

Stretching Practice

- 1 A new spring is 9.0 cm long. You pull it, and it is now 12.5 cm long.
- (a) Calculate the extension.
- (b) You now pull it harder, and make it 15.0 cm long. What is the extension now?
- (c) When you let it go, it is now 9.0 cm long. Was the stretch elastic?

- 2 A museum worker takes the spring out of an old clock and pulls it. The table shows the length of the spring when pulled with different forces.

Force (N)	0	0.1	0.2	0.3	0.4	0.5
Length (cm)	3.5	3.7	3.9	4.1		4.5
Extension (cm)		0.2				



- (a) How long was the spring before they stretched it?
- (b) Fill in the missing length.
- (c) Fill in the row with the extensions.
- (d) What is the extension for a force of 1 N if the pattern continues?
- (e) How much extra force is needed to make it 1 cm longer?

A spring constant of 6 N/cm means that it takes 6 N to make the spring 1 cm longer.

- 3 A spring has a 6 N/cm spring constant.
- (a) How much force is needed to stretch it 5 cm? Use the equation

$$\begin{array}{rclclcl} \text{force (N)} & = & \text{spring constant (N/cm)} & \times & \text{extension (cm)} \\ \boxed{} & = & \boxed{6} & \times & \boxed{5} \end{array}$$

- (b) How much force is needed to stretch it 2.5 cm? Use the equation

$$\begin{array}{rclclcl} \text{force (N)} & = & \text{spring constant (N/cm)} & \times & \text{extension (cm)} \\ \boxed{} & = & \boxed{6} & \times & \boxed{2.5} \end{array}$$

4 A spring gets 2 cm longer each time the force is made 10 N larger.

(a) Complete the equation: force (in newtons) = \times extension (in cm).

(b) Use your equation to calculate the force needed to make the spring 7 cm longer.

5 A spring has a 20 N/cm spring constant.

(a) How far will a 120 N force stretch it? Use the equation

$$\begin{array}{ccccc} \text{force (N)} & = & \text{spring constant (N/cm)} & \times & \text{extension (cm)} \\ \boxed{120} & = & \boxed{20} & \times & \boxed{} \end{array}$$

(b) How far will a 70 N force stretch it? Use the equation

$$\begin{array}{ccccc} \text{force (N)} & = & \text{spring constant (N/cm)} & \times & \text{extension (cm)} \\ \boxed{70} & = & \boxed{20} & \times & \boxed{} \end{array}$$

6 A spring gets 1.5 cm longer when stretched by a 90 N force.

(a) Force to stretch it by 1 cm = \div = newtons.

(b) Complete the sentence: The spring constant (in N/cm) is .

(c) A different spring gets 1.2 cm longer when pulled with a 60 N force. Work out the spring constant using an equation.

$$\begin{array}{ccccc} \text{force (N)} & = & \text{spring constant (N/cm)} & \times & \text{extension (cm)} \\ \boxed{60} & = & \boxed{} & \times & \boxed{1.2} \end{array}$$

7 A spring gets 6.0 cm longer each time the force goes up by 2.0 N.

Calculate the extension for forces of

(a) 4.0 N

(b) 1.0 N

(c) 0.05 N

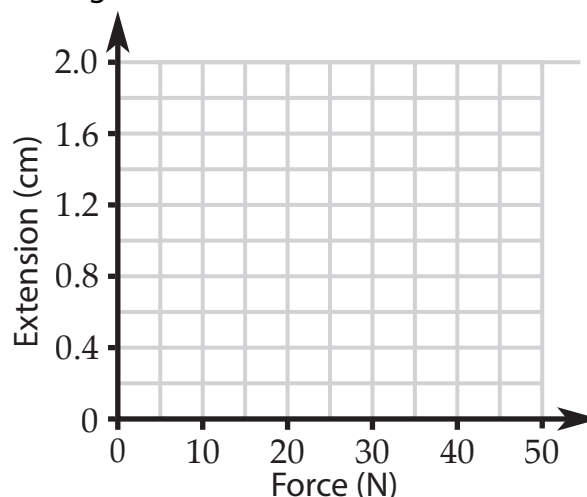
8 Each time you stretch a spring with an extra 1 N of force it gets the _____ amount longer as long as you are below the _____.

If you plot a graph of the force against the _____, the _____ will be _____. A spring behaving like this obeys _____ Law.

Fill in the blanks using the words **best fit line**, **straight**, **curved**, **limit of proportionality**, **length**, **extension**, **same**, **Hooke's**, **Newton's**, **Snell's** and **elastic**. Not all words are used.

- 9 The extension of a spring for different forces is given in the table.

Force (N)	Extension (cm)
0	0.0
10	0.20
25	0.50
35	0.70
40	1.45
50	1.89



- (a) Plot a graph of the data. Add a best fit line to your points.
- (b) Label the limit of proportionality on your graph.
- (c) Is the spring obeying Hooke's law with a 45 N force?
- (d) When the spring obeys Hooke's law, how much longer does the spring get for each extra newton of force?

-
- 10 Complete the word equations using **force**, **extension** and **spring constant**.

(a) spring constant = (b) extension = (c) force =

-
- 11 Use the equation, or your understanding of springs, to answer these questions.

- (a) Calculate the spring constant if a 64 N force causes a 4.0 cm extension.
- (b) Calculate the force needed to extend a $k = 120$ N/cm spring by 2.5 cm.
- (c) Calculate the extension when a 550 N force stretches a $k = 125$ N/cm spring.

-
- 12 A spring has a constant $k = 2.4$ N/cm. When new and unstretched, it is 8.0 cm long. It obeys Hooke's law providing the force is less than 10.8 N.

- (a) What will be the new **length** with a force of 3.6 N?
- (b) What is the extension at the limit of proportionality?
- (c) If you stretch the spring until it is 12.0 cm long, will it still obey Hooke's law?