**HIT THE BALL!**

We all agree that moving objects have energy. How much energy they have depends upon their mass in kilograms and their velocity in meters per second. How can you find out how much energy a moving object has?

Scientists have learned that the Kinetic energy of an object can be calculated by using the following equation:

**KE = ½ m v²** or **KE = (m v v) ÷ 2**

This equation says that the kinetic energy can be calculated by multiplying one half the mass of the object by the square of it’s velocity. (The square of a number is the product of multiplying that number by itself) Read the following example in order to understand how this equation works.

*Suppose the mass of a golf club is 0.6 kilograms. Suppose the club is traveling 2.0 meters per second. What is the club’s Kinetic energy?*

*1. First write down what you know:*

***m = mass = 0.6 kg.***

***v = velocity = 2.0 m/sec***

*2. Next write the equation for Kinetic energy:*

|  |  |
| --- | --- |
| *1. First write down what you know:* | ***m = mass = 0.6 kg.***  ***v = velocity = 2.0 m/sec*** |
| *2. Next write the equation for Kinetic energy:* | **KE = (m v v) ÷ 2** |
| *3. Then put the numbers from step 1 into the equation and perform the calculation:* | *KE = (m v v)÷2*  *KE = 0.6 ∙ 2.0 ∙ 2.0 ÷2*  *KE = 2.4 ÷ 2*  *KE = 1.2 Joules* |

Your Turn: Suppose the mass of a golf club had been 0.8 kilograms. Suppose the velocity of the golf club had been 3.0 meters/second. What would be the club’s Kinetic energy?

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Now you know how to use the equation to calculate kinetic energy. You are ready to find which variable is more important to the kinetic energy of an object - mass or velocity.

Babe Ruth and Hank Aaron were famous baseball players. Both were well known for their batting skills. Suppose the figures in Table 1 below were correct.

TABLE 1

|  |  |
| --- | --- |
| Babe Ruth | Hank Aaron |
| Mass of bat = 1.12 kg | Mass of bat = 0.84 kg. |
| Speed bat was swung =  15.0 meters/sec. | Speed bat was swung =  16.0 meters/sec. |

2. Whose bat had more kinetic energy? (calculate the KE of both baseball players swinging a bat)

3. If all the kinetic energy of a bat were transferred to a baseball, who could hit the ball farther – Hank Aaron or Babe Ruth?

4. Do the calculations you’ve made so far tell you which - mass or velocity - is more important to kinetic energy?

*You may still be having trouble deciding which is more important to kinetic energy - mass or velocity. Let’s play with the data in Table 1 to find out for sure.*

5. Suppose the mass of Hank Aaron’s bat was cut to 0.42 kg. but he still swung at the same velocity (16 m/sec.) What would be the kinetic energy of the swinging bat?

6. What would be the energy of Hank Aaron’s bat if it’s mass were kept at 0.84 kg. but he swung the bat at 8 m/sec?

7. Which contributes more to the kinetic energy of the bat - its mass or its velocity?

Now that you have done this excursion, you are ready to put its big idea to practical use. Suppose you were going to play table tennis or ping pong and you wanted to produce the greatest amount of kinetic energy possible and you had the choice of two paddles. Take a look at Table 2 and decide which paddle you would choose.

|  |  |
| --- | --- |
| Paddle 1 | Paddle 2 |
| Mass = 0.5 kg. | Mass = 1.0 kg. |
| Speed of swing = 0.30 m/s | Speed of swing = 0.15 m/s |

TABLE 2

8. Which paddle would you choose to increase the amount of kinetic energy transferred from the paddle to the ball? Use your calculations to justify your answer.