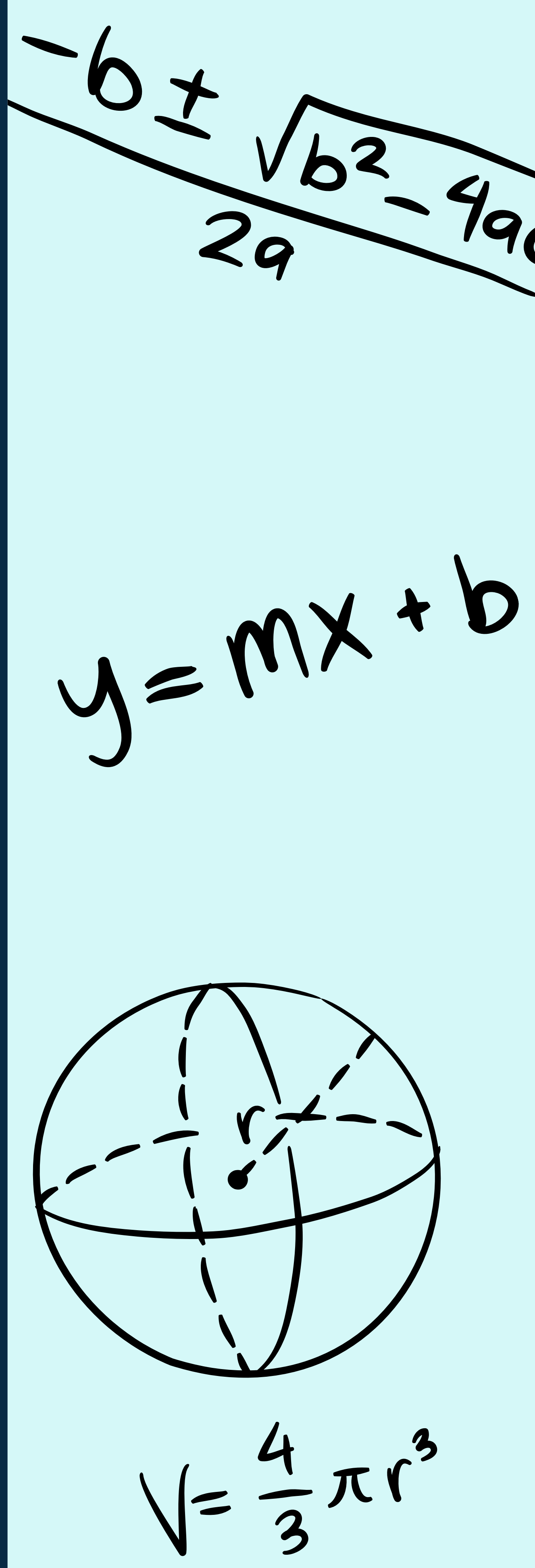
INtroducing

Aggression and Correlation

Introduction

Correlation is a statistical method used to measure the strength and direction of the relationship between two variables, commonly applied in mathematics, statistics, economics, and research.



Concept of Regression

- Regression shows the functional relationship between variables.
- Simple linear regression uses one independent variable (x) to predict dependent variable (y).

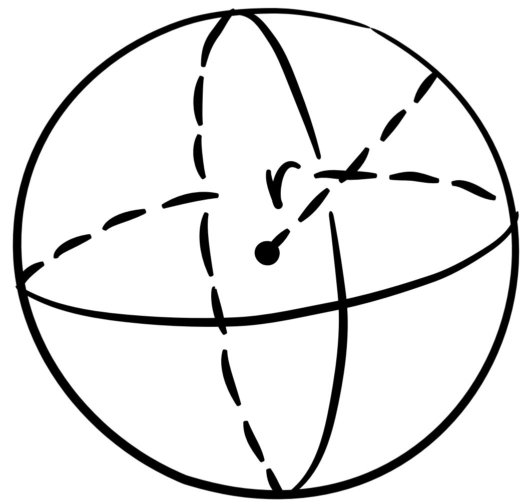
General equation:

$\hat{y} = a + bx$

- a = intercept
- b = slope (rate of change)

