

$4.\overline{646} = 4 + \frac{646}{10^3} + \frac{646}{10^6} + \dots$ . Now  $\frac{646}{10^3} + \frac{646}{10^6} + \dots$  is a geometric series with  $a = \frac{646}{10^3}$  and  $r = \frac{1}{10^3}$ . It converges to  $\frac{a}{1-r} = \frac{646/10^3}{1-1/10^3} = \frac{646/10^3}{999/10^3} = \frac{646}{999}$ . Thus,  $4.\overline{646} = 4 + \frac{646}{999} = \frac{4642}{999}$ .