

注意：計算題請寫出計算式，否則不予計分！

1. Explain the following terms (40%, 4% each)

- (1) Standard error                      (2) Significance level                      (3) Coefficient of determination
- (4) Kruskal-Wallis test                (5) Wilcoxon signed-rank test            (6) Categorical data
- (7) ANOVA                                (8) Median                                    (9) Variance                                (10) Parameter

2. Good nutrition has previously been shown to lower blood pressure. A diet high in fruits, vegetables, and lower fat dairy (the so-called DASH diet) was tested for its efficiency in lowering blood pressure. Ten volunteers were tested before beginning the DASH diet and again after three weeks on the diet. The data below are their systolic blood pressures in mm of Hg. (10%)

Person	1	2	3	4	5	6	7	8	9	10
Before	160	140	130	140	144	153	152	170	129	146
After	152	140	125	136	138	144	142	160	124	140

Did the DASH diet significantly lower the systolic blood pressure?

3. Below are the overall lengths (mm) of a sample of water pennies collected from a stream flowing into Seneca Lake. Calculate the following descriptive statistics for this sample: sample mean, median, sample variance, standard error and range. (10%)

- 5      6      7      7      9      10      11      12      14      15

4. A study was conducted in the tidal zone to examine the distribution of the animals associated with the seaweed *Sargassum* at different distances from the shoreline. Samples of *Sargassum* were taken at 5, 10, and 15 m from the shore and these were examined for amphipods and isopods. The observations are recorded below. Is the distribution of the organisms associated with *Sargassum* the same at all three distances? Use the data below to test the hypothesis at the  $\alpha = 0.05$  level.

Clearly state the hypotheses and interpret the results. (10%)

Distances	5 meters	10 meters	15 meters
Amphipods	5	20	35
Isopods	10	25	50

5. In a project for a botany class, 15 sunflower seeds were randomly assigned to and planted in pots whose soil had been subjected to one of three fertilizer treatments. Twelve of the seeds germinated, and the table below shows the height of each plant (in cm) 2 weeks after germination. Are there significant differences in heights among treatments? Analyze with ANOVA. (15%)

Treatment 1	24	27	32	35
Treatment 2	35	38	37	28
Treatment 3	25	27	34	24

SST= 299

6. As part of a study of the environmental effects of large highways on nearby ecosystems, the cadmium concentrations in grasses at different distances from a major highway were measured. The results are presented below. For these data compute the least squares regression equation (calculate b to two decimal places). Test the equation's significance with ANOVA. (15%)

Distance (m), X	1	2	3	4	5	8
Cd concentration ( $\mu$ g/kg), Y	70	60	55	45	30	12

$\Sigma X = 23$        $\Sigma X^2 = 119$        $\Sigma Y = 272$        $\Sigma Y^2 = 14,594$        $\Sigma XY = 781$

$F_{0.05,2,9} = 4.26$      $F_{0.05,1,4} = 7.71$      $F_{0.05,1,5} = 6.61$      $t_{0.05,9} = 2.26$      $t_{0.05,18} = 2.10$      $\chi^2_{0.05,2} = 5.99$