Individual Differences_4GE

مقرر

Individual Differences

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Second Term

General Education

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Professor of Educational Psychology & Statistics

الفرقة .....الرابعة ...برنامج.. التعليم الأساسي...معلم العلوم باللغة الانجليزية

Individual Differences_4GE

أستاذ المقرر

أ.د/ حجاج غانم : قسم علم النفس التربوي

كلية التربية بقنا

العام الجامعي

2022 – 2023 A. D.

بيـــانـــات أساسية

الكلية: التربية

الفرقة: الرابعة

التخصص: تعليم عام برنامج اللغة: جميع الشعب

Individual Differences_4GE

عدد الصفحات:

القسم التابع له المقرر : قسم علم النفس التربوي

الرموز المستخدمة


فيديو للمشاهدة.


نص للقراءة والدراسة.

رابط خارجي.

أسئلة للتفكير والتقييم الذاتي.

أنشطة ومهام.

تواصل عبر مؤتمر الفيديو.

Individual Differences

محتوي الكتــاب

Individual Differences_4GE

	Video 1: Definitions of Individual Differences
	Video 2 : Types of individual differences
	Video 3 : Causes of individual differences

	Video 4 : The role of individual differences in education
	Video 5_: Measuring individual differences

THE PSYCHOLOGY of Individual Differences

This course is divided into two chapters: The first chapter contains a theoretical background on individual first differences, and the second chapter contains how to measure individual differences.

Let's start by introduction.

The scientific study of how and why people differ in systematic ways is known as the psychology of individual differences. The psychology of individual differences seeks to understand how inter and intra-individual differences in psychological characteristics interact with environmental affordances and demands to produce differences in a variety of

personal, work, educational, and social outcomes.

The theories and psychometric methods developed by individual difference researchers are used by social scientists to understand, critique, and address practical problems in a variety of contexts such as education, selection, evaluation, and guidance.

Chapter 1 : Theoretical Background:

We will study in this chapter:

1.Definitions of Individual Differences.

2.Types of individual differences.

3.Causes of individual differences .

4.The role of individual differences in education.

Chapter 2 : Measuring Individual differences:

We will study in this chapter, how to measure individual differences using the statistical methods such as:

Standard deviation

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Deciles

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Normal curve

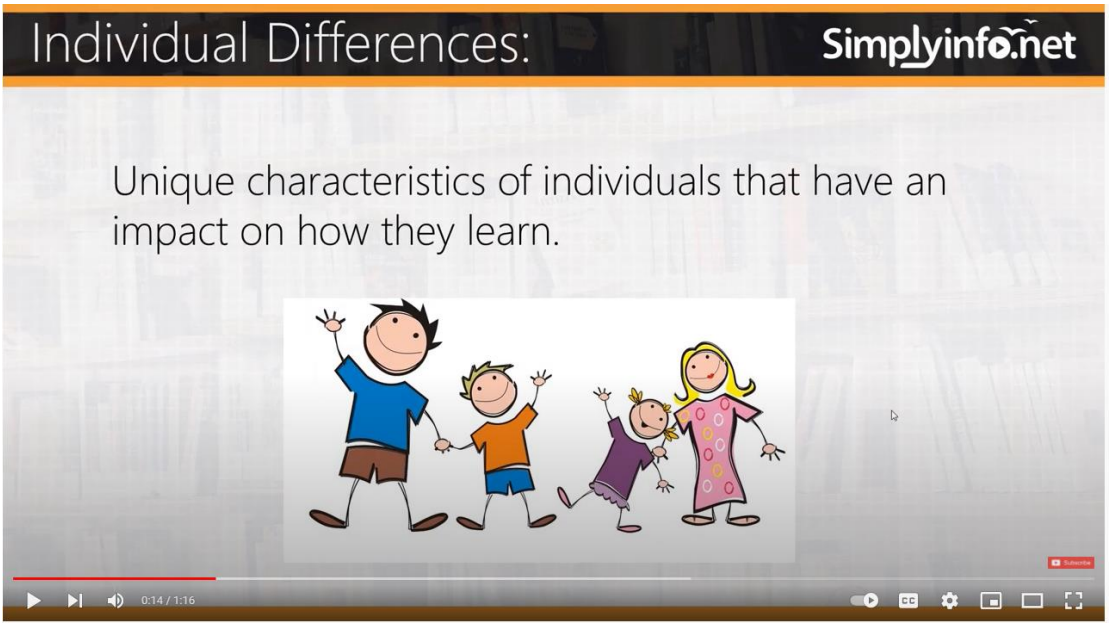
Chapter 1 : Theoretical Background:

1.Definitions of Individual Differences.

“Variations or deviations from the average of the group, with respect to the mental or physical characters, occurring in the individual member of the group are individual differences.”

https://www.youtube.com/watch?v=Cg8HrChyq0A

Individual Differences_4GE



“The variation or deviations among individual is regard to a single characteristic or a number of characteristics, those differences which in their totality distinguish one individual from another.”

“Individual differences are found in all psychological characteristics physical mental

abilities, knowledge, habit, personality and character traits."

According to Skinner, "Today we think of individual differences as including any measurable aspect of the total personality." It is clear from this definition of individual differences that it comprehends every aspect

of human personality which is in some

manner measurable.

2.Types of Individual Differences

That the persons may differ in one type or

more of ……..such as :

……,……,……..,……

……,……..,…….. ,

and so on.

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https://www.youtube.com/watch?v=WbjPMM2RUbw

1. Physical differences:

Shortness or tallness of stature, darkness or fairness of complexion, fatness, thinness, or weakness are various physical individual differences.

2. Differences in intelligence:

There are differences in intelligence level among different individuals. We can classify the individuals from super-normal (above 120 I.Q.) to idiots (from 0 to 50 I.Q.) on the basis of their intelligence level.

Wechsler (WAIS–III) 1997 IQ test classification

IQ Range ("deviation IQ")	IQ Classification
130 and above	Very superior
120–129	Superior
110–119	High average
90–109	Average
80–89	Low average
70–79	Borderline
69 and below	Extremely low

3. Differences in attitudes:

Individuals differ in their attitudes towards different people, objects, institutions and so on.

4. Differences in achievement:

It has been found through achievement tests that individuals differ in their achievement abilities. These differences are very much visible in reading, writing and in learning mathematics.

These differences in achievement are even visible among the children who are at the same level of intelligence. These differences are on account of the differences in the various factors of intelligence and the differences in the various experiences, interests and educational background.

And there are another types such as motor

ability , gender, and so on .

3.Causes of Individual Differences

These causes may be , as we will say later:

Heredity

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Educational

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https://www.youtube.com/watch?v=q_4JpTj0DBY

Some of the main causes of individual

differences are as under:

1. Heredity:

One of the most significant and chief causes of individual differences is heredity. Individuals inherit various physical traits like face with its features, color of eyes and hair, type of skin, shape of skull and size of hands, colour blindness, baldness, stub-finger and tendency to certain diseases like cancer and tuberculosis, mental traits like intelligence, abstract thinking, aptitudes and prejudices.

Now it is an admitted fact that heredity differences result in the quantity and rate of physical as well as mental development being different and different individuals.

2. Environment:

Environment significantly influences individual differences. Changes in child's

environment are reflected in the changes in his personality. Psychologically speaking, a person's environment consists of sum total of stimulation which he receives from conception until his death.

Environment consists of physical, intellectual, social, moral, political, economic and cultural

forces. All these forces cause individual differences. Modern psychologists believe that individual differences are caused by both heredity and environment. Personality is the outcome of mutual interaction between heredity and environment.

3. Influence of caste, race and nation:

Individuals of different castes and races exhibit very marked differences. It is generally seen that son of a Kshatriya has a more of courage in him while the son of a trader has the traits of business.

Similarly individuals of different nations show differences in respect of their personality, character and mental abilities. These are the

outcome of their geographical, social and cultural environment. Many studies have shown the existence of differences between Americans and Negroes, Chinese and Japanese, English and Indian individuals.

4. Sex differences:

Development of boys and girls exhibits differences due to difference in sex. The physical development of the girl takes place a year or two earlier than the boys. Between the age of 11 and 14, girls are taller and heavier than the boys. After 15, boys start winning the race.

Girls are kind, affectionate, sympathetic and tender while the boys are brave, hard, choleric, efficient and competent.

And there are other causes that are limited to the mental , social , cultural , and so on.

Task1: Express in your own words the causes

of individual differences

4.Role of Individual Differences in Education:

Role of Individual Differences in Education.

The teacher must

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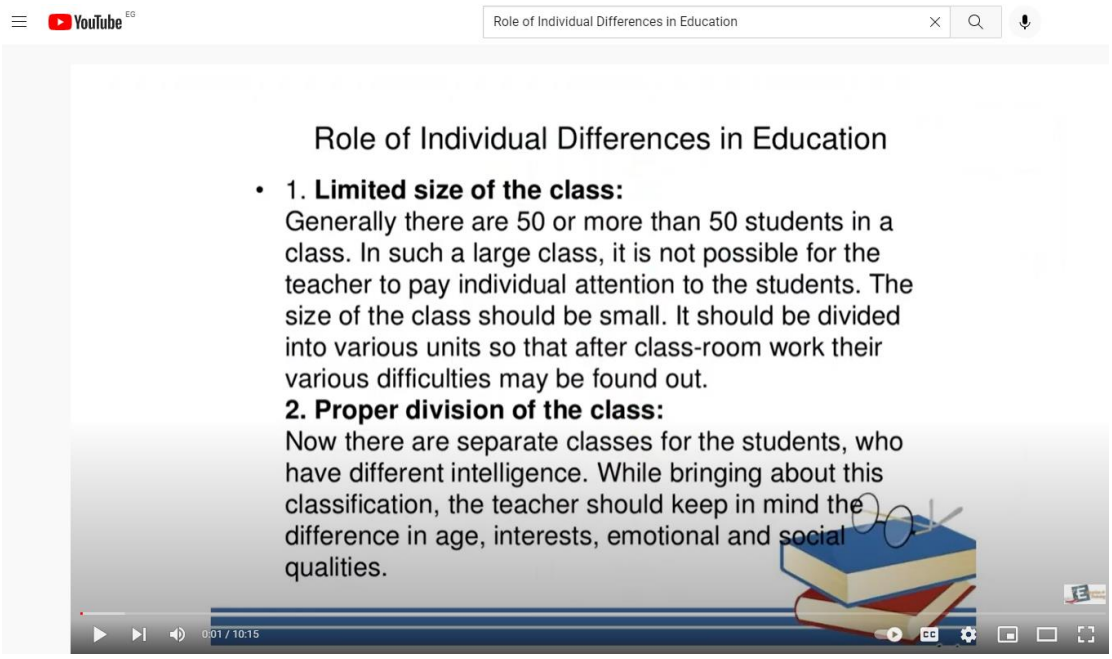
https://www.youtube.com/watch?v=QUcKeJnaMOM



One of the important objectives of modern education is the complete development of the individual. Individuals have different goals,

different interests, different emotional problems and different abilities. We cannot afford to ignore these individual differences in imparting education to children. Since school work is planned on group basis it presents a formidable challenge to all teachers.

Hence some practical procedures for adapting school work to individual differences are suggested:

1. Limited size of the class:

Generally there are 50 or more than 50 students in a class. In such a large class, it is not possible for the teacher to pay individual

attention to the students. The size of the class should be small. It should be divided into various units so that after class-room work their various difficulties may be found out.

2. Proper division of the class:

Now there are separate classes for the students, who have different intelligence.

While bringing about this classification, the teacher should keep in mind the difference in age, interests, emotional and social qualities.

3. Home task:

The teacher should assign home task to the students while keeping in view the individual differences.

4. Factor of sex:

Boys and girls are to play different roles in society. Hence the factor of sex should be kept in mind.

5. Curriculum:

The curriculum should be modified to suit the needs of all types of children. A large number of subjects should be included in the curriculum so that education can be provided to each child according to his interests, needs and abilities. Curriculum should not be rigid but it should be flexible.

6. Methods of Teaching:

Methods of teaching should be chosen on the basis of individual differences. It is not advisable to use the same method of education in the case of all children-gifted or backward.

7. Educational Guidance:

Teacher should impart educational guidance to the students while keeping in view their individual differences. He can assist them in the selection of educational career, selection of subjects, selection of books, selection of hobbies and co-curricular activities and in many other areas connected with education.

Task2: How are individual differences taken into account in our schools and educational institutions?

Chapter 2 : How to measure individual differences :

As we will see later, there are a lot of statistical methods which measure individual differences such as:

Standard deviation

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Deciles

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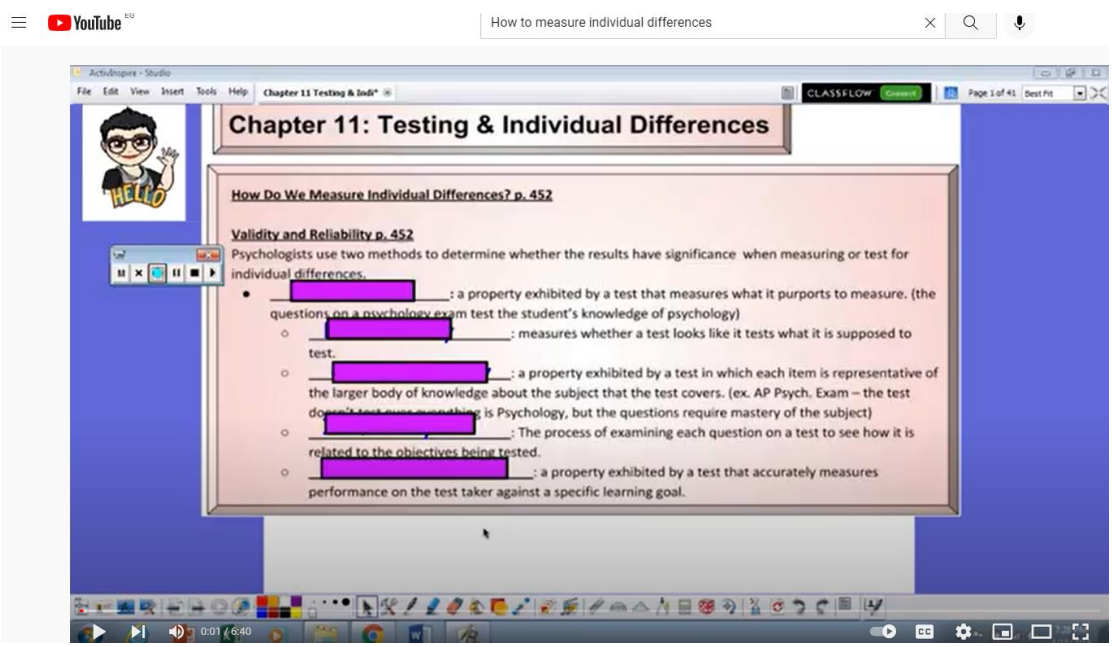
Normal curve

Individual Differences_4GE

https://www.youtube.com/watch?v=cjeJPalNE84



1. (σ) Standard Deviation

2. (σ^2) Variance

3. Range

4. a.Percentiles (Centiles) (C)

b.Deciles (D)

c. Quartiles(Q)

5. Coefficient of Variance(COV)

6. a. Z-score

b. T-score

7. Normal Curve

How to measure individual Differences

There are certain methods which is used to measure individual differences including:

Standard Deviation , Variance, Range, Percentiles , Deciles, Quartiles , Interquartile range ,coefficient of variance ,Z score , T score & Normal curve.

1.Standard Deviation :

- **The most important measure of dispersion, because it is the kernel for calculating other measures of dispersion that are important in interpretation, including variance , coefficient of variation, z score & t score .**

- **Take into account all of data.**

- **It is used in calculating the Pearson correlation , ANOVA, MANOVA, Prediction , and so on .**

STANDARD DEVIATION

standard deviation is a way to measure the dispersion in a given data set—that is, how spread out the values are. Standard deviation is found by calculating the mean of a group of values, then using a type of averaging to determine how far away the other values in the group are from that mean. If the values in the group are all relatively close to the mean, then the standard deviation is low. Conversely, the more spread out the values are relative to the mean, the higher the standard deviation. For example, consider these two groups of values:

Set A: {0, 25, 50, 75, 100}
Set B: {48, 49, 50, 51, 52}

Both sets have five distinct values, and both have a mean of 50. But because the values in Set A are more widely dispersed (as much as 50 units away from the mean) than the values in Set B (all of which are within 2 units of the mean), Set A has a greater standard deviation than does Set B.

Note

- **The standard deviation can not take negative value.**
- **If the values are equal , then the standard deviation will be zero .**
- **The more the standard deviation is far from zero , the more the individual differences will be.**

So , we can formulate standard deviation as follow:

$$\sigma = \sqrt{\frac{\Sigma (X - \overline{X})^2}{n - 1}}$$

Where σ denote to standard deviation

$\sum$ denote to summation

X the values of each person (student or whatever …).

$\bar{x}$ the average or mean of the all values .

n the number of values , in other words the number of cases (persons , students , or whatever).

Note

Task3: The previous formula of S. D. is not the only one , but there are other formulas which lead to the same result .

Can you search to find out that ?

Example: A researcher applied a test concerning the ability to remember with a total score of 10 on five

children of kindergarten, whose scores were as

follows : 2-8-1-3-1:calculate the standard deviation .

The Manual Method:

Step. 1: Calculate the average of scores as follows :

$$\overline{X} = \frac{\sum X}{N}$$

$$\overline{X} = \frac{15}{5} = 3$$

Step.2: using x^- = 3, we can calculate σ as follows:

$(x-x^-)^2$	$x-x^-$	x
1	1-	2
25	5+	8
4	2-	1
0	0	3

4	2-	1
$\sum(x-\bar{x})^2=34$	$\sum(x-\bar{x})=0$	$\sum X=15$

Step. 3 : The previous table indicates that:

، $\sum(x-\bar{x})^2=70$, Thus:

$$\sigma = \sqrt{\frac{\Sigma\,(X-\overline{X})^2}{n-1}}$$

$$\sigma = \sqrt{\frac{34}{4}}$$

$$= 2.92$$

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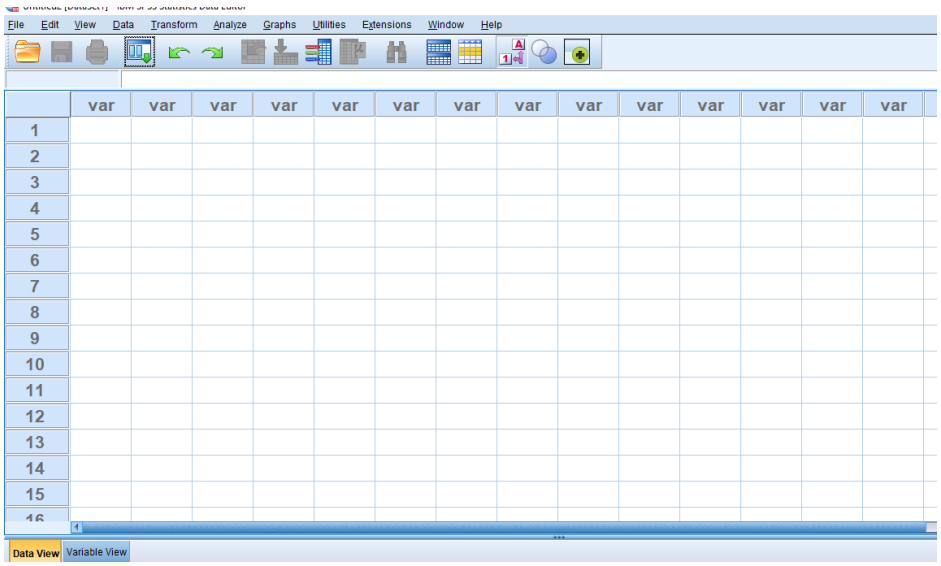
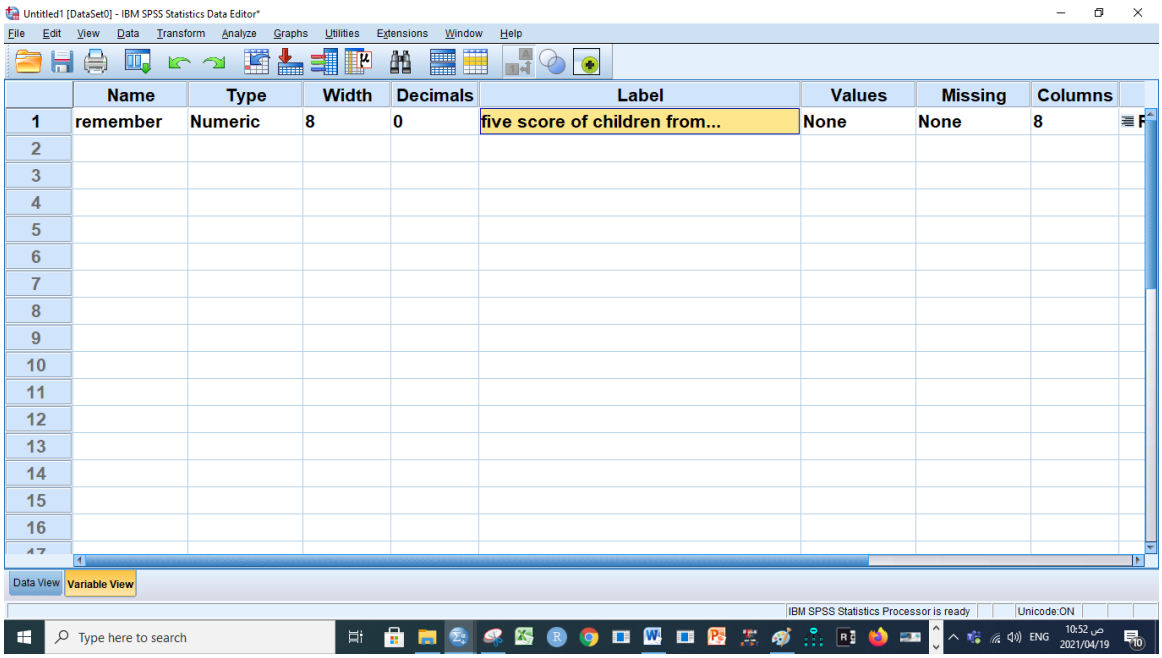
Using SPSS :

SPSS is a program which is used to execute a lot of statistical tools .



