Hooke’s Law: physics of springs

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What do you know about the behavior of springs? What are the important properties of springs? (open discussion)

Consider a spring, one end firmly attached to a wall, and the other of object of mass m that is free to move.

Under what conditions will the spring act on the mass?

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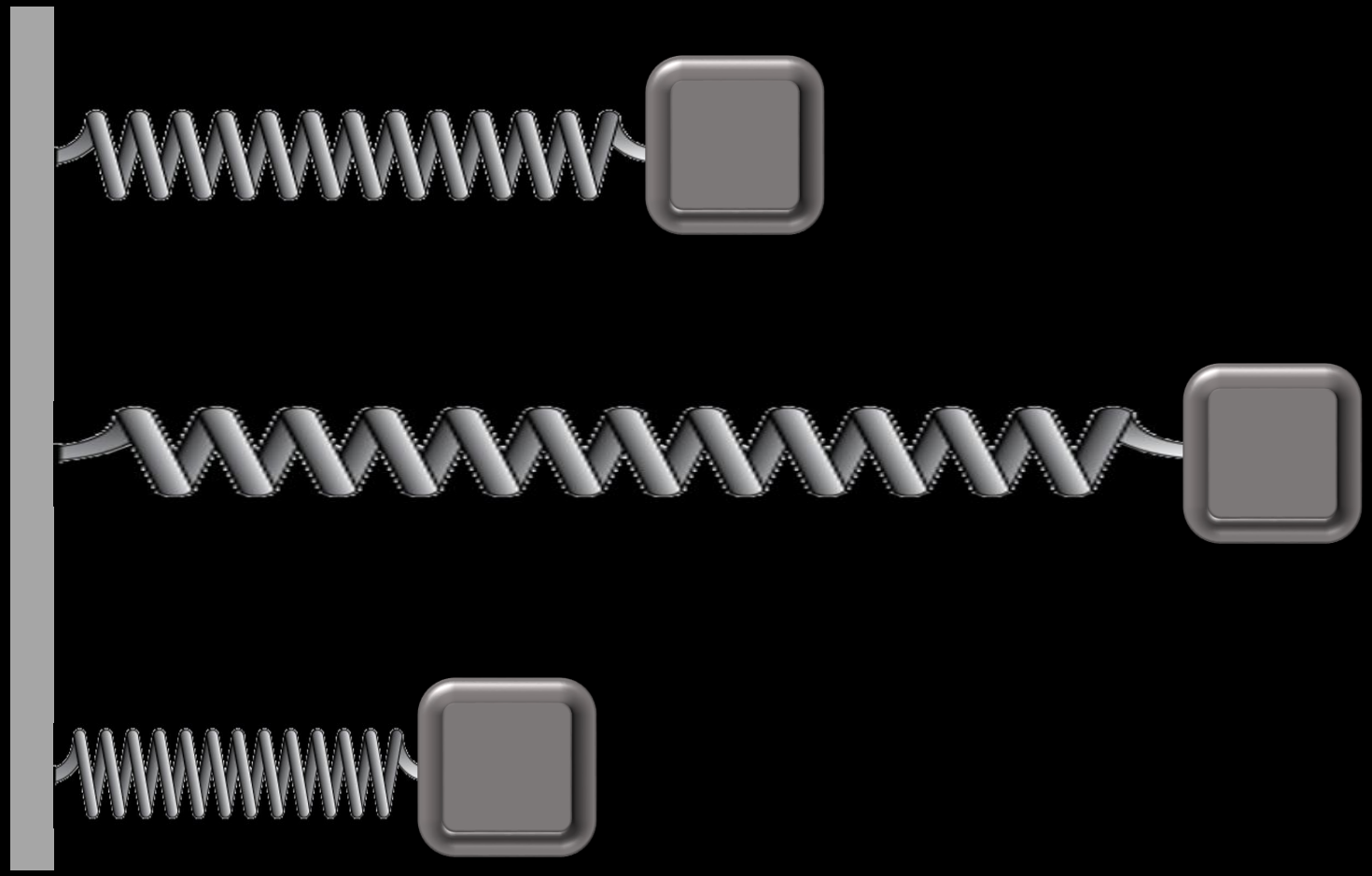

