

In this technology assignment, you'll learn how to use Mathtype. Mathtype is a software tool that allows you to type mathematical equations into documents. A "mini" version can be installed from the Microsoft Office installation disk. Go to <http://office.microsoft.com/en-us/word/HA012303661033.aspx?pid=CH100793981033> for more information on using the Equation Editor in Word 2007. You can get more information on using the Equation Editor in Word 2003 at <http://office.microsoft.com/en-us/word/CH010504621033.aspx>.

A 30-day demo version of Mathtype is available for download from <http://www.dessci.com/en/products/mathtype/default.htm>. Many colleges have Mathtype installed in their computer labs. You will need to have Mathtype or the Equation Editor in Word installed on your computer to complete this assignment. The steps below on using Mathtype pertain only to Mathtype. You'll need to visit the links above if you plan to use Equation Editor.

In this assignment, you'll document the steps to solving a system of equations using substitution. To document the steps you'll learn how to create subscripts, superscripts, multiline equations, and fractions. The skills you learn in this assignment will help you in later assignments where you will need to communicate the steps in your mathematical solutions.

For this assignment, you'll solve the system of equations

$$\begin{aligned} 3x + 2^F y &= 5 \\ 2^L x - 3y &= 2 \end{aligned}$$

where F is the number of letters in your first name and L is the number of letters in your last name. For instance, if your first and last name both contained 1 letter, you would solve

$$\begin{aligned} 3x + 2^1 y &= 5 \\ 2^1 x - 3y &= 2 \end{aligned}$$

to complete this assignment. In the first part of this assignment you'll solve this problem on paper. Once you have completed the steps on paper, you'll transfer the steps to a Word document using Mathtype or the Equation Editor.

Solve the System of Equations Using Substitution

Start by writing down the system of equations you wish to solve. For this demonstration, I'll solve the system

$$\begin{aligned} 3x + 2^1 y &= 5 \\ 2^1 x - 3y &= 2 \end{aligned}$$

To begin, simplify the exponents by writing $2^1 = 2$. The system becomes

$$3x + 2y = 5$$

$$2x - 3y = 2$$

For this assignment we are going to use substitution to solve these equations. Although it is not the most efficient way to solve them, it allows you to learn how to use Mathtype since you'll need to utilize fractions and other mathematical objects.

Solve the first equation for y by subtracting $3x$ from both sides of the equation. This results in the equation

$$2y = 5 - 3x$$

To isolate y , divide both sides of the equation by 2 to yield

$$y = \frac{5 - 3x}{2}$$

Substitute this equation into $2x - 3y = 2$ to give

$$2x - 3\left(\frac{5 - 3x}{2}\right) = 2$$

Now that y has been eliminated from the equation, we'll solve for x by clearing the fraction. Multiply each term in the equation by 2:

$$4x - 3(5 - 3x) = 4$$

Remove the parentheses using the distributive property of multiplication,

$$4x - 15 + 9x = 4$$

Collect like terms to yield

$$13x - 15 = 4$$

Add 15 to both sides,

$$13x = 19$$

Divide by 13 to give the first part of the solution, $x = \frac{19}{13}$. The other coordinate is found by putting this

value into $y = \frac{5 - 3x}{2}$ to give

$$y = \frac{5 - 3\left(\frac{19}{13}\right)}{2} = \frac{4}{13}$$

We can check the solution by putting $\left(\frac{19}{13}, \frac{4}{13}\right)$ into the original equation:

$$3\left(\frac{19}{13}\right) + 2\left(\frac{4}{13}\right) = 5$$

$$5 = 5$$

$$2\left(\frac{19}{13}\right) - 3\left(\frac{4}{13}\right) = 2$$

$$2 = 2$$

So $\left(\frac{19}{13}, \frac{4}{13}\right)$ is the solution to this system of equations.

Document Your Solution Using Mathtype and Word

As you can see from the solution above (which was created using Word and Mathtype), documenting your work with words and equations makes it very easy to follow. When solving and documenting your work, your goal should be to create an explanation like the one above.

