

**ANSWER 5 OUT OF 7 QUESTIONS ( 20 MARKS EACH )**

1. a. Indicate whether the following variables are:

Qualitative or quantitative data (further classify the quantitative variables as discrete or continuous):

- (i) Number of pages in a magazine
- (ii) Opinions about a new program
- (iii) Number of gallons of petrol
- (iv) Types of laptop manufactured

Nominal, ordinal, interval or ratio level of measurement:

- (v) Number of siblings
- (vi) Ratings of soft drinks (like, neutral, dislike)
- (vii) Models of hand-phone used
- (viii) Weights of packets of tomatoes

( 8 marks )

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- b. A DVD player manufacturer found that 5% of all the DVDs produced are defective. The quality control manager randomly selects a sample of 10 DVDs to observe. Express the following probabilities in **3 decimal places**.
- (i) What is the probability that exactly 2 of the DVDs are defective?  
( 3 marks )
  - (ii) What is the probability that more than one DVD are defective?  
( 5 marks )
  - (iii) What is the mean and standard deviation of this distribution?  
( 4 marks )

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2. a. List and describe **three** probability sampling techniques commonly used.  
( 9 marks )

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- b. A property agent wants to study the relationship between the sizes of houses (in hundreds of square feet) and the monthly rents (in \$'000) paid by tenants in a small town. A random sample of 6 houses gives the following information.

Size of House	20	15	23	25	36	32
Monthly Rent	0.9	0.8	1.3	1.4	1.9	1.6

- (i) Identify the independent variable and dependent variable. ( 2 marks )
- (ii) Find the line of best fit. ( 7 marks )
- (iii) Predict the monthly rent of a 3,000 square feet house. ( 2 marks )


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Lined area for writing, consisting of 24 horizontal green lines.

3. a. Two students are randomly selected from a statistics class. They are observed whether or not they suffer from math anxiety.
- (i) Let M denotes the selected student has math anxiety. List down all the possible outcomes for this experiment. ( 1 mark )
  - (ii) What is the probability that at least one student suffer from math anxiety? ( 2 marks )
  - (ii) What is the probability that none of them suffer from math anxiety? ( 1 mark )
- b. A box contains 50 marbles – 20 blue, 14 yellow, 9 green and the rest are red. If a marble is randomly selected out of this box, what is the probability (correct to **2 decimal places**) that this marble is
- (i) yellow? ( 2 marks )
  - (ii) blue or red? ( 2 marks )
  - (iii) not green? ( 2 marks )

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- c. A group of consumers suspects that the packets of 400-gram cheese from a particular manufacturer actually weigh less than 400 grams. The group took a sample of 36 such packets and found that the mean weight was 395 grams. Assume that the population is known to be normally distributed with a population standard deviation of 12 grams.

Test at 5% significance level that the mean weight is less than 400 grams. Include a diagram showing the test value and critical region.

( 10 marks )

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4. a. The following data show the number of orders received by *Yummy Bakery* in a day.

17    15    19    22    12    10    14    23    28    26  
 20    19    21    11    17    28    26    23    19    24  
 18    16    18    15    16    13    24    20    25    18

- (i) Find a suitable class width to construct a grouped frequency distribution with 5 classes. Show your working. (2 marks)
- (ii) Create a grouped frequency distribution using “10 to 13” as an initial class limit, as shown below. Complete the table. (9 marks)
- (iii) Comment on the shape of the frequency distribution. (1 marks)

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Class Limits	Class Boundaries	Class Midpoints	Frequency	Relative Freq	Cumulative Freq	Cum Relative Freq
10 - 13						

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b. The study on the relationship between the sizes of houses and the monthly rents paid by tenants in a small town gives a Pearson's correlation coefficient of 0.974.

(i) What does the value of the Pearson's correlation coefficient tell you about the relationship between the size of a house and its monthly rent?  
( 3 marks )

(ii) Calculate the coefficient of determination. What does this tell you?  
( 5 marks )

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5. a. A survey conducted revealed that employees who had changed jobs in the past 12 months were asked if their new pay were higher, lower or same as their previous jobs. Results are shown in the following table.

Gender	Higher Pay	Same Pay	Lower Pay
Men	70	25	25
Women	46	22	52

Use 1% level of significance, test that the changes in pay are different for men and women.

( 12 marks )

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6. a. The table below shows the gender and dietary preference of 500 randomly selected senior citizens from city.

Gender	Dietary Preference	
	Vegetarian (V)	Non-vegetarian (N)
Male (M)	40	180
Female (F)	80	200

Find the probability, correct to **2 decimal places**, that a randomly selected senior citizen from the city:

- (i) is a vegetarian ( 2 marks )
- (ii) is a female and a vegetarian ( 2 marks )
- (iii) is a male or non-vegetarian ( 2 marks )
- (iv) is female, given that the person is non-vegetarian ( 2 marks )
- (iv) Are the events “female” and “vegetarian” mutually exclusive? ( 2 marks )

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- b. A study claims that all adults spend an average of 10 hours on housework during a weekend. A researcher wanted to check if this claim is true. A random sample of 20 adults shows an average of 11 hours spent on housework during weekend, with a sample standard deviation of 3 hours.

At 10% significance level, can we conclude that all adults spend more than an average of 10 hours on housework during weekend?

( 10 marks )

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7. a. The data give the speed (in kilometers per hour) of six cars that were stopped for speeding violations:

85      81      94      87      89      95

Calculate the following:

- (i) Mean ( 2 marks )
- (ii) Median ( 2 marks )
- (iii) Range ( 1 mark )
- (iv) Standard deviation ( 5 marks )

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- b. A company that sells computer parts by mail assures its customers that products are mailed as soon as the orders are received by the company. A random sample of 64 recent orders at the company revealed that the mean time taken to mail the ordered products to the customers was 48 hours. It is known that the population standard deviation is 12 hours and the population is normally distributed.
- (i) Construct a 95% confidence interval for the population mean time taken to mail the ordered products to the customers.  
( 4 marks )
  - (ii) Interpret the confidence interval obtained in part (i).  
( 3 marks )
  - (iii) How large a sample should the company take so that the population mean is estimated to within 2 hours, with 95% confidence level?  
( 3 marks )

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