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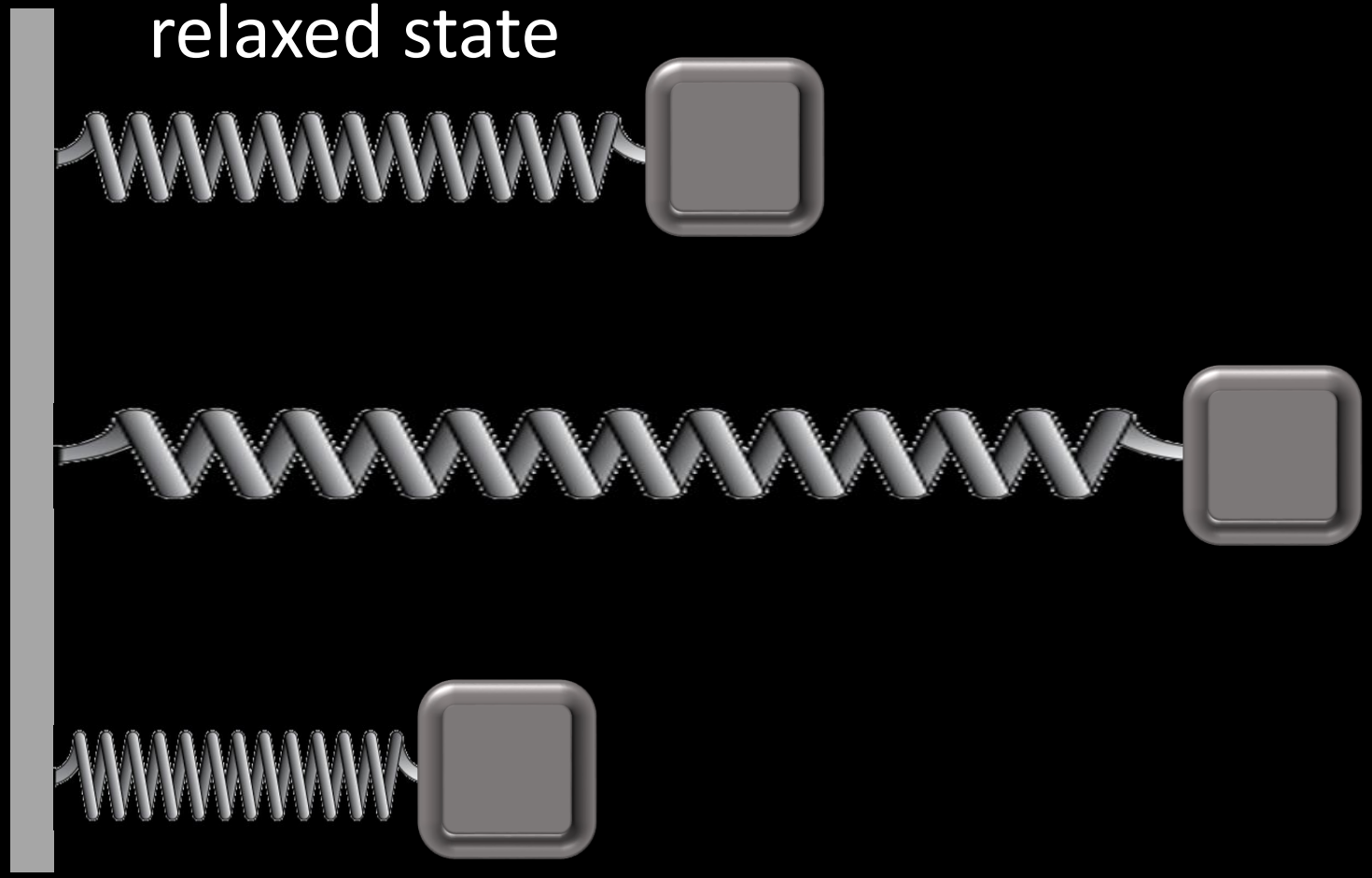

