# SAP: PEMULIAAN TERNAK/HEWAN **(Kontrak; RPS-Penilaian)**

| | Materi Pembelajaran | Dosen |
|---|---|---|
| 1. | Pendahuluan, ruang lingkup, sifat kuantitatid/kualitatif, relevansi PT | |
| 2 | Parameter genetik I I; pengertian, metode estimasi Heritabilitas, penerapan dlm PT | |
| 3 | Parameter genetik II: Ripitabilitas, penerapan PT | |
| 4 | Parameter genetik II: Korelasi genetik, estimasi, manfaat | |
| 5. | Estimasi , MPPA, , Nilai Pemuliaan, Penerapan | |
| 6. | Diskusi kelompok I atau tugas sejenis/tugas/praktikum lapang (kontes ternak) | |
| 7. | Diskusi kelompok II, atau tugas sejenis/ l**atihan ujian open book** | |
| 8. | UTS (closed book) | |
| 9. | Pengertian seseleksi, deff. Seleksi, intensitas seleksi Interval generasi | |
| 10. | Respon seleksi, respon terkorelasi, respon terkorelasi akibat seleksi | |
| 11. | Metode seleksi : individu, famili pedegree, seleksi dua sifat/lebih: tandem, ICL, Indeks | |
| 12. | Sistem Perkawinan Berkerabat: Konsep out breeding, efek geneti, tak berkerabat (out breeding, efek heterosis | |
| 13. | Diskusi kelompok I atau tugas sejenis | |
| 14. | Diskusi kelompok II, atau tugas sejenis | |
| 15. | Diskusi kelompok I atau tugas sejenis | |
| 16. | UAS | |

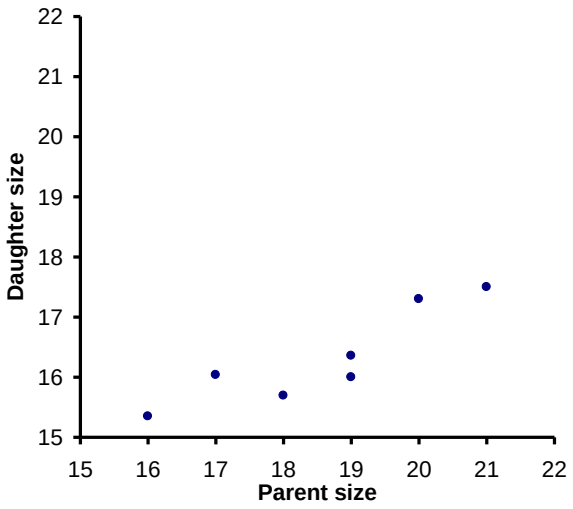
# Overview : Korelasi dan Regresi
# Pengertian Umum

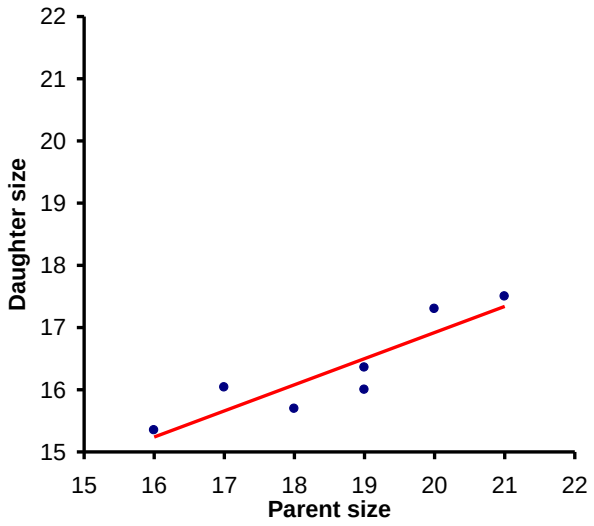
Correlation seeks to establish whether a relationship exists between two variables (X dan Y)

Regression seeks to use one variable to predict another variable

Both measure the extent of a linear relationship between two variables

Statistical tests are used to determine the strength of the relationship

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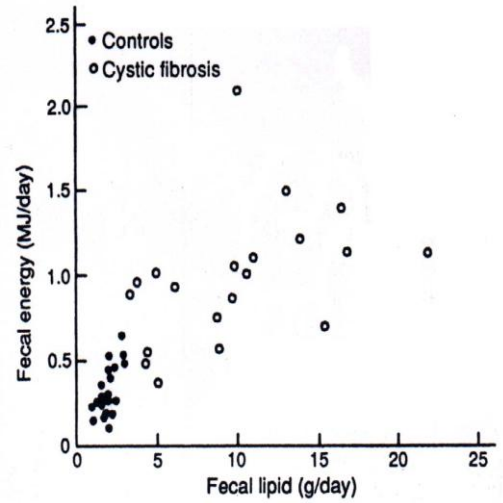
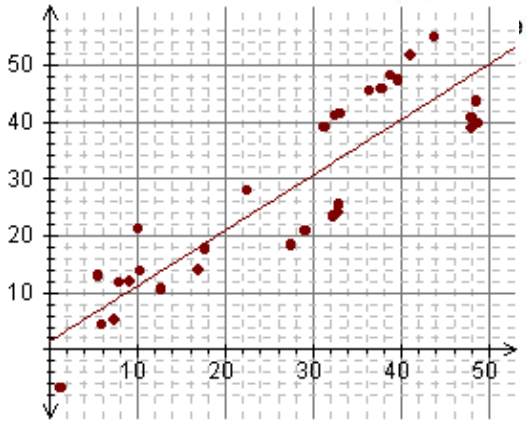
# Korelasi dan Regresi

## FENOTIP DAN GENETIK




### Correlation

- **linear pattern of relationship between one variable (x) and another variable (y) – an association between two variables**
- relative position of one variable correlates with relative distribution of another variable
- graphical representation of the relationship between two variables

