

**Anekant Education Society's  
Tuljaram Chaturchand College of Arts, Science and Commerce,  
Baramati  
Autonomous**

**QUESTION BANK**

**FOR**

***F.Y.B.Com.(SEM-II)***

**STATISTICS**

**COMBS1204A**

**Business Statistics II**

## UNIT-1: Permutation and Combination

### A) Questions for 1 mark:-

#### I] Choose the correct alternative:-

1.  ${}^4P_3$  is evaluated as  
a) 43                      b) 34                      c) 24                      d) None of these
2.  ${}^4P_4$  is equal to  
a) 1                      b) 24                      c) 0                      d) none of these
3. In  ${}^n P_r$ , n is always  
a) an integer                      b) a fraction                      c) a positive integer                      d) none of these
4. In  ${}^n P_r$ , the restriction is  
a)  $n > r$                       b)  $n \geq r$                       c)  $n \leq r$                       d) none of these
5. In  ${}^n P_r = n(n-1)(n-2) \dots (n-r+1)$ , the number of factors is  
a) n                      b) r-1                      c)                      n-r                      d) r
6.  ${}^n P_r$  can also written as  
a)  $\frac{n!}{(n-r)!}$                       b)  $\frac{n!}{r!(n-r)!}$                       c)  $n^r$                       d) none of these
7.  ${}^n C_r$  can also written as  
a)  $\frac{n!}{(n-r)!}$                       b)  $\frac{n!}{r!(n-r)!}$                       c)  $n^r$                       d) none of these
9. If  ${}^n P_4 = 12 \times {}^n P_2$ , the n is equal to  
a) -1                      b) 6                      c) 5                      d) none of these
10. If  ${}^n P_3 : {}^n P_2 = 3 : 1$ , then n is equal to  
a) 7                      b) 4                      c) 5                      d) none of these
12. if  ${}^5 P_r = 60$ , then the value of r is  
a) 3                      b) 2                      c) 4                      d) none of these
13. The number of ways the letters of the word 'COMPUTER' can be rearranged is  
a) 40,320                      b) 40,319                      c) 40,318                      d) none of these

14. The number of arrangements of the letters in the word 'FAILURE', so that vowels are always coming together is  
 a) 576                      b) 575                      c) 570                      d) none of these
15. 10 examination papers are arranged in such a way that the best and worst papers never come together. The number of arrangements is  
 a)  $9 \times 8$                       b)  $10$                       c)  $8 \times 9$                       d) none of these
16. n articles are arranged in such a way that 2 particular articles never come together. The number of such arrangements is
17. There are 6 routes for journey from station A to station B. In how many ways you may go from A to B and return if for returning you make a choice of any of the routes?  
 (A) 6                      (B) 12                      (C) 36                      (D) 30
18. As per question No.(1) if you decided to take the same route you may do it in \_\_\_\_\_ number of ways.  
 (A) 6                      (B) 12                      (C) 36                      (D) 30
19. As per question No.(1) if you decided not to take the same route you may do it in \_\_\_\_\_ number of ways.  
 (A) 6                      (B) 12                      (C) 36                      (D) 30
20. How many telephone connections may be allotted with 8 digits form the numbers 0,1,2.....9?  
 a)  $10^8$                       b)  $10!$                       c)  ${}^{10}C_8$                       d)  ${}^{10}P_8$
21. In how many different ways 3 rings of a lock can not combine when each ring has digits 0,1,2.....9 leading to unsuccessful events?  
 (A) 999                      (B)  $10^3$                       (C)  $10!$                       (D) 997
22. A dealer provides you Maruti Car & Van in 2 body patterns and 5 different colours. How many choices are open to you?  
 (A) 2                      (B) 7                      (C) 20                      (D) 10
23. 3 persons go into a railway carriage having 8 seats. In how many ways they may occupy the seats?  
 !                      a)  ${}^8C_3$                       b)  ${}^8P_3$                       c)  ${}^8P_5$                       d) None

24. Find how many five-letter words can be formed out of the word “LOGARITHMS” (the words may not convey any meaning).
- a)  $^{10}C_5$                       b)  $^{10}P_4$                       c)  $^8P_5$                       d) None
25. How many 4 digits numbers greater than 7000 can be formed out of the digits 3,5,7,8,9?
- (A) 24                      (B) 48                      (C) 72                      (D) 50
26. In how many ways 5 Sanskrit 3 English and 3 Hindi books be arranged keeping the books of the same language together?
- (A)  $5! \cdot 3! \cdot 3! \cdot 3!$  (B)  $5! \cdot 3! \cdot 3!$  (C)  $^5P_3$                       (D) None
27. 12 school teams are participating in a quiz contest, then the number of ways the first, second and third positions may be won is
- a) 1,230                      b) 1,320                      c) 3,210                      d) none of these
28. The sum of all 4 digit number containing the digits 2, 4, 6, 8, without repetitions is
- a) 1,33,330                      b) 1,22,220                      c) 2,13,330                      d) 1,33,320
29. The number of 4 digit numbers greater than 5,000 can be formed out of the digits 3,4,5,6 and 7(no. digit is repeated). The number of such is
- a) 72                      b) 27                      c) 70                      d) none of these
30. 4 digit numbers to be formed out of the figures 0, 1, 2, 3, 4 (no digit is repeated) then number of such numbers is
- (a) 120                      (b) 20                      (c) 96.                      (d) none of these
31. The number of ways the letters of the word ‘TRIANGLE’ to be arranged so that the word ‘angle’ will be always present is
- (a) 20                      (b) 60                      (c) 24                      (d) 32
32. If the letters word ‘DAUGHTER’ are to be arranged so that vowels occupy the odd places, then number of different words are
- (a) 2,880                      (b) 676                      (c) 625                      (d) 576