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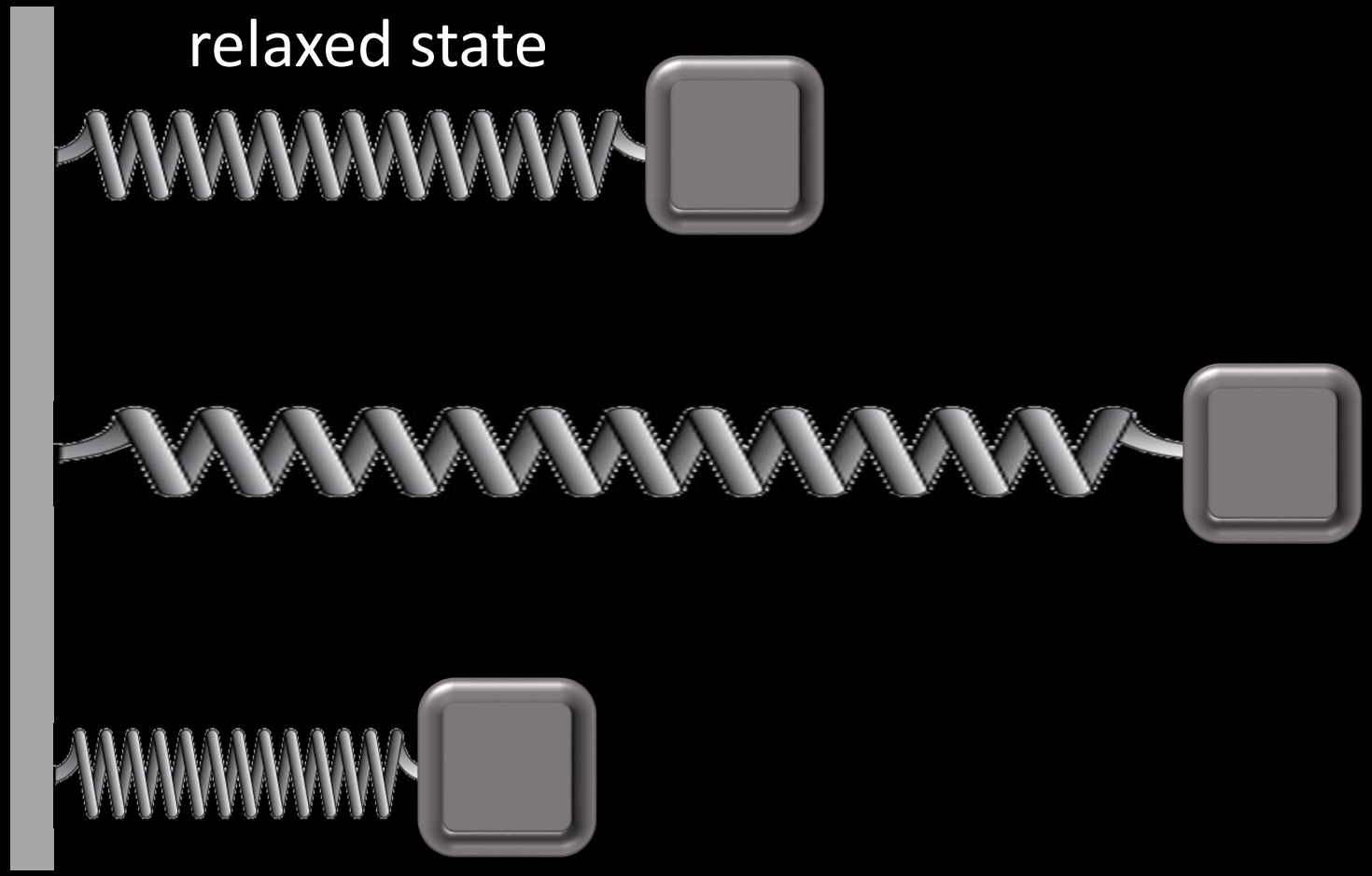
For the 3 situations below, where applicable, draw vector arrows to show the force on the mass from the spring.