**Warning:**

No proof of causality

Cannot assume x causes y

# Analisis (Data Statistik=DASAR GENETIKA)

**Korelasi: (koefisien korelasi = r)** , apakah ada hubungan suatu sifat dengan sifat yang lain: Nilai berkisar antara -1.0 sampai 1.0

r = +1.0 : berarti setiap peningkatan 1 unit satu variabel, akan meningkatkan

1 unit variabel pada sifat yang berkorelasi

r = 0.0 : tidak ada hubungan antara kerua sifat

Misalnya antara: -panjang badan dan lingkar dana

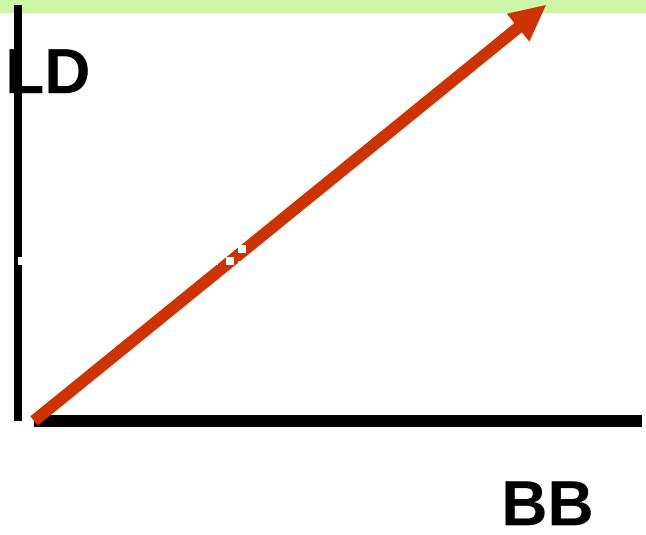
•-jumlah produksi susu dengan kadar lemak

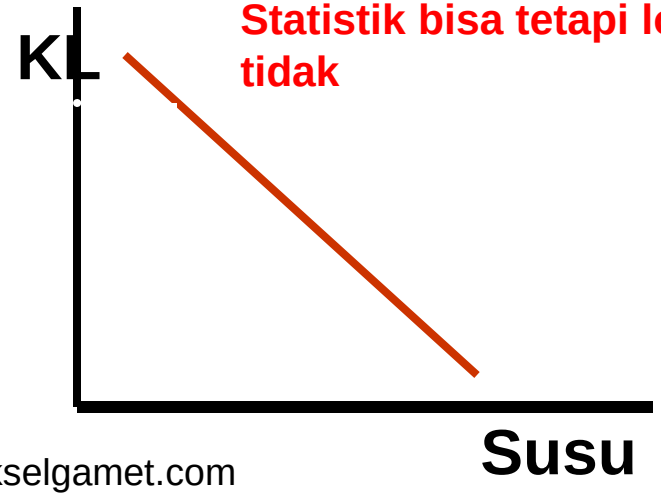
•-Lingkar dada dengan berat badan, dll.

**INGAT BAHWA STATISTIK HANYA ALAT ANALISA**

Mis: Hubungan produksi susu dengan panjang ekor???

**Statistik bisa tetapi logika biologis tidak**



# Analisis STATISTIK :
## t-test, chi square, correlasi

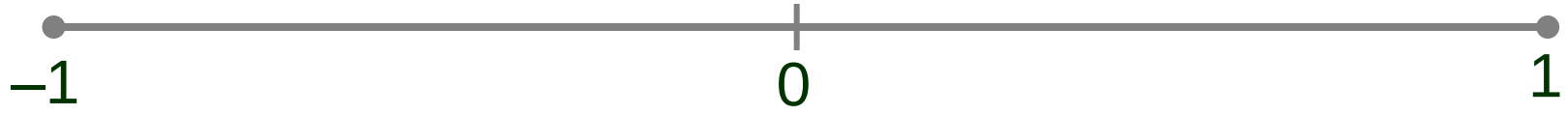
- One qualitative and one quantitative variable = t-test
- Two qualitative variables = chi square
- What if you have two quantitative variables, and you want to know how much they go together?
  - E.g., jumlah pakan (g) and PBB (kg)
  - → correlation

# Koefisien Korelasi“r”

A measure of the strength and direction of a linear relationship between two variables

$$r = \frac{n\Sigma xy - \Sigma x \Sigma y}{\sqrt{n\Sigma x^2 - (\Sigma x)^2}\sqrt{n\Sigma y^2 - (\Sigma y)^2}}$$

The range of *r* is from –1 to 1.



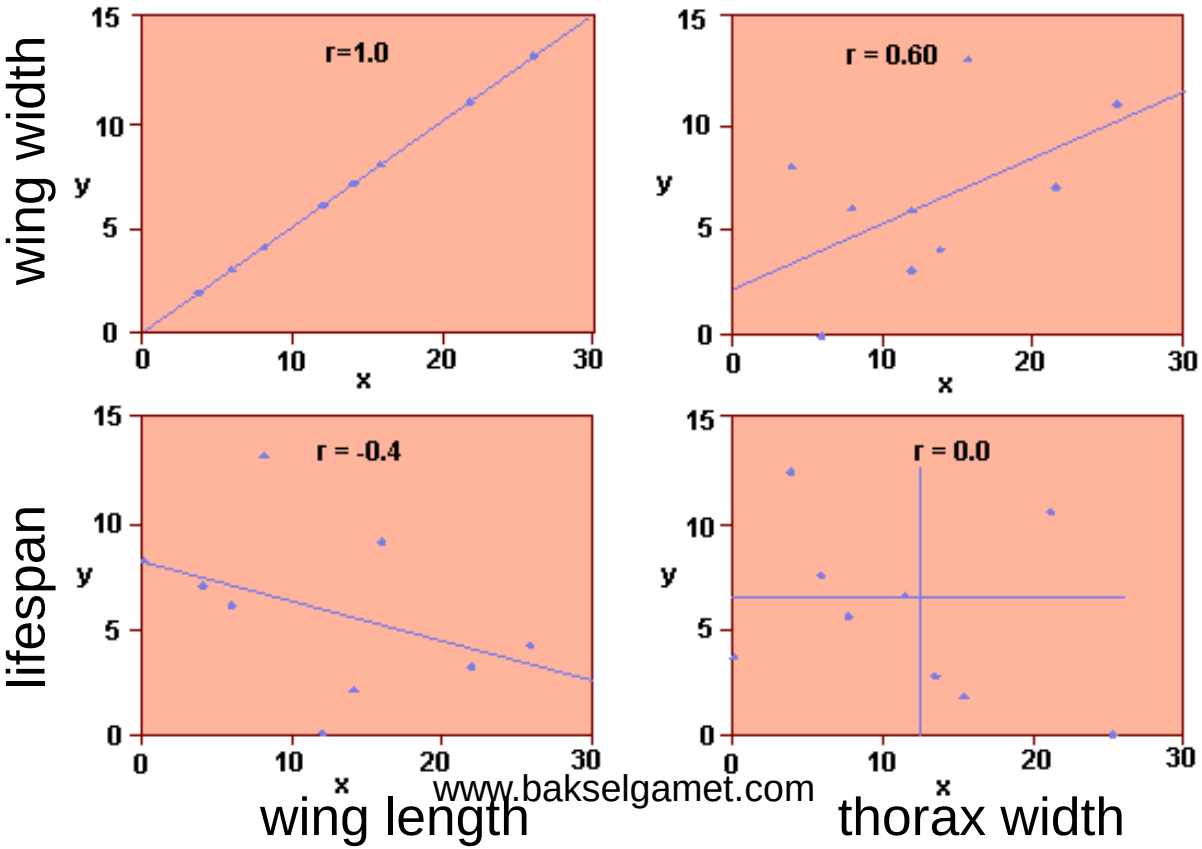

If *r* is close to –1 there is a strong negative correlation.

