

Introduction to Statistics Worksheet

1. Identify population and sample in each of the following
 - a) A sociologist hypothesize that the average annual income of households in a particular large city is less than birr 800 per month. To test her hypothesis, she samples 200 households in the city and determines the income of each.
 - b) An insurance company would like to determine the proportion of all medical doctors who have been involved in one or more malpractice suits. The company selects 500 doctors at random from a professional directory and determines the number in the sample who has ever been involved in a malpractice suit.
 - c) A liquor board official investigates the number of drinks served in bars in a particular city on Friday during "happy hour". In the city there are 213 bars. Since there are too many bars to monitor all of them, he selects 20 and records the number of drinks served in them.
 - d) Addis Ababa University decided to increase the tuition fee from the next academic year. The student union wants to know what percentage of student support the fee and randomly select student from each department and found that 35% of the student support the fee.
2. Classify the following sentences as belonging to the area of descriptive statistics or inferential statistics.

Group Assignment (2 pts.)

- a. As a result of recent cutbacks by oil-producing nations, we can expect the price of gasoline to double in the next year.
- b. At least 5% of all killings reported last year in city X were due to tourists.
- c. Of all patients who received this particular type of drug at a clinic Y, 75% later developed significant side effect.
- d. Adane concludes that his chance of passing the first year this academic year is at least 80% based on the statistics that 75% of the freshmen passed last year.
3. Classify each of the following first as qualitative or quantitative and then Nominal, Ordinal, Interval and Ratio.
 - a. Times for swimmers to complete a 50-meter race
 - b. Months of the year Meskerm, Tikimit...
 - c. Socioeconomic status of a family when classified as low, middle and upper classes.
 - d. Blood type of individuals, A, B, AB and O.
 - e. Regions numbers of Ethiopia (1, 2, 3 etc.)
 - f. The number of students in a college;
4. Which of the diagrams is most appropriate for each of the following data set? Draw the diagrams.
 - a) Students enrolled to a certain department from year 1 to 3

Year	Male	Female
1	50	20
2	45	15
3	40	10

- b) Net profit (in million birr) earned by different companies in 1980

Company	Net profit
A	20
B	-15
C	30

5. The investigator was interested in studying the marital status, which is often grouped as Single(S), Married (M), Divorced (D), and Widowed (W) of people in a certain town. The following data were obtained.

**D S D D S W S D S S D D W M M S D D D W M S S W M D D M D W D S S W D D S D S M
W M D S D W D M S S D W W S S S W S D M W S S**

- a. Summarize the data by constructing the appropriate frequency distribution.
 - b. Present the data using the appropriate Graph/Diagrams.
6. The following is the distribution of weights of 125 mineral specimen collected on the field trip. **(Group Assignment) (2 pts.)**

Weight (Grams)	0-20	20-40	40-60	60-80	80-100	100-120	120-140	Total
No. of Specimen	19	36	35	17	11	3	2	123

Draw an appropriate Diagram / Graph for the distribution.

7. The frequency distribution below shows the number of freshmen, sophomore, juniors, and seniors who attended a workshop on job opportunities in the news media.

Group	Freshmen,	Sophomore	Juniors	Seniors	Total
Frequency	18	12	6	4	40

Construct a Pie and bar Chart for the data.

8. The following data represented the mark of 25 students in statistics course.

90, 60, 75, 55, 72, 61, 91, 82, 67, 55, 72, 45, 60, 90, 74, 75, 82, 60, 67, 69, 90, 91, 95, 77, 84

Construct an ungrouped frequency distribution for the above data

9. Construct a grouped frequency distribution which contains **class limit**, **class boundary**, class mark, frequency, **cf(less than type)**, **relative frequency** of weight of small poodles if the class mark are 6.5, 8.5, 10.5, 12.5, and 14.5kg with the corresponding frequencies are 8, 12, 22, 17, and 3. **(Group Assignment) (3 pts.)**

