_1 \leq \mu_2$ Old avg cycle time <= new avg cycle time

$H_a: \mu_1 > \mu_2$ Old avg cycle time > new avg cycle time

- Mean process time
  - $\bar{x}_1 = 17.23$
  - $\bar{x}_2 = 12.17$
- Standard deviation of process time
  - $s_1 = 4.52$
  - $s_2 = 3.32$
- Sample size (no. job tickets processed)
  - $n_1 = 30$
  - $n_2 = 30$
- Alpha level
  - $\alpha = 0.05$

Two-Sample Hypothesis Tests for Continuous Data (Green)

Select:	Two-tail test	One-tail test	
	Two-tail	Lower/left-tail	Upper/right-tail
	H_0: $\mu_1 = \mu_2$	H_0: $\mu_1 \geq \mu_2$	H_0: $\mu_1 \leq \mu_2$
	H_a: $\mu_1 \neq \mu_2$	H_a: $\mu_1 \mu_2$	H_a: $\mu_1 > \mu_2$
Choose:	Sample size		
	Large $n_1 + n_2 \geq 30$ (or σ known)	Small $n_1 + n_2 < 30$ (or σ unknown)	
Calculate:	Test statistic		
	$Z = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$	$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$ $df = n_1 + n_2 - 2$	
Identify:	*p*-value		
	Two-tail $p = 2 \times$ area past Z or t	Lower/left-tail p = area left of Z or t	Upper/right-tail p = area right of Z or t

Hank's Process: Steps 8 and 9

Compare the p-value with α.

- p-value ≈ 0
- $\alpha = 0.05$
- p-value $< \alpha$

Since p-value $< \alpha$, reject H_0.

$$Z = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} = \frac{17.23 - 12.17}{\sqrt{\frac{4.52^2}{30} + \frac{3.32^2}{30}}} = 4.943$$

= .99999

Pvalue= 1- .99999 = ~0, so we reject Ho… the new avg cycle time is less than the old avg cycle time

Highlights: Video Segment 3.10: Errors

Ignore the vegetable example as it is tricky…..sigma is known (even though in real life this usually isn't the case) and there is an assumption of normality (maybe its not clearly stated that there is this normality assumption but you have a mean and std dev so..)

pg 441 says...
"when a random sample of size n is taken from a population where the standard deviation is known, you can use z test....if either population is normal OR...the sample size is large.

We have ONLY been talking about hypothesis testing as it pertains to the mean of a process...

And usually in real life there seems to be more opportunities to want to test whether this mean is better or worse than this other mean.

But we can Ho/Ha using any population parameter...so that also means we can use VARIANCE which uses the Chi-square statistic

Highlights: Video Segment 3.10: Errors

Risk of a False Conclusion

Because we use a *sample* to draw a conclusion about an entire *population*, our conclusions might be false.

		The actual state of things (what actually happened)	
		H_0 is true	H_0 is false
The conclusion you draw (what you think happened)	Fail to reject H_0	Correct conclusion	Type II error, beta risk, or consumer's risk
	Reject H_0	Type I error, alpha risk, or producer's risk	Correct conclusion

Consumer accepted a shipment that was actually bad

Producer made a good lot yet it was rejected

In a **type I error**, you reject the null hypothesis (accept H_a), when you should have accepted the null hypothesis. You believe you discover something that is in fact false.

In a **type II error**, you fail to reject the null hypothesis when you should have done so. You fail to discover something that is true.

1. α is the probability of a type I error and the probability of incorrectly rejecting H_0 when H_0 is true.
2. β is the probability of a type II error and the probability of incorrectly failing to reject H_0 when H_0 is false.
3. The power of the test is $1 - \beta$, or the probability of correctly rejecting H_0 when H_0 is false.

