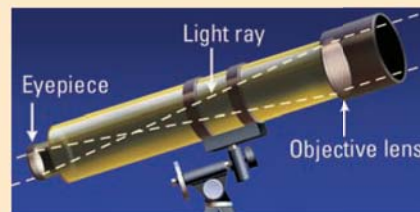


PROBLEM 2

ASTRONOMY The *apparent magnitude* of a star is a measure of the brightness of the star as it appears to observers on Earth. The apparent magnitude M of the dimmest star that can be seen with a telescope is given by the function

$$M = 5 \log D + 2$$

where D is the diameter (in millimeters) of the telescope's objective lens. If a telescope can reveal stars with a magnitude of 12, what is the diameter of its objective lens?

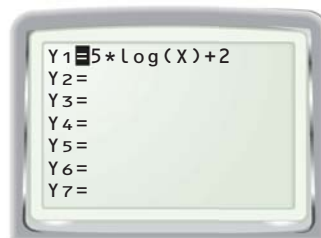
**METHOD 1**

Using a Table Notice that the problem requires solving the following logarithmic equation:

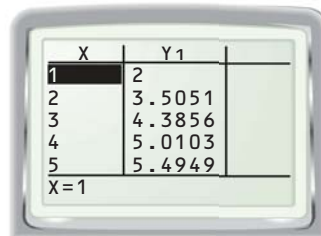
$$5 \log D + 2 = 12$$

One way to solve this equation is to make a table of values. You can use a graphing calculator to make the table.

STEP 1 Enter the function $y = 5 \log x + 2$ into a graphing calculator.

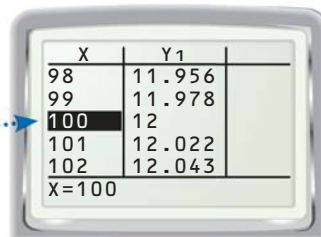


STEP 2 Create a table of values for the function. Make sure that the x -values are in the domain of the function ($x > 0$).



STEP 3 Scroll through the table of values to find when $y = 12$.

The table shows that $y = 12$ when $x = 100$.



► To reveal stars with a magnitude of 12, a telescope must have an objective lens with a diameter of 100 millimeters.