AP Statistics – Inference with Two Sample Means

THE NOT-ENOUGH SHOES PROBLEM How many pairs of shoes do teenagers have? To find out, a group of AP Statistics students conducted a survey in which they selected two separate random samples of 12 male students and 12 female students from their school. Then they recorded the number of pairs of shoes that each respondent reported having. The data is displayed below.

Females:

12	13	15	15	19	21	22	24	26	31	34	41

Mean: 22.75 Standard Deviation: 8.9861 Number of students: 12

Males

4	5	5	6	7	8	10	10	11	12	14	17

Mean: 9.0833 Standard Deviation: 3.988 Number of students: 12

a) Construct and interpret a 95% confidence interval for the difference in the mean number of pairs of shoes owned between male and female students at this high school.

2-sample t-interval

(use calculator!)

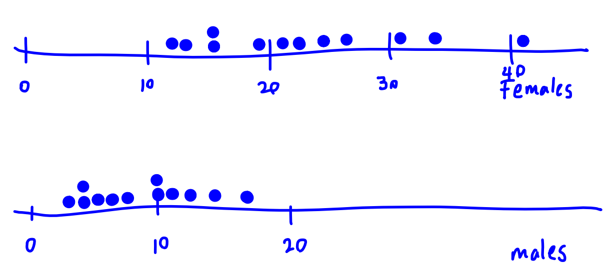
(7.6176, 19.7157)
df = 15.171

We are 95% confident that the true difference in the **mean** number of shoes owned between male and female students (female – male) at this high school is between 7.62 and 19.72 pairs of shoes.

Conditions for inference:

- **Independent Random Samples:** The data was collected via separate (thus, reasonably independent) random samples of male and female students.
- **Nearly Normal Condition:** The plots show some slight skewness, but with no major outliers, normality should be plausible for both groups.

Pairs of shoes:



b) Carefully interpret the meaning of the 95% confidence level in context.

If we repeated this method maaaaaaaaaaaaaany times, about 95% of the resulting intervals would contain the true difference in the mean number of shoes owned between male and female students at this high school

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STEREOTYPE THREAT Back in the old days, one common stereotype was that boys are better at math than girls*. But as a result of this "stereotype", could asking a girl to specify her gender before taking a math test negatively impact her performance on that test? A number of studies in the late 1990's sought to address this question.

Twenty female students that were taking the AP Calculus AB exam at Podunk High School were randomly selected for this study. All 20 took the same test, but half of the girls were randomly assigned to identify their gender before the exam, while the other half were asked to identify their gender after taking the test. The tables below show the raw AP Calculus Exam scores for these 20 students.

Group A (were asked to identify gender before the test)

Raw AP Exam Score	74	59	101	77	63	85	54	40	83	76

Mean Score: 71.2 Standard Deviation of Scores: 17.54

Group B (were asked to identify gender after the test)

Raw AP Exam Score	63	101	82	69	56	92	93	100	75	86

Mean Score: 81.7 Standard Deviation of Scores: 15.55

Do the data provide convincing evidence, at the α = 0.05 level, that the mean exam score for girls who are asked to identify their gender before the exam are lower than girls who are asked to identify their gender after the exam?

2 - sample t - test

μ_1 = true mean score for girls who are asked to identify their gender before exam.

μ_2 = " " " " " " after exam.

$H_0: \mu_1 = \mu_2$ OR $\mu_1 - \mu_2 = 0$

$H_A: \mu_1 < \mu_2$ $\mu_1 - \mu_2 < 0$

$t = -1.417$

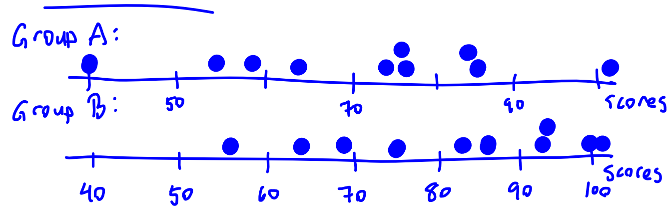
$p = 0.0869$ $\alpha = 0.05$

$df = 17.746$

Conditions:

RANDOM: The 20 girls were randomly assigned to the 2 groups, creating reasonable independence between the two groups.

NEARLY NORMAL:



Neither graph shows any severe departures from normality.

Since $p > \alpha$, we fail to reject Ho.

We lack sufficient evidence that mean exam scores are higher for girls who identify their gender AFTER the exam than girls who identify their gender before the exam.