# Chapter 2: Financial Math

### Exercises 2.2

1. A friend lends you $200 for a week, which you agree to repay with an interest rate of 5% one-time simple interest. How much will you have to repay?good #1
2. You loan your friend $100. They agree to pay an annual interest rate of 3%, simple interest. Six months later they repay that loan.  ADD
   1. How much did they pay you?
   2. How much was interest?
3. Consider a simple interest loan of $200 with an annual interest rate of 6%. If that loan is paid off 1 year and 3 months later, how much was repaid? ADD
4. You deposit $1,000 in an account that earns simple interest. The annual interest rate is 2.5%.
   1. How much interest will you earn in 5 years?
   2. How much will you have in the account in 5 years? Good #2
5. Consider an investment of $20000 with an annual interest rate of 5%.
   1. If that investment is earning simple interest, how much will the investment be worth in 10 years?
   2. If that investment is getting annually compounding interest, how much will the investment be worth in 10 years
6. Nico invests $4,500 into an account that has an annual interest rate of 8.5%. The interest is compounding monthly. Twenty years later what is the account balance?
7. How much will $1,000 deposited in an account that has an annual interest rate of 7% which is compounded weekly be worth in 20 years? Good #3
8. Suppose you obtain a $3,000 Certificate of Deposit (CD) with an annual rate of 3%, that is paid quarterly, with maturity in 5 years. Good #4
   1. What is the future value of the CD in 5 years?
   2. How much interest will you earn?
   3. What percent of the balance is interest?
9. You deposit $300 in an account that has an annual interest rate of 5%, which is compounded annually.
   1. How much will you have in the account in 10 years?
   2. How much interest will you earn?
   3. What percent of the balance is interest?
10. You deposit $2,000 in an account that has an annual interest rate of 3%, compounded monthly.
    1. How much will you have in the account in 20 years?
    2. How much interest will you earn?
    3. What percent of the balance is interest?
    4. What percent of the balance is the principal?
11. You deposit $10,000 in an account that has an annual interest rate of 4% compounded weekly.
    1. How much will you have in the account in 25 years?
    2. How much interest will you earn?
    3. What percent of the balance is interest?
    4. What percent of the balance is the principal?
12. How much would you need to deposit in an account now in order to have $6,000 in the account in 8 years? Assume the account has an annual interest rate of 6% and is compounded monthly.
13. How much would you need to deposit in an account now in order to have $20,000 in the account in 4 years? Assume the account has an annual interest rate of 5% and is compounded quarterly.
14. Breylan invests $1,200 in an account that has an annual interest rate of 4.6% compounded quarterly and Angad invests the same amount in an account that has an annual interest rate of 4.55% compounded weekly. 
    1. What will their balances be after 15 years?
    2. What will their balances be after 30 years?
    3. What is the effective rate for each account?
15. Bill invests $6,700 in a savings account that compounds monthly with an annual interest rate of 3.75%. Ted invests $6,500 in a savings account that compound annually and has an annual interest rate of 3.8%.
    1. Find the effective rate for each account.
    2. Who will have the higher accumulated balance after 5 years?
16. Bassel is comparing two accounts where one has an annual interest rate of 3.45% compounding quarterly and the second has an annual interest rate of 3.4% compounding daily.
    1. What is the effective rate for each?
    2. If he has $5,000 to deposit how much will the balance be in 10 years?
17. You deposit $2,500 into an account that has an annual interest rate of 4% compounded continuously.
    1. How much will you have in the account in 10 years?
    2. How much total interest will you earn?
    3. What percent of the balance is interest?
18. You deposit $1,000 into an account that has an annual interest rate of 5.75% compounded continuously.
    1. How much will you have in the account in 15 years?
    2. How much total interest will you earn?
    3. What percent of the balance is interest?
19. You deposit $5,000 in an account that has an annual interest rate of 4.5% compounded continuously.
    1. How much will you have in the account in 5 years?
    2. How much total interest will you earn?
    3. What percent of the balance is interest?
20. You deposit $10,000 in an account that has an annual interest rate of 5.5% compounded continuously and your friend deposits $10,000 in an account that has an annual interest rate of 5.5% that compounds annually.
21. How will you have in the account two accounts in 10 years?
22. How much more interest did you earn in the 10 years?