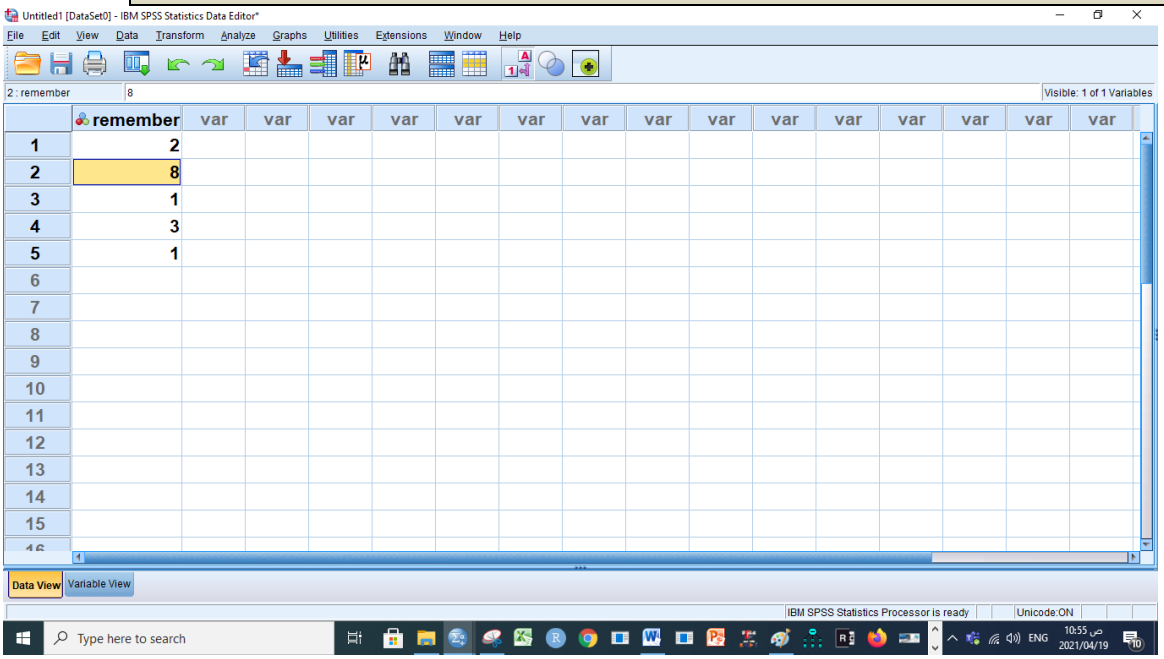
Task4: Evaluate yourself: there are two names of the spss , one ancient , and the other current , can you write the two names?

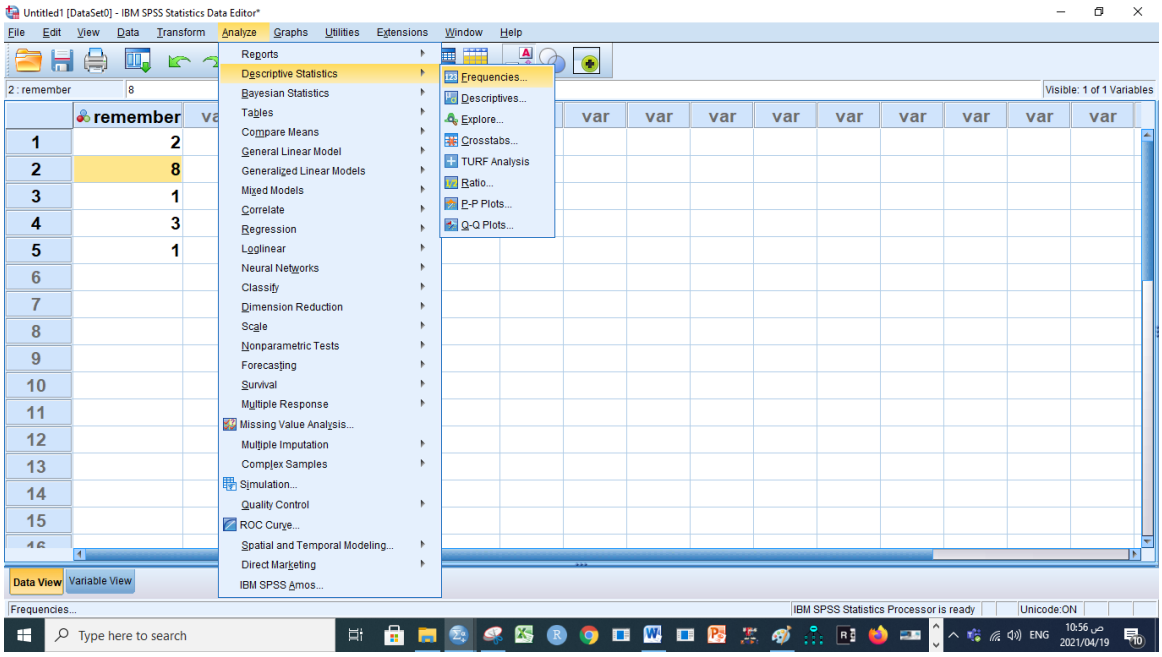
We can use spss to calculate the standard deviation of the previous data , as follows:



Task5: Evaluate yourself: What are the controls

for writing the name?

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Forecasting
Survival
Multiple Response
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Complex Samples
Simulation...
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ROC Curve...
Spatial and Temporal Modeling...
Direct Marketing
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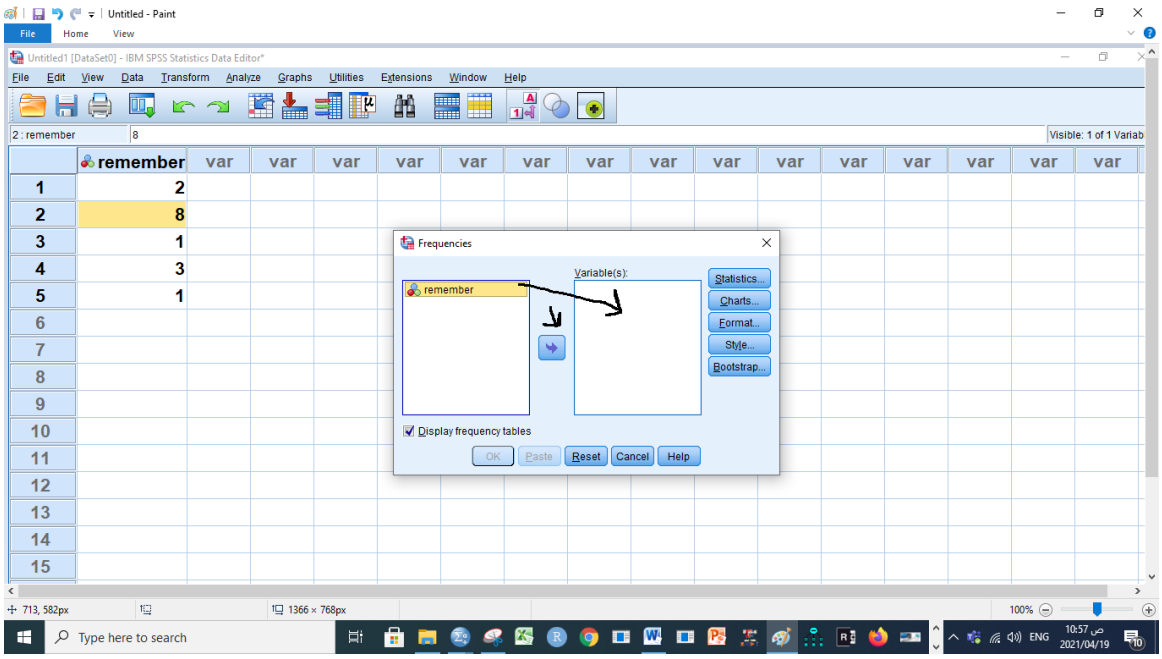
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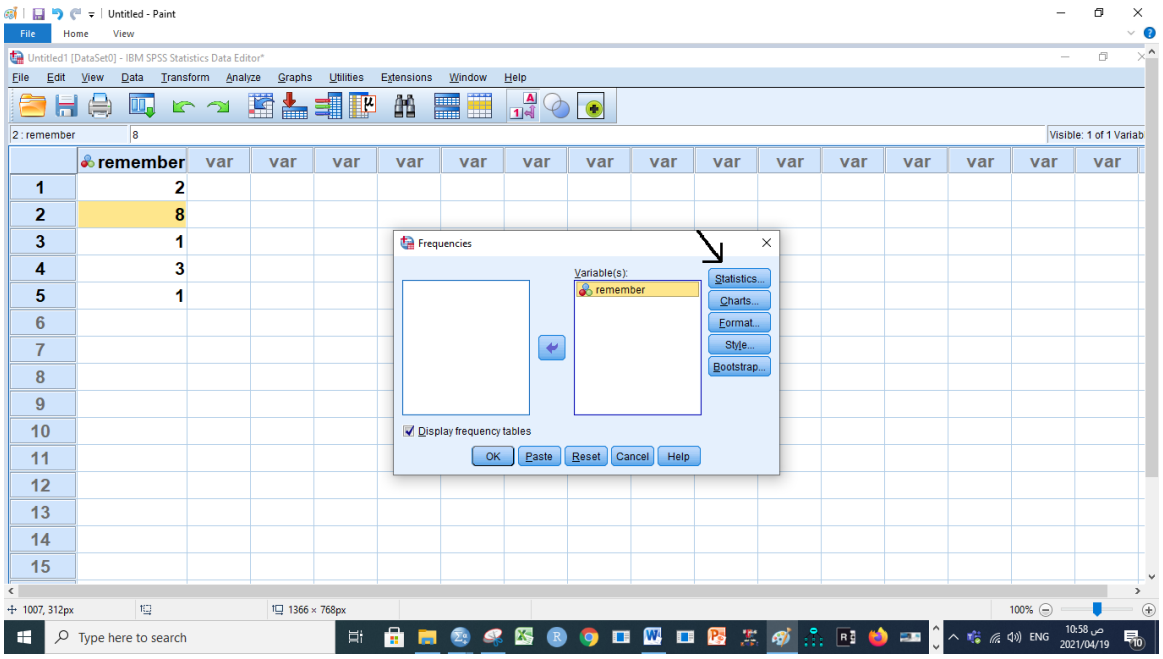
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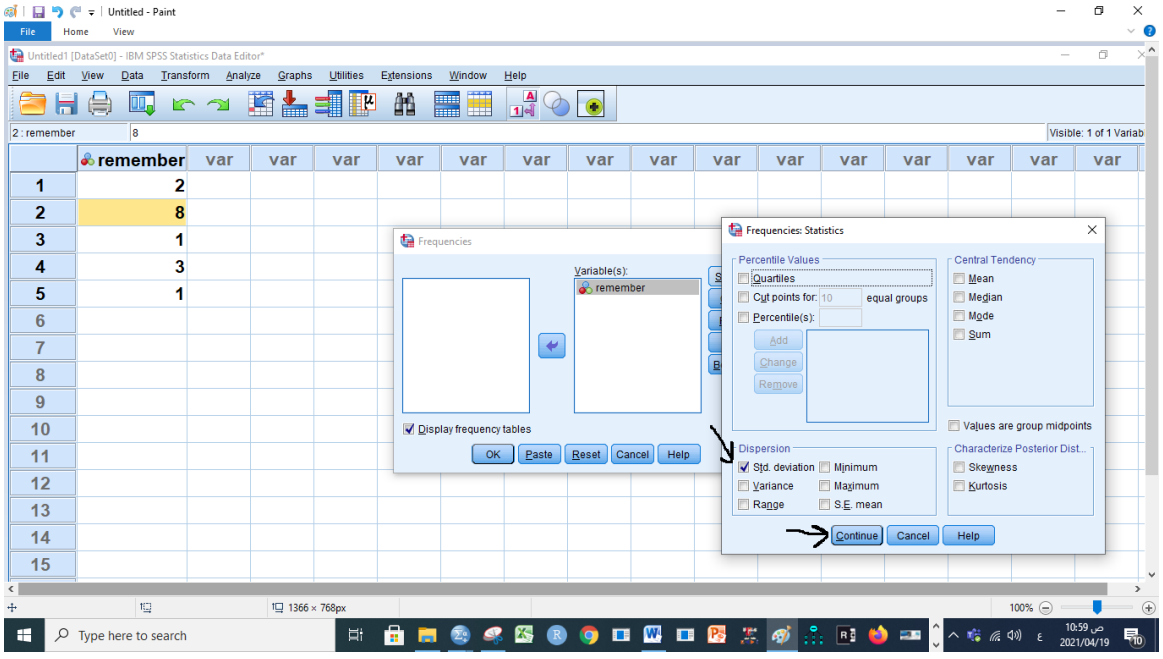
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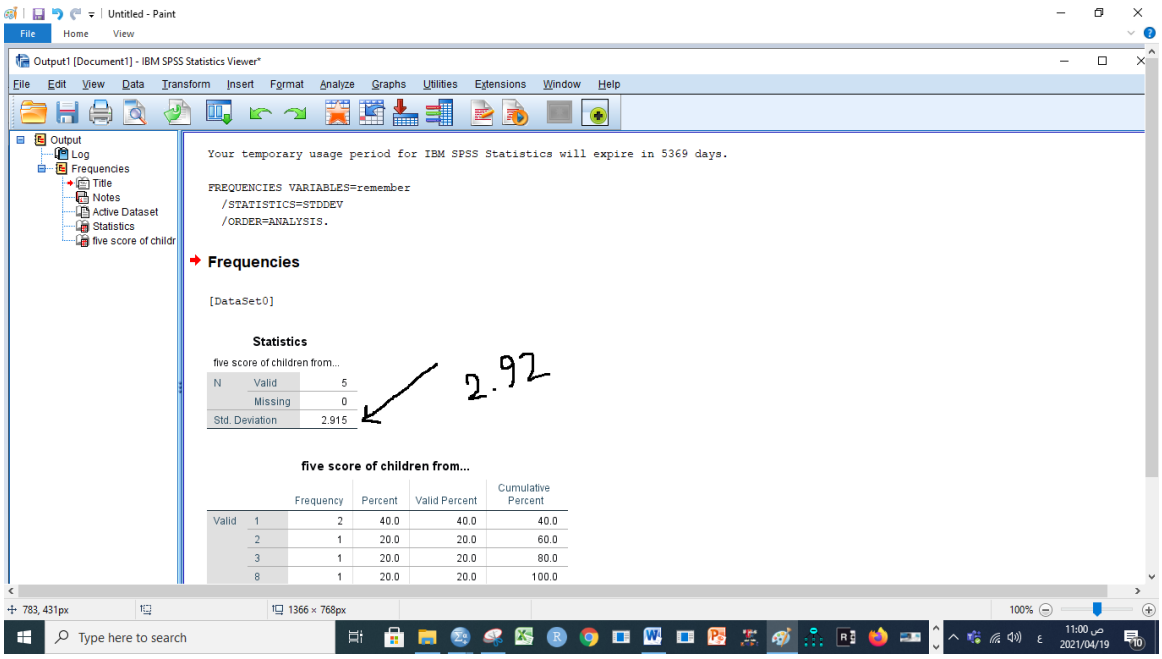


Comparing the manual method with spss:

We conclude that: the two methods lead to the same result , that σ =2.92, which mean that there is a discrepancy among scores equal two units and 0.92 form the unit , so there is some thing from the

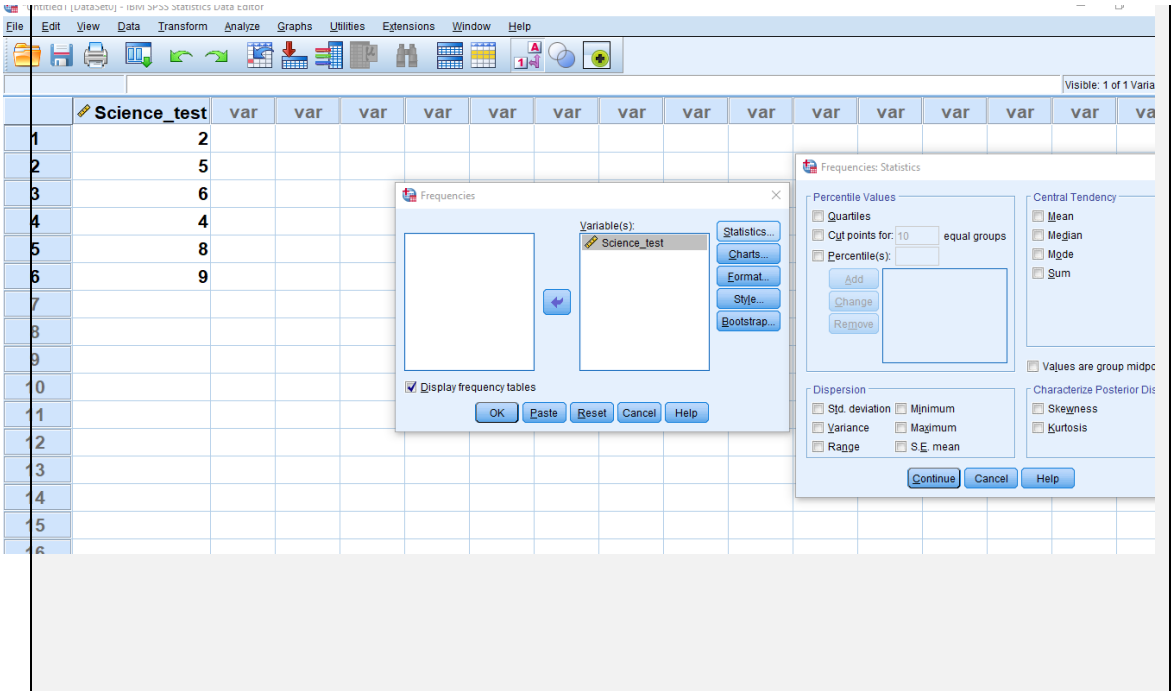
individual differences among the children concerning

the ability to remember .