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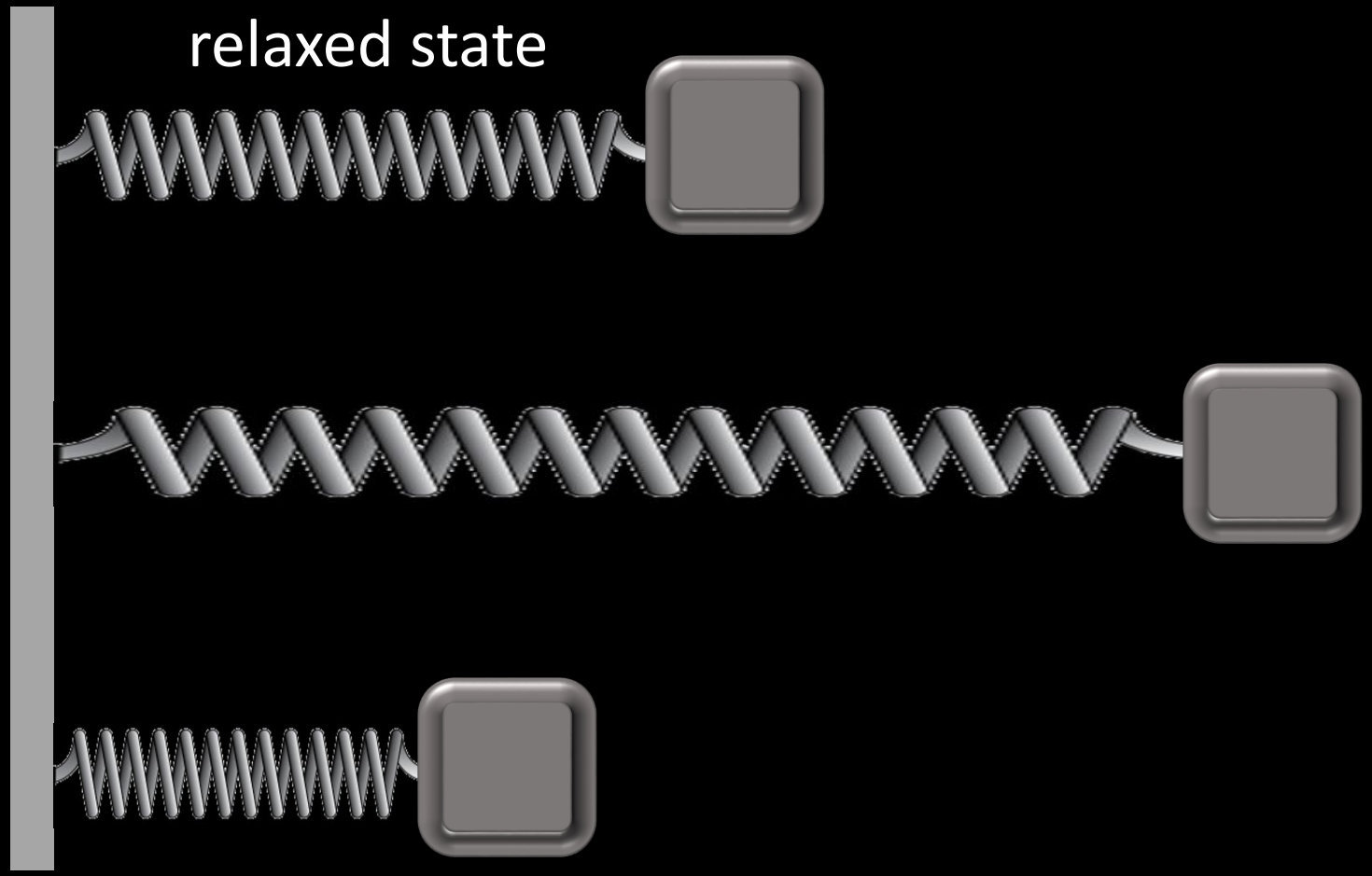

Explain how you chose the direction, and relative sizes of your force vectors.