Let's look at how several of the equations above were created. Once Mathtype is installed on your

computer, you'll see a new tab along the top of Word 2007. Left mouse click on  to display the options for using Mathtype. For this class, the most important options are shown below:



- **Inline** – An inline equation is an equation that is included within a sentence. For instance, in the text above,

Substitute this equation into $2x - 3y = 2$ to give

The equation is inserted in the same line as the text. This is called an inline equation. Left clicking on  starts Mathtype and will place the resulting equation inline.

- **Display** – A display equation is an equation that is on a separate line in your document like

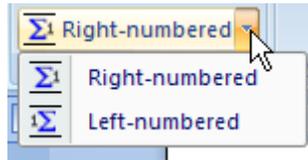
From the equation, we'll solve for x by clearing the denominators.

$$4x - 3(5 - 3x) = 4$$

Using the distributive property of multiplication,

Left clicking  starts Mathtype and will place the resulting equation on a line by itself.

- **XXX-numbered** – A numbered equation is simply a display equation that has been numbered on either the right or left.



By clicking on the arrow on the right side of the button, you can start Mathtype and place a number on either the right or left of the equation. This is useful if you want to refer back to the equation by number later on in your solution.

- **Symbol** – Clicking on the arrow to the right the word symbol brings up a menu of symbols.



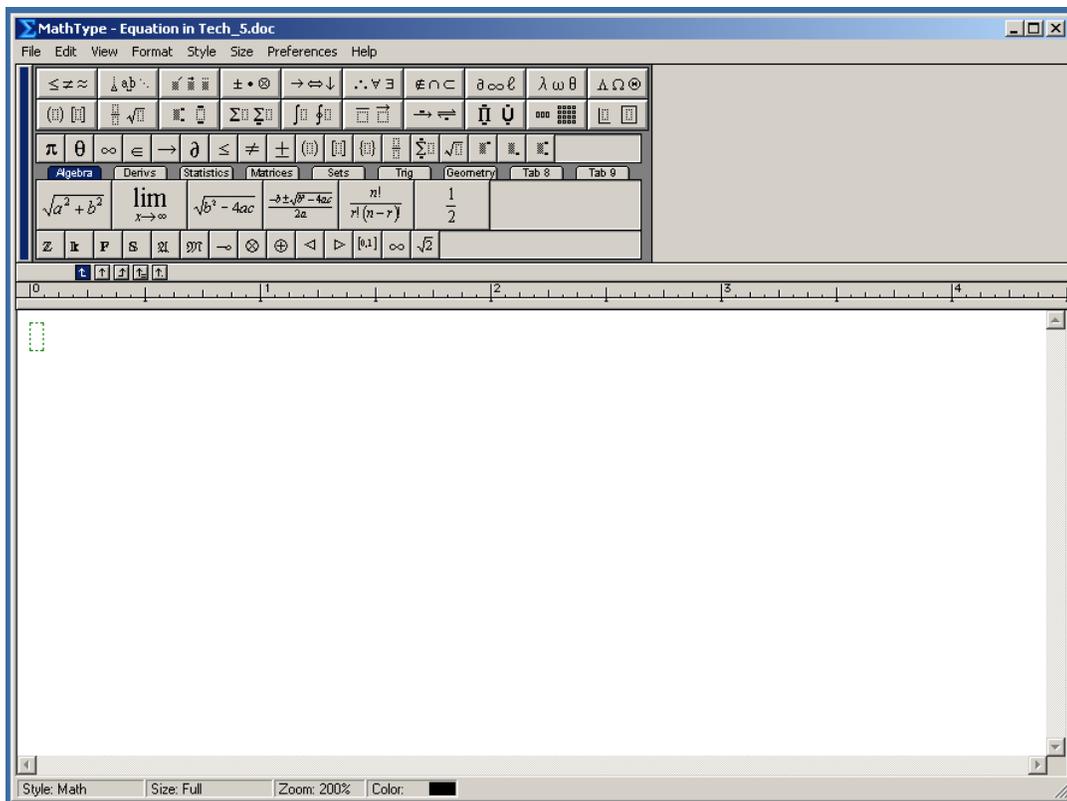
You can click on these buttons to insert any of these symbols into your document.

