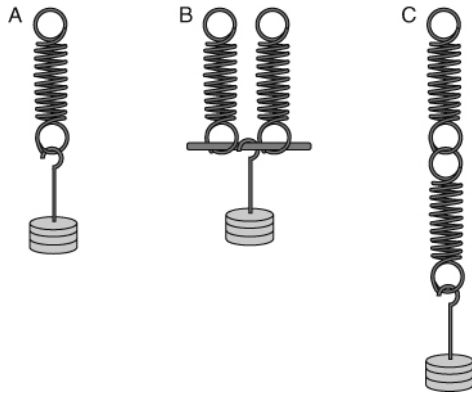


Some students investigate the extension of the different combinations of springs shown below. All the springs are identical. The table shows their results.



Spring arrangement	Extension with a 10 N force (cm)
A	5
B	2.5
C	10

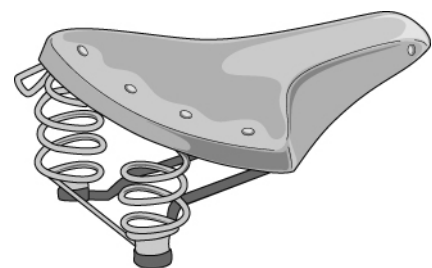
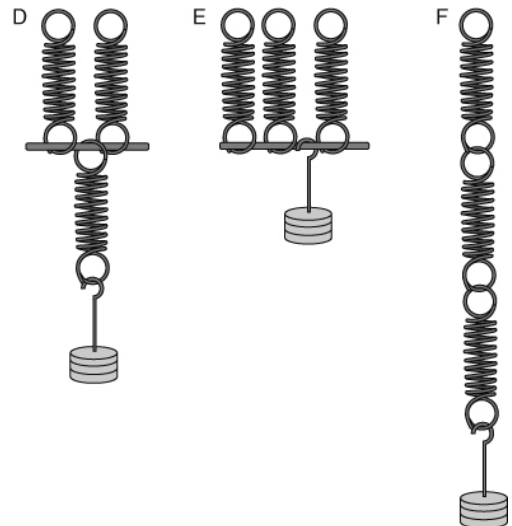
The extension of B is half the extension of A, because the 10 N force is shared between the two springs. Each spring stretches as far as it would if it had only a 5 N force on it.

The extension of C is twice the extension of A because the same force is being applied to both springs. The bottom spring stretches because of the weight of the masses hanging on it. The top spring stretches because it is being pulled downwards by the bottom spring. The 10 N force causes both springs to stretch by 5 cm, so the total extension is 10 cm.

- 1 A 20 N force is applied to the spring arrangements in A, B and C. Explain what the extension will be for each arrangement.

Three more arrangements of springs are shown on the right. All the springs in arrangements A to F are identical.

- 2 What will the extension of arrangement D be when a 10 N weight hangs on it? Explain your answer.
- 3 A spring is made of the same material as spring A and is made in the same way, except that it is twice as long. Suggest what its extension will be when a 10 N weight hangs on it.
- 4 a Explain what the extensions of arrangements E and F will be when a 30 N force is applied.
b What assumption have you made in your answer to part a?
- 5 The bottom drawing on the right shows a bicycle saddle with two springs.
a Suggest why the springs are used.
b A manufacturer wants to replace the springs shown with a single spring. Explain how the springs would have to be changed to provide the same performance for cyclists using the saddle.



I can...

- use my knowledge of springs in new contexts.