Quick Questions 22 Nonparametric Hypothesis Testing of Ordinal Data Part II

I. Linda is tracking the number of work days missed by employees before and after taking part in the company-sponsored lunchtime physical fitness program. This problem first appeared on page 101. At that time it was assumed the populations were approximately normal. If this assumption is not correct, a paired difference sign test may be conducted at the .10 level of significance to determine whether median work days missed has changed.

Employee Absenteeism and Company Sponsored Physical Fitness							
Employee	A	B	C	D	E	F	G
Before	8	9	6	8	3	4	5
After	6	7	5	6	5	2	5
Sign	+	+	+	+	-	+	0

1. Employee G missed the same number of days and will be excluded from the study.
2. Five of six missed fewer days.
3. The Binomial table (ST 1) yields the following: $p(x = \geq 5) = .094 + .016 = .11$.
   For this two-tail problem, $p = 2(.11) = .22$.
4. Accept H_0 because .22 is greater than .10. Employee absenteeism has not changed.
5. **Note:** The null hypothesis would have been rejected if all 6 employees had changed their absenteeism ($p(x \geq 6) = .016$ and $2(.016) = .032 < .10$).

II. The page 112 ANOVA high school and college grades study assumed the populations were normally distributed with equal variances. These assumptions are not true or unknown. Conduct a .05 level of significance Kruskal-Wallis test to determine the equality of treatment median grades. Page 112 data has been increased to conform with the $n \geq 5$ test requirement.

H is the designated statistic.
N, the number of observations, is 15.
k, the number of samples, is 3.
n_k, a sample's size, is 5.
R_k is a sample's rank total.
df = k - 1 = 3 - 1 = 2 → χ^2 = 9.21

Analysis of College Grades Based Upon High School Grades					
High H.S. Grades T_1		Medium H.S. Grades T_2		Low H.S. Grades T_3	
College Grades	Rank (R_1)	College Grades	Rank (R_2)	College Grades	Rank (R_3)
3.4	13	3.2	11	2.1	2
3.5	14	2.8	6	2.5	4
3.1	9.5	3.0	8	2.7	5
3.3	12	3.1	9.5	2.3	3
3.6	15	2.9	7	1.8	1
	63.5		41.5		15

$$H = \frac{12}{N(N+1)}\left[\frac{(\sum R_1)^2}{n_1} + \frac{(\sum R_2)^2}{n_2} + \ldots + \frac{(\sum R_k)^2}{n_k}\right] - 3(n+1)$$

$$= \frac{12}{15(15+1)}\left[\frac{(63.5)^2}{5} + \frac{(41.5)^2}{5} + \frac{(15)^2}{5}\right] - 3(15+1)$$

$$= .05(806.45 + 344.45 + 45.00) - 48.00 = 11.795$$

H_0 is rejected because 11.80 > 9.21. Medians are not equal.