$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$y = mx + b$



$V = \frac{4}{3}\pi r^3$

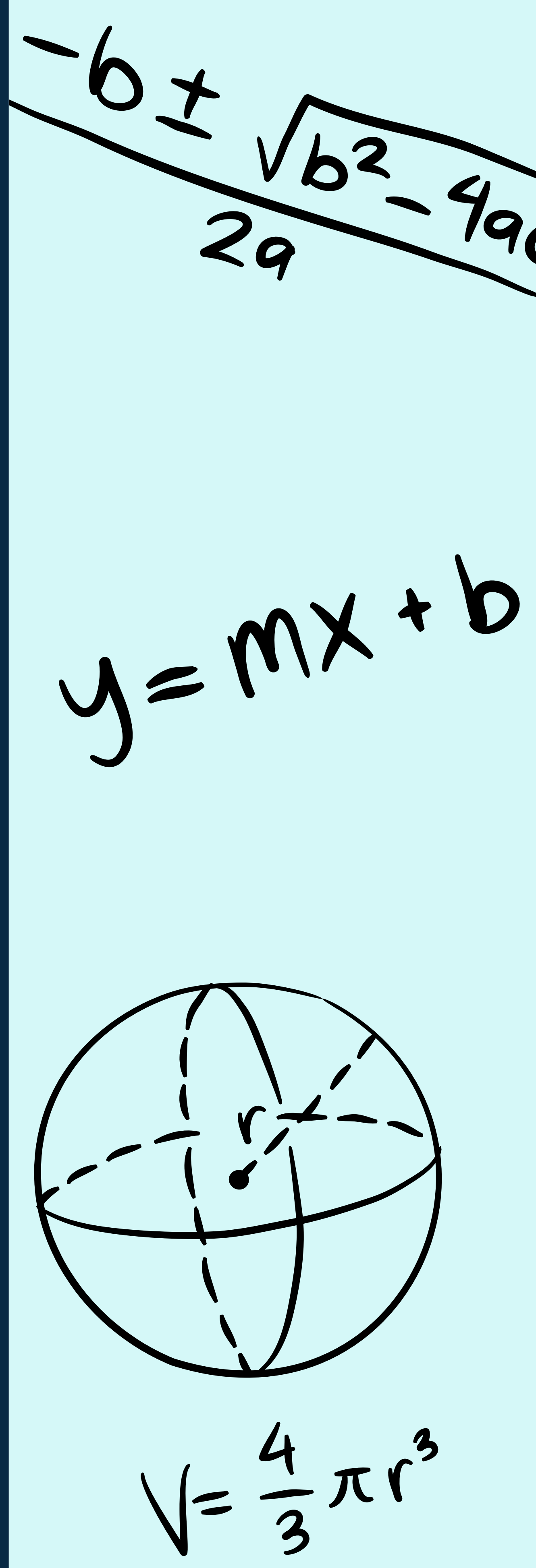
Formula of Regression

To compute regression coefficients:

- $b = [\ n\Sigma xy - (\Sigma x)(\Sigma y)\ ] \div [\ n\Sigma x^2 - (\Sigma x)^2\ ]$
- $a = \bar{y} - b(\bar{x})$

Regression equation:

- $\hat{y} = a + bx$

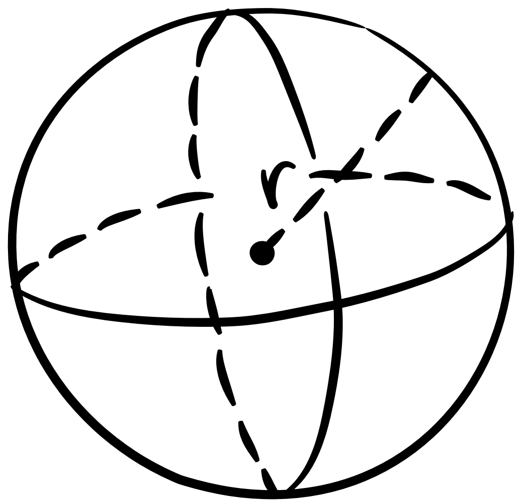


Process of Regression

- Calculate Σx, Σy, Σxy, Σx^2.
- Find slope b.
- Find intercept a.
- Form regression equation $\hat{y} = a + bx$.
- Use equation to predict values of y given x.

$$\frac{-b \pm \sqrt{b^2-4a}}{2a}$$

$$y = mx + b$$



$$V = \frac{4}{3}\pi r^3$$

Concept of Correlation

Correlation measures how strongly two variables are related.

Types:

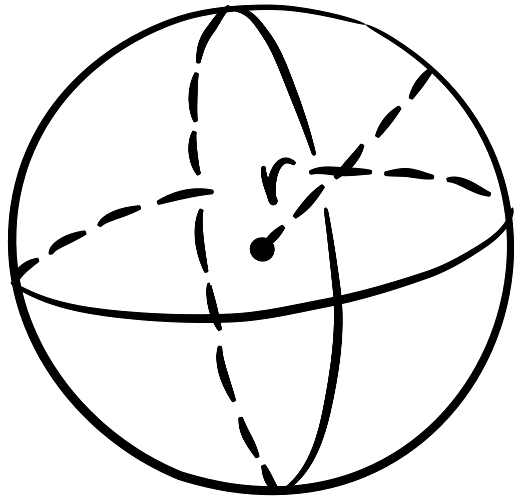
- Positive correlation → both variables increase together.
- Negative correlation → one increases while the other decreases.
- Zero correlation → no relationship.

