

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 $\frac{1}{1000}$

Press **MENU** 7 **TABLE**. Press **F5** SET and change the settings so that the table starts from 1 and ends at 20.

Press **EXIT**.

Table Setting
X

Start:1
End :20
Step :1

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

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

Type $16 \times 0.5^X - 1$ and press **EXE** to enter the equation as Y1.

Table Func :Y=
Y1:16×0.5^{x-1} [—]
Y2: [—]
Y3: [—]
Y4: [—]
Y5: [—]
Y6: [—]
[SELECT] [DELETE] [TYPE] [STYLE] [SET] [TABLE]

Press **F6** TABLE.

A table of values is displayed. Scroll down the table using **▼**.

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

Y1=16×0.5^(x-1)
X Y1
12 7.8E-3
13 3.9E-3
14 1.9E-3
15 9.7E-4
9.765625×10⁻⁴
[FORMULA] [DELETE] [ROW] [EDIT] [GPH-CON] [GPH-PLT]

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

Press **MENU** A **SOLV** **II**

Press **F3** SOLVER.

Eq: [—]
[RECALL] [DELETE] [SOLVE]

Type $16 \times 0.5^X - 1 = 0.001$ in E1 and press **EXE**.

Eq: 16×0.5^{x-1}=0.001
x=20
Lower=-9×10⁹
Upper=9×10⁹
[RECALL] [DELETE] [SOLVE]

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Press **F6** SOLVE to obtain a solution to the problem.

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

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

Eq: $16 \times 0.5^{x-1} = 0.001$
 $x = 14.96578428$
 Lft = 1×10^{-3}
 Rgt = 1×10^{-3}

[REPEAT]

Press **MENU** 1 **RUN-MATRIX** to display the Run-Matrix screen.

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

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

$16 \times 0.5^{15-1}$
 9.765625×10^{-4}

[JUMP] [DELETE] [MAT/VCT] [MATH]