If *r* is close to 0 there is no linear correlation.

If *r* is close to 1 there is a strong positive correlation.

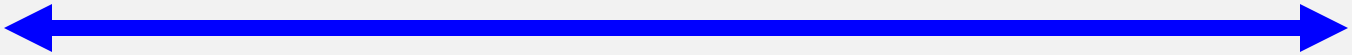
# KORELASI FENOTIPIK

degree to which two traits co-vary among individuals in a population



# Pearson's Correlation Coefficient

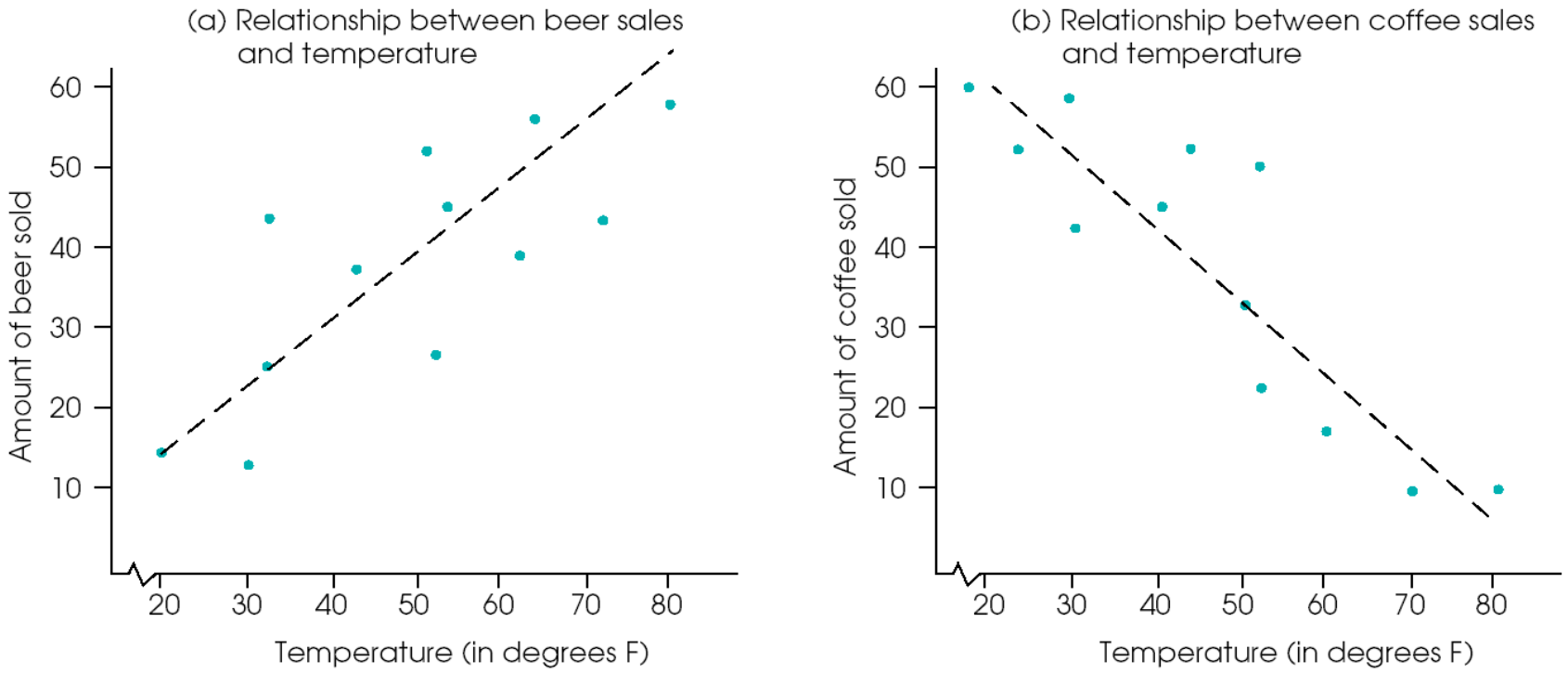
- "r" indicates…
  - strength of relationship (strong, weak, or none)
  - direction of relationship
    - positive (direct) – variables move in same direction
    - negative (inverse) – variables move in opposite directions
- **r ranges in value from –1.0 to +1.0**



