KEY

Paying Interest on Loans

Objective

In this lesson, you will

describe the difference between simple and compound interest.

Simple Interest

→ calculated as a **percentage** of the **principal** amount

Term	Definition
principal	*the original amount borrowed or the part of the amount borrowed which remains unpaid (not including interest)*
interest	**the fee a borrower pays for using the lender's money**
interest rate	**the percentage used to calculate interest**
time	*the amount of time the borrower takes to pay back the borrowed money*

Simple Interest Formula:	In this formula:
$I = P \times r \times t$	P = **principal**, or the original amount of money I = **interest** r = interest rate (in decimal form) t = **time**

Example 1:
Desiree deposited $500 with the bank. The bank pays her 5 percent simple interest annually.

The principal is $**500**. The interest rate is **0.05**. Find the interest earned after 1 year.

$I = 500 \times$ **0.05** $\times 1 =$ $ **25**

After one year, the total amount in Desiree's account will be $500 + $**25**, or $**525**.

monthly interest = yearly interest divided by **12**

So, if Desiree's bank pays monthly interest, she will get $25 ÷ **12**, or $**2.08**, each month.

Example 2:
Bob has a $15,000 car loan from a bank. He must repay the loan at the end of five years at 5 percent.

The principal is $15,000. The interest rate as a decimal is 0.05.

I = 15,000 × 0.05 × 5 = $ 3,750

So, the total amount Bob needs to replay the bank will be $15,000 + $3,750, or $18,750.

His yearly interest will be $3,750 ÷ 5, or $750.

His monthly interest will be $750 ÷ 12, or $62.50.

Compound Interest

→ calculated on the original principal plus the accumulated interest of prior periods

To find the compound interest paid on a principal amount, calculate the simple interest for each time period.

→ Every time you calculate the simple interest for a new time period,
you need to add it to the principal from the previous period.

So, for each time period, there is a new principal to substitute in the simple interest formula.

Suppose you have to pay back a $12,000 loan over five years at 6 percent interest compounded annually.

Time in Years	Interest Calculation
1	I = 12,000 × 0.06 × 1 = $720
2	I = 12,720 × 0.06 × 1 = $763.20
3	I = 13,483.20 × 0.06 × 1 = $809
4	I = 14,292.20 × 0.06 × 1 = $857.53
5	I = 15,149.73 × 0.06 × 1 = $908.98

So, at the end of five years, the total amount you'd need to pay would be $16,058.71.

If the loan were at 6 percent simple interest:

I = $12,000 × 0.06 × 5 = $3,600

Total amount = $12,000 + $3,600 = $15,600

The repayment amount with compound interest is ○ smaller ◉ larger than with simple interest.

Total Payments

The total cost of a loan is the entire amount paid over the life of the loan, principal plus interest.

Total Cost with Annually Compounded Interest: $A = P(1 + i)^t$	In this formula: A = final amount, including the **principal** P = **principal** i = interest rate (in decimal form) t = **time** or number of years

Example:
You have deposited $1,000 in your account. Your bank pays you 5 percent interest compounded annually. You need to find the total amount at the end of three years.

The principal is $**1,000**. The interest rate is **0.05**. Find the interest earned after 1 year.

$$A = \text{**1,000**}\,(1 + \text{**0.05**})^3$$

$$A = \$\text{**1,160**}$$

Calculations using an online calculator may be slightly different due to differences in rounding.

Summary

Why will compound interest always be greater than simple interest over the same period of time?

Answers will vary.