Question 3

A/B testing framework:

1. Defining our test objective : figuring out the better margin, 15% or 18%
2. Defining our Key Performance Indicators : churn rate
3. Generating Hypothesis :

$$H_0: \quad \pi_1 = \pi_2$$
$$H_1: \quad \pi_1 \neq \pi_2$$

4. Run Experiment :

- The group of 15 % margin is regraded as the control group and that of 18 % margin is regarded as the experiment group.
- We segment the data by location and run experiment only on the control and experiment groups with the same location.

- compute the statistics : $$\frac{(p_1 - p_2) - (\pi_1 - \pi_2)}{\frac{p_1 \cdot (1 - p_1)}{n_1} + \frac{p_2 \cdot (1 - p_2)}{n_2}} \sim N(0,1)$$

- make conclusion on the better margin value.

Question 8:

(a) Define the effect size:

Cohen's *d* effect size: Cohen's *d* is known as the difference of two population means and it is divided by the standard deviation from the data. Mathematically Cohen's effect size is denoted by:

$$d = \frac{\bar{x}_1 - \bar{x}_2}{s}$$

Where *s* can be calculated using this formula:

$$s = \sqrt{\frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2}}$$

(b) Example graph: http://rpsychologist.com/d3/cohend/