# Mathspeak Orientation

## Introduction

MathSpeak is a standardized way to describe math, coming in three verbosity levels: verbose, brief, and superbrief. Of these three options, we typically use brief because we believe that it provides a good balance between easy reading and efficiency. Other levels are available at request.

## Common Symbols

While most things in MathSpeak are generally self-explanatory, a few things may be confusing to a new user. The first section of this guide will go over those more confusing things and the second section will go over other symbols.

## Math Operator Symbols

|  |  |
| --- | --- |
| ***Source*** | ***MathSpeak*** |
|  | plus |
|  | minus |
|  | times |
| \* | asterisk |
|  | dot |
|  | Division-sign |
| / | slash (also Over - with Over use StartFrac EndFrac) |
|  | plus-or-minus |

## EqualitySymbols

|  |  |
| --- | --- |
| ***Source*** | ***MathSpeak*** |
|  | equals |
|  | not-equals |
|  | almost-equals |
|  | less-than |
|  | less-than-or-equal-to |
|  | greater-than |
|  | greater-than-or-equal-to |
|  | Is defined as the quantity |

## SetSymbols

|  |  |
| --- | --- |
| ***Source*** | ***MathSpeak*** |
|  | Intersection |
|  | Union |
|  | Logical-and |
|  | Logical-or |
|  | Logical-not |
|  | Element-of |
|  | Not-element-of |
|  | contains-as-member |
|  | Subset-of |

## Grouping Symbols

| ***Symbol*** | ***MathSpeak*** |
| --- | --- |
|  | left-p’ren |
|  | right-p’ren |
|  | left-brack |
|  | right-brack |
|  | left-brace |
|  | right-brace |
|  | l-angle-brack |
|  | r-angle-brack |
|  | l-bar-brack |
|  | r-bar-brack |
|  | StartAbsoluteValue |
|  | EndAbsoluteValue |
| | | v-line  \*Looks the same as absolute value lines but comes alone |
|  | top-l-brack … top-r-brack |

## Fractions

|  |  |
| --- | --- |
| ***Source*** | ***MathSpeak*** |
|  | StartFrac a Over b EndFrac |
|  | StartStartFrac a plus 2 OverOver StartRoot StartFrac 3 b Over c EndFrac EndRoot EndEndFrac |
|  | a StartFrac b Over c EndFrac |

## Subscripts and Superscripts

|  |  |
| --- | --- |
| ***Source*** | ***MathSpeak*** |
|  | a squared |
|  | a cubed |
|  | a Sup 4 Base |
|  | a Sub 1 Base |
|  | a Sup 12 Base |
|  | a Sub 12 Base |
|  | a Sub 12 Sup 24 Base \*subscript first |

## Roots

|  |  |
| --- | --- |
| ***Source*** | ***MathSpeak*** |
|  | StartRoot a EndRoot |
|  | NestStartRoot a StartRoot b EndRoot NestEndRoot |
|  | RootIndex a StartRoot b EndRoot |

## Character Modifiers

|  |  |
| --- | --- |
| ***Source*** | ***MathSpeak*** |
|  | a overBar |
|  | ModAbove left-p’ren a overBar right-p’ren with bar |
|  | ModAbove a with right-arrow |
|  | ModAbove a with caret |
|  | ModAbove a with two-dots |
|  | a prime |
|  | StartCancel a EndCancel (CrossOut and EndCrossOut is also permitted) |

## Summations

|  |  |
| --- | --- |
| ***Source*** | ***MathSpeak*** |
|  | sigma-summation Underscript a Overscript b EndScripts c |

## Limits

|  |  |
| --- | --- |
| ***Source*** | ***MathSpeak*** |
|  | limit Underscript a right-arrow 0 EndScripts b squared |

## Integrals

|  |  |
| --- | --- |
| ***Source*** | ***MathSpeak*** |
|  | Integral Sub a Sup b Base c |
|  | double integral Underscript a EndScripts b |

## Functions

|  |  |
| --- | --- |
| ***Source*** | ***MathSpeak*** |
|  | log |
|  | cosine |
|  | sine |
| tan | tan |

## Greek Letters

|  |  |
| --- | --- |
| ***Symbol*** | ***MathSpeak*** |
|  | Upper Sigma |
|  | pi |
|  | theta |
|  | Upper Delta |
|  | delta |
|  | alpha |
|  | lambda |
|  | mu |
|  | gamma |
|  | rho |
|  | epsilon |
|  | nabla |
|  | chi  \*watch for subtle difference between an “x” and a “chi” |

