Hypotheses about a Single Population Proportion

Another population parameter we may be interested in is a population proportion, .

The first concern when dealing with problems about proportions is that proportions are commonly expressed in words as *percentages*, *shares*, or *fractions*. Regardless of how they are expressed in words, they **must** be converted into mathematical proportions before using them in hypothesis testing. Proportions are always between 0 and 1.

To convert a percentage to a proportion, divide the percentage by 100. If a proportion is expressed as a fraction, divide out the fraction to obtain a decimal. A proportion may be expressed as a share, such as 25 out of 72. To convert a share to a proportion, calculate the relative frequency:

*Example 1*: *Converting a percentage to a proportion*

97% of the people in Michigan live in the Lower Peninsula. What proportion of people in Michigan live in the Lower Peninsula?

* *Answer:* 97% is a percentage. To convert it to a proportion, divide 97 by 100:

*Example 2: Converting a share to a proportion*

A random sample of 38 customers was taken. 23 preferred Brand A. What proportion of customers preferred Brand A? Round to 4 decimal places, and recall that a sample proportion is notated

* *Answer:* This proportion is expressed as a share: 23 out of 38 customers prefer Brand A. To convert it to a proportion, divide the number of customers who prefer Brand A by the total number of customers:

*Example 3*: *Converting a fraction to a proportion*

1/5 of people prefer oranges to apples. What proportion of people prefer oranges to apples?

* *Answer:* This proportion is expressed as a fraction. To convert it to a proportion, divide it out:

For the following exercises, formulate the hypotheses and be sure to express correctly as a proportion:

*Exercise 1*:

An optician reads an article that states that industry-wide, 3 in 10 customers rate new glasses as “unsatisfactory”. This optician would like to find out if the proportion of his customers who would say the same is lower than the industry-wide proportion. Formulate the null and alternative hypotheses the optician should use.

*Exercise 2*:

A manufacturer suspects that a new plant produces a proportion of defective parts that is different from the other plants. At the other plants, the percentage of defective parts is 5.9%. What are the null and alternative hypotheses the company should use to test whether the population proportion of defective parts at the new plant differs from 5.9%?

*Exercise 3:*

Suppose that in 2012, 3/5 of people preferred to write in pen rather than pencil. What null and alternative hypotheses should you use to determine whether the proportion of people who prefer to write in pen has increased?