**INTEREST**

If we borrow an amount of money today, we will repay a larger amount later. The increase in value is known as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. The money *gains value over time*.

The amount of a loan or a deposit is called the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (the amount of money you begin with). The interest is usually computed as a *percent of the principal*. This percent is called the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and is assumed to be an annual rate unless otherwise stated.

**I. Simple Interest:** Interest calculated only on the **principal** amount.

The formula for **simple interest** is:

**I** = simple interest **P** = principal **r** = annual interest rate (decimal) **t** = time (in years)

NOTE: Be careful if time is given in months. Formula is based on **years**, so convert:

**EXAMPLE:** Find the simple interest paid in order for you to borrow $4800 for 6 months at 7%.

P = r = t =

Using formula for **simple interest**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

You would have to repay (round to the nearest cent) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**EXAMPLE:** Find the simple interest (round to the nearest cent) for the following:

Principal: $8000 Rate: 6% Time in Months: 3

P = r = t =

Using formula for **simple interest**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

You would have to repay (round to the nearest cent) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**II. Future and Present Value for Simple Interest:**

The total amount repaid, ***A***, when you borrow money is called the **maturity value** or the **value** of the loan. We will refer to it as the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

The original principal (amount of money originally borrowed), ***P***, can also be thought of as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**P** = principal, the present value of your money. Amount of money you borrow or begin with.

**A** = the future value of your money. The total amount of money you will pay back.

The formula for the future value for **simple interest** is:

A = future value of money P = principal or present value of money borrowed

r = annual interest rate (decimal) t = time (in years)

**EXAMPLE:** Find the future value of $460 in 8 months, if the annual interest rate is 12%.

P = r = t =

Using formula for future value for **simple interest**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

You would have to repay (round to the nearest cent) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**EXAMPLE:** Find the future value of the deposit if the account pays simple interest. Round to the nearest cent. $1920 at 2.3% for 4 years

P = r = t =

Using formula for **future value for simple interest**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

You would have to repay (round to the nearest cent) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**III. Future and Present Value for Compound Interest:**

Interest paid on principal plus any previously earned interest is called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. After a certain period, the interest earned so far is *credited* (added) to the account, and the sum (principal plus interest) then earns interest during the next period.

Interest can be credited to an account at time intervals other than 1 year. For example, it can be done semiannually, quarterly, monthly, or daily. This time interval is called the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

The formula for future value for **compounded interest** is:

**A** = future value of money **P** = principal or present value of money deposited

**r** = annual interest rate **n** = number of periods (per year) **t** = time (in years)

NOTE: Be careful if time is given in months. Formula is based on **years**, so convert:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **compounding period** | **annually** | **semi-annually** | **quarterly** | **monthly** | **daily** |
| **number of periods (*n*)** |  |  |  |  |  |

**EXAMPLE:** Find the future value of $8560 at 4% compounded quarterly for 8 years.

*P* = *r* = *n* = *t* =

Using formula for **future** value for **compound interest**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

The future value will be: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (round to the nearest cent)

**EXAMPLE:** What amount must be deposited today, at 5% compounded monthly, so that it will be $18,000 in 20 years?

**“deposited today”** means **present value** (*P*) from compound interest formula

To get *P* by itself, simply divide both sides by to get:

This is the formula to find the **present** value for **compound interest**.

*A* = *r* = *n* = *t* =

The deposit today should be\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (round to the nearest cent)

**IV. Effective annual yield**

Banks, credit unions, and other financial institutions often advertise two rates: first, the actual annualized interest rate, or **nominal rate** (the “named” or “stated” rate), and second, the rate that would produce the same final amount, or future value, at the end of 1 year if the interest being paid were simple rather than compound. This is called the “effective rate”, or more commonly the **effective annual yield**. (It may be denoted **APY** for **“annual percentage yield.”**)

A nominal interest rate of *r* (as a decimal), compounded *n* times per year, is equivalent to the following **effective annual yield.**

NOTE: Be sure to multiply by 100 to convert this to a percent.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **compounding period** | **annually** | **semi-annually** | **quarterly** | **monthly** | **daily** |
| **number of periods (*n*)** | **1** | **2** | **4** | **12** | **365** or 360 |

**EXAMPLE:** Suppose a savings and loan pays a nominal rate of 3.5% on savings deposits. Find the effective annual yield if interest is compounded daily. Assume that the year is not a leap year. (Round to the nearest thousandth of a percent as needed.)

*r* = *n* = effective annual yield formula:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**EXAMPLE:** Find the effective annual interest rate for the given nominal interest rate. Round your answers to the nearest hundredth of a percent. 4.1% compounded monthly

*r* = *n* = effective annual yield formula:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_