Chi-square assignment.

1. Poker

$N = 4$ since suits are in calculation.

	Observed	Expected
Spades	404	400
Hearts	420	400
Diamonds	400	400
Clubs.	376	400

$$\chi^2 = \Sigma \frac{(O-E)^2}{E} = 0.04 + 1 + 0 + 1.44$$

$$\boxed{\chi^2 = 2.48}$$

$df = 3$. χ^2_{crit} with df 3 and pbty 0.05 is ~~2~~ 7.815.

Since 2.48 is less than χ^2_{crit}. suits are equally likely.

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2. a) 400 from each suit and 62 from jokers.

b) $0.04 + 1 + 0 + 4.84 + 6.451$

$\chi^2 = 12.3$

$\chi^2_{crit} = 9.488$. Hence it shows there are descripancies with selecting card by adding jokers.

3. 4 stripes : 3 spots : 9 both stripes and spots

50 stripes : 41 spots : 85 both.

Since expected in ratio, need to determine values.

$\therefore$ ~~$E = \frac{RT \times CT}{N}$~~

Stripes

Spots

Both

$$\frac{4}{16}, \frac{3}{16}, \frac{9}{16} \text{ ratio}$$

Total number of animals observed;

$$\frac{4}{16} \times 176 = 44; \quad \frac{3}{16} \times 176 = 33 \quad \frac{9}{16} \times 176 = 99$$

$$\chi^2 = \frac{(50-44)^2}{44} + \frac{(41-33)^2}{33} + \frac{(85-99)^2}{99}$$

$$= 0.818 + 1.939 + 1.979$$

$$\chi^2 = 4.736$$

$df = 2$ at $\alpha = 0.05$ $\quad \chi^2_{crit} = 5.991$

4.736 lies within 5.991, hence accepted.

4. $H_0 \Rightarrow$ assort independently.

Using Punnet Square, Ratio. $9:3:3:1$

$\frac{9}{16} \times 994 = 559.125$ $\frac{1}{16} \times 994 = 62.125.$

$\frac{3}{16} \times 994 = 186.375$

$$\therefore \chi^2 = \frac{(556-559.125)^2}{559.125} + \frac{(184-186.375)^2}{186.375}$$

$$+ \frac{(193-186.375)^2}{186.375} + \frac{(61-62.125)^2}{62.125}$$

$$= 0.017 + 0.03 + 0.235 + 0.20$$

$$= 0.482.$$

χ^2_{crit} for df 3 and 0.05 $\Rightarrow$ 7.8.

$0.482 < 7.8$. Hence accept null hypothesis.

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5. $H_0 \Rightarrow$ customers prefer all 5 shops equally.

$\alpha = 0.05$

$df = 4.$

Equally dividing shops would be 20%.

$\therefore$ 20% of 1100 would be 220 which should be expected for all shops.

$$\therefore \frac{(262-220)^2}{220} + \frac{(234-220)^2}{220} + \frac{(204-220)^2}{220}$$

$$\Rightarrow \quad + \frac{(190-220)^2}{220} + \frac{(210-220)^2}{220}$$

$\chi_0^2 \Rightarrow 14.618$

$\chi^2_{crit} \Rightarrow 9.488.$

Since $\chi^2_{crit} < \chi^2$, hence reject hypothesis.

→ Hypothesis testing.

1. $\mu = 2.75$ $n = 256.$
$\sigma = 0.65$
$\bar{X} = 2.85.$

a) Null hypothesis. : grades remain same.
Alternate : grades varied.

b) Sample Standard deviation $= 0.65$
$=$ Standard error.

c) Two sided test with 0.025 on both sides.

d) $\sigma_{SD} = \frac{\sigma_{samp}}{\sqrt{n}} = \frac{0.65}{\sqrt{256}}$

$Z = \frac{\bar{X}-\mu}{\sigma} = \frac{2.85-2.75}{0.04} = 2.5$

Since 2.5 greater than 2 (95%.) Reject