Let's try creating the first equation in the explanation above,

$$3x + 2^1 y = 5$$

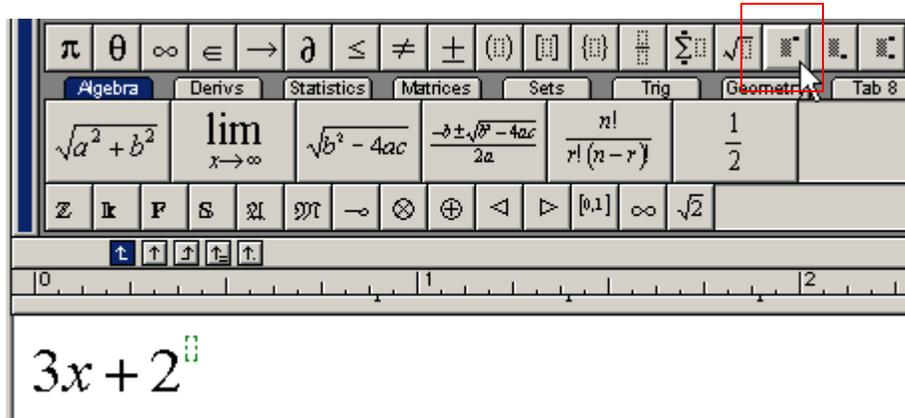
$$2^1 x - 3y = 2$$

1. Start Word.
2. At the top of the document type your name, class and the date.
3. Save the document with an appropriate name.
4. Begin you explanation by typing something like "Solve the system of equations:"
5. If Mathtype is installed properly, you'll see a Mathtype tab along the top of Word 2007. Left click on the  tab.
6. From the Insert Equations panel, select . This starts Mathtype in a separate window.



7. Using Mathtype is as simply as typing on your keyboard and clicking on the buttons in the upper part of the Mathtype window. To begin the equation, use your keyboard to type 3x+2.

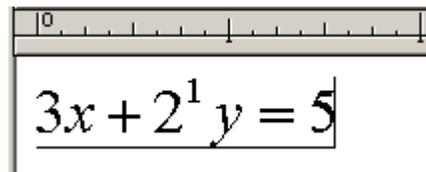
8. The first hurdle to cross is typing the exponent on the 2. Locate the  button in the third row of buttons. Left click on that button to create the exponent or superscript.



The screenshot shows a math software toolbar with various mathematical symbols and functions. The 'Geometric' tab is selected. A red box highlights the superscript button (x²). Below the toolbar, the equation $3x + 2$ is displayed, with a green dotted box around the number 2, indicating that the superscript function is active.

9. In the green dotted box type a 1.
10. If you continue typing, the text will be placed in the superscript. Since the next part of the equation is not in the superscript, press the right arrow key on your keyboard to get out of the superscript. Notice how the editing bars leaves the superscript and now surrounds the entire equation. This indicates that text will now be placed after the editing bars in the equation.

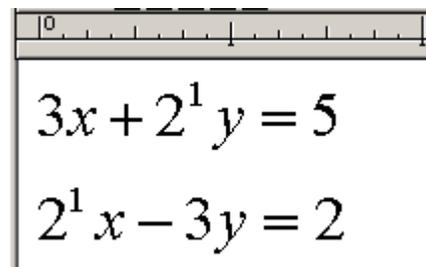
11. On your keyboard, type $y=5$ to complete the first equation.



The screenshot shows the math software interface with the equation $3x + 2^1 y = 5$ displayed. The editing bars are positioned around the entire equation, indicating that the superscript mode has been exited.