**B) Questions for 2 marks:-**

**Define:**

1. Permutation
2. Permutation with repetition
3. Permutation without repetition
2. Combination

3. Addition principal of counting with one illustration
4. Multiplication of counting with one illustration

**C) Questions for 4 marks:-**

1. If 12 horses are entered in a race, how many ways can the first 3 places be awarded?
2. A 4-digit PIN for the ATM must be created. How many different PIN's can be formed if digits can be repeated?
3. How many different arrangements can be made from the letters in the word CHAIR if none of the letters repeat.
4. Given the word WILDCAT, how many permutations are there if 'T' is the second letter?
5. Given the word WILDCAT, how many permutations are there if the letters 'CAT' are always together?
6. How many different arrangements can be made from the letters in the word ILLINOIS?
7. 3 boys and 4 girls are to form a line. How many arrangements can there be if the boys stand together and the girls stand together?
8. How many 4 person committees could be created from a selection of 14 people?
9. How many ways are there to choose 2 sides from a menu with 12 options?
10. How many games will be played in a 10-team league if each team plays every other team exactly once?
11. How many different combinations of 6 numbers are there from a lottery ticket of 26 numbers?
12. Baskin Robbins has 31 flavors of ice cream, 7 different sauces, and 10 different toppings available. How many different sundaes can be made by choosing 3 ice cream flavors, 3 sauces, and 3 toppings?
13. . How many four digit numbers can you make by arranging the numbers 7, 6, 3, and 5?
14. Evaluate  
1.  ${}^4P_3$     2.  ${}^7P_5$                       3.  ${}^{10}P_7$                       4.  ${}^{10}P_3$
15. Evaluate  
1.  ${}^8C_3$     2.  ${}^5C_5$                       3.  ${}^9C_7$                       4.  ${}^8C_3$

16. How many 5 digit numbers can be named using the digits 5, 6, 7, 8, and 9 without repetition?, with repetition?
17. How many 4 digit numbers can be named using the digits 2, 3, 4, and 5 without repetition?, with repetition?
18. In how many ways can 5 students be arranged in a straight line?
19. In how many ways can 7 athletes be arranged in a straight line?
20. In how many distinguishable ways can the letters of the word DIGIT be arranged?
21. In how many ways distinguishable ways can the letters of the word RABBIT be arranged?
22. How many 7 digit phone numbers can be formed with the digits 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9, assuming that no digit is used more than once and the first digit is not 0?
23. In a random arrangement of the letters of the word "STATISTICS", find the probability of, all vowels occupy even places.
24. How many 3 letters words can be arranged using the letters of the word "SEMINAR".
25. How many 3 digits numbers can be formed from the six digits 1,3,5,6,7,9 .  
If each digit is to be used only once. Among these how many will be divisible by 5.
26. How many 3-digit numbers divisible by 5 can be formed out of 3,4,5,6,7 if
  - i) no digit is to be repeated?
  - ii) a digit may be repeated any number of times?

## UNIT-2: SAMPLE SPACE , EVENTS AND PROBABILITY

### A) Questions for 1 mark:-

#### I] Choose the correct alternative:-

- Which of the following is not a random experiment?
  - Number of runs scored by Sachin Tendulkar are noted in an over bowled by Shoaib Akhtar.
  - You watch T.V. for five hours on the day of the examination , and whether you pass or fail is noted.
  - You tie a friendship band to your friend who is your friend indeed!
  - When you walk on the ground, the earth pushes you.
- Relative Complement of A w.r.t. B is given by
  - $A \cap B'$
  - $A' \cup B$
  - $A' \cap B$
  - $(A \cap B)'$
- In an experiment of planting four seeds, the number of seeds germinated after a week are recorded. The Sample space of this experiment is
  - $(0, 4)$
  - $\{1, 2, 3, 4\}$
  - $[0 \ 4]$
  - $\{0, 1, 2, 3, 4\}$
- If  $A \cap B = \phi$  then the two events A and B are
  - Mutually exclusive
  - Exhaustive events
  - Independent events
  - Dependent events
- If two events A & B are mutually exclusive , then  $P(A \cup B) = \text{-----}$ 
  - $P(A)P(B)$
  - $P(A) + P(B)$
  - $P(A \cap B)$
  - $P(A) + P(B) - P(A \cap B)$
- All possible outcomes of a random experiment forms the
  - events
  - sample space
  - both
  - none

7. If one of outcomes cannot be expected to occur in preference to the other in an experiment the events are

- a) simple events (b) compound events  
(c) favourable events (d) equally likely events

8. If two events cannot occur simultaneously in the same trial then they are

- a) mutually exclusive events (b) simple events  
b) favourable events (d) none

9. A card is drawn from a well-shuffled pack of playing cards. The probability that it is a spade is

- (a)  $\frac{1}{13}$  (b)  $\frac{1}{4}$  (c)  $\frac{3}{13}$  (d) None of these

10. A card is drawn from a well-shuffled pack of playing cards. The probability that it is a king is

- a)  $\frac{1}{13}$  (b)  $\frac{1}{4}$  (c)  $\frac{4}{13}$  (d) None of these

11. card is drawn from a well-shuffled pack of playing cards. The probability that it is the ace of clubs is

