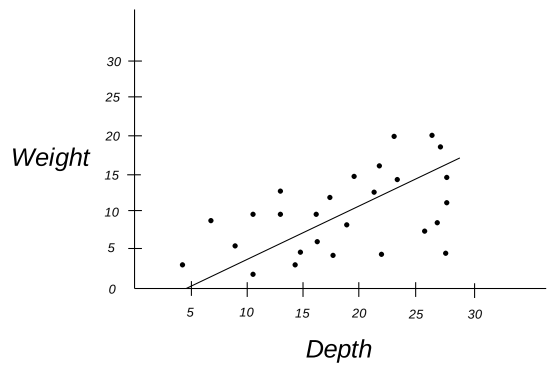
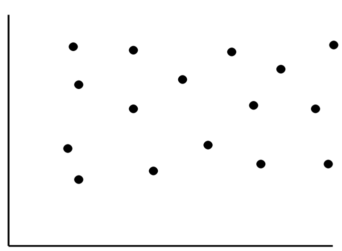
Paired Data and Scatter Diagrams
§3.1

Data from Example 1(pg. 128)

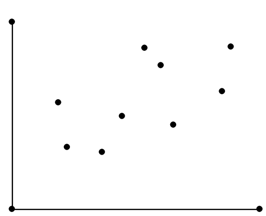
x = root depth y = watermelon weight

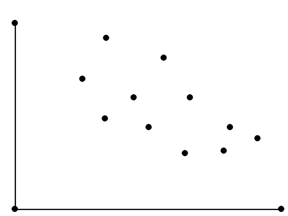
x	y	x	y	x	y	x	y
26.7	20.3	13.9	3.5	10.2	2.1	23.4	20.8
14	4.8	19.3	8.7	13.1	11	27	15.2
18	9	17.5	4.3	19.1	16	24.6	16.1
10.5	9	13.1	8.7	22.6	12.9	15.8	5.7
26.1	10.7	16.5	9.1	9.1	4.5	27	19.3
21.8	17.4	28.4	17.1	17.5	11.1	21.3	4.2
7	8.2	23.9	9.7	20.5	12.3		
26	7.9	27	13.1	4.5	3.1		



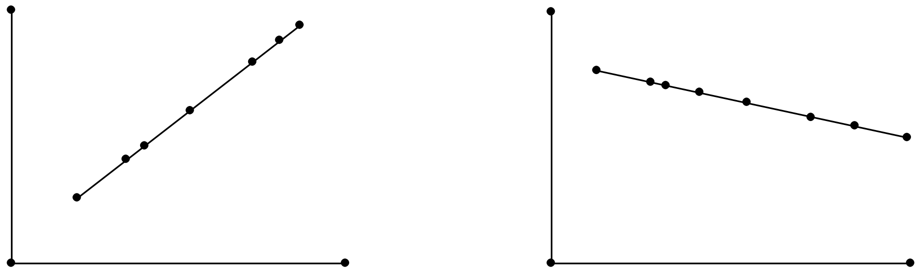


No Correlation





Moderate Linear Correlation



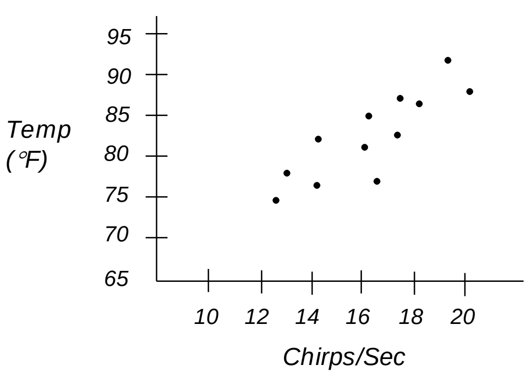
Perfect Linear Correlation

Pg 133, 1-4, 7, 10, 11

Linear Regression
§3.2 (Day 1)

Example 1 (pg. 136)
A professor at Harvard wanted to know if there is a relationship between the number of times a cricket chirps in a second and the temperature in $°F$.