12. To type the second equation below the first, press the Enter key on your keyboard.

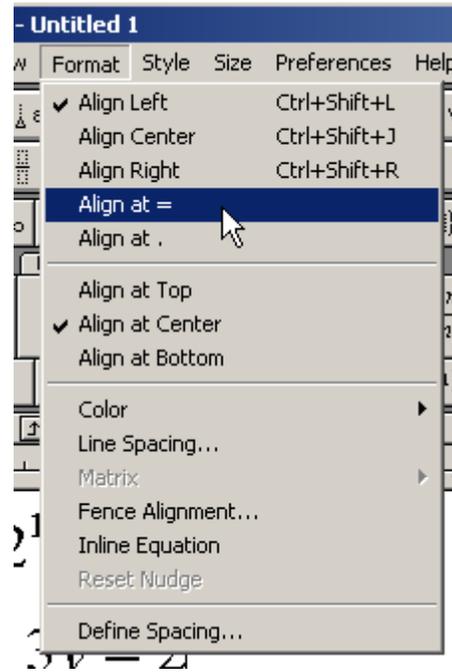
13. Type the second equation using your keyboard keys and the  button in Mathtype as needed.



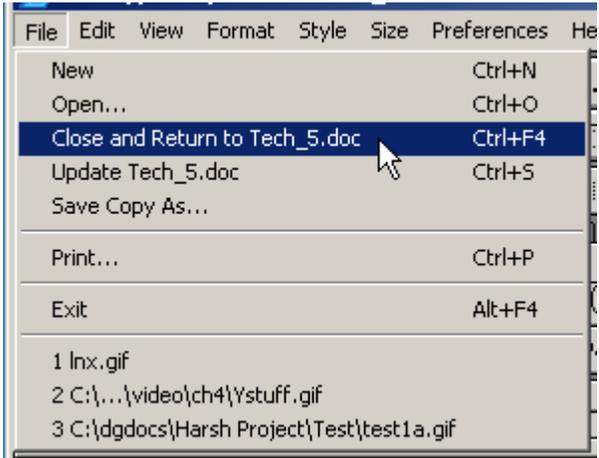
The screenshot shows the math software interface with two equations displayed: $3x + 2^1 y = 5$ and $2^1 x - 3y = 2$. The superscript button is highlighted in the toolbar, indicating it was used to create the second equation.

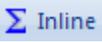
14. These equation line up nicely along the = sign. If yours don't line up nicely, select Format from the menu on the top of the Mathtype window.

15. Left click on Align at =. This will line up your equations on the = sign. Other options allow you to center, left justify or right justify the lines of your equation.

