

# CHI-SQUARED DISTRIBUTION

TEXT:

LAST NAME	FIRST NAME	DATE
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**1** (6 points). For each question, find the required critical value(s) of the  $\chi^2$  distribution, make a sketch of the pdf, label the critical value(s) on the sketch, and shade the corresponding area under the curve.

(a)  $\chi^2$  with 19 degrees of freedom, area in the left tail is 0.05.

(b)  $\chi^2$  with 39 degrees of freedom, area in the right tail is 0.02.

(c)  $\chi^2$  with 16 degrees of freedom, area of 0.05 split equally among the two tails.

**2** (6 points). Find the area under the curve of  $\chi^2$  distribution

(a) with 30 degrees of freedom, to the left of  $x = 20$ .

(b) with 2 degrees of freedom, to the right of  $x = 6$ .

(c) with 17 degrees of freedom, between  $x_1 = 3$  and  $x_2 = 10$ .

**3** (6 points). A manufacturer claims that the average thickness of the spearmint gum it produces is 7.5 one-hundredths of an inch, with standard deviation of 0.1. A quality control team regularly checks this claim. On one production run, they took a random sample of  $n = 70$  pieces of gum and measured their thickness, producing the following sample statistics:  $\bar{x} = 7.55$  and  $s = 0.13$  one-hundredths of an inch. Test the manufacturer's claim about the population standard deviation with  $\alpha = 0.05$ .

(a)  $H_0 :$

$H_1 :$

(b) State the distribution of the test statistic:

(c) Sketch a graph of the distribution of the test statistic, find and label the critical value(s), shade the rejection region.

(d) Compute the test statistic and sketch it on the graph above.

(e) Find the  $p$ -value of the test.

(f) State the conclusion.

4 (1 point). Construct a 90% confidence interval for the population standard deviation if the sample standard deviation in a simple random sample of size  $n = 228$  is  $s = 66$ .

5 (4 points). For each sample, sketch the pdf, compute and shade the  $p$ -value of the test, and determine whether  $H_0$  can be rejected.

(a) A two-tailed test for population standard deviation, sample size 23, test statistic 30.

(a) State the distribution of the test statistic:

(b) Sketch the pdf of the test statistic and shade the  $p$ -value.

(c) Compute the  $p$ -value of the test.

(d) Can  $H_0$  be rejected with  $\alpha = 0.02$ ?

(b) A two-tailed test for population standard deviation, sample of size 80, test statistic 53.

(a) State the distribution of the test statistic:

(b) Sketch the pdf of the test statistic and shade the  $p$ -value.

(c) Compute the  $p$ -value of the test.

(d) Can  $H_0$  be rejected with  $\alpha = 0.1$ ?

(c) A two-tailed test for the population mean, sample size of 11, test statistic  $-3.14$ .

(a) State the distribution of the test statistic:

(b) Sketch the pdf of the test statistic and shade the  $p$ -value.

(c) Compute the  $p$ -value of the test.

(d) Can  $H_0$  be rejected with  $\alpha = 0.05$ ?

(d) A two-tailed test for the population proportion, sample size 444, test statistic 2.22.  
(Use the  $Z$  approximation.)

(a) State the distribution of the test statistic:

(b) Sketch the pdf of the test statistic and shade the  $p$ -value.

(c) Compute the  $p$ -value of the test.

(d) Can  $H_0$  be rejected with  $\alpha = 0.02$ ?