General Education Mathematics
Class Notes
Consumer Math: Simple and Compound Interest (Section 8.2)

Leroy loans Bob $500 at 6% interest. How much will Bob have to pay back?

Let's start with Leroy and Bob from the thought bubble above. Do you remember the formula for the interest earned in a simple interest account? Write it down now, defining all variables if you can.

Let's get some more details. Leroy agrees to loan Bob $500. Let's say Bob will pay Leroy back *plus interest* in two years. If Leroy charges 6% simple interest, that means the interest will be 6% of the borrowed amount for every year. What is 6% of the borrowed amount?

So, what is the interest Bob will owe at the end of two years?

How much will Leroy be expecting to be paid?

Now, that's simple interest. Let's do some more examples. We will see compound interest later in these Notes.

expl 1: Margie takes out a simple interest loan for $1,000 at 8% for 3 years. How much interest will she owe?

Remember, always use the interest rate (r) in decimal form.

expl 2: LaQuisha borrowed $5,000 for 5 years. She paid $1,000 in interest. What was her interest rate? Write your answer as a percent.

We know $I = Prt$. Fill in what we know to make an equation with the unknown r.

Remember, just like before, r is in decimal form.

1

Formulas for Simple Interest Loans:

This is the formula we used on page 1.

$$I = P \cdot r \cdot t$$

The most important thing is to know what the variables mean.

I = interest earned (money paid in order to borrow money)
P = principal, or amount invested or deposited
r = interest rate, in decimal form
t = number of years

Future Value:

Definition: Future value: the amount the investment is worth at the end of the time period.

The amount we found for Leroy, the amount he was repaid, is called the future value of that loan. Using the variables we have above, think about how you found this on page 1 and form an equation for this future value. Use A to denote the future value.

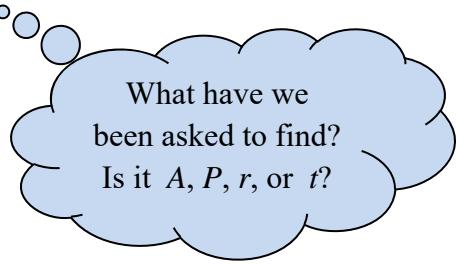Can you write it in an alternative form?

Practice the new, future value formula on this example.

expl 3: Jodie invested $5,000 in an account that paid 6% simple interest for 2 years. What is the future value of this investment?

expl 4: Mack loaned a friend some money and was paid back $2,180. It was a simple interest loan for 3 years at 3% interest. How much did Mack loan his friend?

What have we been asked to find? Is it A, P, r, or t?

expl 5: Find the (simple) interest rate needed to turn a principal of $1000 into $1500 in 7 years. Round the decimal form to two decimal places so that you can write your answer to the nearest percent.
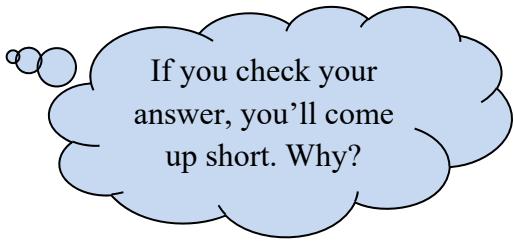
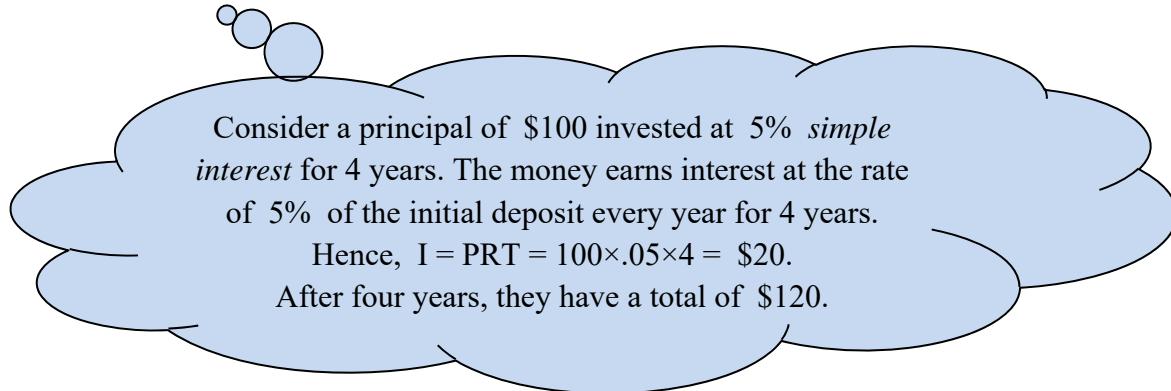If you check your answer, you'll come up short. Why?

expl 6: Breonna wants to defer payment of a tax bill for 4 months. She agrees to pay simple interest at the *annual* rate of 12%. If her tax bill is now $3,000, what will she owe in 4 months?
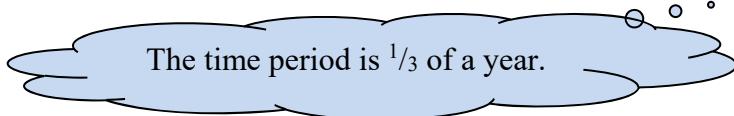
The time period is $^1/_3$ of a year.

