

The length of a wire is a metre when the tension is 4N, Length is b metre when the tension is 5N, What is the length when the tension is 9N?

Solution

Using Hooks law:

$$4=k*(a-l) \quad (1);$$

$$5=k*(b-l) \quad (2);$$

$$9=k*(c-l) \quad (3);$$

Where l – initial length, c – length when the tension is 9N, k – elastic coefficient.

From (1) and (2) we will find initial length and elastic coefficient:

$$K=\frac{4}{(a-l)} \quad (4);$$

$$5=\frac{4}{(a-l)}*(b-l);$$

$$5*(a-l)=4*(b-l);$$

$$5*a-4*b=l \quad (5);$$

Let's substitute (5) into (4):

$$K=\frac{4}{(a-5*a+4*b)}=\frac{1}{(b-a)} \quad (6);$$

Let's substitute (6) and (5) into (3):

$$9=\frac{1}{(b-a)}*(c-5*a+4*b);$$

$$9*b-9*a=c-5*a+4*b;$$

$$5*b-4*a=c;$$

Answer: the length when the tension is 9N is $(5*b-4*a)$ m.