- a)  $\frac{1}{13}$  (b)  $\frac{1}{4}$  (c)  $\frac{1}{52}$  (d) None of these

12. In a single throw with two dice the probability of getting a sum of five on the two dice is

- a)  $\frac{1}{9}$  (b)  $\frac{5}{36}$  (c)  $\frac{5}{9}$  (d) None of these

13. In a single throw with two dice, the probability of getting a sum of six on the two dice is

- a)  $\frac{1}{9}$  (b)  $\frac{5}{36}$  (c)  $\frac{5}{9}$  (d) None of these

14. The probability that exactly one head appears in a single throw of two fair coins is

- a)  $\frac{3}{4}$  (b)  $\frac{1}{2}$  (c)  $\frac{1}{4}$  (d) None of these

15. The probability that at least one head appears in a single throw of three fair coins is

- a)  $\frac{1}{8}$  (b)  $\frac{7}{8}$  (c)  $\frac{1}{3}$  (d) None of these

16. Every subset of a sample space is known as an -----  
 a) Sample space b) Super set c) Event d) An experiment
17. If A is an event then the conditional probability of A given that event  $A^c$  has occurred is  
 a) 0.5 b) 1 c) 0 d) 0.05
18. When a card is drawn from the standard pack of playing cards, which of the following is a pair of disjoint events?  
 a) An ace & an odd denomination  
 b) A heart and a queen  
 c) A club and a red card  
 d) An even denomination & spade
19. The probability of an impossible event is  
 a) 1 b)  $1 - P(\phi)$  c)  $P(\Omega)$  d) 0
20. If  $\Omega = \{ H, TH, TTH, TTTH, \dots \}$  then sample space is:  
 a) Finite sample space b) Uncountable infinite sample space  
 c) Countably finite sample space d) Countably infinite sample space
21. In the simultaneous tossing of two fair coins, the probability of having one head is  
 a) 0.5 b) 0.25 c) 0.75 d) 1
22. Let A be event defined on sample space,  $\Omega$ . Which of the following statement is true?  
 a)  $P(A) = 1$  b)  $P(A) = 0$  c)  $0 \leq P(A) \leq 1$  d)  $0 \leq P(A) < 1$
23. If  $A \cap B = \phi$  then the two events A and B are  
 a) Mutually exclusive b) Exhaustive events  
 c) Independent events d) Dependent events
24. If A and B are two events defined on  $\Omega$  such that  $A \subset B$  then  
 a)  $P(A) = P(B)$  b)  $P(A) < P(B)$  c)  $P(A) \leq P(B)$  d)  $P(A) > P(B)$
25. If  $P(A) = P(B)$  then the two events are  
 a) Equally likely  
 b) Dependent  
 c) Independent  
 d) Both a and b

26. When a card is drawn from the standard pack of playing cards, which of the following is a pair of disjoint events?

- a) An ace and an odd denomination
- b) A heart and a queen
- c) A club and a red card
- d) An even denomination and spade

27.  ${}^n P_r = \dots\dots$

- a)  $\frac{n!}{r!(n-r)!}$
- b)  $\frac{n!}{(n-r)!}$
- c)  $\frac{n!}{r!}$
- d)  $\frac{n!}{n!(n-r)!}$

28. If  $A \subset B$ , then the relation between  $P(A)$  and  $P(B)$  is :

- a)  $P(A) \neq P(B)$
- b)  $P(A) = P(B)$
- c)  $P(A) > P(B)$
- d)  $P(A) \leq P(B)$

29. If  $P(A) = 0.8$ ,  $P(B) = 0.7$ ,  $P(A \cup B) = 0.96$  then  $P(A \cap B)$  is

- a) 0.56
- b) 0.06
- c) 0.6
- d) 0

30. The probability of drawing one red ball randomly from a bag containing 5 red, 7 black and 10 yellow balls is

- a) 0
- b) 1/5
- c) 5/22
- d) 1/22

31. If A and B are independent events with  $P(A) = 0.4$  and  $P(B) = 0.25$  then  $P(A \cup B)$  is

- a) 0.55
- b) 0.65
- c) 0.1
- d) 0.01

32. If A and B are independent events with  $P(A) = 0.4$ ,  $P(B) = 0.5$  then  $P(A \cap B)$

- a) 0.03
- b) 0.9
- c) 0.1
- d) 0.3

33. In conditional probability distribution of Y given  $X=x$ ,

- a) X is variable
- b) X is constant
- c) Y is variable
- d) Y is constant.

34. Which of the following statement is true?

- a) A and A' form partition of  $\Omega$
- b) A and  $\Omega$  form partition of  $\Omega$
- c) A and A' do not form partition of  $\Omega$
- d) Only two events cannot form partition of  $\Omega$

35. If A is an event defined on  $\Omega$  then  $P(A | A')$  is ,  
 a) 1                                      b)  $P(A)$                                       c) 0                                      d)  $P(A')$
36. Which of the following statement is true ?  
 a)  $P(A/B) \geq P(A)$                                       b)  $P(A/B) \leq P(A)$   
 c)  $P(A/B) = P(A)$                                       d) nothing can be said about magnitudes of  $P(A)$  and  $P(A/B)$
37. If A is an event then conditional probability of A given that A has already occurred is  
 a) 1                                      b) 0                                      c) 0.5                                      d) 0.75

