A steel wire of 1 m long and 1 mm square in area of cross section . If it takes 200 N to stretch the wire by 1mm how much force will be required to stretch the wire of same area and same material and having length of 10 m to 1002 cm?

Hooke's law:

$$F = k\Delta l$$

where $k = \frac{ES}{l}$ - a constant factor characteristic of the spring, E - modulus of elasticity of steel, S - cross section, l – length.

In first case:

$$F_1 = \frac{ES}{l_1}\Delta l_1$$

Similarly, for second:

$$F_2 = \frac{ES}{l_2}\Delta l_2$$

Therefore:

$$\frac{F_2}{F_1} = \frac{\Delta l_2}{l_2}\frac{l_1}{\Delta l_1}$$

$$F_2 = \frac{\Delta l_2}{l_2}\frac{l_1}{\Delta l_1}F_1 = \frac{1002\ cm - 10\ m}{10m} * \left(\frac{1m}{1mm}\right)200N = \frac{0.02m}{10m} * \frac{1m}{0.001m} * 200N = 400\ N$$

Answer: 400 N