

# Workbook



## Table of Contents

Statement Exercises.....	3
Statement Exercises.....	3

# Statement Exercises

## Statement Exercises

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### Questions

The following is a list of statements. Determine whether each statement is true or false and explain your answer (an answer without an explanation will not be accepted).

- 1) In a series in which all the observations are equal to each other, the variance is 0.
- 2) The standard score of the median is always 0.
- 3) The standard score of the 70<sup>th</sup> percentile in a right (positive) asymmetric probability will always be positive.
- 4) If we add an observation to a series of observations, this will necessarily increase the average in the series.
- 5) The median in a series is 80. Two observations, 79 and 100, are added to the series. The median will therefore increase.
- 6) If we add the value 4 to all the observations, then the standard deviation will not change.
- 7) If we divide all the observations in a probability distribution by 2, the variance will be halved.
- 8) If we increase the average salary of employees in a company, the variance will increase.
- 9) A real estate agent converts apartment prices from dollars to English Pounds. Assume that the pound-dollar exchange rate is £3.50/\$. If the real estate agent calculates the Pearson Measure of Association between the price of an apartment in pounds and the price of an apartment in dollars, he will get 1.
- 10) For a series of data, it was found that  $\bar{X} = \bar{Y} = 6$ , and  $S_x = S_y = 1$ , the Pearson Measure of Association is therefore 1.
- 11) If the variance of error (the unexplained variance) is 0, then the Pearson correlation coefficient is 1.

- 12) If the Pearson correlation coefficient between two variables is 1, the variance of error (the unexplained variance) is 0.
- 13) If the covariance of  $X$  and  $Y$  is 0, the Pearson correlation coefficient is 0.
- 14) In a series of 13 observations, the average is 40 and the variance is 100. Two new observations are added: 35 and 45. As a result, the average of the new series (of 15 observations) will decrease and the variance will decrease.
- 15) In a series of 61 observations, the average is 120 and the median is 110. Two more observations are added to the series: 100 and 140. As a result, the average and median of the series of 63 observations do not change.
- 16) In a series of 100 observations, the average is 75 and the standard deviation is 10. Two observations, each 75, are added to the series. As a result, the new average (of 102 observations) does not change, and the standard deviation decreases.
- 17) In a series of 10 observations, the average is 25 and the standard deviation is 2. The series is symmetric around the average. At a later stage, three observations are added to the series: 23, 25, and 27. As a result, the standard deviation of the 13 observations does not change.
- 18) In a positive asymmetric probability distribution, the standard score of the 30<sup>th</sup> - percentile is necessarily negative.
- 19) The standard deviation of a series always increases if a constant is added to all the data in the series.
- 20) Events  $A$  and  $B$  are in a sample space  $\Omega$ . It is known that  $P(A) = P(B) = 0.3$ . The probability of exactly one event occurring if the events are mutually exclusive is  $2 \cdot 0.7 \cdot 0.3 = 0.42$ .
- 21) In throwing a balanced die four times, the probability that at least two results are the same is  $\frac{936}{1296}$ .
- 22) Events  $A$  and  $B$  are independent events, and their probabilities are 0.5 and 0.3, respectively. The probability of at least one of them occurring is therefore 0.8.

- 23)**  $A$  and  $B$  are events in a sample space  $\Omega$ . It is known that  $P(A) = P(B) = 0.2$ .  
If  $A$  and  $B$  are independent events, the probability of exactly one of them occurring is 0.4.
- 24)** A dreidel has four faces. The probability of getting the same result each time if the dreidel is thrown three times is  $\frac{1}{16}$ .
- 25)** If  $E(X + Y) = E(X) + E(Y)$ , then  $X$  and  $Y$  are independent random variables.
- 26)** The number of different ways of putting three soldiers in order in a trio is 9.
- 27)** Six different toys must be divided among four girls and two boys. The number of ways to divide the toys is 48.
- 28)** An ATM code is composed of four digits taken from 0-9.  
The probability that all four numbers are different is 0.504.
- 29)** John and Mary go to the mall where there are a number of different activities.  
We are given that:
- The probability that they go bowling is 0.3.
  - The probability that they go to a café is 0.5.
  - The probability that they go to at least one of bowling and a café is 0.7.
- Therefore, the probability that they go only bowling is 0.3.
- 30)** There are three students in a class. The chances of a given student passing an exam are 0.8. All the students are independent of each other.  
Therefore, the chances of at least one student passing an exam are 0.992.
- 31)** A study is conducted on the number of employees in a food company, compared with a communications company. The median and average are both 8.  
Therefore, the mode is the same for both companies.
- 32)** According to a study, the temperature during the winter in a certain region in Ohio has a normal probability distribution with an expectation of 14 and a standard deviation of 4.  
The probability that the temperature in the region is higher than 17 degrees in winter is less than 0.5.

