CS130/230
Functions and Amortization Tables

Built-in Functions

Functions are special routines provided by Excel to do simple and complex calculations. There is no way we can cover all of the functions, but we will look at several which will make life much simpler and the rest you can discover as you need them.

Question: Where do we go to get a feel for the functions that exist in Excel?

The basic syntax required to invoke a function is carried over from algebra and includes the following:

- The function name
- A left parenthesis
- A list of arguments where each argument is separated by a comma
- A right parenthesis

In general, functions take the form: **name(arg1, arg2,...)**

For example, if a worksheet has values in cells A1 to A5 that we want to add, we can do this in several ways:

1. with the formula =A1+A2+A3+A4+A5
2. =sum(A1:A5)

In case 2) above, the name of the function is sum and the argument is A1:A5.

The colon (:) between the cell references indicates a range. So, A1:A5 means include the cells A1, A2, A3, A4 and A5.

As you can imagine, this function is invaluable if you want to sum up the contents of 100 cells in a column.

Notice that Excel is not case-sensitive with names of functions or cells.

Question: What does case-sensitive mean?

A couple of other things to note:

- In general there can be up to 30 arguments in a function. These depend on the function itself, and some of the arguments can be optional.
- Cell entries have a 255 character limit by default
- The number and type of arguments depend on the function being used

We know of the following types of arguments for various functions (some of which we'll discuss later):

- numbers
- cells
- ranges of cells
- text
- other functions
- arrays
- logical values

Excel has over 350 built-in functions divided into 10 categories, including financial, math&trig, statistical, text, logical, database, and information. There are really two different ways to enter functions into a cell:

1. If you know the function well and the options for parameters, then probably just typing away is the best.
2. Using the "Paste Function" dialog box. To invoke this dialog box, click on the f_x icon on the tool bar.

3.1 Exercise

Two incredibly useful functions are INT and MOD. You may or may not have heard of these functions, but I would like you to use both of these functions in a worksheet and then if I call on you, I want you to be able to describe what they do. Also, one of these will potentially be useful in a future assignment.
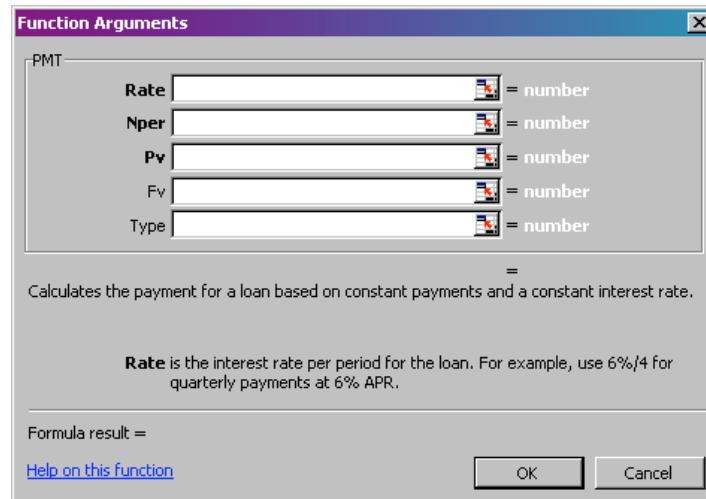
Nested Functions

As was mentioned above, it is possible to have functions as arguments in other functions.

Question: Can you think of an example of when we would do this?

Financial Built-in Functions

The financial functions can be isolated in Excel. Simply go to the Paste Function option in the toolbar and select Financial. Let's study the PMT function. The Paste Function dialog box gives the following:

If you don't understand exactly what to enter into the fields, then go to the help feature and Excel will give you the following help info (in addition to some examples):

PMT

Calculates the payment for a loan based on constant payments and a constant interest rate.

