

INTERESTS

A DEFINITIONS

Discover: Understanding Interest 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 additional amount you pay to use someone else's money for a certain period of time.

Example of interest:

Imagine you borrow \$100 from someone today and promise to pay it back in one year. If you return exactly \$100 after one year, there's no interest involved. However, the lender might ask for more in return—they might want to be compensated for letting you use their money.

They may request a percentage of the amount. For example, at a 10% interest rate per year, the interest you would pay is:

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

Therefore, after one year, you would owe:

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

In this case, you would pay back \$110 instead of \$100. The extra \$10 is the interest, which represents the cost of borrowing the money 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 paid after 1 year = Percentage of Original Amount
$$\begin{aligned}&= \text{Interest Rate} \times \text{Original Amount} \\ &= 10\% \times 100 \\ &= \frac{10}{100} \times 100 \\ &= 10 \text{ dollars}\end{aligned}$$
- Total interest paid after 2 years = $2 \times$ Percentage of Original Amount
$$\begin{aligned}&= 2 \times \text{Interest Rate} \times \text{Original Amount} \\ &= 2 \times 10\% \times 100 \\ &= 2 \times \frac{10}{100} \times 100 \\ &= 20 \text{ dollars}\end{aligned}$$
- Total interest paid after 3 years = $3 \times$ Percentage of Original Amount
$$\begin{aligned}&= 3 \times \text{Interest Rate} \times \text{Original Amount} \\ &= 3 \times 10\% \times 100 \\ &= 3 \times \frac{10}{100} \times 100 \\ &= 30 \text{ dollars}\end{aligned}$$

These observations lead to the simple interest formula:

$$\text{Simple Interest} = \text{Number of years} \times \text{Interest rate} \times \text{Principal (initial amount)}$$

Definition Simple Interest

The **simple interest** is calculated each year as a fixed percentage on the principal (original amount) of money 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
- 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:

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