**33)** A Guest House's dining room has the following items on its menu:

- 3 entrees
- 4 main courses
- 2 desserts

The number of possible orders including one entrée, one main course, and one dessert is 9.

**34)** In a shooting competition, a competitor plays until he hits the target, but does not shoot more than four times. The probability of a competitor hitting the target is 0.6.

Therefore, the chances that a competitor will shoot at the target four times are 0.064.

**35)** In a certain factory, the average level of employee seniority is 12 years, and the standard deviation is 8 years. In three more years, if all the employees continue working at the factory, and no new employees are added, the average seniority will be 15 years and the standard deviation will be 8 years.

**36)** A series of four observations is given. The following are the deviations from the average for three of the four observations: 4, 3, -2.

The variance of the four observations is therefore 7.25.

**37)** The chances that a student will study on a given day are 0.7 if his mother asks him, and 0.4 if his mother does not ask him. The student's mom asks him to study on 60% of the days. Someone came to visit the student and found that he was studying, so the probability that his mother asked him to study on that day is 0.742.

**38)** 70% of the households live in their own houses. Of these, 50% are paying a mortgage on their house. 20 householders were randomly selected. The expectation of the number of households with the owners living in them and paying a mortgage is 7.

**39)** The number of initials that can be created in an alphabet having 22 letters for a first and last name is 44.

**40)** The number of three-digit numbers in which the digits are all different from each other is 648.

**41)** In a normal probability distribution, the higher the standard deviation, the greater the percentage of cases below the average.

**42)** The average mark of five students is 78. Four of the students received the following marks: 70, 86, 72, 74. The mark of the fifth student is 76.

- 43) There are 10 shares in the portfolio of a beginning investor. The chances of a share rising on a given day are 0.6. Assume that the shares are independent of each other. The standard deviation of the number of shares in the investment portfolio rising on a given day is 2.4.
- 44) There are two events. It is given that these two events are mutually exclusive. The chances of each of them occurring are 0.3, so the chances of at least one of them occurring are 0.6.
- 45)  $A$ ,  $B$ , and  $C$  are three events in the sample space  $\Omega$ . It is known that  $P(A) = P(B) = P(C) = 0.2$ . The probability of only event  $B$  occurring if the events are independent is 0.2.
- 46) In a certain population, the distribution of people according to their blood type is as follows:  
Four people are randomly selected from this population. The probability that exactly one of them has blood type A is 0.4.
- | Blood Type | Percentage of the Population |
|------------|------------------------------|
| A          | 40%                          |
| O          | 30%                          |
| B          | 20%                          |
| AB         | 10%                          |
- 47) The Spearman correlation coefficient between two variables was calculated to be 1. If the Pearson Measure of Association is calculated, it will therefore also be 1.
- 48) The Pearson correlation coefficient is calculated for two variables and found to be 1. If the Spearman Measure of Association is calculated, it will be found to be 1.
- 49) The variance of the sum of variables is always equal to the sum of their variances.
- 50) We define  $A$  as the result "4" - when throwing a die, and  $B$  as the result "heads", when tossing a coin. These two events are therefore mutually exclusive events.

### Answer Key

Question	Answer	Question	Answer
1	True	26	False
2	False	27	False
3	False	28	True
4	False	29	False
5	False	30	True
6	True	31	False
7	False	32	True
8	False	33	False
9	True	34	True
10	False	35	True
11	False	36	False
12	True	37	True
13	True	38	True
14	False	39	False
15	True	40	True
16	True	41	False
17	False	42	False
18	True	43	False
19	False	44	True
20	False	45	False
21	True	46	False
22	False	47	False
23	False	48	True
24	True	49	False
25	False	50	False