## Miscellaneous Symbols

|  |  |
| --- | --- |
| ***Source*** | ***MathSpeak*** |
|  | null |
|  | degree |
|  | angle |
|  | angle superimposed arc |
|  | Real |
|  | Ampersand |
|  | percent (only convert in equations, leave as is in text) |
|  | partial |
|  | infinity |
| : | colon |
|  | comma |
|  | ellipsis |
| ? | question-mark |
|  | right-arrow |
| ~ | tilde |
|  | Logical-not |
|  | For-all |
| | | v-line |
|  | There-exists |
|  | integral superimposed circle |
|  | circled-plus |
| @ | at-sign (only convert in equations, leave as is in text) |

## Miscellaneous MathSpeak Standards

|  |  |
| --- | --- |
| ***Source*** | ***MathSpeak*** |
| a | a  \*do nothing special. Lower case is the default |
| A | Upper A |
| -a | negative a |

## MathSpeak Formatting Standards

### Capitalization

* Capitalization and hyphens are important. Go to File -> Options -> Proofing -> Autocorrect Options -> Autocorrect tab and turn off both the Capitalize first letter of sentence and Capitalize first letter of table cells. Also turn off Replace straight quotes with smart quotes and Replace hyphens with dashes in both the Autoformat as you type and Autoformat tabs.
* Be sure to capitalize sup, sub and base as ‘Sub’, ‘Sup’ and ‘Base’

### Math or Not Math

* You can skip the use of [begin math] and [end math] for singular variables or numbers that appear in a sentence, such as underlined items below:
  + Billy gave me negative 3 marbles.
  + Billy gave me Upper X marbles.
  + Billy gave me $300 in marbles.
* If there is more than one variable together, however, make it math:

|  |
| --- |
| Billy gave me  [begin math]  negative 3 x  [end math]  marbles. |
| Billy gave me  [begin math]  Upper X c  [end math]  marbles. |
| Billy gave me  [begin math]  $300 times x  [end math]  in marbles. |

* Indices are math:

|  |
| --- |
| Billy told me to go to point  [begin math]  left-p’ren x comma y right-p’ren  [end math]  on the map. |

* If you see math inside of a block of code in the text, don’t try to approach it as math. Leave it as code:

|  |
| --- |
| Billy wrote out the following function:  [begin code]  1 set launchSeq[x]{  2 rocket.booster.go()  3 f(x)=c+10  4 }  [end code] |

### In-line Equations

Equations that are in-line with text should be separated from the main text with a new line for easier reading:

* First example source:

|  |
| --- |
| The test statistic for the null hypothesis  is . |

* Math Speak editing for the above example:

|  |
| --- |
| The test statistic for the null hypothesis  [begin math]  Upper H Sub 0 Base colon Upper Beta Sub 1 Base equals 0  [end math]  is  [begin math]  StartFrac x Over a minus 1 EndFrac  [end math]  . |

* Second example source:

|  |
| --- |
| Because 3 has only 1 and 3 or -1 and -3 as factors, it is better here to begin by factoring 3. The last (constant) term of the trinomial 6x2 - 11x + 3 is positive and the middle term has a negative coefficient, so we consider only negative factors. |

* Math Speak editing for the above example:

|  |
| --- |
| Because 3 has only 1 and 3 or negative 1 and negative 3 as factors, it is better here to begin by factoring 3. The last (constant) term of the trinomial  [begin math]  6 x squared minus 11 x plus 3  [end math]  is positive and the middle term has a negative coefficient, so we consider only negative factors. |

### Equations Not In-Line With Text

#### Simple Equations

* Single equations that are not in-line with text should be set off with tags on separate lines just like equations that are in-line with text:
  + Example source:

|  |
| --- |
| Consider the following equation:    Does this seem reasonable? |

* Math Speak editing for the above example:

|  |
| --- |
| Consider the following equation:  [begin math]  b Sub 1 Base equals 0.5828  [end math]  Does this seem reasonable? |

#### Multilevel Equations

* Include [begin math] and [end math] in the same line for multi-level equations. Corresponding explanations/comments need to be in as indented bullet points.
  + Example source:

|  |
| --- |
| = (2x2 - 10x) + (3xy - 15y) Group the terms  = 2x(x-5) + 3y(x-5) Factor each group  =(x-5)(2x+3y) Factor out x-5 |

* Math Speak editing for the above example:

|  |
| --- |
| * [begin math] equals left-p’ren 2 x squared minus 10 x right-p’ren plus left-p’ren 3 x y minus 15 y right-p’ren [end math]   + Group the terms * [begin math] equals 2 x left-p’ren x minus 5 right-p’ren plus 3 y left-p’ren x minus 5 right-p’ren [end math]   + Factor each group * [begin math] equals left-p’ren x minus 5 right-p’ren left-p’ren 2 x plus 3 y right-p’ren [end math]   + Factor out [begin math] x minus 5 [end math] |

#### Multiple Subsequent Equations

* Include only one [begin math] and [end math] for exercise problems with only equations and no text in between instead of [begin math] and [end math] for each question.
  + Example source:

|  |
| --- |
| 38) 2t2-14t + 15  39) 20x2+22x+6  40) 36y2+81y+45 |

* + Math Speak editing for the above example:

|  |
| --- |
| [begin math]  38) 2 t squared minus 14 t plus 15  39) 20 x squared plus 22 x plus 6  40) 36 y squared plus 81 y plus 45  [end math] |

## Matrices

There are three different ways we can lay out matrices in MathSpeak. Examples are below.

