# 1010 Personal Finance and Beyond Algebra T/Th Questions

Here are portions of questions from class to help you with your notes or later practice. The wording and ordering may change and we may not have time to cover all of them. Here we actively practice concepts, computational strategies, critical & creative thinking, and communication. Making mistakes is integral to the learning process and enriches our understanding as we extend content and clear up misconceptions.

- **Think** about a possible answer(s) on your own.
- **Pair up**: discuss your thoughts in a group. We may reorganize groups at times.
- Prepare to **share** from your group's discussion. This may take the form of an assertion, question, definition, example, or other connection. It could be something you tried and rejected.
- May be a lag at times—use this to **review** related concepts and examples, and **add** to your notes, or get to know your neighbors.

Appalachian's General Education Program prepares students to employ various modes of communication. Successful communicators interact effectively with people of both similar and different experiences and values and in this class you will practice oral and written communication during class by interacting with various peers and me.

## lump earnings

- Suppose we deposit $1000 in a savings account that pays 5% interest compounded monthly for 142 years—how much will we have in total savings?

- Which is better interest in this scenario, compounding annually, compounding monthly, or are they the same?

- Which do you think best explains why it does make sense to charge interest?

- Which do you think is most compelling of why it might not make sense to charge interest?

- If you were going to design an independent, self-sustaining, space mission, who travel far away to continually explore the geometry of the universe, would you charge interest within it?

- Real-life situation: Past student was told that her certificate of deposit (CD) will be compounded monthly at 8% for 8 months, and is told that this 8% will apply each and every month (i.e. is the monthly rate). Let's say that she put in $1000. How much would her CD be worth at the end of 8 months if the annual rate was indeed $8 \times 12 = 96\%$ instead of 8%?

- What did the bank really mean?

- Which algebraic operations apply to why the lump sum formula holds?

- If a certificate of deposit (c.d.) will be compounded monthly at 3% for 14 years, and William put in $2000, then what is the formula that represents how much would the c.d. be worth at the end of 14 years?

- If a certificate of deposit (c.d.) will compounded monthly at 3% for 14 months, and William put in $2000, how much would the c.d. be worth at the end of 14 months (answer in dollars and cents)? **Caution**: the prevous question asks about 14 years but this problem asks about 14 months.

- What is the problem with Americans keeping their money under their mattress? What does Warren Buffett mean by an economic Pearl Harbor?

- What is the *interest* when $37 is deposited today into an account that earns 12.99% compounded monthly for 2 years?

- You had a balance of 93 cents... and at an average of two and a quarter percent interest over a period of 1000 years, that comes to...

- Lisa put in $100 for one year into a Thrifty Savers 2.3% savings account instead of a 2.25% account, and she earned an extra nickel. What equation represents this scenario?

- Which of the following are true regarding the earned rate of a fund?

- Was the lump sum formula appropriate to use in the case of the Benjamin Franklin fund, when money was going in and out of the account?

- If we put in $100 now and leave it there for 25 years compounded monthly at 5%, then how much interest, in dollars, will we have earned?

- How much should we put in now as a lump sum if we want the future value (FV) to be $500 after 14 years of an account paying 1% compounded annually (i.e. what is the present value (PV) of the account)?

**lump & periodic earnings**

- What is the total savings plus interest when $25 is deposited into an account every month for 8 months at 1% compounded monthly?

  a) $25(1 + \frac{.01}{12})^{8\times12}$

  b) $\dfrac{25((1 + \frac{.01}{12})^{8\times12} - 1)}{\frac{.01}{12}}$

  c) $\dfrac{25((1 + \frac{.01}{8})^{8} - 1)}{\frac{.01}{8}}$

  d) $\dfrac{25((1 + \frac{.01}{12})^{8} - 1)}{\frac{.01}{12}}$

  e) none of the above

- For each of the other choices, write a scenario that represents it. So your response will be different scenarios.

- Joan saved early for the first 10 years and then vacationed for the remaining 34 years. Which formulas must be used to calculate her total savings plus interest?

- What algebraic operations did we use to derive the periodic payment/annuity formula?

- What is equation that represents the total savings plus interest when $100 is deposited into an account each month for 4 years at 3% compounded monthly?

- What is the total interest earned, in dollars and cents, in the last question?

- What is the total savings plus interest when $100 is deposited today into an account that earns 3% compounded monthly for 4 years?

**lottery decisions**

- A Powerball lottery from usatoday.com. said "For the jackpot worth 295 million, if there is one winner, then they will have a choice between 25 annual payments of 11.8 million each (Note that 25*11.8 =295) or a single lump sum payment of 170 million." How can we compare the logical benefits and reasonableness of each choice? Let's cut off the "million" to make it easier to work with (if you look at the formulas for lump sum and periodic payment, this is ok to do to adjust the units, since it is multiplication outside the parenthesis).

- For comparison sake, set up the equation, with numbers filled in, that represents the total savings plus interest if we took the lump sum and leave the 170 in an account at 5% compounded annually for the 25 years.