10. The heights of commonly growing herbs are shown below.

18 20 18 18 24 10 15 12 20 36
14 20 18 24 18 16 16 20 7 33

- a) Organize the data in to grouped frequency distribution using five classes containing Class limit, Class boundary, Class mark, frequency, Less than and more than type cumulative frequency, percentage and relative frequency.
 - b) Draw a histogram.
11. For the following data construct a grouped frequency distribution [which contains class limit, class boundary, class mark, tally, frequency, cumulative frequency (less than type cf,) and relative frequency.
34 54 21 8 19 32 18 19 34 21 54 19 23 35 18 14 19 12 19 42
And draw i) a frequency polygon
ii) Histogram
iii) Ogive (less than type and more than type)
12. Find missing frequency and Complete the distribution, which shows the marks of 15 students

Class limits	tally marks	frequency	Cf(less than type)
7-11		2	
12-16		5	
17-21		A	
22-26		2	
27-31		0	
32-36		2	

- a) Construct the frequency polygon and
- b) Ogive (less than type)

13. A person purchased the following quantities of cement (kg) with rates shown at 4 stores:

Store	Quantity purchased (kg)	Rate of purchase (kg/birr)
A	15	20
B	20	16
C	25	12
D	40	10

Determine the average amount of cement the person purchased for one birr.

14. If the data is given

Class interval	30-44	45-59	60-74	75-89	90-104
Frequency	2	5	6	4	1

Based on the given information Find the mean for the given observation

15. A meteorologist interested in the consistency of temperatures in three cities during a given week collected the following data. The temperatures for the five days of the week in the three cities were

City 1:	25	24	23	26	17
City2:	22	21	24	22	20
City3:	32	27	35	24	28

Which city have the most consistent temperature, based on these data?

16. The number of patients in two hospitals A and B, the average wage of employees and the variances of wages are given below: **(Group Assignment)**

	Hospital A	Hospital B
No. of employees	50	100
Mean wage	120	85
Variance	9	6

In which hospital is the variation in the distribution of wages greater? And interpreted the value **(2 pt.)**

17. In a final exam in a Statistics course, the mean mark of a group of 150 students was 78 and the standard deviation is 8. In Mathematics exam of the same group, the mean was 73 and the standard deviation was 7.6.

- a. In which group was there a greater dispersion?
- b. Suppose a student scored 75 in Statistics and 71 in Mathematics. In which exam was his relative standing better?

18. For the frequency distribution below

Class limits	7-11	12-16	17-21	22-26	27-31	32-36
Frequency	2	5	A	2	0	2

If the modal value is 18.32, then

- a. Find the missing frequency A.
- b. Find the Arithmetic mean and the median value.

19. For a distribution based on 105 observations partly reported below the mode of the distribution is 24 frequencies against two classes are missing. **(Group Assignment)**

Expenditure	0 -10	10- 20	20-30	30-40	40-50
No. Of families	14	24	f_1	25	f_2

- a) Find the two missing frequency f_1 & f_2 ? **(1 pt.)**
- b) Find the Arithmetic mean. **(0.5 pt.)**
- c) Find the median value. **(0.5 pt.)**

20. For the frequency distribution below

Class limits	11-20	21-30	31-40	41-50	51-60	61-70	71-80
Frequency	12	30	9	65	7	25	18

- a) Find the mean of the observation and interpret it.
- b) Find the median value and interpret it.
- c) Find the modal value and interpret it.

