

**Example 1:** A data shows the scores of the exam which was taken by a group of students.

- Specify the type of data ( scale )
- Build up frequency table for the data.
- Explain the highest frequency and the lowest percentile in the table.
- Draw a suitable plot of data.
- Find central measurements (mean, median, mode) using from raw data.
- Find sample mean using frequency table.
- Find and explain Q1, Q2, Q3 quartiles.
- Calculate dispersion measurements ( variance, standard deviation)
- Calculate skewness and kurtosis measurements for the data

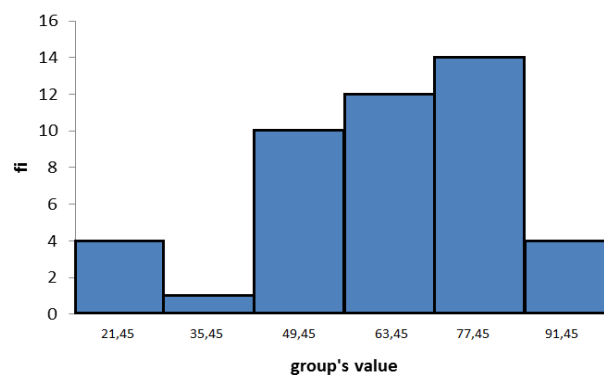
**Table 1.** Students' exam scores

14.5	46.6	59.5	70.5	75.5
18.5	48.4	62.4	70.5	77.5
20.6	50.5	63.4	71.0	83.5
25.3	51.5	65.4	71.5	84.0
28.8	54.8	65.5	71.6	84.4
40.6	54.8	66.5	71.8	87.4
42.5	55.0	69.0	72.0	88.5
43.0	56.8	69.9	75.0	92.0
43.5	57.8	70.0	75.3	98.4

$$\sum_{i=1}^n x_i = 2765.6 \quad \sum_{i=1}^n x_i^2 = 187277.6 \quad \sum_{i=1}^n (x_i - \bar{x})^3 = -198789.9 \quad \sum_{i=1}^n (x_i - \bar{x})^4 = 19294316.2$$

**Table 2.** Frequency table for the students' exam scores data (answer of b)

Group No /Class No	Upper Limit (UL)	Lower Limit (LL)	Class Value (s <sub>i</sub> )	Frequency (f <sub>i</sub> )	Relative Frequency (p <sub>i</sub> =f <sub>i</sub> /n)	f <sub>i</sub> ×s <sub>i</sub>	f <sub>i</sub> ×s <sub>i</sub> <sup>2</sup>
1	14.5	28.4	(14.5+28.4)/2=21.45	4	4/45=0.09	85.80	1840.41
2	28.5	42.4	35.45	2	2/45=0.04	70.90	2513.405
3	42.5	56.4	49.45	10	0.22	494.50	24453.03
4	56.5	70.4	63.45	12	0.24	697.95	44284.93
5	70.5	84.4	77.45	14	0.31	1.084.30	83979.04
6	84.5	98.4	91.45	4	0.09	365.80	33452.41
			<b>TOTAL</b>	<b>n=45</b>	<b>1</b>	<b>2799.25</b>	<b>190523.2</b>



**Figure 1.** Histogram chart for the data given in Table 2. (answer of d)

## Kurtosis Value Range

- Normal distribution kurtosis = 0
- A distribution that is more peaked and has fatter tails than normal distribution has kurtosis value greater than 0 (the higher kurtosis, the more peaked and fatter tails). Such distribution is called *leptokurtic* or *leptokurtotic*.
- A distribution that is less peaked and has thinner tails than normal distribution has kurtosis value less than 0. Such distribution is called *platykurtic* or *platykurtotic*.

**Example 2:** A data set shows the books sales (daily) of a publishing house during a year. The book sales are given for randomly selected 22 days in a year.

