converting a repeating decimal to a fraction

The following algorithm can be used to convert a repeating decimal to a fraction:

1. Set the repeating decimal equal to x.
2. Multiply both sides of the equation by 10^n, where n is the number of digits that appear under the bar.
3. If applicable, rewrite the second equation so that its repeating part up with the repeating part in the original equation.
4. Subtract the original equation from the most recently obtained equation. (The repeating part should cancel at this step.)
5. If applicable, multiply both sides by a large enough power of 10 so that the equation is of the form $ax = b$, where a and b are integers.
6. Divide both sides of the equation by the coefficient of x.
7. Reduce the fraction to lowest terms.

Below, this algorithm is demonstrated for $0.58\bar{3}$ with the steps indicated on the far .

$$x = 0.58\bar{3} \tag{1}$$

$$10x = 5.8\bar{3} \tag{2}$$

$$10x = 5.83\bar{3} \tag{3}$$

$$9x = 5.25 \tag{4}$$

$$900x = 525 \tag{5}$$

$$x = \frac{525}{900} \tag{6}$$

$$x = \frac{7}{12} \tag{7}$$

An important application of this algorithm is that it supplies a proof for the fact that $0.\bar{9} = 1$:

$$\begin{aligned} x &= 0.\bar{9} \\ 10x &= 9.\bar{9} \\ 9x &= 9 \\ x &= 1 \end{aligned}$$

Title	converting a repeating decimal to a fraction
Canonical name	ConvertingARepeatingDecimalToAFraction
Date of creation	2013-03-22 16:55:22
Last modified on	2013-03-22 16:55:22
Owner	Wkbj79 (1863)
Last modified by	Wkbj79 (1863)
Numerical id	10
Author	Wkbj79 (1863)
Entry type	Algorithm
Classification	msc 11A99
Classification	msc 11-00