Task6: a. calculate manually the SD of the following data :

4-2-6-9-1-7

b. From the following screen , what is the next step to calculate the SD?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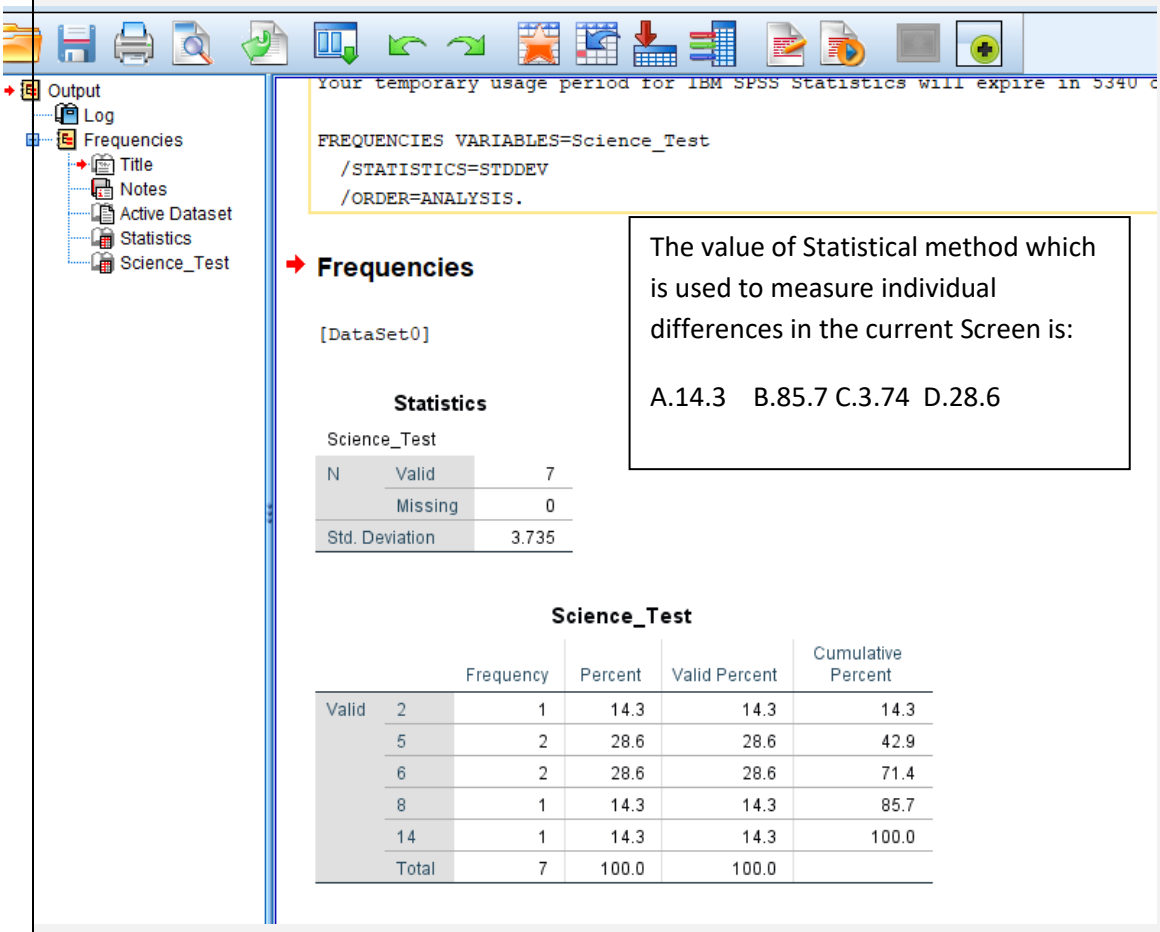
c.



The value of Statistical method which is used to measure individual differences in the current Screen is:

A.14.3 B.85.7 C.3.74 D.28.6

2.Variance :

It is the square of standard deviation (σ^2).

If we have data which its standard deviation $\sigma = 6$,

then the variance = $6^2 = 36$.

- **The variance is the square of standard deviation , it is the other side of standard deviation , that in the time which the standard deviation is used in calculation Pearson correlation &regression , the variance is used in calculation ANOVA, MANOVA , T test , and so on.**

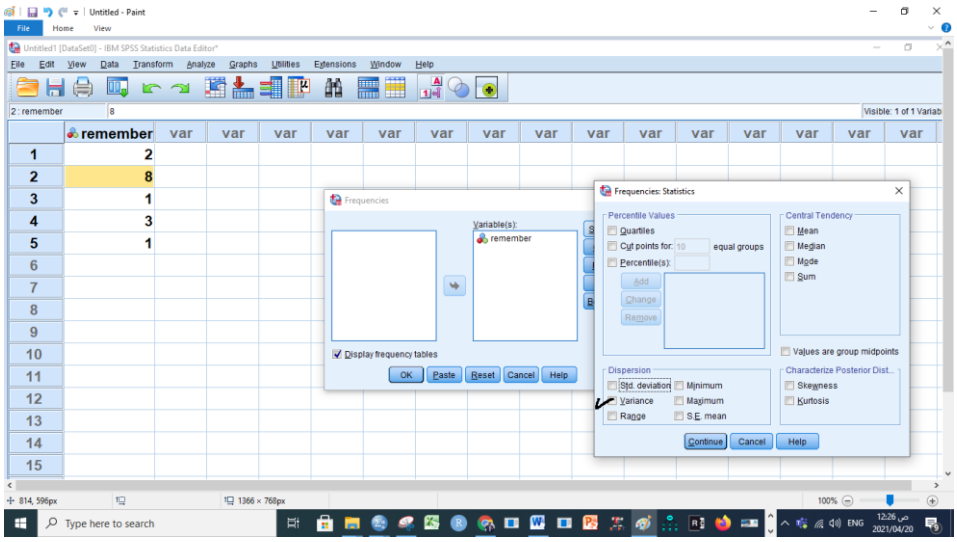
- **The formula of variance:**

$$\sigma^2 = \frac{\Sigma (X - \overline{X})^2}{n - 1}$$

- **So, if we want to calculate variance manually , we will follow the same steps of calculation the standard deviation without the square root in the formula .**

Using spss in calculating variance:

We will follow the same steps of the standard deviation , but we will tick on the front of variance instead of standard deviation , in the following dialog :



Note: using the previous dialog ,you can tick on a lot of options in same time ,for example , you can tick on standard deviation , variance & range at once in the same time , and so on .

Note : The steps which are followed to calculate standard deviation using spss are the same steps for calculating other methods such as: variance , range , percentiles , deciles , quartiles & coefficient of variance

Example: calculate the variance of the scores in the previous example.

Example: A researcher applied a test concerning the ability to remember with a total score of 10 on five children of kindergarten, whose scores were as follows : 2-8-1-3-1:calculate the standard deviation .

The manual Method:

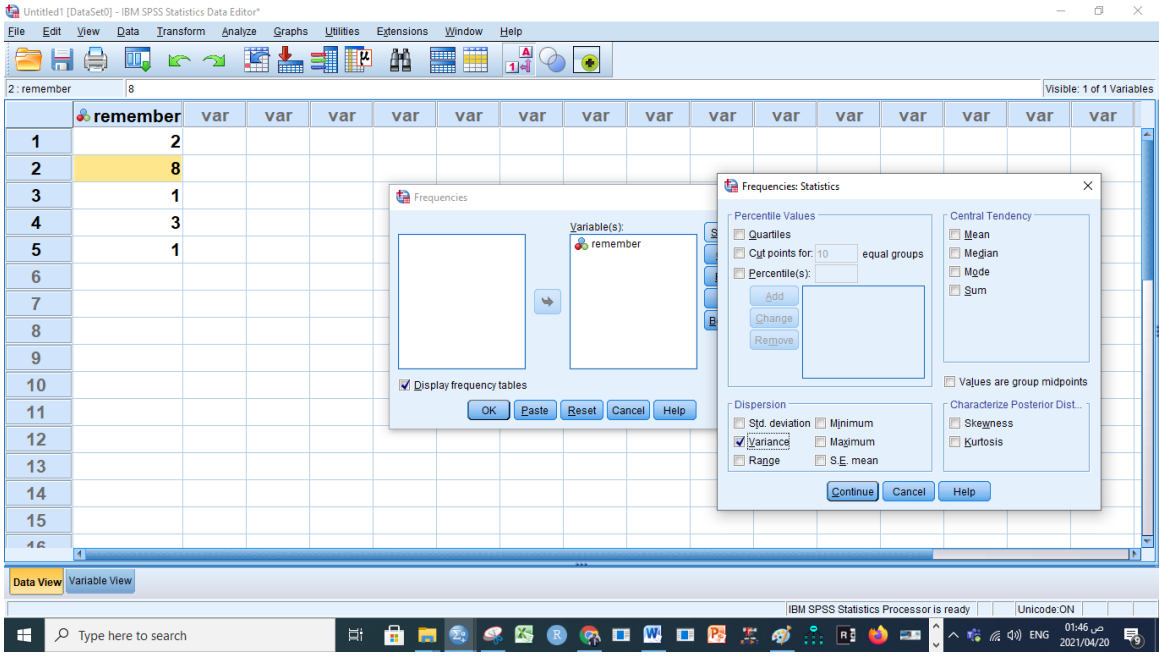
$$\sigma^2 = \frac{34}{4} = 8.5$$

Using spss : the same steps which are used to calculate the standard deviation , except ticking on the variance in the following dialog box, and after that clicking on

continue , and ok in the next dialog box , to

get the output window which contains the

value of variance as follows :



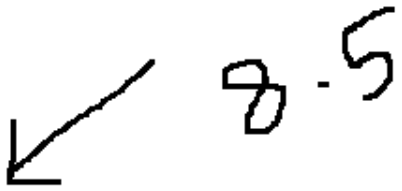
```
FREQUENCIES VARIABLES=remember
  /STATISTICS=VARIANCE
  /ORDER=ANALYSIS.
```

Frequencies

Statistics

five score of children from...

N	Valid	5
	Missing	0
Variance		8.500



five score of children from...

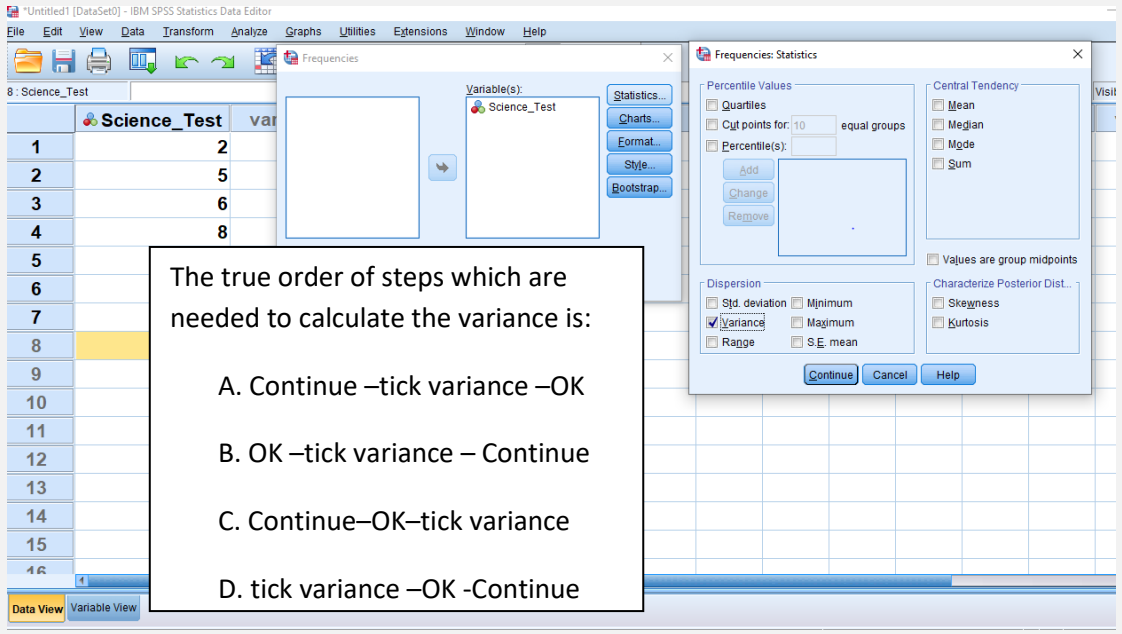
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	2	40.0	40.0	40.0
	2	1	20.0	20.0	60.0
	3	1	20.0	20.0	80.0
	8	1	20.0	20.0	100.0
	Total	5	100.0	100.0	

Comparing the manual method with spss:

We conclude that: the two methods lead to the same result , that σ^2 =8.5, which means that there is a discrepancy among scores equal two units and 0.92 form the unit , so there is some thing from the individual differences among the children concerning the ability to remember .

Task7 : a. If you have data which its variance is 17 , what is the SD of this data .

b.



The true order of steps which are needed to calculate the variance is:

A. Continue –tick variance –OK

B. OK –tick variance – Continue

C. Continue–OK–tick variance

D. tick variance –OK -Continue

3.Range [1]:

In statistics, the **range** is the spread of your data from the lowest to the highest value in the distribution. It is a commonly used measure of variability.

Calculate the range

[1] https://www.scribbr.com/statistics/range/

The formula to calculate the range is:

$$R = H - L$$

- R = range
- H = highest value
- L = lowest value

The range is the easiest measure of variability to calculate. To find the range, follow these steps:

1. Order all values in your data set from low to high.
2. Subtract the lowest value from the highest value.

How useful is the range?

The range generally gives you a good indicator of variability when you have a distribution without extreme values.

But the range can be misleading when you have outliers in your data set. One extreme value in the data will give you a completely different range.

Example : calculate the range of the following data:

Participant	1	2	3	4	5	6	7	8
Age	37	19	31	29	21	26	33	36

The manual method:

Step1 : .

Order all values in your data set from low to high, as follows:

Age	19	21	26	29	31	33	36	37

Step1 : .

- Subtract the lowest value from the highest value, as follows:

$$R = H - L$$

$$R = 37 - 19 = 18$$

The range of our data set is **18 years**.

Note: Range example with an outlierOne value in your data set is replaced with an outlier.

Age	19	21	26	29	31	33	36	61

Using the same calculation, we get a very different result this time:

$$R = H - L$$

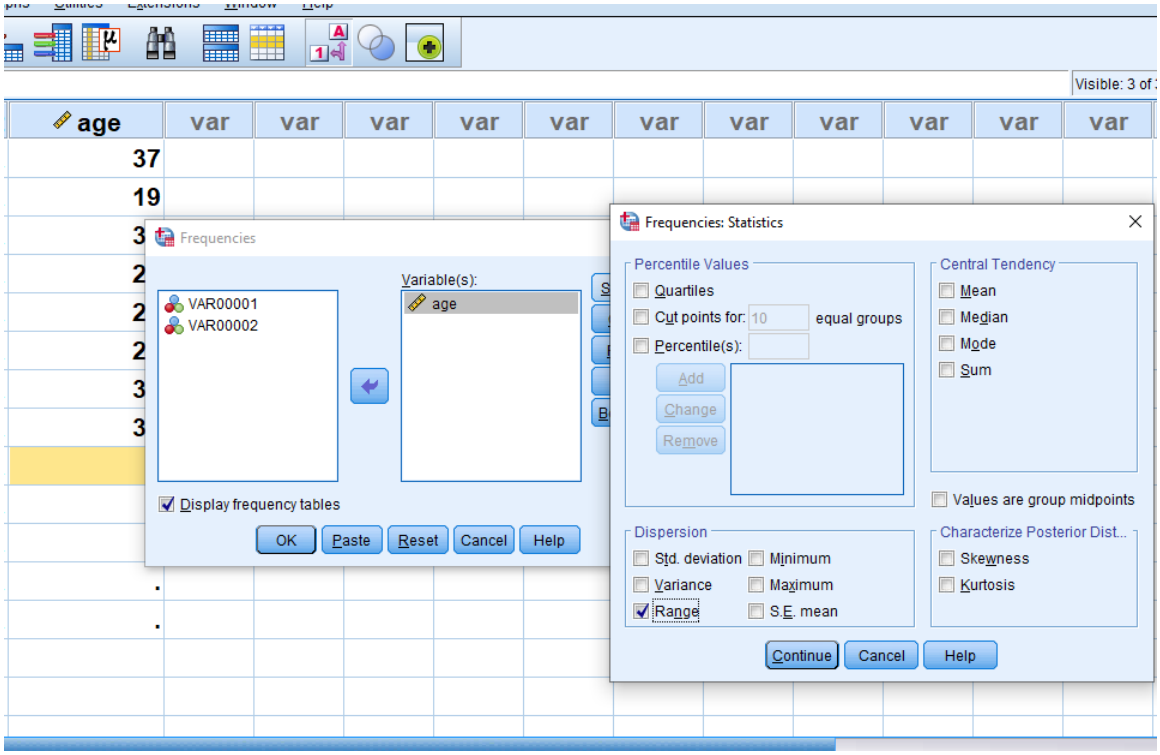
R = 61 – 19 = **42**

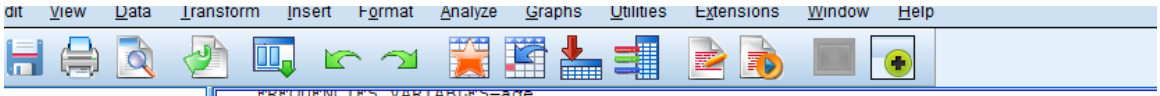
With an outlier, our range is now **42 years**.

https://www.dkfindout.com/us/math/averages/range/

Using spss : As we knew previously that ,

the steps which are followed to calculate standard deviation using spss are the same steps for calculating other methods such as: range, except we will tick on the front of range , after that , continue + ok , to get the value of the range , as follows:


Visible: 3 of
age
var
37
19
Frequencies
VAR00001
VAR00002
Variable(s):
age
Display frequency tables
OK
Paste
Reset
Cancel
Help
Frequencies: Statistics
Percentile Values
Quartiles
Cut points for: 10 equal groups
Percentile(s):
Add
Change
Remove
Central Tendency
Mean
Median
Mode
Sum
Values are group midpoints
Dispersion
Std. deviation
Minimum
Variance
Maximum
Range
S.E. mean
Characterize Posterior Dist...
Skewness
Kurtosis
Continue
Cancel
Help



Output
- Log
- Frequencies
  - Title
  - Notes
  - Statistics
  - age

```
FREQUENCIES VARIABLES=age
  /STATISTICS=RANGE
  /ORDER=ANALYSIS.
```

Frequencies

Statistics

age

N	Valid	8
	Missing	5
Range		18

age

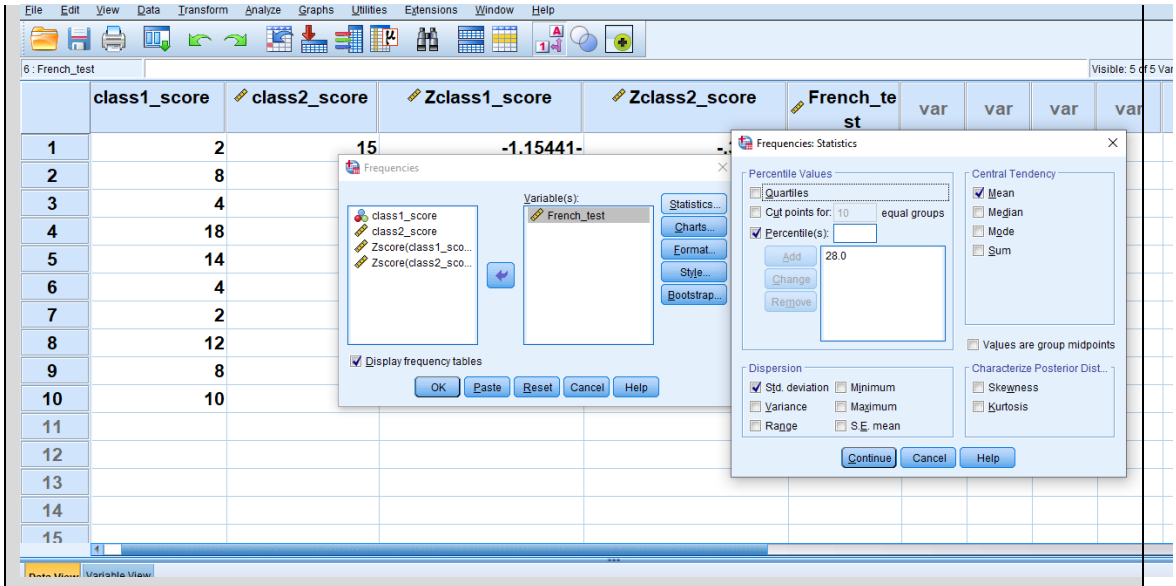
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	19	1	7.7	12.5	12.5
	21	1	7.7	12.5	25.0
	26	1	7.7	12.5	37.5
	29	1	7.7	12.5	50.0
	31	1	7.7	12.5	62.5
	33	1	7.7	12.5	75.0
	36	1	7.7	12.5	87.5
	37	1	7.7	12.5	100.0
	Total	8	61.5	100.0	
Missing	System	5	38.5		
Total		13	100.0		

Task8: A teacher applied a French test on 7 students and their scores were as follows:

