The first term of a geometric series is 10. The sum to infinity is 50.
a) Find the common ratio
The nth term is $U_n$
b) Find the value of $\sum_1^{20} U_n$

a)

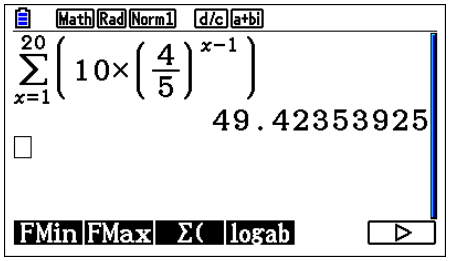
$$U_1 = 10$$
$$S_\infty = 50$$

$$S_\infty = \frac{U_1}{1-r}$$
$$50 = \frac{10}{1-r}$$
$$50(1-r) = 10$$
$$1-r = \frac{10}{50}$$
$$1-r = \frac{1}{5}$$
$$1-\frac{1}{5} = r$$
$$r = \frac{4}{5}$$

b)

$$U_n = 10\left(\frac{4}{5}\right)^{n-1}$$
$$\sum_1^{20} 10\left(\frac{4}{5}\right)^{n-1}$$

We can use our calculators to work this out



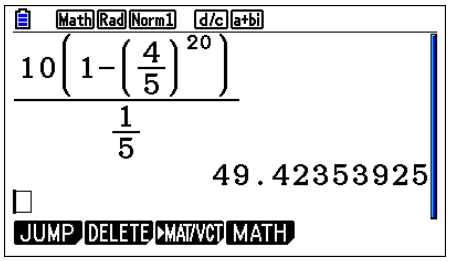

$$\sum_1^{20} U_n = 49.4$$

We can also use the formula

$$S_n = \frac{U_1(1 - r^n)}{1 - r}$$

$$S_{20} = \frac{10(1 - \left(\frac{4}{5}\right)^{20})}{1 - \frac{4}{5}}$$

$$S_{20} = \frac{10(1 - \left(\frac{4}{5}\right)^{20})}{\frac{1}{5}}$$




$$\sum_{1}^{20} U_n = 49.4$$