**Name(s) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**How the Ball Bounces**

**Situations:**

Most athletes and officials consider a *true bounce* important in the world of sports. Baseball players are often dismayed when a baseball takes a bad hop. Basketball officials commonly drop a game ball from chest height to see what its return height will be. If the ball bounces above well the waist, it is considered too bouncy. If the ball bounces well below the waist, it is considered too flat. Similarly, a tennis and ping pong players must react instantly to the bounce of a ball. These athletes cannot afford to play games with unpredictable bounces.

**Team Roles**

Dropper

Catcher

Height Measurer

Data Recorder

**Directions:**

1. Use a small piece of tape to mark a spot on the wall that is 2 meters above the floor. This will be the release height all balls used in this investigation.
2. Drop a ball and let it bounce once. Observe the maximum height that the ball reaches after its first bounce.
3. Drop the ball again and let it bounce once. This time try to catch the ball at its maximum height after the bounce. Freeze the ball!
4. Measure and record the height of the “frozen” ball.
5. Repeat steps 3 and 4 two more times and record the heights obtained.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Bounce Number | Height – 1st trial in meters | Height – 2nd trial in meters | Height – 3rd trial in meters | Mean Height of Trials in Meters |
| 0 | 2 | 2 | 2 | 2 |
| 1 |  |  |  |  |
| 2 |  |  |  |  |
| 3 |  |  |  |  |
| 4 |  |  |  |  |

1. Repeat the procedures above for two bounces instead of one. In other words, you will freeze the ball at the top of the second bounce. Record the data in the table.
2. Repeat the procedures above for three and four bounces instead of one. Record the data in the table.

**Graph the average (mean) return height of the ball as a function of the number of bounces. Then answer the questions that follow.**

**Graph of Average Return Heights of Bouncing Ball**

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0 1 2 3 4 5 6

**Bounce Number**

**Questions**

1. Estimate the return height of the ball after 5 bounces without actually measuring it. Explain how you obtained your estimate.
2. How many bounces do you think the ball takes if is allowed to bounce until it stops?
3. Why would a line-of-best-fit be a bad predictor of bounce heights?
4. Which type of ball do you think would rebound highest if dropped from the same height? What about the make-up of the ball do you think causes a high bounce?
5. Find the total distance the ball travels:
   1. In a downward direction
   2. In an upward direction
   3. In total