Nature of Forces Activity

**MATERIALS**: Metric ruler Masking Tape (for marking lines)

 Two Dimes Nickel Penny Quarter

Explain All Answers to Questions

You may be familiar with a tabletop game in which a flat disk floats on small jets of air as it is hit back and forth by two players. In this activity you play a similar form of tabletop hockey involving coins.

1. Put your finger on a quarter and push it into a stationary dime. What happens to the dime?

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2. Push the quarter into the dime again, observing how far it travels. Try hitting the dime softly, observing how far it travels. Then hit it harder. Again observe how far it travels. How is the distance traveled by the dime affected when you hit it harder?

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3. Describe some sports, games, or examples that show the relationship between how far something moves and how hard you push or throw it.

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1. Use some masking tape and mark two spots exactly **10 cm** apart from each other. Label one piece, “S” for “start” and the other piece, “F” for “Finish.”

 **S F**

 10 cm

* Use the quarter as the pushing object at all times.
* Start with the dime and place it just below the “Start” spot but toward the “Finish” spot.
* Push the quarter into the dime with enough force for the dime to travel to the “Finish” spot.
* Try the same procedure with the other coins (penny, nickel, quarter).
	1. Compare the motion of the penny, nickel and quarter with that of the dime. How are they different? How are they alike?

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 b. Which coins required the most “push” in order to get them to go from “Start” to “Finish?”

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 c. Place the coins (dime, penny, nickel and quarter) in order from hardest to move to easiest.

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5. Describe examples you encounter in which the more massive an object is, the more difficult it is to move.

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6. Gather your coins together again. Take a dime and hit it into another dime. But this time, let go of the coin before it hits the other coin. What happens to the coins after they collide?

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7. Repeat step #6 using another dime, a penny, a nickel and a quarter as the objects to hit.

a. Throw the dime with the same amount of force each time into the various coins. What happens to the motion of the coins as mass increases from the dime to the penny, nickel and quarter?

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b. Set up a “Start” and “Finish” spot as before, but only 2 cm apart. Compare the force needed to move the penny, nickel and quarter using the dime from “Start” to “Finish.”

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8. Realizing that objects do not tend to move on their own, what can you say about the motion of the coins?

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9. What relationship can you state about the force with which something is hit and its motion?

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10. With this activity in mind, can you explain why a batter takes a large swing to knock a ball over the fence?

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ANSWERS

You may be familiar with a tabletop game in which a flat disk floats on small jets of air as it is hit back and forth by two players. In this activity you play a similar form of tabletop hockey involving coins.

1. Put your finger on a quarter and push it into a stationary dime. What happens to the dime?

*The quarter stops (because it has more mass) and the dime travels a certain distance (because MV is transferred).*

2. Push the quarter into the dime again, observing how far it travels. Try hitting the dime softly, observing how far it travels. Then hit it harder. Again observe how far it travels. How is the distance traveled by the dime affected when you hit it harder?

 *The more Force (the harder you the dime) the farther it travels.*

3. Describe some sports, games, or examples that show the relationship between how far something moves and how hard you push or throw it.

 *Place Kicking or Soccer Vertical Leap*

*Billiards/Pool Snowball Fight*

*Throwing a baseball Ping Pong*

4. Use some masking tape and mark two spots exactly **10 cm** apart from each other. Label one piece, “S” for “start” and the other piece, “F” for “Finish.”

 **S F**

 10 cm

* Use the quarter as the pushing object at all times.
* Start with the dime and place it just below the “Start” spot but toward the “Finish” spot.
* Push the quarter into the dime with enough force for the dime to travel to the “Finish” spot.
* Try the same procedure with the other coins (penny, nickel, quarter).
	1. Compare the motion of the penny, nickel and quarter with that of the dime. How are they different? How are they alike?

 *Like the dime, the coins will move when hit. The more mass the object has, the more force required to move it the same distance.*

b. Which coins required the most “push” in order to get them to go from “Start” to “Finish?”

 *Quarter, Nickel, Penny, Dime*

 c. Place the coins (dime, penny, nickel and quarter) in order from hardest to move to easiest.

 *Quarter, Nickel, Penny, Dime*

5. Describe examples you encounter in which the more massive an object is, the more difficult it is to move.

 *Lifting objects (pebble vs. rock vs. can). Blocking in Football (the big guy is harder to block).*

6. Gather your coins together again. Take a dime and hit it into another dime. But this time, let go of the coin before it hits the other coin. What happens to the coins after they collide?

 *The first dime stops and the second dime travels a certain distance (transfer of MV).*

7. Repeat step #6 using another dime, a penny, a nickel and a quarter as the objects to hit.

a. Throw the dime with the same amount of force each time into the various coins. What happens to the motion of the coins as mass increases from the dime to the penny, nickel and quarter?

 *Throw the dime with the same amount of force as the projector and the dime may rebound and the larger objects don’t move as far.*

b. Set up a “Start” and “Finish” spot as before, but only 2 cm apart. Compare the force needed to move the penny, nickel and quarter using the dime from “Start” to “Finish.”

 *Set up start and finish lines 2 cm apart. The force needed to move the P, N, Q using the dime from start to finish.*

8. Realizing that objects do not tend to move on their own, what can you say about the motion of the coins?

 *The coins had to be pushed in order to move.*

9. What relationship can you state about the force with which something is hit and its motion?

 *Greater the force, Greater the motion.*

10. With this activity in mind, can you explain why a batter takes a large swing to knock a ball over the fence?

 *Greater the force, Greater the distance.*