

# Practice Quiz 10

Statistics 200  
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1. (4 pts.) Some shoppers were observed in supermarket bakery departments that provided tongs and others were observed in departments that provided tissues. A researcher recorded how many people used their hands to withdraw baked goods instead of the tongs or tissues provided:

	Hands	No Hands	Total
Tongs	97	11	108
Tissues	83	49	132
Total	180	60	240

- (a) Which *two* of these are correct formulations of the null hypothesis?
- Use of hands, and whether tongs or tissues are provided, are not related.
  - Use of hands, and whether tongs or tissues are provided, are related.
  - Proportions who use their hands are the same for all shoppers in stores that provide tongs and stores that provide tissues.
  - Proportions who use their hands are different for all shoppers in stores that provide tongs and stores that provide tissues.
- (b) Explain how the study's results may be biased if observations were made in the morning for stores with tongs and in the evening for stores with tissues.
- (c) Explain how the study's results may be biased if stores with tongs tended to be located in areas with a large student population.
- (d) If proportions using their hands were actually equal for shoppers in stores providing tongs and tissues, then the proportions would both be \_\_\_\_\_.
- (e) Complete this table of counts expected under the null hypothesis.

	Hands	No Hands	Total
Tongs			108
Tissues			132
Total	180	60	240

- (f) Calculate the chi-square statistic; its size is  
(i) large (ii) not large (iii) borderline
- (g) The  $P$ -value is (i) small (ii) not small (iii) borderline
- (h) Draw your conclusions, first in terms of a relationship, then in terms of population proportions using their hands.

2. (6 pts.) Is there a significant difference in mean ages of students who identify themselves as vegetarians, non-vegetarians, or sometimes-vegetarians? Analysis of variance was carried out on survey data from several hundred Pitt students:

Analysis of Variance for Age

Source	DF	SS	MS	F	P
Veg?	2	14.23	7.11	0.84	0.434
Error	440	3742.07	8.50		
Total	442	3756.30			

				Individual 95% CIs For Mean Based on Pooled StDev			
Level	N	Mean	StDev	-----+-----+-----+-----+			
no	383	20.312	2.872	(---*---)			
some	35	20.548	2.908	(------*-----)			
yes	25	21.058	3.554	(------*-----)			
				-----+-----+-----+-----+			
Pooled StDev =		2.916		20.00	20.80	21.60	22.40

- (a) What are the total sample size  $N$  and the number of groups  $I$ ?
- (b) As far as the sample means are concerned, \_\_\_\_\_ were the youngest and \_\_\_\_\_ were the oldest.
- (c) Sample standard deviations are
- close enough that it is reasonable to assume population standard deviations to be equal.
  - different enough to suggest that population standard deviations are not equal.
- (d) Two of these express the correct conclusions to draw, given the size of the  $P$ -value; which two are they?
- There is a relationship between students' age and their being vegetarian, non-vegetarian, or sometimes-vegetarian.
  - There is no evidence of a relationship between students' age and their being vegetarian, non-vegetarian, or sometimes-vegetarian.
  - Mean age may be equal for populations of students in the three categories (vegetarian, non-vegetarian, sometimes-vegetarian).
  - Mean age differs for populations of students in all three categories (vegetarian, non-vegetarian, sometimes-vegetarian).
  - Mean age differs for populations of students in at least two of the three categories (vegetarian, non-vegetarian, sometimes-vegetarian).
- (e) The  $F$  statistic can be considered (i) large (ii) not large (iii) borderline
- (f) Explain why it is not a problem that the distributions of ages are somewhat skewed.