**II] State whether each of the following statement is True or False.**

1. A and B are mutually exclusive events if and only if  $A \cap B = \phi$ .
2. A and B are exhaustive events if and only if  $A \cup B = \Omega$ .
3. The event  $\Omega$  and  $\phi$  are mutually exclusive.
4. A ball is thrown in the air it will fall down is the example of deterministic experiment.
5. Conditional definition of probability is  $P(A|B) = \frac{P(A \cap B)}{P(B)}$
6. An event doesn't containing all the points of sample space is called sure event.
7.  $P(\Omega)=1$  is one of the axioms of probability.
8. Probability of drawing a card of king from 52 playing cards is  $1/4$ .
9. In tossing a fare coin twice, Probability of getting two heads is  $1/2$ .
10. Independence implies mutual exclusiveness.
11. Number of combinations of n elements is  $\frac{n!}{(n-r)!}$ .
12. Number of permutations of n distinct elements without repetition is  $\frac{n!}{(n-r)!r!}$
13.  ${}^n C_n = 1$
14.  $P(\phi) = 0$  is one of the axioms of probability.
15. If  $A \subset B$  then  $P(A | B) = 1$
16. If A and B are independent then  $A'$  and  $B'$  are also independent events.
17. Baye's' theorem is used to calculate posterior probabilities of events.

**A) Questions for 2 marks:-**

1. Define random experiment.
2. Classify the following experiments into deterministic and Non – deterministic experiment.
  - i) A coin is tossed to decide the team which would bat first in a cricket match.
  - ii) Marketing manager conducts market survey to measure the effect of advertisement on sales.
  - iii) Water is heated up to  $100^{\circ}\text{C}$ .
3. Define sample space and give one example of it.
4. Write down sample space for the following experiment. Also mention its type.
  - i) T.V viewers were asked to give ratings to 3 programmers.
  - ii) Answers to an objective question which has four multiple choices A, B, C, D. Student ticks a single answer.
  - iii) Number of tossing of a die till 6 appear for the first time.
  - iv) A two digit number is formed from the digits 4, 5, 6 using each digit only once.
5. Define an event and give one example of it.
6. Give two examples of countably infinite sample space.
7. Give one example of sure event and impossible event.
8. Define mutually exclusive events.
9. Define mutually exhaustive events.
10. What do you understand by equally likely events?
11. Give the classical definition of probability.
12. Define sample space.
13. State axioms of probability.
14. Prove that the probability of an impossible event is zero i.e.  $P(\phi) = 0$ .
15. Two cards are drawn from a well shuffled pack of playing cards. Find the probability that both cards are of diamond.
16. Four cards are drawn from a well shuffled pack of playing cards. Find the probability that each card is of different suit.

17. Suppose a pair of fair dice is thrown. Find the probability that both the faces are same.
18. Suppose a pair of fair coin is tossed. Find the probability that at least one coin shows head.
19. For events A and B if  $P(A) = P(A/B) = 0.15$  and  $P(B/A) = 0.20$ , then check whether A and B are independent.
20. State Bayes' theorem.
21. Define independence of two events A and B on  $\Omega$ .
22. A and B are two events defined on a sample space  $\Omega$  state the nature of relationship between A and B if (a)  $P(A/B) = 0$  and (b)  $P(A/B) = P(A)$ .
23. Define elementary event.
24. A coin is tossed till head occurs for the first time. Write down the sample space of this experiment.

**C) Questions for 4 Marks:-**

1. Define sample space. Explain types of sample spaces giving examples of each.
2. What do you mean by an experiment? What are different types of experiments? Explain.
3. Define with example each of the following
  - i) Sample space
  - ii) Discrete sample space
  - iii) Event
  - iv) Elementary event
4. Explain the concept of mutually exclusive and exhaustive events.
5. Write down the sample spaces for following experiment. Also state the type of the sample spaces.
  - i) A sample is taken to predict the result of the particular assembly poll.
  - ii) A three digit number is formed from the 5 distinct numbers, using each digit only once.
6. Distinguish clearly between deterministic and non- deterministic experiments. Give suitable examples.
7. What are the limitations of classical probability?
8. Define
  - i) sample space
  - ii) probability of an event

9. Define independence of two events A and B on  $\Omega$ . Give an illustration.
10. Does independence of two events imply that the events are mutually exclusive? Justify.
11. Does mutually exclusiveness of two events imply independence? Justify.
12. A and B are two events defined on  $\Omega$  such that  $A \subseteq B$ , then show that  $P(A) \leq P(B)$
13. State and prove addition theorem of probability for two events.
14. Find the total number of permutations of the letters of the word "INDIAN".
15. Consider the experiment of rolling two fair dice. Let A= odd number on the first die, B= odd number on the second die, and C= sum of two points is odd. Check whether A, B, and C are pair wise independent and mutually independent.
16. Consider a pack of playing cards without face cards. 4 cards from this pack are drawn at random. Find the probability that they belong to
  - i) Different suits
  - ii) 2 are face cards
17. In a certain school, examination results showed that 20% students failed in Mathematics, 5% failed in English while 10% failed in both Mathematics and English. Are the two events failing in Mathematics and failing in English independent. ?
18. Two urns identical in appearance contain respectively 3 white and 2 black balls, and 2 white and 5 black-balls. One urn is selected at random and a ball is drawn from it. What is the probability that it is black?
19. A, B, C form a partition of  $\Omega$ . If  $3P(A) = 2P(B) = P(C)$ , find  $P(A \cup B)$ .
20. Prove that:-
  - i)  $P(A') = 1 - P(A)$  where A' is the complement of A.
  - ii) For any event A of  $\Omega$ ,  $0 \leq P(A) \leq 1$ .
21. In a random arrangement of the letters of the word "DREAM" find the probability that:
  - i) All the vowels come together
  - ii) The arrangement starts with D and ends with M
22. Given that  $P(A_1) = P(A_2) = P(A_3) = 1/3$  and  $P(B/A_1) = 2/7$ ,  $P(B/A_2) = 4/9$ ,  $P(B/A_3) = 1/5$ , find  $P(A_1/B)$ .

