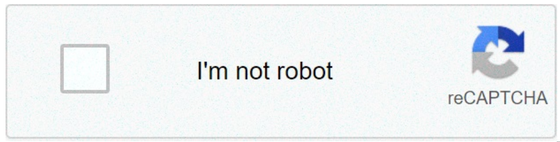

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How to solve compound interest step by step

Albert Einstein famously referred to compound interest as both the eighth wonder of the world and the most powerful force in the universe. Yet many investors enter into the stock market without really understanding what it means. They know they should be investing a solid amount of money, and they've probably heard that they're best off if they start early, but many of them are not entirely sure why. The truth is once you learn the true power of this incredible concept, you'll want to start investing right away so that compound interest can work on your behalf as quickly as possible. Compound Interest: A definition Compound interest is interest that is calculated on the initial principal amount of an investment plus the interest that has already accumulated on a deposit. In other words, compound interest is "interest on interest" that generates over the course of a number of years. The longer the period of time, the higher the amount of interest you'll rack up. You can collect compound interest from a variety of deposits and investments, like bank accounts, traditional savings accounts, high-yield savings accounts (HYSA), certificates of deposit (CD), money market accounts, index funds, mutual funds, ETFs, and individual stocks that pay dividends. Basically, as long as you have an account or fund that promises a return, you will collect interest. And over time, interest will compound and increase your overall pile of money. Finding the Best Interest Rates One of the top reasons investors fail to maximize compound interest is because they do not leverage the best interest rates on the market. Sadly, many people are using accounts that have interest rates of between 0.01% and 0.05% APY, or annual percentage yield. In fact, many investors don't even think to look for higher interest rates. If more people prioritized this, they'd likely be able to find a financial institution that offers daily compounding interest along with a solid annual percentage rate. Compare an interest rate of 0.01% APY to an interest account of 0.50% or 0.60% APY, and the difference in compound interest over time can have an astounding impact on your account balance. Granted, HYSAs offer variable rates. But even during downturns, they are still much higher than interest rates offered by traditional banks. CDs also offer excellent interest rates. They do, however, require you to lock your money for a considerable amount of time (between 3 months to 10 years or more). If you're looking to invest heavily in CDs, consider using CD ladders, which will give you the flexibility to move money around or roll your funds over into higher performing accounts at various intervals. This can help prevent getting locked into underperforming interest rates that essentially crush the present value of your money. So, shop around and try to find savings accounts and investment offerings that will give you the combination of the best flexibility to liquidate your money along with the best possible interest rates. This is how you get ahead with compound interest and make a lot of money over time. How Compound Interest Works If you are interested in calculating compound interest on your own, there's a formula for those who enjoy working out math problems on their own. In this math problem, A is the total amount you'll end with. P is your principal contribution (the initial deposit). R is your annual interest rate as a decimal. N is the number of compounding periods per year. And T is the number of years your money compounds. Tip: Understanding Compounding Periods Understand that interest can be compounded on different frequency schedules. For example, interest can compound continuously, daily, monthly, and annually. Make sure to pay close attention to the frequency of compounding when taking out a loan or making a deposit or investment. This will ultimately determine how much you pay or receive over time. Use a Compound Interest Calculator If math isn't your strong suit, there are plenty of free financial calculators available on the internet that you can use to determine the future value of compound interest. One of the best tools is Investor.gov's Compound Interest Calculator. Fill out various fields — including initial amount, expected monthly contribution, length of time in years, estimated interest rates, interest rate variance range, and compound schedule — to get a better idea about how much money you could generate over a specific period of time. You should also consider working with a financial advisor who can help you understand the total value of your investments when you make them. Financial advisors can provide guidance and tips to help you see the long-term value of your investments. Learn more: These Simple Compound Interest Charts Will Blow Your Mind How to Benefit from Compounding Interest Now that you have a basic understanding of how compounding interest works, it's time to focus on some ways that you can benefit from this strategy. To paraphrase the Oracle of Omaha, Warren Buffett, investors should take advantage of compound interest and avoid getting captivated by the siren song of the market. Time is your friend, Buffett says, and impulse is your enemy. Part of the reason collecting compound interest is so difficult for early investors is because interest takes a significant amount of time to accrue. It can take a decade or longer for interest to compile and significantly surpass the initial investment. But over the course of 20 to 30 years, interest can compile to the point where it dwarfs the initial investment. Is there anything better than making money off of your own money? Understanding the Rule of 72 The Rule of 72 is one strategy you can use to determine how long an investment will take to double. This can be applied to investments that have a fixed annual rate of interest. To calculate the Rule of 72, all you have to do is divide 72 by the annual rate of return. So, if you have $1 invested with an annual fixed interest rate of 20%, it would take 3.6 years for the investment to reach $2. If the interest