### Source

### 

### Matrix in Mathspeak with table

[begin math]

Upper P equals left-p'ren Start 5 By 5 Matrix

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Upper P sub 11 base | Upper P sub 12 base | Upper P sub 13 base | ellipsis | Upper P sub 1n base |
| Upper P sub 21 base | Upper P sub 22 base | Upper P sub 23 base | ellipsis | Upper P sub 2n base |
| Upper P sub 31 base | Upper P sub 32 base | Upper P sub 33 base | ellipsis | Upper P sub 3n base |
| ellipsis | ellipsis | ellipsis | ellipsis | ellipsis |
| Upper P sub n1 base | Upper P sub n2 base | Upper P sub n3 base | ellipsis | Upper P sub nn base |

EndMatrix right-p'ren

[end math]

### Matrix in MathSpeak with a list

[begin math]

Upper P equals left-p'ren Start 5 By 5 Matrix

* 1st Row 1st Column Upper P sub 11 base 2nd Column Upper P sub 12 base 3rd Column Upper P sub 13 base 4th Column ellipsis 5th Column Upper P sub 1n base
* 2nd Row 1st Column Upper P sub 21 base 2nd Column Upper P sub 22 base 3rd Column Upper P sub 23 base 4th Column ellipsis 5th Column Upper P sub 2n base
* 3rd Row 1st Column Upper P sub 31 base 2nd Column Upper P sub 32 base 3rd Column Upper P sub 33 base 4th Column ellipsis 5th Column Upper P sub 3n base
* 4th Row 1st Column ellipsis 2nd Column ellipsis 3rd Column ellipsis 4th Column ellipsis 5th Column ellipsis
* 5th Row 1st Column Upper P sub n1 base 2nd Column Upper P sub n2 base 3rd Column Upper P sub n3 base 4th Column ellipsis 5th Column Upper P sub nn base

EndMatrix right-p'ren

[end math]

### Matrix in Classic MathSpeak

[begin math]

Upper P equals left-p'ren Start 5 By 5 Matrix

1st Row 1st Column Upper P sub 11 base 2nd Column Upper P sub 12 base 3rd Column Upper P sub 13 base 4th Column ellipsis 5th Column Upper P sub 1n base 2nd Row 1st Column Upper P sub 21 base 2nd Column Upper P sub 22 base 3rd Column Upper P sub 23 base 4th Column ellipsis 5th Column Upper P sub 2n base 3rd Row 1st Column Upper P sub 31 base 2nd Column Upper P sub 32 base 3rd Column Upper P sub 33 base 4th Column ellipsis 5th Column Upper P sub 3n base 4th Row 1st Column ellipsis 2nd Column ellipsis 3rd Column ellipsis 4th Column ellipsis 5th Column ellipsis 5th Row 1st Column Upper P sub n1 base 2nd Column Upper P sub n2 base 3rd Column Upper P sub n3 base 4th Column ellipsis 5th Column Upper P sub nn base

EndMatrix right-p'ren

[end math]

## Quick Review Checklist

* Are the pages formatted correctly? (11 by 17 with narrow margins)
* Do the page numbers of the source and the edited document match?
* Does the edited document have the same number of pages as the source?
* Does the document end with [end of document]?
* Search these tag pairs to make sure you have the same number of each:

[Note: There are specific cases when the number of parentheses pairs or bracket pairs do not match up.]

* + [begin math] [end math]
  + StartFrac EndFrac and Over
  + StartRoot EndRoot
  + left-p’ren right-p’ren
  + left-brack right-brack
  + left-brace right-brace
  + StartSet EndSet
  + StartAbsoluteValue EndAbsoluteValue
  + Check Sup and Sub and Bases [Note: Base is not always necessary if the math ends there]
* Are all equals signs marked as equals?
* Are all uppercased letters marked Upper?
* Are commas marked as comma?
* Are all plus signs marked plus?
* Are negative numbers marked negative?
* Do all cases where Sub or Sup are used that need a Base have it?
* Are tables linearized (unless client wants tables left as tables)?
* Are equations in the text also edited?

[end of document]