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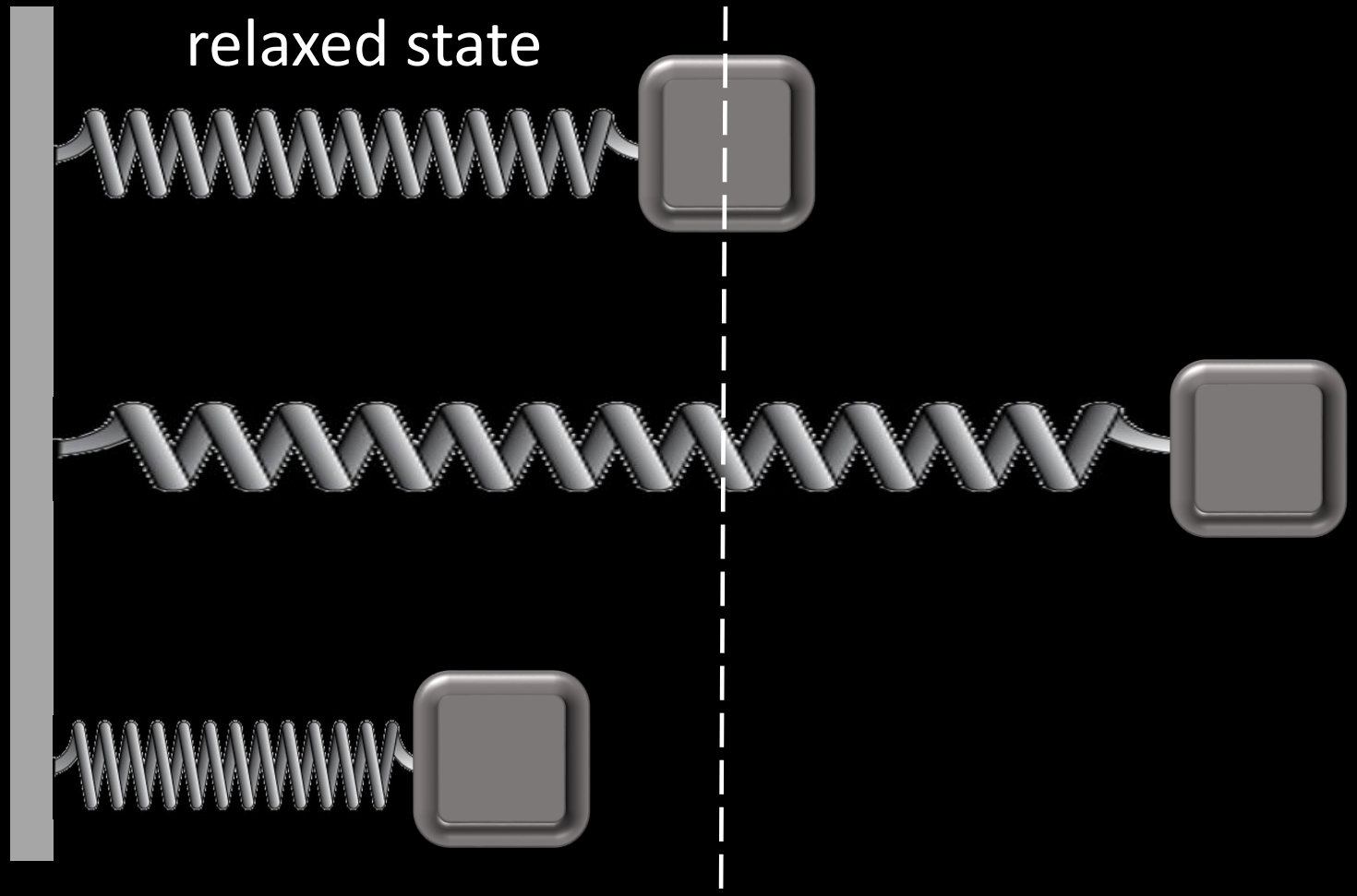
Now draw the displacement vectors for each mass.



