

Name:

Date:

1. UCSC has four divisions. Jake surveys recent graduates on whether or not they graduated within four years. 48 of the 80 social science majors, 63 of the 100 physical & biological science majors, 31 of the 70 humanities majors, and 25 of the 66 art majors surveyed graduated within four years.

a) How many degrees of freedom *df* are there?

b) Find the critical value.

Look in the .05 column of the χ^2 table in the book

$df = (\quad - 1)(\quad - 1) = 3$

c) Sketch the χ^2 curve, label the peak of the curve and the critical value, and shade the critical region.

All χ^2 curves start at $\chi^2 = 0$, because squares cannot be negative.

χ^2 curves are skewed right with a peak of $\chi^2 = df - 2$, which in this case is $\chi^2 = 1$.

The critical value for $df = 3$ is $\chi^2_{.05} = 7.88$, and 92.12% of the curve is to the right of this value.



d) Fill in the observed values in the table below.

	Social Sciences	P&B Sciences	Humanities	Arts	Total
≤ 4 years to graduate	48	63			167
> 4 years to graduate	32				
Total	80				

e) Fill in the expected values in the table below. Show the multiplication for each cell.

	Social Sciences	P&B Sciences	Humanities	Arts	Total
≤ 4 years to graduate	$\frac{80}{316} \times 167 = 42.3$	$\frac{100}{316} \times 167 =$	$\frac{70}{316} \times 167 =$	$\frac{25}{316} \times 167 =$	167
> 4 years to graduate	$\frac{80}{316} \times 149 = 37.7$	$\frac{100}{316} \times 149 =$	$\frac{70}{316} \times 149 =$	$\frac{25}{316} \times 149 =$	
Total	80			66	316

f) Calculate χ^2 without using a calculator test.

Department	Timeline	Observed O	Expected E	O - E	(O - E) ²	(O - E) ² ÷ E	
Social Sciences	≤ 4 years	48	42.3	5.7	32.5	0.77	
Social Sciences	> 4 years	32	37.7	-5.7	32.5	0.86	
P&B Sciences	≤ 4 years	63					
P&B Sciences	> 4 years					2.20	
Humanities	≤ 4 years						
Humanities	> 4 years						
Arts	≤ 4 years						
Arts	> 4 years		31.1				
		$\Sigma O =$	$\Sigma E =$			$\chi^2 = \Sigma$	$= 13.77$

g) Calculate χ^2 and *p* on the calculator, and state the conclusion followed by $\chi^2(df)$ and *p*.

The time it takes to graduate from UCSC is _____ from the department the major is in, $\chi^2(3) =$ _____, *p* = _____.

h) Identify a possible mediating variable, and explain how it could make for a causal relationship between the two variables.

Some majors, especially in the arts department, may be more difficult to finish within four years, because _____.

i) Identify a possible confounding variable, and explain how it could make for a noncausal relationship between the two variables.

The type of people who select certain majors, such as science majors, may be more likely to be _____, and therefore graduate within four years.