**Table3.** Books sales data.

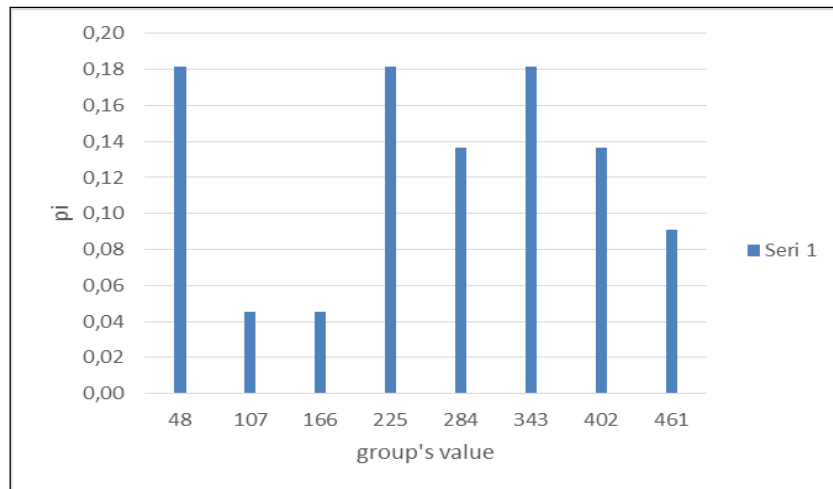
19	39	58	75	135	195	196	200	235	254	255
286	312	314	356	370	371	373	373	430	433	490

$$\sum_{i=1}^n x_i = 5769 \quad \sum_{i=1}^n x_i^2 = 1900063$$

- Specify the type of data ( scale )
- Build up frequency table for the data.
- Explain the highest frequency and the lowest percentile in the table.
- Draw a suitable plot of the data.
- Find central measurements (mean. median. mode) using from raw data.
- Find sample mean using the frequency table.
- Find and explain Q1. Q2. Q3 quartiles.
- Calculate dispersion measurements ( variance. standard deviation)

**Table 4.** Frequency table for the books sales data (**answer of b**).

Group No /Class No	Upper Limit (UL)	Lower Limit (LL)	Class Value ( $s_i$ )	Frequency ( $f_i$ )	Relative Frequency ( $p_i=f_i/n$ )	$f_i \times s_i$	$f_i \times s_i^2$
1	19	77	$(19+77)/2=96/2=48$	4	0.18	192	9216
2	78	136	$(78+136)/2=214/2=107$	1	0.05	107	11449
3	137	195	166	1	0.05	166	27556
4	196	254	225	4	0.18	900	202500
5	255	313	284	3	0.14	852	241968
6	314	372	343	4	0.18	1372	470596
7	373	431	402	3	0.14	1206	484812
8	432	490	461	2	0.09	922	425042
			<b>Total</b>	<b>n=22</b>	<b>1</b>	<b>5717</b>	<b>1873139</b>

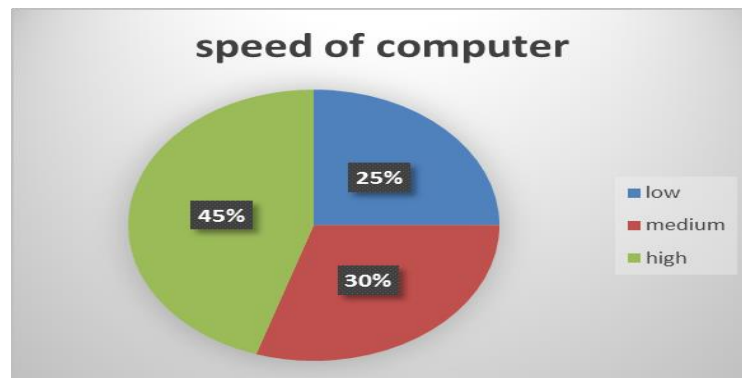


**Figure 2.** Line chart for the data given in Table 4 (answer of d).

**Example 3:** The distribution of computers in lab 1 is given in below. Create cumulative frequency and cumulative relative frequency columns and draw pie chart for data.