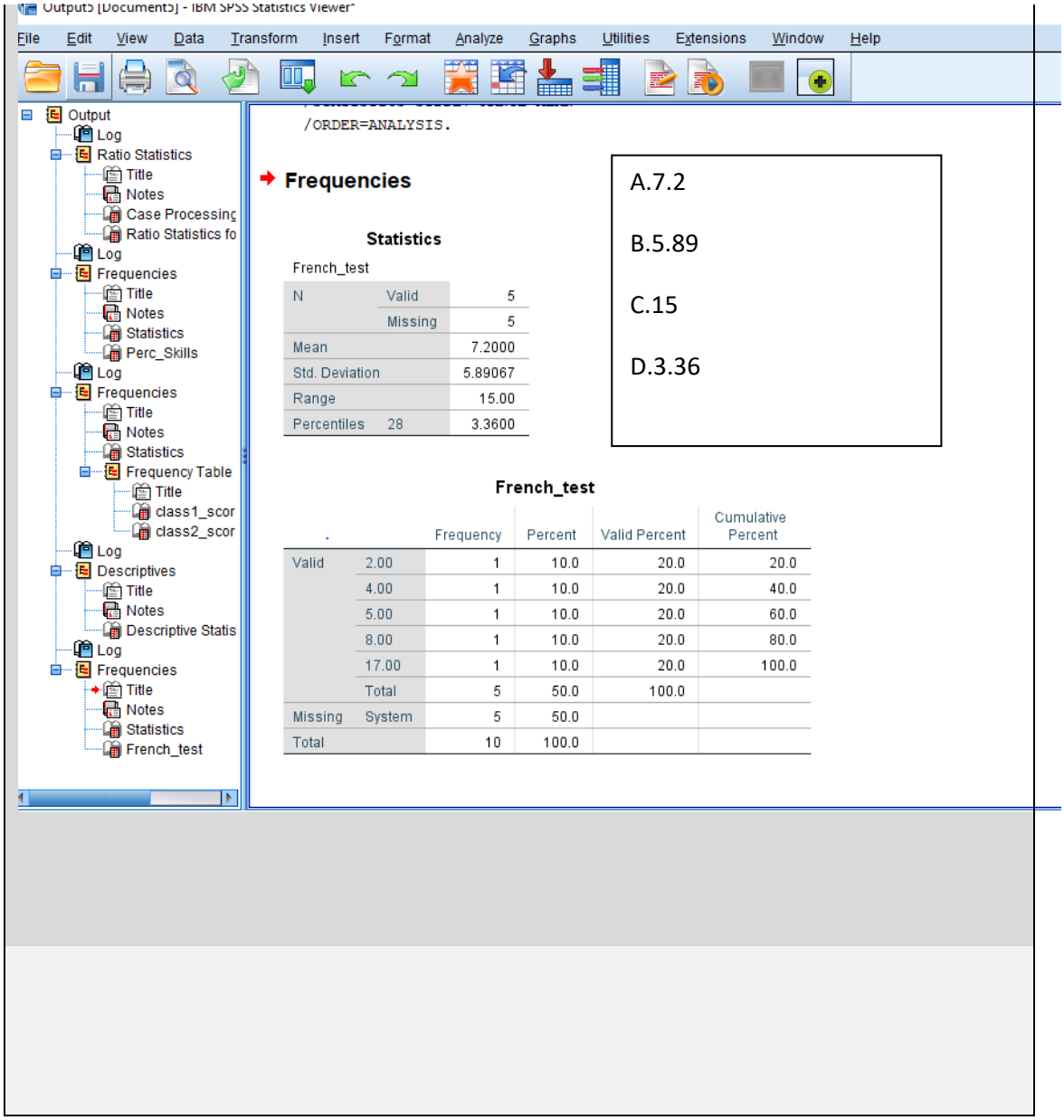
5-2-17-8-4

a.Use the range manually to measure individual differences, explaining whether there are extreme values in the distribution.

b. What are the remaining steps to show the range value in the following screen?



c.From the following screen, the value of statistical tool which is difference between the high score and low score is:?


Output5 [Document5] - IBM SPSS Statistics Viewer
File Edit View Data Transform Insert Format Analyze Graphs Utilities Extensions Window Help
Output
Log
Ratio Statistics
Title
Notes
Case Processing
Ratio Statistics fo
Log
Frequencies
Title
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Statistics
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Frequencies
Title
Notes
Statistics
Frequency Table
Title
class1_scor
class2_scor
Log
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Notes
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Title
Notes
Statistics
French_test
/ORDER=ANALYSIS.
Frequencies
Statistics
French_test
N Valid 5
Missing 5
Mean 7.2000
Std. Deviation 5.89067
Range 15.00
Percentiles 28 3.3600
French_test
Valid 2.00 1 10.0 20.0 20.0
4.00 1 10.0 20.0 40.0
5.00 1 10.0 20.0 60.0
8.00 1 10.0 20.0 80.0
17.00 1 10.0 20.0 100.0
Total 5 50.0 100.0
Missing System 5 50.0
Total 10 100.0
A.7.2
B.5.89
C.15
D.3.36

4.Percentiles or Centiles /Deciles/Quartiles :

a. Percentiles(or Centiles): 99 points divide the data into 100 parts (or groups), after arranging the data in ascending or descending order, each point is called percentile(or centile). Each percentile is denoted by the symbol C in relation to the centiles, for example the 38th percentile is symbolized by the symbol C38 and the 90th

percentile symbolized by the symbol C90 and so on.

Each percentile divides the data into two parts, the first part starts from the percentile & less and the other part after the percentile.

Example: The 35th percentile means score from which 35% of the number of data falls and then 65% of the number of data exit .

The 77th percentile means the score from which

77% of the number of data is located, and then

23% of the number of data exit.

https://www.statisticshowto.com/probability-and-

/statistics/percentiles-rank-range

Note: try to differentiate among three concepts:

(1)the number of Centile, (2) the order of Centile , &

(3) the value of Centile . you can recognize the

differences among these concepts in the following

example, so take care.

Example: calculate the value of C28 , for the

following data for achievement the subject of

Geometry : 7-9-14-5-4-13-19-16 -15-10-14-13-11 .

Solution :

Note: remember that we have 99 Centiles , but we want only the value of C28 .

The manual method:

Step1: We arrange the data in ascending or descending order, as usual in ascending order, as follows:

4-5-7-9-10-11-13-13-14-14-15-16-19

Step2: The required Centile order is equal to (Centile number / 100) x (number of data +1).

Centile number =28 (because we want the value of C28).

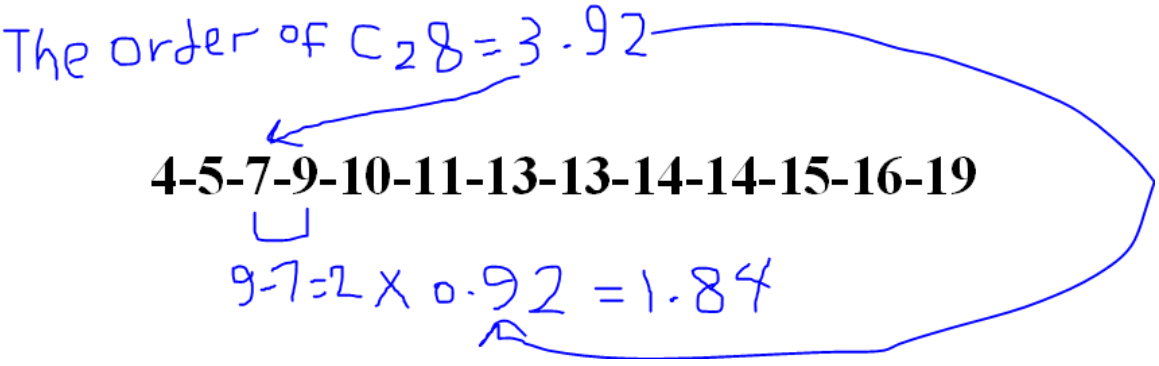
Number of data =13 (you can count the previous data to make sure of that).

So : Centile order=(28/100)×(13+1)=0.28 ×14 = 3.92

Step3: where that the order of C28= 3.92 , so find the the third value in the ascending data which equal =7 , and subtract this value(7) , from the next value (9) to get (9-7)=2, then multiply the last difference by the

decimal in the order(0.92) , to get the product-x

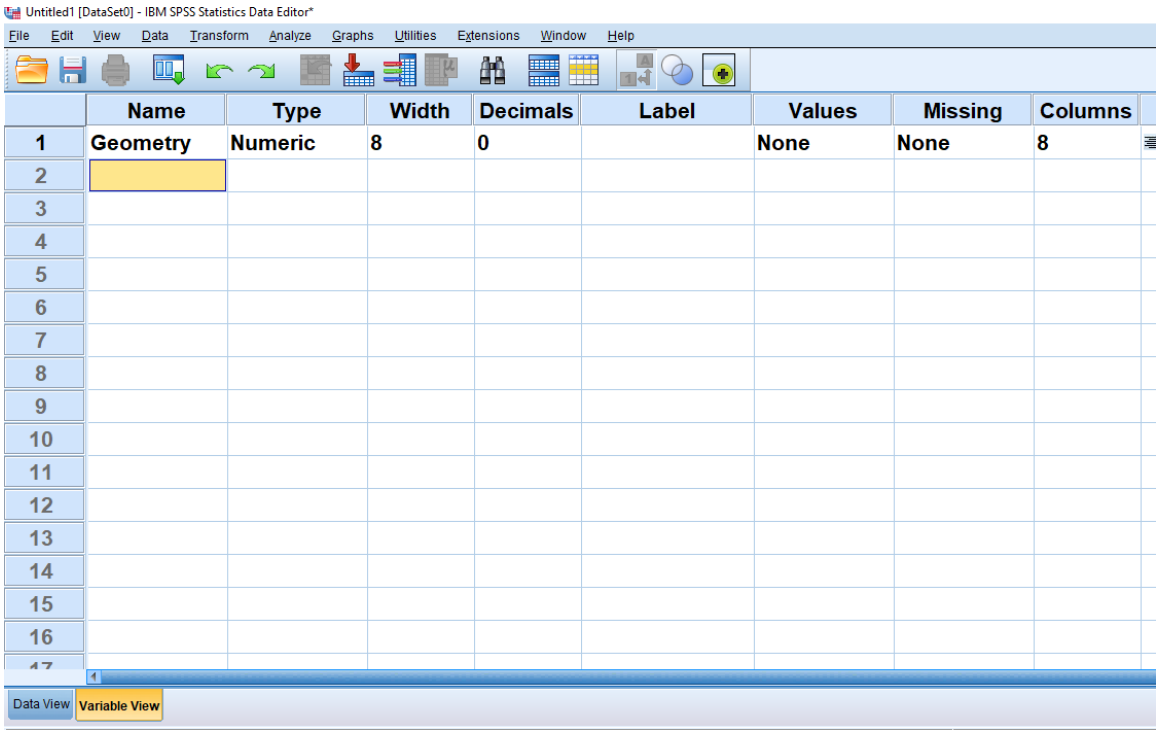
(2×0.92)=1.84 .

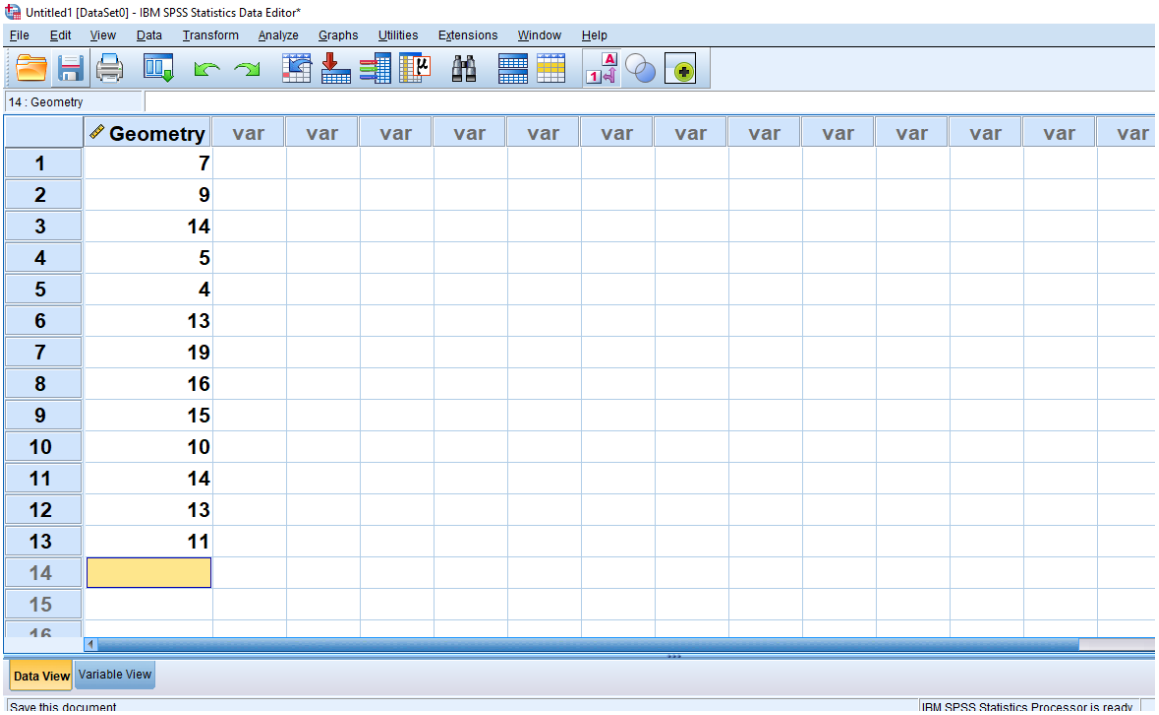


Step 5: Add the value corresponding to the integer number order(3) , which equals 7 , to the product-x which equals 1.84 as follows : 7+1.84 to get the value of centile C28 which equal 8.84 .

Using SPSS :

As we studied previously , the steps for calculating Centiles (and some methods) are the steps for calculating Standard Deviation, so the steps are as follows:




Untitled1 [DataSet0] - IBM SPSS Statistics Data Editor*
File Edit View Data Transform Analyze Graphs Utilities Extensions Window Help
14 : Geometry
Geometry
Data View
Variable View
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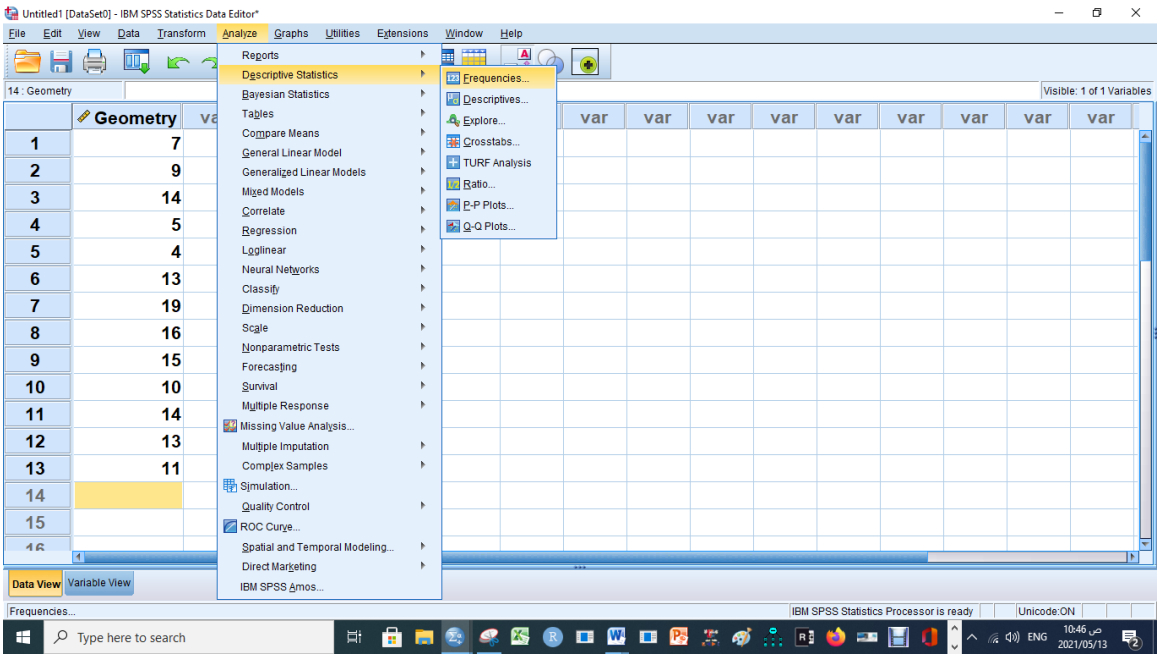
IBM SPSS Statistics Processor is ready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Analyze
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Descriptive Statistics
Bayesian Statistics
Tables
Compare Means
General Linear Model
Generalized Linear Models
Mixed Models
Correlate
Regression
Loglinear
Neural Networks
Classify
Dimension Reduction
Scale
Nonparametric Tests
Forecasting
Survival
Multiple Response
Missing Value Analysis...
Multiple Imputation
Complex Samples
Simulation...
Quality Control
ROC Curve...
Spatial and Temporal Modeling...
Direct Marketing
IBM SPSS Amos...
Frequencies...
Descriptives...
Explore...
Crosstabs...
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Ratio...
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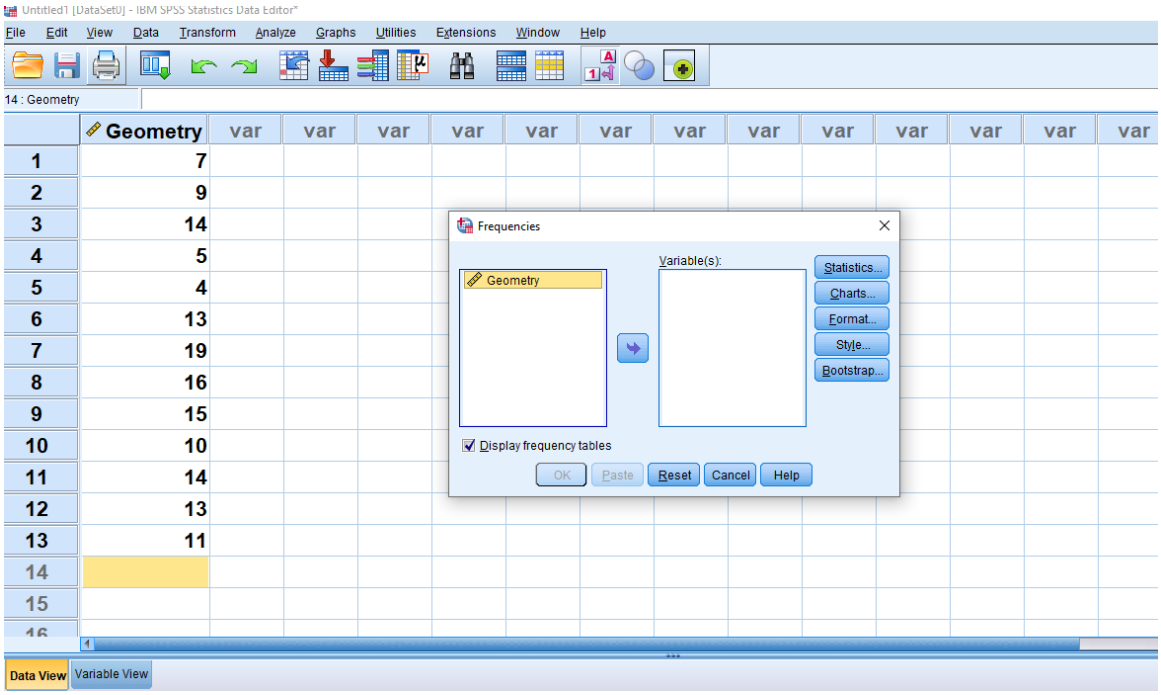
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Format...
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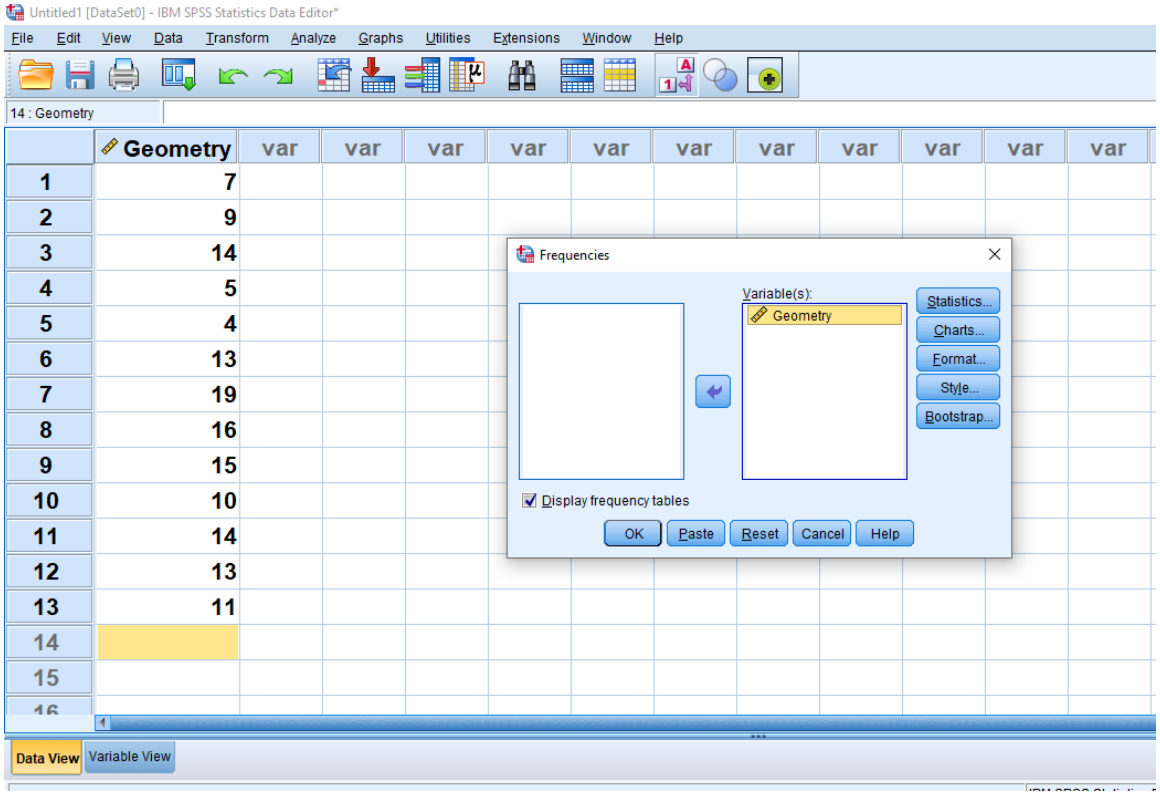
Bootstrap...
Display frequency tables
OK Paste Reset Cancel Help
Data View
Variable View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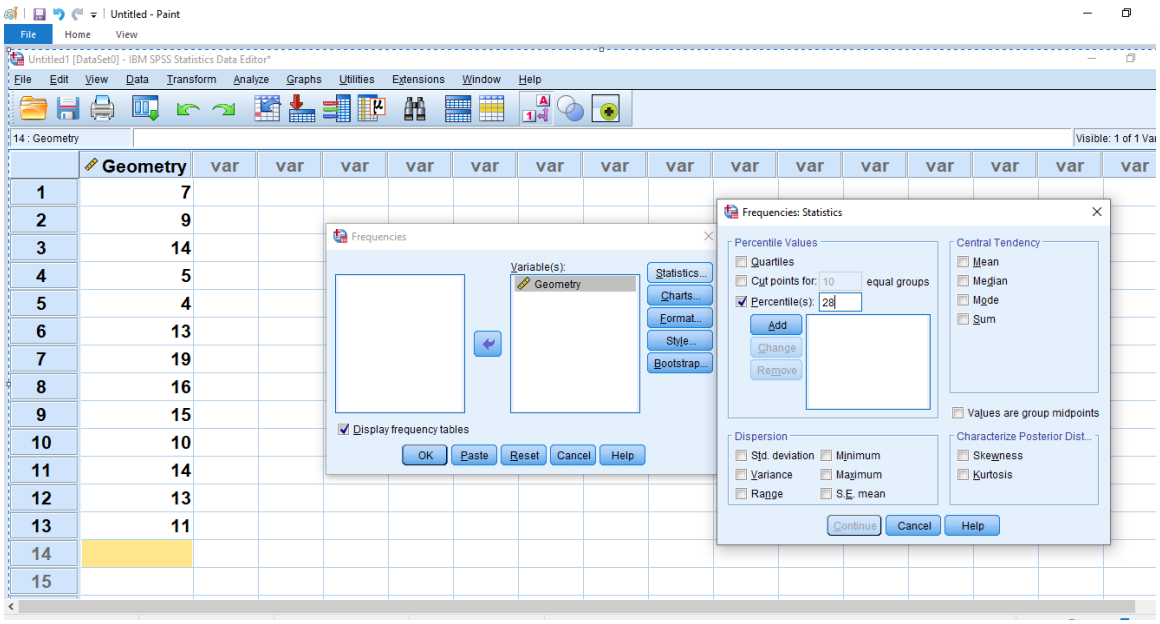
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Untitled1 [DataSet0] - IBM SPSS Statistics Data Editor*
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Frequencies: Statistics
Percentile Values
Quartiles
Cut points for: 10 equal groups
Percentile(s): 28
Add
Change
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Central Tendency
Mean
Median
Mode
Sum
Values are group midpoints
Dispersion
Std. deviation
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Variance
Maximum
Range
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Kurtosis
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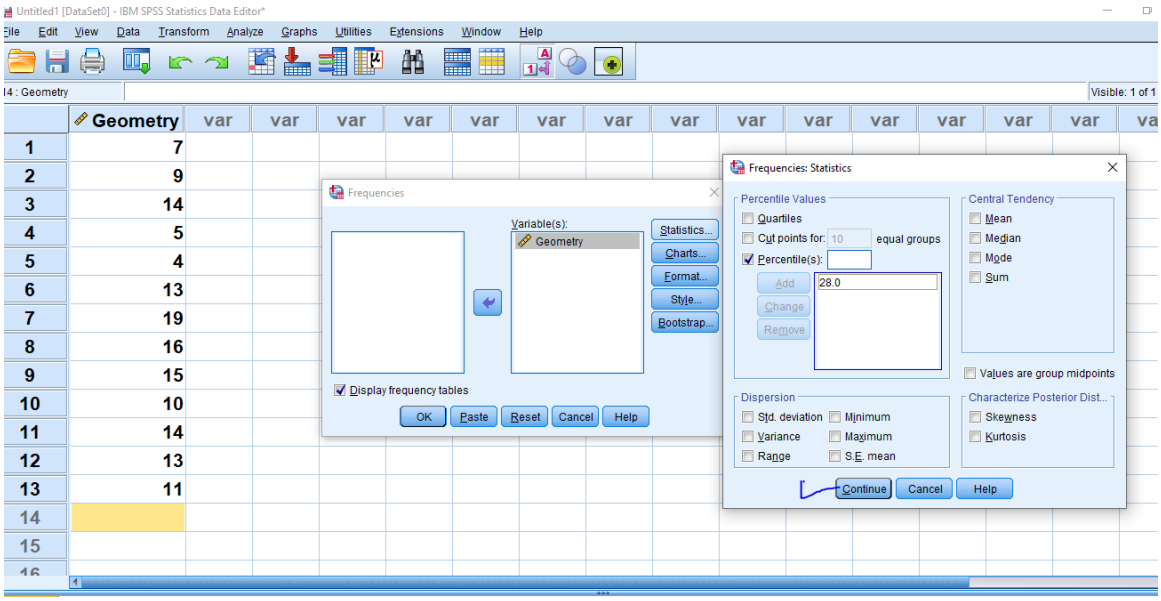
Help


