Department   Registration No.   Name

1. Please specify the wrong points in explanation and/or method to analyze and suggest how to improve it
    for each issues below.
    (1) Randomly select 5 villages among 50 villages in Q district in a developing country, all adults in those
    5 villages were investigated about the frequency of eating fish and hair mercury concentration. The
    results were summarized below.

Eating fish frequency	N	Mean (Hg µg/g hair)	SD (Hg µg/g hair)
A. Rarely or None	30	0.25	0.14
B. monthly to weekly	50	0.27	0.18
C. weekly to daily	100	0.33	0.21
D. everyday	20	0.51	0.25

Conducting Welch's t-test for all combinations of 2 groups among the groups with different fish
consumption levels, then results were obtained as: $t_0=0.55$, $\varphi=72.7$, $p=0.58$ (A vs B), $t_0=1.82$, $\varphi=112.6$,
$p=0.07$ (B vs C), $t_0=2.42$, $\varphi=71.8$, $p=0.018$ (A vs C), $t_0=3.01$, $\varphi=24.6$, $p=0.006$ (C vs D), $t_0=3.91$, $\varphi=27.2$,
$p=0.0006$ (B vs D), $t_0=4.23$, $\varphi=27.0$, $p=0.0002$ (A vs D).   The hair mercury levels was not significantly
different between A vs B and B vs C, but all other comparisons showed statistically significant difference
at 5%.   The group C who eat fish more than once a week showed significantly higher hair mercury than
group A who eat rarely or no fish.   In addition, group D who eat fish everyday showed significantly
higher hair mercury concentration than all other groups.

(2) Apply drug A for 5 mice for 2 weeks everyday, the blood leptin levels increased by 1.1, 1.4, 1.7, 2.5, 2.6
ng/mL and the body weighs decreased by 5.8, 7.4, 13.6, 14, 13.8 g, respectively.   Pearson's correlation
coefficient was -0.87, but p-value was 0.058, which was not significant at 5%.   Thus the weight
reduction is not related with leptin.

(3) The 2 clinical tests are available for a disease X.   At the best cut-off, test A showed the sensitivity 0.9
and specificity 0.8, and test B showed sensitivity 0.85 and specificity 0.81.   Thus we can conclude that
test A has higher performance than test B.

(4) The 40 carcinoma patients were randomly assigned either of new drug X treatment or conventional
drug after informed consent.   The original outcome measure was the rate of remission, but only 3
patients among 20 patients were remitted in each group, so that the reduction percentages of cancer
volume assessed by computer tomography 17 patients in each group were compared by Welch't t-test.
The p-value was 0.07, which indicated no difference between new drug X and conventional drug.

2. Please explain the prevalence as a disease load in a population.   Explanation for the study design
    needed to the prevalence has to be included.

3. Glucose tolerance test was conducted for 5 healthy volunteers, the blood inorganic phosphate concentration was measured at 6 timings (before glucose intake, just after the glucose intake, 30 min later, 1 hour later, 2 hours later and 3 hours later). Please explain what kind of statistical method is applicable?   If better method become available by increasing sample size, explain its possibility.

4. Whether the ability of simple calculation is affected by coffee drinking or not was investigated for 6 healthy volunteers.   The result is shown below.   Please test whether coffee drinking improve calculation ability or not.   P-value is needed.   You can use computer software or calculator, but manual calculation is possible if you use 97.5 % point of t-distribution with d.f. 5 is 2.571 and square root 41=6.403.

| Score before coffee drinking | 8 | 8 | 6 | 4 | 5 | 6 |
| Score after coffee drinking | 10 | 9 | 7 | 6 | 4 | 8 |

5. The doctor who stayed in the village of tropical developing country for 1 year as medical practitioner recorded the disease occurrence for 140 children aged less than 5 at the beginning of his stay.   3 children visited his clinic 3 times and the diagnosis was simple cold at all visit.   10 children visited his clinic 2 times, among them, 5 showed vivax malaria in either visit.   10 children visited his clinic only once, but 9 were diagnosed as vivax malaria.
(1) Please calculate the vivax malaria incidence rate at that village in that year.

(2) Can you suggest anything else about the tendency of medical treatment of children in that village?

6. The RCT (Randomized Controlled Trial) to test new drug for headache intended the superiority of the new drug over the conventional drug.   Based on previous studies, the pain-killer effect of the conventional drug was found in 60% people.   If more than 65% people report the pain killer effect by taking the new drung, the new drug has clinical importance.   Please calculate needed sample size for this RCT, assuming 5% significance level. 90% power chi-square test.

● Please evaluate this lecture by URI-BOH-Net.