CONTROLLING COLLISIONS

STUDENT WORKBOOK

ACCELERATE

ACTIVITY 1

GOLF BALL GLIMPSE

A golf ball is an object that is designed to take an impact from a golf club, which is often made of steel. What happens to a golf ball during a collision with steel?

1 SURPRISINGLY SQUISHY

A **collision** is an event in which two objects hit each other with a lot of force over a short amount of time.

This series of photos shows a collision between a golf ball and a steel plate. Pay close attention to how the ball looks when it hits the steel plate.

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THINK ABOUT IT!

1. What happened to the ball during the collision with the steel plate?

2. The photos show a real event, but there is a misleading video available on the internet that looks similar and has been widely shared. It shows what appears to be a golf ball becoming nearly flat when it hits a steel plate. But it's not a real golf ball; it's a foam ball that only looks like a golf ball.

a. Why might a foam ball behave differently during a collision than a real golf ball?

b. Have you ever seen a video that claims to show something science-related but is misleading or fake? What did you do? If you never have, what would you do?

c. What are some ways you can make sure a photo or video is "telling the truth"?

REFLECT

1. What experiences do you have with collisions? Remember, they can be between any two objects.

2. What are some ways that collisions can be different from each other?

STACKED BALL DROP

You've bounced a lot of different types of balls in this kit, but you haven't stacked them on top of each other yet! Find two balls that have different sizes (a basketball from home and the rubber ball from the kit would be ideal). With your teacher's help, go outside and find a spot to drop the balls from (if you can't find one, just drop them from eye level).

Place the smaller ball on top of the larger one and let go. Explore what happens when bouncing the balls stacked like this compared to what happens when bouncing the balls separately. The smaller ball should bounce much higher when stacked than it does by itself. That's because the rubber of the basketball acts like a spring, storing energy while it's in contact with the ground. It transfers that stored energy to the smaller ball, where it's converted to kinetic energy as the smaller ball rockets upward.

GLOSSARY

Collision – an event in which two objects hit each other with a lot of force over a short amount of time.

Constraints – the limitations on the design of an engineering solution.

Criteria – the requirements an engineered solution must fit to be successful.

Elastic collision – a collision in which the total kinetic energy of the colliding objects is conserved.

Elasticity – the measure of how "squishy" an object is, or its ability to deform and return to its original shape.

Energy – the ability to cause a change.

Energy transfer – the change from one type of energy to another.

Force-momentum relationship – the force of a collision is affected by the change in momentum and the time the two objects are touching.

Inelastic collision – a collision in which some of the total kinetic energy is changed to a different type of energy.

Kinetic energy – the energy of motion or movement of objects or particles.

Law of Conservation of Energy – energy cannot be destroyed or created, only changed into another type of energy.

Law of Conservation of Momentum – the total momentum is the same before and after a collision.

Momentum – the quantity of motion of an object, including its mass and velocity.

Potential energy – energy stored in the position or state of an object.

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