



Answer the following questions. The total credit is 60. **The Exam is in seven Pages**

Question (1) (12 points)

A. (6 points) **MULTIPLE CHOICE:** Choose the correct answer and fill in the following table (**Only one choice**)

1	2	3	4	5	6

1. What is the meaning of the terms population and sample?
 - a. A population is the complete collection of all individuals of a large size, while a sample is the complete collection of all individuals of a small size.
 - b. A population is a set of parameter values, and a sample is a set of statistics.
 - c. A population is the complete collection of all individuals, while a sample is a sub-collection of members selected from a population.
 - d. A population is a set of categorical data, while a sample is a set of quantitative data.

2. Which statement must be true about binomial distributions?
 - a. The trials of the corresponding procedure are independent and all trials have exactly the same outcome.
 - b. The trials of the corresponding procedure are independent and the probability of a success is the same in all trials.
 - c. The trials of the corresponding procedure have two outcomes (T and F) and the probability of a success is different in each trial.
 - d. The corresponding random variable x (the number of successes) can have infinitely many possible values.

3. What is a critical value?
 - a. A critical value is a calculated error margin of less than 5%.
 - b. A critical value is the degree of confidence when constructing a confidence interval.
 - c. A critical value is the length of a confidence interval.
 - d. A critical value is the number on the borderline separating sample statistics that are likely to occur from those that are unlikely to occur.

Question (2) (16 points)

A. (8 points) In the table, the random variable x represents the number of cups of coffee per day consumed by adults.

x	$P(x)$
0	0.22
1	0.41
2	0.14
3	0.10
4	0.06
5	0.04
6	0.03

- Find the mean of the random variable x
- Find the standard deviation
- Use probabilities to determine if the value $x = 5$ is unusual. Explain why or why not.

B. (4 points) A person wants to estimate the mean score of some test. How many scores does he need to obtain so that the sample mean is within 0.07 from the population mean? Assume that a 95% confidence is desired and the population standard deviation is 0.84.

C. (4 points) Use the data in the following table, which summarizes blood groups and Rh types for 100 subjects

Type	Group			
	O	A	B	AB
RH ⁺	35	36	9	4
RH ⁻	8	5	1	2

- If a subject is randomly selected, find the probability of getting someone who is group A and type Rh₊.
- If a subject is randomly selected, find the probability of getting someone who is group A or type Rh₊.
- If 2 of the 100 subjects are randomly selected with replacement, find the probability that they are both group A and type Rh₊.
- If 2 of the 100 subjects are randomly selected without replacement, find the probability that they are both group A and type Rh₊.

Question (3) (16 points)

A. (8 points) If one thermometer is randomly selected, Assuming that the mean freezing point is 0 and the standard deviation is 1.

- a. Find the probability that, at the freezing point of water, the reading is less than 1.27° .

- b. Find the probability that, at the freezing point of water, the reading is more than -1.23 degrees.

- c. Find the probability that, at the freezing point of water, the reading is between -2.00 and 1.50 degrees.

B. (8 points) Given are the results (in mmHg) of the blood pressure of the same person at 12 different times. Assume that the population has normal distribution and its standard deviation is known to be 6 mmHg.

122 141 135 129 131 125 140 121 137 130 128 136

- i. Give the best point estimate of the population mean.

- ii. Give the margin of error.

- iii. Construct a 99% confidence interval for the population mean.

- iv. Also construct a 90% confidence interval of the mean. Which interval is wider? Why?

Question (4) (16 points)

A. (8 points) A sample of 40 songs results in a mean length of 229.75 sec. Assume the standard deviation of song lengths is 53.1 sec. Use a 10% significance level to test the claim that the mean song length is less than 240 sec.

(a) State the null and the alternative hypotheses.

(b) Compute the test statistic. (Round off to three decimal places.)

(c) Draw a diagram. Find and mark the critical value(s).

(d) Make an initial conclusion and a final conclusion.

B. (8 points) In a study of 1400 randomly selected medical cases (حالات مرضية), it is found that 967 of them were completely cured (شفاء تام).

a. What is the best point estimate of the proportion of cured medical cases?