**Table 5.** Frequency table for the computers in lab 1.

speed	f <sub>i</sub>	p <sub>i</sub>	Cumulative Frequency (F <sub>i</sub> )	Cumulative Relative Frequency (P <sub>i</sub> )	Angles
low	5	0.25	5	0.25	$360 \times 0.25 = 90^\circ$
medium	6	0.30	11	0.55	$360 \times 0.30 = 108^\circ$
high	9	0.45	20	1.00	$360 \times 0.45 = 162^\circ$
<b>Total</b>	<b>20</b>	<b>1.00</b>			<b>360</b>



**Figure 3.** Pie graph for the data given in Table 5.

### PERSONAL STUDY QUESTIONS

**Example 4:** A data set shows the amount of boron reserves (gr/1000) in computer processors (bilgisayar işlemcileri) produced by a producer.

- Specify the type of data ( scale )
- Build up frequency table for the data.
- Explain the highest frequency and the lowest percentile in the table.
- Draw a suitable plot of data.
- Find central measurements (mean, median, mode) using from raw data.
- Find sample mean using frequency table.
- Find and explain Q1, Q2, Q3 quartiles.
- Calculate dispersion measurements ( variance, standard deviation)
- Calculate skewness and kurtosis measurements for the data

**Table 6.** Boron reserves data.

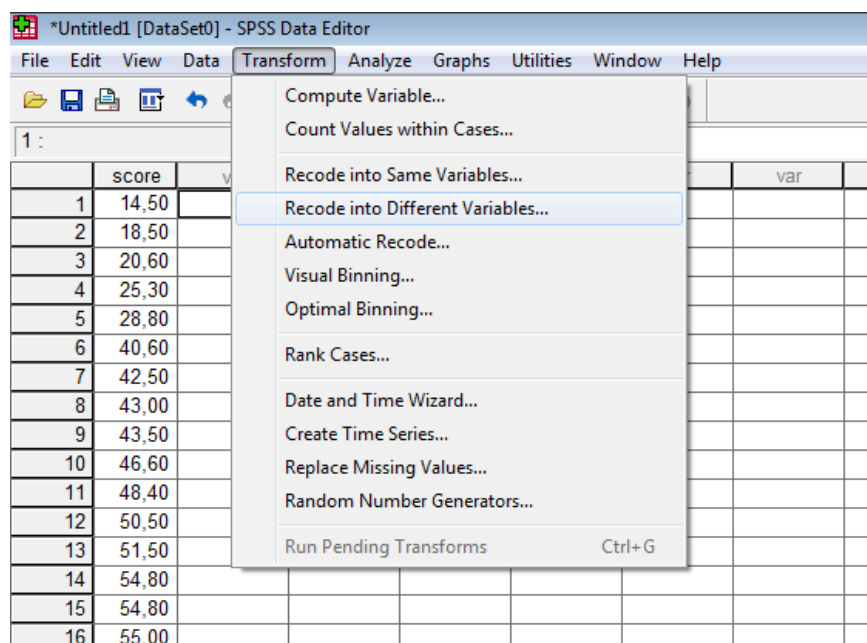
83.4	88.5	90.4	92.6
84.3	88.6	90.6	92.7
87.5	89.0	90.7	93.0
87.8	89.2	90.9	93.7
87.9	89.6	91.0	94.4
88.2	89.7	91.2	94.7
88.3	89.9	91.6	96.5
88.3	90.1	91.8	98.8
88.4	90.4	92.2	

