# Problem Set No. 1

**Use the Problem Set 1 Answer Sheet to record your answers.**

1. Identify the scale of measurement most appropriate for each of the following variables. (Use A = *nominal*, B = *ordinal*, C = *interval*, D = *ratio*.) Include a defense for your answers.

   a. ___response latency (i.e., the elapsed time between being exposed to a stimulus and responding to that stimulus)
   b. ___motivation measured by scores on the *XYZ Motivation Inventory*
   c. ___political party affiliation (Democrat, Republican, Independent, Other)
   d. ___academic rank in high school
   e. ___scores on the *SAT* or *GRE*
   f. ___grade point average
   g. ___responses to a Likert-type item (i.e., always, sometimes, neutral, rarely, never)
   h. ___the sum (or average) of responses to Likert-type items.

2. Identify the independent and dependent variables in each of the following experiments.

| | Independent | Dependent |
|---|---|---|
| a. students are taught statistics either with or without a textbook: then test scores of the two groups are compared | _____ | _____ |
| b. ratings of self-confidence are found to be correlated with high school GPA | _____ | _____ |
| c. fifteen minutes a day practicing shooting 3 point- goals proved more effective than thirty minutes of practice twice a week | _____ | _____ |

3. Use the following sets of data to compute the values requested.

   Data (X): 9 12 13 14 15 16 16 17 18 20

   Data (Y): 2 1 0 -1 2 2 -2 1 0 1

| | | |
|---|---|---|
| $\Sigma X =$ | $\Sigma X^2 =$ | $(\Sigma X)^2 =$ |
| $\Sigma X + 2 =$ | $\Sigma (X+2) =$ | $\Sigma (X+2)^2 =$ |
| $\Sigma 2X =$ | $\Sigma 2X + 2 =$ | $\Sigma 2(X+2) =$ |

| | | |
|---|---|---|
| $\Sigma XY =$ | $\Sigma XY + 2 =$ | $\Sigma (X+2)(Y+2) =$ |
| $\Sigma X/N =$ | $\Sigma X^2/N =$ | $\Sigma XY/N =$ |
| $\Sigma X \Sigma Y =$ | $\Sigma 6y$ | $5\Sigma y$ |

4. Assuming a normal distribution with a mean ($\mu$) = 50, and a standard deviation ($\sigma$) = 10, using a table of areas under the normal curve, compute the following. (Note, you can find a table of areas under the normal curve in just about any introductory statistics book. You can find a table of areas under a normal curve, HERE, also.)

    a. the proportion of cases below a score of 42.
    b. the proportion of cases below a *z* score of 66.
    c. the proportion of cases above a score of 70.
    d. the proportion of cases above a score of 25.
    e. the proportion of cases between scores of 35 and 65.
    f. the proportion of cases between scores of 65 and 75.

5. Assume the mean on an IQ test is 100 with a standard deviation of 16. Using a table of areas under the normal curve, estimate each of the following.

    a. the percentage of individuals having an IQ of 130 or higher.
    b. the proportion of individuals with an IQ of 90 or lower.
    c. the percentage of individuals with IQs between 85 and 115.
    d. the proportion of individuals with IQs between the first and third quartiles.
    e. the percentage of individuals with IQs above 130.
    f. the IQ of individuals at the 85th percentile.
    g. the IQ of individuals at the 35th percentile.

6. A survey of 1,000 kindergarten children reveals that the average child watches 145 minutes of TV per week. The *sample* standard deviation is 40 minutes. Construct the 95% confidence to estimate the mean number of minutes spent viewing TV per week in the general *population* of kindergarteners.

7. To obtain evidence of *validity* for her new instrument for measuring students' interest in pursuing further study of *mathematics*, Schmalling administered the instrument along with two other instruments: and *Attitude Toward Mathematics* instrument and the *Motivations for Reading* instrument discussed earlier in this course.

    Give brief answers to the following questions:

a. Is it important that Schmalling first examine the *reliability* of her new instrument? Explain your reasoning.
b. What type of evidence for validity was Schmalling looking for? What results would provide evidence instrument is valid?

8. The table below shows the number of students, classified by age and whether or not a parent had attended college, over a 10-year period, who attained an Associate's Degree from a local community college.
   a. What is the probability of attaining an Associate's Degree for a student who is 28 years old?
   b. What is the probability of attaining an Associate's Degree for a first-generation student who is 23 years old?
   c. Of the six combinations (of age and parent attendance) which group has the highest probability of attaining an Associate's Degree?