rate is 10%, then it would take 7.2 years to reach $2. Feel free to substitute numbers in the above example as you begin considering your next investment. Avoiding Credit Card Compound Interest Here's the catch about compound interest: It can help you, but it can also bite you. If you're not careful about taking out loans from lenders and using credit cards, compound interest can work against you just as much as it can benefit you. This is frightening when considering that 124 million Americans are in credit card debt, with no sign of this trend reversing any time soon. Many Americans are in way over their heads because they didn't understand how compounding interest works when they opened a credit account. And now they're paying for it. So, be very cautious about collecting credit card debt. Always try to pay off your credit card balance at the end of every cycle to avoid accruing compounding interest. If you have any outstanding payments, it's in your best interest to pay them down as quickly as possible. Otherwise, the accumulated interest could compound to a point where the total amount snowballs out of control and you're stuck having to consolidate loans just to make your monthly payment. Do Student Loans Have Compound Interest? Student loans have a bad reputation as being unfair to investors. However, people are often surprised to learn that student loans typically use simple interest instead of compound interest. In fact, all federal student loans are required to be simple in nature. Here's the difference: Simple loans charge interest on the principal amount only, while compound interest includes interest on the principal as well as unpaid interest that has accrued. This benefits borrowers because a loan with compound interest is more expensive than a loan with simple interest. Of course, there are some student loans that offer compound interest but the vast majority are simple. FAQs How does an annual percentage yield work? Annual percentage yield (APY) refers to the actual rate of return that will be earned over the course of a year after interest is compounded. Compounded interest from an APY gets tacked onto a total investment, increasing the overall balance in your bank account or investment portfolio. As such, it's important to always choose accounts that offer the strongest possible interest rates. What if my account doesn't offer interest payments? If the account you are using doesn't offer a relatively high rate of interest, then you should strongly consider the purpose of that account. It might be time to look into a better offering with a higher rate of return. Only you can make this decision. But the whole point of saving and investing is to grow your money. If an account doesn't offer you interest, or if it offers very low interest, you could be cheating yourself out of a significant amount of income over time. What is the average rate of return for APY? The average stock market rate of return is about 10% annually. This has been the case for about 100 years. As such, the stock market is an excellent vehicle for investing and generating a healthy return on your investment. That said, if you're considering using the stock market to invest, then you need to be aware of market volatility. Most successful investors will tell you to avoid moving money around frequently and instead focus on playing the long-term game. Look into index funds and exchange-traded funds (ETFs). That way, you can spread your investments around over a broader area for ready-made diversification, flattening out the effects of the ups and downs of the market a bit. Can I double my money in the second year of an investment? You can technically double your money in the first year or the second year of an investment. But you would need an exorbitantly high-interest rate. It's not impossible to do this. But if you try, it will likely pull you into dangerous waters because you will need to look for fringe investment opportunities that offer much higher return potential, along with higher risks. Remember to always consider the rule of 72 when investing, which tells you how long you can expect to double your initial investment. Many investors will tell you to get rich slowly by investing in secure or conservative stocks that offer moderate returns over time. If an investment seems too good to be true, it probably is. But only you can determine this. Can compound interest lead to exponential growth? Compound interest is the way to exponential growth when investing or depositing money. This strategy requires significant patience and being smart about where you park your capital. If you make the right decisions, you can expect to achieve exponential growth over the course of around 20 to 30 years. So, if you're just entering into the workforce, you can expect to receive the full benefits of compound interest as you approach your golden years — right around the time of your retirement. Frequent compounding can help you grow your money well beyond your initial investment. That's why many investors love it. Can money market accounts offer compound interest? Some money market accounts offer competitive interest rates which are comparable to high-yield savings accounts (HYSA). However, some can also be very stingy in what they offer to consumers. If you're considering leveraging a money market account, look around for an account that offers you the best possible rate. The Bottom Line As you can see, compound interest is a very powerful concept that can make or break your overall portfolio over the course of several decades. Investors that choose to pay close attention to maximizing compound interest and minimizing bad compound interest tend to perform much better when it comes to achieving their overall personal finance goals. Ultimately, the small decisions you make on a daily basis — like putting a few extra dollars in savings, paying down or avoiding credit card debt, and investing in the stock market, will yield massive returns over time. It's not always possible to see the bigger picture during daily life, which is why investors run into trouble. Remember: Time is the most powerful tool of all in investing. Make smart decisions and let time