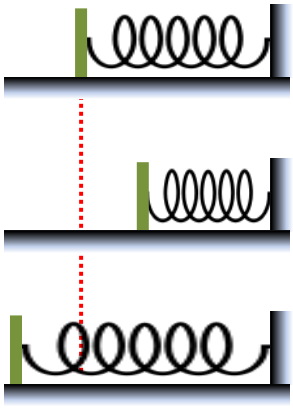
SPRING FORCE

● When you push/pull against a spring with F_A, the spring pushes back (Newton's _____ Law):

$F_S = -F_A =$ _____



- **x =** _____ (_____ or _____).

  - NOT the spring's length, but its **change** → **x =** _____.

- **k** is the spring's _____ (Units: _____)

  - How _____ the spring is. Higher **k** → _____ to deform.

- F_S is a _____ force, always opposite to deformation (____)

  - Always pulling spring back to its original length (**x =** ____).

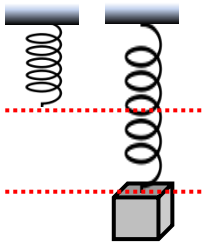
EXAMPLE 1: A 1.0 m-long spring is laid horizontally with one of its ends fixed. When you pull on it with 50 N, it stretches to 1.2 m. **(a)** What is the spring's force constant? **(b)** How much force is needed to compress it to 0.7 m?

● If you attach a mass to a vertical spring, and let the mass come down slowly:

- Its weight will stretch the spring, until they reach _____:

_____ = _____

- This also applies to a mass on top of a spring, slowly compressing it.



PRACTICE 1: A vertical spring is originally 60 cm long. When you attach a 5 kg object to it, the spring stretches to 70 cm. **(a)** Find the force constant on the spring. **(b)** You now attach an additional 10 kg to the spring. Find its new length.