

HW #3

3) $\binom{6}{3} = 20$ possibilities to list

| | 1 | 2 | diff in median | | 1 | 2 | diff in median |
|----|------------|------------|----------------|----|------------|------------|----------------|
| 1 | 10, 12, 15 | 17, 19, 50 | 7 | 1 | 17, 19, 50 | 10, 12, 15 | -7 |
| 2 | 10, 12, 17 | 15, 19, 50 | 7 | 2 | 15, 19, 50 | 10, 12, 17 | -7 |
| 3 | 10, 12, 19 | 15, 17, 50 | 5 | 3 | 15, 17, 50 | 10, 12, 19 | -5 |
| 4 | 10, 12, 50 | 15, 17, 19 | 5 | 4 | 15, 17, 19 | 10, 12, 50 | -5 |
| 5 | 10, 15, 17 | 12, 19, 50 | 4 | 5 | 12, 19, 50 | 10, 15, 17 | -4 |
| 6 | 10, 15, 19 | 12, 17, 50 | 2 | 6 | 12, 17, 50 | 10, 15, 19 | -2 |
| 7 | 10, 15, 50 | 12, 17, 19 | 2 | 7 | 12, 17, 19 | 10, 15, 50 | -2 |
| 8 | 10, 17, 19 | 12, 15, 50 | -2 | 8 | 12, 15, 50 | 10, 17, 19 | 2 |
| 9 | 10, 17, 50 | 12, 15, 19 | -2 | 9 | 12, 15, 19 | 10, 17, 50 | 2 |
| 10 | 10, 19, 50 | 12, 15, 17 | -4 | 10 | 12, 15, 17 | 10, 19, 50 | 4 |

Null distribution:

| | diff in median | probability |
|--|----------------|-------------|
| H_0 : The treatment has no effect | 7 | 0.1 |
| H_a : The treatment 1 tend to bigger | 5 | 0.1 |
| diff in median: $15 - 17 = -2$ | 4 | 0.1 |
| | 2 | 0.2 |
| p Value = 0.7 | -2 | 0.2 |
| At level 0.05, | -4 | 0.1 |
| we retain H_0 | -5 | 0.1 |
| we can't conclude that | -7 | 0.1 |

Value for treatment 1
tend to be bigger

5) $\binom{6}{2} = 15$ they are 6 sequences to consider

| Sequence | Dics | Sequence | Dics |
|--|---------------|--|---------------|
| $X X X X \overset{1}{Y} \overset{2}{Y}$ | 1 | $\overset{1}{Y} \overset{2}{Y} X X X X$ | 1 |
| $X X X \overset{3}{Y} X \overset{4}{Y}$ | $\frac{3}{4}$ | $\overset{1}{Y} \overset{2}{X} \overset{3}{Y} X X X$ | $\frac{3}{4}$ |
| $X X X \overset{1}{Y} \overset{2}{Y} X'$ | $\frac{3}{4}$ | $\overset{1}{Y} X X \overset{2}{Y} X' X$ | $\frac{1}{2}$ |
| $X X \overset{3}{Y} \overset{4}{X} \overset{1}{Y} \overset{2}{X}'$ | $\frac{1}{2}$ | $\overset{1}{Y} X X X \overset{2}{Y} X'$ | $\frac{1}{2}$ |
| $X X \overset{1}{Y} \overset{2}{X} \overset{3}{X}' \overset{4}{Y}$ | $\frac{1}{2}$ | $\overset{1}{Y} X X X X \overset{2}{Y}$ | $\frac{1}{2}$ |
| $X \overset{1}{X}' X \overset{2}{Y} \overset{3}{Y} X X$ | $\frac{1}{2}$ | | |
| $X \overset{1}{Y} \overset{2}{X} X \overset{3}{X}' X \overset{4}{Y}$ | $\frac{1}{2}$ | | |
| $\overset{1}{X} X \overset{2}{Y} X X \overset{3}{X}' \overset{4}{Y} X$ | $\frac{1}{4}$ | | |
| $\overset{1}{X} X \overset{2}{Y} X \overset{3}{X}' \overset{4}{Y} X X$ | $\frac{1}{2}$ | | |
| $X \overset{1}{Y} \overset{2}{Y} \overset{3}{X}' X X X$ | $\frac{3}{4}$ | | |

| Dics | null prob |
|---------------|----------------|
| 1 | $\frac{2}{15}$ |
| $\frac{3}{4}$ | $\frac{4}{15}$ |
| $\frac{1}{2}$ | $\frac{8}{15}$ |
| $\frac{1}{4}$ | $\frac{1}{15}$ |

- 7) a) ARE is a notion which enables to implement in large samples the quantitative comparison of two statistics
- b) The availability of several tests also opens up other possibilities, both for misuse and for improvement
- c) i) If firmly convinced of normality, the t test is best
 ii) If the tail of F distribution are believed to be as heavy as or heavier than those of the normal, then Wilcoxon test is the first choice