

**Question Bank**  
**Statistics for Business Economics**

1. Find the coefficient of variation for the first  $n$  natural numbers.
2. For a distribution, the first four moments about the value 5 are -1, 24.6, 60.2 and 131.1 respectively. Obtain mean, standard deviation, coefficient of skewness and kurtosis of this distribution.
3. For the following data points calculate median and 10% trimmed mean, compare the values with mean and comment on the difference  
  
6.5, 12.0, 14.9, 10.0, 10.7, 7.9, 21.9, 12.5, 14.5, 9.2
4. For a set of observations, mean  $>$  median  $>$  mode. Draw the relevant figure for distribution and comment on the nature of skewness. Can you also infer about the kurtosis?
5. If second, third and fourth central moments of a distribution are in geometric progression, how are skewness and kurtosis of the distribution related?
6. What is the degrees of freedom related with sample variance and why?
7. If a constant  $c$  is added to each data point, how will the variance and mean of the new data relate with the respective values of the original data. Show the same thing when each data point is multiplied by the constant  $c$ .
8. The median and standard deviation of a distribution that is symmetric and mesokurtic (with kurtosis value=3) are 20 and 3 respectively. Find first four moments about zero.
9. What property of arithmetic mean leads to zero first order central moment? Show it.
10. If the coefficient of correlation between  $X$  and  $Y$  is 0.3
  - a. Find the coefficient of correlation between  $X$  and  $2Y$
  - b. Find the coefficient of correlation between  $X$  and  $-Y$
11. Suppose marks of 10 students are given by the following:  
  
15.0, 13.0, 18.0, 14.5, 12.0, 11.0, 8.9, 8.0, 8.4, 9.6  
  
What would you report as a representative value of marks and why.
12. If  $A$  and  $B$  are mutually exclusive events with  $P(A) = 0.6$  and  $P(B) = 0.2$ , find the  $P(\bar{A} \cap B)$  and  $P(\bar{A} \cap \bar{B})$ .

13. Income distribution in Mojoland is normally distributed with mean of 70 and standard deviation 10. Find the top 10 percent of the income group.
14. Find the probability of getting two heads when five coins are tossed.
15. A bag contains some coins one of which is a 2-headed coin (both side heads) and rest are fair coins. A coin is selected at random and the probability of heads comes out to be  $\frac{7}{12}$ . Find the number of fair coins in the bag.
16. A man is known to speak truth 2 out of 3 times. He throws a die and reports that number obtained is a four. Find the probability that the number obtained is actually a four given he reports that the no. is 4.
17. a) Define a Random Variable and a Bernoulli Random Variable

b) For a random variable Y, the probability density function is given by the following:

Y	1	2	4	5	6
P(y)	.05	.10	.35	.40	.10

- i) Plot cumulative density function
- ii) Find probability that  $(2.5 < Y < 8.5)$
- iii) Find  $E(Y)$
- iv) Find  $E(5Y + 2)$
- v) Find Variance (Y)
- vi) Find Variance  $(5Y + 2)$
18. If X is a continuous random variable with probability density function

$$f(x) = \begin{cases} \frac{x}{6} + k & 0 < x < 3 \\ 0 & \text{Otherwise} \end{cases}$$

- i) Find k and draw the corresponding density curve
- ii) Find  $P(1 < X < 2)$  and  $P(X > 2)$
19. Let X be a normal random variable with mean 104 and standard deviation 5
- i) Find the probability that X 'differs' from the mean value by more than one standard deviation
- ii) Find  $P(X > 106)$  and  $P(X \geq 106)$

20. a) Find  $E(X)$  for which Joint probability distribution of random variables X and Y is given by:

$$f(x, y) = \begin{cases} 24xy & 0 < x < 1, 0 < y < 1, x + y < 1 \\ 0 & \text{Otherwise} \end{cases}$$

b) Construct the sampling distribution of the sample of size 2 taken from a finite population consisting of numbers 5,6,7,8 and 9.

21. a) State the Central Limit Theorem

b) X is a random variable with mean 4 and standard deviation 1.5. Sample of 50 is independently produced; Find the probability that mean value of X lies between 3.5 and 3.8, sum of the x's lie between 205 and 208, also derive the 95 percent confidence interval for mean and give its interpretation.

22. a) Calculate Laspeyers' price index with year 2008 as base:

YEAR	X (quantity)	X (price)	Y (quantity)	Y (price)
2008	4	100	20	200
2009	5	120	25	300

b) Why does Laspeyers' price index overvalue the true value as compared with Paasche's price index?

23. The prices of a certain commodity increased by 10 percent from year 2005 to 2006. The price index in 2007 with base 2006 was 130. The price index in 2008 with 2005 as base was 150. Calculate the price index series from 2005 to 2008 with 2006 as base.

24. a) For a normal population with standard deviation 1.20 a random sample of 16 is chosen resulting in sample mean of 94.32 to test the null hypothesis  $H_0: \mu = 95$  versus alternate hypothesis  $H_a: \mu \neq 95$  using a two-tailed test with a level of significance  $\alpha = 0.01$ . Find the result of the test using p value.

b) Explain type I and type II errors. What will be the respective values in the above mentioned case if the true population mean is 94?

c) Without calculating explain what would happen to type II error if  $\alpha$  is increased to 0.05.

25. Consider the following information :

	Population 1	Population 2
Standard deviation	1.6	1.4
Sample size	40	32
Sample mean	18.12	16.87

Test the null hypothesis  $H_0: \mu_1 - \mu_2 = 0$  versus alternate hypothesis  $H_a: \mu_1 - \mu_2 > 0$  with a level of significance  $\alpha = 0.01$ .