1. Recall last lesson information

We learned about cash flow, ways to manage cash flow (analyze person income and spending), and decision making based on current situation such as current cost of driving expenses vs. buying a new car.

1. Today, we will learn about interests whether interest on loans or interest on investment, which you could create based on the money you save.
2. Key terms to know when working with interests.
* Principal – the balance upon which interest is paid.
* Simple interest – interest paid **only** on the original principal, and not on any interest added at later date.
* Compounding interest – interest paid both on original principal and all interest that has been added on the original principal.
* Annual percentage rate – interest compounded just once a year.
* Present value (PV) – starting principal, the amount of money in an account at present.
* Future value (FV) – accumulated balance, the amount that will be accumulated at some time in the future.
* Annual percentage yield – the actual percentage by which a balance increase in one year. It is also known as effective yield or simply the yield.
* Continuous compounding – compounding infinitely many times per year.
1. On July 18, 1461, King Edward IV of England borrowed the modern day equivalent of $384 from New College of Oxford. The Kind soon paid back $160, but never repaid the remaining balance of $224. The debt was forgotten for 535 years. Upon the rediscovery in 1996, a New College administrator wrote to the Queen of England asking for repayment of interest. Assuming an interest rate of 4% per year, he calculated that college was owed $290 billion. This is an example of the “power of compounding;” the money grows when interest continues to accumulate year after year.
2. Imagine you deposit $1000 in money holding company that promises to pay 5% interest each year.
3. At the end of the first year, you received $50 of interest: $1000x.05 = $50.
4. You also get $50 at the end on the second and third years. Over the years, you received the total of $150 on interest: $50x3 = $150.
5. Your original $1000 has grown in value to $1150. This method of payment represents simple interest.
6. **Simple interest formula** is \_\_\_\_\_\_\_\_\_\_ A = total accrual, P = Principal, r = rate, and t = time in year.
7. Now, suppose that you place $1000 in a bank account that pays the same 5% interest once a year
8. At the end of the first year, you earned $50 of interest: $1000x.05 = $50.
9. You get $52.50 of interest on the end of the second year: $1050x.05 = $52.50.
10. At the third year, you received $55.13 of interest: $1102.50x.05 = $55.13.
11. Despite the identical rate, you ended up with $7.63 more if you use the bank instead of money holding company: $50+$52.50+$55.13 = $1157.63
12. The type of interest offers by the bank is known as compound interest.
13. **Compound interest formula** is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, n = number of compounding period.
14. **Example 1 – Saving Bond**

While bank almost always pay compound interest, bonds usually pay simple interest. Suppose you invest $1000 in a savings bond that pays simple interest of 10% per year. How much total interest will you receive in 5 years?

1. Recall King Edward IV, he has a balance of $224. If the interest rate is 2%. How much does he owe with simple interest over 535 years?
2. You deposit $700 in an account with annual interest rate of 4%. What is the amount of money will you have in the account after 5 years with simple interest?
3. You deposit$1200 in an account with annual interest rate of 2%. What is the amount of money will you have in the account after 10 years with simple interest?
4. You deposit$4000 in an account with annual interest rate of 2.5%. What is the amount of money will you have in the account after 5 years with simple interest?
5. **Example 5 – Monthly Compounding.**

You deposit $5000 in a bank account that pays an APR of 3% and compounds interest monthly. How much money will you have after 5 years? Compare this amount to the amount you’d have if the interest were paid only once per year.

1. Recall King Edward IV, he has a balance of $224. If the interest rate is 2%. How much does he owe with compound interest over 535 years?
2. You invest $10,000 at an APR of 4% for 10 years. Compute the balance assuming interest is compounded annually.
3. You invest $10,000 at an APR of 5% for 20 years. Compute the balance assuming interest is compounded annually.
4. You invest $10,000 at an APR of 4% for 10 years. Compute the balance assuming interest is quarterly compounded.
5. You invest $2000 at an APR of 3% for 5 years. Compute the balance assuming interest is compounded daily.
6. You invest $10,000 at an APR of 2.75% for 5years. Compute the balance assuming interest is compounded monthly.
7. You invest $10,000 at an APR of 4% for 10 years. Compute the balance assuming interest is compounded semiannually.
8. **Calculate annual percentage yield.**



1. A bank offers an APR of 5.5% compounded daily.
2. A bank offers an APR of 4.5 compounded monthly.
3. A bank offer an APR 6% compounded semiannually.
4. A bank offers an APR 2% quarterly.
5. **Example 7 – Continuous Compounding**

You deposit $100 in an account with an APR of 8% and continuously compounding. How much will you have after 10 years? A = P × ert

1. A $10,000 deposit in an account with an APR of 3.5%. Compute the balance after 1, 5, and 20 years with continuous compounding interest.
2. A $2000 deposit in an account with an APR of 3.1%. Compute the balance after 1, 5, and 20 years with continuous compounding interest.
3. A $7000 deposit in an account with an APR of 5.5%. Compute the balance after 1, 5, and 20 years with continuous compounding interest.