

1. The data in the following table represent scores obtained by ten students on a statistics examination and their final grade point average. Prepare a scatter diagram and calculate a Pearson r for these data.

Student	Score on statistics exam, X	Grade point average, Y	Student	Score on statistics exam, X	Grade point average, Y
A	90	2.50	F	70	1.00
B	85	2.00	G	70	1.00
C	80	2.50	H	60	0.50
D	75	2.00	I	60	0.50
E	70	1.50	J	50	0.50

In StatTool open: HW_Correlation_1.dat

2. Explain in *your own words* the meaning of correlation.
3. In each of the examples presented below, identify a possible source of contamination in the collection and/or interpretation of the results of a correlational analysis.
- The relationship between age and reaction time for subjects from three months to 65 years of age.
 - The correlation between IQ and grades for honor students at a university.
 - The relationship between vocabulary and reading speed among children in an economically disadvantaged community.
4. Explain the difference between $r = 0.76$ and $r = -0.76$.
5. A store owner recorded the number of times consumers bought or asked for a given item. She called this amount the demand. Each month she had 15 of the items to sell. In addition, the owner recorded the price of the item each month.
- Determine the relation between the demand and price, using Pearson r .
 - Determine the above relation using Spearman r_s .

Month	Demand	Price	Month	Demand	Price
Jan.	25	\$0.50	July	13	\$0.80
Feb.	10	.90	Aug.	19	.70
Mar.	12	.80	Sept.	18	.72
April	18	.75	Oct.	16	.74
May	11	.85	Nov.	15	.75
June	20	.70	Dec.	15	.75

In StatTool open: HW_Correlation_5.dat

6. Construct a scatter diagram for each of the sets of data listed in the table below.

a.	X	Y	b.	X	Y	c.	X	Y	d.	X	Y
1.5	0.5		0.5	5.0	0.5	0.5			0.5	1.0	
	1.0	0.5		0.5	4.5		1.0	1.0		0.5	2.5
	1.0	2.0		1.0	3.5		1.0	1.5		0.5	4.5
	1.5	1.5		1.5	4.0		1.5	2.5		1.0	3.5
	1.5	2.0		1.5	2.5		1.5	3.5		1.5	1.0
	2.0	2.0		2.0	3.0		2.0	2.5		1.5	2.5
	2.5	2.5		2.5	2.0		2.0	3.5		1.5	4.0
	2.5	3.2		2.5	3.5		2.5	4.5		2.0	1.0
	3.0	2.5		3.0	2.5		3.0	3.5		3.0	2.0
	3.0	3.5		3.0	2.0		3.5	3.0		3.0	3.5
	3.5	3.5		3.5	2.0		3.5	2.5		3.0	4.5
	3.5	4.5		3.5	2.5		3.5	2.0		3.5	1.0
	4.0	3.5		4.0	1.5		4.0	2.5		3.5	1.0
	4.0	4.5		4.0	0.7		4.0	2.0		3.5	3.5
	4.5	4.5		5.0	0.5		4.5	1.0		4.0	3.5
	5.0	5.0					5.0	1.0		4.0	4.5
							5.0	0.5		4.5	2.5
										4.5	1.0

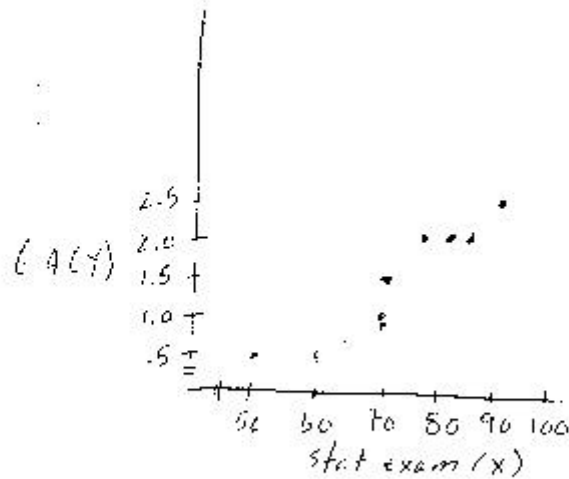
In Stat Tool open: HW_Correlation_6a.dat, HW_Correlation_6b.dat, HW_Correlation_6c.dat, HW_Correlation_6d.dat,

7. By inspecting the scatter diagrams for the data in Exercise 6, determine which one represents
- a curvilinear relation between X and Y ?
 - a positive correlation between X and Y ?
 - little or no relation between X and Y ?
 - a negative correlation between X and Y ?

