Addis Ababa University
College of Natural Sciences
Department of Statistics
Probability & Statistics (Stat 2171) Worksheet I

1. Distinguish the following statistical terms with examples:
   a) Descriptive Vs Inferential statistics
   b) Sample Vs Population
   c) Parameter Vs Statistic
   d) Census Vs Sample survey
   e) Quantitative Vs Qualitative variables
   f) Continuous Vs Discrete variables
   g) Nominal Vs Ordinal scales of measurements
   h) Interval Vs Ratio scales of measurements

2. Classify the following sentences as belonging to the area of descriptive statistics or inferential statistics.
   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 and quantitative and **second** as nominal, ordinal, interval and ratio measure.
   a. Monthly income of persons.
   b. Socio-economic status of a family when classified as low, middle and upper class.
   c. Temperature inside 10 refrigerators.
   d. Classification of marital status as single, married, divorced and widowed.
   e. Times for swimmers to complete a 50-meter race
   f. Months of the year Meskerm, Tikimit, …
   g. Regions numbers of Ethiopia (1, 2, 3 etc.)
   h. The number of students in a college
   i. the net wages of a group of workers
   j. The expansion of a rod of metal when heated
   k. the height of the men in the same town
   l. For 16 persons arrested for driving while intoxicated you record whether they live in urban, suburban, or rural areas.

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

   $D\,S\,D\,D\,S\,W\,S\,D\,S\,S\,D\,D\,W\,M\,M\,S\,D\,D\,D\,W\,M\,S\,S\,W\,M\,D\,D\,M\,D\,W\,D\,S\,S\,W\,D\,D\,S\,D\,S\,M\,W\,M\,D\,S\,D\,W\,D\,M\,S$

   a) To which scale of measurement do these data belong?
   b) Summarize the data by constructing the appropriate frequency distribution.
   c) Present the data using the appropriate graph/diagrams.

5. A survey taken in a restaurant shows that the following number of cups of coffee consumed with each meal. Construct an ungrouped frequency distribution for the following data.

0	2	2	1	1	2
3	5	3	2	2	2
1	0	1	2	4	2
0	1	0	1	4	4
2	2	0	1	1	5

6. Given below is raw data on ages of 40 employees of a certain organization. Construct a frequency distribution with the class boundaries, class marks, relative frequencies, less than and more than type cumulative frequencies. Use struge's formula to determine the number of classes.

62	58	53	27	30	31	26	34	49	47	48	41	50
61	40	47	41	43	50	45	43	32	37	31	35	38
29	65	58	43	44	41	37	27	62	65	36	42	63
50												

7. Suppose data collected for heights (in cms) 0f 390 cows were tabulated in a frequency distribution and the following results were obtained.

Frequencies	6	25	48	72	116	60	38	22	3
Class marks	112	117							

   a. Construct a complete frequency distribution with class limits, class boundaries, frequencies, and the less than type cumulative frequencies.
   b. Determine a height above which 50% of the cows found?
   c. Below which height do we get 25% of the cows?
   d. Compute the mean, median and modal height of the distribution.
   e. Draw a histogram, frequency polygon and less than type Ogive for the above data.

8. Find two numbers whose arithmetic mean is 9.0 and whose geometric mean is 7.2.

9. If the harmonic mean and geometric mean of two observations are respectively 8 and 10, what will be the arithmetic mean of the two observations?
10. The price of DELL computer is assumed to be increased by 40% in value in the first year, 25% in the second year and 10% per annum for the next two years; each percentage is being calculated on the increasing value. What is the average percentage increase?
11. Suppose the average salary of male employees is 520 Birr and that of females is 420 Birr. The mean salary of all employees is 500 Birr. Find the ratio of the number of male and female employees.
12. Suppose that Mr. X pays 15 cents/kwhr for his electricity and Mr. Y pays 20 cents/kwhr if Mr. X consumed 50 kwhrs while Mr. Y uses 120 kwhrs.
    a. If Mr. X consumed 50 kwhrs and Mr. Y used 120 kwhr, find the average cost per kwhr.
    b. If Mr. X pays 10 Birr while Mr. Y pays 15 Birr at the indicated rates, what is the average cost per kwhr?
13. The price of a commodity increased by 5% from 1996 to 1997, by 8% from 1998 to 1999 and by 77% from 2000 to 2001. What was the average yearly price increase?
14. Suppose you have given the following distribution.

Class limits	frequency
0-9	4
10-19	16
20-29	f_3
30-39	f_4
40-49	f_5
50-59	6
60-69	4
Total	230

If the median and mode of the distribution are given to be 33.5 and 34.0 respectively, then.

a) Determine the missing frequencies
b) Compute the arithmetic mean.
c) Compute the value below which 25% of the observations lie.
d) Compute the value above which 25% of the observations lie.

15. In a certain test the ***pass mark*** is 30. The distribution of marks of ***passing*** candidates classified by sex is given below.

