Mini Lesson: Loan Tables (Loan Amortization and Loan Payment Table)

Revised August 2016

Requires Personal Budget Project as Prerequisite

An **amortized loan** is a loan with scheduled periodic payments of both principal and interest.

A **loan amortization schedule** is a complete table of periodic blended loan payments, showing the amount of principal and the amount of interest that comprises each payment so that the loan will be paid off at the end of its term.

In order to calculate the payment amount for each period, we must know the principal, annual interest rate, the total number of payments, and whether payments are due at the beginning or end of the period. The payment function can be used to calculate the payment amount of each period. The syntax for the payment function is PMT(rate,nper,pv,fv,type), where:

- rate = interest rate of the loan
- nper = total number of payments for the loan
- pv = present value or principal
- fv = future value or cash value attained after last payment has been made
- type = indicates when payments are due
    - 0, when payments are due at the end of the period
    - 1, when payments are due at the beginning of the period

Below are some important terms to know in regards to the loan amortization schedule:
- Total Balance Outstanding is the unpaid, interest-bearing balance of a loan
    - Total Balance Outstanding = Principal for the Period + Interest for the Period
- Principal Reduction is the decrease in the principal owing in the loan. In the loan amortization schedule, there is a higher principal reduction each time a payment for the period is made
    - Principal Reduction = Payment for the Period – Interest for the Period
- Revised Balance Outstanding is the new balance of the loan each time a payment for the period is made. It can be calculated using two formulas,
    - Revised Balance Outstanding = Total Balance Outstanding – Payment for the Period
    - Revised Balance Outstanding = Principal for the Period – Principal Reduction

Click the tab for the worksheet titled Activity 1 to begin.

Activity 1: Loan Amortization Table

Daniel recently took out a loan to start up a business and he needs to know how much he should pay each month in order to pay off the loan within 3 years. He took out a $30,000 loan with an annual interest rate of 6.25% and payments due at the end of the period. Fill in the table using the information provided and calculate the monthly payments Daniel must make to pay off the loan within 3 years.

Directions:

a. Create a copy of the current worksheet and rename the worksheet "Activity 1 Solution."

b. Use the Zoom settings to resize the view of the worksheet to a size that is appropriate to view both this textbox and the table to the left.

c. Using the information provided in the problem, enter the amounts given in cells D4:D8. Format Loan Amount to Currency with 2 decimal places, comma separator, and $ symbol. Format Annual Interest Rate to Percentage with 2 decimal places.

d. Enter a formula in cell G4 to calculate the Rate per Period using relative cell references to the Annual Interest Rate and the # of Payments per Year. Format cell G4 to Percentage with 2 decimal places.

e. Enter a formula in cell G5 to calculate the Number of Payments using relative cell references to Term of Loan in Years and the # of Payments per Year.

f. Use the Payment function in cell D9 to calculate the Monthly Payment for the amortized loan.

g. Select cells B13:B14, then use the Fill Handle to enter periods 3-36 in cells B15:B48.

h. Link the Principal amount in cell D4 as an absolute cell reference to cell D13.

i. Enter a formula in cell D13 to calculate the Interest for the 1st Period using a relative cell reference to the Principal in cell C13 and an absolute cell reference to the Rate per Period.

j. Enter a formula in cell E13 to calculate the Total Balance Outstanding.

k. Since you have already calculated the Monthly Payment, enter a formula in cell F13 that will make the Payment for the Period a positive amount. *This is similar to the formula used in the Personal Budget Project.* Be sure to use an absolute cell reference to the Monthly Payment amount in cell D9.

l. Enter a formula to calculate the Principal Reduction in cell G13.

m. Enter a formula in cell H13 to calculate the Revised Balance Outstanding*.*

n. Set cell C14 equal to the contents of cell H13. Use the Fill Handle on cell C14 to apply to cells C15:C48.

o. Use the Fill Handle on cell D13 to apply to cells D14:D48. Repeat for columns E-H. *If the correct formulas have been entered, cell H48 should be equal to $0.*

p. Use AutoSum in cell D49 to calculate Total Interest for the Period. Link this amount to cell G7.

q. Use AutoSum in cell F49 to calculate Total Payment for the Period. Link this amount to cell G6.

r. Use AutoSum in cell G49 to calculate Total Principal Reduction.

s. Hold down the CTRL key to select non-adjacent cells B12:B48, C12:C48, D12:D48, E12:E48, F12:F48, G12:G48, and H12:H48 and use outside borders.

t. Change cells B49:H49 to Bold Font and use outside borders.

u. Fill color for cell areas B13:B48 and B11:H11 to Light Yellow.

v. Save file as Loan Tables XX, where XX are your initials.

w. Click on the tab with the worksheet titled Activity 2 to continue.