Untitled1 [DataSet0] - IBM SPSS Statistics Data Editor*
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Display frequency tables
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Frequencies: Statistics
Percentile Values
Quartiles
Cut points for: 10 equal groups
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Values are group midpoints
Dispersion
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Variance
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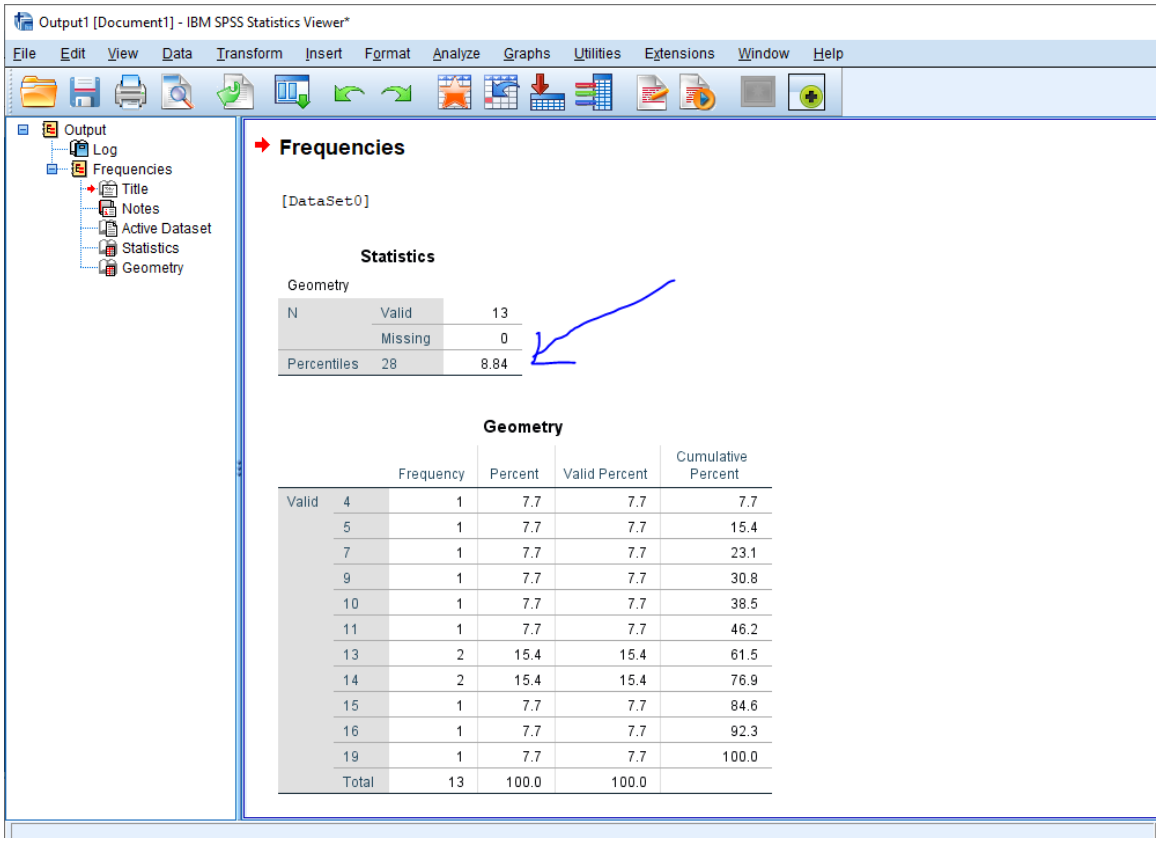
S.E. mean
Characterize Posterior Dist...
Skewness
Kurtosis
Continue
Cancel
Help



https://ezspss.com/how-to-calculate-percentiles-in-spss/

It is the same result which we got using the manual method , that C28 = 8.84 .

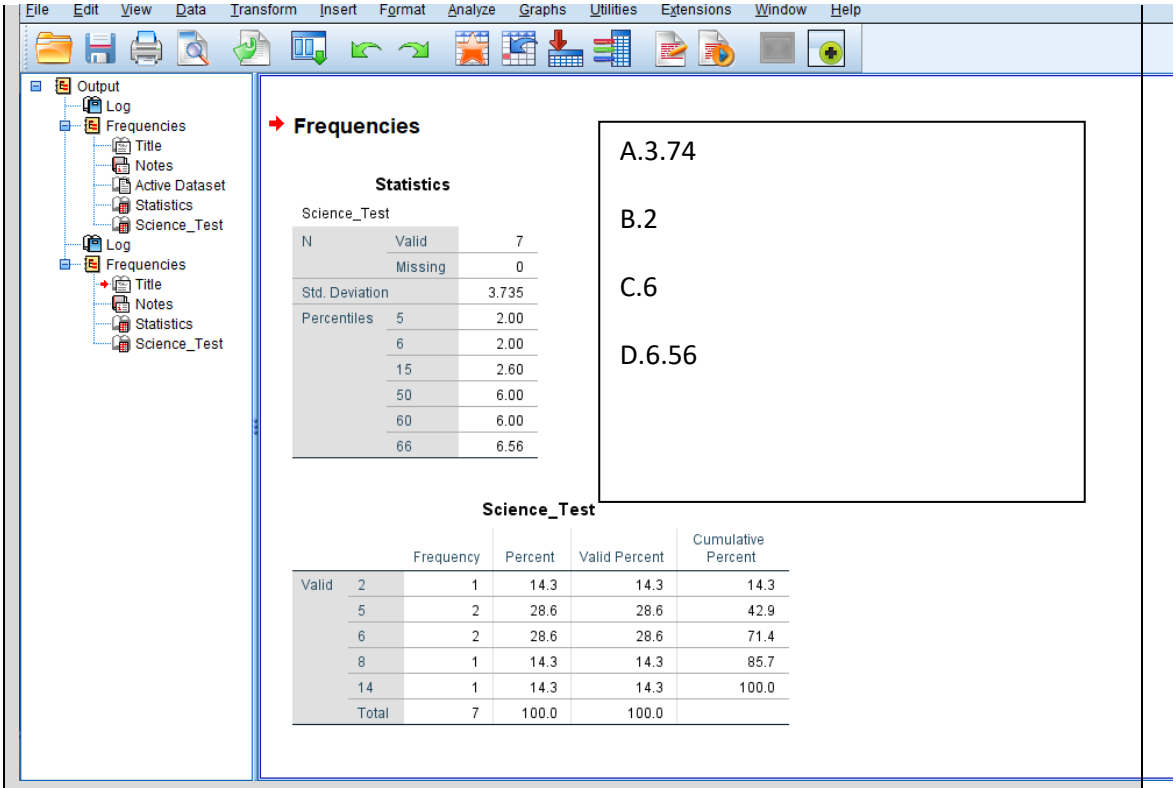
C28=8.84 means that first 28% of the ascending score are 8.8 or bellow, and the rest of the scores are above 8.84 , this may direct the teacher to change his educational practices to move this point as required, to the right or the left.

Task9: A teacher applied an English test on 7 students and their scores were as follows:

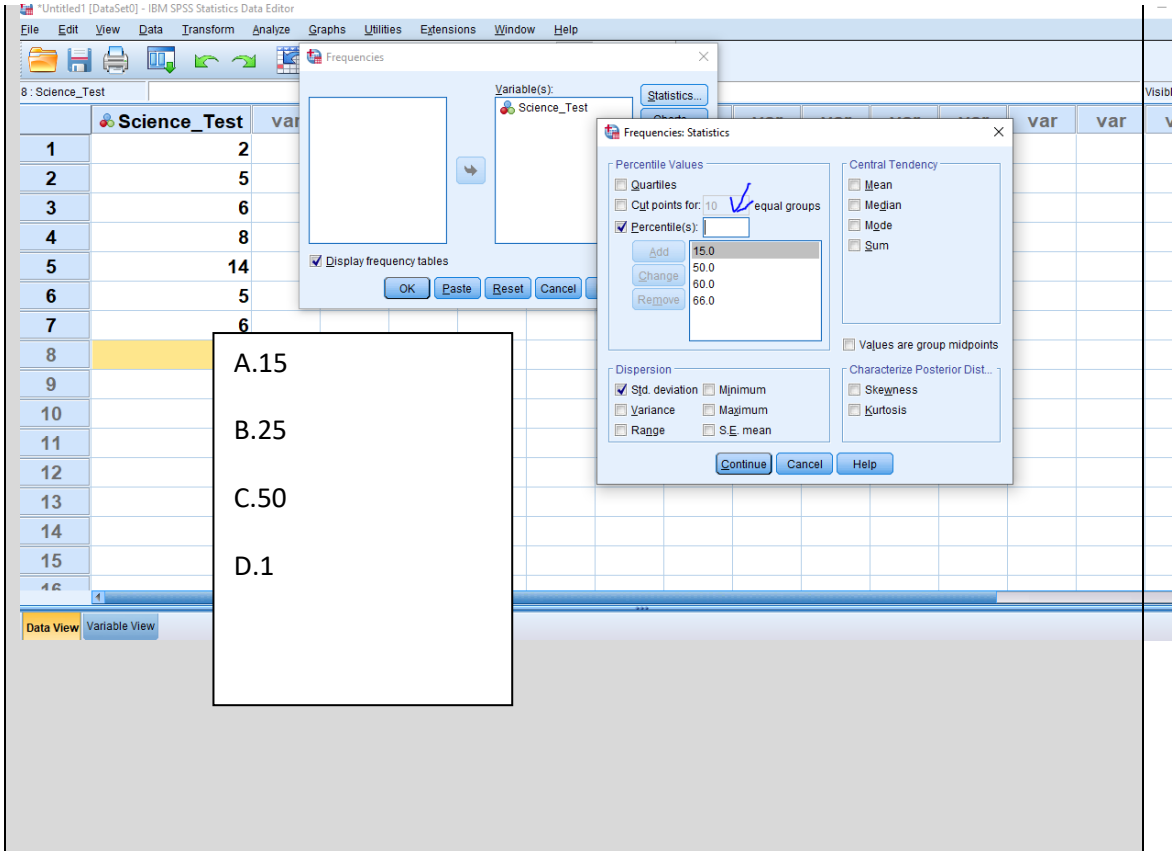
9-1-5-2-4-7-3

a. Calculate manually C43.

b. From the following screen , the value of the D6 =?



c.From the following screen, what is the number you should insert in the indicated cell , to calculate Q1:


*Untitled1 [DataSet0] - IBM SPSS Statistics Data Editor
File Edit View Data Transform Analyze Graphs Utilities Extensions Window Help
8 : Science_Test
Science_Test
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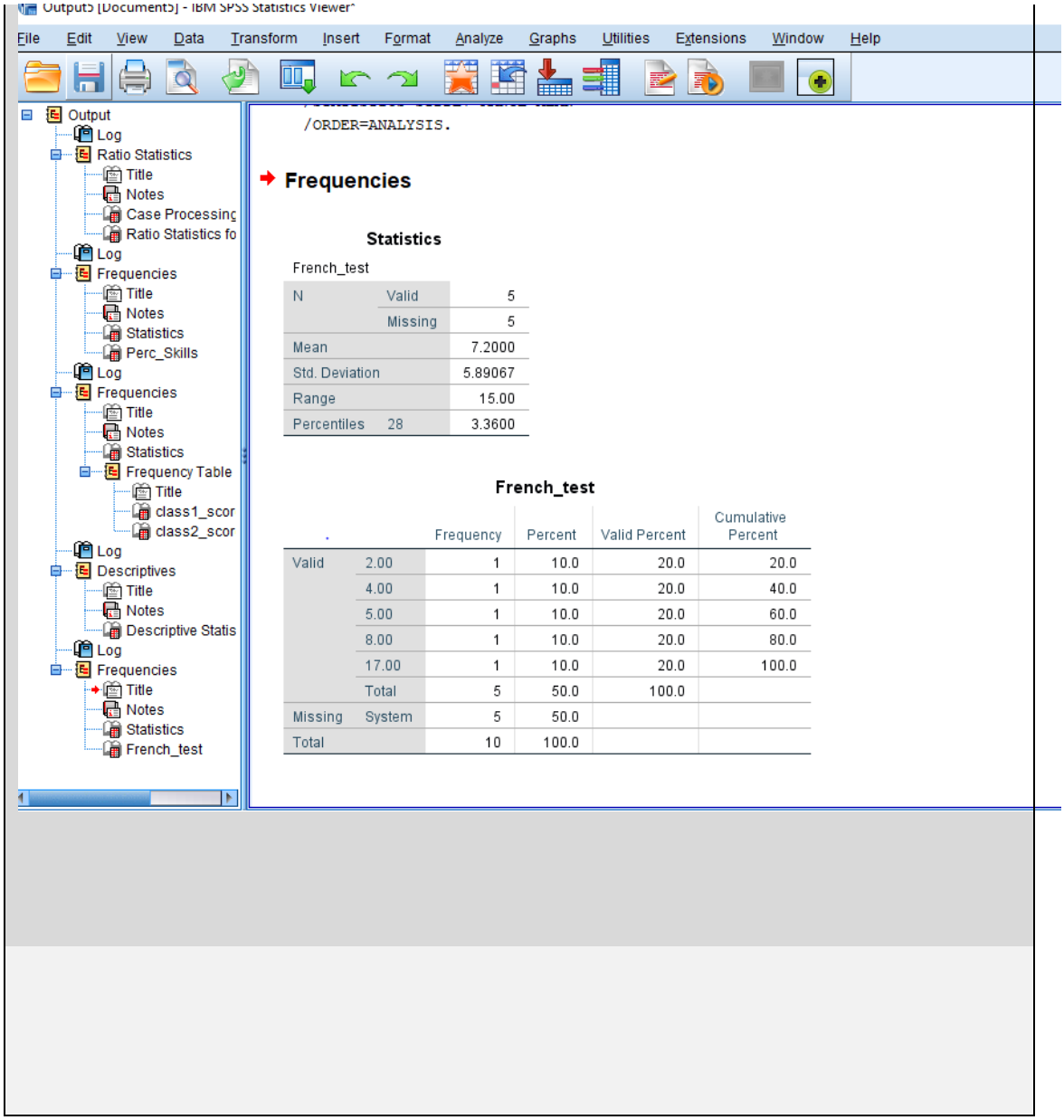
Display frequency tables
OK Paste Reset Cancel
Frequencies: Statistics
Percentile Values
Quartiles
Cut points for: 10 equal groups
Percentile(s):
Add
Change
Remove
15.0
50.0
60.0
66.0
Central Tendency
Mean
Median
Mode
Sum
Values are group midpoints
Dispersion
Std. deviation
Minimum
Variance
Maximum
Range
S.E. mean
Characterize Posterior Dist...
Skewness
Kurtosis
Continue Cancel Help
Data View
Variable View
A.15
B.25
C.50
D.1



b. Deciles: 9 points divide the data into 10 parts (or groups), after arranging the data in ascending or

descending order, each point is called Decile. Each Decile is denoted by the symbol D in relation to the Decile, for example the 3rd Decile is symbolized by the symbol D3 and the 9th Decile is symbolized by the symbol D9 and so on.

