Example:

In a study 57 out of 104 pregnant women correctly guessed the sex of their babies. Use these sample data to test the claim that the success rate of such guesses is no different from the 50% success rate expected with random chance guesses. Use a 0.05 significance level.

Example:

Requirements are satisfied:
simple random sample;
$n\pi = (104)(0.5) = 52 \geq 5$
and $n(1-\pi) = (104)(0.5) = 52 \geq 5$

H_0: $\pi = 0.50$ null hypothesis
H_1: $\pi \neq 0.50$ alternative hypothesis

significance level is $\alpha = 0.05$
two-tailed test
critical values +/-1.96

Example:

Sample involves proportion so the relevant statistic is the sample proportion p

1) Traditional method:

calculate *the statistical test*

$$z = \frac{p - \pi}{\sqrt{\pi(1-\pi)/n}} = \frac{\frac{57}{104} - 0.5}{\sqrt{0.5(0.5)/104}} = 0.98$$

The test statistic 0.98 is within -1.96 and +1.96 thus we fail to reject H_0

There is not sufficient evidence to warrant rejection of the claim that women who guess the sex of their babies have a success rate equal to 50%.

Example:

2) P-value method:

Table A-2: *z* = 0.98 has an area of 0.8365 to its left, so area to the right is 1 – 0.8365 = 0.1635, doubles yields 0.3270 (test is two tails so *P*-value is twice the area to the right of test statistic)

$$[0.548 - 1.96 * 0.049; 0.548 + 1.96 * 0.049]$$

the *P*-value of 0.3270 is greater than the significance level of 0.05, so fail to reject the null hypothesis

Example:

3) Confidence interval method:

$$95\% CI:$$

$$0.548 \mp 1.96\sqrt{0.548(1-0.548)/104}$$

$$[0.548 - 1.96 * 0.049; 0.548 + 1.96 * 0.049]$$

$$[0.452; 0.644]$$