Problem 1

a) State the hypothesis of the test

H_o : there was no fraudulent use of absentee ballots

H_a : there was fraudulent use of absentee ballots

b) Explain

Since p-value : $p = 0.06 > \alpha = 0.05 \Rightarrow$ reject H_o.

Therefore, the judge does not use a level of significant of $\alpha = 0.05$. Instead, the judge use a level of significant of 0.06 .

Problem 2

a) Test the claim

H_o : only 10% of females have at least one tattoo

H_a : more than 10% of females have at least one tattoo

$P = 10\% = 0.1$

$X = 143$

$n = 1097$

$\alpha = 0.07$

$Z_c = InvNorm(1 - 0.07, 1, 0)$

$= 1.48$

$\Rightarrow Z = 3.35$ is in RR

$P = 4.02 > \alpha = 0.07$

∴ Reject H_o. There are reason that more than 10% of females have at at least one tattoo.

b) Determine

$$H_o: P_1 = P_2$$
$$H_a: P_1 \neq P_2$$

$\alpha = 0.05$

$x_1 = 181$ $x_2 = 143$

$n_1 = 1205$ $n_2 = 1097$

$Z_c = \text{InvNorm}(\quad 0.05, 1, 0)$

$= 1.645$

RR: $(-\infty, -1.645] \cup [1.645, \infty)$

$\Rightarrow Z = 1.37 \rightarrow$ is not in RR

$P = 0.17 > \alpha = 0.05$

$\therefore$ Accept $H_o: P_1 = P_2$. There are no evidence that the proportion of males with at least one tattoo differs from the proportion of females with at least one tattoo.

Problem 3

$$H_o: \mu_A = \mu_B$$
$$H_a: \mu_A \neq \mu_B$$

$\Rightarrow t = 0.93$

$P = 0.39 > \alpha = 0.05 \Rightarrow$ Accept H_o

$\therefore$ There are not enough evidence that the mean grades differ between the two students.

Problem 4

a) Determine

	Group A	Group B	Group 3	Total
Experienced Pain	51	5	16	72
Experienced No Pain	1532	152	163	1847
Total	1583	157	179	1919

Group A:

Expected Pain $= (51 \times 1583)/1919$ Expected No Pain $= (1532 \times 1583)/1919$

$\qquad = 42.07$ $\qquad = 1263.76$

Group B:

Expected Pain $= (5 \times 157)/1919$ Expected No Pain $= (152 \times 157)/1919$

$\qquad = 0.409$ $\qquad = 12.44$

Group C:

Expected Pain $= (16 \times 179)/1919$ Expected No Pain $= (163 \times 179)/1919$

$\qquad = 1.49$ $\qquad = 15.20$

$$\chi^2 = \frac{(51-42.07)^2}{42.07} + \frac{(1532-1263.76)^2}{1263.76} + \frac{(5-0.409)^2}{0.409} + \frac{(152-12.44)^2}{12.44} + \frac{(16-1.49)^2}{1.49}$$

$$+ \frac{(163-15.20)^2}{15.20}$$

$$= 3254.50$$

$r = 2$

$C = 3$

$\Rightarrow V = (2-1)(3-1) = 2$

$\Rightarrow P = 0 < \alpha = 0.01 \Rightarrow$ Reject H_o

$\therefore$ Drug group and side effect are not independent

b) The result from (a) indicates that the three drug groups are not homogeneous.

Problem 5

$\alpha = 0.05 \qquad\qquad n = 3$
$P = 0.85 \qquad\qquad 300$ days

Cakes sold	Days	Probability	Expected Count
0	1	0.003375	$300(0.003375) = 1.0125$
1	16	0.057375	$300(0.057375) = 17.2125$
2	55	0.32512	$300(0.32512) = 97.536$
3	228	0.614125	$300(0.614125) = 184.2375$

H_o: The data are binomial with success probability $\pi = 0.85$
H_a: Otherwise

$v = 4 - 1 - 1 = 2$

$x^2 = 29.03$
$P = 4.966 \times 10^{-7} < \alpha = 0.05 \Rightarrow$ Reject H_o

$\therefore$ The data are not from binomial distribution with success probability $\pi = 0.85$