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?

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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 ___ 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

force (N)	=	spring constant (N/cm)	×	extension (cm)
	=	6	×	_

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

force (N)	=	spring constant (N/cm)	×	extension (cm)
	=	6	×	___

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

(a) Complete the equation: force (in newtons) = ☐ × extension (in cm).

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

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

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

force (N)	=	spring constant (N/cm)	×	extension (cm)
☐	=	20	×	☐

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

force (N)	=	spring constant (N/cm)	×	extension (cm)
☐	=	20	×	☐

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

(a) Force to stretch it by 1 cm = ☐ ÷ ☐ = ☐ 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.

force (N)	=	spring constant (N/cm)	×	extension (cm)
☐	=	☐	×	1.2

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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

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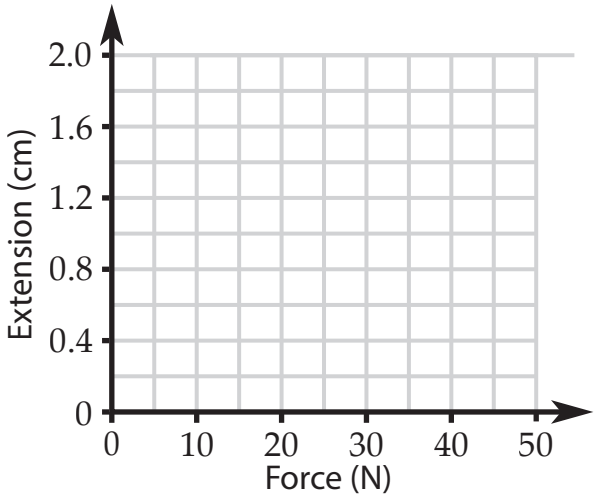
8 Each time you stretch a spring with an extra 1 N of force it gets the _____ amount longer as long as you are below the _____.
If you plot a graph of the force against the _____, the _____ will be _____. A spring behaving like this obeys _____ Law.
Fill in the blanks using the words **best fit line**, **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?

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

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

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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.

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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?