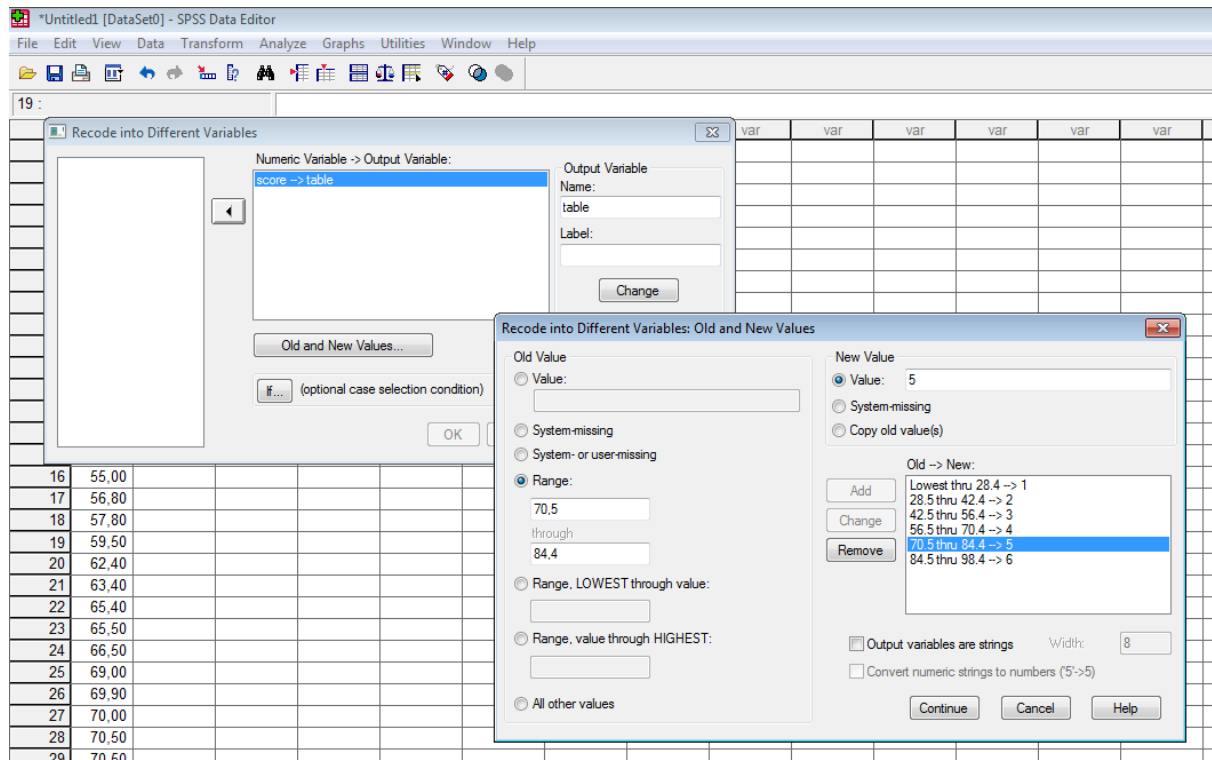
**Example 5:** A research is done for describing the computer users (for which purpose/purposes they use computers). 263 computer users attended to this research and 112 of them stated that they use computer for playing games. 57 of them using computer for utilizing internet. 82 of them using computer for their work. 12 of them using computer for mixed purpose (playing games, work, internet etc.). Build up frequency table for the data. Create cumulative frequency and cumulative relative frequency columns and draw pie chart for data.