**D) Questions for 6 Marks:-**

1. Explain with one illustration
  - i) Complement of an event
  - ii) Mutually exclusive events
  - iii) Exhaustive events
2. Suppose three fair coins are tossed simultaneously. Let A be the event that exactly 2 coins show heads and B be the events that at least 2 coins show heads. List the elements of A, B, A' and B'. Verify whether A and B are i) mutually exclusive ii) exhaustive events.
3. Two fair dice are rolled. Let A be the event that sum of the points on the uppermost faces is even and B be the event that the product of the two numbers is not greater than. List the elements contained in the events- i)  $A \cup B$  ii)  $A \cap B$  iii)  $(A \cap B') \cup A'$
4. State addition theorem of probability for three events.
5. Let A, B, C be any three events defined on  $\Omega$ , such that
  - i.  $P(A) = 3/8, P(B) = P(C) = 1/4, P(B \cap C) = 0,$
  - ii.  $P(A \cap B) = 1/8 = P(A \cap C)$Evaluate i)  $P(A \cup B \cup C)$  ii)  $P(A \cup C)$  iii)  $P(A' \cap B' \cap C')$
6. If A and B are two independent events defined on  $\Omega$ ; then prove that.
  - b. A and B' are independent,
  - c. A' and B are independent
  - d. A' and B' are independent
7. Of the three events A, B and C. A and B are mutually exclusive, A and C are independent. B and C are independent. If  $P(A) = 1/4, P(B) = 1/3, P(C) = 1/6$ . Find
  - i. (i)  $P(A \cup B)$  (ii)  $P(A \cap C)$  (iii)  $P(A \cup B \cup C)$ .
8. A husband and wife appear for two vacancies in the same post. The probability of husband's selection is  $1/7$  and that of wife's selection is  $1/5$ . What is the probability that-
  - a. Both of them will be selected?
  - b. Only one of them will be selected?
  - c. None of them will be selected?

9. The letters of the word 'REGULAR' are arranged at random. Find the probability that :
- i. vowels may occupy the even places
  - ii. all vowels are together
  - iii. vowels are never together
10. The letters of the word 'COMMERCE' are arranged at random. Find the probability that :
- i. vowels may occupy the even places
  - ii. all vowels are together
  - iii. vowels are never together
11. The letters of the word 'COSTING' are arranged at random. Find the probability that the word so formed :
- i. starts with T
  - ii. ends with N
  - iii. starts with T and ends with N

## UNIT 3: LINEAR PROGRAMMING PROBLEM

### 1. Questions for 2 marks:-

#### 1. Define

1. Linear programming problem
  2. Feasible solution
  3. Basic solution
  4. Basic feasible solution
  5. optimal solution
2. Shade the region defined by the inequality:  
 $3x + 6y \geq 18$
3. Shade the region defined by an inequality  $3x + 4y \leq 12$ .

### 2. Questions for 4 marks:-

1. A firm manufactures two types of products 'EXE' and 'PXP'. Each unit of product 'EXE' requires 4 kg. of raw material and 8 labour hours for processing; while each unit of product 'PXP' requires 6kg. of raw material 6 labour hours for processing. The firm has 60kg. of raw material and 96 labour hours. The estimated profit on each unit of product 'EXE' and product 'PXP' will be 7.40 and 7.35 respectively. Formulate L.P.P. to maximize profit.
2. Define 'Feasible Solution' and 'Optimal Solution' with respect to L.P.P.
3. A manufacturer makes two types of Toys A and B which require cutter and finisher treatment. Toy A requires 2 Hours of cutter and 1 Hour of finisher time. Toy B requires 1 Hour of cutter and 2 Hours of finisher time. The cutter has 104 Hours and finisher has 70 Hours of available time each month. Profit of one Toy A is 7 6 and on one Toy B is 7 ll. Formulate the problem as L.P.P. to maximize the profit.
4. Solve the following L.P.P. using graphical method Minimize  $Z = 4x + 3y$   
Subject to constraints  
 $x + 2y \leq 6, x \geq 2, y \leq 3, \text{ and } x, y \geq 0$

5. A small firm builds two types of garden shed. Type A requires 2 hours of machine time and 5 hours of craftsman time. Type B requires 3 hours of machine time and 5 hours of craftsman time. Each day there are 60 hours of machine time and 80 hours craftsman time available. The profit on each type of A shed is Rs.160 and each type of B shed is Rs. 184. Formulate L.P.P. assuming that all garden sheds are sold.
6. Solve the following L.P.P. by Graphical method.  
To maximize profit =  $f = 25x + 30y$

