



Chapter 7: The Basics of Simple Interest (Time & Money)

Loans are a common part of business and life. Money is borrowed or lent for a period of time and interest is charged on the loan. Interest can be thought of as "the rent" charged for using the money. The formula to calculate simple interest is:

$$\text{Interest} = \text{Principal} \times \text{Rate} \times \text{Time} \quad \text{or} \quad I = Prt$$

Rate (r) is the annual rate of interest, Time (t) is the interest period in years, and Principal (P) is the original amount of money borrowed or loaned.

We can compute the **future value** of a sum of money (or **maturity value**) by adding the original principal to the interest due. (Think of this as the value of a loan with interest that must be repaid.)

$$\begin{aligned} \text{Future Value} &= \text{Principal} + \text{Interest} \\ S = P + I &= P + Prt \quad (\text{substitute in the first equation above for interest}) \\ S &= P(1 + rt) \end{aligned}$$

We can also rearrange this equation to solve for the principal value of money when the future or maturity value is known:

$$P = S/(1 + rt)$$

When given any 3 of the 4 variables (time, interest rate, principle or maturity value), we can solve for the one unknown.

Things become slightly more complicated when the terms of repayment of a loan are renegotiated to a new payment schedule. The value of money changes as time passes. (Think about how much more an income of \$40,000 was worth 40 years ago than it is today!) The value of the original investment or payment on any particular day is a **dated value** (or equivalent value).

Since the value of money changes with time, we cannot compare sums of money that are given at different points in time. In order to compare money at different points in time, we choose a **focal date**, and move all the amounts of scheduled payments (or money) to that specific date. This lets us compare the money values without inflation effects.

The steps to solving a problem with money at different points in time are:

1. Draw a timeline and enter the focal date and the old and new payment schedules.
2. Move all money amounts to the focal date using the correct formula.
3. Once the amounts are all at the focal date, we can add, subtract, and compare monetary amounts.