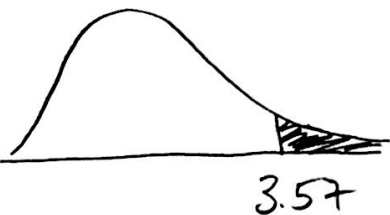


1. A new donut shop plans to sell chocolate, strawberry, blueberry, cinnamon, and powdered donuts. They wonder if there is a preference for one of these types or if each type is preferred by the same proportion of customers. A random sample of 70 customers resulted in the data summarized in the table below. The table entries are observed frequencies or counts. Perform a test using a significance level of 0.05.

	Ch	S	B	Ci	P
	Chocolate	Strawberry	Blueberry	Cinnamon	Powdered
Observed count	13	12	16	19	10

Hypothesis	$H_0: P_{ch} = P_s = P_b = P_{ci} = P_p = \frac{1}{5}$ $H_a: \text{at least 2 of the proportions of donut flavors sold is not } \frac{1}{5}$
Conditions	Random \rightarrow given as a random sample Independent \rightarrow assume Pop of donuts sold is $\geq 10(70) = 700$ Expected counts $\rightarrow 70(\frac{1}{5}) = 14 \geq 5$ for each type of donut.
Calculations	χ^2 GOF Test w/ 4 d.f. $\chi^2 = \frac{(13-14)^2}{14} + \dots + \frac{(10-14)^2}{14} = 3.57$  <p style="text-align: right;">p-value = .467</p>
Conclusion	Since p-value of .467 is $>$ α of .05 we fail to reject H_0 . we don't have convincing evidence that the proportion of each type of donut sold is not $\frac{1}{5}$ for each type

2. The distribution of blood type among all U.S. residents is as follows: Type A: 42%; Type B: 10%; Type AB: 4%; Type O: 44%. In some countries, people believe that blood type has a strong impact on personality. For example, Type B blood is thought to be associated with passion and creativity. A statistics student at a large U.S. university decides to test this theory. Reasoning that people involved in the arts should be passionate and creative, she takes a simple random sample of students majoring in performing arts at her university and asks them for their blood type. Here are her results:

Observed number of performing arts majors with each blood type				Total 150
Type A	Type B	Type AB	Type O	
58	28	4	60	

The student wants to carry out a significance test to see if the distribution of blood types among performing arts majors is different from the U.S. distribution. Carry out the appropriate test to answer her question.

$$\chi^2 \text{ GOF with 3 d.f. @ } \alpha = .05$$

$$H_0: p_A = .42 \quad p_B = .1 \quad p_{AB} = .04 \quad p_O = .44$$

H_a : At least 2 proportions of blood types is not as expected

Random \rightarrow given as random sample

Independent \rightarrow Assume Pop of Performing Arts students at this university is $\geq 10(150) = 1500$

$$\text{Expected counts} \rightarrow \left. \begin{array}{l} 150(.42) = 63 \\ 150(.1) = 15 \\ 150(.04) = 6 \\ 150(.44) = 66 \end{array} \right\} \geq 5$$

$$\chi^2 = \frac{(58-63)^2}{63} + \frac{(28-15)^2}{15} + \frac{(4-6)^2}{6} + \frac{(60-66)^2}{66} = 12.88$$

$$p\text{-value} = .005$$

Since $p\text{-value of } .005 < \alpha \text{ of } .05$ we reject H_0 . We have enough evidence to conclude that performing arts majors at this university have blood type proportions that are different from the distribution of blood types among all U.S. residents.