Revit Formulas for "everyday" usage

I´ve been building a lot of parametric content in Revit, and always enjoy the power of using formulas to drive and control things. So here´s a few examples that I´ve collected over time, and also some VERY recent additions (New rounding functions in Revit 2012).
The basic operators (add, subtract, multiply, ect.) have been left out on purpose, but feel free to add more useful formulas, that you use in your families 🍺

Exponentiation

X raised to the power of Y = X ^ Y

E raised to an x power

E is a mathematical constant that is approximately equal to 2.7. It is an irrational number, but if we truncate it to 20 decimals it would be 2.7182818284590452353.
Revit usage = exp(x)

Circles with pi π

Usage in Revit = pi()

Circumference = pi() * (Radius * 2)
Circumference = pi() * Diameter
Circle Area = pi() * Radius ^ 2

Square Root

Fixed value = sqrt(999)
Parameter = sqrt(Width)
Formula= sqrt(Width + Height)

Logarithm

The logarithm of a number to a given base is the exponent to which the base must be raised in order to produce that number. For example, the logarithm of 1000 to base 10 is 3, because three factors of 10 must be multiplied to yield a thousand: 10 × 10 × 10 equals 1000
Revit usage = log(1000)

Force yes/no parameters to be checked or unchecked

Force checked = 1 < 2
Force unchecked = 1 > 2

Conditional statements

Conditional statement uses this structure:

IF (<condition>, <result-if-true>, <result-if-false>)

Supported Conditional Operators

< Less than
> Greater than

= Equal
/ Divide
AND Both statements are true
OR One of the statements is true
NOT Statement is false

Conditional statements can contain numeric values, numeric parameter names, and Yes/No parameters.
Currently, <= and >= are not implemented. To express such a comparison, you can use a logical NOT. For example, a<=b can be entered as NOT(a>b)

Simple IF Statement
IF (Length < 900, <true>, <false>)

Formula That Returns Strings
IF (Length < 900, “Opening too narrow”, “Opening OK”)

Using logical AND
IF (AND (x = 1 , y = 2), <true>, <false>)
Returns <true> if both x=1 and y=2, else <false>

Using logical OR
IF (OR (x = 1 , y = 2) , <true>, <false>)
Returns <true> if either x=1 or y=2, else <false>

Nested IF statements
IF (Length < 500 , 100 , IF (Length < 750 , 200 , IF (Length < 1000 , 300 , 400)))
Returns 100 if Length<500, 200 if Length<750, 300 if Length<1000 and 400 if Length>1000

IF with Yes/No condition
Length > 40
Returns checked box (<true>) if Lenght > 40

NOT with Yes/No condition
not(Viz)
Returns checked box (<true>) if Yes/No parameter "Viz" is unchecked, and returns unchecked box (<false>) if Yes/No parameter "Viz" is checked.

IF AND OR Returning the greatest of three values
Say you have these 3 length parameters, and want a fourth parameter to return the greates value/lenght of the 3:

Length A
Length B
Length C
Return Length (Returns the greatest of the three length parameters)

Return Length = if(and(or(Length A > Length B, Length A = Length B), or(Length A > Length C, Length A = Length C)), Length A, if(and(or(Length B > Length A, Length B = Length A), or(Length B > Length C, Length B = Length C)), Length B, if(and(or(Length C > Length A, Length C = Length A), or(Length C > Length B, Length C = Length B)), Length C, 0 mm)))

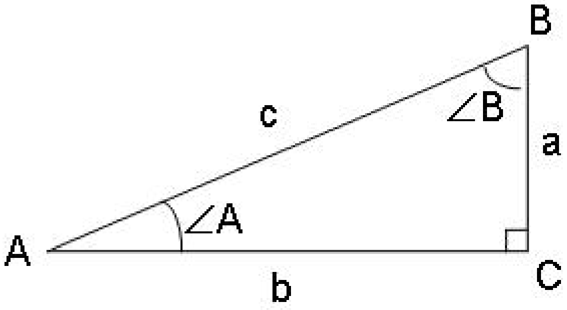
Credit to: Joe Zhou for this formula!

Another option is to use an extra "Calc" parameter, which is a bit more clumsy but also way easier and more manageable for us mortals.

Calc = if(Length A > Length B, Length A, Length B)

Return Length = if(Calc > Length C, Calc, Length C)

Trigonometry for right triangles:



Known: a+b
c = sqrt(a ^ 2 + b ^ 2)
A = atan(a / b)
B = atan(b / a)

Known: a+c
b = sqrt(c ^ 2 - a ^ 2)
A = asin(a / c)
B = acos(a / c)

Known: b+c
a = sqrt(c ^ 2 - b ^ 2)
A = acos(b / c)
B = asin(b / c)

Known: c + A
a = c * sin(A)
b = c * cos(A)
B = 90° - A

Known: c + B
a = c * cos(B)
b = c * sin(B)

A = 90° - B

Known: a + B
b = a * tan(B)
c = a / cos(B)
A = 90° - B

Known: b + A
a = b * tan(A)
c = b / cos(A)
B = 90° - A

Known: a + A
b = a / tan(A)
c = a / sin(A)
B = 90° - A

Known: b + B
a = b / tan(B)
c = b / sin(B)
A = 90° - B

Round Function In Formulas - New in Revit 2012

Values in formulas can be now rounded up or down. For example, when riser height is calculated, one needs the function "round" to find the appropriate value.

ROUND(x)

The **round** function returns a number rounded nearest to a whole number. It doesn't take into consideration rounding direction (round up or down). If the number is (for example) from 24.5 to 24.9, the function rounds it to 25. If it is from 23.1 to 23.4, the function rounds it to 23.

Examples:
round (23.4) = 23
Round (23.5) = 24
Round (23.6) = 24
Round (-23.4) = -23
Round (-23.5) = -23
Round (-23.6) = -24

Syntax

The syntax for the **round** function is: round(number)

number is the number to round.

ROUNDUP(x)

"x" is a unitless value that should return the largest integral value less than or equal to x.

For example:
roundup (23.0) = 23
roundup (23.5) = 23
roundup (23.9) = 23
roundup (-23.0) = -23
roundup (-23.5) = -24

roundup (-23.9) = -24

The syntax for the **roundup** function is: **roundup** (number)

number is the number to round up.

ROUNDDOWN(x)

“x” is a unitless value that should return the smallest integral value greater than or equal to x.

For example:

rounddown (23.0) = 23
rounddown (23.5) = 24
rounddown (23.9) = 24
rounddown (-23.0) = -23
rounddown (-23.5) = -23
rounddown (-23.9) = -23

The syntax for the **rounddown** function is: **rounddown** (number)

number is the number to round down.

Note that when numbers such as 23.5 are rounded, they can result in either 23 or 24. To produce a stable result, for all the .5 cases, we round to the larger integer. That means that 23.5 is rounded to 24, while -23.5 to -23

Author: Klaus Munkholm