Group Activity Answers

Directions: Using the formulas for Future Value and Present Value calculations or the Investopedia calculators, work in a group of 2-4 students to answer the following questions:

Future Value

$X \times (1 + r)^{\#periods}$ = future value

Present Value

$X = \dfrac{\text{future value}}{X \times (1 + r)^{\#periods}}$

1. Alex's grandmother has $10,000 in a bank account that is not earning interest. Alex is 12 years old, and his grandmother has promised to give him this $10,000 to spend on college tuition – once he graduates from high school in six years. Alex understands the time value of money, so he wants to persuade his grandmother to put the money in an S&P index fund instead. Although no one can be sure what the rate of return will be, historically S&P funds have earned an average of 10% per year. Calculate the future value of the $10,000 (in six years) if the money was invested at a 10% annual return instead. Assume compounding is only once a year.
   Answer: $17,715.61 , Explanation: Future value = $10,000 x (1 + 0.10)^6

2. Sofia has a government bond that will be worth $500 when it matures in 5 years. She wants to sell it to her brother because she needs the cash now for car repairs. Assuming an interest rate of 3% and assuming monthly compounding, what is the present value of the bond?
   *Answer: $430.43 , Explanation: Present value = $500/(1 + 0.0025)^{60} *remind students to divide the interest rate by 12 because of monthly compounding*

3. Darius worked in a union motorcycle factory for 20 years before returning to school to become a paramedic instead. He is 45 now. He has a pension from his previous employer, which would pay him $1500/month after his retirement at 65. Assuming he will live to 80 (which is slightly higher than the life expectancy for an American man), he would earn $270,000 over 15 years. The company has stopped offering pensions and wants to buy out his pension today. Should Darius accept a buyout offer of $125,000? Assume that he could invest the money at an interest rate of 3% with monthly compounding.
   Answer: Yes. If he invests the money at 3%, it will grow to $227,594 by the time he retires: $125,000 x (1.0025)^{240} It would grow to more than $350,000 by age 80: $125,000 x (1.0025)^{420} Even if he withdrew half the money to spend at age 65, the remaining $114,000 would grow to $178,687 (an additional $64,687) by age 80.

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4. Sam and Nadia just inherited $150,000 from Nadia's grandmother. This is exactly the amount of principal remaining on their mortgage. They are wondering: *Should they pay off the mortgage or keep making their monthly payments and invest the money in an S&P Index fund?* They have a 30-year mortgage at 4% interest, and they have 16 years remaining to pay. They pay $1000/month in principal and interest payments. Assume they could earn about 6% annual interest on an investment, which would compound monthly.

   They should not pay off the mortgage; they should invest the money. If they invest and earn 6%, they would have $390,818 at the end of 16 years. The equation is $150,000 x (1.005)$[192]
   In the same time, they would have spent $192,000 on house payments ($1000 x 12 months x 16 years), so they will come out ahead. Students can also solve this problem by simply comparing the interest rates. If the mortgage interest rate is higher than the interest on their investment, they should probably pay off the mortgage, although that would depend on them having other savings.