-1.0 0.0 +1.0

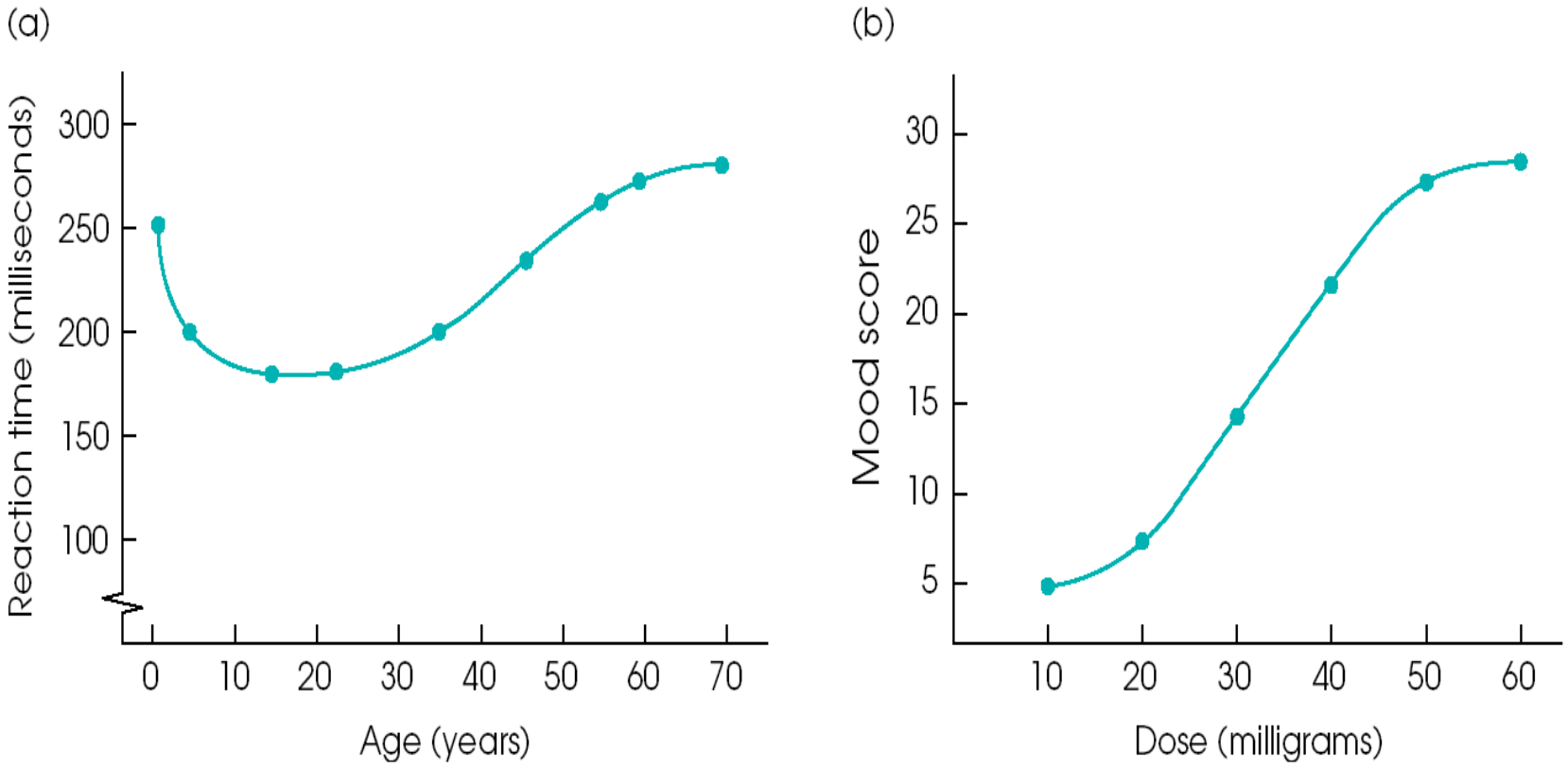
Strong Negative No Rel. Strong Positive

# Contoh: Positive vs Negative




**Examples of positive and negative relationships. (a) Beer sales are positively related to temperature. (b) Coffee sales are negatively related to temperature.**

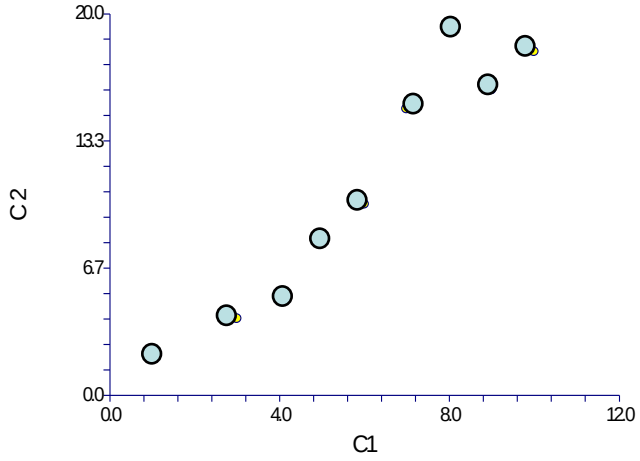
# Contoh: non-linear relationships




Examples of relationships that are not linear: (a) relationship between reaction time and age; (b) relationship between mood and drug dose.

# Correlations:

## Positive

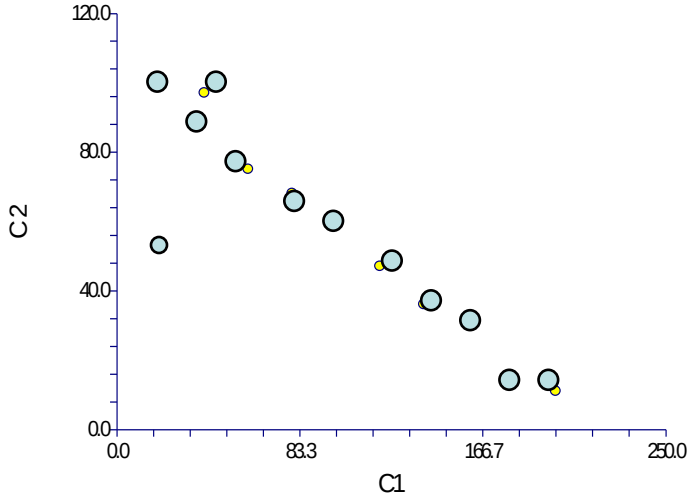



Large values of X associated with large values of Y,

small values of X associated with small values of Y.

