**Rascal and HiJinks Rockets Activity** (if used with the parachute)

|  |  |
| --- | --- |
| **Subject Areas** | Physics and Physical Science |
| **Grade Level(s)** | 7th to 12th grade |
| **Learning Objective(s)** | 1. Apply Newton’s second and third laws to real life examples 2. Draw free body diagrams for objects in free fall 3. Calculate the terminal velocity of an object in free fall 4. Calculate the magnitude of the drag force of an object in free fall |

1. **Vocabulary Activity. Go to dictionary.com and look for the definition of the following words. Then, write a sentence with the word.**

|  |  |
| --- | --- |
| **Vocabulary word** | **Definition** |
| **Newton’s second law** |  |
| **Newton’s third law** |  |
| **Vector** |  |
| **Force** |  |
| **Acceleration** |  |
| **Drag force** |  |
| **Parachute** |  |
| **Free fall** |  |
| **Free fall acceleration** |  |
| **Terminal velocity** |  |
| **Free body diagrams** |  |

**\* After students complete the vocabulary activity, EOW representatives can explain how rockets work and how NASA recovers the spacecraft after a mission.**

1. **Reflection Questions.**
2. What is the function of a parachute?

|  |
| --- |
|  |

1. If the area of the parachute is increased, how would it affect the drag force?

|  |
| --- |
|  |

1. How can skydivers increase or decrease their terminal velocity?

|  |
| --- |
|  |

**3. Free Body Diagram ( Rocket and parachute in free fall). EOW representatives will help students identify the forces acting on the rocket.**

****

**4. Calculating the drag force and terminal velocity (EOW representatives will launch the rockets and students can record the data needed. The first rocket launched will have no parachute)**

**Mathematical expressions needed.**

****

****

**This activity can be used to discuss how mathematical expressions are manipulated in the engineering field in order to improve the efficiency of the processes.**

**Isolating Fd from the equation given**

|  |
| --- |
|  |

**Table 1 . Drag Force**

|  |  |  |  |
| --- | --- | --- | --- |
| **Rockets (trials)** | **Flying time(s)** | **Terminal Velocity ( m/s)** | **Drag Force (Newtons)** |
| **1 ( without parachute)** |  | 9.8 m/s² . \_\_\_\_\_\_\_\_ = |  |
| **2** |  | 9.8 m/s² . \_\_\_\_\_\_\_\_ = |  |
| **3** |  | 9.8 m/s² . \_\_\_\_\_\_\_\_ = |  |

**4. Conclusion Questions**

1. What was your observation after the parachute was added to the rocket?

|  |
| --- |
|  |

1. What do you think will happen if the area of the parachute is increased?

|  |
| --- |
|  |

1. Was the activity helpful? What did you learn during the demonstration?

|  |
| --- |
|  |