HW - Correlation

Student	Score (X)	X ²	GPA (Y)	Y ²	XY
A	90	8100	2.5	6.25	225
B	85	7225	2.0	4.00	170
C	80	6400	2.5	6.25	200
D	75	5625	2.0	4.00	150
E	70	4900	1.5	2.25	105
F	70	4900	1.0	1.0	70
G	70	4900	1.0	1.0	70
H	60	3600	.5	.25	30
I	60	3600	.5	.25	30
J	50	2500	.5	.25	25
	710	51,750	14	25.50	1075
	ΣX	ΣX^2	ΣY	ΣY^2	ΣXY

$$\begin{aligned}
 r_{xy} &= \frac{N \Sigma XY - (\Sigma X)(\Sigma Y)}{\sqrt{(N \Sigma X^2 - (\Sigma X)^2)(N \Sigma Y^2 - (\Sigma Y)^2)}} \\
 &= \frac{(10)(1075) - (710)(14)}{\sqrt{(10)(51,750) - (710)^2} \sqrt{(10)(25.50) - (14)^2}} \\
 &= \frac{10750 - 9940}{\sqrt{517,500 - 504,100} \sqrt{255 - 196}} \\
 &= \frac{810}{\sqrt{13,400}(59)} \\
 &= \frac{810}{889.16} \\
 &= .91
 \end{aligned}$$



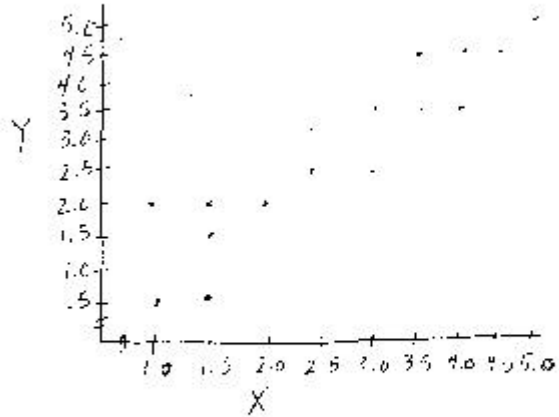
- 2 Describes the relationship between two variables (strength & direction)
- 3a Nonlinear
- b Truncated/restricted range
- c Truncated/restricted range
- 4. $r = 0.76$ direct relationship (move up or down together)
- 5. $r = 0.6$ indirect relationship (move up or down in opposite directions)

5a- Month	Demand(x)	X ²	Price (Y)	Y ²	XY
Jan	2.5	6.25	.50	.25	12.5
Feb	10	100	.90	.81	9
Mar	12	144	.80	.64	9.60
Apr	18	324	.75	.56.25	13.50
May	11	121	.85	.7225	9.35
Jun	20	400	.70	.49	14
Jul	13	169	.80	.64	10.40
Aug	19	361	.70	.49	13.30
Sep	18	324	.72	.5184	12.96
Oct	16	256	.74	.5476	11.84
Nov	15	225	.75	.5625	11.25
Dec	15	225	.75	.5625	11.25
	192	3274	8.96	6.796	138.95
	ΣX	ΣX^2	ΣY	ΣY^2	ΣXY

$$\begin{aligned}
 r_{xy} &= \frac{N \Sigma XY - (\Sigma X)(\Sigma Y)}{\sqrt{(N \Sigma X^2 - (\Sigma X)^2)(N \Sigma Y^2 - (\Sigma Y)^2)}} \\
 &= \frac{(12)(138.95) - (192)(8.96)}{\sqrt{(12)(3274) - (192)^2} \sqrt{(12)(6.796) - (8.96)^2}} \\
 &= \frac{1,667.4 - 1,720.32}{\sqrt{(39,288 - 36,864)} \sqrt{(81.552 - 80.282)}} \\
 &= \frac{-52.92}{\sqrt{(2424)} \sqrt{(1.27)}} \\
 &= \frac{-52.92}{55.48} \\
 &= -.951
 \end{aligned}$$