- Solve for the total (in millions)

- What is the interest (in millions)? Show work.

- Set up the equation that represents the total savings plus interest, in millions, if we took the annual payment and deposit each 11.8 annual payment into the same type of account at 5% compounded annually for the 25 years.

- Solve for the total (in millions)

- What is the interest (in millions)? Show work.

- Which yields more money? Circle one: lump      periodic

- Which yields more interest? Circle one: lump      periodic

- Do these make sense? If so, write yes. If not, explain why not.

- Which would you select?

- Set up but do not solve: Different lottery: Let's say we take a periodic payment option and the lottery will pay us each month. What if we want to spend much of our winnings—write the equation that represents how much (in millions) we would need to deposit per month to obtain 1 million in 25 years, say at 1.5% compounded monthly.

- Set up but do not solve: Let's say we plan to save 2000 dollars per month and spend the rest of our winnings. Write the equation that represents how long (in years or months—whichever you prefer) it will take the savings account to reach 1,000,000 dollars, at 1.5% compounded monthly.

- Search for recent news on: **lottery winner lump** and report back, giving a source.

**loans**

- On Excel we see

  | month | Payment | To Interest | To Principal | Loan Balance |
  |-------|---------|-------------|--------------|--------------|
  | 119   | $58.18  | $0.76       | $57.42       | $57.17       |
  | 120   | $58.18  | $ 0.38      | $57.80       | ($0.63)      |

  where the .63 is in red. What is the total amount paid on the loan?

- If we pay an extra $20 each month on a loan then we will pay...

- We can calculate the total interest in Excel via two of the three methods. Which is **<u>incorrect</u>**?

- What algebraic operations did we use to derive the loan payment formula?

- Which option would you choose in the condo decisions? They both take the same amount of time—30 years—to pay off.

- If we take out a $100 loan at 700% compounded monthly for 2 months, the monthly payment would be

  a) $100(1 + \frac{7}{12})^2$

  b) $\dfrac{100((1 + \frac{7}{12})^{(2\times12)} - 1)}{(\frac{7}{12})}$

  c) $\dfrac{100\frac{7}{12}}{(1 - (1 + \frac{7}{12})^{-2})}$

  d) other

- For each of the other choices, write a scenario that represents it. So your response will be different scenarios.

- If we take out a $100 loan at 700% compounded monthly for 2 months, what is the payment to interest for the first month in the amortization table?

- Real-life Payday lender in Boone: Within 2 weeks of my next paycheck I can come in and (if I qualify), write a check to them for $117.50 and receive $100 cash at that time, so the interest on $100 is $17.50. Then, when I get paid, I bring $117.50 in cash to their office and buy back my check. If I don't show up, they deposit my check, and if it bounces I will owe "returned check charges," plus the amount, and then on to a collection agency with potential civil charges if I don't pay. They told one of our faculty members that their rate was better than a credit card. First, compute the 2-week rate as the percentage of interest. Next, what is the annual rate (multiply the 2-week rate by 26, as there are 26 double weeks in a year) and how does it compare to credit card rates?

**review**

- Alex works part-time and earns $100 each week. Alex deposits the earnings at the end of each month in an account which pays 6.8% compounded monthly. If Alex does this consistently for three years, will they have enough to buy the $15,000 car they are hoping to get? (Assume 4 weeks in a month.)

- If you have $800 to invest for two years, which is the better investment: 7.5% compounded annually or 7.3% compounded monthly? Why?

- Maya is 38 years old and settled into a job making about $27,000 per year that they receive in equal payments at the end of each month. Maya decides it's time to begin putting 10% of each paycheck immediately into a retirement account which pays 6.7% compounded monthly. Alice, Maya's sister, is 22 years old. She decides to go ahead and start putting $75 at the end of each month into the same retirement account, even though she isn't making much money at her job yet. If both continue doing the same until they retire at age 65, who will have more retirement money? Who will have deposited more?

- Taylor deposits $500 at the end of each quarter into an account paying 6.5% interest compounded quarterly for 7 years. Taylor then changes the deposit to $725 each quarter for 5 more years at the same rate. What will the total savings plus interest be after the entire 12 years?

- You are buying a house and taking out a loan for $54,000. The lowest interest rate is 8.25% compounded monthly.

  a) Find the monthly payments if you get a thirty year loan.
  b) What are your monthly payments if you get a fifteen year loan?
  c) How much money will you save with the fifteen year loan?

- Isaac decided to buy that beautiful 10 acres just off the Blue Ridge Parkway. Isaac can purchase the land for $42,000, and the owner has agreed to allow them to make payments each quarter for the next 5 years at 10% interest on the unpaid balance.

  a) What is the quarterly payment?
  b) What is the total interest paid over the life of the loan?
  c) What is the first quarter's interest?
  d) Prepare the first two rows of an amortization schedule for the loan. What is the balance at the end of the second quarter?