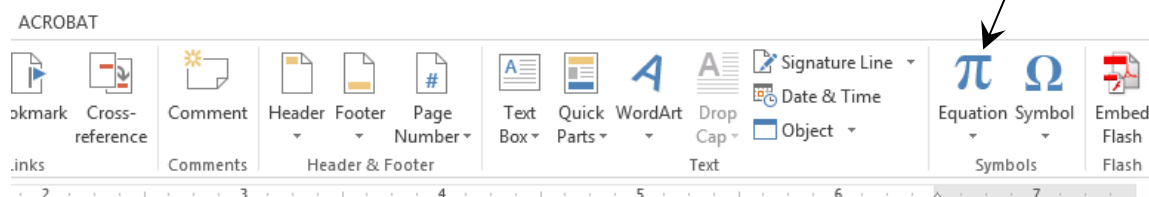


Typing Math in Microsoft Word

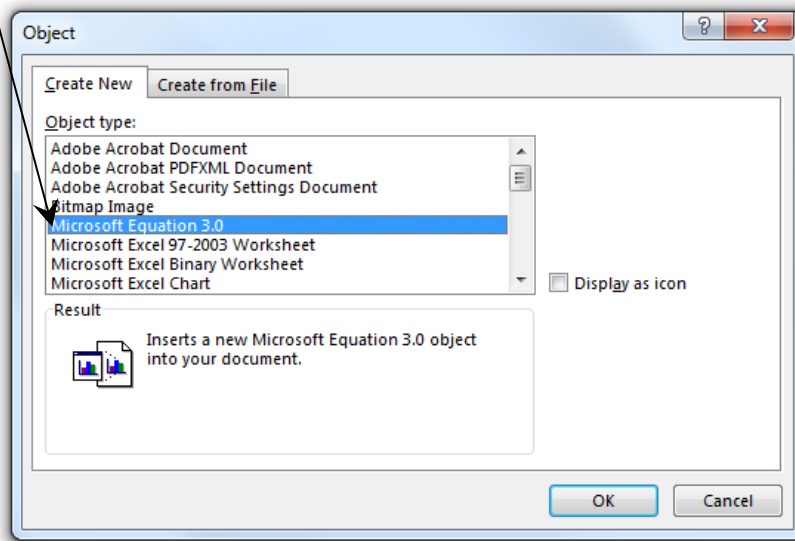
I. Introduction

There are at least two ways to type professionally looking mathematical objects in Microsoft Word. Older versions of MS Word used primarily Microsoft Equation 3.0 as the main tool for typing equations. With Microsoft Office 2007, new Equation Tools were introduced, and gradually MS office reduced the support for the old equation editor. In MS Office 2013, the old MS Equation 3.0 is still available, but does not show up with typical installation. The next screenshot shows both equation editors:

1. Microsoft Equation 3.0 (the old equation editor),
2. New equation editor.



Old Equation Editor



To access the old equation editor, choose the “Insert” tab on the main menu and click “Object”. From the Object dialog select Microsoft Equation 3.0, and click OK. If you have a recent version of MS Word, you may not be able to see Microsoft Equation 3.0 from the Object menu, and it may require custom installation. You can also click on equation object that was typed earlier, and edit it.

To access the new Equation Tools, either choose the “Insert” tab on the main menu, and click on the π symbol, or press “Alt=”, and an equation editor object will open.

Which Equation Editor should you use? Obviously, if you don't have access to the old equation editor (Microsoft Equation 3.0), the only choice you have is to use the new Equation Tools. The old equation editor is easy to use, and with only a few shortcut commands (described in the next section), you can create most of the mathematical objects needed for your undergraduate courses. The new Equation Tools has much more symbols available, so virtually any mathematical object you can find in scientific journals can be created with the new editor. The downside is that with the new editor, there are more shortcuts to learn, before you can type your mathematical objects fast. Both the old and the new equation editors have template of menu through which you can scroll and choose object with a mouse. However, the real strength of these editors is revealed once you learn the shortcuts, and can type mathematical objects with only using the keyboard.

My advice is, if my course is the only time you'll need to type mathematical objects in your life, and if you can use the old equation editor, then use it. However, if you may need to write papers with mathematical objects in them, and if there is a chase that you pursue graduate degree, then invest some effort in learning to use the new Equation Tools. In the following sections, I will provide brief instructions for both the old and the new equation editors.

