Section 8.3: Simple Interest

§1 What Is Interest

Interest is the amount of money that we get paid for lending or investing money, or that we pay for borrowing money. The amount of money that is borrowed is called the principal. Whenever we calculate interest, we need to know a couple things – the principal, the interest rate, and the amount of time for which the money is borrowed.

It’s very important to note that the interest rate is always given as a yearly rate. Simple interest involves interest calculated only on the principal. In the next section we look at compound interest; that is, interest that is calculated on the principal plus any added interest.

The formula for simple interest is quite easy, actually! Its $I = Prt$, where $I$ represents the interest, $P$ represents the principal, $r$ represents the interest rate, and $t$ represents the time (in years).

Most car loans are calculated using simple interest. For example, let’s say you decide to purchase a car and need to finance $14,000. The terms are for 5 years at 4%. How much interest do you end up paying? Using the simple interest formula, we can see that $I = Prt = 14000 \cdot 0.04 \cdot 5$, hence the interest is $2,800.

PRACTICE

1) Alice deposits $2000 in a savings account that earns 6.5% simple interest. Find the interest at the end of the first year.

§2 Future Value

The future value simply represents the total amount of a loan to be repaid. It makes sense that the future value should be equal to the principal plus the interest. If we represent the future value as $A$, then we see that $A = P + i = P + Prt = P(1 + rt)$. This is the formula you want to use to calculate future value. Of course, if you prefer to first find the interest and then add it to the principal, you can do that as well!

For example, say a loan of $3000 has been made at 8% for half a year. What is the future value of the loan?

We can use the simple interest formula to calculate $I = Prt = 3000 \cdot 0.08 \cdot \frac{1}{2} = 120$. Hence the interest is $120, and the future value is then $3000 + $120 = $3120. If you use the formula given above, we get that $A = P(1 + rt)$, so we get that $A = 3000(1 + 0.08 \cdot 0.5)$. This equals $A = 3000(1.04) = 3120$. Either way we get the same answer! Note that the time is given as $\frac{1}{2}$, since time is always given in years!

PRACTICE

2) Find the future value of a loan of $10,000 at 4.75% for 8 months.
§3 Finding The Interest Rate

In some examples, you will be asked to find the interest rate. We are simply solving for one of the variables. Hence for these types of examples, you will be given the interest earned, the principal, and the time. You just need to solve for the rate!

For example, let’s say a loan shark agrees to loan you $1500 for 6 months, but you have to repay him $1800. What is the interest rate?

Here, the principal is $1500 and the time is \( \frac{1}{2} \) year. You must be careful, though! The interest is not $1800. That is how much you need repay the loan shark – it’s the future value. How much interest are you actually paying? The interest is $300! It’s the future value minus the principal. Hence we can setup our equation as

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300 = 1500 \cdot r \cdot \frac{1}{2}.
\]

You should be able to solve this for \( r \). We get that \( r = 0.4 \). But remember, this is the decimal form. In percent form, the final answer is 40%. Note that we can use the future value formula as well!

PRACTICE

3) A loan shark agrees to loan you $5000 for one 3 months, but you must repay him $6000. Find the interest rate.