

INTEREST

When you deposit money into a savings account or make an investment, you earn interest from your financial institution because you are lending them your money. When you borrow money – take out a loan – you must pay interest to the financial institution. This interest is the cost for borrowing their money. So we can define **interest** as the amount of money paid or charged when you deposit or borrow money.

There are two ways that interest can be calculated; simple interest and compound interest.

SIMPLE INTEREST

Simple interest is interest that is based only on the original amount borrowed or invested. This original amount is called the **principal**. The percent of the principal that is paid or earned as interest called the **interest rate**. The interest rate is often stated as being “per annum” which means per year. The **term** is the length of time in years over which the money is deposited or borrowed.

The formula used to calculate simple interest is:

$$\text{Interest } (I) = \text{Principal } (P) \times \text{interest rate } (r) \times \text{term } (t)$$
$$I = Prt$$

When using this formula to calculate interest, substitute the values for their letters and multiply. Remember, the interest rate is written as a percentage and it must be changed to a non-percentage number before being used in a formula. To do this, divide it by 100.

$$7.25\% \div 100 = 0.0725$$

Example 1: David invested \$1500 for 2 years at an interest rate of 2.5%. How much interest did he earn?

Solution: Assign the values to their correct spot, substitute and solve.

$$I = ? \quad P = \$1500 \quad r = 2.5\% \div 100 = 0.025 \quad t = 2 \text{ years}$$

$$I = Prt$$

$$I = 1500 \times 0.025 \times 2 = 75$$

David earned \$75 interest.

Sometimes, the term will not be given in years but rather days, weeks, or months. to use these lengths of time, divide each by how many there are in a year to get a part of a year.

t = Term (in years)

Ex. 2 years = 2

$$20 \text{ weeks} = \frac{20}{52} \text{ or } 20 \div 52 \quad \text{There are 52 weeks in one year.}$$

$$200 \text{ days} = \frac{200}{365} \text{ or } 200 \div 365 \quad \text{there are 365 days in one year.}$$

$$6 \text{ months} = \frac{6}{12} \text{ or } 6 \div 12 \quad \text{There are 12 months in one year.}$$

NOTE: when using these terms in your calculations, it is more accurate to use the division statement for the term than dividing first and using the rounded answer.

Example 2: Robin saved \$600 for 6 months at 1.5%. How much interest will she earn?

Solution: Assign the values to their correct spot, substitute and solve.

$$I = ? \quad P = \$600 \quad r = 1.5\% \div 100 = 0.015 \quad t = 6 \text{ months} = 6 \div 12$$

$$I = 600 \times 0.015 \times 6 \div 12 = \$4.50$$

Robin earned \$4.50 interest.

Example 3: Jasjot invested \$5000 in a short term deposit for 120 days at 0.5%. How much interest will he earn?

Solution: Assign the values to their correct spot, substitute and solve.

$$I = ? \quad P = \$5000 \quad r = 0.5\% \div 100 = 0.005 \quad t = 120 \text{ days} = 120 \div 365$$

$$I = Prt$$

$$I = 5000 \times 0.005 \times 120 \div 365 = \$8.219178082 \text{ (this must be rounded)}$$

Jasjot earned \$8.22 interest.

For any investment, you can calculate the total value at the end of the term by using the formula:

$$A = P + I$$

where A is the final value of the investment.

So the total value of Jasjot's investment is

$$A = P + I = \$5000 + \$8.22 = \$5008.22$$

So far we have only calculated the simple interest (I) in this equation. It is possible to calculate any of the other variables, principal, interest rate, or term, in one of two ways. First, we can use algebra to solve an unknown or secondly, we can rearrange the formula to isolate for the unknown we want. This is done for you below.

Other versions of this formula to use when finding rate, term, or principal:

$r = I \div (P \times t) \times 100$ $t = I \div (P \times r)$ $P = I \div (r \times t)$
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NOTE: Type this into your calculator **exactly** as written - with brackets - to get the correct answer.

Example 4: Petra earned \$30.24 in interest from her bank when she invested \$1200 for 2 years. What was the interest rate she received?

Solution: Assign the values to their correct spot, choose the correct formula, substitute and solve.

$$I = \$30.24 \quad P = \$1200 \quad r = ? \quad t = 2 \text{ years}$$

$$r = I \div (P \times t) \times 100 \quad (\text{Multiply by 100 to get a percent})$$

$$r = 30.24 \div (1200 \times 2) \times 100 = 1.26$$

Petra's interest rate was 1.26%.

Example 4: Marcela is saving to buy a new computer. He needs \$35 more to make the purchase. Her savings of \$2900 are invested at 1.59%. How many days longer will she need to keep her investment in the bank in order to earn that \$35 in interest?

Solution: Assign the values to their correct spot, choose the correct formula, substitute and solve.

$$I = \$35 \quad P = \$2900 \quad r = 1.59\% \div 100 = 0.0159 \quad t = ?$$

$$t = I \div (P \times r)$$

$$t = 35 \div (2900 \times 0.0159) = 0.759054435 \text{ years}$$

The questions asks for how many days, so multiply the term in years by 365 to get the answer in days

$$t = 35 \div (2900 \times 0.0159) \times 365 = 277 \text{ days}$$

Marcela will need to save for 277 more days.

ASSIGNMENT 3 - SIMPLE INTEREST

1) Match each variable with a value by placing the correct letter on each line.

<u>Variable</u>	<u>Value</u>
a) principal	_____ 280 days
b) interest	_____ 1.95%
c) interest rate	_____ \$2000
d) term	_____ \$29.92

e) Using the values above, calculate whether the interest earned is the correct amount.

f) What is the total value of this investment?

2) Calculate the amount of simple interest earned in each of the situations.

a) principal = \$1500 interest rate = 2.5% term = 5 years

b) principal = \$3245 interest rate = 7.5% term = 3 years

c) principal = \$500 interest rate = 11% term = 9 years

- 3) Peter invested \$1860 for 10 months at a rate of 3.8%. How much interest did he earn?
- 4) What amount of principal invested at 6% for 2 years that generates \$22 in interest?
- 5) Mike invested \$4040 for 3 years and earned \$410. What interest rate was this invested at?
- 6) How many months does it take to earn \$180 in interest on an investment of the principal is \$5000 and the interest rate is 2%?
- 7) Sarpreet borrowed \$550. Four months later, he sent a cheque for \$562.83 to repay the loan and interest. What was the interest rate charged?
- 8) Dorothy loaned John \$5000 at an interest rate of 6%. He repaid her \$5750 to cover the principal and interest. How long did he borrow the money?