

AP Statistics - Significance Tests for a Proportion - Worksheet

Common Core AP STAT 6.4, AP STAT 6.5, AP STAT 6.6, AP STAT 6.7, HSS-IC.A.2, HSS-IC.B.5 · maths-pdf.fr/en/

Name: _____ Class: _____ Date: ____/____/____

These 20 problems practice AP Statistics topics 6.4 to 6.7. You will write hypotheses, check conditions, compute z statistics and p-values, interpret p-values, reach conclusions, and describe Type I and Type II errors and power.

AP Statistics · Common Core State Standards: **AP STAT 6.4, AP STAT 6.5, AP STAT 6.6, AP STAT 6.7, HSS-IC.A.2, HSS-IC.B.5**

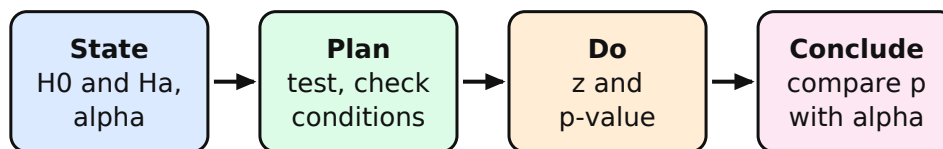
Exercise 1 - Write hypotheses

Write H_0 and H_a and define p : (a) A company claims 90% of its packages arrive on time; a customer thinks the true rate is lower. (b) A coin is suspected of being unfair. (c) A teacher believes more than 60% of students support block scheduling.

Exercise 2 - Check conditions

A random sample of 120 of the 2,500 customers at a store is asked whether they prefer self-checkout; 54 say yes. Test $H_0: p = 0.40$. Check the conditions.

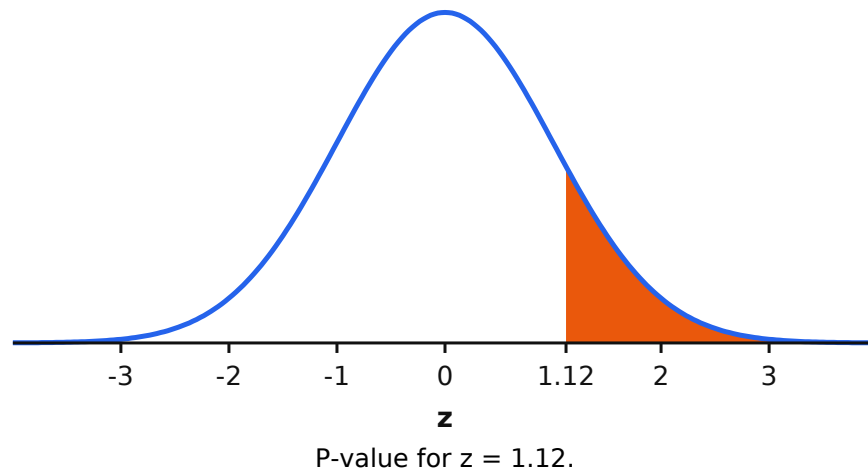
Exercise 3 - Compute z



The four-step process for a test.

For the previous problem, compute the sample proportion, the standard error under H_0 , and the z statistic.

Exercise 4 - Find the p-value

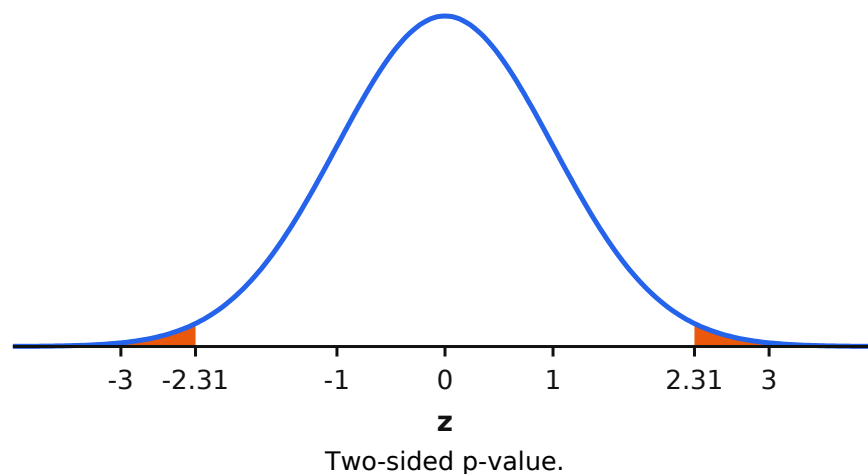


With $H_a: p > 0.40$ and $z = 1.12$, find the p-value.

