

1. We want to investigate whether there's any dependency between i) being a Berkeley or Stanford student and ii) being a dog or cat person. We sampled 200 students from each university and asked their preference. The results are in below.

	Berkeley	Stanford
Dogs	40	60
Cats	160	140

- (a) Specify the null and alternative hypothesis.
 (b) Compute the expected numbers of each cell.
 (c) Compute the χ^2 -statistic.
 (d) If the significance level was $\alpha = 0.05$, do we reject H_0 or not? You may need χ^2 -table.

(a)

$$\begin{cases} H_0 : \text{there's no dependency between school and animal preference} \\ H_A : \text{there's a dependency between school and animal preference} \end{cases}$$

(b) Expectations are the followings.

	Berkeley	Stanford
Dogs	50	50
Cats	150	150

(c)

$$\frac{(40 - 50)^2}{50} + \frac{(60 - 50)^2}{50} + \frac{(160 - 150)^2}{150} + \frac{(140 - 150)^2}{150} = \frac{16}{3} = 5.333$$

(d) Degree of freedom is $(2 - 1)(2 - 1) = 1$. The cutoff for the significance level 0.05 is 3.84, which is smaller than 5.333. This means that the p-value is smaller than the significance level 0.05, so we reject H_0 .

2. Thanos claimed that the proportion of creatures integrated when he snap his finger depends on his snapping hand - left or right. He made an infinite-gauntlet-simulator to test his claim and he got the following results from experiments.

- (a) Specify the null and alternative hypothesis.
 (b) Compute the expected numbers of each cell.
 (c) Compute the χ^2 -statistic.

	Disintegrated	Survived
Left	15	25
Right	35	25

- (d) If the significance level was $\alpha = 0.05$, do we reject H_0 or not? You may need χ^2 -table.
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(a)

$$\begin{cases} H_0 : \text{there's no dependency between hand and disintegrating probability} \\ H_A : \text{there's a dependency between hand and disintegrating probability} \end{cases}$$

(b) Expectations are the followings.

	Disintegrated	Survived
Left	20	20
Right	30	30

(c)

$$\frac{(15 - 20)^2}{20} + \frac{(35 - 30)^2}{30} + \frac{(25 - 20)^2}{20} + \frac{(25 - 30)^2}{30} = \frac{25}{6} = 4.167$$

- (d) Degree of freedom is $(2 - 1)(2 - 1) = 1$. The cutoff for the significance level 0.05 is 3.84, which is larger than 4.167. This means that the p-value is smaller than the significance level 0.05, so we reject H_0 .