Values of correlation coefficient (r):

- r = +1 → perfect positive correlation
- r = -1 → perfect negative correlation
- r = 0 → no correlation

$\frac{-b \pm \sqrt{b^2-4ac}}{2a}$

$y = mx + b$



$V = \frac{4}{3}\pi r^3$

Formula of correlation

Pearson's Correlation Coefficient (r):

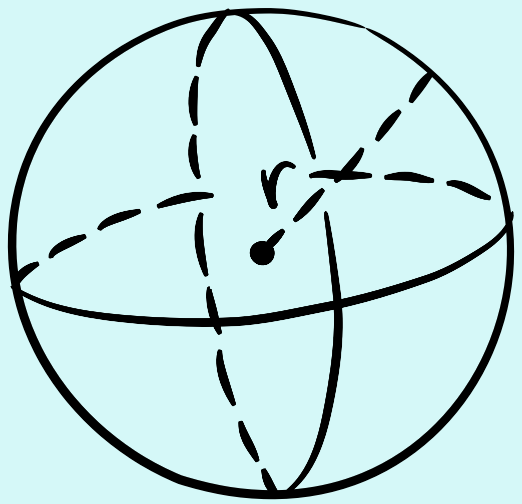
- $r = \Sigma[(x - \bar{x})(y - \bar{y})] \div \sqrt{[\Sigma(x - \bar{x})^2 \Sigma(y - \bar{y})^2]}$

Alternate formula:

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

$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$y = mx + b$



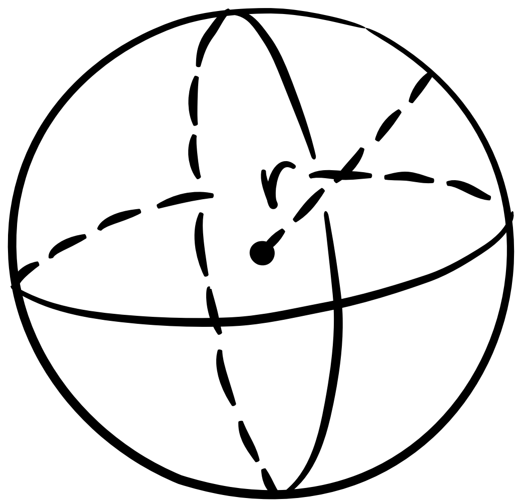
$V = \frac{4}{3}\pi r^3$

Process of Correlation

- Collect paired data (x, y).
- Calculate Σx, Σy, Σx^2, Σy^2, Σxy.
- Substitute into the formula.
- Solve numerator and denominator.
- Compute r.
- Interpret: strength and direction of relationship.

$$\frac{-b \pm \sqrt{b^2-4a}}{2a}$$

$$y = mx + b$$



$$V = \frac{4}{3}\pi r^3$$

Example of the Problem

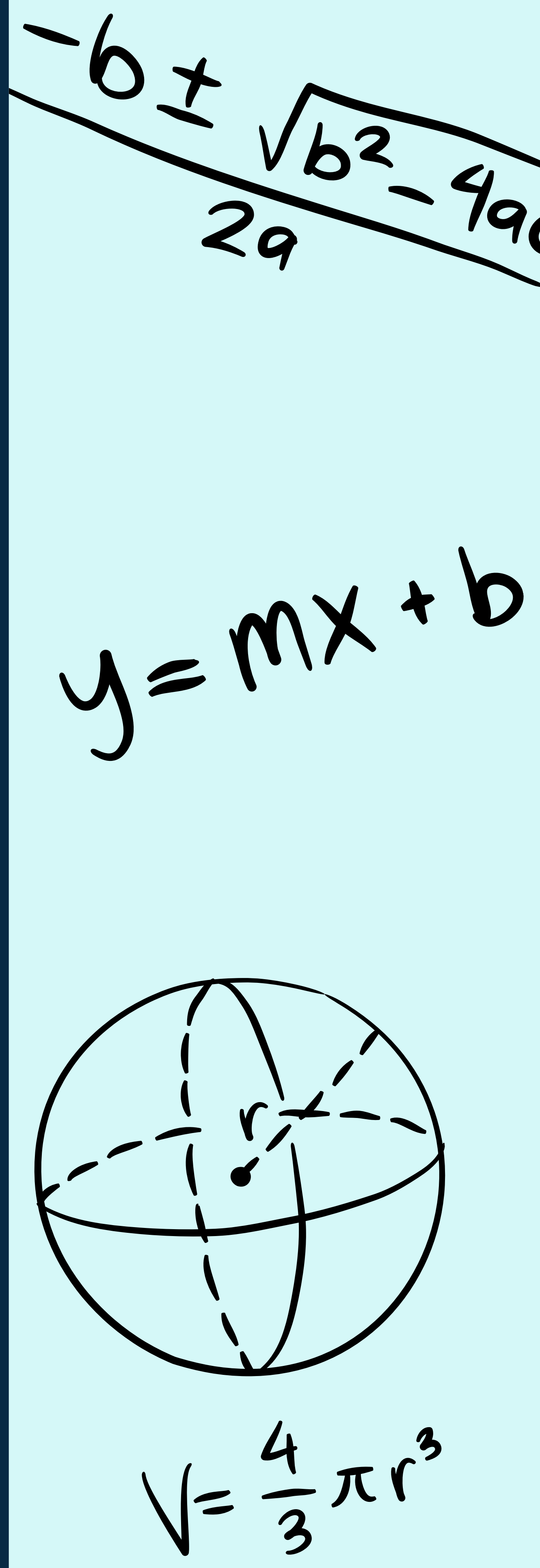
Data:

