

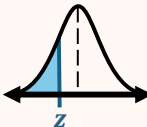
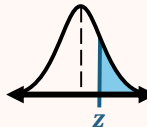
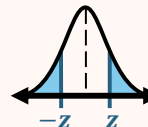
TOPIC: HYPOTHESIS TESTS FOR PROPORTION

Performing a Hypothesis Test for Population Proportion

◆ Recall: To run a hypothesis test 1) Write Hypotheses, 2) Calc. Test Statistic, 3) Find P -Value, & 4) State Conclusion.

EXAMPLE

A tech company says 90% of its devices pass inspection. A quality inspector thinks it's less, so they test 200 devices, 172 of which passed. At the 0.01 significance level, is there evidence the pass rate is below 90%?

New		Hypothesis Tests for Proportion	
1) Hyp	$H_0: p = \underline{\hspace{2cm}}$	$H_a: p [< > \neq]$	
2) Test Stat	$z = \frac{\hat{p} - p}{\sqrt{p(1-p)/n}}$	$n = \underline{\hspace{1cm}}$	$x = \underline{\hspace{1cm}} \quad \hat{p} = \frac{x}{n} = \underline{\hspace{1cm}}$
		$z = \underline{\hspace{1cm}}$	
Area "beyond" z			
3) P -Value	If $H_a: p <$	If $H_a: p >$	If $H_a: p \neq$
			
			$P\text{-Value} = \underline{\hspace{2cm}}$
4) Conclusion	Because P -value [< >] α , we [REJECT FAIL TO REJECT] H_0 .		
	There is [ENOUGH NOT ENOUGH] evidence to suggest...		
Criteria	Random Samples? <input type="checkbox"/>	$np \geq 5$ <input type="checkbox"/>	$nq \geq 5$ <input type="checkbox"/>
		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> Recall $q = 1 - p$ </div>	

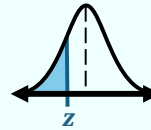
TOPIC: HYPOTHESIS TESTS FOR PROPORTION

EXAMPLE

Perform each hypothesis test using $n = 20$, $x = 14$, a claim of $p = 0.5$ & $\alpha = 0.05$.

(A) One tail - Left

Random Samples? $H_0:$ $H_a:$
 $np \geq 5$ $n = \underline{\hspace{2cm}}$ $x = \underline{\hspace{2cm}}$ $\hat{p} = \underline{\hspace{2cm}}$
 $nq \geq 5$ $z =$



Recall

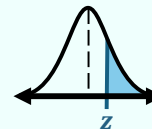
$$z = \frac{\hat{p} - p}{\sqrt{p(1-p)/n}}$$

$$\hat{p} = \frac{x}{n}, \quad q = 1 - p$$

Because P -value = $\underline{\hspace{2cm}}$ [$<$ | $>$] $\alpha = \underline{\hspace{2cm}}$, we [**REJECT** | **FAIL TO REJECT**] H_0 .
 There is [**ENOUGH** | **NOT ENOUGH**] evidence to suggest $H_a: p$ [$<$ | $>$ | \neq] 0.5

(B) One tail - Right

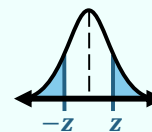
Random Samples? $H_0:$ $H_a:$
 $np \geq 5$ $n = \underline{\hspace{2cm}}$ $x = \underline{\hspace{2cm}}$ $\hat{p} = \underline{\hspace{2cm}}$
 $nq \geq 5$ $z =$



Because P -value = $\underline{\hspace{2cm}}$ [$<$ | $>$] $\alpha = \underline{\hspace{2cm}}$, we [**REJECT** | **FAIL TO REJECT**] H_0 .
 There is [**ENOUGH** | **NOT ENOUGH**] evidence to suggest $H_a: p$ [$<$ | $>$ | \neq] 0.5

(C) Two tail

Random Samples? $H_0:$ $H_a:$
 $np \geq 5$ $n = \underline{\hspace{2cm}}$ $x = \underline{\hspace{2cm}}$ $\hat{p} = \underline{\hspace{2cm}}$
 $nq \geq 5$ $z =$



