Functions...

- have a unique name,
- have an argument list (also called a parameter list), surrounded by parentheses, which may be empty,
- return one single value,
- may be used in any formula wherever values of the function’s return-type are appropriate.

Function Categories

- Mathematical (ABS, SQRT, SIN, COS, LOG, etc.)
- Statistical (SUM, AVERAGE, STDEV, MAX, etc.)
- Logical (AND, OR, NOT, IF, etc.)
- Financial (FV, NPV, PV, etc.)
- Date & Time (NOW, MONTH, DAY, YEAR, etc.)
- Engineering (DEC2BIN, HEX2DEC, etc.)
- Complex (IMSUM, IMPRODUCT, etc.)
- String (UPPER, LOWER, CHAR, MID, etc.)
- Lookup (VLOOKUP, MATCH, HLOOKUP, etc.)

Statistical Function arguments:

- Literal Numbers
- Expressions
  - simple calculations
  - involving results of other functions
- Cell addresses (both relative and absolute)
- Ranges

Ranges:

- Two cells specifying opposite corners of a box,
- May be either pair of corners,
- May be in either order.
- Example (three columns by ten rows):
  - A1:C10 or
  - C10:A1 or
  - A10:C1 or
  - C1:A10

Statistical Functions can do Ranges

- SUM(A1,12,6*B7,C10:F22)
- AVERAGE(A1,12,6*B7,C10:F22)
- STDEV(A1,12,6*B7,C10:F22)
- MIN(A1,12,6*B7,C10:F22)
- MAX(A1,12,6*B7,C10:F22)
Some Functions can’t do Ranges

- \( \text{SQRT}(A1:C10) \) is illegal, but...
- \( \text{SQRT}(\text{SUM}(A1:C10)) \) is OK,
- \( \text{SQRT}(\text{AVERAGE}(A1:C10)) \) is OK,
- \( \text{SQRT}(\text{MAX}(A1:C10)) \) is OK.
- \( \text{SQRT} \) expects a single numeric argument, but \( \text{SUM}, \text{AVERAGE}, \text{MAX} \), etc., reduce the range to a single value before \( \text{SQRT} \) is evaluated.

Don’t Use \text{SUM} if not Needed

- \( \text{SUM}(A1) \) is a stupid use of the \text{SUM} function (it works, though).
- \( A1 \) gives the same result without using a function.

Some Functions have NO Arguments (but they still have parentheses)

- \( \text{PI}() \) Returns best value for \( \pi \) that fits in the given bits (approximately 3.141592653...).
- \( \text{RANDOM}() \) Returns a random number \( \geq 0, <1 \).
  The formula \( \text{INT}(\text{RANDOM}() \times 6) + 1 \) simulates a six-sided die. Changes when sheet recalculated.
- \( \text{NOW}() \) Returns date/time from system clock. Changes when sheet recalculated.

Time and Date

- At 6:00am on March 19, 2015, the formula \( \text{NOW}() \) returns 42082.25, encoding both date and time into a single number.
- The whole part (42082) is the date, as the number of days since the beginning of the 20\textsuperscript{th} Century (day #1 is January 1, 1900).
- The fraction (0.25) is the portion of the day since midnight (0.5 = noon, 0.75 is 6:00pm, 0.9999... is just before midnight of the following day.

Using Serial Date Numbers

- \( \text{INT}(\text{NOW}()) \) returns just the date part.
- \( \text{INT}(\text{NOW}()) + 30 \) returns a date 30 days in the future (for billing, say).
- \( \text{INT}(\text{NOW}()) - 30 \) returns a date 30 days in the past.
- \( \text{DATE}(1969,7,20) - \text{INT}(\text{NOW}()) \) returns the number of days since the first moon landing. \( \text{DATE} \) requires exactly three arguments, year, month, and day, in that order.

Using Serial Time Fractions

- The \text{TIME} function also expects exactly three arguments, hour (0...23), minute (0...59), and second (0...59), and returns a time fraction.
- Can be used to figure hourly wages:
  - \( \text{TIME}(17,0,0) - \text{TIME}(8,0,0) \times 24 \) computes the number of hours worked between 8:00am and 5:00pm.
Problems with Dates/Times

- Excel tends to format formulae containing \texttt{NOW}, \texttt{DATE}, and \texttt{TIME} functions as date and/or as time, even if it doesn’t make sense. You may have to reformat results as General.
- Dates prior to 1900 cannot be represented.
- Excel treats 1900 as a leap year (it isn’t), because Microsoft copied a bug from an early version of Lotus 1-2-3.
- Some versions of Excel for Mac start at 1904.