



Lesson Plan: Are Colleges Still Affordable?

The Mathematical Model

A **mathematical model** is a method of understanding a complex real-world process involving multiple variables. To design a model, important features are identified and quantified symbolically using a number of mathematical tools. Once designed, a mathematical model must be evaluated and critiqued for accuracy, advantages, and limitations.

The following mathematical model compares the cost of education to potential earnings in order to decide if the investment is a good one. Using information about the current cost of college, we will investigate the model and compute the amount to be repaid each year for the life of the loan and then compare the answer to some probable starting salaries. Finally, we will critique the model discussing its advantages, limitations, and any improvements we would make.

A Mathematical Model for Comparing the Cost of Education to Potential Earnings

Definitions of Terms and Variables:

Principal: the amount borrowed. (P)

Interest: the total dollar amount charged for the loan. (I)

Rate: the interest rate charged per year. (R)

Time: the number of years to repay the loan. (T). College loans are usually repaid over 10 years with interest starting 6 months after graduation.

Yearly Payment: Amount to be repaid each year. (Y_p)

Affordability factor: Percent of personal income needed to repay the debt each year. (A)

Yearly Starting Salary: (Y_s)

Principal = [(tuition + room & board + fees + textbooks + transportation) - (parents' contribution + student's contribution + scholarships or grants)] * years of schooling.

$$A: \quad P = [(t_u + r + f + b + t_r) - (p + s + g)] * y$$

$$B: \quad I = P * R * T$$

$$C: \quad Y_p = (I + P) / 10$$

$$D: \quad A = (100 * Y_p) / Y_s$$