x (chirps/sec)	y (temp/ $°F$)
20	88.6
16	71.6
19.8	93.3
18.4	84.3
17.1	80.6
15.5	75.2
14.7	69.7
17.1	82
15.4	69.4
16.2	83.3
15.0	79.6
17.2	82.6
16	80.6
17	83.5
14.4	76.3



Steps to Compute Least Square Line

1. Find $\sum x,\ \sum y,\ \sum x^2,\ \sum xy$.

2. Compute SS_x: $\sum x^2 - \frac{(\sum x)^2}{n}$

3. Compute SS_{xy}: $\sum xy - \left(\frac{\sum x \sum y}{n}\right)$

4. Compute $\bar{X}$

5. Compute $\bar{Y}$

6. Compute *b* (slope): $\frac{SS_{xy}}{SS_x}$

7. Compute *a* (y-intercept): $\bar{Y}$ - b$\bar{X}$

8. Write Equation: $y = bx + a$

x	y	x^2	xy
20	88.6		
16	71.6		
19.8	93.3		
18.4	84.3		
17.1	80.6		
15.5	75.2		
14.7	69.7		
17.1	82		
15.4	69.4		
16.2	83.3		
15.0	79.6		
17.2	82.6		
16	80.6		
17	83.5		
14.4	76.3		
$\sum x$	$\sum y$	$\sum x^2$	$\sum xy$

SS_x: $\sum x^2 - \frac{(\sum x)^2}{n} =$

SS_{xy}: $\sum xy - \left(\frac{\sum x \sum y}{n}\right) =$

$\bar{X}$ =

$\bar{Y}$ =

b: $\frac{SS_{xy}}{SS_{x}}$ =

a: $\bar{Y}$ - b$\bar{X}$ =

y = bx + a

Pg 145, 1(a-b), 2(a-b)

Linear Regression
§3.2 (Day 2)

Cont'd from yesterday

$\sum x = 249.8$ $\sum y = 1200.6$ $\sum x^2 = 4200.6$ $\sum xy = 20{,}727.5$

$SS_x = 40.6$ $SS_{xy} = 133.5$ $\bar{X} = 16.7$ $\bar{Y} = 80$

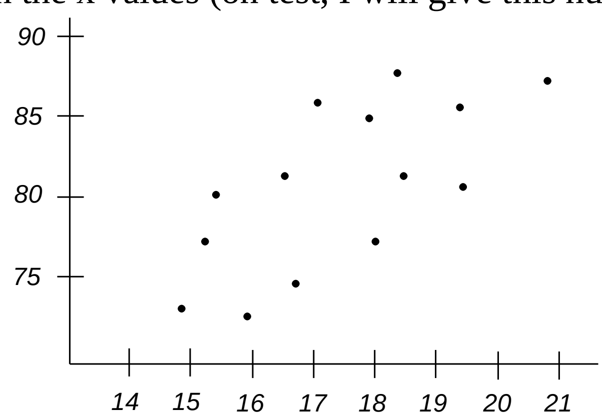
$b = 3.3$ $a = 24.9$

$y = bx + a$

$y = 3.3x + 24.9$

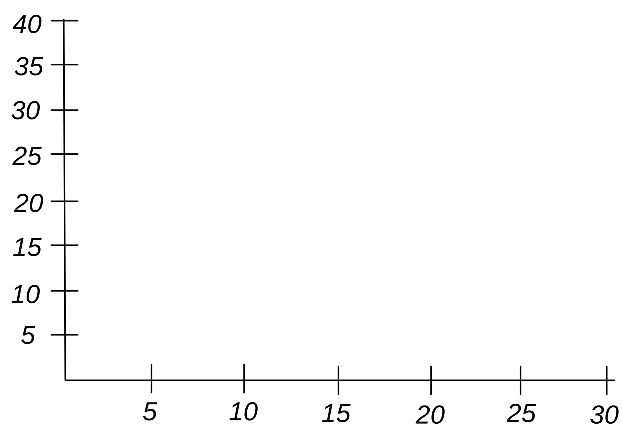
1. Put $\bar{X}$ and $\bar{Y}$ on Graph.