e.g. IQ and SAT

## Negative

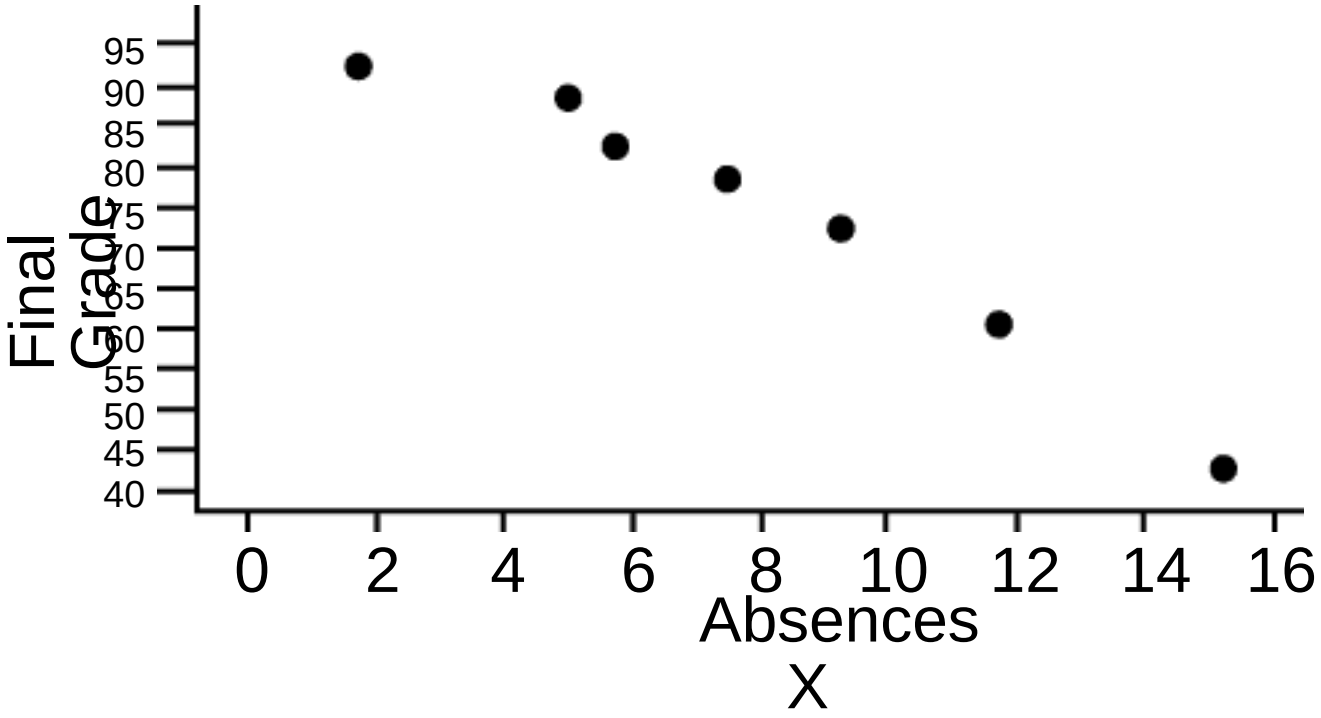



Large values of X associated with small values of Y

& vice versa

e.g. SPEED and ACCURACY

# Application




| Absences | Final Grade |
|---|---|
| *x* | *y* |
| 8 | 78 |
| 2 | 92 |
| 5 | 90 |
| 12 | 58 |
| 15 | 43 |
| 9 | 74 |
| 6 | 81 |

# Computation of *r*

| | $x$ | $y$ | $xy$ | $x^2$ | $y^2$ |
|---|---|---|---|---|---|
| 1 | 8 | 78 | 624 | 64 | 6084 |
| 2 | 2 | 92 | 184 | 4 | 8464 |
| 3 | 5 | 90 | 450 | 25 | 8100 |
| 4 | 12 | 58 | 696 | 144 | 3364 |
| 5 | 15 | 43 | 645 | 225 | 1849 |
| 6 | 9 | 74 | 666 | 81 | 5476 |
| 7 | 6 | 81 | 486 | 36 | 6561 |
| | **57** | **516** | **3751** | **579** | **39898** |

$$r = \frac{n\Sigma xy - \Sigma x \Sigma y}{\sqrt{n\Sigma x^2 - (\Sigma x)^2}\sqrt{n\Sigma y^2 - (\Sigma y)^2}} = \frac{7(3751) - (57)(516)}{\sqrt{7(579) - (57)^2}\sqrt{7(39898) - (516)^2}}$$

$$r = \frac{-3155}{\sqrt{804}\sqrt{13030}} = -0.975$$

# Korelasi Genetik

# KORELASI GENETIK

phenotypic correlation = genetic + environmental correlation

$$r_P = r_A + r_D + r_E$$

$$r_P = h_x h_y r_A + e_x e_y r_E$$

# To measure genetic correlations

Use same breeding designs as for additive variance, but measure two traits instead of just one

**Correlations between traits in parents and offspring**

**Correlation between traits in half-sibs and full-sibs**

OR

Perform artificial selection

# Kenapa karakter scr genetik berkorelasi?

## Pleiotropy: single gene affects multiple traits

## The genetic Correlation

Traits are not inherited as independent unit, but the several traits tend to be associated with each other

This phenomenon can arise in 2 ways:

1. A subset of the genes that influence one trait may also influence another trait (pleiotropy)
2. The genes may act independently on the two traits, but due to non random mating, selection, or drift, they may be associated (linkage disequilibrium)

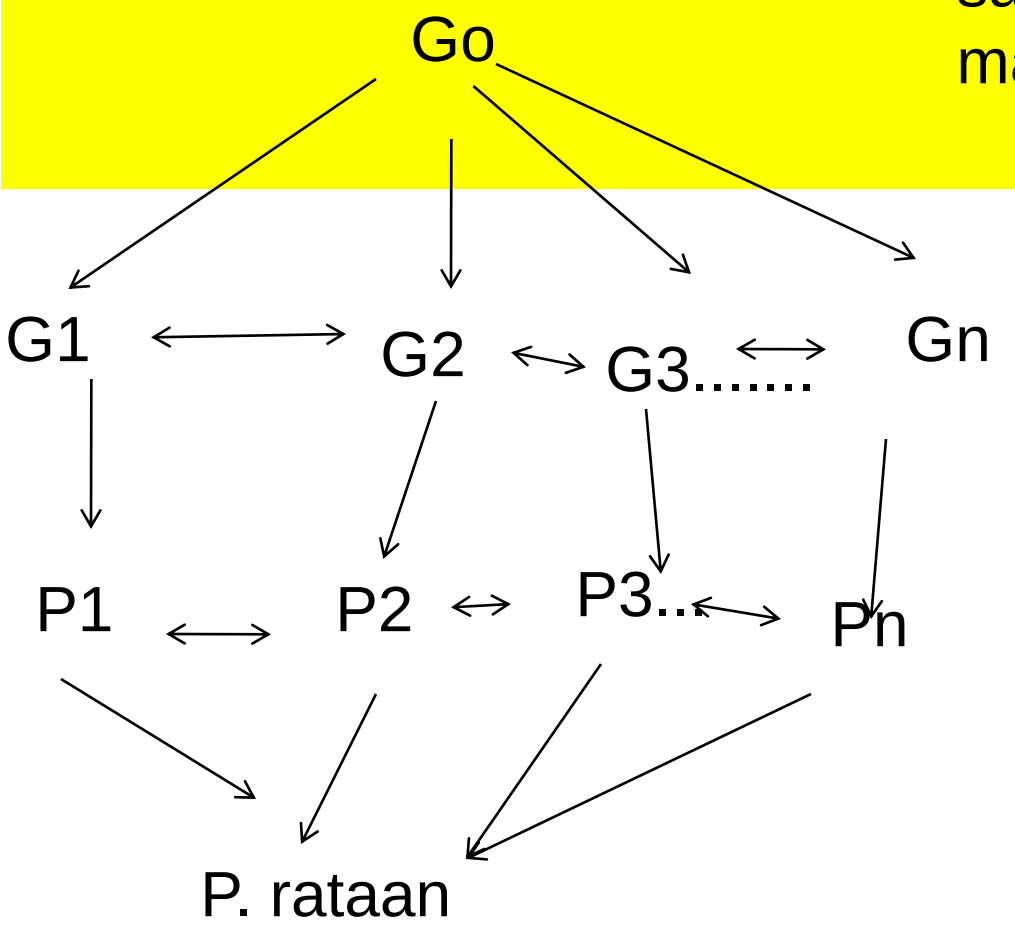
Hubungan Phenotip = Genetik

Apa yang nampak di Phenotip = Genetik

$P = G + E$

saat E = 0

maka P = G



# RUMUS DASAR:

$$\mathbf{r_G = cov_{XY} / (var_X \cdot var_Y)^{0.5}}$$

$r_G$ often used both for additive ($r_A$) and genotypic ($r_G$) correlation!