Syntax

PMT(rate,nper,pv,fv,type)

Where,

- rate is the interest rate for the loan.
- nper is the total number of payments for the loan.
- pv is the present value, or the total amount that a series of future payments is worth now; also known as the principal.
- fv is the future value, or a cash balance you want to attain after the last payment is made. If fv is omitted, it is assumed to be 0 (zero), that is, the future value of a loan is 0.
- Type is the number 0 (zero) or 1 and indicates when payments are due.
  - o Set type equal to 0 or omitted if payments are due at the end of the period
  - o Set type equal to 1 if payments are due at the beginning of the period

Remarks

- The payment returned by PMT includes principal and interest but no taxes, reserve payments, or fees sometimes associated with loans.
- Make sure that you are consistent about the units you use for specifying rate and nper. If you make monthly payments on a four-year loan at an annual interest rate of 12 percent, use 12%/12 for rate and 4*12 for nper. If you make annual payments on the same loan, use 12 % for rate and 4 for nper.

Tip: To find the total amount paid over the duration of the loan, multiply the returned PMT value by nper.

3.2 Examples

a. The following formula returns the monthly payment on a $10,000 loan at an annual rate of 8 percent that you must pay off in 10 months:

   `PMT(8%/12, 10, 10000)` equals -$1,037.03

b. For the same loan, if payments are due at the beginning of the period, the payment is:

   `PMT(8%/12, 10, 10000, 0, 1)` equals -$1,030.16

c. The following formula returns the amount someone must pay to you each month if you loan that person $5,000 at 12 percent and want to be paid back in five months:

   `PMT(12%/12, 5, -5000)` equals $1,030.20

d. You can use PMT to determine payments to annuities other than loans. For example, if you want to save $50,000 in 18 years by saving a constant amount each month, you can use PMT to determine how much you must save. If you assume you'll be able to earn 6 percent interest on your savings per year, you can use PMT to determine how much to save each month.

   `PMT(6%/12, 18*12, 0, 50000)` equals -$129.08

   If you pay $129.08 into a 6 percent savings account every month for 18 years, you will have $50,000.

3.3 Exercise

When purchasing large and expensive objects (such as cars, furniture, boats, etc) most of us cannot afford to pay for them right away. Instead, we take out a loan on the object for a certain interest rate and period and pay it back monthly.

Now, let's imagine that you want to purchase a car worth $29,899. The car dealer is ready to grant you a 5-year loan at 6.5% annual interest rate, but you must put down 10% of the car price as down payment.

Design an Excel spreadsheet to allow the user the ability to input:
   a. The price of the car
   b. The yearly interest rate
   c. The period of the loan in years

Your spreadsheet should then compute and display:
   d. The amount of the down payment
   e. The amount of the loan
   f. The monthly payment of the loan

Question: How can we calculate the total interest that has been paid on this loan? See if you can include this calculation in your worksheet.

3.4 Submitting Assignments

Name the worksheet you created in Exercise 3.4 'Car Loan', and save the workbook to the desktop as '03XXXXXXXX', replacing XXXXXXXX with your PU Net ID. For example, my workbook would be called '03khoj0332'.

Connect to \turing.cs.pacificu.edu\students, and copy the worksheet you created to the folder named 'CS130 Drop'. This is how you will submit your assignments.

You should also save a copy to your own folder on turing. Copy the worksheet from the desktop to your folder in \turing.cs.pacificu.edu\students.

Payment or Amortization Schedule

A payment schedule is a table that lists all the payment periods along with the monthly payment, and the starting balance and the ending balance.

3.5 Exercise

Let's return to the worksheet you created in 3.3. Before you make up your mind, you would like to see a table of the payment schedule. Specifically, you want to see for each monthly payment the payment number, starting balance, monthly payment, monthly interest, and ending balance.

Add a payment schedule to your spreadsheet. Your spreadsheet should have columns for (1) payment number, (2) starting balance, (3) monthly payment, (4) monthly interest and (5) ending balance for each of the 60 payments.

The first few lines of your payment schedule should contain the following:

Payment Number	Starting Balance	Monthly Payment	Monthly Interest	Ending Balance
1	$26,909.10	$526.51	$145.76	$26,528.35
2	$26,528.35	$526.51	$143.70	$26,145.54
3	$26,145.54	$526.51	$141.62	$25,760.65
4	$25,760.65	$526.51	$139.54	$25,373.68
5	$25,373.68	$526.51	$137.44	$24,984.61
6	$24,984.61	$526.51	$135.33	$24,593.44
..	….	….	….	…..

Use filling and cell referencing as much as you can while creating this table.

Question: How can you be sure that your payment schedule is correct?

Question: Does your table still give the correct values if the interest rate is changed to 6%?