13.6: Thinking about the material

13.6.1: Reflect and research

1. What is an example of a system that is a simple harmonic oscillator (not covered in this this chapter)? What is the restoring force for that system?
2. What happens to the motion of a mass-spring system in the presence of friction? Sketch out the position as a function of time.
3. What is a “damped” harmonic oscillator?
4. What is a coupled oscillator? Find a video of a coupled oscillator online and describe the motion.
5. How do the shock absorbers on a car relate to simple harmonic motion?

13.6.2: To try at home

1. Compare values of θ and $\sin\theta$ to see when the small angle approximation holds. Does it matter if θ is expressed in radians?
2. Build a simple pendulum and describe the motion. Is it simple harmonic motion? Is it damped simple harmonic motion? Does the frequency depend on the length of the pendulum as expected?

13.6.3: To try in the lab

1. Theory lab: what is the function $x(t)$ if there is a frictional force, proportional to velocity, $-bv$, exerted on the spring mass system?
2. Propose an experiment to test whether the period of the motion of pendulum depends on the amplitude of the motion.
3. Propose an experiment to test whether a physical pendulum is well-described by simple harmonic motion.

Propose an experiment which measures the gravitational constant (G) using a torsion pendulum.