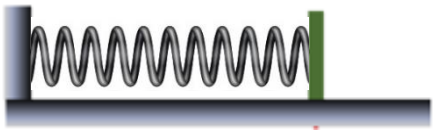
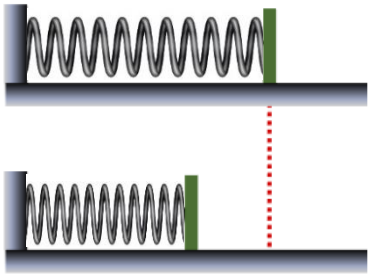
CONCEPT: Hooke's Law & Springs

● When you push/pull against a spring (F_A), spring pushes back in the _____ direction. (Action-Reaction!)

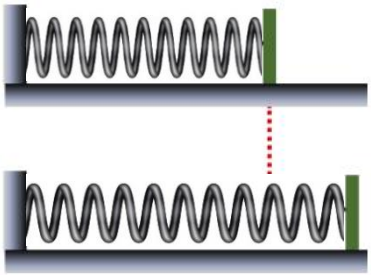


$F_S = -F_A =$ _____ → $|F_s| = |F_A| =$ _____

Ex. 1: You push on a spring with a force of 120N. The spring constant k is 20. How much does it compress?



Ex. 2: How much force is required to pull a spring of length 10m out to 16m, if the spring constant k is 40N/m?



● **x = D**_____

- Relaxed position → _____ (x = ___)
- **NOT** the spring's length → (x = _____)

● **k =** spring's force constant

- Measures how _____ the spring is.
- Higher **k** → _____ to deform
  - Ex. 1: **x** = **k** = **F** =
  - Ex. 2: **x** = **k** = **F** =
- Units of **k**: _____

● F_S **= R**_____ force, always opposes deformation

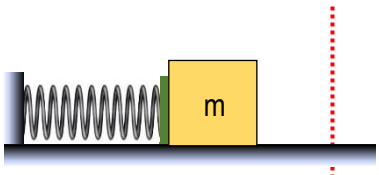
PRACTICE**:** A 1**.**0 m-long spring is laid horizontally with one of its ends fixed**.** When you pull on it with 50 N, it stretches to 1**.**2 m**. (a)** What is the spring's force constant? **(b)** How much force is needed to compress it to 0**.**7 m?

CONCEPT: Spring Forces

● If you attach a mass to a spring (mass-spring system) and release, the _____ force pulls it back to equilibrium.

- The "m" always refers to the mass of the _____ → (springs are always massless!)

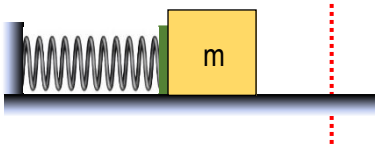
- Compressed**:**



ΣF = ma

→ a = _____

- Released**:**



ΣF = ma

→ a = _____

EXAMPLE 1**:** A 0.60-kg block attached to a spring with force constant 15 N/m. The block is released from rest when the spring is stretched 0.2 m**.** At the instant the block is released, find **(a)** the force on the block and **(b)** its acceleration**.**

PRACTICE**:** You push a 3-kg mass against a spring and release it from rest**.** Its maximum acceleration is 10m/s^2 when pushed back 0.5m**.** What is the **(a)** spring constant and the **(b)** restoring force at this point?