JSIS

Math Stylesheet

This book is about the Math Builder (officially called as Equation Editor) tool in Microsoft Word and Outlook 2007 and higher. It also applies to Microsoft PowerPoint and Excel 2010 and higher. Note that this is a different tool than the legacy tool Equation Editor 3.0 (which is still available on 32-bit Office versions until the January 2018 update) and MathType.

Typesetting mathematics on a computer has always been a challenge. The mathematical community almost universally accepts a typesetting language called LaTeX. Math Builder is a much easier to use tool that has less functionality than LaTeX but more than typical document processing. Microsoft call this hybrid language the Office Math Markup Language, or OMML for short. It is an appropriate tool for :

- Typing any document whose focus is not itself mathematics.
- Typing a short math document quickly.
- A stepping stone between word processing (MS Word) and typesetting (LaTeX)

PROS and CONS

Pros :

- Math Builder is WYSIWYG: after typing an equation you see immediately what it looks like.
- It's easy to get started: it's already built in to Microsoft Word. Common symbols have point-and-click icons.
- It's easy to use: Common symbols have keyboard shortcuts so that a veteran user need not use a mouse at all.
- Nearly all symbols use the same commands as LaTeX.
- It can be used in Outlook to easily write equations in emails; it renders as images to the recipent.

Cons :

- Some uncommon symbols are not listed in the menu and require knowing the keyboard shortcut. Typically this is the LaTeX code for the symbol.
- There are differences between Math Builder and LaTeX code: advanced functionality that requires more than just a symbol tend to follow the same flavor but have slightly different syntax. Math Builder code tends to be shorter than LaTeX code and disappears upon completion to the WYSIWYG output. Examples here are matrices, multiple aligned equations, and binomial coefficients.
- No LaTeX typesetting tools such as labels and references are implemented.
- No highly advanced LaTeX tools such as graphing, commutative diagrams, or geometric shapes are implemented. (Note:- Geometric shapes are otherwise available in the Insert ribbon)
- Students studying mathematics might not be motivated to learn LaTeX because they might be able to get by with Equation Builder in Word to satisfy the vast majority of their needs. However, when such a student reaches the limits, unlike LaTeX there is absolutely no recourse to expand the program to satisfy it.

GENERAL STYLE

• Italic type :

- variables: *T* for temperature
- axes: *x* axis
- planes: *ab* plane
- components of vectors and tensors: *a1 + b1*
- elements of determinants and matrices: g_n
- constants: k_B, the Boltzmann constant
- functions: *f(x)*

Greek letters can be used anywhere that a Latin letter is used; lowercase Greek letters are italicized, and uppercase are set in roman type. Spacing is determined by the function of mathematical operators. Operators that function as verbs or conjunctions, that is, have numbers (or a variable and a number) on both sides, have space all around the operators. When they are used as adjectives, with one number that is not part of a mathematical operation, the symbol is closed up to the number (e.g., a conversion of >50%). With the exception of some standard abbreviations that never need to be defined, abbreviations that are used only in the context of mathematical equations should be defined the first time that they are used. Units of measure do not need to be defined. They should be abbreviated when they accompany numbers, with a space between the number and the unit (with exceptions for percent, angular degree, angular minute, and angular second symbols), and left without a period (with an exception: in. for inch). Surnames that are used for units of measure should be lowercase.

EQUATION

Equations can be presented as in-line or displayed. When an equation is short and will not be referred to again, it can be run into the text either linearized or built up. For Example :

$$(1 + x)^n = 1 + \frac{nx}{1!} + \frac{n(n-1)x^2}{2!} + \dots \qquad (1)$$

Display equations can be numbered using any consistent system of sequencing with unique numbers for all equations. Number labels are positioned on the ~~lower~~ right-hand side of the equation. End punctuation is not used in display equations. Equations should not contain extraneous text information that is not part of the equation itself. To cite an equation in text, use the abbreviation “eq” if it is not the first word in the sentence. Spell out “equation” when it is the first word of a sentence or when it is not accompanied by a number. The plural of “eq” is “eqs”.

