

# Bouncing Balls

## Instructor's Handout

### 1 Objective

This activity will help students understand some concepts in force, acceleration, and speed/velocity.

### 2 Materials

At least one bouncy ball, such as a superball or a tennis ball. If you want, you can bring more balls for the students to bounce themselves, but that's not critical.

### 3 Height

Bounce a superball many times in the front of the classroom. Ask the students to call out observations about the ball and its bouncing. Things to observe include:

- The ball's starting acceleration and speed are 0;
- The ball's acceleration and speed increase until the ball hits the ground and bounces;
- After the bounce, the ball returns to a maximum height that is less than the original height of the ball

Questions to ask:

- What forces are acting on the ball? (*Answer: gravity. friction, the normal force*)
- Where does the ball reach its maximum speed and acceleration? (*Answer: right before it hits the ground*)
- What is the acceleration of the ball when it is at its peak heights? (*Answer: Zero...it's about to change direction*)

### 4 Applications

#### 4.1 Tall Tower

What happens when you drop a bouncy ball off of a gigantic building, such as the Sears Tower in Chicago (440 m), or the new tallest building in the world, the Burj Khalifa in Dubai (500 m)? Well, some Australian scientists dropped a bouncy ball off of a tall radio tower. The ball actually shattered like glass on impact.

#### 4.2 Sports

What sports require knowledge of bouncing balls for their success? (*Tennis, cricket, racquetball, baseball, and basketball are a few*). How would understanding a bouncing ball help you be awesome at any of these sports?