PIERIAN DATA

EXERCISE #7 – Chi-square Tests – ANSWER KEY

1. An automobile manufacturer believes that, out of every 100 cars sold, on average 25 are white, 20 are silver, 15 are black, and 40 are other colors like blue, red and green. To test their assumption, they gather data on 100 recent sales.
Perform a chi-square test to determine if the observed sales match the manufacturer's expectations, with a 95% level of confidence.

	Color	# Sold	Expected	$(O-E)$	$(O-E)^2$	$\frac{(O-E)^2}{E}$
	white	19	25	-6	36	1.44
	silver	31	20	11	121	6.05
	black	18	15	3	9	0.60
	other	32	40	-8	64	1.60
Sum:		100	100		Sum:	9.69

$$\chi^2 = \sum \frac{(O-E)^2}{E} = 9.69$$

$\alpha = 0.05$

$df = 4 - 1 = 3$

$\chi^2_{critical} = 7.815$

Chi-square Critical Values

df	0.15	0.10	0.05	0.01	0.005	0.001
1	2.072	2.706	3.841	6.635	7.879	10.828
2	3.794	4.605	5.991	9.210	10.597	13.816
3	5.317	6.251	7.815	11.345	12.838	16.266

What conclusion can be drawn?

Since our calculated chi-square value exceeds the critical value, we reject the null hypothesis – the manufacturer's assumptions are likely false.