

## Reliability (Continuous [sort of] Data)

*A little more about Cronbach's alpha before you start...*

Cronbach's alpha is used to measure internal consistency...does the participant respond similarly from question to question (assuming the questions are asking similar things). Generally, we believe that it is more reliable to ask a participant something multiple times and then average his or her responses rather than ask the participant one question and use that single response.

Suppose we wanted to know if a child liked school. We might ask the child to rate each of the following statements from 1 to 3 with 1= Strongly disagree and 3=Strongly agree:

*School is fun.*

*I like school.*

*I enjoy going to school.*

The average of the student's responses to those three statements is more reliable than asking any one of the statements.










Sometimes statements don't work well together...they actually are measuring different things. Cronbach's alpha is used to determine whether the statements work well together and are measuring a similar thing.

A survey may be designed to measure several constructs. In that case, separate Cronbach's alphas are calculated for each construct. In your homework assignment, the survey is designed to measure attitude toward math, attitude toward science, and attitude toward reading. Rather than investigate the reliability of the entire survey, the researcher should investigate the reliability of each construct separately.





































You will find 20 students' survey results shown on the following pages. Each survey measures three constructs—attitude toward reading, attitude toward mathematics, and attitude toward science. The statements are mixed for each construct (e.g., math is statement 1, 2, 5, and 12). You will be assigned one of the three constructs (math, reading, or science). Enter the data on the Excel reliability spreadsheet for that construct only for each of the 20 students whose data is presented below. Enter 3 for Agree, 2 for Neutral, and 1 for Disagree. You need to determine which statements apply to the construct you select. Each construct has exactly four questions. For example, enter the first math statement (#1) as Question 1 on the spreadsheet, the second math statement (#2) as Question 2, the third math statement (#5) as Question 3, and the fourth math statement (#12) as Question 4. When you are finished, you will have filled in the cells for Question 1-4, for Subjects 1-20.

Cronbach's alpha is the appropriate reliability to report for this data. Cronbach's alpha is appropriate for continuous data as well as dichotomous (correct (1) / incorrect (0)) data. A reliability of .70 is considered adequate for an attitude instrument. One would want a higher reliability for an achievement test.





































Bobby

	Agree		Disagree
1. Mathematics is fun to do. ....			
2. Schools should teach mathematics. ....			
3. I like to read stories. ....			
4. Science is an interesting subject. ....			
5. Students should know how to do mathematics. ....			
6. Students need science classes. ....			
7. Students should read often. ....			
8. I want to take more science classes. ....			
9. I read stories in my free time. ....			
10. Science is important to me. ....			
11. Reading is important to me. ....			
12. I think mathematics is interesting. ....			

Chris

	Agree		Disagree
1. Mathematics is fun to do. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
2. Schools should teach mathematics. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
3. I like to read stories. ....	<input type="radio"/> 	<input type="radio"/> 	<input checked="" type="radio"/> 
4. Science is an interesting subject. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
5. Students should know how to do mathematics. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
6. Students need science classes. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
7. Students should read often. ....	<input type="radio"/> 	<input type="radio"/> 	<input checked="" type="radio"/> 
8. I want to take more science classes. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
9. I read stories in my free time. ....	<input type="radio"/> 	<input type="radio"/> 	<input checked="" type="radio"/> 
10. Science is important to me. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
11. Reading is important to me. ....	<input type="radio"/> 	<input type="radio"/> 	<input checked="" type="radio"/> 
12. I think mathematics is interesting. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 



Jane

	Agree		Disagree
1. Mathematics is fun to do. ....			
2. Schools should teach mathematics. ....			
3. I like to read stories. ....			
4. Science is an interesting subject. ....			
5. Students should know how to do mathematics. ....			
6. Students need science classes. ....			
7. Students should read often. ....			
8. I want to take more science classes. ....			
9. I read stories in my free time. ....			
10. Science is important to me. ....			
11. Reading is important to me. ....			
12. I think mathematics is interesting. ....			

































Jenny

	Agree		Disagree
1. Mathematics is fun to do. ....	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
2. Schools should teach mathematics. ....	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. I like to read stories. ....	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Science is an interesting subject. ....	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
5. Students should know how to do mathematics. ....	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Students need science classes. ....	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
7. Students should read often. ....	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. I want to take more science classes. ....	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. I read stories in my free time. ....	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
10. Science is important to me. ....	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. Reading is important to me. ....	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. I think mathematics is interesting. ....	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>





































John

	Agree		Disagree
1. Mathematics is fun to do. ....			
2. Schools should teach mathematics. ....			
3. I like to read stories. ....			
4. Science is an interesting subject. ....			
5. Students should know how to do mathematics. ....			
6. Students need science classes. ....			
7. Students should read often. ....			
8. I want to take more science classes. ....			
9. I read stories in my free time. ....			
10. Science is important to me. ....			
11. Reading is important to me. ....			
12. I think mathematics is interesting. ....			





