Subject To,

$$4x + 3y \geq 60$$

$$2x + 3y \geq 36$$

$$x \geq 0, y \geq 0$$

7. Define LPP and explain different terms in it.
8. Write a Note on SENSEX and NIFTY
9. A manufacturer makes two types of lamps A & B requiring treatment by a cutter & finisher. Lamp A requires 2 hours of cutters time & 1 hour of finisher's time. Lamp B requires 1 hour of cutter & 2 hours of finishers time. The cutter has 104 hours & finisher has 78 hours of available time for each month Profit on 1 Lamp of A is Rs. 6 & on Lamp B is Rs. 11. Formulate the given problem as L.P.P. to maximize the profit.
10. Explain the steps for formulation of L.P.P.
11. Solve the following L.P.P. by graphical method. Maximize  $Z = 2x + 5y$

$$\text{Subject to: } 2x + y > 60$$

$$x + y > 45 \text{ and}$$

$$x, y > 0$$

13. A toy manufacturer produces two types of toys, dolls and guns each of which must be processed through two machines 'A' and 'B'. The maximum availability of machines 'A' and 'B' per day are 12 and 18 hours respectively. Manufacturing a doll requires 4 hours in machine 'A' and 2 hours in machine 'B', where as a gun requires 3 hours of machine 'A' and 6 hours of machine 'B'. If the profit per doll is Rs. 20 and gun is Rs. 50, formulate the LPP to maximize profit.
14. A manufacturer produces bicycles and tricycles each of which must be processed through two machines A and B. Machine A has maximum of 120 Hours available and machine B has of 180 hours available. Manufacturing of tricycle requires 6 Hours on Machine A and 3 Hours on Machine B, while a bicycle requires 4 Hours on Machine A and 10 Hours on Machine B. If profits are Rs. 45 for a tricycle and Rs. 65 for a bicycle. Formulate LPP to have a maximum profit.

15. Solve the following Linear Programming Problem (L.P.P.) by graphical method.

$$\text{Maximise } Z = 10x + 15y$$

Subject to

$$12x + 5y \leq 60$$

$$5x + 10y \leq 20$$

$$x, y \geq 0.$$

16. Solve the following L.P.P. by graphical method: Maximize  $Z = 5x + 10y$

Subject to

$$2x + 3y \leq 6$$

$$6x + 10y \leq 30 \text{ and } x, y \leq 0$$

## Unit 4: Correlation (for bivariate raw data)

### A) Multiple Choice Questions

1. The extent of linear relation between the two variables is called as \_\_\_\_\_  
a) Correlation            b) covariance            c) skewness            d) kurtosis
2. If the correlation between X and Y is 0.5, then the correlation between the variables X and (-Y) is \_\_\_\_\_  
a) -0.5            b) 0.5            c) 0            d) 1
3. Spearman's rank correlation coefficient lies between \_\_\_\_\_  
a) 0 to 1            b) -1 to 1            c) 0 to  $\infty$             d)  $-\infty$  to  $\infty$
4.  $\text{Cov}(X, X) =$  \_\_\_\_\_  
a)  $v(x)$             b) 0            c) 1            d)  $-\infty$
5.  $\text{Cov}(X, \text{Constant}) =$  \_\_\_\_\_  
a)  $v(x)$             b) 0            c) 1            d)  $-\infty$
6. Karl Pearson's coefficient of correlation lies between  
a) 0 to 1            b) -1 to 1            c) 0 to  $\infty$             d)  $-\infty$  to  $\infty$
7. If  $\text{Corr}(X, Y) = 0$  then we conclude that  
a)  $\sigma_x = \sigma_y$             b)  $\bar{X} = \bar{Y}$             c) There is no relationship between X and Y            d) None of the above.
8. Correlation measures the extent of  
a) Parabolic relation between two variables.  
b) Linear relation between two variables.  
c) Logarithmic relation between two variables.  
d) Exponential relation between two variables

### *Questions for 2 marks.*

1. Define the term correlation.
2. What is bivariate data?
3. State the merits of scatter diagram.
4. Discuss demerits of scatter diagram.

5. Which are measures of correlation?
6. Define covariance.
7. Given  $X = 53$ ,  $Y = 28$ ,  $b_{yx} = -1.5$  &  $b_{xy} = -0.2$ . Find  $r$ .
8. Explain the term :Karl Pearson's coefficient of correlation
9. State any two properties of Karl Pearson's coefficient of correlation.
10. When two variables said to be correlated? Give two examples.
11. What do you mean by positive correlation? Give two examples.
12. What do you mean by negative correlation? Give two examples.
13. If  $r = 0$ . Comment on it.

***Questions for 4 marks.***

1. Explain the concept of correlation for a bivariate data and its types.
2. Define positive correlation and negative correlation with an illustration each.
3. State the uses of Regression Analysis.
4. State the meaning of 'Scatter Diagram'.
5. State the properties of regression coefficients.
6. State the properties of regression coefficients.
7. Consider the following bivariate data :

<b>X</b>	<b>6</b>	<b>2</b>	<b>10</b>	<b>4</b>	<b>8</b>
<b>Y</b>	<b>9</b>	<b>11</b>	<b>5</b>	<b>8</b>	<b>7</b>

Compute Rank correlation coefficient between X and Y.

8. Find correlation coefficient ( $r$ ) between X and Y given the following data  
 $n = 7$ ,  $\sum X = 119$ ,  $\sum X^2 = 2833$ ,  $\sum Y = 87$ ,  $\sum Y^2 = 2385$ ,  $\sum XY = 521$ .
9. Find number of pairs of observations from the following data  
 $r = -0.4$ ,  $\sum X = 100$ ,  $\sum X^2 = 2250$ ,  $\sum Y = 100$ ,  $\sum Y^2 = 2250$ ,  $\sum XY = 1900$

10. Following are the ranks given by two teachers to their students. Calculate Spearman's Rank Correlation Coefficient.

Roll No.	Ranks by teacherA	RanksbyteacherB
<b>1</b>	6	5
2	2	3
3	<b>1</b>	2
4	3	<b>1</b>
5	4	6
6	5	4

11. Given the following data:

	Rainfall (incms)	Production of a commodity (in quintals)
Mean	45	65
S.D.	<b>10</b>	8

The correlation coefficient between rainfall and production is 0.80. Estimate the production of a commodity when rainfall is 60 cms.