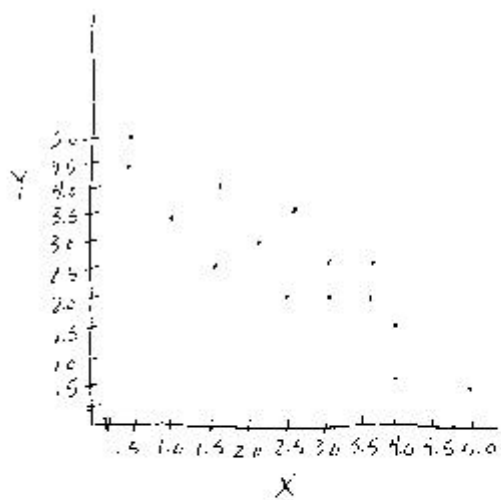
6a.

X	Y
1.0	1.5
1.0	1.5
1.0	2.0
1.5	1.5
1.5	2.0
2.0	2.0
2.5	2.0
2.5	3.0
3.0	2.5
3.0	3.5
3.5	3.5
3.5	4.5
4.0	3.5
4.0	4.5
4.5	4.5
5.0	5.0



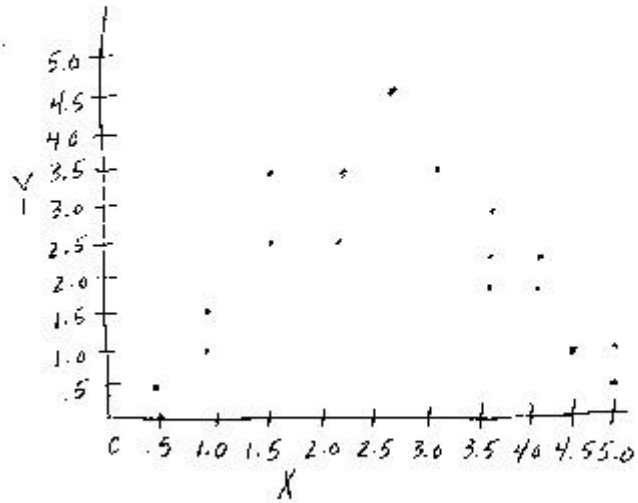
6b.

X	Y
1.0	5.0
1.5	4.5
1.0	3.5
1.5	4.0
1.5	2.5
2.0	3.0
2.5	2.0
2.5	3.5
3.0	1.5
3.0	2.0
3.5	2.0
3.5	2.5
4.0	1.5
4.0	1.7
5.0	1.5



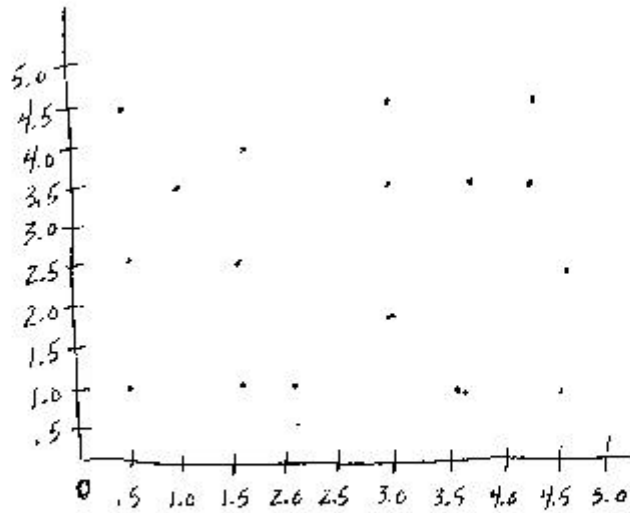
c

X	Y
.5	.5
1.0	1.0
1.0	1.5
1.5	2.5
1.5	3.5
2.0	2.5
2.0	3.5
2.5	4.5
3.0	3.5
3.5	3.0
3.5	2.5
3.5	2.0
4.0	2.5
4.0	2.0
4.5	1.0
5.0	1.0
5.0	.5



d

X	Y
.5	1.0
.5	2.5
.5	4.5
1.0	3.5
1.5	1.0
1.5	2.5
1.5	4.0
2.0	1.0
3.0	2.0
3.0	3.5
3.0	4.5
3.5	1.0
3.5	1.0
3.5	3.5
4.0	3.5
4.0	4.5
4.5	2.5
4.5	1.0



7a. bc
b. ba
c. cd
d. bb

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HW CORRELATION PAGE