

Stat 403 - Solution to Assignment 4
Turned in Tuesday, October 3, 2000

1. Data is collected on the amount of time spent by students at the ISU Recreation Facility. Thirty students, 15 males and 15 females are observed. The elapsed time (minutes) spent during one visit to the area that has the aerobic fitness devices, weight machines and free weights is recorded for each student.

Males					Females				
52	75	74	68	93	63	32	86	53	49
77	41	87	72	53	73	39	56	45	67
84	65	66	69	62	49	51	65	54	56

- (a) Males tend to spend longer times at the ISU Recreation Facility. This is indicated by the box plot for the males being shifted higher than that of the females. The spreads and shapes of the distributions for the two groups are quite similar.
- (b) Side-by-side stem plot of the data.

Male	Female
	3
	2 9
	1 4 5 9 9
3 2	5 1 3 4 6 6
9 8 6 5 2	6 3 5 7
7 5 4 2	7 3
7 4	8 6
3	9

Combined sample median is $M=64$.

	Males	Females	Total
below 64	4	11	15
above 64	11	4	15
Total	15	15	30

The expected numbers for each cell is 7.5.

$$\begin{aligned}\chi^2 &= \frac{(4 - 7.5)^2}{7.5} + \frac{(11 - 7.5)^2}{7.5} + \frac{(11 - 7.5)^2}{7.5} + \frac{(4 - 7.5)^2}{7.5} \\ &= \frac{49}{7.5} = 6.53\end{aligned}$$

With one degree of freedom the P-value is between 0.01 and 0.02. This P-value is low enough to reject H_0 and conclude that there is a difference between males and females in the amount of time they spend at the ISU Recreation Facility.

- (c) The number of male times that are greater than the largest female time (86 mins) is 2 and the number of female times that are less than the smallest male time (41 mins) is 2. The value of Tukey's quick test statistic is 4. This is not significant (it is less than 6). According to this test there is not a significant shift of the distribution of times for males relative to that for females.
- (d) Side-by-side stem plot of the data.

Male	Female
	3
1	4
3 2	5
9 8 6 5 2	6
7 5 4 2	7
7 4	8
3	9

Combined sample median is $M=62.5$.

	Males	Females	Total
below 62.5	4	11	15
above 62.5	11	4	15
Total	15	15	30

The expected number for each cell is 7.5.

$$\begin{aligned}\chi^2 &= \frac{(4 - 7.5)^2}{7.5} + \frac{(11 - 7.5)^2}{7.5} + \frac{(11 - 7.5)^2}{7.5} + \frac{(4 - 7.5)^2}{7.5} \\ &= \frac{49}{7.5} = 6.53\end{aligned}$$

With one degree of freedom the P-value is between 0.01 and 0.02. This P-value is low enough to reject H and conclude that there is a difference between males and females in the amount of time they spend at the ISU Recreation Facility.

The number of male times that are greater than the largest female time (73 mins) is 6 and the number of female times that are less than the smallest male time (41 mins) is 3. The value of Tukey's quick test statistic is 9. This is significant with a P-value between 0.01 and 0.05. According to this test there is a significant shift of the distribution of times for males relative to that for females.

- (e) It may not be sex, male/female, but what types of exercises the people are doing. Since this is elapsed time it does not take into account the amount of time spent going from one machine to another. If people are lifting weights, there will be some time spent going from one weight machine to another or in resetting weights on bars. If people are using the aerobic fitness devices, there is usually not much wasted time as they tend to use the one device for the whole time.