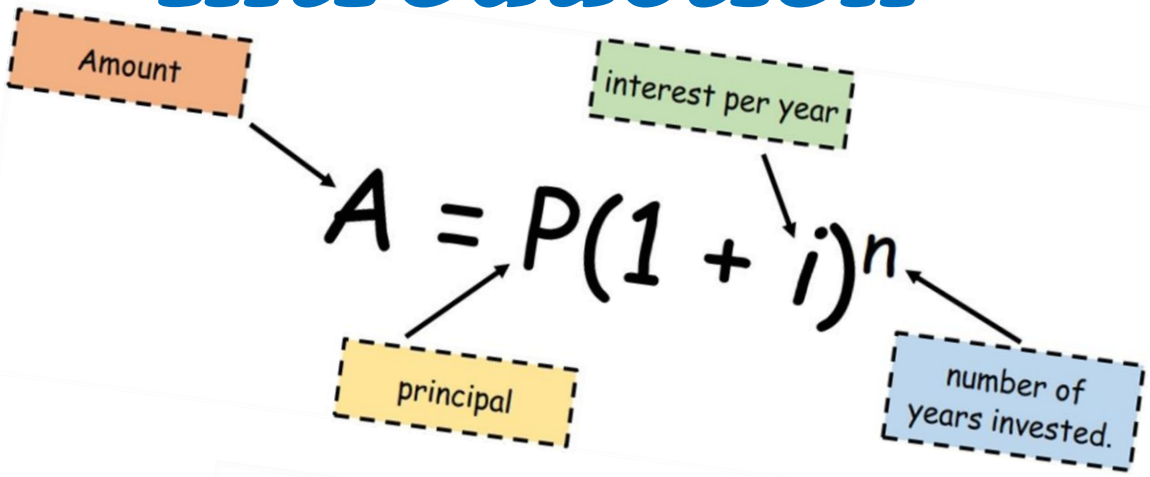
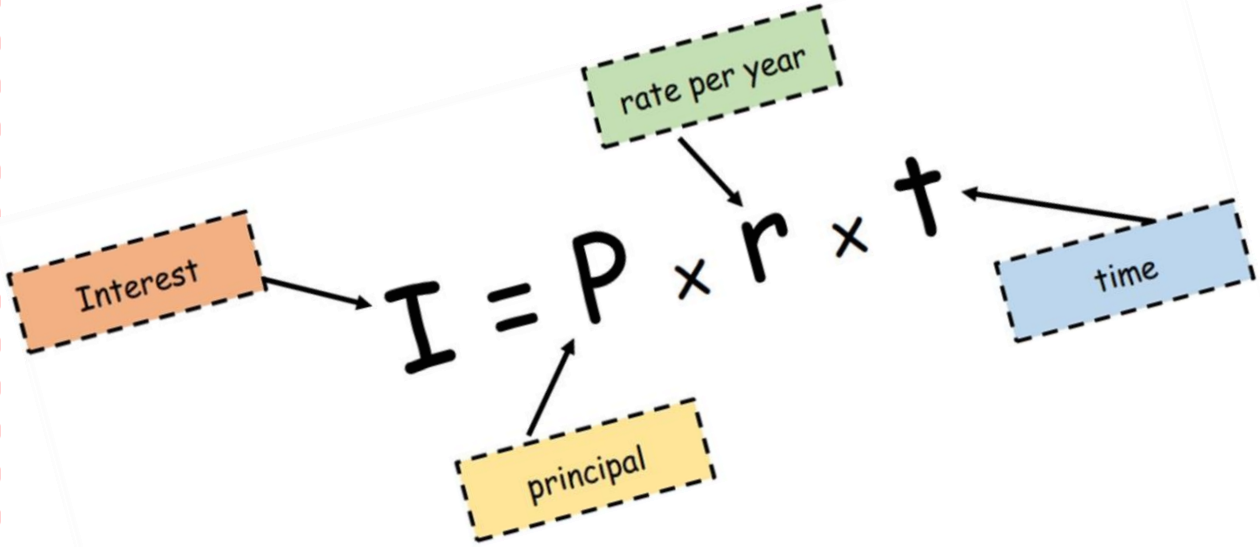
Simple and compound interest

Introduction



$$A = P(1 + i)^n$$
$$A = 2000(1 + 0.12)^5$$
$$A = 2000(1.12)^5$$
$$A = \$3{,}524.68$$



Simple and compound interest.