Because P -value = $\underline{\hspace{2cm}}$ [$<$ | $>$] $\alpha = \underline{\hspace{2cm}}$, we [**REJECT** | **FAIL TO REJECT**] H_0 .
 There is [**ENOUGH** | **NOT ENOUGH**] evidence to suggest $H_a: p$ [$<$ | $>$ | \neq] 0.5

TOPIC: HYPOTHESIS TESTS FOR PROPORTION

PRACTICE

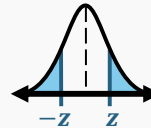
Perform a 2-tailed hypothesis test for the true proportion of successes using the given values:

(A) $\alpha = 0.01$, $n = 40$, $x = 28$, & claim is $p = 0.75$

Random Samples? $H_0:$ $H_a:$

$np \geq 5$ $\hat{p} = \underline{\hspace{1cm}}$ $z =$

$nq \geq 5$



Recall

$$z = \frac{\hat{p} - p}{\sqrt{p(1-p)/n}}$$
$$\hat{p} = \frac{x}{n}, \quad q = 1 - p$$

Because P -value = $\underline{\hspace{1cm}}$ [$<$ | $>$] $\alpha = \underline{\hspace{1cm}}$, we [REJECT | FAIL TO REJECT] H_0 .

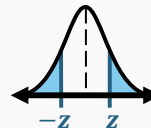
There is [ENOUGH | NOT ENOUGH] evidence to suggest $H_a: p$ [$<$ | $>$ | \neq] 0.75

(B) $\alpha = 0.10$, $n = 100$, $x = 42$, & claim is $p = 0.25$

Random Samples? $H_0:$ $H_a:$

$np \geq 5$ $\hat{p} = \underline{\hspace{1cm}}$ $z =$

$nq \geq 5$



Because P -value = $\underline{\hspace{1cm}}$ [$<$ | $>$] $\alpha = \underline{\hspace{1cm}}$, we [REJECT | FAIL TO REJECT] H_0 .

There is [ENOUGH | NOT ENOUGH] evidence to suggest $H_a: p$ [$<$ | $>$ | \neq] 0.25

TOPIC: HYPOTHESIS TESTS FOR PROPORTION

EXAMPLE

A school claims that 30% of its students participate in after-school sports. A survey of 200 students finds that 72 participate. Using $\alpha = 0.01$, determine if the proportion of students who participate in sports is different from 30%.

Random Samples? $H_0:$ $H_a:$
 $np \geq 5$ $n = \underline{\quad}$ $x = \underline{\quad}$ $\hat{p} = \underline{\quad}$
 $nq \geq 5$ $z =$

Recall

$$z = \frac{\hat{p} - p}{\sqrt{p(1-p)/n}}$$
$$\hat{p} = \frac{x}{n}, \quad q = 1 - p$$

Because P -value = $\underline{\quad}$ [$<$ | $>$] $\alpha = \underline{\quad}$, we [**REJECT** | **FAIL TO REJECT**] H_0 .

There is [**ENOUGH** | **NOT ENOUGH**] evidence to suggest...

PRACTICE

A local park claims that less than 15% of visitors litter. A random sample of 120 visitors finds that 25 litter. At the 0.05 significance level, test if the proportion of visitors who litter is greater than 15%.

TOPIC: HYPOTHESIS TESTS FOR PROPORTION

Performing Hypothesis Tests: Proportion Using TI-84

◆ To perform a Hyp. Test for a pop. proportion using a calculator, use the **5: 1-PropZTest** function.

EXAMPLE

A fast-food chain wonders if the proportion of orders with drinks is less than 0.87. They collect a random sample of 80 orders and find 68 include drinks. Perform a hypothesis test with $\alpha = 0.05$ to test the claim.

$$H_0: \underline{\hspace{2cm}} \quad H_a: \underline{\hspace{2cm}}$$

$$x = \underline{\hspace{2cm}} \quad n = \underline{\hspace{2cm}} \quad P\text{-value: } \underline{\hspace{2cm}}$$

Because $P\text{-value}$ [< | >] α , we [**REJECT** | **FAIL TO REJECT**] H_0 , there is [**ENOUGH** | **NOT ENOUGH**] evidence to suggest...