Kristy

	Agree		Disagree
1. Mathematics is fun to do. ....			
2. Schools should teach mathematics. ....			
3. I like to read stories. ....			
4. Science is an interesting subject. ....			
5. Students should know how to do mathematics. ....			
6. Students need science classes. ....			
7. Students should read often. ....			
8. I want to take more science classes. ....			
9. I read stories in my free time. ....			
10. Science is important to me. ....			
11. Reading is important to me. ....			
12. I think mathematics is interesting. ....			





































Mary

	Agree		Disagree
1. Mathematics is fun to do. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
2. Schools should teach mathematics. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
3. I like to read stories. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
4. Science is an interesting subject. ....	<input type="radio"/> 	<input type="radio"/> 	<input checked="" type="radio"/> 
5. Students should know how to do mathematics. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
6. Students need science classes. ....	<input type="radio"/> 	<input type="radio"/> 	<input checked="" type="radio"/> 
7. Students should read often. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
8. I want to take more science classes. ....	<input type="radio"/> 	<input type="radio"/> 	<input checked="" type="radio"/> 
9. I read stories in my free time. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
10. Science is important to me. ....	<input type="radio"/> 	<input type="radio"/> 	<input checked="" type="radio"/> 
11. Reading is important to me. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
12. I think mathematics is interesting. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 





































Mike

	Agree		Disagree
1. Mathematics is fun to do. ....			
2. Schools should teach mathematics. ....			
3. I like to read stories. ....			
4. Science is an interesting subject. ....			
5. Students should know how to do mathematics. ....			
6. Students need science classes. ....			
7. Students should read often. ....			
8. I want to take more science classes. ....			
9. I read stories in my free time. ....			
10. Science is important to me. ....			
11. Reading is important to me. ....			
12. I think mathematics is interesting. ....			
























Sandy

	Agree		Disagree
1. Mathematics is fun to do. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
2. Schools should teach mathematics. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
3. I like to read stories. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
4. Science is an interesting subject. ....	<input type="radio"/> 	<input checked="" type="radio"/> 	<input type="radio"/> 
5. Students should know how to do mathematics. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
6. Students need science classes. ....	<input type="radio"/> 	<input checked="" type="radio"/> 	<input type="radio"/> 
7. Students should read often. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
8. I want to take more science classes. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
9. I read stories in my free time. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
10. Science is important to me. ....	<input type="radio"/> 	<input checked="" type="radio"/> 	<input type="radio"/> 
11. Reading is important to me. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
12. I think mathematics is interesting. ....	<input type="radio"/> 	<input checked="" type="radio"/> 	<input type="radio"/> 





































Susie

	Agree		Disagree
1. Mathematics is fun to do. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
2. Schools should teach mathematics. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
3. I like to read stories. ....	<input type="radio"/> 	<input type="radio"/> 	<input checked="" type="radio"/> 
4. Science is an interesting subject. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
5. Students should know how to do mathematics. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
6. Students need science classes. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
7. Students should read often. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
8. I want to take more science classes. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
9. I read stories in my free time. ....	<input type="radio"/> 	<input type="radio"/> 	<input checked="" type="radio"/> 
10. Science is important to me. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
11. Reading is important to me. ....	<input type="radio"/> 	<input type="radio"/> 	<input checked="" type="radio"/> 
12. I think mathematics is interesting. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 





































Roberto

	Agree		Disagree
1. Mathematics is fun to do. ....			
2. Schools should teach mathematics. ....			
3. I like to read stories. ....			
4. Science is an interesting subject. ....			
5. Students should know how to do mathematics. ....			
6. Students need science classes. ....			
7. Students should read often. ....			
8. I want to take more science classes. ....			
9. I read stories in my free time. ....			
10. Science is important to me. ....			
11. Reading is important to me. ....			
12. I think mathematics is interesting. ....			

Katrina

	Agree		Disagree
1. Mathematics is fun to do. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
2. Schools should teach mathematics. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
3. I like to read stories. ....	<input type="radio"/> 	<input type="radio"/> 	<input checked="" type="radio"/> 
4. Science is an interesting subject. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
5. Students should know how to do mathematics. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
6. Students need science classes. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
7. Students should read often. ....	<input type="radio"/> 	<input type="radio"/> 	<input checked="" type="radio"/> 
8. I want to take more science classes. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
9. I read stories in my free time. ....	<input type="radio"/> 	<input type="radio"/> 	<input checked="" type="radio"/> 
10. Science is important to me. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
11. Reading is important to me. ....	<input type="radio"/> 	<input type="radio"/> 	<input checked="" type="radio"/> 
12. I think mathematics is interesting. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 

























Jamie

	Agree		Disagree
1. Mathematics is fun to do. ....			
2. Schools should teach mathematics. ....			
3. I like to read stories. ....			
4. Science is an interesting subject. ....			
5. Students should know how to do mathematics. ....			
6. Students need science classes. ....			
7. Students should read often. ....			
8. I want to take more science classes. ....			
9. I read stories in my free time. ....			
10. Science is important to me. ....			
11. Reading is important to me. ....			
12. I think mathematics is interesting. ....			





































