Math 9 Assignment 8: Financial Literacy (solutions)

1. You borrow \$200 for 3 years at 10% interest.
   a. Use the simple interest formula $I = P \times r \times t$ to roughly estimate how much you owe in 3 years.
   $\mathbf{I = 200 \times 0.10 \times 3 = 60}$
   $\mathbf{200 + 60 = \$260}$

   b. Now recalculate the new interest at the end of each year. How much do you need to pay at the end of 3 years?
   Year 1: $\mathbf{\$200 \times 1.10 = \$220}$
   Year 2: $\mathbf{\$220 \times 1.10 = \$242}$

2. EQ Bank up to 3.5% cash back on your savings. If you have \$50,000 in this bank, how much do you earn on interest each month?
   $\mathbf{50,000 \times 0.035 = \$1750}$ annually
   $\mathbf{\frac{1750}{12} \approx \$145.83}$

3. How much would you earn in a month after taxes if you work a full-time job at \$25 per hour? Assume that you are taxed at 20%.
   $\mathbf{\$25 \times 8 = \$200}$ gross each day
   $\mathbf{\$200 \times 20}$ days $= \mathbf{\$4000}$ gross per month
   $\mathbf{\$4000 \times 0.80 \approx \$3200}$

4. Suppose your family makes \$100,000 which is taxed at an average rate of 25%. How much can you spend each day for all your expenses?
   Net $\mathbf{\$75,000}$
   $\mathbf{\frac{75000}{365} \approx \$205.48}$

5. When paying off your mortgage, is it better to pay \$1000 to the bank 12 times a year, or pay \$500 bimonthly?
   Bimonthly (every pay cheque)

6. You manage to invest \$1 million by the time you retire. If your investments make 10% annual interest, how much do you earn in interest each year?
   \$100,000

7. Suppose the stock market crashes the day your retire. Your 1 million dollar savings crashes down to \$500,000.
   a. According to the 4% rule, how much can you safely withdraw each year?
   $\mathbf{\$500,000 \times 0.04 \approx \$20,000}$

   b. What is a criticism of the 4% rule?
   Does not take into consideration Black Swan events (stock market crashes) or sequence or returns risk.

8. You pay off half your mortgage on a \$1.6 million home and own a car worth \$20,000. But you owe \$10,000 on your credit cards. What is your net worth?
   $\mathbf{800,000 + 20,000 - 10,000 = \$810,000}$

9. Restaurant
    a. Your family restaurant bill comes out to be $200. Taxes is 12%.
    You decide to tip 15%. How much do you end up paying in total
    if tip is calculated after taxes?
    $\$\mathbf{200 \times 1.12 \approx \$224}$
    $\$\mathbf{224 \times 1.15 \approx \$257.60}$

    b. You bring a dozen of your friends to a restaurant. The bill ends up being $400. Taxes and 18% gratuity are included in the bill. How much extra should you tip?
    $0 (it's already included!)

10. Planning a "best buy": At the supermarket orange juice is sold:
    Deal A: 4L of for $9.99
    Deal B: 2.63L for $7.48
    Deal C: 500 mL for $3.99 cents
    a. Calculate the unit cost of milk for each of these deals.
    Deal A: 4000 mL $=$ $\mathbf{999}$ cents → 1 mL $=$ $\mathbf{0.250}$ cents
    Deal B: 2630 mL $=$ $\mathbf{748}$ cents → 1 mL $=$ $\mathbf{0.284}$ cents
    Deal C: 500 mL $=$ $\mathbf{399}$ cents → 1 mL $=$ $\mathbf{0.798}$ cents

    b. Which is the best deal?
    Deal A is the cheapest

11. What is the best deal?
    Deal A: Pay $200 for a phone and pay $20 per month for 24 months
    Deal B: Pay $0 but pay $30 per month for 24 months
    Deal C: Pay $900 for the phone with no monthly payments

    Deal A: $\mathbf{200 + 20 \times 24 = \$680}$
    Deal B: $\mathbf{30 \times 24 = \$720}$
    Deal C: $900
    Deal A is the best deal

12. Suppose you have $100,000 in car loans. The annual interest rate is 10%.
    a. How much does your debt grow by in 1 year?
    Your debt grows by $10,000

    b. If you pay this "debt growth" amount each year, how many years will it take to pay off your $100,000 car loan?
    Paying $10,000 only pays off the interest (but you still owe the original $100,000).
    At this rate, you will never pay off your debt.

13. True or False: Banks typically charge 2.5% MER fees. This fee can lead to you losing half of the value of your investments.
    True

14. Rank from lowest interest rate to highest:
    I. Interest earned on a high interest savings account
    II. Interest paid on your mortgage
    III. Interest paid on your credit cards
    IV. Interest paid on a PayDay loan
    V. Interest paid on your student loans

    I, II, V, III, IV