PRACTICE

A city government claims that no more than 25% of households have solar panels. A researcher suspects the rate is actually higher and surveys 200 households, finding that 62 have solar panels. Test if there is evidence that more than 25% of households have solar panels using $\alpha = 0.01$.

$$H_0: \underline{\hspace{2cm}} \quad H_a: \underline{\hspace{2cm}}$$

$$\bar{x} = \underline{\hspace{2cm}} \quad n = \underline{\hspace{2cm}} \quad P\text{-value} = \underline{\hspace{2cm}}$$

Because $P\text{-value}$ [< | >] α , we [**REJECT** | **FAIL TO REJECT**] H_0 , there is [**ENOUGH** | **NOT ENOUGH**] evidence to suggest...


PRACTICE

A city claims that 30% of households recycle regularly. A researcher surveys 200 households to see if the true proportion is different and finds that 78 recycle regularly. Use $\alpha = 0.05$ to test the claim.

$$H_0: \underline{\hspace{2cm}} \quad H_a: \underline{\hspace{2cm}}$$

$$\bar{x} = \underline{\hspace{2cm}} \quad n = \underline{\hspace{2cm}} \quad P\text{-value} = \underline{\hspace{2cm}}$$


Because $P\text{-value}$ [< | >] α , we [**REJECT** | **FAIL TO REJECT**] H_0 , there is [**ENOUGH** | **NOT ENOUGH**] evidence to suggest...



HOW TO: Hyp. Test for Proportion On TI-84

1) **STAT**, **>** **TESTS**
5: **1-PropZTest**


2) p_0 :
x:
n:
prop: $\neq p_0$ $< p_0$ $> p_0$
Calculate Draw



HOW TO: Hyp. Test for Proportion On TI-84

1) **STAT**, **>** **TESTS**
5: **1-PropZTest**

2) p_0 :
x:
n:
prop: $\neq p_0$ $< p_0$ $> p_0$
Calculate Draw



HOW TO: Hyp. Test for Proportion On TI-84

1) **STAT**, **>** **TESTS**
5: **1-PropZTest**

2) p_0 :
x:
n:
prop: $\neq p_0$ $< p_0$ $> p_0$
Calculate Draw

TOPIC: HYPOTHESIS TESTS FOR PROPORTION

	Mean		Proportion	Variance
Step 1) Hypotheses	$H_0: \mu = \underline{\hspace{2cm}}$ $H_a: \mu [< > \neq] \underline{\hspace{2cm}}$		$H_0: p = \underline{\hspace{2cm}}$ $H_a: p [< > \neq] \underline{\hspace{2cm}}$	$H_0: \sigma^2 = \underline{\hspace{2cm}}$ $H_a: \sigma^2 [< > \neq] \underline{\hspace{2cm}}$
Step 2) Calc. Test Statistic	<i>(σ Known):</i> $z = \frac{x - \mu}{\sigma/\sqrt{n}}$	<i>(σ Unknown):</i> $t = \frac{x - \mu}{s/\sqrt{n}}$	$z = \frac{\hat{p} - p}{\sqrt{p(1-p)/n}}$	$\chi^2 = \frac{(n-1)s^2}{\sigma^2}$
Step 3) P-Value	$P(Z [< >] z)$ OR $2 \cdot P(Z [< >] z)$	$P(T_{n-1} [< >] t)$ OR $2 \cdot P(T_{n-1} [< >] t)$	$P(Z [< >] z)$ OR $2 \cdot P(Z [< >] z)$	$P(\chi_{n-1}^2 [< >] \chi^2)$ OR $2 \cdot P(\chi_{n-1}^2 [< >] \chi^2)$
Step 4) State Conclusion	Because P -value [< >] α , we [REJECT FAIL TO REJECT] H_0 . There is [ENOUGH NOT ENOUGH] evidence to { restate H_a }			