1. National Cheng Kung university has 23,000 registered students. As part of a survey, 900 of these students are chosen at random. The average age of the sample students turns out to be 21.5 years, and the SD is 6 years.

(a) (10 points) Find an approximate 95%-confidence interval for the average age of all 23,000 registered students at National Cheng Kung University? or can this be determined from the information given?

(b) (5 points) A manager at the President's office interprets the survey data to mean for about 68% of all 23,000 registered students at National Cheng Kung University, the age is between 21.3 and 21.7 years. Would you agree? Answer yes or no and explain briefly.

(c) (10 points) If another sample of 900 students are drawn at random, there will be about 95% chance for the new sample average to be in the range from 21.1 to 21.9 years. Answer true or false and explain briefly.

2. Suppose that in a group of 180 people, there are

(i) 50% of them with an IQ of 120, one-third with an IQ of 110, and the remaining with an IQ of 100;

(ii) One-third of them is 65 inches tall, another one-third is 70 inches tall, and the remaining one-third is 75 inches tall.

(a) (5 points) How many in this group of 180 people are 70 inches tall with an IQ of 100?

(b) (10 points) A person in this group is to be selected at random, what is the chance for the person chosen to be 75 inches tall, given that the person is of IQ 120?

(c) (10 points) Are height and IQ independent for people in this group? Explain your answer briefly and justify it by computation.

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3. In a study of subliminal detection, the subject is seated in a room in front of a square screen divided into four equal parts and is instructed to guess in which part of the screen a tiny, very faint, spot of light is shown for a fraction of a second. The energy of the light is made so low that the subject can not in any conscious sense actually "see" the light. The subject is told that the light will appear on the screen in a completely random manner over a total 256 trials. But, in fact, the light always comes on in the same part of the screen. The subject is paid 5 cents per trial for her best effort. The data are shown below.

Outcome	Number of trials
Guess Right	60
Guess wrong	196

(a) (5 points) What is the null hypothesis?

(b) (5 points) What is the alternative hypothesis?

(c) (15 points) Find the possible experimental outcomes that will reject the notion that the subject really is in no way detecting the invisible light and is merely guessing at random?

4. A developmental psychologist recorded both the age in days of babies and their visual attending time (measured in milliseconds) to a moving sinusoidal pattern that stayed on the video screen for 5,000 milliseconds. The data are shown below.

Subject	Age	Attending time
1	90	600
2	120	700
3	150	1000
4	150	1200
5	180	1200
6	180	1500
7	240	2500
8	300	2100
9	330	1700
10	360	2500

The mean age is 210 days with an standard deviation of 92.7 days. The mean attending time is 1,500 milliseconds.

(a) (5 points) What is the standard deviation of the attending time?

(b) (10 points) Draw a scatter diagram of the visual attending time against the age of the babies in days.

(c) (10 points) What is the correlation coefficient between the age of babies and the visual attending time? Choose a value below and explain briefly.

$$-0.79 \qquad -0.36 \qquad 0.25 \qquad 0.86$$