Exercise 5 - Conclude

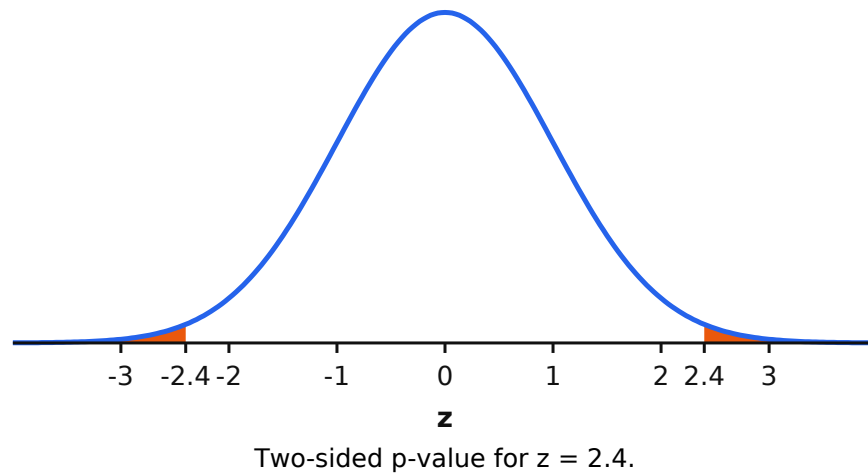
Using $\alpha = 0.05$ and the p-value 0.1314, state a conclusion in context.

Exercise 6 - Interpret a p-value



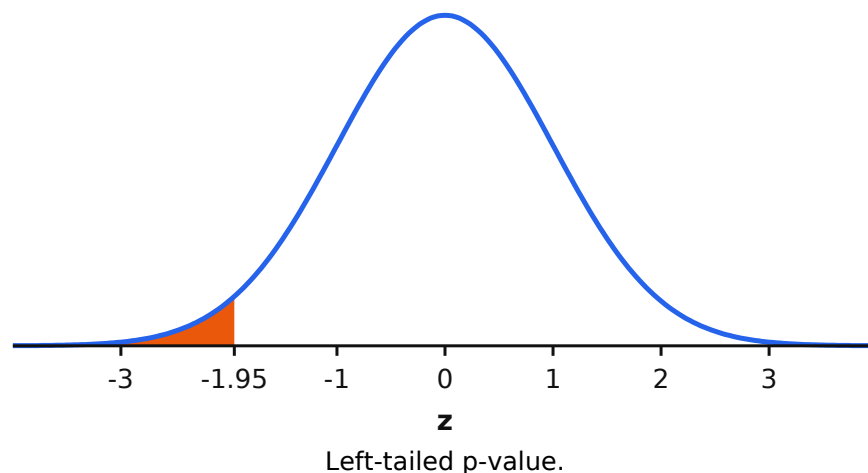
A test of $H_0: p = 0.5$ gives a p-value of 0.021. Interpret the p-value in context if p is the true proportion of voters favoring a proposal and the sample is 400 voters.

Exercise 7 - Two-sided test



A coin lands heads 62 times in 100 flips (suppose). Test $H_0: p = 0.5$ against $H_a: p$ not equal to 0.5.

Exercise 8 - Left-tailed test



A factory says 95% of its bulbs last over 1,000 hours. In a random sample of 200 bulbs, 184 do. Test $H_0: p = 0.95$ against $H_a: p < 0.95$.

Exercise 9 - Fail to reject

A test gives p-value 0.18 with $\alpha = 0.05$. A student writes: "We accept H_0 , so p equals 0.5."

Correct the conclusion.

Exercise 10 - Alpha and the conclusion

The p-value is 0.03. State the conclusion for $\alpha = 0.05$ and for $\alpha = 0.01$.

Exercise 11 - Confidence interval and test

A 95% confidence interval for p is (0.52, 0.64). A two-sided test of $H_0: p = 0.50$ at $\alpha = 0.05$ is done. What is the conclusion?

Exercise 12 - Type I error

	H_0 true	H_0 false
Reject H_0	Type I error	Correct (power)
Fail to reject H_0	Correct	Type II error

Type I and Type II errors.

A school tests H_0 : the new schedule does not change attendance, against H_a : it increases attendance. Describe a Type I error in context and its consequence.

Exercise 13 - Type II error

For the same test, describe a Type II error in context.

Exercise 14 - Probability of Type I

A test uses $\alpha = 0.10$. What is the probability of a Type I error when H_0 is true?

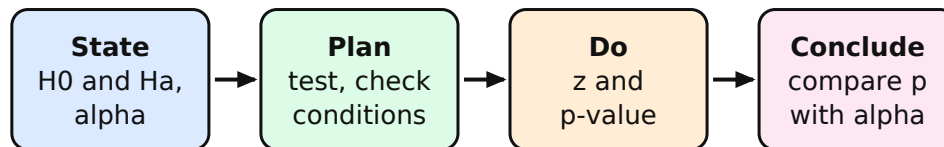
Exercise 15 - Increase power

Name two ways to increase the power of a one-proportion test and explain one of them.

Exercise 16 - Which error is worse?

A medical test screens for a serious disease. H_0 : the patient is healthy. Which error might be more serious, Type I or Type II? Explain.

Exercise 17 - Complete test



The four-step process for a test.

A random sample of 300 voters from a large city finds 132 who favor a transit tax. Test whether fewer than half of all voters in the city favor it, at $\alpha = 0.05$.

Exercise 18 - Sample size effect

The same sample proportion 0.44 is observed in samples of $n = 100$ and $n = 1,000$ with $H_0: p = 0.5$. Compare the z statistics and say what this shows.

Exercise 19 - Statistical vs practical

A very large study finds that 50.4% of births are boys, a statistically significant departure from 50% (p-value 0.004). Is the difference practically important?

Exercise 20 - Multi-step

In 400 random trials of a new treatment, 252 patients improved. The old treatment helped 60% of patients. Test whether the new treatment helps more than 60% at $\alpha = 0.01$.