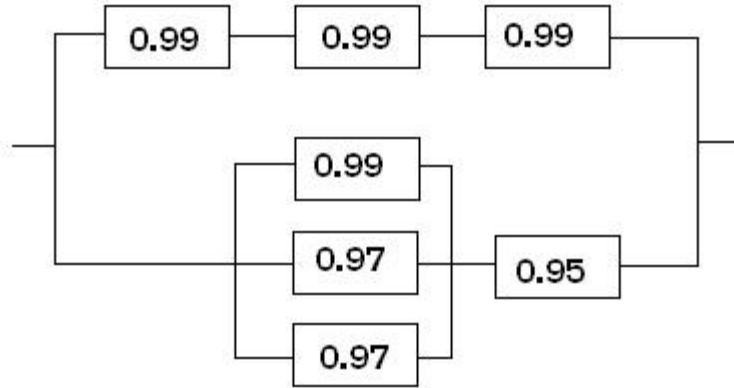


MAT 2377 Practice Final Exam Questions

1. The following circuit operates only if there is a path of functional devices from left to right. The probability that each device functions is shown on the graph. Assume that devices function independently. What is the probability that the circuit operates?



- (A) 0.9744 (B) 0.9985 (C) 0.9898 (D) 0.7567 (E) 0.0222

2. The data from 200 machined parts are summarized as follows :

Edge Condition	Depth of bore	
	Above target	Below target
Coarse	15	10
Moderate	25	20
Smooth	50	80

We select one of the 200 parts at random. Given that the part has a coarse edge condition, what is the probability that the depth of bore is above target?

- (A) 10/25 (B) 15/25 (C) 15/200 (D) 15/90 (E) 75/90
3. Consider the data from Question 2. We select one of the 200 parts at random. Define the events: A = "moderate edge condition" and B = "depth of bore is below target". Are the events A and B independent?
- (A) Yes (B) No (C) Insufficient Information

4. Consider a random sample X_1, \dots, X_{15} from a normal population with mean $\mu = 10$. The sample mean and the sample variance are \bar{X} and S^2 , respectively. Find c such that

$$P\left(\frac{\bar{X} - \mu}{S/\sqrt{15}} < c\right) = 0.05$$

- (A) 1.761 (B) 1.645 (C) -1.761 (D) -1.753 (E) -1.645

5. A random sample of $n = 50$ suspension helmets used by motorcycle riders and automobile race-car drivers was subjected to an impact test, and on 18 of these helmets some damage was observed. Construct a 95% confidence interval for the true proportion of helmets of this type that would show damage from this test.
- (A) [0.227; 0.493] (B) [0.227; 0.502] (C) 0.36 (D) [0.306; 0.414] (E) [0.305, ∞)
6. A manufacturer packages boxes with a 12-ounce label weight. Suppose that the actual distribution is $N(12.2, 0.0036)$. What is the probability that a box will weigh less than 12 ounces?
- (A) 0.005 (B) 0.0004 (C) 0.5 (D) 0.0001 (E) 0.25
7. An engineer who is studying the tensile strength of a steel alloy intended for use in golf club shafts knows that tensile strength is normally distributed with $\sigma = 57$ psi. A random sample of 25 specimens is selected to test $H_0: \mu = 3500$ against $H_1: \mu \neq 3500$ at a level of significance of $\alpha = 5\%$. Compute the probability of committing an error of type II if mean strength $\mu = 3470$.
- (A) 0.7486 (B) 0.2514 (C) 0.8238 (D) 0.1762 (E) 0.0244
8. Consider the hypothesis test from Question 7. From the $n = 25$ observations, we compute a sample mean of $\bar{x} = 3465$ psi. Compute the p-value and give the conclusion of the hypothesis test at $\alpha = 5\%$.
- (A) 0.0021 (B) 0.0011 (C) 0.0250 (D) 0.0500 (E) 0.1145
9. The brightness of a television picture tube can be evaluated by measuring the amount of current required to achieve a particular brightness level. The researchers produced the following descriptive statistics of the data:

Mean	sd	Min	Q1	Median	Q3	Max	n
323.24	9.991482	299.8	317.95	323.3	327.1	340.8	15

Give a point estimate of the population mean and the estimated standard error.

- (A) point estimate = 323.24 ; standard error = 9.991482
 (B) point estimate = 323.24 ; standard error = 9.15
 (C) point estimate = 323.24 ; standard error = 2.579790
 (D) point estimate = 323.24 ; standard error = 0.666099
 (E) point estimate = 323.3 ; standard error = 323.24

10. An assembly plant receives its voltage regulators from three different suppliers, 30% from supplier A, 60% from supplier B and 10% from supplier C. Suppose that 95% of the voltage regulators from supplier A perform according to specifications and that the rates for suppliers B and C are 80% and 65%, respectively. If a voltage regulator performs according to specifications, what is the probability that it came from supplier A?

(A) 0.1226 (B) 0.4545 (C) 0.9500 (D) 0.3000 (E) 0.3434

11. An expert wishes to determine the average time (in seconds) that it takes to drill holes in a certain metal clamp. How large a sample is required to be 95% confident that the sample mean will be within 15 seconds of the true mean? Assume that it is known from previous studies that $\sigma = 40$ seconds.

(A) 26 (B) 27 (C) 28 (D) 29 (E) none of the preceding

12. Let X be a continuous random variable with mean $\mu_X = 0.75$ and probability density function

$$f_X(x) = 3x^2, \quad 0 < x < 1.$$

Give the standard deviation of the random variable X .

(A) 0.0375 (B) 0.1936 (C) 0.7746 (D) 0.3873 (E) none of the preceding

13. A scientist inoculates several mice, one at a time, with a disease germ until she finds one that has contracted the disease. If the probability of contracting the disease is $1/6$, what is the probability that 8 mice are required?

(A) 0.0465 (B) 0.935 (C) 0.074 (D) 0.260 (E) none of the preceding

14. For a set of 12 pairs of observations on (x_i, y_i) from an experiment, the following summary for x

and y is obtained: $\sum_{i=1}^{12} x_i = 25$, $\sum_{i=1}^{12} y_i = 432$, $\sum_{i=1}^{12} x_i^2 = 59$, $\sum_{i=1}^{12} y_i^2 = 15648$, $\sum_{i=1}^{12} x_i y_i = 880.5$.

The estimated mean value of y at $x = 5$ from the least squares regression line is:

(A) 27.78 (B) 47.77 (C) 41.87 (D) 55.97 (E) 65.21

15. Assuming the simple linear regression model $y_i = \beta_0 + \beta_1 x_i + \varepsilon_i$ is appropriate for $n = 14$ observations, we computed the estimated regression line $\hat{y}_i = 0.6649 + 0.83075x_i$. Given that $S_{yy} = 4.1289$ and $S_{xy} = 4.4094$, compute the estimated standard error for the slope.

(A) 0.3176 (B) 0.0388 (C) 0.0855 (D) 0.0073 (E) 0.0575