

# Tutorial 4

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# Outline

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## Question 1 (True/False question)

Given two independent random samples  $X_1, \dots, X_n$  and  $Y_1, \dots, Y_n$ , if the Lepage rank test for either location or dispersion rejected the null hypothesis, then the following procedure is sensible to identify the differences in location or dispersion:

- (a) Test the difference in the locations of the two samples by the sign test based on the sample differences  $Z_i = Y_i - X_i, i = 1, \dots, n$ .
- (b) Test the difference in the locations of the two samples by the Wilcoxon rank sum test for the two-sample location problem.
- (c) Test the difference in the dispersions of the two samples by the Ansari-Bradley rank test for dispersion.
- (d) Test the difference in the dispersions of the two samples by the Millers Jackknife test for dispersion.

## Question 2 (True/False question)

Based on two independent samples, if the Wilcoxon rank sum test rejects  $\Delta = 0$  and the Ansari-Bradley test finds little evidence against  $\gamma^2 = 1$ , then:

- (a) We can reasonably conclude that the two samples have a significant difference in location, but not in dispersion.
- (b) The difference in location is justified, but not the equal dispersion.
- (c) The results of both tests are questionable and not well justified.

## Question 3

Consider the chorioamnion permeability data in the following table. Assume that the human chorioamnion is as permeable to water transfer at 12 – 26 weeks gestational age as it is at term.

With this in mind and using the same data, test the hypothesis of equal dispersions versus the alternative that the variation in tritiated water diffusion across human chorioamnion is different at term than at 12 – 26 weeks gestational age by the **Ansari-Bradley rank test for dispersion**.

# Question 3

**Table 4.1** Tritiated Water Diffusion Across Human Chorioamnion

| $Pd(10^{-4} \text{ cm/s})$ |                             |
|----------------------------|-----------------------------|
| At term                    | 12–26 Weeks gestational age |
| 0.80                       | 1.15                        |
| 0.83                       | 0.88                        |
| 1.89                       | 0.90                        |
| 1.04                       | 0.74                        |
| 1.45                       | 1.21                        |
| 1.38                       |                             |
| 1.91                       |                             |
| 1.64                       |                             |
| 0.73                       |                             |
| 1.46                       |                             |

Source: S.J. Lloyd, K.D. Garlid, R.C. Reba and A.E. Seeds (1969).

## Question 4

Two independent random samples drawn from two populations are presented below:

$$(X_1, \dots, X_8) = (28, 35, 42, 66, 98, 107, 113, 126)$$

$$(Y_1, \dots, Y_7) = (38, 46, 51, 55, 66, 75, 98).$$

Assume the location-scale parameter model for the samples.

- (a) Calculate the values of the Wilcoxon rank sum test statistic  $W$  for location and the Ansari-Bradley test statistic  $C$  for dispersion.
- (b) Test whether there is a significant difference in location or dispersion between the two populations by the Lepage rank test at the 10% level.