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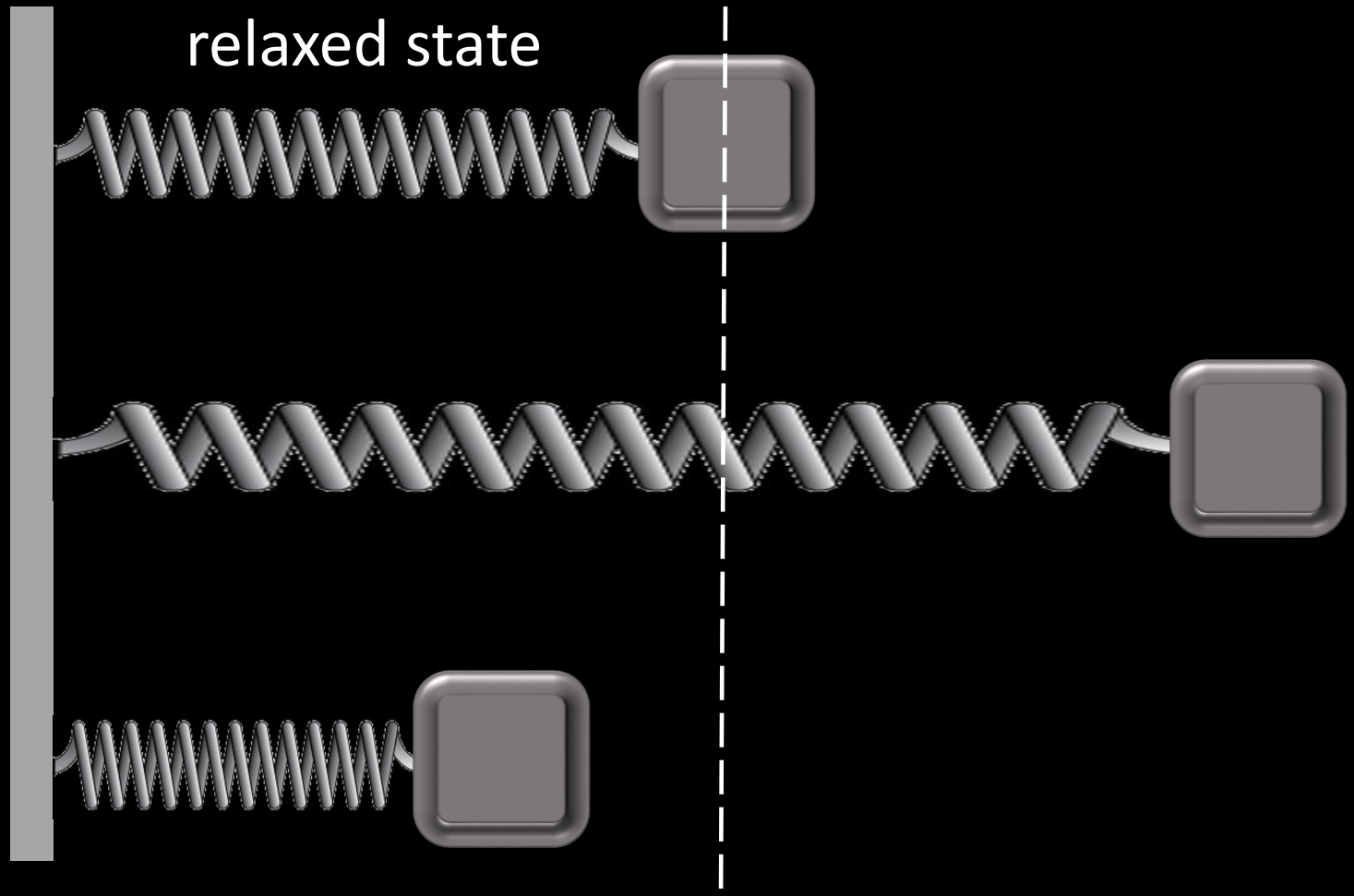

What is the relationship between the force vector and the displacement vector?

