Part 1: “Leave it Alone” Finances: Compound and Simple Interest

Description:

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Three Scenarios:

(1) **Simple Interest:**

   (a) 

   (b) 

   (c) **Equation:** \[ S = P + t(Pr) = P(1 + rt) \]

   (d) **Variables:**
   - \( S = \)
   - \( P = \)
   - \( t = \)
   - \( r = \)

   (e) **Types of Questions:**

(2) **Compound Interest:**

   (a) 

   (b) 

   (c) **Equation:** \[ S = P(1 + \frac{r}{n})^{nt} \]

   (d) **Variables:**
   - \( S = \)
   - \( P = \)
   - \( t = \)
   - \( r = \)
   - \( n = \)

   (e) **Types of Questions:**
(3) Continuously Compounded Interest:

(a)

(b)

(c) Where does “e” come from?

(d) Equation: \( S = Pe^{rt} \)

(e) Variables:
• \( S = \)
• \( P = \)
• \( t = \)
• \( r = \)

(f) Types of Questions:

APY: What if we want to compare the total interest earned across multiple investment methods?

(1) Simple Interest: \( APY = r \)

(2) Periodic Compounding Interest: \( APY = (1 + \frac{r}{n})^n - 1 \)

(3) Continuously Compounding Interest: \( APY = e^r - 1 \)

APY is the percent increase in your account over 1 year.

i.e. the simple interest rate necessary to earn the amount of interest
Example 1: Given that we invest $10,000 for four years at a annual interest rate of 7.5%

(a) If it's simple interest, how much interest will we receive at the end of the four year period? What will the account value be?

(b) If the interest is compounded twice yearly, what will the account be worth? How much interest will we receive at the end of the four year period

Example 2: Mary borrowed $3,000 at an interest rate of 18%. How much interest is due in 65 weeks if

(a) If it is simple interest

(b) If interest is compounded quarterly

(c) If the interest is compounded continuously
Example 3: Assume that we invest $6,000 at 5% annual interest

(a) If it's simple interest, how long will it take to double the value of the investment?

(b) If the interest is compounded every month, how long will it take to double in value?

(c) If the interest is compounded continuously, how long will it take to double in value?

Example 4: How much money do you need to invest now in order to retire with 2,000,000 in 4 years if money compounds monthly at 8%? What if we have 45 years?
Example 5:
(a) Find the value of an account after 3 years if it's compounded continuously and we originally invested $5,000 at an interest rate of 10%.

(b) What interest rate must we find if we want to invest the same $5,000 in a continuously compounded account for 3 years and have a future value of at least $7,000.

Example 6: Which is a better investment deal?
(a) An account earning 10% simple interest.

(b) An account earning 9% interest compounded annually

(c) An account earning 8.75% interest compounded quarterly

(d) An account earning 8.6% interest compounded continuously