do the trick and you are almost guaranteed to wind up on top in the end. Whatever you decide to do, I'll be cheering you on. Many companies featured on Money advertise with us. Opinions are our own, but compensation and in-depth research determine where and how companies may appear. Learn more about how we make money. Compound interest is almost like magic. It makes dollars multiply before your eyes. Let's say you start with $1,000 in the bank. If the interest rate is 4%, you'll have $40 more in the account at the end of the year. That's simple interest. But in a year or two, you earn interest not just on the original $1,000, but also on the $40 in interest you've already earned. In other words, your interest earns interest. That's compound interest. And as long as interest rates don't fall, the amount you receive in interest grows each year you keep your money in the bank. The same principle works when you invest in stocks or mutual funds, where annual returns are, on average, higher than they are at the bank. With compounded returns, the money your investments earn one year will earn money for you in following years — as long as you reinvest it. Whether you're taking out a loan or depositing some funds in a savings or retirement account, you're likely to either pay or receive interest in return for money borrowed or saved. In many cases, you'll end up dealing with compound interest, which means you not only accrue interest on the original sum but on top of the interest that accumulates over time as well. While this is good news if you're getting paid interest on deposited funds, it means additional costs if you're a borrower. So, it's crucial to learn how compound interest works, how you can calculate it in different scenarios and how it differs from simple interest. When you encounter interest on a loan, credit card or savings account, you can consider it a fee charged or paid in exchange for borrowing, either from your end or the bank's end. In the case of a loan or credit card, you're paying the interest since the lender or creditor is letting you use their money. But in the case of a savings product, the bank will be paying you for the benefit of allowing them the privilege to hold your money and invest or lend it to others. Depending on the financial product, you'll face either simple or compound interest, and these work differently and have their own formulas and pros and cons. In the case of simple interest, interest just builds on the principal amount, which is the amount you received as a loan or the amount you deposited. However, it's more common to find yourself dealing with compound interest, which means that you either get or pay interest based on the amount of interest accrued already plus the principal. Regardless of the type of interest, the actual rate can depend on various factors that range from the financial institution and type of financial product to your creditworthiness and current market conditions. For example, your mortgage interest rate can depend on your credit score, location, home cost and loan type, while your savings account interest rate can depend on the bank, amount deposited and tier of account you have. The Federal Reserve has a role in changing interest rates in response to changing economic conditions like unemployment levels, economic growth and inflation. Read More: 7 Kinds of Interest Rates When you get a student loan, personal loan, credit card or savings account, there's a good chance that the financial institution will use compound interest rather than simple interest when calculating what to charge or pay you. Depending on the financial institution and type of account, you'll find that the interest will compound as often as daily or as little as annually. It's also common for interest to compound on a monthly or quarterly basis. This compounding period is important since it impacts the annual percentage yield. This differs from the annual percentage rate, or APR, that you often see advertised as the interest rate, as the APY provides the most realistic interest rate that applies to your financial product. The more often the interest accrues, the more it will build up, so daily compounding interest adds up slightly more than monthly compounding interest, for example. You can use the formula APY = (1 + r/n)^n - 1 to convert from APR to APY, where r is the APR and n is number of times each year that the interest compounds. Knowing how compound interest works is especially important for investors who seek the biggest return on their money. The Rule of 72 is often used as it provides a quick glance at how long someone needs to invest their money to build up enough compound interest at a set rate to double their investment. It's often used for lower interest rates where there's higher accuracy, and it involves simply dividing the number 72 by the annual interest rate to get a number of years. For example, if you only earn 2 percent interest on an investment, then you'd divide 72 by 2 to see it would take around 36 years to double your money. To calculate how much compound interest accrues on your loan or investment, you can expect to use a more complex formula than you would with simple interest. That's because the formula has to account for the frequency of compounding. However, you won't need to do work beforehand to determine the APY from the APR since the formula will handle this in the calculation. The compound interest formula is A = P(1 + r/n)^ (n * t). To break down the formula, the r refers to the APR as a decimal, the n refers to the compounding frequency, the t refers to the number of years for the loan or investment and the P means the principal. The A is the resulting total principal and accumulated compound interest over the term. When using this formula, keep in mind that rounding numbers can give you considerably different results in some cases, so it helps to round further out for more accuracy. Since it can be easy to make mistakes with the math, using a compound interest calculator like the one available on the Investor.gov website can save you time and help you run different scenarios for borrowing and investing decisions. You'll just need to know the