INTERESTS

A DEFINITIONS

Discover: We've all heard of interest rates—whether on a mortgage, a credit card, or a loan. But what does it really mean?
Interest is essentially the "rent" you pay for borrowing money. It's the extra amount you pay to use someone else's money for a certain period.
Example of interest:
Imagine you borrow \$100 today and promise to pay it back in one year. If you return exactly \$100 after one year, there's no interest. However, the lender might want to be compensated for letting you use their money.
They may ask for a percentage as interest. For example, at a 10% interest rate per year, the interest paid is:

$$\begin{aligned}\text{Interest Paid} &= \text{Percentage of the Original Amount}\\ &= \text{Interest Rate} \times \text{Original Amount}\\ &= 10\% \times 100\\ &= \frac{10}{100} \times 100\\ &= 10 \text{ dollars}\end{aligned}$$

Therefore, after one year, you owe:

$$\begin{aligned}\text{Amount at Year 1} &= \text{Original Amount} + \text{Interest Paid}\\ &= 100 + 10\\ &= 110 \text{ dollars}\end{aligned}$$

So you would pay back \$110 instead of \$100. The extra \$10 is the interest—the cost of borrowing for a year.

Definition **Principal**

The **principal** is the original amount of money that is either invested or loaned.

Definition **Interest**

Interest is the cost paid for borrowing money or the amount earned from lending or investing money.

B SIMPLE INTEREST

Discover: Suppose you borrow \$100 with an interest rate of 10% per year. With simple interest, the interest is calculated only on the initial amount each year.

- Total interest after 1 year $= 10\% \times 100$
$$= \frac{10}{100} \times 100$$
$$= 10 \text{ dollars}$$
- Total interest after 2 years $= 2 \times 10\% \times 100$
$$= 2 \times \frac{10}{100} \times 100$$
$$= 20 \text{ dollars}$$
- Total interest after 3 years $= 3 \times 10\% \times 100$
$$= 3 \times \frac{10}{100} \times 100$$
$$= 30 \text{ dollars}$$

These observations lead to the simple interest formula:

$$\text{Simple Interest} = \text{Number of years} \times \text{Interest rate} \times \text{Principal}$$

Definition **Simple Interest**

The **simple interest** is calculated each year as a fixed percentage of the principal (original amount) borrowed or invested.

Proposition **Simple Interest Formula**

The simple interest, denoted by I, is calculated as:

$$I = t \times r \times P$$

where:

- P is the principal (original amount)
- r is the interest rate per year (expressed as a decimal)
- t is the time (in years)

The final amount, denoted by A, is:

$$A = P + I$$

Ex: Find the simple interest on a principal of \$500 at a rate of 3% per year over 5 years.

Answer:

$$\begin{aligned} \text{Interest} &= 5 \times 3\% \times 500 \\ &= 5 \times \frac{3}{100} \times 500 \\ &= 75 \text{ dollars} \end{aligned}$$