

AP* Statistics Practice Questions Using TI-Nspire™ Technology

Example 4: While blood type frequencies in the U.S. are in the ratios of 9:8:2:1 for types O, A, B, and AB, respectively, local differences are often found depending upon a variety of demographic characteristics. A researcher is assigned to determine if patients at a particular large city general hospital exhibit blood types supporting the above model. The table below gives the data results from a random sample of 500 patient lab results.

	0	А	В	AB
Researcher	253	194	38	15

Do the data reported by the researcher support the 9:8:2:1 model for blood types of patients at the particular hospital? Justify your answer.

Help from the TI-Nspire:

Select "mm" \rightarrow "Add Lists & Spreadsheet" Name the column "researcher" and enter the data. Name the second column "ratios" and enter the data.

	A researcher	■ ratios	C	
+				
1	253	9		
2	194	8		
3	38	2		
4	15	1		
5				
6				 ▼
B5				

Name the third column "predicted", in the gray region put the formula: **predicted**:= (**ratios**/sum(**ratios**))Asum(**researcher**)

	A researcher	ratios	C predicted	D
٠			⁴searcher)	
1	253	9		
2	194	8		
3	38	2		
4	15	1		
5				
6				
C	C *ed = (ratios/sum(ratios)) · sum(researcher)			

"enter" now results in:

	A resea	rcher	[■] ratios	C predicted	
+				=ratios/(sum	
1		253	9	225	
2		194	8	200	
3		38	2	50	
4		15	1	25	
5					
6					
6	<i>C1</i> =225				

	ratios	C predicted	D	E	Ê
٠		=ratios/(sum		=χ²GOF('r	
1	9	225	Title	χ² GOF	
2	8	200	χ²	10.5444	
3	2	. 50	PVal	0.014462	
4	1	25	df	3.	
5			CompLis	{3.48444	
6					
$E1 = \chi^2 \text{ GOF}$					

From this TI-Nspire screen we can answer the question.

There are four elements to this solution.

State the hypotheses

 H_0 : the distribution of blood types among patients at this hospital are in the ratios of 9:8:2:1 for types O, A, B, and AB, respectively.

 H_a : the distribution of blood types among patients at this hospital are not in the ratios of 9:8:2:1 for types O, A, B, and AB, respectively.

Identify the test by name or formula and check the assumptions

Chi-square goodness-of-fit test

$$\chi^2 = \sum \frac{(\text{ observed} - \text{ expected})^2}{\text{expected}}$$

Check assumptions

1. The researcher claims that the data are from a random sample of patient records.

2. From the Nspire, the ratios 9:8:2:1 give expected cell frequencies of 225, 200, 50, and 25 each of which is at least 5.

Correct mechanics:

From the Nspire we have $\chi^2 = 10.5444$, df = 3, and *P* = .014462

Conclusion in context with linkage to the *P*-value:

With this small a *P*-value (for example, less than $\alpha = .05$), there is evidence that the distribution of blood types among patients at this hospital are <u>not</u> in the ratios of 9:8:2:1 for types O, A, B, and AB, respectively.

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