12. Following are the ranks given by a Business Analyst to the sixteen industries in the state according to their profitability and net worth. Calculate Rank Correlation Co-efficient.

Industry	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
Rank (Profitability)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Rank (Networth)	13	16	14	15	10	12	4	11	5	9	8	3	1	6	7	2

13. You are given the following data:

Particulars	Fertilizer used (Metric tons)	Productivity (Quintals)
Arithmetic Mean	36	85
Standard Deviation	<b>11</b>	8

The Correlation Co-efficient between the fertilizer used and productivity is 0.66.  
Estimate the value of fertilizer used when the productivity is 75 quintals.

14. The ranks given by two judges to ten competitors in a Fashion Show at Pune in the following order.

Judge - I	1	6	5	10	3	2	4	9	7	8
Judge - II	3	5	8	4	7	10	2	1	6	9

Calculate Spearman's rank correlation co-efficient.

15. Given the following data.

	Advertisement Cost(Lakh 7)	Sales (Lakh 7)
Mean	<b>12</b>	40
S.D.	5	8

The correlation coefficient between Advertisement cost and sales is 0.70. Estimate the sales when Advertisement cost is 7.5 Lakh.

16. You are given below the information about advertising expenses and sales:

	Advertising Exp. (Rs. Lac.)	Sale (Rs. Lac.)
Arithmetic Mean	10	90
Standard deviation	3	12
Correlation Co-efficient between the two is 0.8.		

Calculate the regression equations.

17. Obtain the Rank Correlation Coefficient for the ranks given by two judges in a contest:

**Rank by Judge 'A'** 3 6 2 4 5 1

**Rank by Judge 'B'** 4 5 2 3 6 1



4. Calculate co-efficient of correlation from the following data.

Fertilizer used (tones)	15	18	20	24	30	35	40	50
Productivity (Tones)	85	94	95	108	122	130	150	160

5. Find Karl Pearson's coefficient of correlation between Sales and Expenses.

Sales(Lakhs 7)	56	60	64	65	65	60	60	50
Expenses (Lakhs 7)	14	1	14	1	16	12	1	10

6. Calculate Karl - Pearson's Coefficient of Correlation from the following data :

**Demand in Tonnes** 9 11 13 15 17 19 21 23

**Supply in Tonnes** 6 8 10 12 14 16 18 20

19. Following are the values of import and export of finished goods in suitable units.

**Export** 10 11 14 14 20 22 16 12 18 13

**Import** 12 14 15 16 21 16 21 15 16 14

Calculate Karl Pearson's correlation coefficient between Export and Import values.

## Unit 5: Index Number

1. A series of numerical figures which show the relative position is called  
a) index number    b) relative number    c) absolute number    d) none
2. Index number for the base period is always taken as  
a) 200                      b) 50                      c) 1                      d) 100
3. \_\_\_\_\_play a very important part in the construction of index numbers.  
a) weights                      b) classes                      c) estimations                      d) none
4. \_\_\_\_\_is particularly suitable for the construction of index numbers.  
a) H.M.                      b) A.M.                      c) G.M.                      d) none
5. Index numbers show\_\_\_\_\_changes rather than absolute amounts of change.  
a) relative                      b) percentage                      c) both                      d) none
6. The\_\_\_\_\_makes index numbers time-reversible.  
a) A.M.                      b) G.M.                      c) H.M.                      d) none
8. \_\_\_\_\_Index number is equal to  
a) sum of price relatives                      b) average of the price relatives  
c) product of price relative                      d) none
9. The\_\_\_\_\_of group indices given the General Index  
a) H.M.                      b) G.M.                      c) A.M.                      d) none
10. Circular Test is one of the tests of  
a) index numbers    b) hypothesis    c) both    d) none
11. \_\_\_\_\_is an extension of time reversal test  
a) Factor Reversal test                      b) Circular test  
c) both                      d) none
12. Weighted G.M. of relative formula satisfy\_\_\_\_\_test  
a) Time Reversal Test                      b) Circular test  
c) Factor Reversal Test                      d) none
13. Factor Reversal test is satisfied by  
a) Fisher's Ideal Index                      b) Laspeyres Index  
c) Paasches Index                      d) none
14. Laspeyre's formula does not satisfy  
a) Factor Reversal Test                      b) Time Reversal Test  
c) Circular Test                      d) all the above



26. The circular test is satisfied by  
 (a) Fisher's index number. (b) Paasche's index number.  
 (c) Laspeyre's index number. (d) None of these.
27. Fisher's index number is based on  
 (a) The Arithmetic mean of Laspeyre's and Paasche's index numbers.  
 (b) The Median of Laspeyre's and Paasche's index numbers.  
 (c) the Mode of Laspeyre's and Paasche's index numbers.  
 (d) None of these.
28. Paasche index is based on  
 (a) Base year quantities. (b) Current year quantities.  
 (c) Average of current and base year. (d) None of these.
29. Fisher's ideal index number is  
 (a) The Median of Laspeyre's and Paasche's index numbers  
 (b) The Arithmetic Mean of Laspeyre's and Paasche's index numbers  
 (c) The Geometric Mean of Laspeyre's and Paasche's index numbers  
 (d) None of these.
30. Time reversal Test is satisfied by following index number formula is  
 (a) Laspeyre's Index number.  
 (b) Simple Arithmetic Mean of price relative formula  
 (c) Marshall-Edge worth formula.  
 (d) None of these.
31.  $P_{10}$  is the index for time  
 (a) 1 on 0 (b) 0 on 1 (c) 1 on 1 (d) 0 on 0
32. When the product of price index and the quantity index is equal to the corresponding value index then the test that holds is  
 (a) Unit Test (b) Time Reversal Test  
 (c) Factor Reversal Test (d) none holds
33. The formula should be independent of the unit in which or for which price and quantities are quoted in  
 (a) Unit Test (b) Time Reversal Test  
 (c) Factor Reversal Test (d) none
34. Laspeyre's method and Paasche's method do not satisfy  
 (a) Unit Test (b) Time Reversal Test  
 (c) Factor Reversal Test (d) b & c
35. The purpose determines the type of index number to use  
 (a) yes (b) no (c) may be (d) may not be

