Chi-Square Assignment

① Given, $n = 1600$

	observed	expected
spades	404	400
hearts	420	400
Diamonds	400	400
clubs	376	400

$$\chi^2 = \sum \frac{(ob-ex)^2}{ex} = \frac{16}{400} + \frac{400}{400} + \frac{0}{400} + \frac{576}{400}$$

$$\chi^2 = 2.480$$

$\chi^2_{critical} (DF=3, \alpha=0.05) = 7.815$

∴ Null is accepted. Suits are equally likely.

② Given, $n = 1662$

	observed	expected
spades	404	400
Hearts	420	400
Diamonds	400	400
Clubs	356	400
Jokers	82	62

$$\chi^2 = \sum \frac{(ob-exp)^2}{E} = 12.680$$

$\chi^2_{critical} (DF=4, \alpha=0.05) = 9.488$

∴ Null is rejected.

Expected No. of jokers are 62.

③ Given,

	observed	expected
stripes	50	44
spots	41	33
Stripes/spots	85	99

Given ratio is 4 stripes : 3 spots : 9 stripes/spots.

Expected stripes = $\frac{4}{16} \times 176 = 44$

Expected spots = $\frac{3}{16} \times 176 = 33$

Expected stripes/spots = $\frac{9}{16} \times 176 = 99$

$$\chi^2 = \sum \frac{(obs - ex)^2}{ex} = 4.74$$

χ^2 critical (DF = 2, $\alpha = 0.05$) = 5.991

∴ null is accepted. She get the predicted outcome.

④ Given, ratio = 9:3:3:1

	observed	expected
YI	556	559
YC	184	186
GI	193	186
GC	61	62

Expected YI = $\frac{9}{16} \times 994 = 559$ Expected GI = $\frac{3}{16} \times 994 = 186$

Expected YC = $\frac{3}{16} \times 994 = 186$ Expected GC = $\frac{1}{16} \times 994 = 62$

$$\chi^2 = \sum \frac{(obs - ex)^2}{ex} = 0.312$$

χ^2 critical (DF = 3, $\alpha = 0.05$) = 7.815

∴ null is accepted, genes assort independently.

⑤

	observed	expected	$(O-E)^2/E$
A	262	220	8.01
B	234	220	0.89
C	204	220	1.16
D	190	220	4.09
E	210	220	0.45

$$\chi^2 = \sum \frac{(O-E)^2}{E} = 14.6$$

χ^2 critical (DF 4, $\alpha = 0.05$) = 9.488

∴ null is rejected. Shoppers do not prefer each of five states equally.