

use LuaLaTeX as a calculator to automate question versions

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suppose you need to create different versions of the following question (and its solution)

version 1, not automated: solve for x : $2x^2 + 11x - 21 = 0$

solution:

$$\begin{aligned}(2x - 3)(x + 7) = 0 &\implies \begin{cases} 2x - 3 = 0 \\ x + 7 = 0 \end{cases} \\ &\implies \begin{cases} x = 1.5 \\ x = -7 \end{cases}\end{aligned}$$

it's probably kind of a pain in the butt to go through and solve the problem over and over again. the good news is LaTeX can do it for you!!! you need to be using LuaLaTeX.

for this particular problem, it will probably be easiest to start from the factored version of the problem, and have LaTeX compute the numbers that should go in the question.

version 1, automated: solve for x : $\text{tex.sprint}(\text{string.format}(\text{"\%g"}, 2 * 1))x^2 + \text{tex.sprint}(\text{string.format}(\text{"\%g"}, 2 * 7 - 1 * 3))x - \text{tex.sprint}(\text{string.format}(\text{"\%g"}, 3 * 7)) = 0$

solution:

$$\begin{aligned}(2x - 3)(x + 7) = 0 &\implies \begin{cases} 2x - 3 = 0 \\ x + 7 = 0 \end{cases} \\ &\implies \begin{cases} x = \text{tex.sprint}(\text{string.format}(\text{"\%g"}, (3/2))) \\ x = -7 \end{cases}\end{aligned}$$

now that we have automated the calculations, to create different versions we just need to edit the “changeables” commands in the tex document! (there's certainly a way to automate this too, but I don't have that figured out yet.)

let's make another version!

version 2, automated: solve for x : $\text{tex.sprint}(\text{string.format}(\text{"\%g"}, 3 * 1))x^2 + \text{tex.sprint}(\text{string.format}(\text{"\%g"}, 3 * 2 - 1 * 6))x - \text{tex.sprint}(\text{string.format}(\text{"\%g"}, 6 * 2)) = 0$

solution:

$$\begin{aligned} (3x - 6)(x + 2) = 0 &\implies \begin{cases} 3x - 6 = 0 \\ x + 2 = 0 \end{cases} \\ &\implies \begin{cases} x = \text{tex.sprint}(\text{string.format}(\text{"\%g"}, (6/3))) \\ x = -2 \end{cases} \end{aligned}$$

you can also use functions within `\luaexec`, but they are not the familiar LaTeX commands. for example, say you want to take the square root of 9: (check the tex code)

$$\sqrt{9} = \text{tex.sprint}(\text{string.format}(\text{"\%g"}, \text{math.sqrt}(9)))$$