Paper Football Activity

**Introduction**

**Purpose** To demonstrate the principle of momentum using practical fun!

**Discussion**

Momentum is inertia in motion and is determined by the product of the mass of an object times its velocity: ρ = m v. Momentum includes mass (m) of objects, speed (v) of objects, and the angle at which objects collide or move.

**Hypothesis**

If one competes in a paper football activity incorporating momentum, then they can more effectively control the outcome by adjusting mass, speed and direction directly or indirectly.

**Materials** piece of paper Meter stick Masking tape

**Procedure**

1. Obtain an 8 ½ x 11 inch piece of paper and a meter stick for your group.

2. Create a “paper football”:

 a. fold the paper in half (the long way)

 b. fold the paper in half again (the long way)

 c. start at one end of the double folded paper and fold a triangle (as shown)

Fold 1

 d. continue to fold the paper as shown

Fold 2

 e. make triangular folds as far as you can and then tuck the end into the fold.

 f. if necessary secure your “football” with a piece of tape.

3. Set the “football” on its tip and use your index or middle finger to “kick” it (as shown below).

table

4. Use 3 - 10 cm strips of masking tape (fold over 1 cm on one end of the tape so you can remove it later) and mark off 0.5 m, 1.0 m, 1.5 m on your tables. Place the tape in the center of the table at each distance.

5. Go to the side of the table in the middle of the room, facing the wall.

a. Place the football on the end of the table and “kick” it so that it lands as close to the 0.5 m tape mark as possible. Record the number of trials it takes for you to accomplish this.

b. Have the partner(s) repeat the “kick” from the end of the table to the 1.0 m tape mark.

c. Have the partner(s) repeat the “kick” from the end of the table to the 1.5 m tape mark. Record the number of trials it takes for you to accomplish this.

d. Have the partner(s) repeat the “kick” from the end of the table and try to “kick” it off the table completely. Record the number of trials it takes for you to accomplish this.

**Calculations & Data**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Trials to 0.5 m mark | Trials to 1.0 m mark | Trials to 1.5 m mark | Trials to off the table |  |
| Person 1 |  |  |  |  |  |
| Person 2 |  |  |  |  |  |
| Person 3 |  |  |  |  |  |
| Person 4 |  |  |  |  |  |

**Make a sketch of the football traveling from the end of table to each distance (0.5 m, 1.0 m, 1.5 m, and off the table) from the viewpoint of being at eye level to the end of the tables:**

0.5 m

1.0 m

1.5 m

Off Table

**Conclusions and Questions**

1. How would you have to adjust if you used a heavier object?

2. What three factors are involved in “kicking” the football so that it lands at each particular mark on the table? Consider how these factors may or may not have changed when kicking the football to a different mark (farther distance).

 a.

 b.

 c.

3. If you cannot think of the three factors (or even if you can), play a football according to the following rules and determine what the three factors are:

a. Choose a table and have your “opponent” on the opposite side of the table.

b. Lay the “football” flat on its side about 10 cm from the edge of the table nearest you.

c. You get two hits of the football to see if you can get it to overhang the opposite edge without falling off. If you do, you get one point.

d. Once you hit the football twice (whether you score or not), your opponent gets to go from the spot the football sits after your second hit. If you score or if the football goes off the edge, your opponent starts as you did (about 10 cm from the edge of the table nearest them).

e. The first person to score two points, wins.

f. Find another person who won their match and play them. If you lost, find another person who lost and play them.

g. Continue playing until time is up. Everyone should keep a record of their wins and losses.

**Make a sketch of the football traveling on the table for the two hits from the viewpoint of looking down on the table from the ceiling:**