Highlights: Video Segment 3.10: Errors

Null Hypothesis	Type I Error / False Positive	Type II Error / False Negative
Wolf is not present	Shepherd thinks wolf is present (shepherd cries wolf) when no wolf is actually present	Shepherd thinks wolf is NOT present (shepherd does nothing) when a wolf is actually present
Cost Assessment	Costs (actual costs plus shepherd credibility) associated with scrambling the townsfolk to kill the non-existing wolf	Replacement cost for the sheep eaten by the wolf, and replacement cost for hiring a new shepherd

False Alarm

Null Hypothesis	Type I Error / False Positive	Type II Error / False Negative
Person is not guilty of the crime	Person is judged as **guilty** when the person actually **did not** commit the crime (convicting an innocent person)	Person is judged **not guilty** when they actually **did** commit the crime (letting a guilty person go free)
Cost Assessment	Social costs of sending an innocent person to prison and denying them their personal freedoms (which in our society, is considered an almost unbearable cost)	Risks of letting a guilty criminal roam the streets and committing future crimes

Source: https://infocus.emc.com/william_schmarzo/understanding-type-i-and-type-ii-errors/

Highlights: Video Segment 3.10: Errors

Type I Error (False Positive Error): A type I error occurs when the null hypothesis is true, but is rejected as false by the testing. A type I error, or false positive, is asserting something as true when it is actually false. This false positive error is basically a "false alarm" – a result that indicates a given condition has been fulfilled when it actually has not been fulfilled.

Let's use a shepherd and wolf example. Let's say that our null hypothesis is that there is "no wolf present." A type I error (or false positive) would be "crying wolf" when there is no wolf present. That is, the actual condition was that there was no wolf present; however, the shepherd wrongly indicated there was a wolf present by calling "Wolf! Wolf!" This is a type I error or false positive error.

Type II Error (False Negative): A type II error occurs when the null hypothesis is false, *but was accepted as **true** by the testing.* A type II error, or false negative, is where a test result indicates that a condition failed, while it actually was successful. A Type II error is committed when we fail to believe a true condition.

Continuing our shepherd and wolf example. Again, our null hypothesis is that there is "no wolf present." A type II error (or false negative) would be doing nothing (not "crying wolf") when there is actually a wolf present. That is, the **actual situation** was that there was a wolf present; however, the shepherd wrongly indicated there was no wolf present. This is a type II error or false negative error.

Source: https://infocus.emc.com/william_schmarzo/understanding-type-i-and-type-ii-errors/

Breakouts

Do you think current airport security places more emphasis on an alpha or beta risk? Explain your answer.

(Note: Your answer should have a minimum of 10 words and a maximum of 500 words. Once submitted, your response cannot be edited. This response will be posted on a public discussion wall for your classmates to view.)

Agenda

Topic	Time	Thursday Section	Sunday Section
Introduction	5 min	9:00 – 9:05	6:30-6:35
Highlights from Week 3 Video	50 min	9:05 - 10:00	7:35-7:30
Process Improvement Project	10 min	10:00 – 10:10	7:30-7:40
Review of Upcoming Assignments and Open Question	15 min	10:10 – 10:25	7:40-8:55

Process Improvement Project

1. Questions….
2. Rubric
3. Tools

Agenda

Topic	Time	Thursday Section	Sunday Section	Monday Section
Introduction	5 min	9:00 – 9:05	6:30-6:35	9:00 – 9:05
Highlights from Week 3 Video	50 min	9:05 - 10:00	7:35-7:30	9:05 - 10:00
Process Improvement Project	10 min	10:00 – 10:10	7:30-7:40	10:00 – 10:10
Review of Upcoming Assignments and Open Question	15 min	10:10 – 10:25	7:40-8:55	10:10 – 10:25

Review of Upcoming Assignments: 15 min

Topic	Thursday Section Due Dates	Sunday Section Due Dates
Homework #1 1. Ch 3 Learning Curve 2. Ch 6: Stat Tutor for Normal Distributions 3. Ch 6: The Standard Normal Distribution 4. Ch 6: Using the Standard Normal Table	Sunday 10/21 Midnight EST	Wednesday 10/24 Midnight EST
Week 4 Video	Optional Learning 4.7 Relate Chi-Square to Your Project	
Project Activities	• Measure should be in full swing and you should be collecting current state data (Measurement plan or stratification tree should be done) • Process Map – tweaked based on feedback • SQL of Current State – start thinking about what you'll call a defect	
Start working on HMWK #2 in LaunchPad, Ch 9 Online Quiz and Ch 11 Stat Tutor	Sunday, 10/28 Midnight EST	Wednesday,10/31 Midnight EST