Alignment and Indentation. Most equations are broken at their operators. This varies depending on the size, length, and content of specific equations. For example :

$$U(\mathbf{r}) = U_{\text{bond}}(\mathbf{r}) + U_{\text{angle}}(\mathbf{r}) + U_{\text{UB}}(\mathbf{r}) + U_{\text{imp}}(\mathbf{r}) + U_{\text{tors}}(\mathbf{r}) + U_{\text{vdW}}(\mathbf{r}) + U_{\text{elec}}^{\text{perm}}(\mathbf{r}) + U_{\text{elec}}^{\text{ind}}(\mathbf{r}) \quad (3)$$

$$U_{\text{elec}}^{\text{slow}}(r) = \tilde{U}_{\text{real}}^{\text{long}}(r) + \tilde{U}_{\text{recip}}(r; k_{\max}) - \sum_{i} \sum_{j>i} (1 - \delta_{ij}^{0}) q_i q_j \frac{\text{erf}(\alpha r_{ij}^{0})}{r_{ij}^{0}} S(r_{ij}^{0} - r_{\text{elec}}^{\text{res}}) \quad (4)$$

$$(1 + x)^n = 1 + \frac{nx}{1!} + \frac{n(n-1)x^2}{2!} + \frac{n(n-2)x^2}{3!} + \frac{n(n-3)x^2}{4!}\frac{n(n-4)x^2}{5!} + \frac{n(n-5)x^2}{6!} + \frac{n(n-6)x^2}{7!}$$

Breaking Equations. Long equations should typically be broken before an operator. Equations should not be broken after integral, product, and summation signs; after trigonomic and other functions set in roman type; or before derivatives.

SUBSCRIPTS and SUPERSCRIPTS

Single subscripts and superscripts are set flush against their accompanying character.

X^1

y^{10}

X^2

10^2

$X^{1/2}$

Subscripts and superscripts can be either staggered or stacked. If the superscript is a power, it should be staggered. Other chemical conventions may require either staggering (e.g., oxidation numbers, ionic charge) or stacking (symmetry operations and structural point groups). Space within subscripts and superscripts should be minimized and used only to avoid misunderstanding.

LIMITS

Limits that are set for in-text expressions are treated as subscripts and superscripts. Please note that in-text expressions compose slightly smaller than their displayed counterparts.

BRACKETING

Bracket size is determined by the information contained within but may vary depending on the specific layout and formatting of individual equations.

$$f(x) = a_0 + \sum_{n=1}^{\infty}\left(a_n \cos cos \frac{n\pi x}{L} + b_n \sin sin \frac{n\pi x}{L}\right)$$

VECTOR

In what follows, we show additional examples of mathematical expressions. Note that when composed, the spacing and alignment of some expressions are imprecise. In particular, in bra-ket notation, the vertical bar is composed smaller than the angle brackets. Some symbols, such as the set symbols, have a fixed size.

Vector notation

$A\rightarrow$ = +
A = +
Â = +

UNAVAILABLE CHARACTERS

- Italicized uppercase Greek letters
- Colored fonts
- Some bond symbols (e.g., bonds with dashed lines above or below)
- Lowercase fraktur characters
  e.g., 𝔞, 𝔟, 𝔠
- Uppercase fraktur (with the following exceptions: C, H, I, R, and Z)
  𝔈, 𝔊, 𝔍, 𝔎, 𝔏
- Some specialized arrows (e.g., maplet arrows)
  ↦
- Variations of precedes or succeeds characters such as precedes or approximates
  ⪷ , ⪸
- Less than or approximate/greater than or approximate and not approximate variations
  ⪅ , ⪆
- Looped script ell
  ℓ
- Hex character (Greek upsilon with hook symbol)
  ϒ
- Hebrew aleph symbol
  א
- Surface integral and volume integral
  ∯ , ∰

In the event that a character is unavailable, the editor will format the equation with the available characters or process it as a graphic. Please note that the font available in the Author Direct Correct (ADC) character picker tool is not the same as the font that is used in our production system. For example, a looped ell character appears in the ADC character picker with the other lower case script characters, but this represents the script ell in our font set, which is not looped. When you insert this character, you will get a script ell from our character set, not a looped ell. Looped ell is not

available in the characters that we currently support. We are working to resolve this issue in the future.

PAGE-WIDE EQUATION

Page-wide equations include any equation that will compose wider than one column width. These include long fractions, long roots, arrays, matrices, and other equations with complicated formatting. Note that page-wide equations are used sparingly as they can be difficult to compose, resulting in text that does not flow elegantly or in the insertion of unsightly or awkward spacing. Disrupting composition can affect the way that information in the article is conveyed. In the following, Latin text is used to display the flow of text only. As seen in the following, the text flows down the column until the page-wide equation and then continues below the equation in the left- and right-hand columns.