Each Decile divides the data into two parts, the first part starts from the Decile & less and the other part after the Decile.

Example: The 4th Decile means score from which 40% of the number of data falls and then 60% of the number of data exit .

The 7th Decile means the score from which 70% of the number of data is located, and then 30% of the number of data exit.

c. Quartiles: 3 points divide the data into 4 parts (or groups), after arranging the data in ascending or descending order, each point is called Quartile. Each Quartile is denoted by the symbol Q in relation to the

Quartile, for example the 2nd Quartile is symbolized by the symbol Q2 and the 1st Quartile symbolized by the symbol Q1 and so on.

Each Quartile divides the data into two parts, the first part starts from the Quartile & less and the other part after the Quartile.

Example: The 2nd Quartile means score from which 50% of the number of data falls and then 50% of the number of data exit .

The 3rd Quartile means the score from which 75% of the number of data is located, and then 25% of the number of data exit.

Note:C10=D1,C20=D2,C25=Q1,C30=D3,C40=D4,C50 =D5=Q2, C60=D6,C70=D7,C75=Q3,C80=D8,C90=D9.

Note: The steps either manually or using spss which are used to calculate the percentiles are the same steps which are used to calculate the Deciles & the Quartiles , because the two later are other forms from the Centiles , that the Deciles

(D1,D2,D3,D4,D5,D6,D7,D8,D9) are the Centiles (C10,C20,C30,C40,C50,C60,C70,C80, & C90) , respectively , and the Quartiles (Q1,Q2,Q3), are the Centiles(C25,C50 & C75), respectively .

So , if you want to calculate the fourth Decile (D4) , all you have to do is to calculate the fortieth Centile(C40), which equal (D4).

Also , if you want to calculate the second Quartile (Q2) , all you have to do is to calculate the fiftieth Centile(C50), which equal (Q2).

Note: Depending on the relation among C, D, & Q, we can say that : calculation the Centile is the most important operation , because , we can conclude from the value of Centile the values of Deciles or Quartiles.

Task 10 : Complete :

10-1: The maximum number on centiles =……

10-2: D2=……=……

10-3:Q3=…..

Task11: what is the value of C1 for the following

data: 8-17-20-5-33-11

5: Coefficient of variance (COV)

https://www.investopedia.com/terms/c/coefficient

ofvariation.asp

$$COV = \frac{\sigma}{\bar{X}}$$

x- refer to the average of scores,

σ refer to the standard deviation

COV refer to coefficient of variance

In the time that Standard Deviation can not give us a percentage of discrepancy(individual differences), and it just tells us about the distances of scores from the sample mean without absolute value, COV gives us a percentage of the discrepancy this percentage is easy to understand, so it is better than SD .

Example: A researcher applied a test concerning perceptual skills with a total score of 20 on eight

students, whose scores were as follows : 3-14-16-9-18-12-15-9 :calculate the coefficient of variance .

Solution:

The manual method:

Step 1: calculate the average (the mean) of scores:

$$\overline{X} = \frac{\sum X}{N} = \frac{96}{8} = 12$$

Step 2: calculate the standard deviation of scores :

$$\sigma = \sqrt{\frac{\Sigma (X - \bar{X})^2}{n - 1}}$$ = 4.84 (review the lecture of standard deviation)

Step3: calculate the COV as follows:

$$COV = \frac{\sigma}{\bar{X}} = \frac{4.84}{12} = 0.403 = 40.3\ \%$$

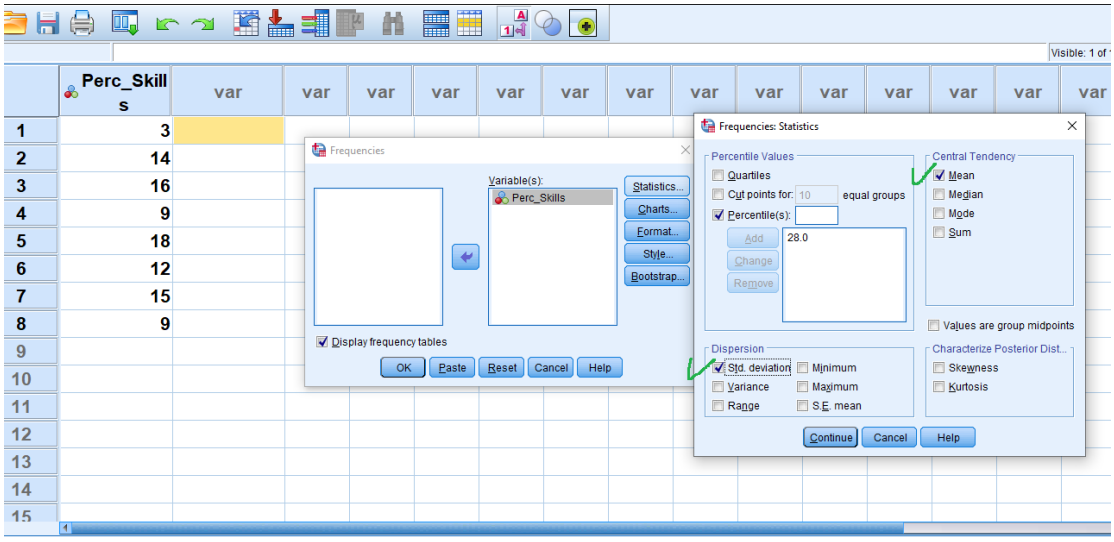
Using SPSS:

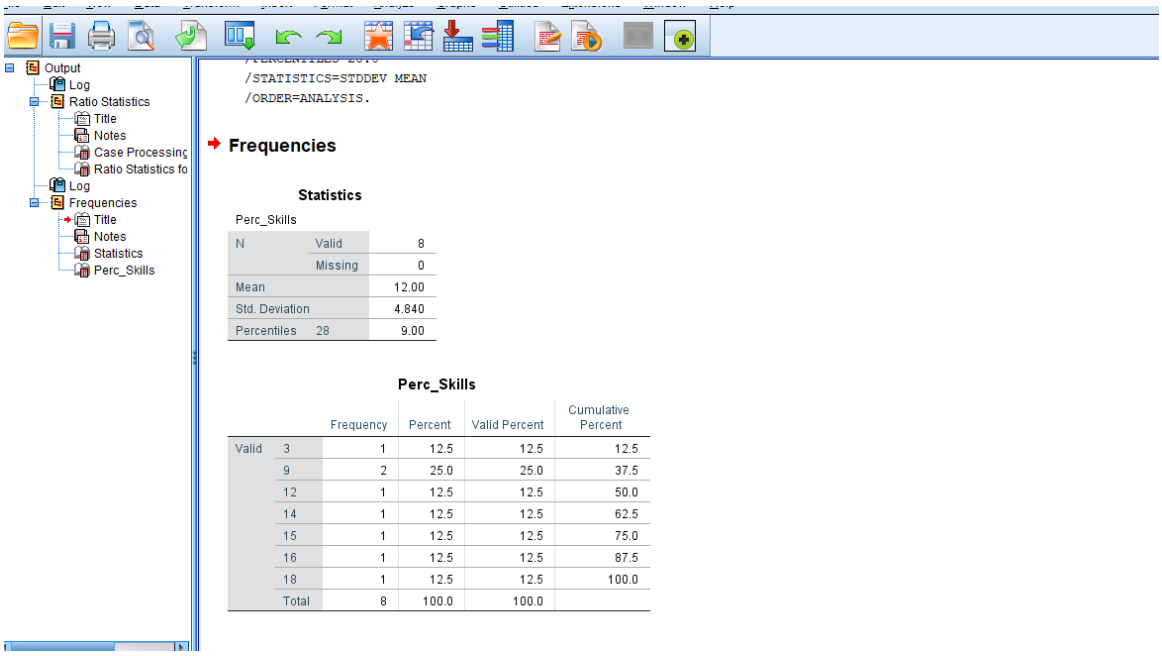
We can calculate COV using two SPSS methods as

follows:

SPSS1:

By following the same steps which are followed to calculate the SD, plus ticking on the mean beside the SD , to get the values of mean & SD in the outputs windows :

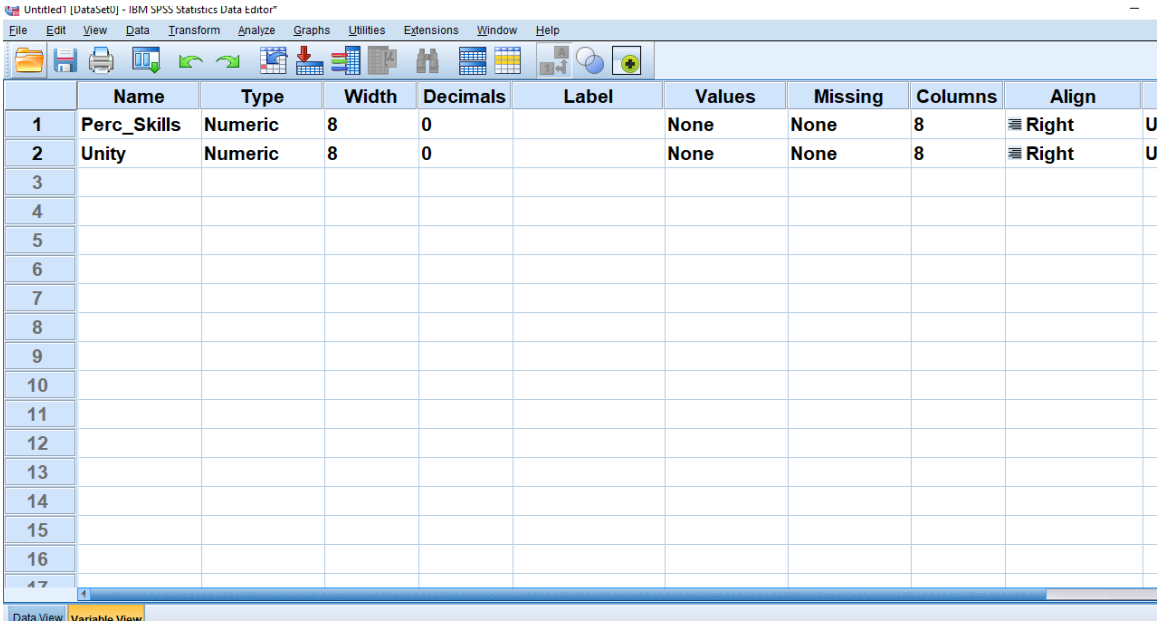




From the previous window, we divide manually the SD over mean (4.84/12) to get the value of COV which equal 0.403 (40.3%).

SPSS2:

Step1:



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2	Unity	Numeric	8	0		None	None	8	Right	U
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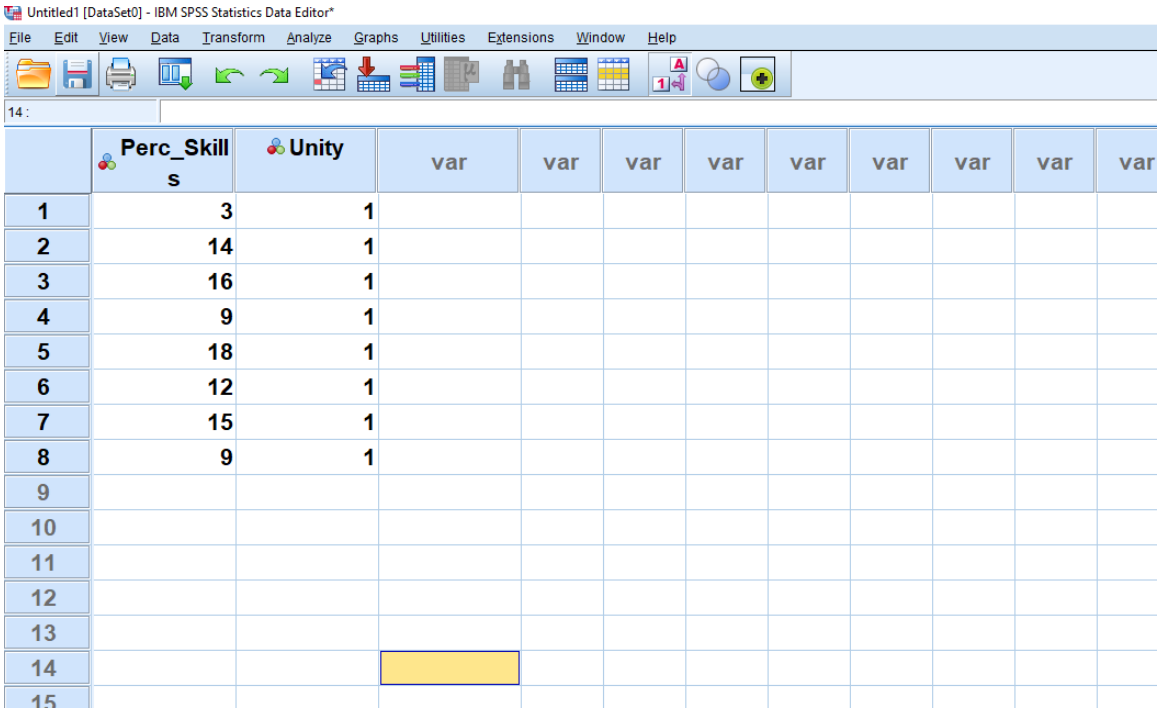
Step 2:



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2	14	1									
3	16	1									
4	9	1									
5	18	1									
6	12	1									
7	15	1									
8	9	1									
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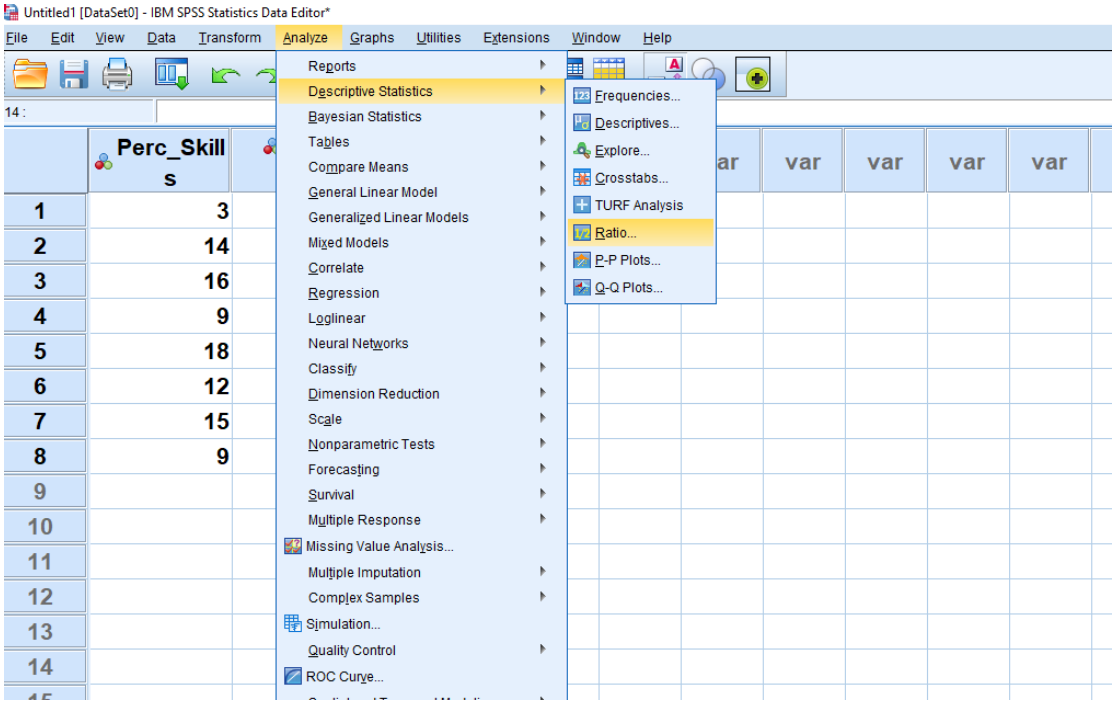
Step 3:


Untitled1 [DataSet0] - IBM SPSS Statistics Data Editor*
File Edit View Data Transform Analyze Graphs Utilities Extensions Window Help
Reports
Descriptive Statistics
Bayesian Statistics
Tables
Compare Means
General Linear Model
Generalized Linear Models
Mixed Models
Correlate
Regression
Loglinear
Neural Networks
Classify
Dimension Reduction
Scale
Nonparametric Tests
Forecasting
Survival
Multiple Response
Missing Value Analysis...
Multiple Imputation
Complex Samples
Simulation...
Quality Control
ROC Curve...
Frequencies...
Descriptives...
Explore...
Crosstabs...
TURF Analysis
Ratio...
P-P Plots...
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var
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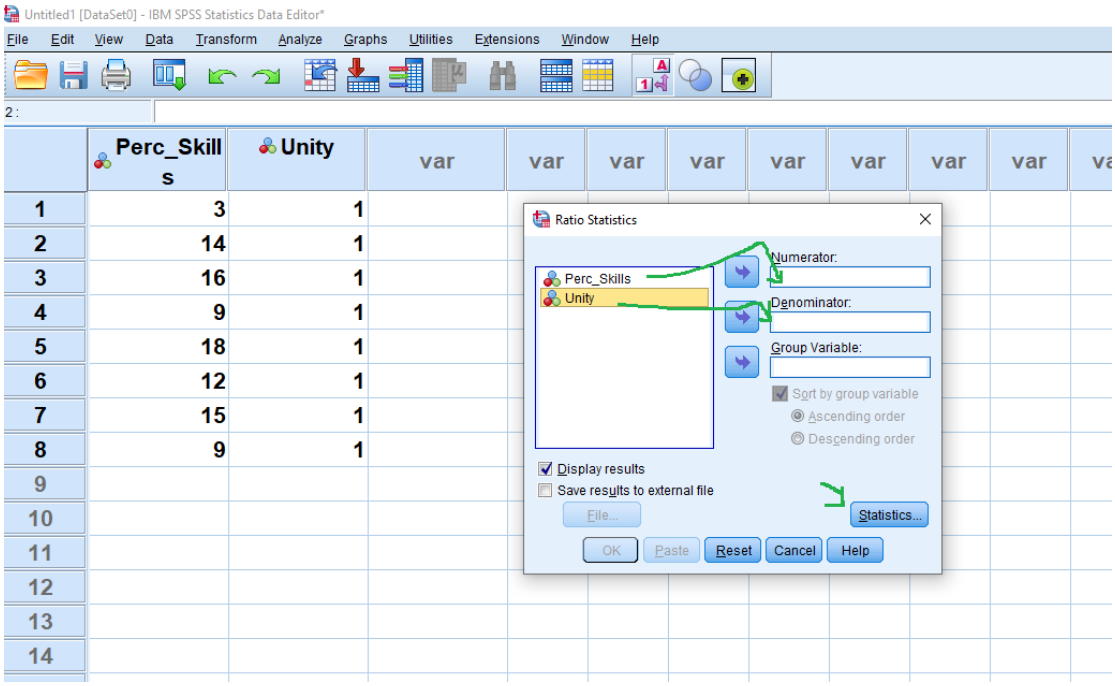
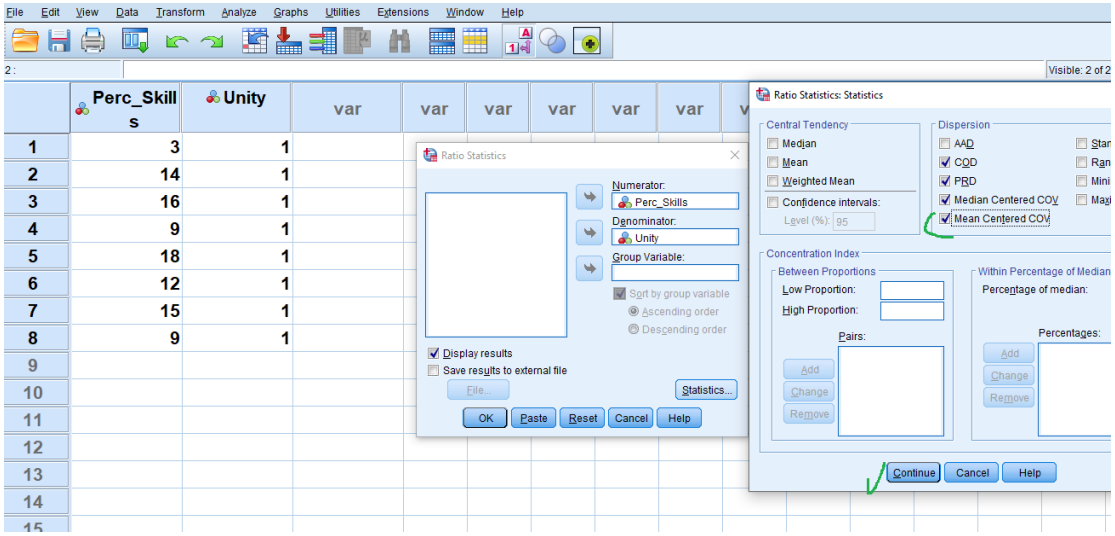
1 3
2 14
3 16
4 9
5 18
6 12
7 15
8 9

