

The subtraction trick:

$$\begin{array}{r} r = 3.\overline{14} \\ 100r = 314.\overline{14} = 314.141414\dots \\ -r = -3.\overline{14} = -3.141414\dots \\ \hline 99r = 311 = 311.000000\dots \\ r = \frac{311}{99} \end{array}$$

$$\begin{array}{r} r = 0.\overline{142857} \\ 1000000r = 142857.\overline{142857} = 142857.142857142857\dots \\ -r = -0.\overline{142857} = 0.142857142857\dots \\ \hline 999999r = 142857 = 142857.000000000000\dots \\ r = \frac{142857}{999999} \end{array}$$

$$\begin{array}{r} r = 3.45\overline{6} \\ 1000r = 3456.\overline{6} = 3456.66666\dots \\ -100r = -345.\overline{6} = -345.66666\dots \\ \hline 900r = 3111 = 3111.00000\dots \\ r = \frac{3111}{900} \end{array}$$