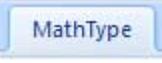


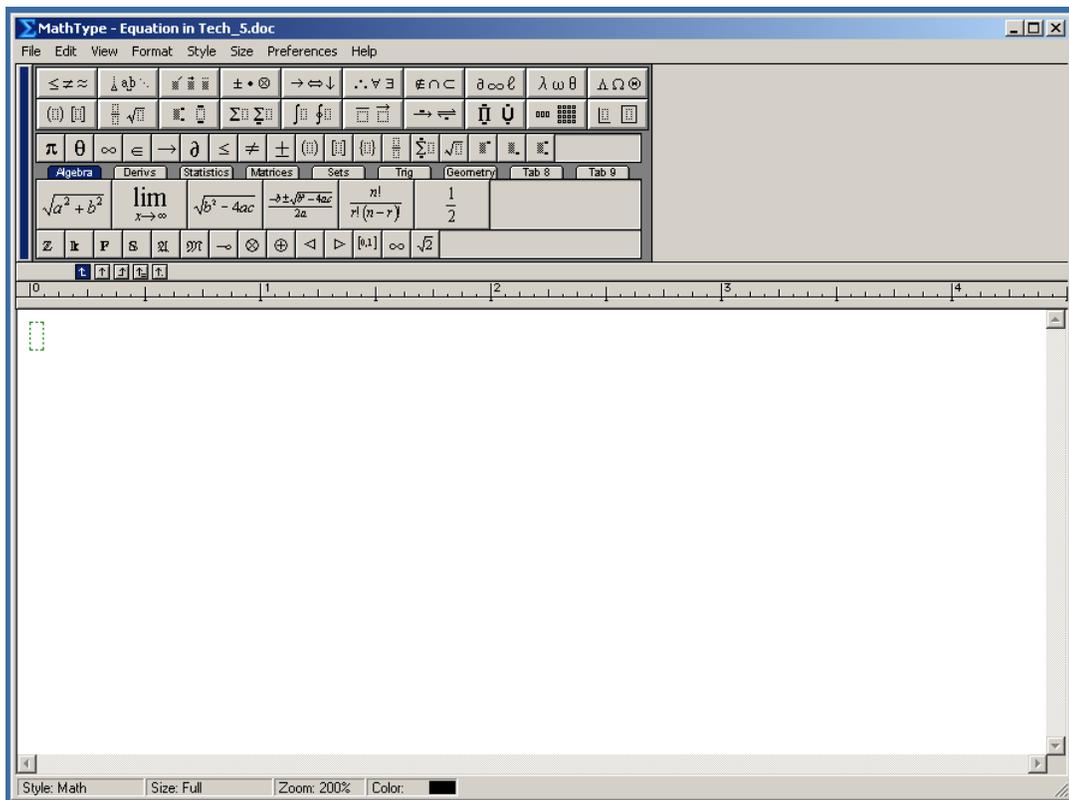
16. Once you have finished editing your equation, click on File at the top of the Mathtype window. Select Close and Return to XXXX.doc. This will close Mathtype and paste the equation into your Word document.



Continue documenting your solution in Word. When you want to place an equation on a line by itself, use the  Display button under the Mathtype tab. If you want to place an equation within a sentence, use the  Inline button under the Mathtype tab.

The equation $2x - 3\left(\frac{5-3x}{2}\right) = 2$ is a bit more complicated. It contains parentheses as well as a fraction. Follow the steps below to create an equation like this in your document.

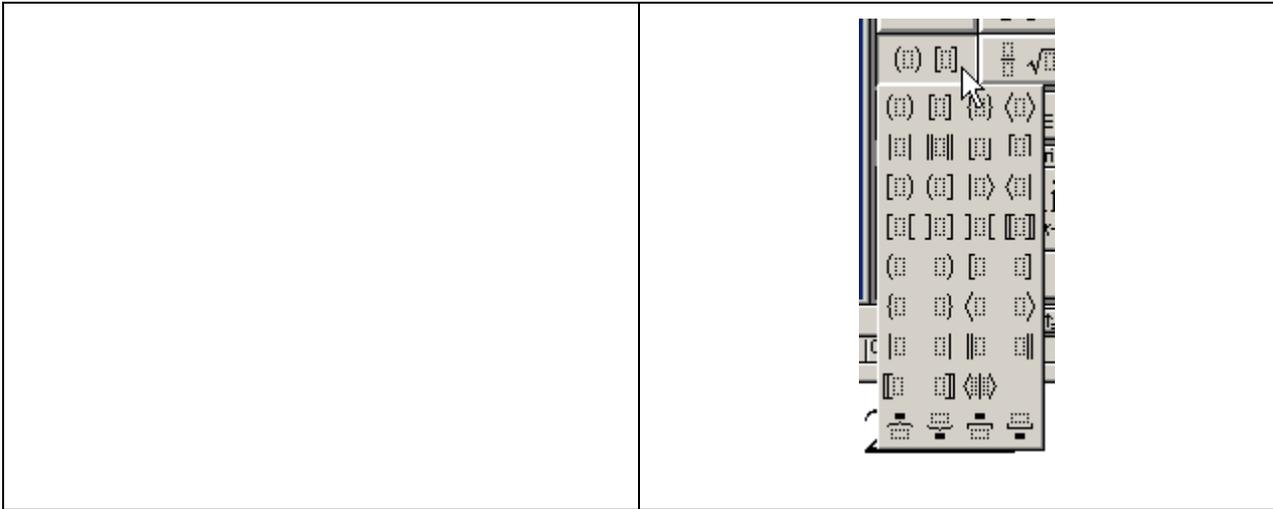
1. Start Word.
2. At the top of the document type your name, class and the date.
3. Save the document with an appropriate name.
4. Begin you explanation by typing something like “Solve the system of equations:”
5. If Mathtype is installed properly, you’ll see a Mathtype tab along the top of Word 2007. Left click on the  tab.
6. From the Insert Equations panel, select . This starts Mathtype in a separate window.