Activity 2: Amortized Loans with Different Payment Durations

Daniel, Brian, and Carolina all took out a $33,950 loan with an APR of 5.15% to start-up their businesses. Daniel has to pay off his loan in 7 years, Brian has to pay off her loan in 5 years, and Carolina has to pay off her loan in 3 years. Each payment is due during the end of the period. Use the Payment Function to determine how much interest accumulated over time and the monthly payment for each individual.

Directions:

a. Create a copy of the current worksheet and rename the worksheet "Activity 2 Solution."
b. Type in the information given in the problem in cells D4:D8.
c. Enter formula in cell G4 to calculate Daniel's Rate per Period using a relative cell reference to the Annual Interest Rate and # of Payments per Year.
d. Enter a formula in cell G5 to calculate Daniel's Number of Payments using relative cell references to the Term of Loan in Years and the # of Payments per Year.
e. Use the Payment Function in cell G6 to calculate Daniel's Monthly Payment.
f. Enter formula in cell G7 to calculate Daniel's Total of Payments. *DO NOT* use a relative cell reference to the Monthly Payment (type it in manually as a positive amount) and use a relative cell reference to the Number of Payments.
g. Enter formula in cell G8 to calculate Daniel's Total Interest using a relative cell reference to Total of Payments and Principal.
h. Repeat steps B-G in cells G11:G15 and G18:G22 for Brian's and Carolina's Loans.
i. Hold down the CTRL key to select non-adjacent cells D5, G4, D12, G11, D19, and G18 and format cells to Percentage with 2 decimal places and % symbol.
j. Hold down the CTRL key to select non-adjacent cells D4, G6:G8, D11, G13:G15, D18 and G20:G22 and format cells to Currency with 2 decimal places, comma separator, and % symbol.
k. Use All Borders for cells B3:G8, B10:G15, and B17:G22.
l. Fill color for cell areas B3:G3, B10:G10, and B17:G17 to Light Yellow.
m. Insert a textbox below the third table and explain why each individual has a different monthly payment and total interest amount. Type in the name of the individual who has to pay the highest interest amount and explain why.
n. Save file.
o. Click on the tab with the worksheet titled Activity 3 to continue.

Activity 3: Loan Payment Table

A **loan payment table** is a table that allows a borrower to determine the balance of their loan after each payment. From the same scenario as Activity 1, in which Daniel took out a $30,000 loan with a 6.25% annual interest rate to be paid back within 3 years. In Activity 1, the Payment Function was used to calculate a monthly payment of $916.06 that will allow Daniel to pay off the loan within 3 years. Fill in the Payment Table to determine whether this is accurate.

Directions:
   a. Create a copy of the current worksheet and rename the worksheet "Activity 3 Solution."
   b. In cell B9, type in May 2012. Then, use the Fill Handle from cell B9 to apply to cells B10:B20 to enter months June-April. Repeat for the other 3 tables with the corresponding year.
   c. Enter formula in cell D5 to calculate the Period Interest Rate. Copy formula from cell D5 to cells E5 and F5. Format cell to Percentage with 2 decimal places and % symbol.
   d. In cell C9, enter the Principal Amount.
   e. Enter formula in cell D9 to calculate the Interest for the Period using an absolute cell reference to the Period Interest Rate.
   f. Enter formula in cell E9 to calculate the Adjusted Balance.
   g. Enter formula in cell G9 to calculate the End Balance.
   h. Link the End Balance amount from cell G9 to cell C10. Use the Fill Handle on cell C10 to apply to cells C11:20.
   i. Use the Fill Handle to apply formula in cell D9 to cells D10:D20. Repeat for columns E and G.
   j. Link the End Balance amount from cell G20 to cell C25. Repeat steps E through I for the other two tables.
   k. Enter the Payment amounts for the months of May 2012-April 2015.
   l. Enter a formula in cell D21 to calculate the Total Interest for 2012-2013. Repeat for the other 2 tables.
   m. Enter a formula in cell F21to calculate the Total Payments for 2012-2013. Repeat for the other 2 tables.
   n. Hold down the CTRL key to select non-adjacent cells C9:G21, C25:G37, and C41:G53 and format cells to Currency with 2 decimal places, comma separator, and $ symbol.
   o. Hold down the CTRL key to select non-adjacent cells B9:B20, C9:C20, D9:D20, E9:E20, F9:F20, G9:G20, and B21:G21 and use outside borders.
   p. Change cells B21:G21 to Bold Font.
   q. Fill color for cells B7:G8 to Light Yellow.
   r. Select cells B7:G21, then use Format Painter to apply the same format to the other two tables.
   s. Fill color for cell G52 to Bright Yellow. *Make sure the End Balance is $0.*
   t. Save file.

