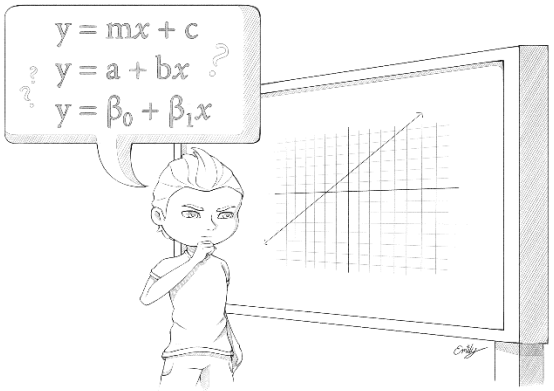
SYMBOLIC SYNONYMS



What's the issue?

When students are drilled, and undertake practice using algebraic expressions which always employ the same letters, they may not recognize a familiar rule if a different letter is substituted.

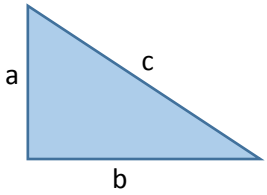
For example: Many students who rote learn y=mx +c, or any ***one*** of the common forms, as a general rule for a linear function do not also recognize its 'symbolic synonyms' y=mx+b , y=ax+b or even less likely y=a+bx . Later, in statistics y= b_0 +b_1x is often viewed as a new mystery.

Mishaps? Perhaps not...

This issue is long lasting and afflicts even a number of our best maths students. As a University tutor, whom we interviewed, said of their first year mathematics students:

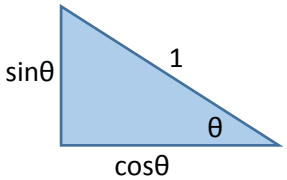
> *"Using a different letter upsets them, you know, a different parameter*
> *If you start with y as a function of x and you change the problem to x is a function of t, you're in trouble if I use p is a function of q or something that's really not common, it's like they cannot do the question anymore…they know how to solve a problem with y in terms of x."*

Mishaps in school maths...



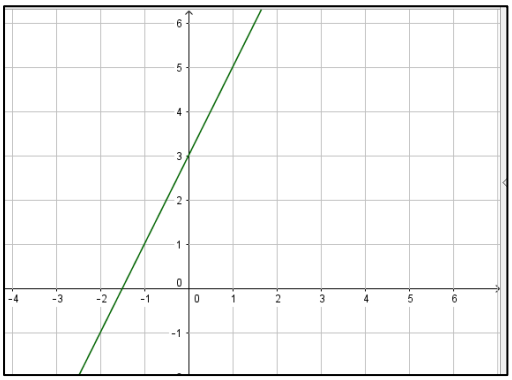
Similarly, in many classrooms the name Pythagoras brings forth a chorus of $a^2+b^2=c^2$.
Using different letters or naming the right-angled triangle such that "c" is not on the hypotenuse causes confusion and anxiety.

Later students do not recognize other applications of the theorem. For example: $\sin^2\theta+\cos^2\theta=1$



Ideas from the classroom...

- Resist the temptation to always stick to familiar letters and reduce immediate stress. Why not?? This sets students up for future failure.
- Deliberately practice recognition of the pattern for a rule using a variety of the commonly used forms – not just one.
- Have students keep a word & symbol glossary: add the symbolic synonyms when encountered
- Sometimes deliberately have students use different letters. Draw letters from a hat so that different students work with different letters or the class has "letters for today".
- Play "matching cards" games and include symbolic synonyms in multiple representation tasks.



$y = 2x+3$

$y = 3x+2$

$y = (3/2)x+3$

$y= ax+b$ where a=2 b=3

$s = 3+2t$

p	q
-1	1
0	3
1	5

For more ideas on matching cards see:

Malcolm Swan (2008) *The Design of Multiple Representation Tasks to Foster conceptual Development* http://tsg.icme11.org/document/get/289

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