 Sum of a geometric sequence

The activity below lead students to discover the sum of a geometric sequence.

Method.

* Consider the sum of a geometric series:

$$S\_{n}=a+ar+ar^{2}+... +ar^{n-3}+ar^{n-2}+ar^{n-1}$$

* Consider the r multiplied by this series:

$$rS\_{n}=ar+ar^{2}+ar^{2}+... +ar^{n-2}+ar^{n-1}+ar^{n}$$

* Subtract $S\_{n}$ from $rS\_{n}$

$$rS\_{n}-S\_{n}=ar^{n}-a$$

* Solve for $S\_{n}$

$$S\_{n}(r-1)=a(r^{n}-1)$$

$$S\_{n}=\frac{a(r^{n}-1)}{r-1}=\frac{a(1-r^{n})}{1-r}$$

by multiplying the numerator and denominator by negative 1.