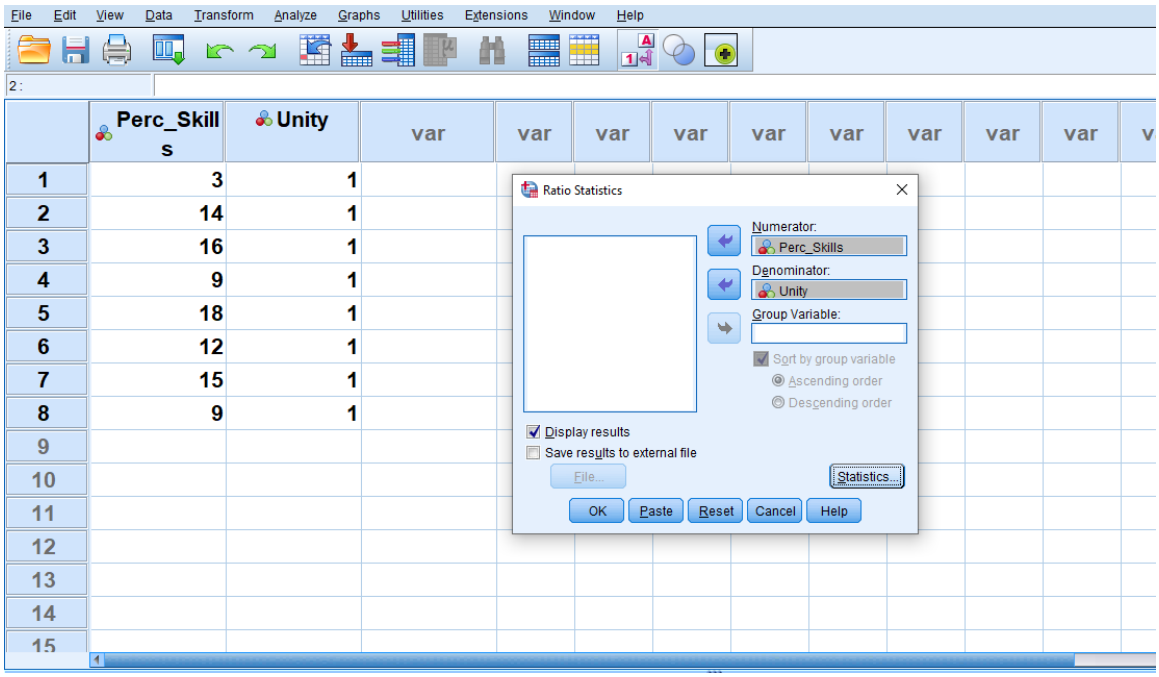
Step 4:


Untitled1 [DataSet0] - IBM SPSS Statistics Data Editor*
File Edit View Data Transform Analyze Graphs Utilities Extensions Window Help
Perc_Skills
Unity
var
Ratio Statistics
Numerator:
Denominator:
Group Variable:
Perc_Skills
Unity
Sort by group variable
Ascending order
Descending order
Display results
Save results to external file
File...
Statistics...
OK
Paste
Reset
Cancel
Help

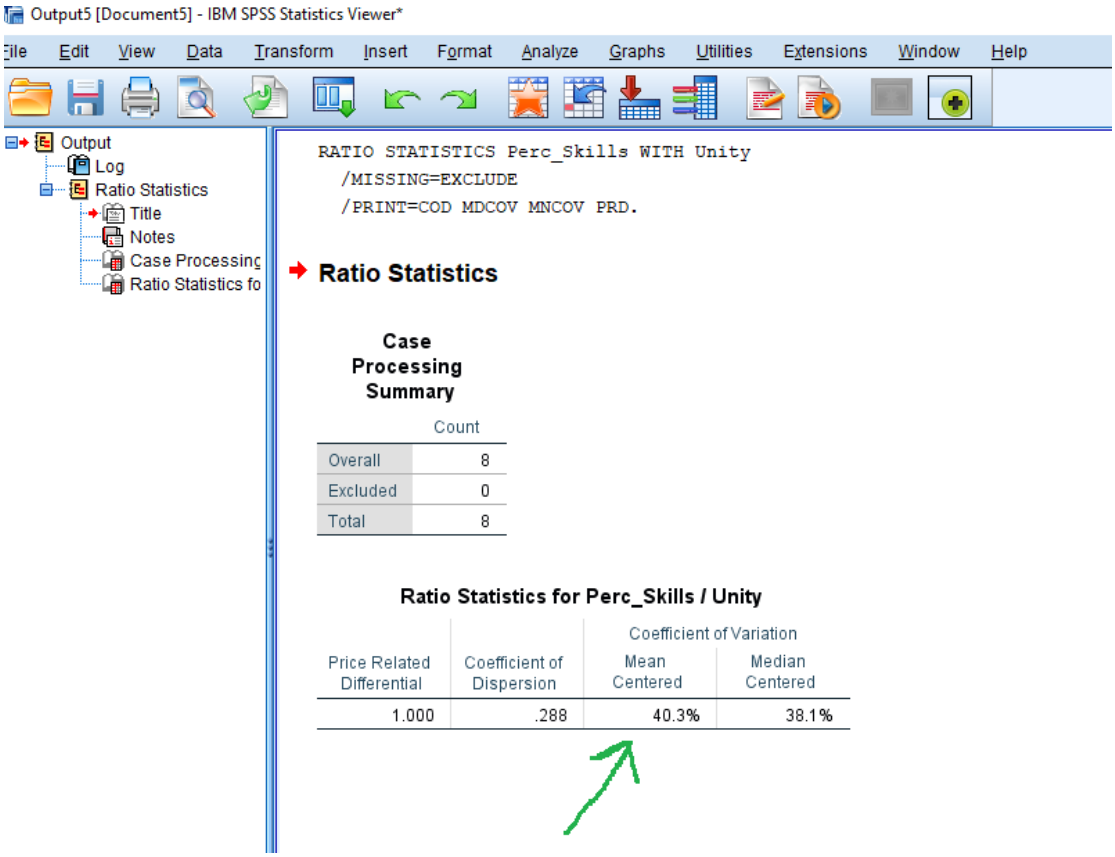
Step 5:


File Edit View Data Transform Analyze Graphs Utilities Extensions Window Help
Perc_Skills
Unity
var
Ratio Statistics
Numerator:
Perc_Skills
Denominator:
Unity
Group Variable:
Sort by group variable
Ascending order
Descending order
Display results
Save results to external file
File...
Statistics...
OK
Paste
Reset
Cancel
Help
Ratio Statistics: Statistics
Central Tendency
Median
Mean
Weighted Mean
Confidence intervals:
Level (%): 95
Dispersion
AAD
COD
PRD
Median Centered COV
Mean Centered COV
Concentration Index
Between Proportions
Low Proportion:
High Proportion:
Pairs:
Add
Change
Remove
Within Percentage of Median
Percentage of median:
Percentages:
Add
Change
Remove
Continue
Cancel
Help

Step6:


File Edit View Data Transform Analyze Graphs Utilities Extensions Window Help
Perc_Skills
Unity
var
Ratio Statistics
Numerator:
Perc_Skills
Denominator:
Unity
Group Variable:
Sort by group variable
Ascending order
Descending order
Display results
Save results to external file
File...
Statistics...
OK
Paste
Reset
Cancel
Help

Step7:



It is the same result whether manually or using

SPSS , that COV=40.3% which means that there is

40.3% of discrepancy in the data , means that there is

individual differences among students equal 40.3% ,

this result mat redirect the teacher to do his best to

minimize this percentage in the next time .

Note: COV can be used either to recognize the

discrepancy of one group , or to recognize the

difference between the discrepancy of two groups

,in situations where the sample, time, and unit of

measure differ, so it is better than SD .

For example, if we want to know the differences

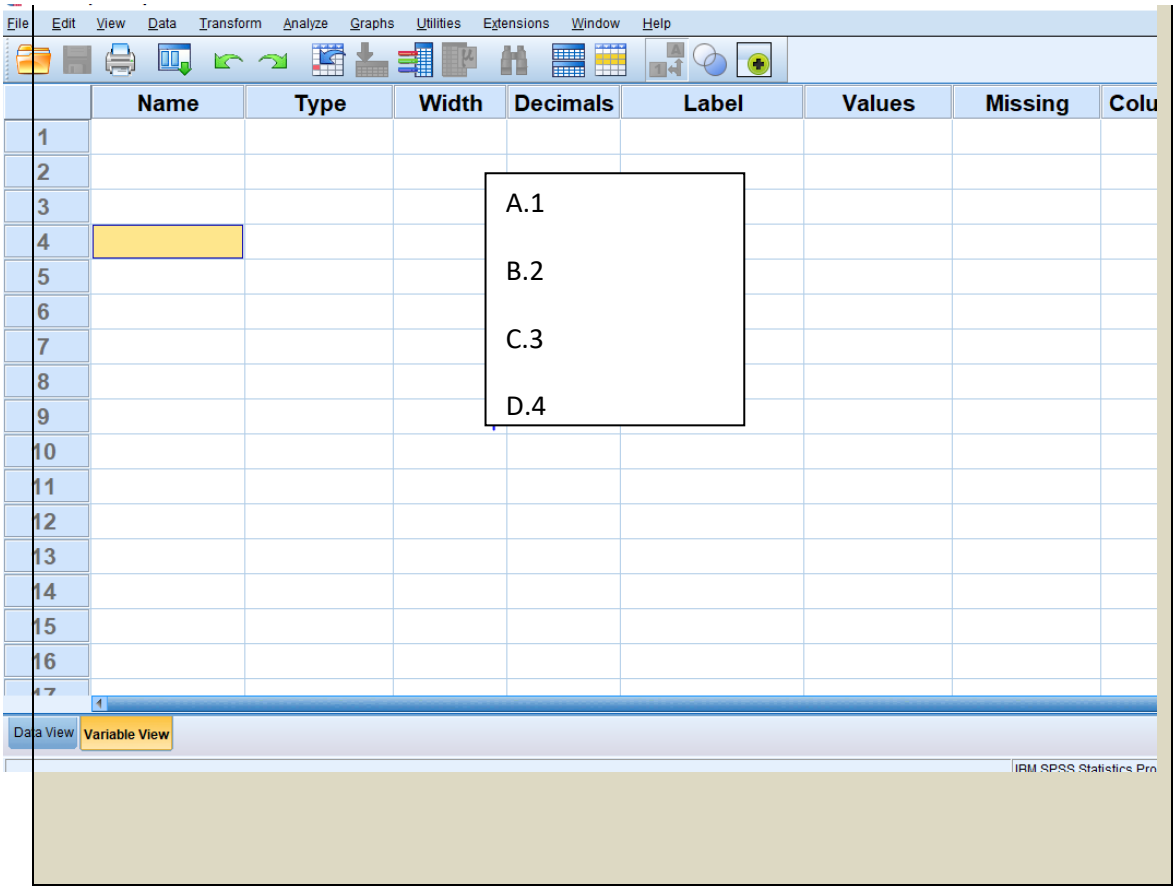
between the discrepancy of two classes in scores for

the same test, or the differences between the discrepancy of scores for the same test and the same class but in two different periods, or compare the discrepancy in income for two samples from two different countries using different currencies.

Task12 . A researcher applied an achievement test on 5 students to get the following scores : 1-4-2-2-7,

calculate manually the percent of discrepancy for this data.

Task13: In the following Screen , the number of variables which should be edited to calculate COV, for one set of data is:



https://www.statology.org/coefficient-of-variation-spss

Why has the coefficient of variation not been studied in research?

6. Z-scores

https://www.statisticshowto.com/probability-and-

/statistics/z-score

It is a redistribution of scores with mean = 0, and standard deviation = 1. It is useful in the absolute comparison between scores, regardless of the test difficulty or the difference in circumstances, so it is a fair statistical tool .

$$Zscore = \frac{X - \bar{X}}{\sigma}$$

Where x: the raw score

X^- the average(mean)

σ is the Standard Deviation

Example:

Two students from two different classes got 14 /20 in two arithmetic tests, and the grades of the class1 in which the first student is located are:

2-8-4- 18 - 14 -4-2-12-8-10

The grades of the class2 in which the second student is located are:

15-17-11-19-18-17-14-13-17-19

Which student grade is better than the other?

Solution :

The manual method:

Step 1: calculate the average (the mean) of scores:

$$\overline{X}_1 = \frac{\sum X}{N} = \frac{82}{10} = 8.2 \text{ (for class 1)}$$

$$\overline{X}_2 = \frac{\sum X}{N} = \frac{160}{10} = 16 \text{ (for class 2)}$$

Step 2: calculate the standard deviation of scores :

$$\sigma_1 = \sqrt{\frac{\Sigma (X - \overline{X}_1)^2}{n - 1}} = 5.37$$ **(review the lecture of standard deviation)** For class 1

$$\sigma_2 = \sqrt{\frac{\Sigma (X - \overline{X}_2)^2}{n - 1}} = 2.67$$ **(review the lecture of standard deviation)** For class 2

Step3: calculate the Z score as follows:

$$Zscore_1 = \frac{14 - 8.2}{5.37} = 1.08$$

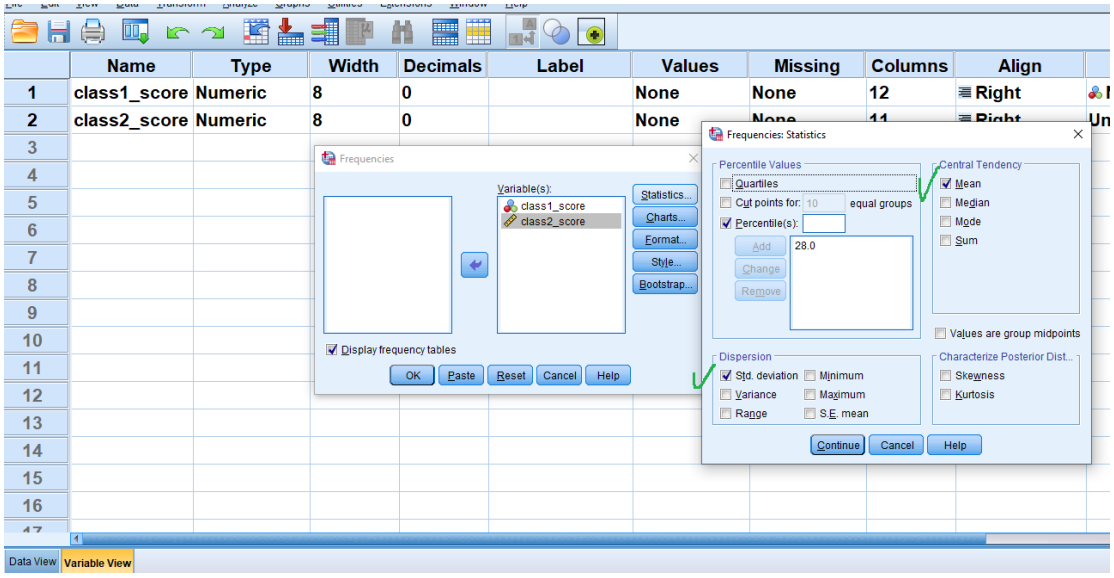
$$Zscore_2 = \frac{14 - 16}{2.67} = -0.75$$

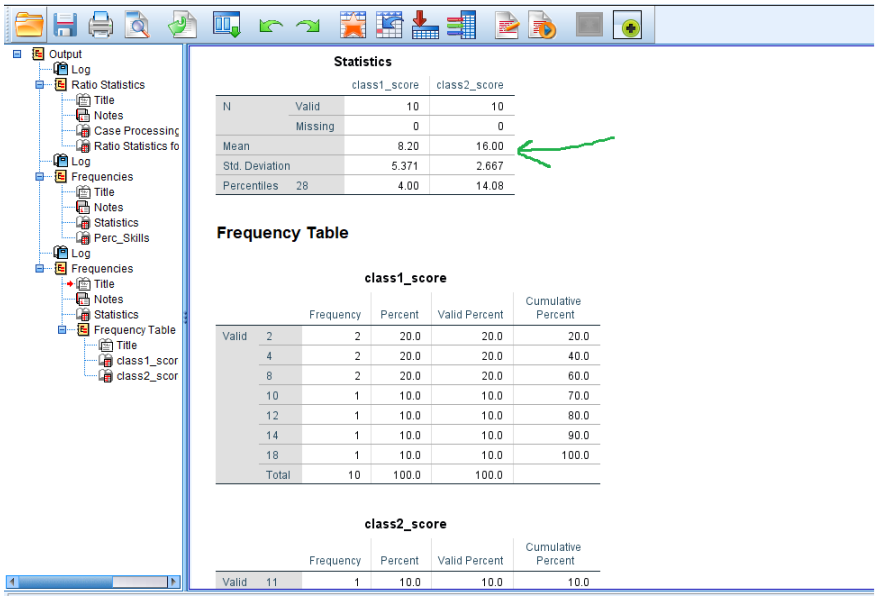
Using SPSS:

We can calculate Z score using two SPSS methods as follows:

SPSS1:

By following the same steps which are followed to calculate the SD, plus ticking on the mean beside the SD , to get the values of mean & SD for each variable in the output window :





From the previous window, we note that :

$\bar{X}_1 = 8.2$, $\sigma_1 = 5.37$; $\bar{X}_2 = 16$, $\sigma_2 = 2.67$, using these