- x = [2, 4, 6, 8, 10]
- y = [3, 5, 7, 9, 11]

Correlation: r = 1 → perfect positive correlation.

Regression:

- b = 1, a = 1
- Equation: $\hat{y} = 1 + 1x = x + 1$
- If x = 12, $\hat{y}$ = 13.



Application

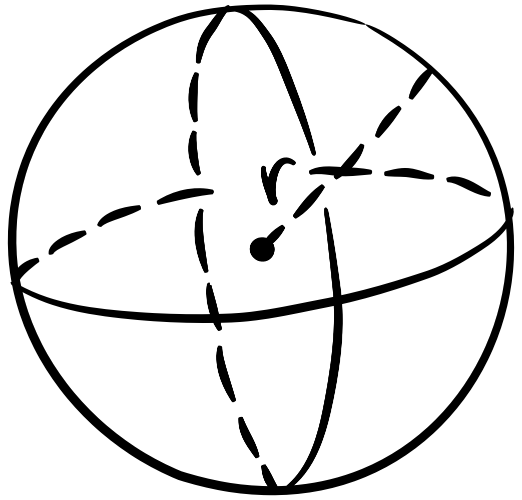
- Correlation: measures association between variables.
- Regression: predicts outcomes and trends.

Fields of use:

- Business → sales prediction
- Economics → income vs. spending
- Science → experimental data modeling
- Education → study hours vs. test scores

$$\frac{-b \pm \sqrt{b^2-4ac}}{2a}$$

$$y = mx + b$$



$$V = \frac{4}{3}\pi r^3$$

Critical Thinking

- Correlation does not imply causation.
- Regression builds prediction, but accuracy depends on data quality.
- Example: A high correlation between shoe size and reading skills is due to age, not causation.
- Always check for hidden variables before making conclusions.

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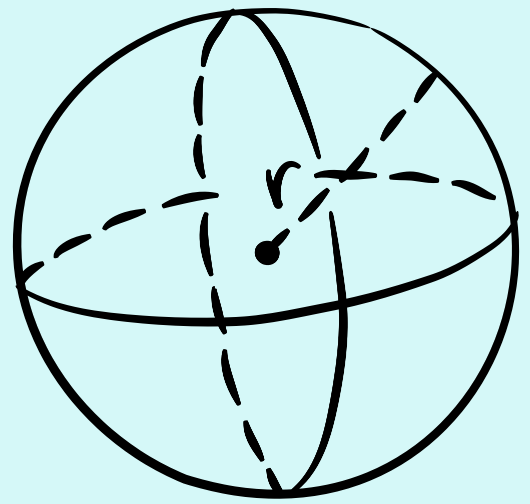
$$y = mx + b$$



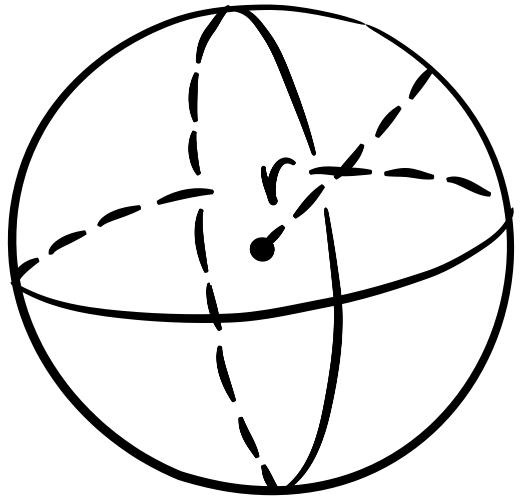
$$V = \frac{4}{3}\pi r^3$$

Conclusion

- Correlation explains the strength and direction of relationships.
- Regression provides a predictive model using those relationships.
- Both are powerful tools in mathematics and statistics.
- Correct application leads to better analysis, prediction, and decision-making.

$$\frac{-b \pm \sqrt{b^2 - 4a}}{2a}$$

$$y = mx + b$$



$$V = \frac{4}{3}\pi r^3$$