Phenotypic correlation:

**A combination of genetic and environmental (incl. nonadd gen effects) corr:**

$$\mathbf{r_P = h_X \cdot h_Y \cdot r_G + (1\text{-}h^2_X)^{0.5} \cdot (1\text{-}h^2_Y)^{0.5} \cdot r_E}$$

$$\mathbf{r_P = h_X \cdot h_Y \cdot r_G + e_X \cdot e_Y \cdot r_E}$$

The magnitude and even the sign of $r_G$ cannot be determined from $r_P$ alone!

# MANFAAT KORELASI GENETIK

## 1. Trait-trait correlation

Relation between different traits.

For studies of how the improvement of one trait will affect another trait.

## 2. Age-age correlation

Relation between a trait at young and mature age. Gives info about when reliable estimations can be achieved.

## 3. Site-site correlation

Relation between genotype and environment. For deliniation of breeding and seed zones and for optimization of number of trials per zone

**Another basic use of $r_G$ is** prediction of genetic gain**.**

# DASAR ESTIMASI: rG

- Burdon correlation, type A:

Both traits are measured on the same individual (true genetic corr.). Trait-trait and age-age correlations

- Burdon correlation, type B:

Two traits are measured on different individuals (approximated genetic corr.). One trait expressed at two sites are considered as two different traits. Site-site correlations.

# Contoh:Genetic correlations in natural populations

| Species | Trait 1 | Trait 2 | $r_A$ or $r_G$ | $r_E$ |
|---|---|---|---|---|
| Darwin's finch<br>$r_p$ = -0.18 | wing length | Bill length | +0.95 | -0.68 |
| House mouse<br>$r_p$ = 0.22 | brain size | body size | -0.23 | +0.34 |
| Water strider<br>$r_p$ = 0.33 | abdomen length | femur width | +0.71 | +0.10 |
| *Daphnia*<br>$r_p$ = 0.35 | Size at maturity | Clutch size | +0.11 | +0.49 |
| *Phlox*<br>$r_p$ = 0.17 | Height | Petal width | +0.42 | +0.13 |

# Coefficient of Determination, $r^2$

- To understand the strength of the relationship between two variables
- The correlation coefficient, *r,* is squared
- ***r*** $^2$ shows how much of the variation in one measure (say, fecal energy) is accounted for by knowing the value of the other measure (fecal lipid loss)

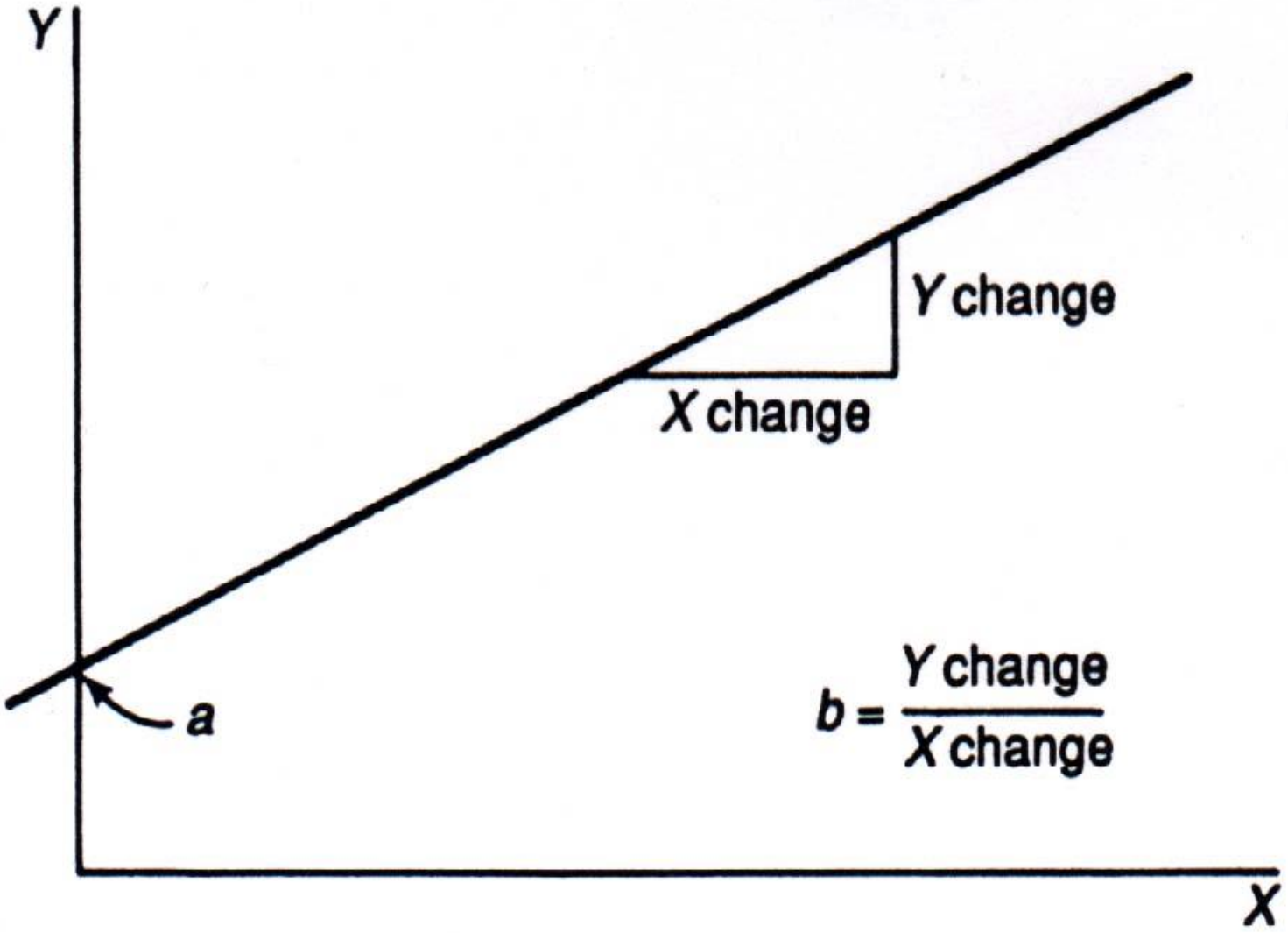
# Koefisien determinasi

- $R^2 = 91.83\ \%$
- Nilai koefisien determinasi sebesar 91.84 % artinya bahwa bobot badan sapi ditentukan oleh lingkar dada sebesar 91.84 % sedangkan 8.16 % ditentukan oleh factor lain.

