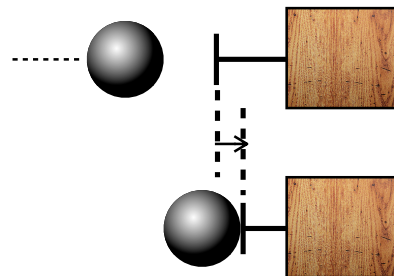


PHYZ SPRINGBOARD: KINETIC ENERGY



A nail is partially driven into a block of wood. An iron ball is thrown at the nail, driving the nail some depth into the wood. Without changing any characteristics of the wood or nail, how could a thrown iron ball drive the nail deeper into the wood?



1. Factor 1

a. One way a thrown iron ball could drive the nail even deeper into the wood is if...

b. So the drive depth is (___directly ___inversely) proportional to...

c. In symbols, $D \propto$

2. Factor 2

a. Another way a thrown iron ball could drive the nail even deeper into the wood is if...

b. So the drive depth is (___directly ___inversely) proportional to...

c. In symbols, $D \propto$

3. Experimental Finding

a. Consider the following evidence.

Doubling the _____ doubles the drive depth.

Doubling the _____ quadruples the drive depth;
tripling it increases the drive depth by a factor of nine.

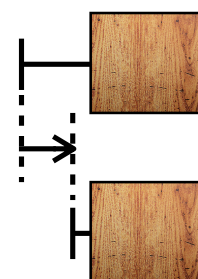
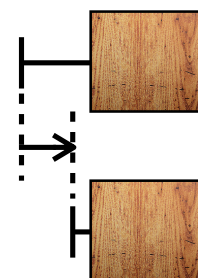
b. So the drive depth is **actually** (___directly ___inversely) proportional to...

c. Correct the corresponding symbol proportionality above.

4. The extent to which a thrown ball can drive in a nail is called its kinetic energy.

a. What determines a body's kinetic energy?

b. Write a proportionality for kinetic energy: $KE \propto$



5. Suppose a body with a mass m and a speed v had a kinetic energy KE . The questions below refer to changes in kinetic energy that result from changing the mass and/or speed of the body. To make these questions easy to answer, rewrite the expression above as an **equation** using 1's for all the variables.

What would be the kinetic energy of a body with

a. a mass of $2m$ and a speed v ?

b. a mass of m and a speed of $2v$?

c. a mass of $2m$ and a speed of $2v$?

d. a mass of $2m$ and a speed of $v/2$?

6. Suppose a body with a mass m and a speed v had a kinetic energy KE .

a. What would be the mass of a body with a speed of v and a kinetic energy of $2KE$?

b. What would be the speed of a body with a mass of m and a kinetic energy of $4KE$?

c. What would be the speed of a body with a mass of m and a kinetic energy of $2KE$?

7. The actual equation relating kinetic energy to mass and speed is $KE = \frac{1}{2}mv^2$. The $\frac{1}{2}$ is simply a constant of proportionality. It doesn't change any of the findings above! If the mass of a body is 1.5 kg and its speed is 8.7 m/s,

a. select the correct value for the kinetic energy of the body from the choices below,

__i. 9.8 J

__ii. 13.1 J

__iii. 57 J

__iv. 113 J

b. Identify the mistake made in the calculation of each incorrect choice. Describe it in the space below each incorrect choice.