

2.1-2.3: Spreadsheets, Simple and Compound Interest and Savings Plans - SOLUTIONS

Group Activity

Use a spreadsheet to work on these problems.

These formulas will be given to you on quizzes and tests. Write down the spreadsheet syntax to show your work. For example: =FV(.05/12, 2*12, 0, 1000).

Answer each question in a complete sentence.

1. Your uncle is giving you a **simple interest** loan of \$500 for one year at 4% interest. What is the total amount you will owe him?

$$= 500 + 500 * 0.04 * 1 = \$520$$

I would owe my uncle \$520 after one year.

2. You borrowed \$1500 from another relative. She charged you 5% APR, **compounded monthly**. If you paid her back 2 years later, how much money did you give her?

$$=FV(0.05/12, 12*2, 0, 1500)$$

$$= \$1,657.41$$

I would owe my relative \$1,657.41 after 2 years.

3. You got a bonus of \$7,500 and you want to start a college fund for your child. You find an account paying 9.75% APR **compounded quarterly**. If your child just turned two years old, how much will you have when they turn 18? How much of that account balance is interest?

Since they just turned 2, we have 16 more years.

$$=FV(0.0975/4, 16*4, 0, 7500)$$

$$= \$35,029.62$$

I would have \$35,029.62 when my child turns 18.

To calculate the amount that is interest: \$35,029.62 - \$7,500 = \$27,529.62. The amount of interest earned is \$27,529.62.

Financial Formulas

=principal + principal*rate*years

=FV(rate, nper, pmt, [pv], [type])

=PV(rate, nper, pmt, [fv], [type])

=principal*EXP(rate*years)

=EFFECT(nominal rate, periods per year)

=PMT(rate, nper, pv, [fv], [type])

4. Calculate how much you would have in problem 3 above if it was compounded **continuously** instead of quarterly.

$$=7500*\exp(.0975*16)$$

$$=\$35,691.16$$

I would have \$35,691.16 when my child turns 18 if the interest was compounded continuously.

5. If you are considering a credit card with an APR of 27.49%, compounded daily, what annual rate are you **effectively paying**?

$$=\text{Effect}(.2749, 365)$$

$$\approx 0.316262829$$

$$\approx 31.63\%$$

If I am using a credit card with an APR of 27.49%, compounded daily, I am effectively paying 31.63% per year.

6. How much would you need to deposit today to have one million dollars if you can find an account that pays 10% interest **compounded daily** for 50 years?

$$=\text{PV}(0.10/365, 50*365, 0, 1000000)$$

$$=\$6,742.56$$

If I could deposit \$6,742.56 in an account with 10% interest compounded daily, I would have one million dollars in 50 years.

2.3 Savings Plans

Use a spreadsheet to work on these problems. Write down the syntax to show your work. Answer each question in a complete sentence.

7. Jackie is 34 years old. She would like to have one million dollars in her retirement account when she is 65 years old.

- a. How much would she need to deposit every month into an account with an APR of 7.25%, compounded monthly, to achieve her goal?

$$=PMT(0.0725/12, (65-34)*12, 0, 1000000)$$

$$= \$719.22$$

She would need to deposit \$719.22 each month to have a million dollars when she retires.

- b. If she had started the account at age 21 (same APR), how much would she need to deposit every month to achieve her goal?

$$=PMT(0.0725/12, (65-21)*12, 0, 1000000)$$

$$= \$262.04$$

She would need to deposit \$262.04 each month to have a million dollars when she retires.

- c. If she had started the account at age 21 (same APR) and deposited the amount calculated in part (a) every month, what would the balance be when she retired at age 65?

$$=FV(0.0725/12, (65-21)*12, -719.22)$$

$$= \$2,744,713.35$$

She would have over \$2.7 million dollars when she retired.

- d. How much would she need to deposit as a lump sum at age 21 with the same APR (without making another payment) to have a million dollars at age 65?

$$=PV(0.0725/12, (65-21)*12, 0, 1000000)$$

She would need to deposit \$41,568.93 at age 21 to have a million dollars when she retires.

Challenge Problem

Sage deposited \$2498 into an account paying 7.05% APR, compounded quarterly. Dionne deposited \$2994 into an account paying 5.19% APR, compounded monthly. How many years will it take for their balances to (nearly) match?

Write a spreadsheet formula for each person, using a cell reference for the year. Then you can copy the formula down using the fill-down feature.

With cell references:

Year	Sage	Dionne
1	=FV(0.0705/4, A2*4, 0, 2498)	=FV(0.0519/12, A2*12, 0, 2994)
2	=FV(0.0705/4, A3*4, 0, 2498)	=FV(0.0519/12, A3*12, 0, 2994)
3	=FV(0.0705/4, A4*4, 0, 2498)	=FV(0.0519/12, A4*12, 0, 2994)

Full Table:

Year	Sage	Dionne
1	\$2,678.82	\$3,153.14
2	\$2,872.73	\$3,320.74
3	\$3,080.67	\$3,497.24
4	\$3,303.67	\$3,683.13
5	\$3,542.81	\$3,878.90
6	\$3,799.26	\$4,085.07
7	\$4,074.27	\$4,302.20
8	\$4,369.19	\$4,530.87
9	\$4,685.46	\$4,771.70
10	\$5,024.62	\$5,025.33
11	\$5,388.33	\$5,292.44
12	\$5,778.37	\$5,573.75
13	\$6,196.64	\$5,870.00
14	\$6,645.19	\$6,182.01
15	\$7,126.21	\$6,510.60

Their balances are about the same after 10 years. Dionne starts out with a higher deposit but after 10 years, Sage passes her due to the higher interest rate.

Round-Robin Problems. Choose two people from your group to travel together and two to stay. Use the space below to write your formula for each problem.

1. You deposit \$2000 in an account earning 3% interest compounded monthly.
- How much will you have in the account in 20 years?
 - How much interest will you earn?

a. $=FV(0.03/12, 20*12, 0, 2000) = \$3,641.51$

b. $=\$3,641.51 - \$2,000 = \$1,641.51$

2. Which is better? An account that earns 7.25% compounded quarterly or an account that earns 7.15% compounded daily? Give the effective rate for each account.

$=Effect(.0725, 4)$

≈ 0.074495

$\approx 7.45\%$

$=Effect(.0715, 365)$

≈ 0.07411

$\approx 7.41\%$

3. 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 earns 6% interest compounded monthly.

$=PV(0.06/12, 8*12, 0, 6000) = \$3,717.14$

4. You deposit \$4,500 in an account that earns 3.5% interest compounded continuously. How much will you have in 15 years?

$=4500*EXP(0.035*15) = \$7,607.06$

5. A friend lends you \$200 for a week, which you agree to repay with 5% one-time interest. How much will you have to repay?

$= 200 + 200*0.05 = \$210$