

## Egg Drop Interactive

**Background:** This Interactive involves observing the results of dropping an egg onto a surface. The size of the egg, the height from which it is dropped, and the characteristics of the landing surface can be varied. The effect of these variations upon the safety of the egg will be examined. The Interactive is based on the impulse-momentum change theorem. The questions below target a Interactive ability to reason scientifically.

### Questions:

1. When a **small egg** is dropped onto the piece of **1-inch foam**, from which height did the egg break entirely? Select all that apply.
  - a. When dropped from 1 meter.
  - b. When dropped from 5 meters.
  - c. When dropped from 10 meters.
  - d. Nonsense! The small egg never broke when dropped onto 1-inch foam.
2. When a **small egg** is dropped onto the piece of **1-inch foam**, from which height did the egg fracture but not break? Select all that apply.
  - a. When dropped from 1 meter.
  - b. When dropped from 5 meters.
  - c. When dropped from 10 meters.
  - d. Nonsense! The small egg never fractured when dropped onto 1-inch foam.
3. When a **large egg** is dropped from a height of **10 meters**, upon which landing surface did the egg break entirely? Select all that apply.
  - a. When landing on the hard floor.
  - b. When landing on the 1-inch piece of foam.
  - c. When landing in the box filled with foam pieces.
  - d. Nonsense! The large egg never broke when dropped onto any of the landing surfaces from a height of 10 meters.
4. How do the three surfaces compare in terms of providing the egg with a safe landing? Which ordering below ranks the three surfaces from least safe to most safe?
  - a. hard floor < foam box < 1-inch foam
  - b. hard floor < 1-inch foam < foam box
  - c. foam box < 1-inch foam < hard floor
  - d. 1-inch foam < foam box < hard floor
  - e. None of these orderings are correct.
5. Which statement describes the effect of increasing drop height upon the force encountered by the egg when colliding with the surface?
  - a. The force is directly related to the drop height.
  - b. The force is inversely related to the drop height.
  - c. The force is not affected by the drop height.
  - d. It is not possible to tell the effect of drop height on the force.

6. Trials with which two sets of experimental conditions would allow an experimenter to determine the effect of increasing drop height upon the force experienced by the egg? Select two.
- a. **size:** large, **drop height:** 1 meter, **surface:** hard floor
  - b. **size:** large, **drop height:** 5 meters, **surface:** 1-inch foam
  - c. **size:** jumbo, **drop height:** 5 meters, **surface:** 1-inch foam
  - d. **size:** small, **drop height:** 10 meters, **surface:** foam box
  - e. **size:** large, **drop height:** 10 meters, **surface:** hard floor

7. Two trials were conducted with these conditions:

Small egg dropped from 5 m onto 1-inch foam.

Jumbo egg dropped from 5 m onto 1-inch foam.

What could be the purpose of these two trials?

- a. To determine if changing the egg size affects the drop height.
  - b. To determine how the landing surface affects the safety of the egg.
  - c. To determine the effect of mass of an egg upon the force it experiences.
  - d. To determine the effect of the drop height upon the force the egg experiences.
8. When a **jumbo egg** was dropped from **5 meters** onto a **1-inch foam surface**, it fractured. Which of the following changes in conditions would lead to a safe landing? Select all that would.
- a. Change the egg size to a large egg.
  - b. Change the drop height to 1 meter.
  - c. Change the drop height to 10 meters.
  - d. Change the landing surface to a hard floor.
  - e. Change the landing surface to a box of foam.
9. Which of the following variations would increase the force experienced by the egg upon landing? Select all that apply.
- a. Increase the mass of the egg.
  - b. Decrease the mass of the egg.
  - c. Increase the drop height.
  - d. Decrease the drop height.
  - e. Change the surface to a hard floor.
  - f. Change the surface to a box of foam.
10. When a **large egg** was dropped from **5 meters** onto a **1-inch foam surface**, it landed safely. Which changes in conditions would lead to a fractured or a broken egg? Select all that would.
- a. Change the egg size to **small**.
  - b. Change the egg size to **jumbo**.
  - c. Change the surface to a **hard floor**.
  - d. Change the surface to a **box of foam**.
  - e. Change the drop height to **1 meter**.
  - f. Change the drop height to **10 meters**.

11. Which set of experimental conditions would result in the least amount of force on the egg?
  - a. Drop a **small egg** from a height of **1 meter** into a **box of foam**.
  - b. Drop a **jumbo egg** from a height of **10 meters** on a **hard surface**.
  - c. Drop a **jumbo egg** from a height of **10 meters** onto **1-inch foam**.
  - d. Drop a **small egg** from a height of **1 meter** into a **box of foam**.
  - e. Drop a **small egg** from a height of **10 meter** into a **box of foam**.
  
12. Which set of experimental conditions would result in the most amount of force on the egg?
  - a. Drop a **small egg** from a height of **1 meter** on a **1-inch foam** surface.
  - b. Drop a **large egg** from a height of **5 meters** on a **hard floor**.
  - c. Drop a **small egg** from a height of **1 meter** on a **box of foam**.
  - d. Drop a **jumbo egg** from a height of **10 meter** on a **hard floor**.
  
13. What affect does doubling the mass of an egg have upon the force that the egg experience?
  - a. Doubling the mass makes the force twice as large.
  - b. Doubling the mass makes the force one-half as large.
  - c. Doubling the mass makes the force larger, but less than two times larger.
  - d. Doubling the mass seems to have no affect upon the force experienced by the egg.
  
14. Which one of the following questions cannot be answered by the **Egg Drop Interactive**?
  - a. What affect does rebounding have upon the safety of an egg as it lands?
  - b. What affect does the size of an egg have upon its impact force upon landing?
  - c. What affect does the nature of a surface have upon the impact force of an egg that lands upon it?
  - d. What affect does the height from which an egg falls have upon the velocity change it will encounter upon impact?