ASSIGNMENT 3

1. Use the data in assignment3.sav to estimate the reliability of this scale, which measures students' views on the utility of math and science courses.

ANSWER: *Reliability: 0.903*

Case Processing Summary

		N	%
Cases	Valid	23503	100.0
	Excluded[a]	0	.0
	Total	23503	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.903	14

2. Use software to obtain the confidence interval for Alpha.

Intraclass Correlation Coefficient

	Intraclass Correlation[b]	95% Confidence Interval		F Test with True Value 0			
		Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measures	.398[a]	.393	.403	10.262	23502	305526	.000
Average Measures	.903[c]	.901	.904	10.262	23502	305526	.000

Two-way mixed effects model where people effects are random and measures effects are fixed.

a. The estimator is the same, whether the interaction effect is present or not.

b. Type C intraclass correlation coefficients using a consistency definition. The between-measure variance is excluded from the denominator variance.

c. This estimate is computed assuming the interaction effect is absent, because it is not estimable otherwise.

**ANSWER: Confidence Interval:**

Lower bound: .901

Upper bound: .904

3. Obtain the reliability if the item removed.

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
S2 E01A Teenager sees himself/herself as a math person	26.20	52.494	.645	.894
S2 E01B Others see teenager as a math person	26.25	52.775	.674	.893
S2 E01C Most people can learn to be good at math	26.61	56.860	.557	.897
S2 E01D You have to be born with the ability to be good at math	26.01	55.694	.479	.902
S2 E02A Teenager thinks math is useful for everyday life	26.84	56.894	.560	.897
S2 E02B Teenager thinks math will be useful for college	27.10	58.387	.562	.898
S2 E02C Teenager thinks math is useful for future career	26.94	56.891	.589	.896
S2 E03A Teenager sees himself/herself as a science person	26.32	52.995	.681	.892
S2 E03B Others see teenager as a science person	26.27	52.975	.703	.891
S2 E03C Most people can learn to be good at science	26.66	56.963	.573	.897
S2 E03D You have to be born with the ability to be good at science	25.96	55.165	.523	.900
S2 E04A Teenager thinks science is useful for everyday life	26.60	54.999	.659	.893
S2 E04B Teenager thinks science will be useful for college	26.91	56.843	.643	.895
S2 E04C Teenager thinks science is useful for future career	26.79	55.506	.640	.894

4. **Write a brief report on your findings focusing on the overall reliability of the scale and including a discussion of which items may be problematic and why**

Overall, the reliability of the report is .903 which indicates an excellent measure. As can be seen from the Table in Q2. The reliability will be decreased if any of the items were removed. Item S2 E01D has a loose correlation with the overall score (0.479) which does not affect too much on the overall reliability score if this item is removed (r = .901). Item S1 E03B, on the other hand, has the highest correlation with the overall score (.703). Once it is removed, the overall r score will be reduced to .891

5. **Calculate the reliability estimates using the Spearman-Brown formula**

   a. Given a 20-item test with reliability=.60, what would be the reliability if the test length were tripled (i.e., made three times longer)?

   Given $\rho_{YY'} = .60$, N = 3. The reliability if the test length were tripled is calculated as:

   $$\rho_{XX'} = \frac{N\rho_{YY'}}{1+(N-1)\rho_{YY'}} = \frac{3*0.6}{1+(3-1)*0.6} = \frac{1.8}{2.2} = 0.818$$

   b. Given a 30-item test with reliability=.90, what would be the reliability if the test length were reduced to only 10 items?

   $$\rho_{XX'} = \frac{N\rho_{YY'}}{1+(N-1)\rho_{YY'}} = \frac{(1/3)*0.9}{1+(1/3-1)*0.9} = \frac{0.3}{0.4} = 0.75$$