

# Math 103 Section 3.1, 3.2: Math of Finance

- simple interest
- compound interest

## Simple Interest:

$$A = P(1 + rt)$$

- $A$ : amount, or future value
- $P$ : principal, or present value
- $r$ : annual simple interest rate (decimal form)
- $t$  time in years.

## Example:

$$A = P(1 + rt)$$

Find the total amount due on a loan of \$1200 at 8% simple interest at the end of 6 months.

$$A = \text{unknown}$$

$$P = 1200$$

$$r = .08$$

$$t = .5 \text{ (Note: 6 months is half a year.)}$$

Then

$$A = 1200(1 + (.08)(.5)) = 1200(1 + .04) = 1200(1.04) = 1248$$

**Summary:** The total amount due (future value) on a loan of \$1200 at 8% simple interest at the end of 6 months is \$1248.

## Example:

$$A = P(1 + rt)$$

Find the total amount due on a loan of \$6,000 at 12% simple interest at the end of 9 months.

$A =$  unknown

$P =$

$r =$

$t =$  (Note: 9 months is  $3/4$  (0.75) of a year.)

**Summary:**

## Warmup for Compound Interest:

**Problem:** That new atomic cell phone you've always wanted is marked at a price of \$100. But today only, the phone store is giving a 30% discount. The sales tax is 8.25%.

You jump on it and ask the cashier to ring up the sale. The cashier does something strange. He adds in the sales tax on the full price of \$100 and then subtracts the discount of 30%. You expected him to take the discount off first and then add in the sales tax? Does it matter which way he computes the final price?

## Warmup for Compound Interest:

Sales tax rate: 8.25%, discount: 30% off.

Method I: add sales tax first, then subtract discount.

Method II: subtract discount first, then add sales tax.

## Warmup for Compound Interest:

Sales tax rate: 8.25%, discount: 30% off.

Another way to look at the problem: multiply, don't add.

Method I: add sales tax first, then subtract discount.

Method II: subtract discount first, then add sales tax.

## Compound Interest: An example

Deposit \$100.00 into an account earning 5% compounded annually (each year). How much will you have after 10 years?

Year	\$Interest	\$Balance
	\$	\$100.00
1	\$5.00	\$105.00
2	\$5.25	\$110.25
3	\$5.51	\$115.76
4	\$5.79	\$121.55
5	\$6.08	\$127.63
6	\$6.38	\$134.01
7	\$6.70	\$140.71
8	\$7.04	\$147.75
9	\$7.39	\$155.13
10	\$7.76	\$162.89

## Compound Interest: An example

Deposit \$100.00 into an account earning 5% compounded annually (each year). How much will you have after 10 years?

$$A = 100(1.05)^{10} = 162.89$$

**Summary:** You will have \$162.89 after 10 years.

# Compound Interest:

$$A = P(1 + i)^n$$

- $A$ : amount, or future value
- $P$ : principal, or present value
- $r$ : annual nominal rate
- $m$ : number of compounding periods per year
- $i = r/m$ : rate per compounding period
- $n$  number of compounding periods.

## Compound Interest:

**Example:** Invest \$1200 (principal, present value) at an annual rate of 6% compounded semi-annually. How much will you have (future value) at the end of 10 years?

$A$  amount, or future value

$P = 1200$  principal, or present value

$r = .06$  annual nominal rate

$m = 2$  number of compounding periods per year

$i = .03 = .06/2$  rate per compounding period

$20 = 10(2)$  number of compounding periods.

$$A = 1200(1 + .03)^{20} = 1200(1.03)^{20} = 2167.33$$

**Summary:** You will have \$2167.33 after ten years.

## Compound Interest:

**Example:** Invest \$45,000 (principal, present value) at an annual rate of 8% compounded quarterly. How much will you have (future value) at the end of 5 years?

$A$  amount, or future value

$P =$  principal, or present value

$r =$  annual nominal rate

$m =$  number of compounding periods per year

$i =$  rate per compounding period

number of compounding periods.

$A =$

**Summary:**