**Number of Students Attaining an Associate's Degree by Parent College Attendance Status and Age Category**

| | Age Category | | |
|---|---|---|---|
| Status of at least one parent attended college | Less than 25 yrs old | 25 to 35 yrs old | Greater than 35 yrs old |
| Parent attended college | 1252 | 1215 | 632 |
| No parent attended college | 643 | 736 | 592 |

9. A school district dietitian wants to construct a confidence interval to estimate the mean number of soft drinks high-school students consume daily in her district. She intends to survey the students. Assuming a *population* standard deviation of 1.8 soft drinks a day, per student.

   a. how many students must she survey in order to obtain a 95% confidence interval that is .5 soft drinks wide?
   b. how many students would she have to survey to obtain a 99% confidence interval that is .5 soft drinks wide?

10. The distribution of SAT-V scores is assumed to be normal with $\mu = 500$ and $\sigma = 100$.

   a. What is the *probability* of someone having an SAT-V score *higher* than 650?

   b. What is the *probability* of an SAT-V score *between* 550 and 650?

11. The correlation between SAT scores and first semester GPA in the general population is about .53. What do you suppose is the correlation between SAT and GPA at Harvard? Will it be higher, lower, or about the same? Explain your reasoning.

12. The mean GRE score for a sample of 121 students who completed a GRE preparation course was 1030 with a corrected standard deviation of 175. The national mean GRE score is 1000. Is this difference statistically significant? Do you think the difference is practically significant? Explain your reasoning.

13. Using the dataset below set up an SPSS database and run the following descriptive analyses: gender, ethnicity, and score. Also, create a graphic display (of your choice) that explains the data. Export all SPSS output into Word.

    Be sure to label all values so the output is readable and clear. Data is listed in order for each subject (gender, ethnicity, grade).

    1) 1, 3, 75
    2) 1, 4, 98
    3) 2, 6, 90
    4) 1, 4, 85
    5) 1, 6, 88
    6) 2, 4, 90
    7) 2, 1, 94
    8) 2, 1, 83
    9) 1, 1, 75
    10) 1, 4, 70

    Gender: 1=female; 2=male

    Ethnicity: 1=African American; 2=American Indian; 3=Asian; 4=Caucasian; 5=Hispanic; 6=Multiracial

14. Using the data set below, conduct an independent-samples t-test examining the differences between Cohort 18 (18) and Cohort 19 (19) on exam scores.

    Is there a significant difference between the two groups? Produce SPSS output and write a p value statement to indicate your answer.

    1) 99 18
    2) 80 18
    3) 65 18
    4) 50 18
    5) 88 18

| | | |
|---|---|---|
| 6) | 90 | 18 |
| 7) | 80 | 18 |
| 8) | 61 | 18 |
| 9) | 77 | 18 |
| 10) | 70 | 18 |
| 11) | 90 | 19 |
| 12) | 92 | 19 |
| 13) | 85 | 19 |
| 14) | 84 | 19 |
| 15) | 71 | 19 |
| 16) | 90 | 19 |
| 17) | 60 | 19 |
| 18) | 86 | 19 |
| 19) | 83 | 19 |
| 20) | 71 | 19 |

15. Using the data set below, conduct a paired-samples t-test examining the differences between pre- and post-exam scores.

    Is there a significant difference between the two groups? Produce SPSS output and write a p value statement to indicate your answer.

| | | |
|---|---|---|
| 1) | 9998 | |
| 2) | 80 | 87 |
| 3) | 65 | 77 |
| 4) | 50 | 77 |
| 5) | 88 | 85 |
| 6) | 90 | 96 |
| 7) | 80 | 89 |
| 8) | 6189 | |
| 9) | 77 | 80 |
| 10) | 70 | 90 |
| 11) | 90 | 88 |
| 12) | 92 | 98 |
| 13) | 85 | 98 |
| 14) | 84 | 98 |
| 15) | 71 | 89 |
| 16) | 90 | 98 |
| 17) | 60 | 59 |
| 18) | 86 | 89 |
| 19) | 83 | 92 |
| 20) | 71 | 90 |