

2.3-2.4: Savings Plans and Loan Payments - SOLUTIONS

Group Activities

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

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

- 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.

- 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.

- 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.

- 2) Sam has a student loan of \$30,000 at a fixed APR of 4.45%. If they want to pay it off in 15 years,
- How much would they pay per month?

$$=PMT(0.0445/12, 15*12, 30000, 0)$$

$$= \$228.73$$

They would need to pay \$228.73 per month for 15 years.

- How much would they pay in total?

$$= \$228.73 * 15 * 12$$

$$= \$41,171.40$$

They would pay a total of \$41,171.40 for the loan.

- What percentage of the total was paid toward the loan amount of \$30,000 and what percentage was paid toward interest?

Percentage toward the principal:

$$= \$30,000 / 41,171.40$$

$$\approx 73\%$$

About 73% of the total was paid toward the principal. That means about 27% was paid in interest.

- 3) You want to buy a \$350,000 home. You plan to put 10% down and take out a 30-year fixed mortgage on the rest.
- What will the loan amount be?

$$\text{Amount of down payment: } 0.10(350,000) = \$35,000$$

$$\text{Loan amount} = \$350,000 - \$35,000 = \$315,000$$

The loan amount is \$315,000.

- What will your monthly payment be if the interest rate is 4.5%?

$$=PMT(0.045/12, 30*12, 315000, 0)$$

$$= \$1,596.06$$

My monthly mortgage payment would be \$1,596.06.

- c. If you make all the payments for 30 years, how much would you have paid for the house in total?

$$= \$1,596.06 * 30 * 12$$

$$= \$574,581.14$$

If I owned the house for 30 years I would pay \$574,581.14.

- d. In part b above, what number would you get if you switch the 0 and the 315,000? Why are the answers so different? Explain the difference between these two scenarios.

$$= \text{PMT}(0.045/12, 30*12, 0, 315000)$$

$$= \$414.81$$

In part b, we are making loan payments that include interest in addition to the principal of \$315,000. The present value is \$315,000 and the future value is \$0.

Part d is different because we switched the present value to \$0 and the future value to \$315,000. In this case we would be depositing \$414.81 per month to save up to \$315,000. Interest is working with us instead of against us.

Car Loan Activity

- 1) Open the Excel Car Loan Spreadsheet. It has 8 cars in columns with different purchase prices and loan information.
 - a. Write a formula using cell references in B5 for the loan amount. Then use the fill-across feature to copy the formula across the row.

=B3-B4

- b. Write a formula using cell references in B8 for the monthly payment. Then copy the formula across the whole row.

=PMT(B7/12,B6*12,B3-B4)

- c. Which car would you choose and why?

Personal answers

- 2) You are checking out a special for a 2016 Nissan Pathfinder SL priced at \$33,750. There are two offers to choose from (both with zero down):
 - A. No rebate and 4.99% APR
 - B. \$3,000 rebate and 8.75% APR (The rebate reduces the loan by \$3,000)

- a. Type in the principal values for options A and B in B15 and B19.

- b. Write a formula in cell C14 using cell references to calculate the monthly payment for option A. Copy the formula across.

=PMT(\$B\$17/12,C13*12,\$D\$11)

- c. Write a formula in cell C18 using cell references to calculate the monthly payment for option b. Copy the formula across.

=PMT(\$B\$21/12,C13*12,30750)

- d. Which is the best option, A or B? Explain.

If your loan is more than five years, skip the rebate for the better interest rate. If you plan to take a loan for five years or less, the rebate option is better even though the annual interest rate is higher.

- 3) For problem 2, option A, how much would you need for a down payment to keep your monthly payment less than \$350 on a 7-year loan? (Can you do this in two different ways as a check?)

If you put \$8,980 down on the \$33,750 vehicle, at 4.99% APR for seven years, the new monthly payment would be \$349.98.

Home Loans

- 1) Open the Excel Home Loan Spreadsheet. It has 8 houses in columns with different purchase prices and loan information.
 - a. Write a formula with cell references for the loan amount in B6 and copy it across.

=B3-B4+B5

- b. Write a formula with cell references for the monthly payment on a 15-year mortgage and copy it across.

=PMT(B7/12,180,B6)

- c. Write a formula with cell references for the monthly payment on a 30-year mortgage and copy it across.

=PMT(B8/12,360,B6)

- 2) If you stay in a house until the loan is paid off, how much do you save by choosing the 15-year loan? (Hint: write formulas for the total of all payments for each and the difference)

=B10*360

=B9*180

=B13-B14

- 3) Optional Challenge Problem.

- a. Check to see if you will need to pay PMI (private mortgage insurance). If your down payment is less than 20% of the purchase price, you will have to pay 0.042% of the loan amount each month for PMI.

Find the percentage of the down payment on each house:

=B4/B3

- b. Calculate the monthly cost for insurance and for taxes.

$$=0.042\%*B6$$

c. Find your total monthly expense: loan payment plus insurance, taxes, and PMI (if applicable).

$$=B9+B19+B20+B22$$

$$=B10+B19+B20+B22$$

d. If the maximum amount you can afford is \$2000 per month, which mortgages can you afford? Which house would you choose and why?

With a 15-year mortgage I could only afford house B.

With a 30-year mortgage I could afford A, B, C or G.

It depends on the size and location of the house. I would try to get house B with a 15-year mortgage to pay it off sooner or build up more equity in the house.