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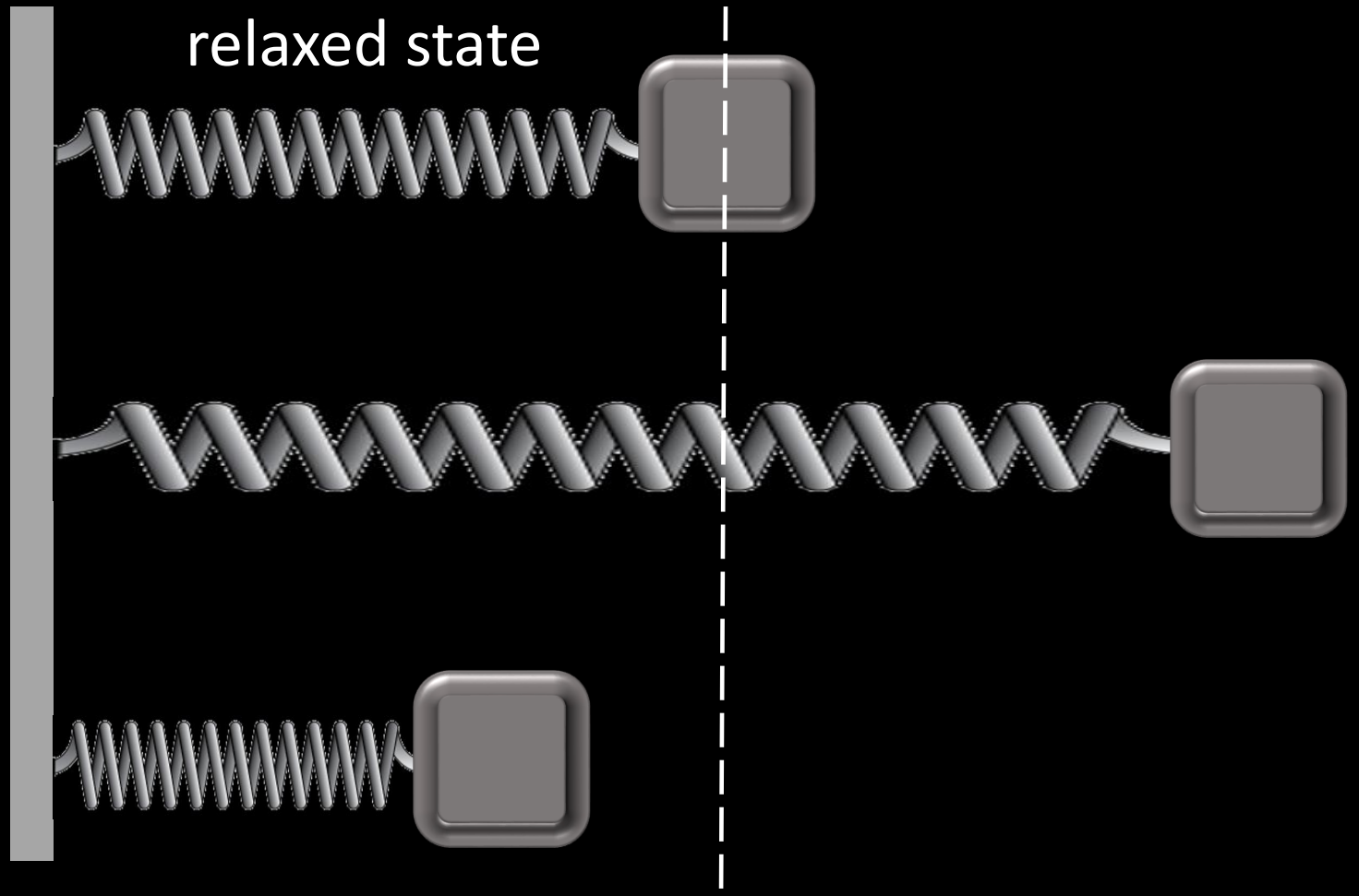

Examine a mass on a spring on the workbench.

Set the system into motion and describe what you see.