# Linear Regression

- Used when the goal is to predict the value of one characteristic from knowledge of another
- Assumes a straight-line, or linear, relationship between two variables
- when term *simple* is used with regression, it refers to situation where one explanatory (independent) variable is used to predict another
- *Multiple* regression is used for more than one explanatory variable

- If the point at which the line intercepts or crosses the Y-axis is *a* and the slope of the line is denoted as *b*, then $Y = ß_1X + ß_0$
  - Like $y = mx + b$
- The slope is a measure of how much Y changes for a one-unit change in X

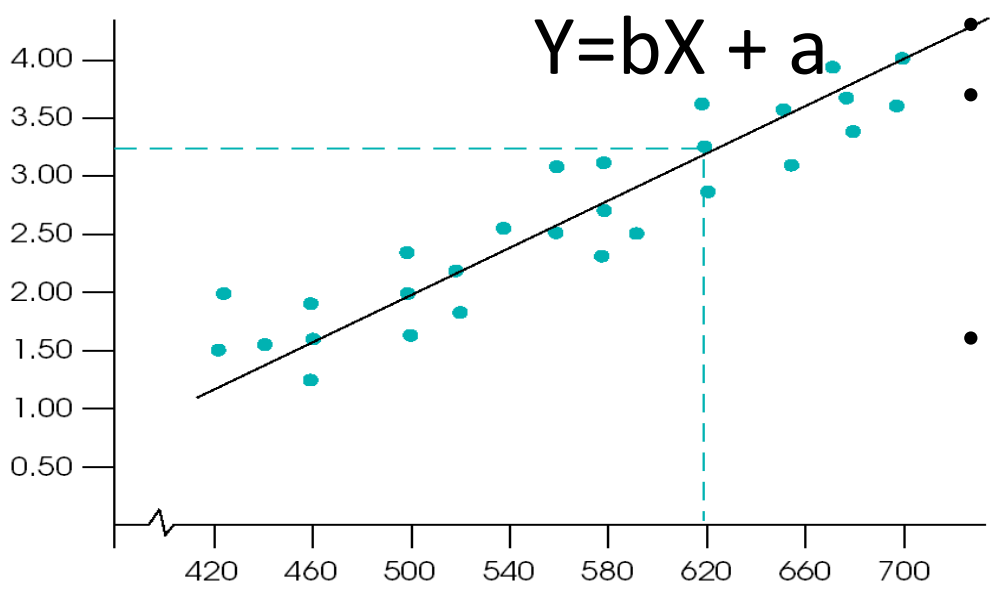



Geometric interpretation of regression line

# Regression

- Regression:  Correlation + Prediction
  - predicting y based on x
- Regression equation
  - formula that specifies a line
  - y’ = bx + a
  - plug in a x value (distance from target) and predict y (points)
  - note
    - y= actual value of a score
    - y’= predict value

# Simple Linear Regression




- Y is the dependent variable
- b is the slope of the line - the rate at which Y will change when X changes by one unit of X
- a is the intercept – that value of Y when X is equal to zero

**The regression line is the best fit through the data. Best fit is defined as the average line – the one that minimises the distance between the data points and the line. It is the best description of the data**

# The Line of Regression

**Regression indicates the degree to which the variation in one variable X, is related to or can be explained by the variation in another variable Y**

**Once you know there is a significant linear correlation, you can write an equation describing the relationship between the *x* and *y* variables. This equation is called the line of regression or least squares line.**

**The equation of a line may be written as $y = mx + b$ where *m* is the slope of the line and *b* is the y-intercept.**

**The line of regression is:**

$$\hat{y} = mx + b$$

**The slope *m* is:**

$$m = \frac{n\Sigma xy - \Sigma x \Sigma y}{n\Sigma x^2 - (\Sigma x)^2}$$

**The y-intercept is:**

$$b = \bar{y} - m\bar{x}$$

| | $x$ | $y$ | $xy$ | $x^2$ | $y^2$ |
|---|---|---|---|---|---|
| 1 | 8 | 78 | 624 | 64 | 6084 |
| 2 | 2 | 92 | 184 | 4 | 8464 |
| 3 | 5 | 90 | 450 | 25 | 8100 |
| 4 | 12 | 58 | 696 | 144 | 3364 |
| 5 | 15 | 43 | 645 | 225 | 1849 |
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| 7 | 6 | 81 | 486 | 36 | 6561 |
| | **57** | **516** | **3751** | **579** | **39898** |

Write the equation of the line of regression with $x$ = number of absences and $y$ = final grade.

Calculate $m$ and $b$.

$$m = \frac{n\Sigma xy - \Sigma x\Sigma y}{n\Sigma x^2 - (\Sigma x)^2} = \frac{7(3751) - (57)(516)}{7(579) - (57)^2} = -3.924$$