21. If the data is given **(Group Assignment)**

Confidence interval	frequency
30-44	2
45-59	5
60-74	6
75-89	4
90-104	1

Based on the given information

- a) Find the mean for the given observation **(0.5 pt.)**
 - b) Find the median for the given observation **(0.5 pt.)**
 - c) Find the modal value for the above observation **(1 pt.)**
22. If $\sum_{i=1}^5 x_i = 10$ and $\sum_{i=1}^5 x_i^2 = 20$ then calculate
- a) $\sum_{i=1}^5 (x_i + 8)$
 - b) $\sum_{i=1}^5 (x_i - 2)x_i$
 - c) $\sum_{i=1}^5 (x_i - 1)^2$
23. The mean of five observations is found to be 4.4 and the variance is 8.24. If the three observations are 1, 2 and 6 find the other two.
24. By adding 5 to each of the numbers in the set 3, 6, 2, 1, 7, 5, we obtain the set 8, 11, 7, 6, 12, and 10, show that the two sets have the same standard deviation but different means. Why this is happened?
25. If a test consists of 10 multiple choice questions, with each permitting a possible answers. How many ways are there in which a student gives his answer?
26. Suppose a photographer must arrange four people in a row for a photo graph by taking two of them at a time. How many ways can the arrangements are done?
27. How many different committee of two can be formed from a group of six people?
28. A coin is tossed five times. Find the probability of getting at least one head.
29. When two dice are rolled, find the probability of getting **(Group Assignment) (2 pts.)**
- a) a sum of 6
 - b) a sum less than 13
30. The total possible outcomes of rolling a die four times is equals to _____
31. Let A and B be two events associated with an experiment and suppose that $p(A) = 0.4$ while $p(A \cup B) = 0.7$ let $p(B) = t$ **(Group Assignment)**
- a) For what choice of t are A and B mutually exclusive? **(1 pt.)**
 - b) For what choice of t are A and B independent? **(1 pt.)**
32. A box contains three white, two red balls, if two balls are selected at random find the probability that
- a) One red and one white ball are selected
 - b) Two of the same color is selected
 - c) No white balls are selected
33. A coin is loaded so that $P(H) = 0.52$, and $P(T) = 0.48$. If the coin is tossed three times, what is the probability of getting
- a) all heads; b) two tails and a head in this order; c) two tails & a head in any order?

34. Two dice were rolled it was observed that the sum of the numbers was odd. Determine the probability it was less than eight.
35. If $P(A) = 0.7$, $P(B) = 0.6$, and $P(A \cup B) = 0.8$, find
- a) $P(A \cap B)$ b) $P(A' \cap B)$ c) $P(A' \cap B')$
36. If $P(A) = 0.5$, $P(B) = 0.3$ and $P(A/B) = 0.4$, then **(Group Assignment) (2 pts.)**
- a) $P(A \cap B) =$ _____ b) $P(B/A) =$ _____
37. The personnel department of the company has records which show the following analysis of 206 Managers.

Age	BA Degree only	Master's degree
Less than 30	90	10
30-40	20	30
Greater than 40	40	10

- If one Manager is selected at random from the company finds
- a) The probability that he has only BA degree
- b) The probability that he has master given that he is greater than 40
- c) The probability he is under 30, given that he has a BA degree
38. Two dice are rolled. Let X is a random variable denoting the sum of the numbers on the two dice.
- a) Give the probability distribution of X
- b) Compute the expected value of X and its variance
39. Let X is a random variable representing the number of tail when a coin is tossed four times. **(Group Assignment)**
- a) Construct a probability distribution of X **(0.5 pt.)**
- b) Find the mean and variance of X **(0.5 pt.)**
40. Find the probability of guessing correctly at least 6 of the 10 true-false questions.
41. Find the parameters of a binomial distribution whose mean is 18 and variance is 12.
42. The number of monthly breakdowns of a computer is a random variable having a Poisson distribution with $\lambda = 1.8$. Find the probabilities that this computer will function for a month
- a) Without a breakdown b) with only one breakdown.
43. The number of telephone calls that arrive at a phone exchange is often modeled as a Poisson distribution. Assuming that there are 10 calls per hour, find the probabilities that there will be
- a) Fewer than 3 calls per hour b) 15 calls in two hours c) 5 calls in 30 minutes.
44. It is known that 20% of all persons given a certain sedative drug get very drowsy within 2 minutes. Find the probabilities that among 14 persons given this drug,
- a) At least 5. b) 2, 3 or 4 will get very drowsy within 2 minutes.
45. A normal distribution has mean $\mu = 62.4$. Find its standard deviation if 20% of the area under the curve lies to the right of 79.2.