7. Use your keyboard to type $2x-3$.
8. There are several places in Mathtype where you can find different types of parentheses.



OR



9. Click on the  button to create the parentheses.

$$2x - 3 \left(\right)$$

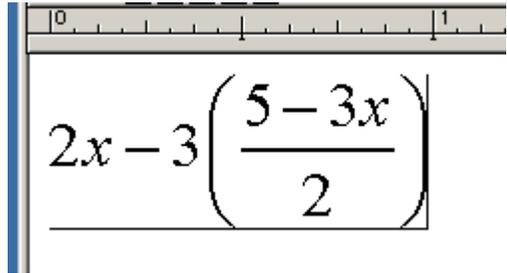
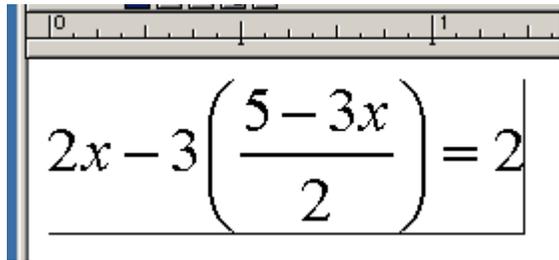
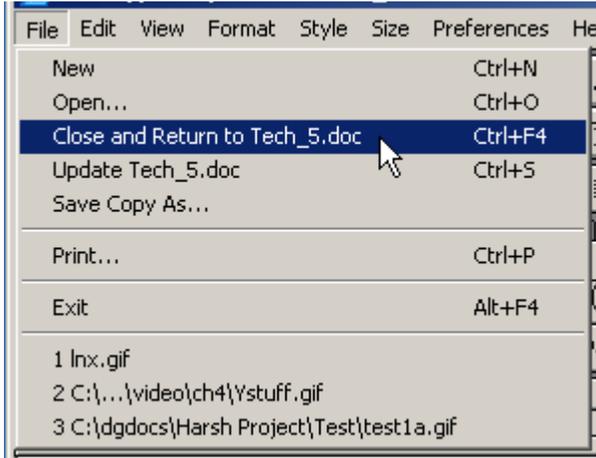
10. The editing bars should be inside the dotted green box. If not, use the arrow keys on the keyboard to move it there.

11. Left click on the  button in the third row or



in the second row to create the fraction.

$$2x - 3 \left(\frac{\quad}{\quad} \right)$$

<p>12. In the numerator and denominator, type the appropriate expressions. You may need to use the arrow keys on your keyboard or the mouse to move around the fraction.</p> <p>13. Use the right arrow key to move the editing bars to the outside of the equation.</p>	
<p>14. Complete the rest of the equation.</p>	
<p>15. Click on File at the top of the Mathtype window. Select Close and Return to XXXX.doc. This will close Mathtype and paste the equation into your Word document.</p>	

There are many other symbols, operations, and editing options within Mathtype. Click on some of the buttons in the first two rows of the Mathtype window to get a feel for what is possible.

Finish documenting your solution for your set of equations. Remember to save your document often as you work. Once you have completed your solution, compare it to the explanation on the second page of this document. Can you improve on your explanation?