

Name:

Date:

1. UCSC has four divisions. Matis 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 $\chi^2_0 = 7.88$, and 95% 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, $\chi^2(\quad) =$ _____, $p =$ _____.

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.