Jenoah

	Agree		Disagree
1. Mathematics is fun to do. ....	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
2. Schools should teach mathematics. ....	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. I like to read stories. ....	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Science is an interesting subject. ....	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
5. Students should know how to do mathematics. ....	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Students need science classes. ....	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
7. Students should read often. ....	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. I want to take more science classes. ....	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. I read stories in my free time. ....	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
10. Science is important to me. ....	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. Reading is important to me. ....	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. I think mathematics is interesting. ....	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>



































Alexia

	Agree		Disagree
1. Mathematics is fun to do. ....			
2. Schools should teach mathematics. ....			
3. I like to read stories. ....			
4. Science is an interesting subject. ....			
5. Students should know how to do mathematics. ....			
6. Students need science classes. ....			
7. Students should read often. ....			
8. I want to take more science classes. ....			
9. I read stories in my free time. ....			
10. Science is important to me. ....			
11. Reading is important to me. ....			
12. I think mathematics is interesting. ....			





































Abdullah

	Agree		Disagree
1. Mathematics is fun to do. ....			
2. Schools should teach mathematics. ....			
3. I like to read stories. ....			
4. Science is an interesting subject. ....			
5. Students should know how to do mathematics. ....			
6. Students need science classes. ....			
7. Students should read often. ....			
8. I want to take more science classes. ....			
9. I read stories in my free time. ....			
10. Science is important to me. ....			
11. Reading is important to me. ....			
12. I think mathematics is interesting. ....			





































Maria

	Agree		Disagree
1. Mathematics is fun to do. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
2. Schools should teach mathematics. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
3. I like to read stories. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
4. Science is an interesting subject. ....	<input type="radio"/> 	<input type="radio"/> 	<input checked="" type="radio"/> 
5. Students should know how to do mathematics. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
6. Students need science classes. ....	<input type="radio"/> 	<input type="radio"/> 	<input checked="" type="radio"/> 
7. Students should read often. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
8. I want to take more science classes. ....	<input type="radio"/> 	<input type="radio"/> 	<input checked="" type="radio"/> 
9. I read stories in my free time. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
10. Science is important to me. ....	<input type="radio"/> 	<input type="radio"/> 	<input checked="" type="radio"/> 
11. Reading is important to me. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
12. I think mathematics is interesting. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 




































Ramone

	Agree		Disagree
1. Mathematics is fun to do. ....		<input checked="" type="radio"/> 	
2. Schools should teach mathematics. ....			<input checked="" type="radio"/> 
3. I like to read stories. ....	<input checked="" type="radio"/> 		
4. Science is an interesting subject. ....		<input checked="" type="radio"/> 	
5. Students should know how to do mathematics. ....		<input checked="" type="radio"/> 	
6. Students need science classes. ....		<input checked="" type="radio"/> 	
7. Students should read often. ....	<input checked="" type="radio"/> 		
8. I want to take more science classes. ....	<input checked="" type="radio"/> 		
9. I read stories in my free time. ....	<input checked="" type="radio"/> 		
10. Science is important to me. ....		<input checked="" type="radio"/> 	
11. Reading is important to me. ....	<input checked="" type="radio"/> 		
12. I think mathematics is interesting. ....		<input checked="" type="radio"/> 	

Paulo

	Agree		Disagree
1. Mathematics is fun to do. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
2. Schools should teach mathematics. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
3. I like to read stories. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
4. Science is an interesting subject. ....	<input type="radio"/> 	<input checked="" type="radio"/> 	<input type="radio"/> 
5. Students should know how to do mathematics. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
6. Students need science classes. ....	<input type="radio"/> 	<input checked="" type="radio"/> 	<input type="radio"/> 
7. Students should read often. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
8. I want to take more science classes. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
9. I read stories in my free time. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
10. Science is important to me. ....	<input type="radio"/> 	<input checked="" type="radio"/> 	<input type="radio"/> 
11. Reading is important to me. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
12. I think mathematics is interesting. ....	<input type="radio"/> 	<input checked="" type="radio"/> 	<input type="radio"/> 

Sonja

	Agree		Disagree
1. Mathematics is fun to do. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
2. Schools should teach mathematics. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
3. I like to read stories. ....	<input type="radio"/> 	<input type="radio"/> 	<input checked="" type="radio"/> 
4. Science is an interesting subject. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
5. Students should know how to do mathematics. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
6. Students need science classes. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
7. Students should read often. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
8. I want to take more science classes. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
9. I read stories in my free time. ....	<input type="radio"/> 	<input type="radio"/> 	<input checked="" type="radio"/> 
10. Science is important to me. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 
11. Reading is important to me. ....	<input type="radio"/> 	<input type="radio"/> 	<input checked="" type="radio"/> 
12. I think mathematics is interesting. ....	<input checked="" type="radio"/> 	<input type="radio"/> 	<input type="radio"/> 