Saving Money: Future value of an investment

When we save money in an account, we typically deposit it with some account that will give us a percent interest. If we put a dollar into a piggy bank and never touch it again, in a year it will still only be one dollar. If we put a dollar into a savings account that is awarding us **interest** then that dollar could turn into $1.50 in a year. How much we gain is based on the interest and the **compounding** period. Compounding period refers to how often the interest is calculated on the current amount. Below is the formula used to find the future value of an investment based on interest and compounding periods.

$$FV = PV\left(1 + \frac{i}{n}\right)^{nt}$$

What do the variables stand for?

FV	PV	i	n	t
FUTURE VALUE	PRESENT VALUE	i = INTEREST RATE (MUST CONVERT INTO DECIMAL FORM)	COMPOUNDING PERIOD	TIME IN YEARS

What are the different compounding periods?

Annual	Semi-annual	Quarterly	Monthly	Weekly	Daily
1	2	4	12	52	365

1. Jackson has $2,600 he is going to deposit into a savings account with a 4.25% compounded quarterly. How much will he have after 5 years? How much will he have after 10 years? How much will he have after 20 years?

5 years	$FV = 2600\left(1 + \frac{.0425}{4}\right)^{4 \cdot 5} = \$3211.99$
10 years	$FV = 2600\left(1 + \frac{.0425}{4}\right)^{4 \cdot 10} = \$3968.03$
20 years	$FV = 2600\left(1 + \frac{.0425}{4}\right)^{4 \cdot 20} = \$6055.87$

2. What if the same account compounded monthly? How much would he have after each of the following years?

	Compounded Quarterly (copy answer from #1)	Compounded Monthly
5 years	$3211.99	$2600\left(1+\frac{.045}{12}\right)^{12\cdot5} = \$3254.67$ $3254.67 - 3211.99 = \$42.68$ MORE
10 years	$3968.03	$2600\left(1+\frac{.045}{12}\right)^{12\cdot10} = \$4074.18$ $4074.18 - 3968.03 = \$106.15$ MORE
20 years	$6055.87	$2600\left(1+\frac{.045}{12}\right)^{12\cdot20} = \$6384.21$ $6384.21 - 6055.87 = \$328.34$ MORE

3. What can you determine about total money saved (future value) and compounded period? THE GREATER THE COMPOUNDING PERIOD, THE MORE YOU CAN SAVE

4. Kami has $5,000 she is going to invest and has two different options

Savings account	Money Market account
• 3.15% interest rate • Compounded monthly	• 3.98% interest rate • Compounded semi-annually

Determine Kami's account balance after the following years

	Savings account	Money Market account
5 years	$5{,}000\left(1+\frac{.0315}{12}\right)^{12\cdot5} = \$5851.70$	$5{,}000\left(1+\frac{.0398}{2}\right)^{2\cdot5} = \$6088.00$
10 years	$5{,}000\left(1+\frac{.0315}{12}\right)^{12\cdot10} = \$6848.47$	$5{,}000\left(1+\frac{.0398}{2}\right)^{2\cdot10} = \$7415.18$
20 years	$5{,}000\left(1+\frac{.0315}{12}\right)^{12\cdot20} = \$9380.31$	$5{,}000\left(1+\frac{.0398}{2}\right)^{2\cdot20} = \$10{,}996.99$

5. Which has a greater impact on future value, compounding period or interest rate? Why? INTEREST RATE BECAUSE AS YOU MAKE MORE YOU EXPONENTIALLY MAKE MORE MONEY

6. So wake-up call. Interest rates on savings accounts is muuuuuuuch lower than 3%. Look up a savings account and determine the future value of a $3,000 investment.

Bank: BANK OF AMERICA Type of Account: REWARDS MONEY MARKET SAVINGS ACCOUNT

Interest Rate: .03% Compounding period: MONTHLY

Future value of account after 10 years: 3009.01

$3000\left(1+\frac{.0003}{12}\right)^{12\cdot10}$

How much money did you earn out of savings after 10 years? $9.01 WOO!

7. Sometimes we like to work backwards when planning for a specific purpose. Like saving for a car, saving for college, saving for a house, or saving for retirement. Jada wants to start saving for retirement. A general rule of thumb is that you should have $1,000,000 saved by the time you retire. Let's assume that Jada is 20 years old and plans to retire at 67. She plans on opening up a savings account that has 1.2% interest compounded quarterly. (Even though this is unrealistic) Let's assume she does not make any additional deposits into her account. How much money will she need to put away right now in order to have $1,000,000 when she retires? 67-20 = 47 YEARS UNTIL RETIREMENT

$1{,}000{,}000 = PV\left(1+\frac{.012}{4}\right)^{4\cdot47}$

$\frac{1{,}000{,}000}{1.756} = \frac{PV\cdot1.756}{1.756}$

$\$569{,}476.08 = PV$

8. Jesus is saving up to have a down payment on a new car when he graduates from college. He wants to have $3,500 saved. He plans on depositing a lump sum into a CD (Certificate of Deposit) account and withdrawing it after graduation. The CD account from Bank of America offers 0.15% interest compounded monthly. If we assume he does not make any deposits or withdraws for 4 years, how much will he need to deposit now in order to have the amount needed for a down payment? (and yes, you should be surprised by that number because the interest rate is so small)

$3{,}500 = PV\left(1+\frac{.0015}{12}\right)^{12\cdot4}$

$\frac{3{,}500}{1.006} = \frac{PV(1.006)}{1.006}$

$\$3{,}479.13 = PV$

HE NEEDS TO SET ASIDE $3,479.13 IN ORDER TO HAVE $3,500 IN FOUR YEARS. SO BASICALLY, HIS SAVINGS ACCOUNT ONLY MAKES HIM ABOUT $21 OVER FOUR YEARS....