For many years, the medically accepted practice of giving aid to a person experiencing a heart attack was to have the person who placed the emergency call administer chest compression (CC) plus standard mouth-to-mouth resuscitation (MMR) to the heart attack patient until the emergency response team arrived. However, some researchers believed that CC alone would be a more effective approach. In the 1990s a study was conducted in Seattle in which 518 cases were randomly assigned to treatments: 278 to CC plus standard MMR and 240 to CC alone. A total of 64 patients survived the heart attack: 29 in the group receiving CC plus standard MMR, and 35 in the group receiving CC alone. A test of significance was conducted on the following hypotheses.

H0: The survival rates for the two treatments are equal.
Ha: The treatment that uses CC alone produces a higher survival rate.

This test resulted in a p-value of 0.0761.

(a) Interpret what this p-value measures in the context of this study.

(b) Based on this p-value and study design, what conclusion should be drawn in the context of this study? Use a significance level of $\alpha = 0.05$.

(c) Based on your conclusion in part (b), which type of error, Type I or Type II, could have been made? What is one potential consequence of this error?

Solution
Part (a):
The p-value of 0.0761 measures the chance of observing a difference between the two sample proportions $(\hat{p}_{CC} \hat{p}_{CC+MMR})$ – as large as or larger than the one observed, if the survival rates for the two treatments (CC alone and CC + MMR) are in fact the same.

Part (b):
Because the p-value of 0.0761 is greater than 0.05, the null hypothesis should not be rejected. That is, there is not sufficient evidence to conclude that the treatment "CC alone" produces a higher survival rate than the standard treatment "CC + MMR."

Part (c):
Because the null hypothesis was not rejected, a Type II error could have occurred. A possible consequence is that CC + MMR would continue as the accepted practice when, in fact, CC alone would result in a higher survival rate.

a.) Do boys have better short term memory than girls? A random sample of 200 boys and 150 girls was administered a short term memory test. The average score for boys was 48.9 with standard deviation 12.96. The girls had an average score of 48.4 with standard deviation 11.85. Is there significant evidence at the 5% level to suggest boys have better short term memory than girls? ~~4-step process~~ $\bar{x}_B = 48.9$ $s_B = 12.96$ $\bar{x}_G = 48.4$ $s_G = 11.85$

Note: higher test scores indicate better short term memory.

We will perform a 2 sample t test at the $\alpha = 0.05$ significance level of

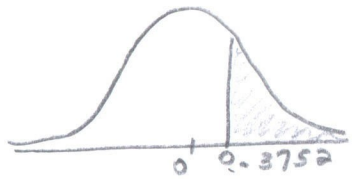
$H_0: \mu_B = \mu_G$ where μ_B = mean memory test score for boys and μ_G = mean memory test score for girls.

$H_a: \mu_B > \mu_G$

We are told these are 2 random samples. Since both sample sizes are more than 30, CLT assures us that the dist. will be approx. normal. There are more than 2000 boys and 1500 girls.

$df = 149$

$$t = \frac{(\bar{x}_B - \bar{x}_G) - 0}{\sqrt{\frac{s_B^2}{n_B} + \frac{s_G^2}{n_G}}} = \frac{(48.9 - 48.4) - 0}{\sqrt{\frac{12.96^2}{200} + \frac{11.85^2}{150}}} = 0.3752$$



$P(t > 0.3752) = 0.354$

Since the p-value is greater than α, I will fail to reject H_0. There is not significant evidence to suggest that boys have better short term memory than girls.