

What a Drag! Activity – Worksheet

Activity Instructions

1. Cut out the four shapes: small cube, large cube, small cone and large cone.
2. Add clay to the bottom of each shape so that they are all the same mass.
3. Each object has a mass of: _____.
4. Select one person to stand on a chair and drop the objects from a height of 2 meters. Record how long it takes each shape to fall the same distance. Each time, be sure to drop the cones with the pointy side facing down! Do three trials for each shape. Calculate the average time to fall for each shape (add all three times and divide by three).

Object	Mass	Attempt	Time to fall (seconds)	Average Time
Small Cube		1		
Small Cube		2		
Small Cube		3		
Large Cube		1		
Large Cube		2		
Large Cube		3		
Small Cone		1		
Small Cone		2		
Small Cone		3		
Large Cone		1		
Large Cone		2		
Large Cone		3		

5. Fill in the table below using the average times each group calculated for their large cubes.

Object	Mass (grams)	Average Time (seconds)
Large Cube	10	
Large Cube	20	
Large Cube	30	
Large Cube	40	

6. Did mass affect how long each shape took to fall? Use data to back up your answer.

7. Make a bar graph showing the different shapes on the horizontal axis and the average dropping times on the vertical axis. Be sure to clearly label your axes!

8. Which object fell the fastest? Why?

9. Which object fell the slowest? Why?

10. What is drag (in your own words)?

Challenge Question

The equation for drag is:

$$F_D = \frac{1}{2} \rho v^2 C_D A$$

where F_D = force of drag, C_D = drag coefficient, ρ = density of the fluid (in this instance, air), v = velocity of the object relative to the fluid, and A = area of the object (facing its direction of motion).

After opening her parachute and obtaining a constant velocity, a parachutist has a velocity of 3 m/sec. The density of the air is 0.95 kg/m^3 , the drag coefficient of the parachute is 0.75, and the total area of the parachute is 58 m^2 . What is the drag force?