initial principal, term length, APR and compounding frequency to use this tool. An advantage is the online calculator can easily account for additional deposits you might make to your savings or investment account. Read More: What Is Interest-Bearing Debt? Before getting into some sample calculations, it helps to compare compound interest with simple interest. This type of interest is what you'll more often see with auto loans, personal loans, mortgages and some types of savings accounts. Since interest doesn't build on interest, this feature offers an advantage for people borrowing money but disadvantages those who are saving or investing. The fact that interest only builds on the principal means that you'll find simple interest much easier to calculate than compound interest. To do the calculation, you can use the formula I = P * r * t, where you multiply the principal times the APR in decimal form times the number of years in the term. This gets you the interest accrued, which you can easily add to the principal to get the total amount of principal plus interest. While you can easily calculate simple interest by hand or with a regular calculator, you can find tools online like the simple interest calculator from MoneyChimp that lets you run scenarios quickly and compare the result with what compound interest would have looked like. You can best see the impact of compound interest with an example that shows how it benefits savers and disadvantages borrowers. Consider you're dealing with $5,000 for the principal, 4 percent for the interest rate and a five-year term. As you've learned, the compound interest formula to find the amount with interest is A = P(1 + r/n)^(n*t), where P is the principal of $5,000, r is the 4 percent interest rate converted to the 0.04 decimal form, n is 365 for daily compounding, and t is 5 for the term in years. Plugging all these figures in, you'd get A = $5,000(1 + 0.04/365)^(365*5) initially. After dealing with the calculations within the parentheses and using some rounding, you'd get A = $5,000(1.00011)^(1,825). This works out to A = $5,000 * (1.22231), which finally simplifies to $6,111.55 in interest and principal paid. As a borrower, this would mean that you end up paying $1,111.55 in combined interest on your loan over those five years. The entire amount paid back including the principal would be $6,111.55. On the other hand, if the $5,000 was saved under the same terms and you made no additional contributions, you would have earned the $1,111.55 in interest over the five years and ended up with a $6,111.55 balance in your savings account. To see the lower interest paid and earned when you're dealing with simple interest, consider that you're dealing with the same $5,000 in principal, interest rate of 4 percent and a term of five years, except this time it's simple interest. You can use the simple formula I = P * r * n to get the amount of interest paid, where P is $5,000, r is 0.04, and n is 5. Plugging in those numbers, you get I = $5,000 x 0.04 x 5, which works out to I = $1,000 in interest. This means a total principal and interest amount of $6,000. If you had taken out a loan with these terms, this means that you would end up paying $1,000 in interest over the term, and this is $111.55 less than with daily compounding. This works out to $200 paid per year. When adding this $1,000 in interest to the principal for the loan, it means you would pay back $6,000 altogether versus the $6,111.55 with compounding daily interest. On the other hand, consider that you had instead deposited that $5,000 into a savings account with the same terms. After you had kept all the money in the account for five years, you would have accrued $1,000 in earnings, or $200 per year. This means you'd have the $6,000 in hand, which is $111.55 less than you'd have with daily compounding interest. As you've learned, compound interest is more of an enemy when you're a borrower due to the added costs. This means you should take steps to get the best interest rate beforehand and then make good debt payment decisions that minimize the interest charged over the term. When borrowing, shop around for low interest rates on loans or credit cards and compare a few options while also considering any fees that will add to the interest costs. Since your interest rate can depend on your credit history, it can also help to work on paying off existing debt or fixing errors on your credit report so that you don't face both difficulties borrowing and unfavorable interest rates. Once you start making payments, make them on time to avoid fees and interest rate increases, try to pay more principal each month when you can and aim to pay credit cards in full since they tend to have the highest rates. If you have extra cash, try to use it to pay off your debts that charge the most interest and then work your way down to debts with lower rates. You can consider debt consolidation or refinancing if your credit situation changes where you can possibly get lower rates, but keep in mind that the fees involved might wipe out most of the potential interest savings in some cases. Whether you're working on long-term savings for retirement or short-term savings for a personal goal, compound interest can work in your favor. For the best results, you'll want to contribute as much as possible to your savings and find the right investment and savings products that offer competitive interest rates and accrue interest frequently. As a saver, you'll also want to shop around for the highest interest rates and aim for savings products like certificates of deposit and money market accounts versus traditional savings accounts that can yield very low rates. When you have extra money and want a higher possible return, you can look into retirement accounts and investments. However, keep in mind the market fluctuations that can also result in losses with these riskier investments, at least in the short term. By putting as much money as possible into savings and adding more regularly, you can get more interest. Some banks may have bonuses for accounts with high balances that can lead to even more of a return.

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