Marks	30-34	35-39	40-44	45-49	50-54	55-59	***Total***
Boys	5	10	15	30	5	5	***70***
Girls	15	20	30	20	4	1	***90***

The ***overall (combined)*** mean mark for boys including the ***20 failed*** was 39. While the ***Overall (combined)*** mean mark for girls including the ***10 failed*** was 37.

a) Find the mean marks obtained by the 20 boys who ***failed*** in the test.

b) Find the mean marks obtained by the 10 girls who ***failed*** in the test.

16. The following table shows the distribution of a group of families according to their expenditure per week. The ***median*** and the ***mode*** of the distribution are known to be ***25.50*** birr and ***24.50*** birr respectively. Two frequency values are however missing from the table.

Expenditure (CI)	1-10	11-20	21-30	31-40	41-50
No of families (f_i)	14	f_2	27	f_4	15

Find,

a) The missing frequencies. b) The mean. C) The variance

17. Two sections were given an examination on a certain course. For section 1, the average mark (score) was 72 with standard deviation of 6 and for section 2, the average mark (score) was 85 with standard deviation of 7. If student A from section 1 scored 84 and student B from section 2 scored 90, then who perform better relative to the group?
18. An engineer must select three tests to perform in a certain order on a manufactured part. He has a choice of seven tests. How many ways can he perform three different tests?
19. In how many ways can a committee of 4 be formed from 10 men and 12 women if it is to have

a) 2 men and 2 women? c) 4 men?

b) 1 man and 3 women?d) 4 people regardless of sex?

20. Four married couples have bought 8 seats in a row for a show. In how many different ways can they be seated

a. If each couple is to sit together. b. If all the women sit together.

c. If all the women sit together to the right of all the men?

21. The letters of the word **CONSTANTINOPLE** are written on 14 cards? The cards are shuffled and then arranged in a straight line.
    a) How many different possible arrangements are there?
    b) How many arrangements begin with P
    c) How many arrangements start and end with O
    d) How many arrangements are there where no two vowels are next to each other?
22. Let *A*, *B*, and *C* be events.
    i. Write down expressions for the events where

(a) At least two of *A*, *B*, and *C* occur.

(b) Exactly two of *A*, *B*, and *C* occur.

(c) At most two of *A*, *B*, and *C* occur.

(d) Exactly one of *A*, *B*, and *C* occurs.

    ii. If A and B are independent, A and C are independent, A and B U C are independent, then show that A and Bn C are independent.

23. One urn contains three red balls, two white balls, and one blue ball. A second urn contains one red ball, two white balls and three blue balls.
    a) One ball is selected at random from each urn.
        i) Describe a sample space for this experiment
        ii) Find the probability that both balls will be of the same color.
        iii) Find the probability that at least one of the balls is red.
    b) The balls in the two urns are mixed together in a single urn, and then a sample of three is drawn. Find the probability that all the three colors are represented, when:
        i) Sampling with replacement
        ii) Sampling without replacement
24. Consider four objects, say a, b, c and d. suppose that the order in which these objects are listed represents the outcome of an experiment. Let the events A and B be defined as follows: A = {a is in the first position}; B = {b is in the second position}.
    a. List all elements of the sample space.
    b. List all elements of the events AnB and AUB.
25. A lot consists of 10 good articles, 4 with minor defects and 2 with major defects.
    i. One article is chosen at random. Find the probability that

a. It has no defects; c) It is either good or has major defects.

b. It has no major defects,

ii. Two articles are chosen (without replacement), Find the probability that

a. Both are good d. At most one is good

b. Both have major defects e. Exactly one is good

c. At least one is good f. Neither has major defects

26. A farmer has a box containing 30 eggs, 5 of which are spoiled. He checks 3 eggs by taking them at random one after another from the box. What is the probability the first two eggs are spoiled and the third will be fresh?

27. Two defective tubes get mixed up with two good ones. The tubes are tested one by one, until both defectives are found. What is the probability the last defective tube is obtained on the:

a. Second test? b) Third test? c) Fourth test?

28. Four horses (A, B, C, and D) have raced many times. It is estimated that A wins 30 percent of the time, B 40 percent of the time, C 20 percent of the time, and D 10 percent of the time. The game allows only one of the horses to be a winner in any race. If these horses will compete in a race,

a) What is the probability that A will win?

b) What is the probability that A or B will win?

c) What is the probability that A or B but not both will win?

d) What is the probability that neither A nor B will win?

e) What is the probability that A or B or C will win?

f) Are A and B independent?

29. One bag contains 4 white balls and 3 black balls, and the second bag contains 3 white balls and 5 black balls. One ball is drawn at random from the second bag and placed in the first bag. What is the probability that a ball now drawn from the first bag is white?

30. A factory has two machines M1 and M2 making 60% and 40% respectively of the total production. Machine M1 produces 3% defective items, and M2 produces 5% defective items. Find the probability that a given defective part came from M1.

Note concerning group assignment:

Group formation: you can form groups with not more than 7 students.

Assignment Questions: 1, 2, 3, 7,11, 13, 14, 15, 17, 20,23,24, 25, 28, 29, 30.

Due Date: before you sit for Mid/test exam.