Compound Interest:

We have been studying **simple interest**.

Consider a principal of $100 invested at 5% *simple interest* for 4 years. The money earns interest at the rate of 5% of the initial deposit every year for 4 years. Hence, I = PRT = 100×.05×4 = $20. After four years, they have a total of $120.

With simple interest, interest is based on how much was initially deposited. But after one year, we have an extra $5 (the interest earned or 5% of $100) that we could invest. *If* we put that money back into the account and let it earn interest, we call that **compound interest**. All interest that is earned is subsequently reinvested to start earning the same rate as the initial deposit.

There are various versions of the formula but this is the one you see in the book.

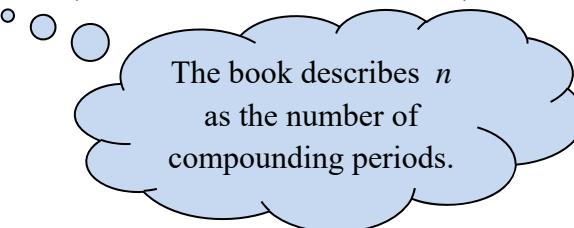$$A = P\left(1 + \frac{r}{m}\right)^n$$

A = future value of investment
P = principal, initial investment
r = interest rate, in decimal form
m = number of times it compounds *per year*
n = *total* number of times it compounds (over the life of the investment)

The book describes n as the number of compounding periods.

Definition: Compounding: when interest is calculated and it is added to the account's balance.

Definition: Compounding period: the amount of time between each compounding.

Accounts are most often **compounded quarterly** (four times a year), **monthly** (12 times a year), **daily** (365 times a year), or **semiannually** (twice a year).

Worksheet: Understanding Compound Interest Through Simple Interest:

This worksheet will work us through an example where we find compound interest by using the simple interest formula again and again. We will also compare compound and simple interest investments to see which has a better yield. Lastly, we get a taste of the compound interest formula, in a slightly different form than you see in these Notes.

expl 7: Krissy and Jamal received $400 as a wedding gift. They will deposit it in an account that pays 2% compound interest, compounded quarterly, for five years. How much will their money be worth in five years? Round to two decimal places and include a dollar sign.
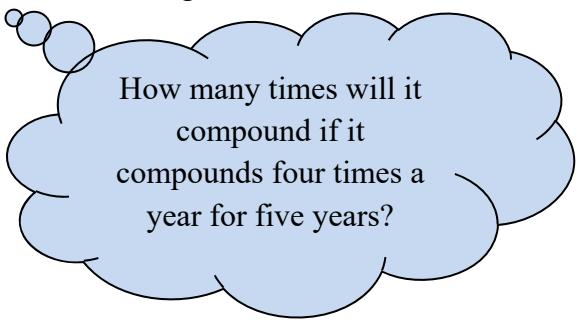
How many times will it compound if it compounds four times a year for five years?

expl 8: Find the future value of this compound interest investment. Round to two decimal places and include a dollar sign.
P = $4,000 invested at 10% compounded daily for 2 years
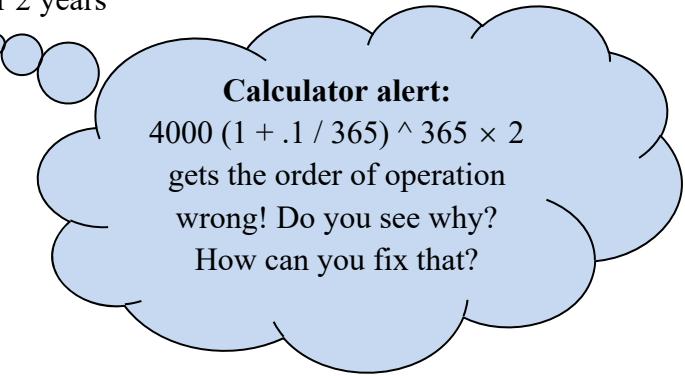
Calculator alert:
4000 (1 + .1 / 365) ^ 365 × 2 gets the order of operation wrong! Do you see why? How can you fix that?

5