Assignment#1
Due: Sept 29/2003 at 12 pm in the box marked Stat 333 inside room MS315
Assignments will not be accepted if they are passed in after this time.

1. A veterinary anatomist investigated the spatial arrangement of the nerve cells in
    the intestine of a pony. He removed a block of tissue from the intestinal wall, cut
    the block into many equal sections, and counted the number of nerve cells in each
    of 23 randomly selected sections. The counts were as follows:

    35 19 33 34 17 26 16 42
    28 30 23 4 27 33 22 31
    28 28 40 23 23 19 29

    (A) Construct a stem-and-leaf diagram of the data.
    (B) Does the graphic in (A) support the claim that the data came from
        a reasonably bell shaped distribution (normal distribution)?
    (C) Use the stem-and-leaf display of part (A) to determine the median,
        the quartiles, and the interquartile range. Calculate by hand.
    (D) Construct a boxplot of the data. Indicate fences and if there are
        any outliers.

2. Can diet affect the size of a caterpillar's head? Such an effect is plausible,
    because a caterpillar's chewing muscles occupy a large part of the head. To study
    the effect of diet, a biologist raised caterpillars on three different diets: diet 1, an
    artificial soft diet; diet 2, soft grasses; and diet 3, hard grasses. He measured the
    weight of the head and of the entire body in the final stage of larval development.
    The file name is caterpil. mtp or caterpil.xls in chp 12 data file.

    (A) Use two different graphical methods to describe the head weight
        and use them to estimate the answers to question (i)-(v). You
        can also use values calculated by the computer to help with
        these questions.
        (i)   Give two different estimates of the average (central
                measure) head weight.
        (ii)   Which is the best measure and why do you believe that
                this is the best measure?
        (iii)   What is the range in head weight for your sample?
        (iv)   How would you describe variability in head weight in
                your sample?
        (v)   What percentage of your sample was given soft
                grasses? Show calculations.
    (B) You want to examine to see if diet affects the weight of the
        caterpillar's head.
        (i)   How would you look at this graphically?
        (ii)   What conclusions can you draw from your graph and
                descriptive statistics about the data?

3. Narin et all (1971) investigated the AFB smear as a diagnostic test for pulmonary tuberculosis. AFB smears and AFB cultures were obtained from 6, 453 residents of Bangalor District in Southern India. There were 142 positive smears and 180 positive cultures. In 98 instances the smear was negative and culture positive.

    (A) Construct a 2×2 table showing the relationship between smear results and culture.

    (B) What is the sensitivity (probability that a diseased patient test positive) and specificity (probability that a non-diseased patient tests negative) of the AFB smear as a test for tuberculosis? Assume that the culture results are the "gold standard" for the diagnosis of tuberculosis. Interpret your results (eg. Are these probabilities good or bad and what do they say about the test?)

    (C) An individual comes into a hospital in the Bangalor district with a cough. Chest X-ray shows a right upper lobe infiltrate. A sputum sample is obtained and the AFB smear is positive. What is the probability of active tuberculosis in the light of this test result? Interpret your results.