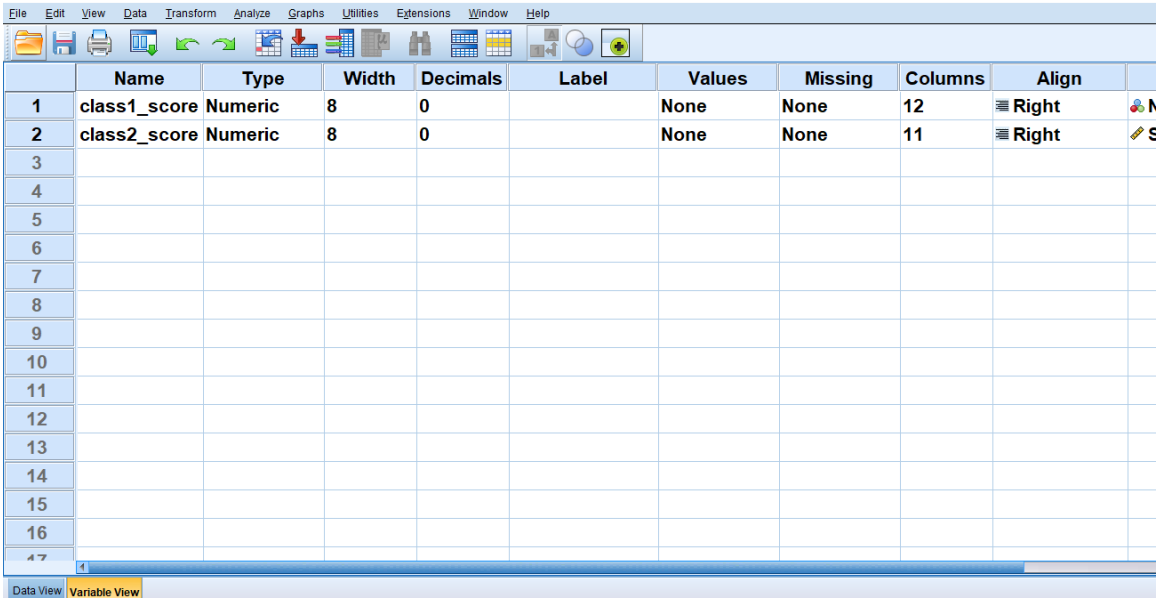
results we can calculate the z-score as follow:

$$Zscore_1 = \frac{14 - 8.2}{5.37} = 1.08$$

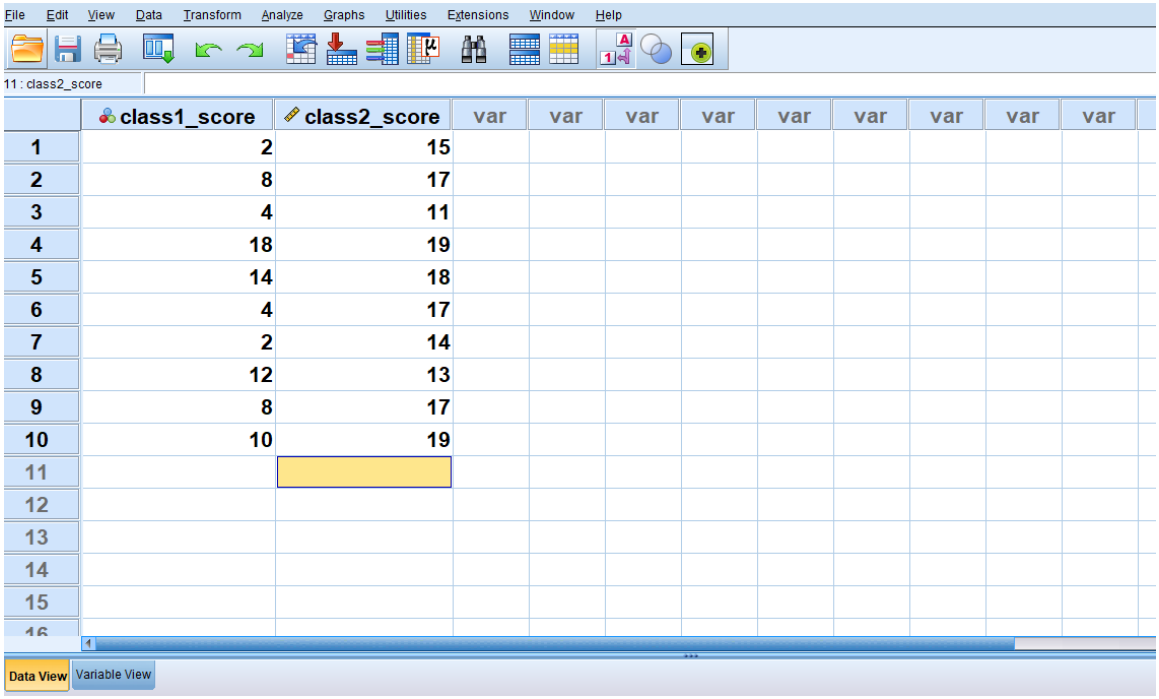
$$Zscore_2 = \frac{14 - 16}{2.67} = -0.75$$

SPSS2:

Step1:

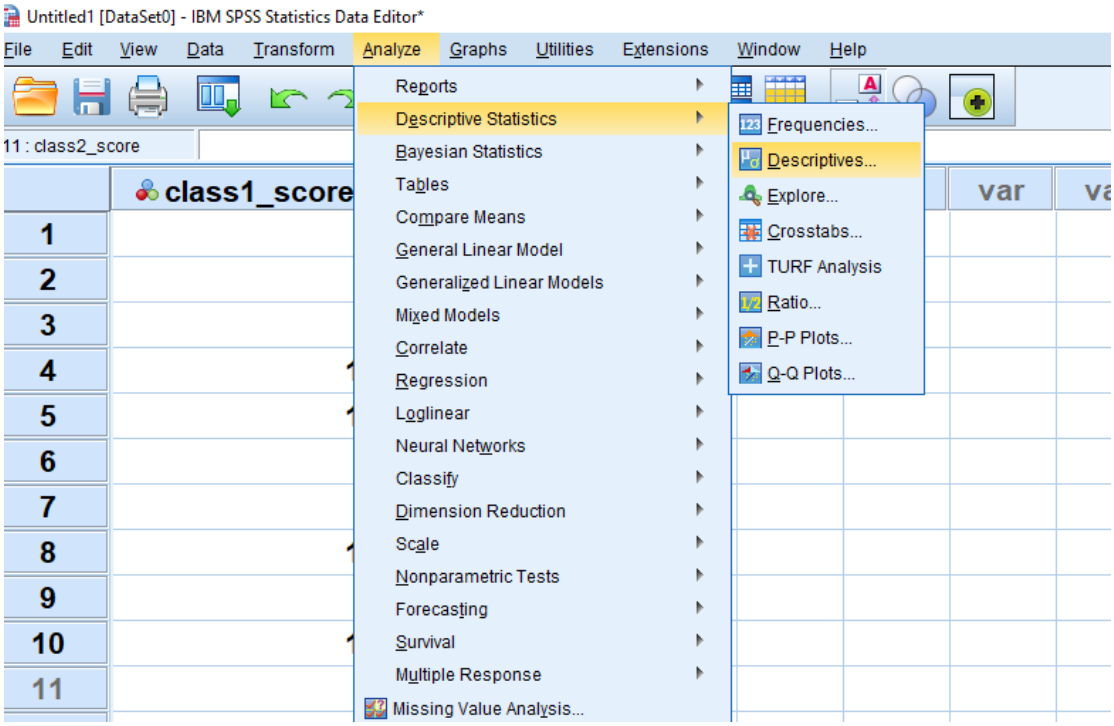


Step 2:

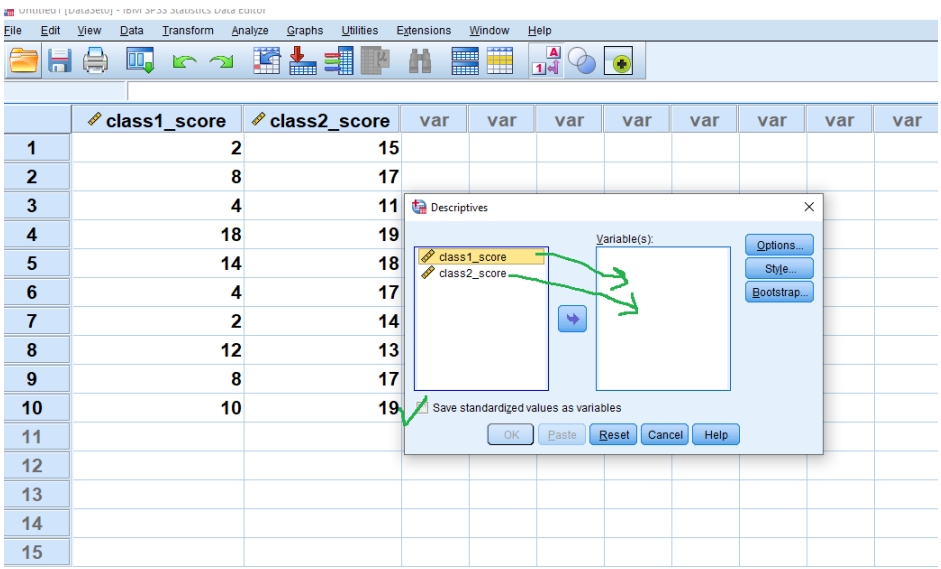


	class1_score	class2_score	var	var	var	var	var	var	var	var	var
1	2	15									
2	8	17									
3	4	11									
4	18	19									
5	14	18									
6	4	17									
7	2	14									
8	12	13									
9	8	17									
10	10	19									
11											
12											
13											
14											
15											

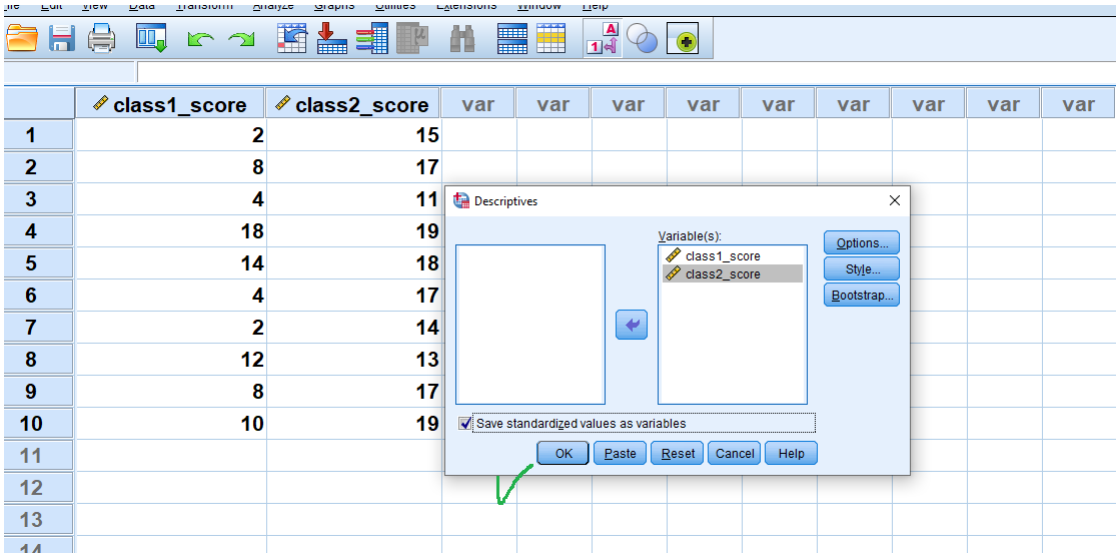
Step 3:


Untitled1 [DataSet0] - IBM SPSS Statistics Data Editor*
File Edit View Data Transform Analyze Graphs Utilities Extensions Window Help
11 : class2_score
class1_score
var
Reports
Descriptive Statistics
Bayesian Statistics
Tables
Compare Means
General Linear Model
Generalized Linear Models
Mixed Models
Correlate
Regression
Loglinear
Neural Networks
Classify
Dimension Reduction
Scale
Nonparametric Tests
Forecasting
Survival
Multiple Response
Missing Value Analysis...
Frequencies...
Descriptives...
Explore...
Crosstabs...
TURF Analysis
Ratio...
P-P Plots...
Q-Q Plots...

Step 4:

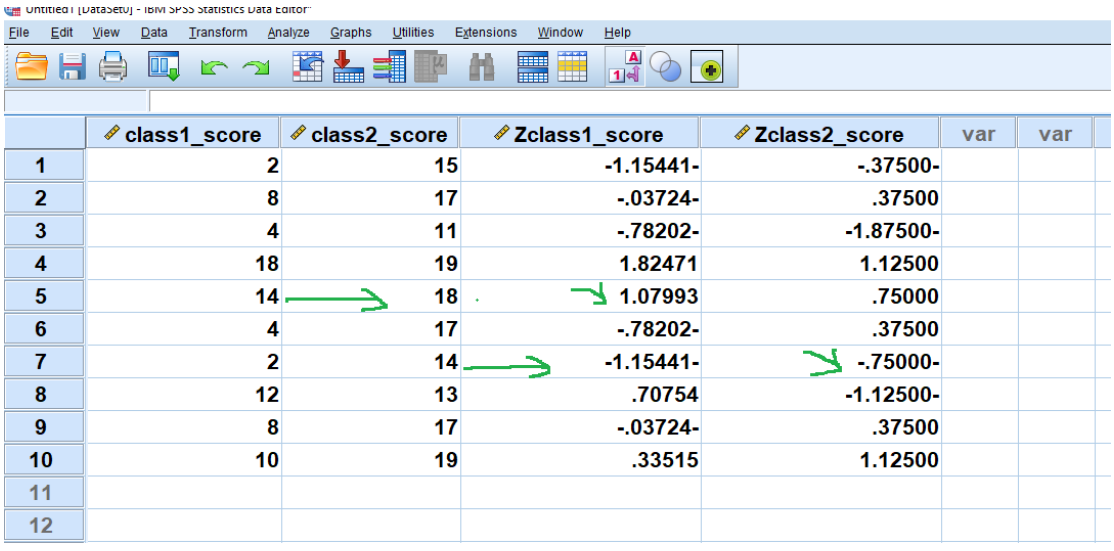

File Edit View Data Transform Analyze Graphs Utilities Extensions Window Help
class1_score
class2_score
var
Descriptives
Variable(s):
class1_score
class2_score
Options...
Style...
Bootstrap...
Save standardized values as variables
OK
Paste
Reset
Cancel
Help

Step 5:



	class1_score	class2_score	var	var	var	var	var	var	var	var	var
1	2	15									
2	8	17									
3	4	11									
4	18	19									
5	14	18									
6	4	17									
7	2	14									
8	12	13									
9	8	17									
10	10	19									
11											
12											
13											

Step6:



	class1_score	class2_score	Zclass1_score	Zclass2_score	var	var
1	2	15	-1.15441-	-.37500-		
2	8	17	-.03724-	.37500		
3	4	11	-.78202-	-1.87500-		
4	18	19	1.82471	1.12500		
5	14	18	1.07993	.75000		
6	4	17	-.78202-	.37500		
7	2	14	-1.15441-	-.75000-		
8	12	13	.70754	-1.12500-		
9	8	17	-.03724-	.37500		
10	10	19	.33515	1.12500		
11						
12						

It is the same result whether manually or using SPSS , that Zscore1=1.08, Zscore2=-0.75, which means that the score of student1 (14) is better than the score of student 2 (14), and that maybe because the test in class1 is more difficult than the test in class2 , so this method is fair in comparison among individuals .

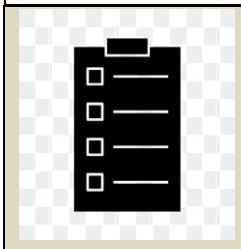
Note: there is another form of Z-score called T-score , which is a new distribution of the raw scores by

,mean =50 , In contrast to the Z-score, the T-score is free of negative values, and always takes positive values. The form of T-score as follows:

$$\text{T scores} = (\text{Z score} \times 10) + 50$$

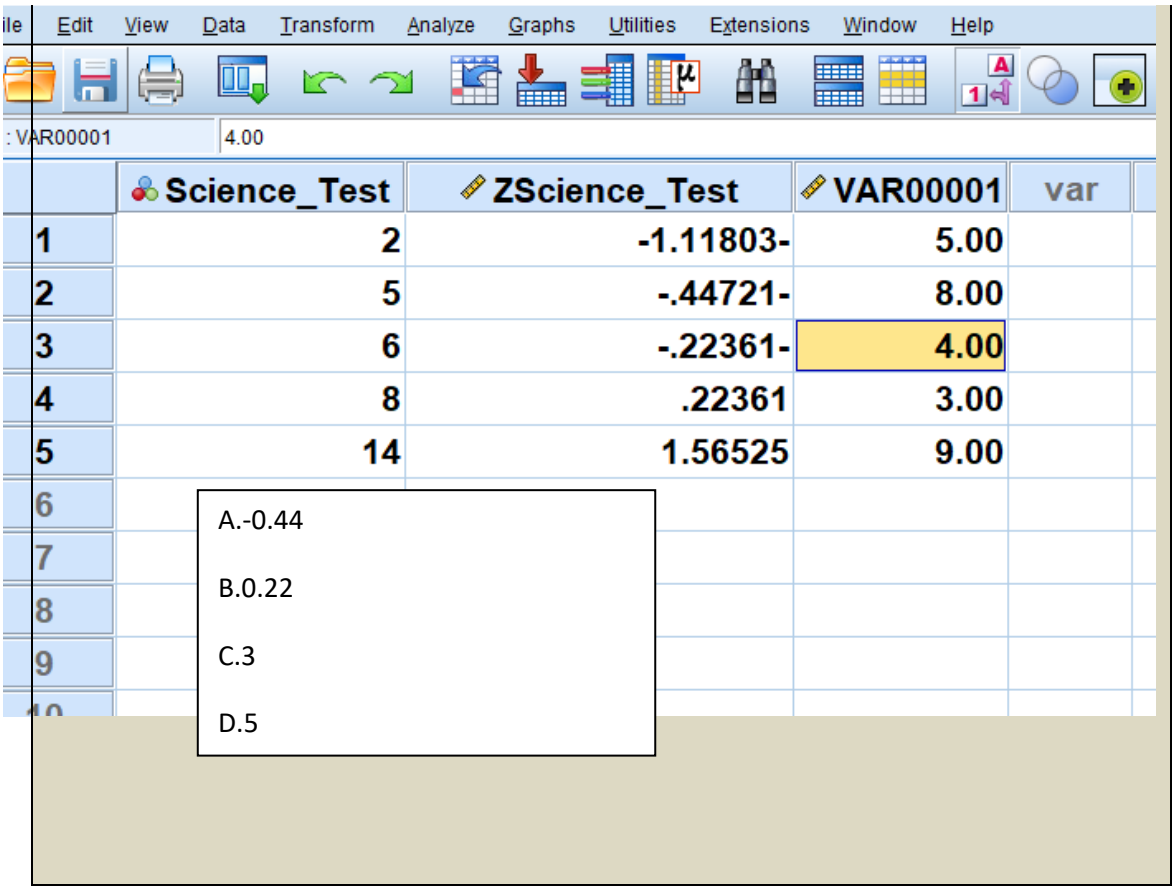
Task14. From the following table, which student score is better than other?

Student	Raw score	$\bar{X}$	**σ**
A	11.5	9	1.6
B	8	7	0.72



Task 15 . In the following screen , the value of z-score

which is corresponding to the score 8 is :



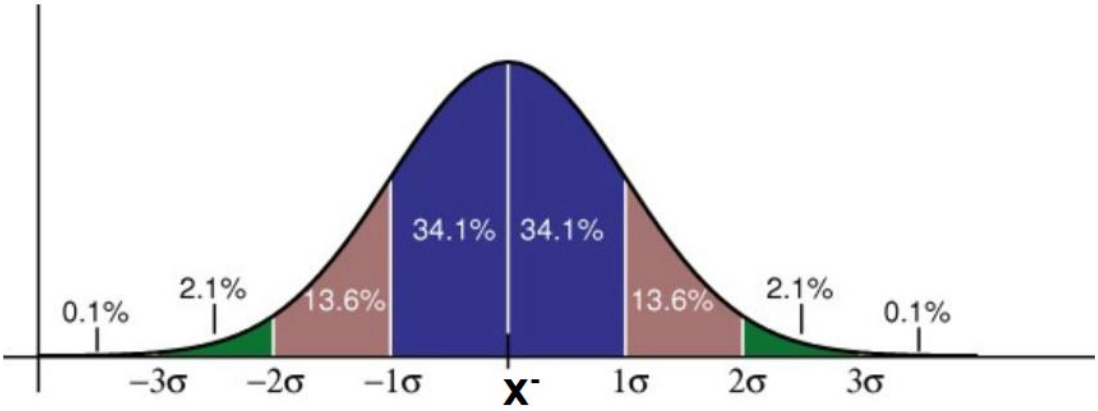
/https://www.statisticshowto.com/z-scores-in-spss

What is the relationship of the z standard scores to the fairness of the test?

7.Normal Curve

https://courses.lumenlearning.com/boundless-

/statistics/chapter/the-normal-curve



A normal distribution, sometimes called the bell curve, is

a distribution that occurs naturally in many situations.

For example, the bell curve is seen in tests like the SAT

and GRE. The bulk of students will score the average

(C), while smaller numbers of students will score a B or D. An even smaller percentage of students score an F or an A. This creates a distribution that resembles a bell (hence the nickname). The bell curve is symmetrical. Half of the data will fall to the left of the mean; half will fall to the right.

Many groups follow this type of pattern. That's why it's widely used in business, statistics and in government bodies like the FDA:

Heights of people.

Measurement errors.

Blood pressure.

Points on a test.

IQ scores.

Salaries.

The empirical rule tells you what percentage of your data falls within a certain number of standard deviations from the mean:

• 68% of the data falls within one standard deviation of the mean.

• 95% of the data falls within two standard deviations of the mean.

of the data falls within three standard deviations %99.7 • of the mean

Task16: Explain using your own words the normal curve , and how can we make use of it in the educational field ?

https://www.spss-tutorials.com/normal-distribution/

Are all phenomena subject to the distribution of the normal curve?

References

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Jonassen. D.& Grabowski, B.(2012). Handbook of Individual Differences, Learning, and Instruction. Routledge.