

Chapter 1 / **Example 18**

Finding the number of terms in a geometric sequence

The first term of a geometric sequence is 16 and the common ratio is $\frac{1}{2}$

Find the biggest term that is smaller than $\frac{1}{1000}$

$$u_1 = 16, r = \frac{1}{2}$$

$$u_n = 16 \times \left(\frac{1}{2}\right)^{n-1} > \frac{1}{1000}$$

Press $\boxed{\text{f1}}$ $\boxed{\text{y=}}$ to display the equation entry screen.

Type $16 \times 0.5 \wedge X - 1$ in the first equation as Y_1 .

Plot1	Plot2	Plot3
$\text{Y}_1 = 16 \times 0.5^{X-1}$		
$\text{Y}_2 =$		
$\text{Y}_3 =$		
$\text{Y}_4 =$		
$\text{Y}_5 =$		
$\text{Y}_6 =$		
$\text{Y}_7 =$		
$\text{Y}_8 =$		

Press $\boxed{2\text{nd}}$ $\boxed{\text{f5}}$ ($\boxed{\text{table}}$)

You can scroll down the table using $\boxed{\downarrow}$.

From the table, $Y_1 = 0.000977$ when $n = 15$

X	Y1				
5	1				
6	.5				
7	.25				
8	.125				
9	.0625				
10	.03125				
11	.01563				
12	.00781				
13	.00391				
14	.00195				
15	.000977				

$Y_1 = 9.765625 \times 10^{-4}$

An alternative method is to solve $16 \times \left(\frac{1}{2}\right)^{n-1} > \frac{1}{1000}$ using the numerical solver.

Press $\boxed{\text{math}}$ B:Solver...

EQUATION SOLVER	
E1:	
E2:	

Type $16 \times 0.5 \wedge X - 1$ in E1 and press $\boxed{\text{enter}}$.

Type 0.001 in E2 and press $\boxed{\text{enter}}$.

EQUATION SOLVER	
E1:	$16 \times 0.5^{X-1}$
E2:	0.001
$\boxed{\text{OK}}$	

Press $\boxed{\text{X}\text{X}\text{X}\text{X}}$ $\boxed{\text{enter}}$ [solve].

$$16 \times \left(\frac{1}{2}\right)^{n-1} = \frac{1}{1000} \text{ when } n = 14.96...$$

Hence the smallest value of n for which $u_n < \frac{1}{1000}$ is 15.

$16 \times 0.5^{X-1} = 0.001$
$\bullet X = 14.965784284662$ $\bullet \text{bound} = \{-1 \times 10^{99}, 1 \times 10^{99}\}$ $\bullet E1 - E2 = 0$

Chapter 1 / **Example 18**

Finding the number of terms in a geometric sequence

Press **2nd** **[quit]**.

Calculate $16 \times 0.5^{15-1}$

The biggest term that is smaller than $\frac{1}{1000}$ is $u_{15} = 0.000977$

$16 \times 0.5^{15-1}$
 $9.765625E-4$