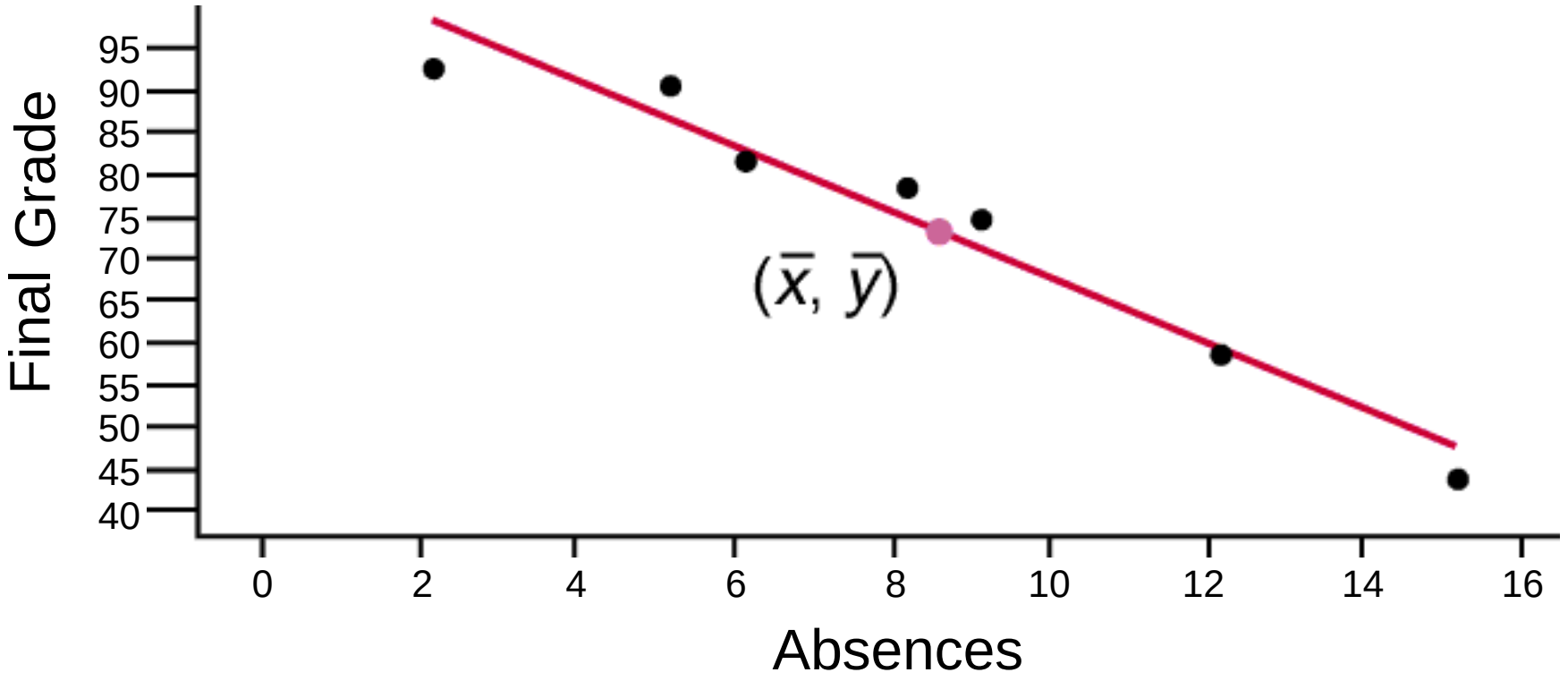
$$b = \bar{y} - m\bar{x} = 73.714 - (-3.924)(8.143) = 105.667$$

The line of regression is: $\hat{y} = -3.924x + 105.667$

# The Line of Regression

$m = -3.924$ and $b = 105.667$

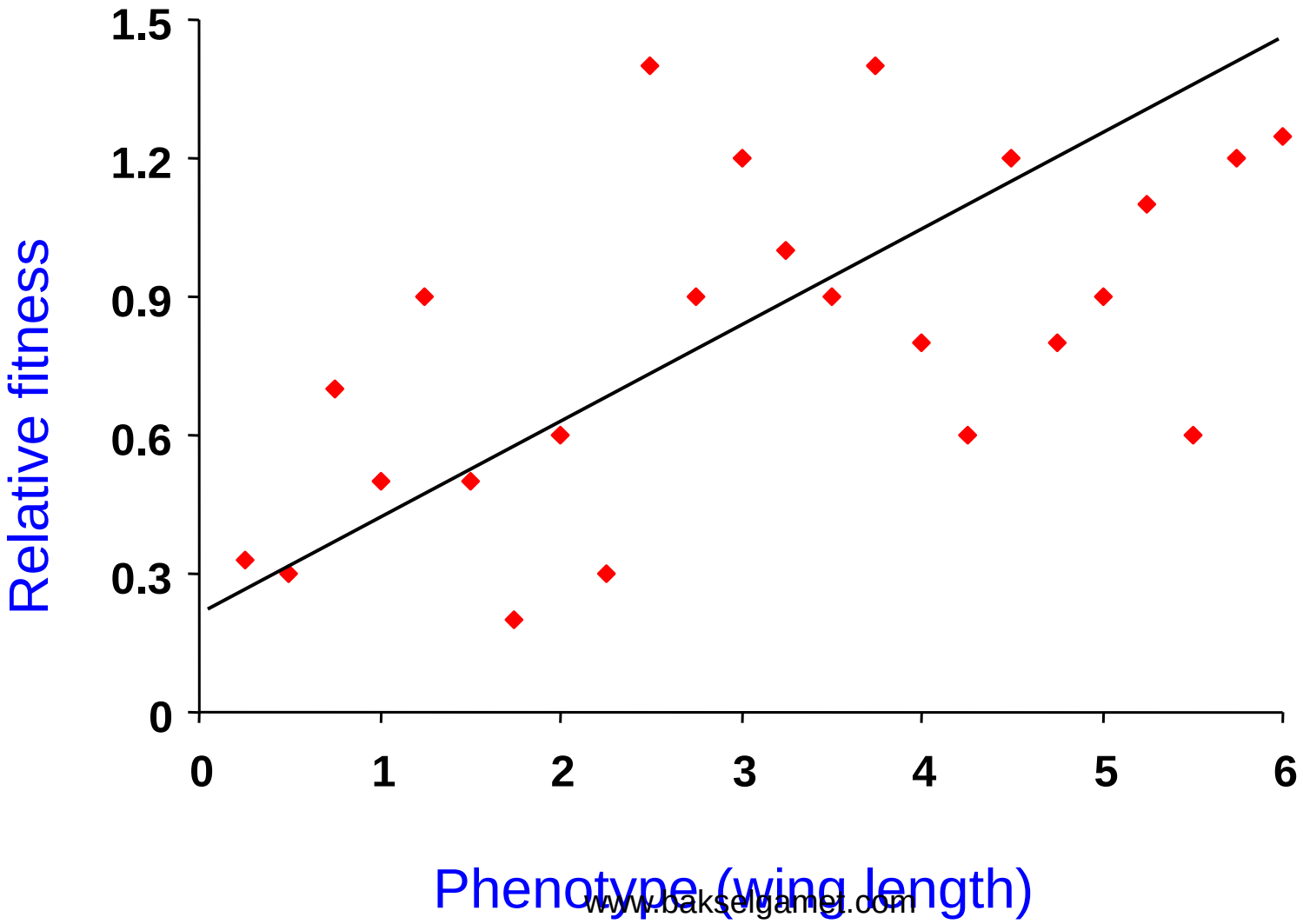
The line of regression is: $\hat{y} = -3.924x + 105.667$




Note that the point $(\bar{x}, \bar{y}) = (8.143, 73.714)$ is on the line.

# Linear regression: $y = a + bx$

$$\omega = \alpha + \beta z$$



# Linear and nonlinear terms: $y = a + bx + cx^2$

$$\omega = \alpha + \beta z + \gamma z^2$$