**Table 7.** Frequency table for describing computer users.

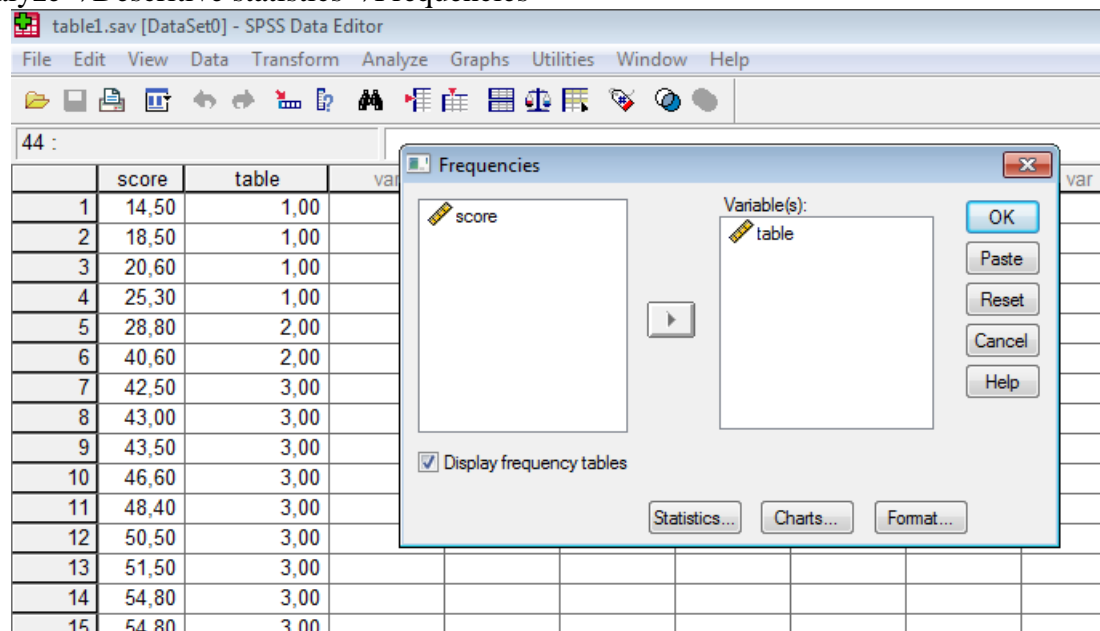
Purpose of Computer Usage	$f_i$	$p_i$	Cumulative Frequency ( $F_i$ )	Cumulative Relative Frequency ( $P_i$ )	Angles
Game					
Internet					
Work					
Mixed Purpose					
Total					

### Application with SPSS





## Analyze→Descriptive statistics→Frequencies



**Statistics**

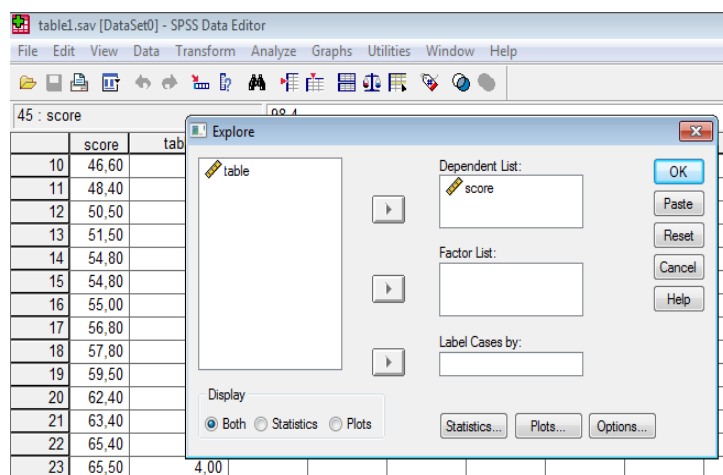
table

N	Valid	45
	Missing	0

table

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 1.00	4	8.9	8.9	8.9
2.00	2	4.4	4.4	13.3
3.00	10	22.2	22.2	35.6
4.00	11	24.4	24.4	60.0
5.00	14	31.1	31.1	91.1
6.00	4	8.9	8.9	100.0
Total	45	100.0	100.0	

Analyze→Descriptive statistics→Explore...

**Descriptives**

			Statistic	Std. Error
score	Mean		61,4556	2,95781
	95% Confidence Interval for Mean	Lower Bound	55,4945	
		Upper Bound	67,4166	
	5% Trimmed Mean		62,0944	
	Median		65,5000	
	Variance		393,688	
	Std. Deviation		19,84156	
	Minimum		14,50	
	Maximum		98,40	
	Range		83,90	
	Interquartile Range		24,05	
	Skewness		-,605	,354
	Kurtosis		,027	,695

## score Stem-and-Leaf Plot

Frequency Stem &amp; Leaf

1,00 Extremes (= <15)  
 1,00 1 . 8  
 3,00 2 . 058  
 ,00 3 .  
 6,00 4 . 023368  
 8,00 5 . 01445679  
 7,00 6 . 2355699  
 12,00 7 . 000111125557  
 5,00 8 . 34478  
 2,00 9 . 28

Stem width: 10,00

Each leaf: 1 case(s)

Histogram

