Problem 1. Summary statistics show that variable w has sample mean 52 and sample variance 4. Provide the formula for a transformation of variable w that has sample mean 0 and sample variance 1.

Problem 2. Calculate $\sum_{i=1}^{3}(2+6/i)$. Show all of your work.

Problem 3. Consider the following Stata output.

```
. sum highmeaning, d

        Fraction who say their work makes the world a
                        better place
-------------------------------------------------------------
      Percentiles      Smallest
 1%           .28           .26
 5%           .41           .28
10%           .45           .33       Obs                 194
25%           .54           .34       Sum of Wgt.         194

50%           .68                     Mean           .6662887
                      Largest         Std. Dev.      .1602189
75%            .8           .93
90%           .88           .93       Variance       .0256701
95%           .91           .95       Skewness      -.1739289
99%           .95           .97       Kurtosis       2.164972
```

```
. sum major earlycareer midcareer highmeaning

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
       major |          0
 earlycareer |        194    56257.22    14535.76       36100     139000
   midcareer |        194    85715.46    22338.64       48100     173000
 highmeaning |        194   .6662887    .1602189         .26        .97
```

$t_{193,\ 0.005} = 2.6015$

$t_{193,\ 0.010} = 2.346$

$t_{193,\ 0.025} = 1.9723$

$t_{193,\ 0.050} = 1.6528$

$t_{193,\ 0.100} = 1.3062$

(a) Does variable `highmeaning` appear to be symmetrically distributed? Explain.

(b) If variable `highmeaning` war normally distributed, then what range of values would you expect 95% of observations to lie in? Explain.

(c) Provide a 90 percent confidence interval for the population mean earnings for Masters graduates with 0-5 years of work experience. Show your work.

(d) What Stata command would enable you to directly answer part (c)?

(e) The claim is made that population mean earnings for Masters graduates with 0-5 years of work experience equals \$60,000. Test this claim at significance level 0.10. State clearly the null and alternative hypothesis and your conclusion.

(f) Suppose we perform a test of a hypothesis and find that $p = 0.06$. Will we reject or not reject the null hypothesis at significance level 5%? Explain your answer.

Problem 4. For a sample of four thirty-year olds, the years of completed schooling are 12, 15, 13, and 12. Compute the sample mean, sample variance, and sample standard deviation. Is the data left- or right-skewed? Show all workings.

Problem 5. Suppose $X = 10$ with probability 0.6, $X = 20$ with probability 0.3, and $X = 30$ with probability 0.1. Compute the mean, variance, and standard deviation of X. Show your work.

Problem 6. Suppose for $X \sim (200, 10^2)$, we form 100 samples of size 25 and obtain 100 sample means $\bar{x}$. What approximately do you expect the average of the $\bar{x}$ to equal? What about the standard deviation of $\bar{x}$? Explain your answer.

Problem 7. Consider the following Stata output

```
. summarize growth, detail

        Percentage annual growth in variable real
-------------------------------------------------------------
      Percentiles      Smallest
 1%    -.5972697      -.5972697
 5%     .4553079       .4553079
10%     1.010702       1.010702       Obs                  28
25%     2.056625       1.037691       Sum of Wgt.          28

50%     3.288075                      Mean            4.155236
                       Largest        Std. Dev.       2.974328
75%     5.993356       8.543264
90%     8.990582       8.990582       Variance        8.846628
95%     10.00192       10.00192       Skewness        .6414501
99%     10.44776       10.44776       Kurtosis        2.458796
```

Calculate the interquartile range of variable `growth`.

Problem 8. Consider the following Stata output.

```
. sum diff, detail

                            diff
-------------------------------------------------------------
      Percentiles      Smallest
 1%    -100.7092      -107.1325
 5%     -36.7719       -104.92
10%     -20.9986      -100.7092       Obs                 274
25%    -8.998913      -61.88319       Sum of Wgt.         274

50%      -2.2891                      Mean           1.421385
                        Largest       Std. Dev.      35.51708
75%     2.870001       162.9905
90%      19.2143         175.58       Variance       1261.463
95%     70.69516            180       Skewness       2.505035
99%       175.58        215.399       Kurtosis       14.55209
```

Does variable `diff` appear to be normally distributed? Explain.

Problem 9. An estimator is the best among consistent estimators if

(a) it is also unbiased,

(b) it has the smallest variance,

(c) it is normally distributed,

(d) none of the above.