

Problem 3: Eng Probability and Statistics

Five guests are invited to a party. How many combinations of one or more guests are possible?

- (A) 25
- (B) 31
- (C) 48
- (D) 63

Solution:

$$\begin{aligned}\sum_{r=1}^5 \binom{n}{r} &= \sum_{r=1}^5 \left(\frac{n!}{(n-r)!r!} \right) \\ &= 5 + 10 + 10 + 5 + 1 \\ &= 31\end{aligned}$$

The answer is B.

Problem 4: Eng Probability and Statistics

The service time (in hours) for a copy machine is approximately exponentially distributed. In examining the records for 50 breakdowns, it is determined that the average service time is 1.25 hr. An estimate for the probability that a service time will exceed 2 hr is approximately

- (A) 0.05
- (B) 0.10
- (C) 0.15
- (D) 0.20

Solution:

Let t = service time in hours. $f(t)$ is exponentially distributed.

$$f(t) = \lambda e^{-\lambda t} \quad [t > 0]$$

$$\lambda = \frac{1}{\mu}$$

μ = the population mean

Let the sample mean be an estimate of the population mean.
The estimate for μ is the sample average, which is 1.25.

$$\lambda = \frac{1}{1.25} = 0.8$$

$$\begin{aligned} P(t > 2) &= \int_2^{\infty} 0.8e^{-0.8t} dt = -e^{-0.8t} \Big|_2^{\infty} \\ &= 0 + e^{-1.6} = 0.2018 \quad (0.20) \end{aligned}$$

The answer is D.

Problem 5: Eng Probability and Statistics

You would like to test the null hypothesis at a 5% level of significance that the mean shear strength of spot welds is at least 450 psi. You randomly select 15 welds, measure the shear strength, and determine the following results.

sample mean ($\bar{x}$): 445 psi

sample standard deviation (s): 10 psi

Based upon the data,

- ☐ (A) the null hypothesis is true
- ☐ (B) the null hypothesis is false
- ☐ (C) there is not enough information to say the hypothesis is true
- ☐ (D) there is not enough information to say the hypothesis is false

Solution:

$$H_0: \mu \geq 450$$

$$H_1: \mu < 450$$

Accept hypothesis H_0 if

$$\frac{\bar{x} - 450}{\frac{s}{\sqrt{15}}} \geq -t_{0.05, 14} = -1.761$$

$$t = \frac{445 - 450}{\frac{10}{\sqrt{15}}} = -1.936$$

$$-1.936 < -1.761$$

Reject H_0 .

The answer is B.