# CAPTIONING WITH MATH

Caption maker has limits for handling math.

* **Each bullet indicates an individual cell**.

## Simple math

Exponents are handled with the caret symbol (^); two squared would be written as 2^2.

* 2^2

Subscripts are handled similarly with the underscore; water, with two hydrogen and an oxygen would be

* H\_2O.

In general, do not write out, but use the symbols for

 addition (+),

 subtraction (-),

 multiplication (\* - NOT the ‘x’) and

 division (/)

 parens/parentheses ( )

 brackets [ ]

 braces { }

## Items which need to be spelled out:

Anything Greek, anything not on the basic keyboard; vectors, directionality, parallel or perpendicular , angular symbols, any kind of root.

## Equations

If the professor is talking, mid-equation, spell out the operator:

(Audio) “so this is gonna be 66.74\*10 to the minus 12\* 150^2 divided by, what should we divide this by?”

The completed portion of the equation ’66.74 \* 10^-12 \* 150^2’ should be captured with numbers and operators. When he asks what it is being divided by, that should be spelled out, rather than using an operator mid-text.

Captioned in two cells as:

* So this is gonna be

66.7\*10^-12 \*150^2…

* divided by, what should we divide this by?

### Order of operations:\*\*

**NOTE**: Per the Math Department: equations which span more than one line; ‘=’ begins a new line. Other operators ‘+,’ ‘-,‘ ‘\*,’ ‘/’should remain on the prior line.

Try not to split an equation/formula over more than one line and certainly contain within one caption.

If a formula is going to extend over one line/ caption, for clarity, it should be broken into component parts, maintaining orders of operation with open and close parens in appropriate spots.

(Audio) “So I have that the unit vector equals cosine alpha I + cosine beta J + cosine gamma k.”

Captioned in two cells as:

* So I have that the unit vector
* Equals cos alpha\_I +

cos beta\_J + cos gamma\_K.

Second and third lines above should be in same caption, because it is a complete, coherent equation.

Don’t separate cosine from its identifiers (alpha/beta/gamma) or the letters (I/J/K).

Be Consistent; if you use lower case, great, but stick with it for all modifiers. Upper case or lower case, unless the professor specifies a mix (which, hopefully they won’t, because it’s confusing, and to be avoided.)



Would be transcribed as:

B\_1 = r((s\_y)/s\_x)) = -0.7756(1.1389/257.66); since it is more than one line, break it before the equal sign

Captioned in one cell as:

* B\_1 = r((s\_y)/s\_x))

=-0.7756(1.1389/257.66)



Equations with equal signs that span more than one cell should be started with an equal sign at the start of the cell.

Captioned in three cells as:

* ((b-a)^2)+4 (ab/2)
* =(b-a)^2+2ab
* =a^2+b^2

## Vectors and Direction

We need to write out vector, and direction, since we can’t use symbols in Caption Maker.

(Audio) “Alright, so we’re gonna describe this vector here, R, a position vector and we describe it again by its coordinates, I in the-X in the I direction, plus Y in the J direction, plus Z in the K direction.”

To be captioned as straight text, since Caption Maker does not allow symbols. Keep ‘I direction’ phrase (J direction, K direction) together as you would a verb and helper or noun and modifier.

Captioned as:

* Alright, so we’re gonna describe

 this vector here,

* R, a position vector and
* we describe it again

by its coordinates,

* I in the-X in the I direction,
* plus Y in the J direction,
* plus Z in the K direction.”

## For triangles or line descriptions

Write the letters together, ‘XAI’ rather than ‘X-A-I’

(Audio) “XAI plus YAJ plus ZAK and we have a position vector B, similarly, XBI plus YBJ plus ZBK. Alright?”

Caption as:

* XAI + YAJ + ZAK
* And we have a position vector B,
* Similarly, XBI + XBJ + ZBK.
* Alright?

(Audio) “Line segment RB minus line segment RA. “

Caption as:

* Line segment RB
* minus line segment RA

(Audio) “We are now going to add vectors: RB minus RA.”

* We are now

going to add vectors:

* RB – RA.

(Audio) “Angles CBD and FBA are both right angles; therefore angle ABD equals angle FBC, since both are the sum of a right angle and angle ABC.”

Caption as:

* Angles CBD and FBA

are both right angles;

* therefore angle ABD

equals angle FBC,

* since both are the sum

 of a right angle

* and angle ABC.

## Coordinates

If they say: “0 in the X, 2 in the Y, and 0.5 in the Z direction.”

Caption as:

* 0 in the X, 2 in the Y,

and 0.5 in the Z direction.

If they say specifically ”*coordinates are:* zero, 2, zero point five”

Caption as:

* Coordinates are: (0,2,0.5)

Also, if they are talking about points and say

 “Divide the distance from 2, 0, 1.5 to 1, 1, 1.”

Caption as:

* Divide the distance

from (2,0,1.5) to (1,1,1).

Coordinate points should be placed in parens, **IF**

1. they are stated as numbers,

AND

1. it is clear that the speaker is referring to a point (as above).

## Dot product

(Audio) “So, we’re gonna define the dot product here as the length of the vector A times the length of the vector B times cosine of theta, which is the angle.“

Caption maker will not accept the dot, so we need to replace it with the more standard multiplication operator, the asterisk.

Given the limitations of Caption Maker, the quoted sentence can be left as is; removing the ‘times’ with an asterisk will not improve clarity or flow since nothing else in the equation can be reduced.

If you get an equation

(Audio) “Vector\_A dot product vector\_B”

Caption as:

* Vector\_A \* Vector\_B

We trust that someone in this level of math understands that dot product is multiplication.

## Parallel scalar

“A parallel scalar is nothing else other than A dotted with U hat, and then times U hat again”

The ‘hat’ is typically the caret symbol over a letter, but CaptionMaker cannot allow this functionality so we caption this as:

* (A\*U-hat)\*U-hat

\*\*As a reminder on orders of operations:

<https://www.khanacademy.org/math/cc-seventh-grade-math/cc-7th-variables-expressions/cc-7th-order-of-operations/v/order-of-operations> - quick video which explains simple order of operations or our friend, Wikipedia: <http://en.wikipedia.org/wiki/Order_of_operations>

If your instructor speaks Queen’s English (British English, former colonies) rather than King’s English (‘American’), they may use different terminology to mean the same thing, to wit:

**Note**: Rather than the US PEDMAS (Parens, Exponents, Division, Multiplication, Addition, Subtraction), in the UK they say [BODMAS](http://www.mathsisfun.com/operation-order-bodmas.html) (Brackets, Orders, Divide, Multiply, Add, Subtract), and in Canada they say BEDMAS (Brackets, Exponents, Divide, Multiply, Add, Subtract). It all means the same thing! It doesn't matter how you remember it, just so long as you get it right. <http://www.mathsisfun.com/operation-order-pemdas.html>