Activity 4: Loan Payment Table - Consistent vs. Inconsistent Payers

Daniel and Brian both took out a loan for $10,000 with an APR of 7.45% and they must pay it off within 1 year with payments due at the end of the period. Daniel pays consistent monthly payments during the entire year. On the other hand, Brian pays the first month, but then misses the next 6 months of payments. He decides to pay the 6 missed payments in January, and then pays consistently for the next 3 months. Calculate the End Balance of both Daniel and Brian by the end of April 2015.

Directions:
   a. Create a copy of the current worksheet and rename the worksheet "Activity 4 Solution."
   b. Enter the information given in the problem to cells D3:D7.

c. Enter formula in cell G3 to calculate the Rate per Period using a relative cell reference to the Annual Interest Rate and # of Payments per Year.

d. Enter a formula in cell G4 to calculate the Number of Payments using relative cell references to the Term of Loan in Years and the # of Payments per Year.

e. Use the Payment Function in cell G5 to calculate Monthly Payment.

f. In cell B11, type in May 2014. Then, use the Fill Handle from cell B9 to apply to cells B10:B20 to enter months June-April. Repeat for the table in cells B27:B38.

g. In cell C11, link the Principal amount from cell D3.

h. Enter formula in cell D11 to calculate Interest for the month of May using an absolute cell reference to the Rate per Period and a relative cell reference to the Beginning Balance. Use the Fill Handle on cell D11 to apply to cells D12:D22.

i. Enter formula in cell E11 to calculate the Adjusted Balance for the month of May. Use the Fill Handle on cell E11 to apply to cells E12:E22.

j. In cell F11, type in the Monthly Payment amount. *Be sure to type this amount as a positive number.* Then, copy this amount and paste it to cells F12:F23.

k. Enter formula in cell G11 to calculate End Balance. Use the Fill Handle on cell G11 to apply to cells G12:G22.

l. In cell C12, link the End Balance amount from cell G11. Use the Fill Handle on cell C12 to apply to cells C13:C22.

m. In cell C27, link the Principal amount from cell D3.

n. Enter formula in cell D27 to calculate Interest for the month of May using an absolute cell reference to the Rate per Period and a relative cell reference to the Beginning Balance. Use the Fill Handle on cell D27 to apply to cells D28:D38.

o. Enter formula in cell E27 to calculate the Adjusted Balance for the month of May. Use the Fill Handle on cell E27 to apply to cells E28:E38.

p. In cell F11, type in the Monthly Payment amount. *Be sure to type this amount as a positive number.* Then, copy this amount and paste it to cells F36:F38.

q. Enter 0 in cells F28:F34 for the months of June through December.

r. Enter formula in cell F35 to calculate the Monthly Payment for the month of January using a relative cell reference to the monthly payment in cell F27. Since Brian missed 7 payments, he wants to pay for these 7 missed payments and the monthly payment for January.

s. Enter formula in cell G27 to calculate End Balance. Use the Fill Handle on cell G27 to apply to cells G28:G38.

t. In cell C28, link the End Balance amount from cell G27. Use the Fill Handle on cell C28 to apply to cells C29:C38.

u. Use AutoSum to calculate Total Interest in cells D23 and D39.

v. Use AutoSum to calculate Total Payment in cells F23 and F39.

w. Format cells D3, C11:G23, and C27:G29 to Currency with 2 decimal places, comma separator, and $ symbol.

x. Fill color for cell areas B9:G9 and B25:G25 to Light Yellow.

y. Fill color for cells D23 and D39 to Bright Yellow, for cell G22 to Green, and for cell G38 to Red. Insert a textbox below the second table and explain why Brian still has a balance at the end of his loan, while Daniel does not.

z. Save file.