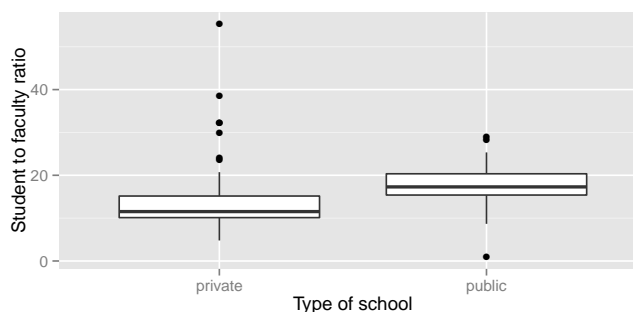# Application Exercise 2.2: Randomization testing - KEY

Write your responses in the spaces provided below. WRITE LEGIBLY and SHOW ALL WORK! Concise and coherent are best!

Student-to-faculty ratio data collected from random samples of public and private four-year colleges:

type	mean	SD	n
private	13.84	7.28	85
public	17.60	4.57	57

1. We would like to test if there is a *difference* between the average student-to-faculty ratio between public and private four-year colleges using a randomization test. What are the hypotheses?

   $H_0 : \mu_{public} = \mu_{private}$; $H_0 : \mu_{public} \neq \mu_{private}$

2. Fill in the blanks below for the appropriate set up for this test:

   We write the student-to-faculty ratio of each public and private college in this sample on a total of

   _____ index cards. Then, we shuffle these cards and split them into two groups: one group

   of size _____ representing public colleges, and another group of size _____ representing

   private colleges. We calculate the difference between the average student-to-faculty ratios in the

   public and private colleges $(\bar{x}_{public} - \bar{x}_{private})$ and record this value. We repeat this many times to

   build a randomization distribution, which should be centered at _____ . Lastly, we compare

   the simulated differences with the observed difference by checking the proportion of simulations

   where the differences in means are _____.

   142, 57, 85, 0, ≤ -3.76 or ≥ 3.76

3. The dot plot below is created using 100 simulations. Based on the simulation results, does this data provide convincing evidence to suggest that the student-to-faculty ratio in public four-year colleges is different than that of private four-year colleges?

Distribution of simulated differences (public − private)
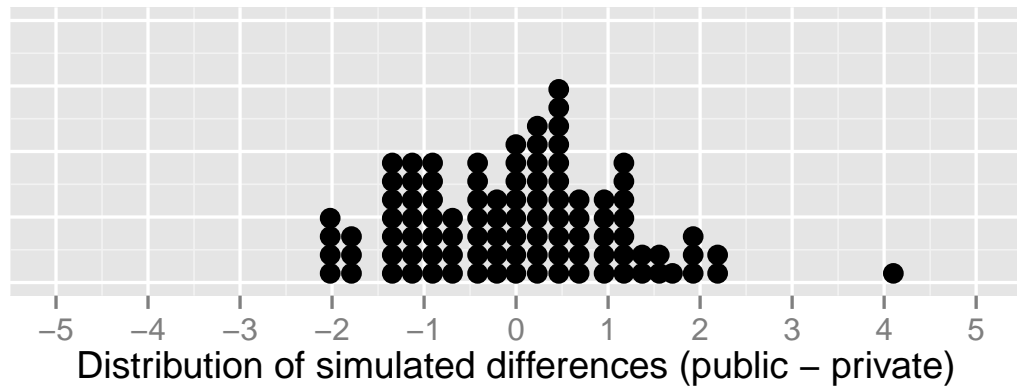
Yes. Since only one observation is below -3.76 or above 3.76, the ovserved difference is obviously different from 0, which suggests sufficient difference between private and public college ratios.