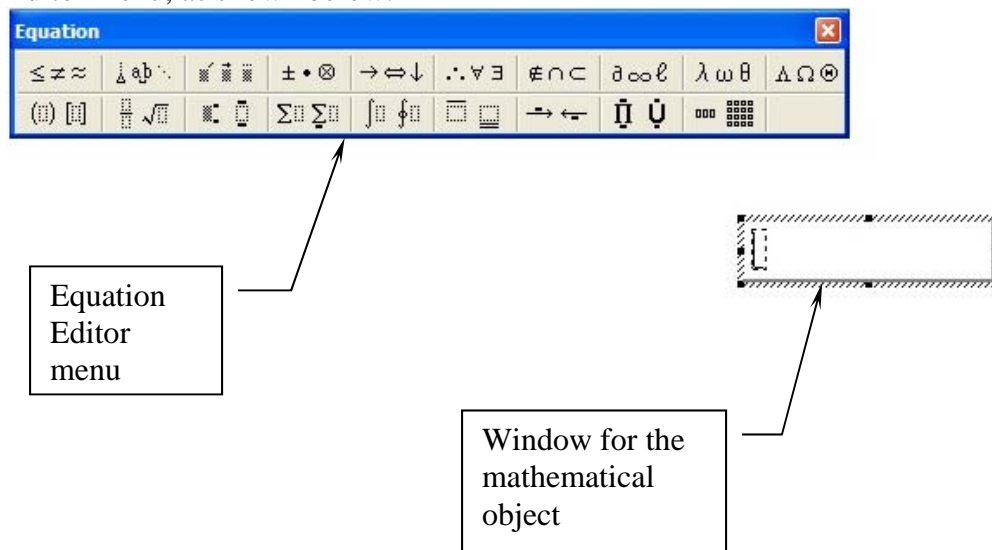
II. Instructions for Old Equation Editor (Microsoft Equation 3.0).

1. Opening the Equation Editor

To access the old equation editor, choose the "Insert" tab on the man menu and click "Object". From the Object dialog select Microsoft Equation 3.0, and click OK. If you have a recent version of MS Word, you may not be able to see Microsoft Equation 3.0 from the Object menu, and it may require custom installation. You can also click on equation object that was typed earlier, and edit it.

2. Typing equations.

The previous step opens a window for the mathematical object, and also displays the Equation Editor menu, as shown below:



Using the menu, you can insert Greek letters, fractions, parenthesis, and other mathematical symbols in your math object. Once you are finished, to exit the math window you can press the “Esc” button or click with a mouse anywhere outside the math window.

3. Useful Shortcuts

The Equation Editor has some useful shortcuts that allow you to type the math objects faster. The shortcuts are very intuitive and easy to remember.

1. Ctrl + g gives you the Greek letters. For example, Ctrl + g and a gives you α (alpha), Ctrl + g and b gives β (beta), and so on.
2. Ctrl + f creates the fraction object. For example $\frac{3}{4}$.
3. Ctrl + r creates the root, for example in $\sqrt{4} = 2$.
4. Ctrl + h allows you to insert a superscript and Ctrl + l allows you to insert a subscript. To remember those shortcuts, think of “h” as standing for “high” (superscript) and “l” standing for “low” (subscript). For example, to create x^2 you need to type x, then Ctrl+h and then 2. To create A_t you need to type A then Ctrl+l and then t.
5. Ctrl + j allows you to insert both superscript and subscript, as in K_t^θ .

There are many more shortcuts that you can use as you progress. They can be found in the Help menu for the Equation Editor (just click on “Help” once you enter the Equation Editor, and then search for “shortcut keys”). As an exercise, type the following math objects.

1. $\int_{-\infty}^{\infty} \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2} dx = 1$
2. $\ln(x^\alpha y^\beta) = \alpha \ln(x) + \beta \ln(y)$
3. $k_{t+1} = \frac{(1-\delta)k_t}{1+n} + \frac{sA_t k_t^\theta}{1+n}$

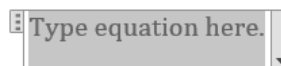
III. Instructions for New Equation Tools

1. Opening the Equation Editor

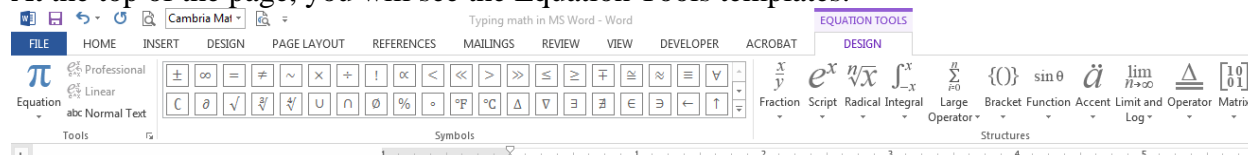
To access the new equation editor, either choose the “Insert” tab on the main menu, and click on the π symbol, or press “Alt=”, and an equation editor object will open.

