

Interest Couse



Tutoring Centre Ferndale

Introduction

Interest is the cost of borrowing money or the return on investment for money that is deposited or invested. There are two main types of interest: simple interest and compound interest.

Key Terms

- **Investment** An amount of money deposited in return for gain.
- **Loan** An amount of money borrowed for a price.
- **Principal:** The initial amount of money that is either borrowed or invested.
- **Interest:** The cost of borrowing money or the return earned on an investment, typically expressed as a percentage of the principal.
- **Rate:** The percentage of the principal charged as interest per period.
- **Time:** The duration for which the money is borrowed or invested, typically expressed in years.

Simple Interest

Simple interest is calculated on the principal amount, or on that portion of the principal amount which remains unpaid.

The formula to calculate simple interest is:

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

where:

- I = Interest
- P = Principal amount (initial sum of money)
- r = Annual interest rate (in decimal form)
- t = Time (in years)

Example

Suppose you invest \$1,000 at an annual interest rate of 5% for 3 years. The interest earned would be:

$$I = 1000 \times 0.05 \times 3 = \$150$$

Exercises

1. Calculate the simple interest on a principal of \$2,000 at an annual interest rate of 4% for 5 years.
2. If you invest \$500 at an annual interest rate of 6% for 4 years, how much interest will you earn?

Answers

1. $I = 2000 \times 0.04 \times 5 = \400
2. $I = 500 \times 0.06 \times 4 = \120

Compound Interest

Compound interest is calculated on the initial principal, which also includes all the accumulated interest from previous periods on a deposit or loan.

The formula to calculate compound interest is:

$$A = P \left(1 + \frac{r}{n} \right)^{nt}$$

where:

- A = Amount of money accumulated after n years, including interest
- P = Principal amount (initial sum of money)
- r = Annual interest rate (in decimal form)
- n = Number of times that interest is compounded per year
- t = Time (in years)

Example

Suppose you invest \$1,000 at an annual interest rate of 5% compounded annually for 3 years. The amount accumulated would be:

$$A = 1000 \left(1 + \frac{0.05}{1} \right)^{1 \times 3} = 1000 \times 1.157625 = \$1157.63$$

Exercises

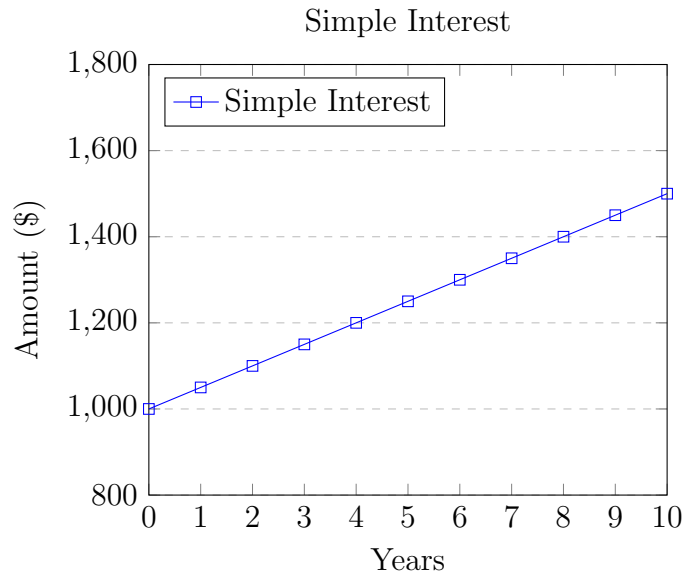
1. Calculate the amount accumulated on a principal of \$2,000 at an annual interest rate of 4% compounded annually for 5 years.
2. If you invest \$500 at an annual interest rate of 6% compounded quarterly for 4 years, how much will you have?

Answers

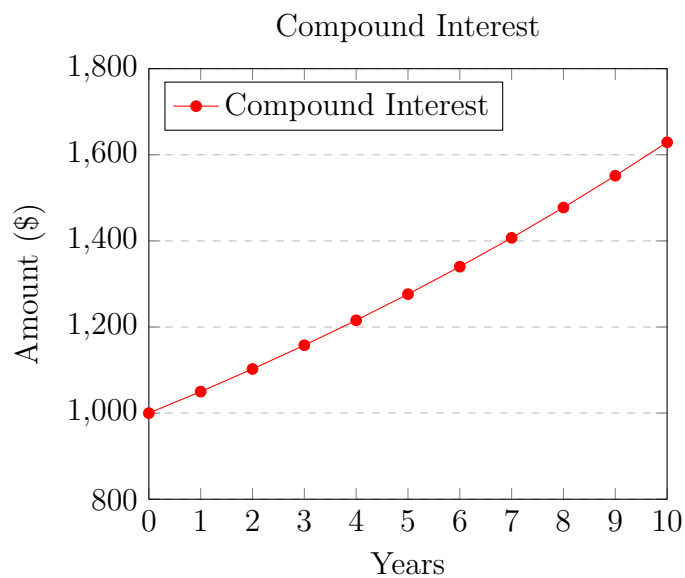
1. $A = 2000 \left(1 + \frac{0.04}{1} \right)^{1 \times 5} = 2000 \times 1.2166529 = \2433.31
2. $A = 500 \left(1 + \frac{0.06}{4} \right)^{4 \times 4} = 500 \times 1.2682418 = \634.12

Comparing Simple and Compound Interest

Here are charts showing the growth of \$1,000 over 10 years with simple and compound interest at an annual rate of 5%.



Yr	0	1	2	3	4	5	6	7	8	9	10
\$	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500



Yr	0	1	2	3	4	5	6	7	8	9	10
\$	1000	1050	1102	1158	1216	1276	1340	1407	1477	1551	1629

Examples

Simple Interest

You take out a loan of \$5,000 at a simple interest rate of 6% per year for 4 years. How much interest will you pay and what is the total amount to be repaid?

$$I = 5000 \times 0.06 \times 4 = \$1200$$

The total amount to be repaid is:

$$5000 + 1200 = \$6200$$

Compound Interest

You invest \$3,000 at an annual interest rate of 5% compounded annually for 6 years. How much will you have at the end of the period?

$$A = 3000 \left(1 + \frac{0.05}{1} \right)^{1 \times 6} = 3000 \times 1.3400956 = \$4020.29$$

Exercises

Simple Interest

1. If you borrow \$2,500 at a simple interest rate of 7% per year for 3 years, how much interest will you pay?
2. A savings account offers a simple interest rate of 3% per year. How much interest will you earn in 5 years on a deposit of \$1,500?

Compound Interest

1. Calculate the amount accumulated on a principal of \$4,000 at an annual interest rate of 5% compounded annually for 8 years.
2. If you invest \$1,200 at an annual interest rate of 4% compounded semiannually for 5 years, how much will you have?

Answers

Simple Interest

1. $I = 2500 \times 0.07 \times 3 = \525
2. $I = 1500 \times 0.03 \times 5 = \225

Compound Interest

1. $A = 4000 \left(1 + \frac{0.05}{1}\right)^{1 \times 8} = 4000 \times 1.4774554 = \5909.82
2. $A = 1200 \left(1 + \frac{0.04}{2}\right)^{2 \times 5} = 1200 \times 1.221386 = \1465.66