Sometimes, to encourage people to put money into their bank, banks offer to add a small percentage of the money you placed in their bank. This is called *interest*.

There are two types of interest we'll look at here. *Simple interest* and *compound interest*. The best way to understand each is to look at an example using $1000.

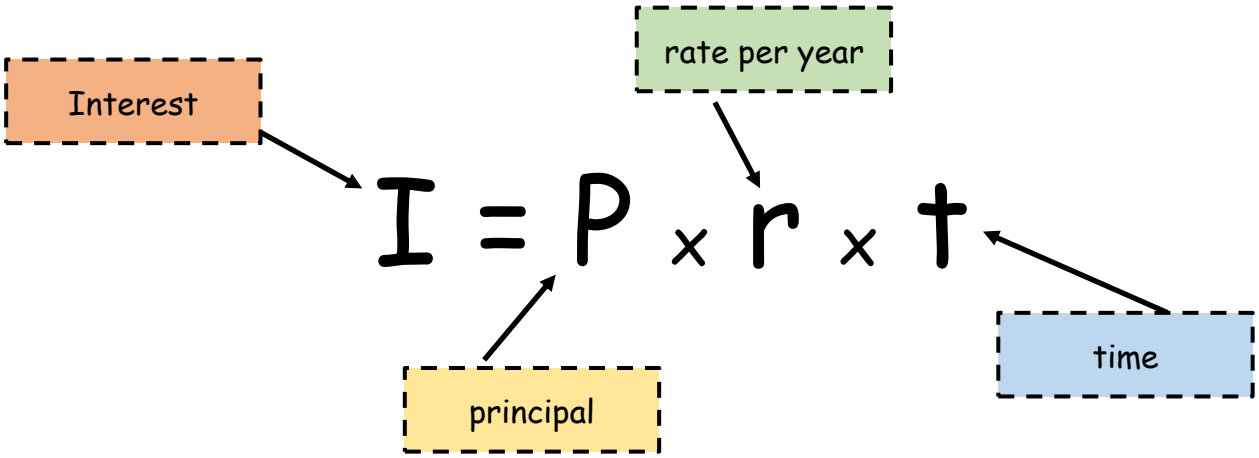
If you put $1000 into an account with *simple interest* of 2%, that means that every year, your account will get 2% of that $1000 – so $20 is adding to your account each year. So, in 5 years, you will get 10 x $20 added to your account and will have $1,100.

If you use the same $1000 and get 2% *compound interest*, you will have $1000 + $20, at the end of year 1 you will have $1020. However, in the second year, you will get 2% of this $1020, not just 2% the $1000 you had at the start.

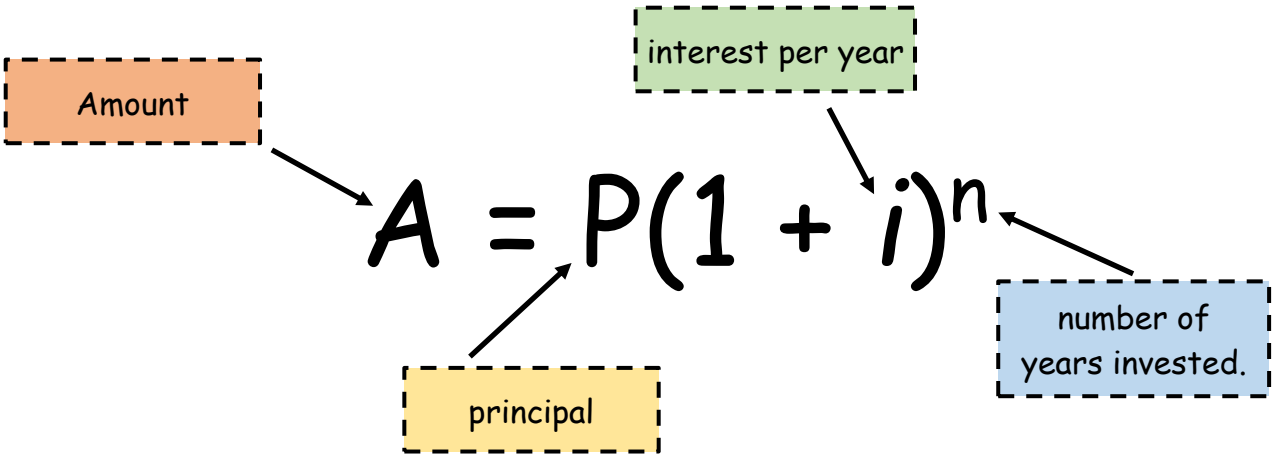
Look at the table below to see the difference between simple interest and compound interest. As you can see, compound interest is a better option.