2. Typing equations.

Once you pressed the “Alt=”, an equation window will appear:



At the top of the page, you will see the Equation Tools templates:



You can use the mouse to choose the symbols and structures. For example, regular fraction template, power, integral, summation, etc., as shown below:

$$\frac{\square}{\square}, \square^{\square}, \sqrt{\square}, \int_{\square}^{\square} \square, \sum_{\square}^{\square} \square$$

You can move within the template using the arrow keys. As an exercise, type the following equations, which were created with an old and the new equation editor for comparison:

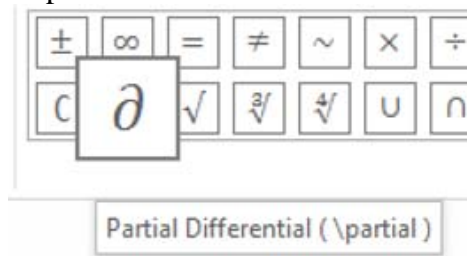
Old Equation Editor	New Equation Tools
$\int_{-\infty}^{\infty} \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2} dx = 1$	$\int_{-\infty}^{\infty} \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2} dx = 1$
$\ln(x^{\alpha} y^{\beta}) = \alpha \ln(x) + \beta \ln(y)$	$\ln(x^{\alpha} y^{\beta}) = \alpha \ln(x) + \beta \ln(y)$
$k_{t+1} = \frac{(1-\delta)k_t}{1+n} + \frac{sA_t k_t^{\theta}}{1+n}$	$k_{t+1} = \frac{(1-\delta)k_t}{1+n} + \frac{sA_t k_t^{\theta}}{1+n}$

3. Useful Shortcuts

The true power of the new equation editor is that it allows typing a huge variety of mathematical objects and symbols using shortcut codes.

1. Greek letters and mathematical symbols can be typed using the backslash “\” key followed by space key. Let [SP] denote the space key. For example, “\alpha[SP]” gives α , “\infty[SP]” gives ∞ , “\sqrt[SP]x[SP]” gives \sqrt{x} , etc. In order to use these code names efficiently, one needs to know the Greek alphabet, and the meaning of various mathematical symbols.
2. Subscripts and superscripts are obtained using the underscore “_” key and the caret “^” key. For example, “x^2[SP]” gives x^2 , “A_(t+1)[SP]” gives A_{t+1} , “K_(t+1)^\theta[SP][SP]” gives K_{t+1}^{θ} and “\int_a^b[SP]” gives \int_a^b .
3. Fractions can be typed with the forward slash. For example “3/4[SP]” gives $\frac{3}{4}$, and “(a+b)/(c+d)[SP]” gives $\frac{a+b}{c+d}$.

Notice that when you point with the mouse to any symbol, the name of the symbol and its shortcut code shows up, for example:



This is one way to learn some of the shortcuts in the new Equation Tools.
Comprehensive list with many shortcuts used in the new equation editor are available at:
<http://www.iun.edu/~mathiho/useful/Equation%20Editor%20Shortcut%20Commands.pdf>

and

http://www.chem.mtu.edu/~tbco/cm416/EquationEditor_main.pdf.

4. Breaking long equations into parts

Suppose that you have a long equation, or several mathematical steps of solving a problem, for example:

$$E(X) = \int_0^2 x(1 - 0.5x)dx = \int_0^2 xdx - 0.5 \int_0^2 x^2 dx = \left[\frac{x^2}{2}\right]_0^2 - 0.5 \left[\frac{x^3}{3}\right]_0^2 = 2 - 0.5 \cdot \frac{8}{3} = \frac{2}{3}$$

The above can be written as:

$$\begin{aligned} E(X) &= \int_0^2 x(1 - 0.5x)dx \\ &= \int_0^2 xdx - 0.5 \int_0^2 x^2 dx \\ &= \left[\frac{x^2}{2}\right]_0^2 - 0.5 \left[\frac{x^3}{3}\right]_0^2 \\ &= 2 - 0.5 \cdot \frac{8}{3} \\ &= \frac{2}{3} \end{aligned}$$

In order to break the long equation into several parts, right click with the mouse at the point where you wish to break the equation and choose “Insert Manual Break”. Then use the “Tab” key to align the equations as shown above.

5. Aligning systems of equations.

Suppose you have the system of equations:

$$\begin{aligned} 2x + 10y &= 15 + 3z \\ x - y + 16z &= -5 \\ x^2 + y^3 &= 7z \end{aligned}$$

Click on the right edge of the any of the equations, and select “Justification”, “Center as a Group”. Then Select the “=” sign, right click with the mouse and choose “Align at this Character”. You need to do this in every equation. The result is:

$$\begin{aligned} 2x + 10y &= 15 + 3z \\ x - y + 16z &= -5 \\ x^2 + y^3 &= 7z \end{aligned}$$

All the above equations are aligned at “=”.