AP Statistics – 9.2a	Name: 2020 KEY
Goal: 1-Sided Significance Tests for a Population Proportion (p) Date:	

I. Right-Tail Test of Significance for Proportions

Example #1 "Can you be confident of victory?" Jack is a candidate for mayor running against only one other candidate, so he must gain at least 50% of the votes to be elected. Heading into the mayoral election, Jack is feeling fairly confident that he will be elected by obtaining more than 50% of the vote. Suppose that a random sample of 100 voters shows that 56 will vote for Jack. Based on a poll of voters just before the election, can Jack be confident of victory?

Step I: Set up your Test of Hypothesis (TOH).

- Define parameter: P = TRUE PROPORTION WHO VOTE FUR JACK
- Ho: p=0.5 (JACK WINS) Define hypothesis:
- Define your Level of Significance: $\alpha = 0.05$ (correction)

 Step II: Check the conditions for carrying out a significance test to determine if Jack should feel confident of victory

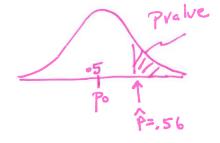
in the mayoral election.

Random: Random Semple (stated)
$$\sim$$
INDEPENDENT: $N = 100 \text{ yotes} \leq \frac{1}{10} \text{ (all voters)} \sim$
NORMAL: $N P_0 = 100 \text{ (.50)} = 50 > 10 \sim$
 $N (1-P_0) = 100 \text{ (.50)} = 50 > 10 \sim$

Step III: Define your choice of significance test: 1 SAMPLE ZTEST FOR P

Step IV: Define Sampling Distribution. Sketch of the sampling distribution of the sample statistic under the null hypothesis, indicating the mean.

• Sketch the graph:



Step V: Calculate the test statistic:

$$Z = \frac{\hat{P} - P_0}{\int \frac{P_0(1-P_0)}{n}} = \frac{.56 - .50}{\int \frac{(.5)(.s)}{100}} = 1.20$$

Step VI: Calculate the p-value (write as a probability statement):

Step VII: Interpret the P-value. Decision Reject or Rail to Reject the activity peoples is.

ASSUMING THE PROPORTION OF VOTERS WHO VOTE YES IS.50 THERE IS A O.1151 Probability OF GETTING A SAMPLE PROPORTION AS FAR AS 0.56 OR FURTHER PURELY BY CHANCE.

Step VIII: Interpret your significance test decision in context. (4 PARTS MUST BE INCLUDED!)

- → SINCE THE PVALUE (0,1151) IS GREATER \(\alpha = 0.05 \) (correction)

 WE FAIL TO REJECTHA.
- WILL WIN THE MAYOR ELECTION.
- II. Left-Tail Test of Significance for Proportions

Example #2 Eleven percent of the products produced by an industrial process over the past several months have failed to conform to specifications. The company modifies the process in an attempt to reduce the rate of nonconformities. In a random sample of 300 items from a trial run, the modified process producess 16 nonconforming item. Do these results provide convincing evidence that the modification is effective? Support your conclusion with a test of significance.

- Use the "Test of Significance Template" to work through these steps:
 - 1. Parameter of Interest
 - 2. Level of Significance
 - 3. Choice of Test
 - 4. Null Hypothesis (symbols and words)
 - 5. Alternative Hypothesis (symbols and words)
 - 6. Conditions of Test
 - 7. **Sampling Distribution** (Sketch of the sampling distribution of the sample statistic under the null hypothesis, indicating the mean)
 - 8. Test Statistic (clearly show calculation)
 - **9. P-value** (Use correct probability notation.)
 - 10. Meaning of the P-value (Reject or Fail to reject null hypothesis)
 - 11. Conclusions (in context)

Test of Significance Template

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Parameter of Interest	P= TRUE PROPURTION OF NON CONFORMING PRODUCTS	
Choice of Test	1 SAMPLE Z TEST FOR P (Proportions)	
Level of Significance	d=0.05 ← USE WHEN NOT GIVEN d	
Null Hypothesis	English: Ho: P=.11 (Company Claims 1170 PRODUCTS FAIL TO CONFORM TO STANDARDS Symbols:	
Alternative Hypothesis	English: HA: P Z.11 - HAVE THE MODIFICATIONS REDUCED THE PROPORTIONS Symbols:	
	Random: Random sample (stated)	
Conditions of	Tudence de la Weimust assume each triel run must	
Test	have more than 10 (300) = 3,000 ITEMS.	
	Normal: $P_0 = .11 < \frac{(.11)(3\infty) = 337.107}{(.89)(3\infty) = 267.2.10}$	
	Sketch of the sampling distribution of the sample statistic under the null hypothesis, indicating	
	the mean:	
Sampling Distribution	$A = \frac{16}{300} = 0.053$	
	0,05	
Test Statistic	Formula: Plug-ins & Value: $Z = \frac{\hat{P} - P_0}{\sqrt{\frac{P_0(1-p_0)}{2}}} = \frac{.053 - 0.11}{\sqrt{\frac{(0.11)(0.89)}{300}}} = -3.16$	
P-value	Use correct probability notation. Praise = $P(Z = -3.16) = 0.00079$ Praise = 0 0.00095	
Meaning of	ASSUMING THE TRUE PROPORTION OF NONCONFORMING ITEMS	
the P-value	1511%, THERE IS ONLY A 0.00079 Probability of getting	
	a sample proportion AS FAR FROM 06056 OR FURTHER	
	Reject null hypothesis PURELY BY CHANCE.	
	English:	
Conclusions	Since the puctue (0.00079) is less than d=.05,	
	We reject to.	
. *	we have convincing evidence that the true	
	propurtion of nonconforming items is less than 0.11.	