	Simple interest	Compound interest
Sum of money:	$1000	$1000
Year 1	$1020	$1020
Year 2	$1040	$1040.40
Year 3	$1060	$1061.21
Year 4	$1080	$1082.43
Year 5	$1100	$1104.08
Year 10	$1200	$1218.99
Year 20	$1400	$1485.95

To calculate simple interest, we use this formula:



To calculate compound interest, we use this formula:



Let's look at an example of compound interest, so we can understand the formula a bit better.

1. If Robert invests $2,000 at a rate of 12% per year, how much will he have after 5 years?

In this problem, we need to find the amount. Write down what we know.

A = ?

P = $2,000.

I = 12%...which we write as a decimal, so I = 0.12.

n = 5

Plug them all into out formula:

$$A = P(1 + i)^n$$
$$A = 2000(1 + 0.12)^5$$
$$A = 2000(1.12)^5$$
$$A = \$3{,}524.68$$

So, after 5 years, the $2,000 investment will be worth $3,524.68. If we want to find how much interest is earned, it's just $3,524.68 – $2,000, so interest is $1,524.68.

2. *If Sarah has a choice of investing $4,000 for 5 years simple interest at a rate of 3% each year, or compound interest at a rate of 2% each year, which will yield a better return?*

Simple interest	*Compound interest*
$I = P \times R \times T$	$A = P(1 + i)^n$
→ $I = \$4{,}000 \times 0.03 \times 5$	$A = \$4{,}000(1 + 0.02)^5$
→ $I = \$4{,}000 \times 0.03 \times 5$	$A = \$4{,}000(1.02)^5$
→ $I = \$600$	$A = \$4{,}416.32$
	$I = \$4{,}416.32 - \$4{,}000$
	$\boldsymbol{I = \$416.32}$

3. *James invests $7,500 at a rate of 3% compound interest for 8 years. How long would he have to invest the same amount at a simple interest rate of 5% to earn more than the compound interest option?*

4. Samantha invested $100,000 at a compound interest rate of 1.5% for 20 years. Marty invested $120,000 at a compound interest rate of 3% for 10 years. Calculate who has earned more interest?

5. Jake invested a sum of money for 6 years at a simple interest rate of 2.5% and earned $11,700.00? What was the initial amount that he invested?

6. $43,000 was invested for 4 years and earned $3,010.00 simple interest? What was the interest rate?

7. How long should $75,000 be invested for at a simple interest rate of 1.5% to finally earn a total of $7,975.00 interest?

8. Ben purchased a car for $52,000.00? If the car depreciates by 6.5% each year, in how many years will it be less than half its purchase value?

9. A man in invested $9,000 in a high risk investment to earn his godson's university fees. How much will it be worth after 10 years if the amount earns 0.5% compound interest each month?

10. Dan has $15000 and needs $22,000 to buy a car? If he finds a high risk investment that will offer 2% compound interest per month, how long will it take for his investment to earn enough to purchase the car?

Answers

3. 6 years ($2,250 earned, compound interest yields a return of $2,000.78).
4. Compound interest yields $34,685.50, simple interest yields $36,000.
5. $78,000.
6. 1.75.
7. 7 years.
8. 11 years.
9. $16,374.57.
10. 1 year and 10 months (22 months)