2. Pick point between the x values (on test, I will give this number).



Example 1

x	y	x^2	xy
6	15	36	90
20	31	400	620
0	10	0	0
14	16	196	224
25	28	625	700
16	20	256	320
28	40	784	1120
18	25	324	450
10	12	100	120
8	15	64	120
$\sum x =$	$\sum y =$	$\sum x^2 =$	$\sum xy =$

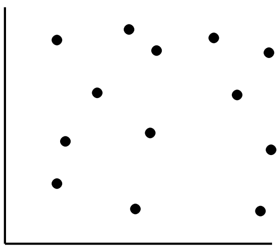


Pg 145, 1c, 2c

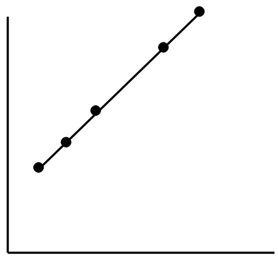
The Linear Correlation Coefficient
§3.3

How does the Least-Square-Line correspond to data?

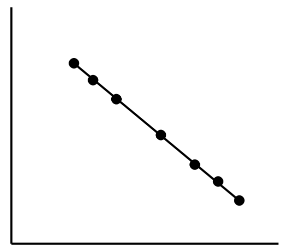
Correlation Coefficient (r)



No Correlation
$r = 0$

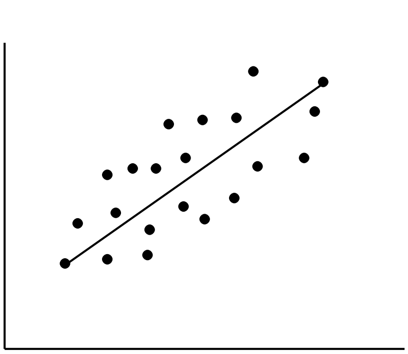


Perfect + Linear Correlation
$r = 1$

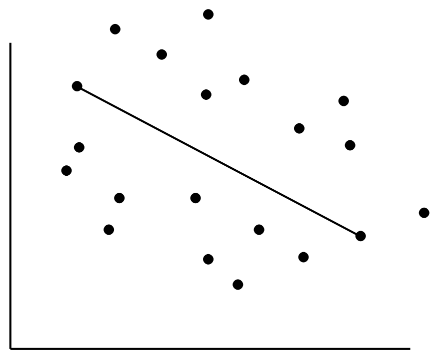


Perfect - Linear Correlation
$r = -1$

The closer r is to 1 or -1, the better the linear relationship. The closer r is to 0, the weaker the linear relationship.



$0 < r < 1$
maybe .8



$-1 < r < 0$
maybe -.6

$$r = \frac{SS_{xy}}{\sqrt{(SS_x)(SS_y)}}$$

$$SS_y = \sum y^2 - \frac{(\sum y)^2}{n}$$

Therefore, we must add y^2 to our chart.

IQ vs. GPA

x (IQ)	*y* (GPA)	*x* (IQ)	*y* (GPA)
117	3.7	107	2.8
92	2.6	108	3.2
102	3.3	121	3.8
115	2.2	91	3.0
87	2.4	113	4.0
76	1.8	98	3.5

x	y	x^2	y^2	xy
117	3.7	13689	13.7	432.9
92	2.6	8464	6.8	239.2
102	3.3	10404	10.9	336.6
115	2.2	13225	4.8	253
87	2.4	7569	5.8	208.8
76	1.8	5776	3.2	136.8
107	2.8	11449	7.8	299.6
108	3.2	11664	10.2	345.6
121	3.8	14641	14.4	459.8
91	3.0	8281	9	273
113	4.0	12769	16	452
98	3.5	9604	12.3	343
$\sum x =$	$\sum y =$	$\sum x^2 =$	$\sum y^2 =$	$\sum xy =$

$SS_x =$

$SS_{xy} =$

$SS_y =$

$$r = \frac{SS_{xy}}{\sqrt{(SS_x)(SS_y)}}$$

Pg 159, 1, 3, 5