

Question 1. [5 marks]

The following data give the weight (in kg) of 10 laboratory animals.

14.1 15.5 16 18 19 9 9 9.9 10.5 14.0

For the given data,

(i) find the mean;

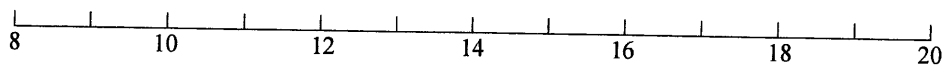
[1 mark]

(ii) find the median;

[1 mark]

(iii) draw a boxplot.

[3 marks]



Question 2. [5 marks]

In a study to evaluate the efficacy and safety of a pH-sensitive, polymer-coated oral preparation of mesalamine in patients with mildly to moderately active ulcerative colitis, the following table shows the results of treatment at the end of 7 weeks by treatment received:

Outcome	Treatment group	
	Mesalamine, 1.6 g/d (D ₁)	Mesalamine, 2.4 g/d (D ₂)
In remission (R)	7	10
Improved (I)	15	15
Maintained (M)	14	15
Worsened (W)	14	10

A patient is selected at random from this group at the end of the study, what is the probability that he/she is

- (i) worsened; **[1 mark]**
 - (ii) maintained or received a dose of 2.4 g/d; **[2 marks]**
 - (iii) improved given that he/she has received a dose of 1.6 g/d. **[2 marks]**
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Question 3. [5 marks]

Suppose the probability of a second stroke within two weeks is 0.1 for patients with cardio embolic stroke. Ten patients with cardio embolic stroke are randomly selected and carefully monitored for evidence of a second stroke. Find the probability that

- (i) at most two patients have a second stroke? **[1 mark]**
 - (ii) two or three patients have a second stroke? **[2 marks]**
 - (iii) only one patient has a second stroke? **[2 marks]**
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Question 4. [5 marks]

Suppose that the yearly average number of deaths from a certain non contagious disease is 6 deaths. If the yearly number of deaths from this disease follows the Poisson distribution, what is the probability that during the current year:

- (i) exactly seven people will die from the disease?
- (ii) more than ten people will die from the disease?
- (iii) no person will die from the disease?

[2 marks]

[2 marks]

[1 mark]

Question 5. [5 marks]

The weights a certain population of female patients are normally distributed with mean of 90 kg and standard deviation 5 kg.

(a) Find the probability that a female patient selected at random from this population will have weight:

(i) below 100 kg;

[1 mark]

(ii) between 80 and 100 kg.

[2 marks]

(b) Find the probability that a group of 9 female patients selected at random from this population will have a mean weight more than 95 kg.

[2 marks]

Question 6. [5 marks]

The following are summaries of two independent samples on the sizes of two types of tumors.

<i>Type of Tumor</i>	<i>Sample size</i>	<i>Mean</i>	<i>Standard deviation</i>
A	9	3.15 cm	1.9 cm
B	9	2.80 cm	1.7 cm

Assume that the sizes of the tumors are normally distributed with equal variances.

- (i) Construct a 95% confidence interval for the mean size of tumor of type A. **[2 marks]**
- (ii) Can we conclude at $\alpha = 0.05$ that the actual mean sizes of both tumors are different? **[3 marks]**
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Question 7. [5 marks]

In a study of obesity the following results were obtained from samples of males and females between the ages of 20 and 60:

	Sample size	Overweight persons
Males	200	30
Females	250	40

(i) Construct a 95% confidence interval for the difference of the proportions of overweight males and females. **[2 marks]**

(ii) Can we conclude at $\alpha = 0.05$ that the proportion of overweight females is smaller than 0.19? What is the p-value of the test? **[3 marks]**

Question 8. [5 marks]

The following are the pulmonary blood flow values Y (in ml/sqM) and pulmonary blood volume values X (in L/min//sqM) recorded for 10 infants and children with congenital heart disease:

Y	168	280	391	420	303	370	531	516	211	439
X	4.31	3.40	6.20	17.30	12.30	4.24	19.41	16.61	7.21	11.60

$$\sum x = 102.58 \quad \sum y = 3629 \quad \sum x^2 = 1376.32 \quad \sum y^2 = 1450073 \quad \sum xy = 42153.2$$

- (i) Compute the sample correlation coefficient. Comment. **[2 marks]**
(ii) Find the least squares regression line to predict y in terms of x . **[2 marks]**
(iii) Predict y when $x = 10$. **[1 mark]**
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