36. The index number is a special type of average  
 (a) false (b) true (c) both (d) none
37. The choice of suitable base period is at best temporary solution  
 (a) true (b) false (c) both (d) none
38. Fisher's Ideal Formula for calculating index numbers satisfies the \_\_\_\_\_ tests  
 (a) Unit Test (b) Factor Reversal Test  
 (c) both (d) none
39. Fisher's Ideal Formula does not satisfy \_\_\_\_\_ test  
 (a) Unit test (b) Circular Test (c) Time Reversal Test (d) none
40. \_\_\_\_\_ satisfies circular test  
 a) G.M. of price relatives or the weighted aggregate with fixed weights  
 b) A.M. of price relatives or the weighted aggregate with fixed weights  
 c) H.M. of price relatives or the weighted aggregate with fixed weights  
 d) none
41. Laspeyre's and Paasche's method \_\_\_\_\_ time reversal test  
 (a) satisfy (b) do not satisfy (c) are (d) are not
42. There is no such thing as unweighted index numbers  
 (a) false (b) true (c) both (d) none
43. Theoretically, G.M. is the best average in the construction of index numbers but in practice, mostly the A.M. is used  
 a) false (b) true (c) both (d) none
44. Laspeyre's or Paasche's or the Fisher's ideal index do not satisfy  
 (a) Time Reversal Test (b) Unit Test  
 (c) Circular Test (d) none
44. \_\_\_\_\_ is concerned with the measurement of price changes over a period of years, when it is desirable to shift the base  
 (a) Unit Test (b) Circular Test  
 (c) Time Reversal Test (d) none
45. The test of shifting the base is called  
 (a) Unit Test (b) Time Reversal Test  
 (c) Circular Test (d) none
46. We use price index numbers  
 (a) To measure and compare prices (b) to measure prices  
 (c) to compare prices (d) none
47. Simple aggregate of quantities is a type of  
 (a) Quantity control (b) Quantity indices  
 (c) both (d) none

**B) Questions for 4 marks:-**

1. Explain the concept of Index Number.
2. What is Index Numbers? Give the importance or utility of Index Numbers?
3. Explain the variouxs methods of constructing Index Numbers?
4. What are the methods of constructing Consumer Price Index or Cost of Living Index Numbers?
5. What problems are involved in the construction of index numbers?
6. Calculate Fisher's Price Index Number from the following data.

Commodity	Year - 2014		Year - 2016	
	Price	Qty.	Price	Qty.
M	20	74	30	82
N	50	125	40	140
O	70	40	60	33

7. Calculate price index number by using Fisher's Method.

Commodity	Base Year		Current Year	
	Price	Qty	Price	Qty
A	21	15	20	17
B	70	10	75	12
C	60	14	62	15
D	32	10	30	10
E	36	12	38	08

8. From the following data, calculate Fisher's price Index Number.

Commodity	Year 2010		Year 2014	
	Price	Quantity	Price	Quantity
Wheat	28	6	40	8
Rice	22	5	30	6
Jowar	17	4	28	5
Gram	25	2	34	3

9. With the help of following data calculate fisher's price Index Number.

Commodity	Year 2016		Year 2015	
	Price	Quantity	Price	Quantity
A	10	4	12	4
B	12	3	11	2
C	15	2	14	3
D	18	3	15	1

10. Given :  $\sum p_1q_0 = 1900$ ,  $\sum p_0q_0 = 1360$ ,  $\sum p_1q_1 = 1880$ ,  $\sum p_0q_1 = 1344$   
Find Laspeyre's, Paasche's and Fisher's Price Index Number.

12. Given :  $\sum p_1q_0 = 175$ ,  $\sum p_0q_0 = 91$ ,  $\sum p_1q_1 = 190$ ,  $\sum p_0q_1 = 100$   
Find Laspeyre's, Paasche's and Fisher's Price Index Number.

13. Define Index Number and state uses of it.

14. Calculate cost of living Index number:

Group	Index no.	Weight
Food	350	50
Fuel	200	10
Clothing	240	10
House rent	160	10
miscellaneous	250	20

15. Calculate :

- i) Laspeyr's Price Index Number
  - ii) Paasches Price Index Number
  - iii) Fisher's Price Index Number
- For the following data :

**Commodity**

	1995		2005	
	Price	Quantity	Price	Quantity
A	5	10	8	4
B	2	12	16	2
C	1	4	2	3

16. Calculate Price index number by:

- i) Simple aggregate method
- ii) Average of price relative

Group	Price	
	Base year	Current year
Food	30	47
Fuel	8	12
Clothing	14	18
House rent	22	15
miscellaneous	25	30

17. Calculate cost of living Index number by family Budget Method:

Commodity	2010		2015	
	Price	Quantity	Price	Quantity
A	5	12	8	4
B	4	10	16	2
C	2	4	2	3

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