2.2 Answers

1.  You will have to repay $210
2. a.  b. 

They paid $101.50 total, $1.50 was interest

1.  $215 was repaid  
   1. 
   2. 

The interest earned was $125. This brings the account balance to $1,125.

1. a.  b. 

The simple interest account would be worth $30,000 and the account that was compounding would be worth $32,577.89 in ten years.

1.  The account balance is $24,485.59 in 20 years.

or =FV(0.085/12, 12\*20, 0, 4500)

1. The account balance is $4,051.38 in 20 years.

or =FV(0.07/52, 52\*20, 0, 1000)

1. 1.  The future value is $3,483.55.

or =FV(0.03/4, 4\*5, 0, 3000)

* 1.  The interest earned is $483.54
  2.  13.88% of the balance is interest.
  3. There will be $488.67 in the account in 10 years.

or =FV(0.05/1, 1\*10, 0, 300)

* 1.  $188.67 of the balance will be interest.
  2.  The interest makes up 38.61% of the balance.
  3. The account will have $3,641.51 in 20 years.

or =FV(0.03/12, 12\*20, 0, 2000)

* 1.  The interest will be $1641.51.
  2.  The interest is 45.08% of the balance.
  3.  The principal is 54.92% of the balance.
  4.  The balance is $27,172.37.

or =FV(0.04/52, 52\*25, 0, 10000)

* 1.  The interest is $17,172.37
  2.  The percentage that is interest is 63.2%
  3.  The percentage that is the principal is 36.8%

1.  The principal required would be $3717.14.

or =PV(0.06/12, 12\*8, 0, 6000)

1.  The principal required would be $16,394.79.

Or =PV(0.05/4, 4\*4, 0, 20000)

1. 1. Brylan Angad 

or =FV(0.046/52, 4\*52, 0, 1200) or =FV(0.0455/52, 4\*52, 0, 1200)

Brylan has an account balance of $1,442.30 and Angad has a balance of $1,439.42

* 1. Brylan Angad 

or =FV(0.046/52, 15\*52, 0, 1200) or =FV(0.0455/52, 15\*52, 0, 1200)  
Brylan has an account balance of $2,391.73 and Angad has a balance of $2,373.87

* 1. Brylan Angad 

or =FV(0.046/52, 30\*52, 0, 1200) or =FV(0.0455/52, 30\*52, 0, 1200)

Brylan has an account balance of $4,766.97 and Angad has a balance of $4,696.06

* 1. Brylan =EFFECT(0.046,52) 4.71%   
     Angad =EFFECT(0.0455,52) 4.65%   
     Brylan has an effective rate of 4.71% and Angad has an effective rate of 4.65%.

1. 1. Bill =EFFECT(0.0375,12) 3.82% and Ted =EFFECT(0.038,1) 3.8%  
      Bill has an effective rate of 3.82% and Ted has a rate of 3.8%.

 

or =FV(0.0375/12, 5\*12, 0, 6700) or =FV(0.038, 5, 0, 6500)

The account balances are $8,079.38 and $7,832.49. So, Bill’s balance is higher.

1. 1. =EFFECT(0.0345,4) 3.49% and =EFFECT(0.034,365) 3.46%

The effective rates are 3.49% and 3.46%.

* 1.  

or =FV(0.0345/4, 10\*4, 0, 5000) or =FV(0.034/365, 10\*365, 0, 5000)

The account balances are $7,049.51 and $7,024.63.

* 1.  The account balance is $3,729.56.

=2500\*EXP(0.04\*10)

* 1.  The interest earned is $1229.56
  2.  32.97% of the balance is interest.

1. 1.  The account balance is $2,369.08

=1000\*EXP(0.0575\*15)

* 1.  The interest is $1,368.08
  2. 

The interest is 57.77% of the account balance.

* 1.  The account balance is $6261.61

=5000\*EXP(0.045\*5)

* 1.  The interest is $1,261.61
  2.  The interest is 20.15% of the balance.

1. 1. You  Friend 

=10000\*EXP(0.055\*10) =FV(0.055, 10, 0, 10000)   
Your balance is $17,332.53 and your friend’s balance is $17,081.44. You have



You have $251.09 more than your friend.