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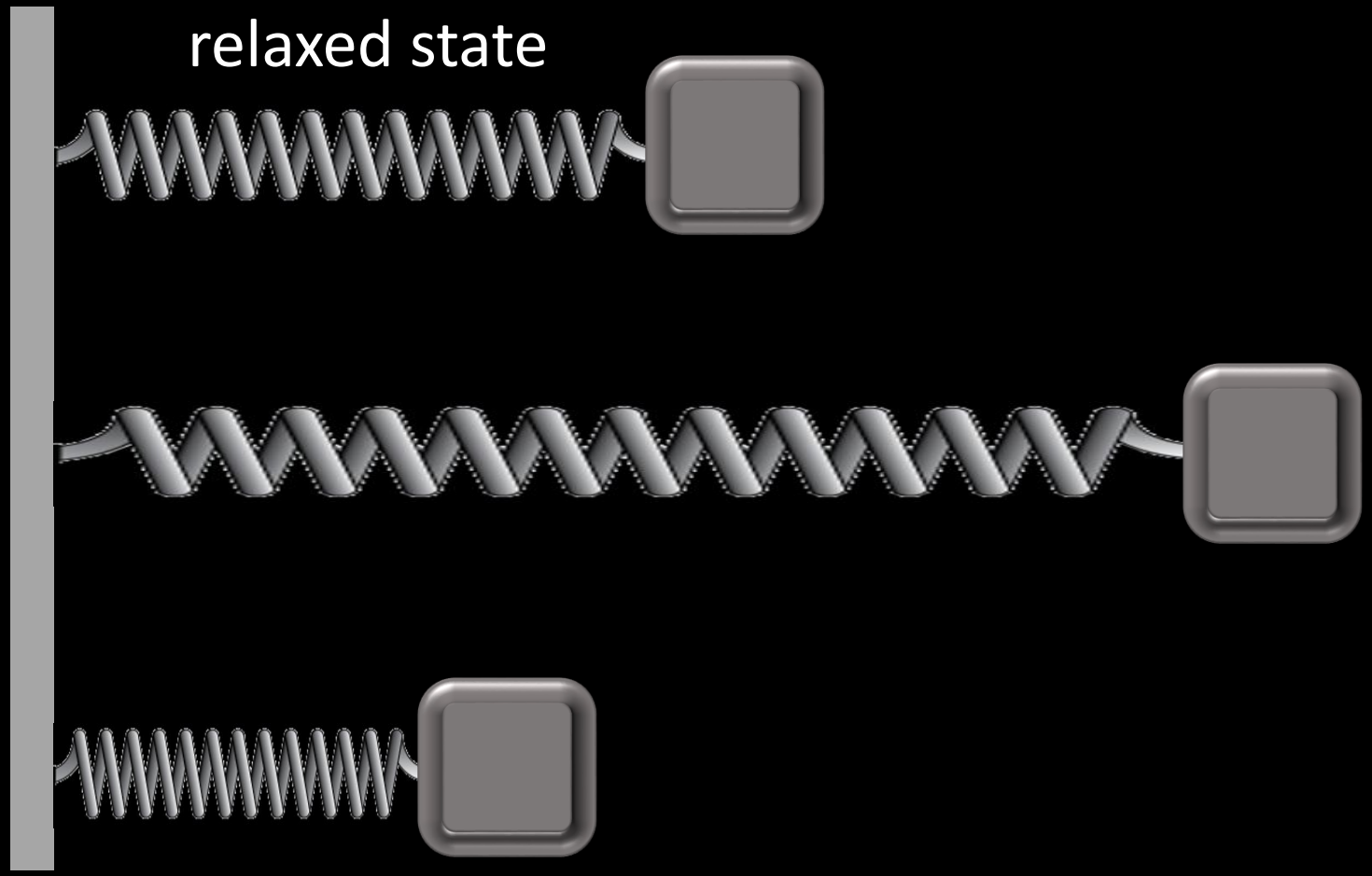
Enable the spring force vector arrows for the mass.

Move the mass and check to see if the force arrows you drew match the simulation.



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Create a graph of force magnitude v. displacement magnitude.

Move the mass along the horizontal direction and take a few data points.

Once you have a few data points, describe a mathematical relationship for Force F as a function of displacement x. F(x)= ?

Hooke’s Law: physics of springs

$F(x)= -kx$

$F(x) = -kx$

k = spring constant. What are the units on k?

A. kg/m
B. N/m2
C. N/m
D. Nm
E. m/N

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Quick Discussion:

In your own words- what property of the spring does k describe?

$F(x)= -kx$

A spring is measured to have a very large spring constant, k = 10,000 N/m. Which statement best describes this spring?

A. the spring is easy to stretch like a slinky toy
B. the spring could be used like a bungee cable
C. the spring is very stiff and hard to compress
D. the spring is flexible like a noodle

More to come—

$F(x) = -kx$

Build and second mass on a spring. Open the spring force menu and decrease the spring constant by a factor of 2 and compare to the first mass and spring.