

Question 1. (1.0/10) Three plants manufacture hard drives and ship them to a warehouse for distribution. Plant I produces 54% of the warehouse's inventory with a 4% defect rate. Plant II produces 35% of the warehouse's inventory with an 8% defect rate. Plant III produces the remainder of the warehouse's inventory with a 12% defect rate.

- What is the probability that a randomly selected hard drive is defective?
- Suppose a hard drive is defective. What is the probability that it came from Plant II?

Question 2. (1.0/10) A large lot of tires contains 5% defectives. 4 tires are to be chosen for a car.

- Find the probability that you find at most 2 defective tires before 4 good ones.
- Find the mean and variance of the number of defective tires you find before finding 4 good tires.

Question 3. (1.0/10) A shipment of 25 integrated circuits (ICs) arrives at an electronics manufacturing site. The site manager will randomly select 4 ICs and test them to see whether they are faulty. Unknown to the site manager, 5 of these 25 ICs are faulty. Suppose the shipment will be accepted if and only if at most one of the inspected ICs is faulty. What is the probability this shipment of 25 ICs will be accepted?

Question 4. (1.5/10) Based on extensive data from an urban freeway near Toronto, Canada, "it is assumed that free speeds can best be represented by a normal distribution". The mean and standard deviation reported in the article were 118 km/h and 13.1 km/h, respectively.

- The posted speed limit was 100 km/h. What percentage of vehicles was traveling at speeds exceeding this posted limit?
- If five vehicles are randomly and independently selected, what is the probability that at least one is not exceeding the posted speed limit?

Question 5. (2.0/10)

a. A randomly selected sample of $n = 16$ students at a university is asked, "How much did you spend for textbooks this semester?" The responses, in dollars, are

380, 290, 310, 200, 175, 450, 300, 350, 250, 150, 200, 320, 370, 404, 250, 420

Calculate a 95% confidence interval for the population mean.

b. A soft drink manufacturer wants to determine if one of its fill operations is working properly. A random sample of twenty "1 liter" bottles of the same soft drink showed an average fill of 0.996 liters with a standard deviation of 0.008 liters. At a 1% level of significance, is it true that the average fill is under 1 liter? Show your working and reasoning.

Question 6. (2.5/10)

a. A study was conducted to determine if office background noise at an office decreases productivity. Fifteen office workers were studied at work for one week both before and after the wearing of noise-reduction head gear. Their productivity on a 100 point scale as determined by the company

conducting the study were recorded as follow:

Subject	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Before	91	88	95	81	86	79	84	79	87	86	75	87	93	85	77
After	92	90	94	83	84	89	85	78	87	91	74	89	86	89	78

At a 5% level of significance is there evidence that wearing the noise reduction head gear increases worker productivity?

b. “Would you marry a person from a lower social class than your own?” Researchers asked this question of a sample of 685 never-married students at two historically colleges in the South. Of the 349 men in the sample, 291 said “Yes.” Among the 336 women, 217 said “Yes.” At a 2% level of significance is there reason to think that different proportions of men and women in this student population would be willing to marry beneath their class?

Question 7. (1.0/10) *Do heavier people burn more energy?* We have data on the lean body mass and resting metabolic rate for 12 women who are subjects in a study of dieting. Lean body mass, given in kilograms, is a person’s weight leaving out all fat. Metabolic rate, in calories burned per 24 hours, is the rate at which the body consumes energy.

Mass	36.1	54.6	48.5	42.0	50.6	42.0	40.3	33.1	42.4	34.5	51.1	41.2
Rate	995	1425	1396	1418	1502	1256	1189	913	1124	1052	1347	1204

Determine the correlation coefficient for the above set of results and the equation of least-squares regression line for predicting metabolic rate from body mass. Another woman has lean body mass 45 kilograms. What is her predicted metabolic rate?

Note: Proctors are not allowed to give any unauthorised explanation.

Learning outcome mapping	Assessed in
[LO 2.1.1]: Compute mean, median, mode, standard deviation, variance, and know their function	Question 1
[LO 2.4.3; 2.4.4]: Become familiar with various graphical representations of data and learn to recognize misleading graphs.	Question 2
[LO 2.1.1; 2.1.2; 2.4.3; 2.4.4]: Use binomial, normal, Poisson distributions, Hyper geometric distribution and their relationships.	Questions 3,4
[LO 2.1.1, 2.1.2]: Calculate the confidence intervals for proportion, mean, variance based on a sample collected.	Question 5
[LO 2.1.3, 2.1.4]: Use test procedures to solve and develop proficiency in its applications.	Question 6
[LO 2.4.4]: Use linear regression model.	Question 7

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Approved by program chair

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