

$$S_n = 1 + r + \dots + r^n$$

is complex in that
it has too many terms
How can we simplify it?

We need to capitalize
on the regularity of the
expression.

Notice:

$$rS_n = r + r^2 + \dots + r^{n+1}$$

Subtracting equals from equals

$$S_n - rS_n = 1 - r^{n+1}$$

so for $r \neq 1$,

$$S_n = \frac{1 - r^{n+1}}{1 - r}$$

$\rightarrow \frac{1}{1-r}$