Chi-square test / assignment

1) No. of cards = 1600

H_0: Suits are equally likely

ie, $\frac{1}{4} \times 1600 = 400$ cards of each suit type

H_1: Suits are not equally likely

O_i	E_i	$\sum \frac{(O_i - E_i)^2}{E_i}$
404	400	$4^2/400$
420	400	$20^2/400$
400	400	0
376	400	$24^2/400$
		2.48

$\therefore \chi^2_3 = 2.48$ '3' degrees of freedom

from tables @ 5%, probability is 7.815.

As, $2.48 < 7.815$, we accept the H_0.

∴, we conclude suits are equally likely or discrepancies are too much random

2) In a deck of 54 cards 2 are jokers

probability = $\frac{2}{54}$

No. of jokers in 1662 cards = $\frac{2}{54} \times 1662$

$= 61.55$

≈ 62 jokers

O_i	E_i	$\frac{\sum(O_i-E_i)^2}{E_i}$
404	400	$16/400$
420	400	$20^2/400$
400	400	0
356	400	$44^2/400$
82	62	$20^2/62$

$$\chi_4^2 = 12.33$$

At 5% C.I, $\chi_4^2 = 9.488$, as $12.33 > 9.488$, we reject H_0. and hence conclude that cards are ~~not~~ really random

3)

	O_i	E_i	$\frac{\sum(O_i-E_i)^2}{E_i}$
With stripes	50	$\frac{4}{16} \times 176$	$36/44$
Spots	41	$\frac{3}{16} \times 176$	$8/33$
Both	85	$\frac{9}{16} \times 176$	$14/99$
	176		

$$\chi_2^2 = 1.202$$

At 5% C.I, critical value $\chi_2^2 = 5.991$, as $1.202 < 5.991$, we accept null hypothesis & conclude that predicted outcome was right

4) H_0: Genes assort independently.

	O_i	E_i	$\frac{\sum(O_i-E_i)^2}{E_i}$
Inflat	193	$\frac{9}{16}\times 994 = 186$	$7^2/186$
Constri	184	186	$4/186$
YInflat	556	$\frac{9}{16}\times 994 = 560$	$16/560$
G. Const	61	$\frac{1}{16}\times 994 = 62$	$1/62$
	994		$\chi^2_3 = 0.329$

At 5%, $\chi^2_3 = 7.815$. As $0.329 < 7.815$, we accept H_0 and conclude genes assort independently.

5) H_0: Proportion for store shoppers preference are same

	O_i	$E_i = \frac{1100}{5} = 220$	$\sum \frac{(O_i-E_i)^2}{E_i}$
A	262	220	42^2
B	234	220	14^2
C	204	220	16^2
D	190	220	30^2
E	210	220	10^2
	1100		$\chi^2_4 = 14.62$

At 5% CL, $\chi^2_4 = 9.488$, as $14.62 > 9.488$, we reject H_0 and conclude that shoppers do not prefer all stores in the same way.