**SC20F Inertia & The Unrestrained Passenger**

In this activity, you will investigate the relationship between the distance an unrestrained passenger travels in a collision, and the speed of the vehicle.

**Materials:**

* 2 lengths of track - 1 Hotwheels Car
* Masking Tape - Metre Stick
* Small piece of Play-do - Text book

**Instructions:**

1. Join the 2 lengths of track together. Use the metre stick to make a mark at 10cm intervals from the one end of the track – this end will be the finish line.
2. Use your chair, binders, etc, to create a ramp with your track. You may need to use masking tape to hold the track in place. Be sure the track is supported along most of the length (ie. Be sure it is not too bouncy).
3. Place the spine of a textbook at the finish line for the cars to crash into.
4. Make a “passenger” out of play-do. Your passenger should be a cube shape, about 1cm in all dimensions.
5. Set the passenger on the hotwheels car, and place the car at the farthest mark away from the start (likely 110cm).
6. Release the car, and record the distance that the “passenger” is thrown in the table provided.
7. Perform 4 more trials at this distance, for a total of 5 trials, and find the average distance the passenger was thrown.
8. Repeat the experiment, collecting 5 trials of data at each distance until the passenger is not thrown anymore.
9. Clean up your lab area, put the materials back where they came from.

**Data Table**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Distance Passenger is Thrown** | | | | | |
| **Speed**  **(Height on Ramp)** | **Trial 1** | **Trial 2** | **Trial 3** | **Trial 4** | **Trial 5** | **Average Distance** |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
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**Analysis:**

1. Graph the data on the graph paper provided. **Speed (height on the ramp)** should go on the x-axis, and **average distance** the passenger was thrown should go on the y-axis. Be sure to include a title, labels, and units.
2. Use your data to describe the relationship between the distance an unrestrained passenger is “thrown”, and the speed of the vehicle.
3. Give two sources of error in the experiment. Ie. Give two factors (besides speed) that would affect the distance your “passenger” was thrown.
4. We have seen that the relationship between the speed of a car and the distance its passengers can be thrown is **d α v2** (ie. The distance a passenger is thrown is proportional to the speed of the car squared). Which of the following sets of data represents this relationship?

|  |  |
| --- | --- |
| **Set A** | |
| **d (m)** | **v (m/s)** |
| 1 | 1 |
| 4 | 2 |
| 9 | 3 |
| 16 | 4 |
| 25 | 5 |

|  |  |
| --- | --- |
| **Set B** | |
| **d (m)** | **v (m/s)** |
| 1 | 1 |
| 2 | 2 |
| 3 | 3 |
| 4 | 4 |
| 5 | 5 |

|  |  |
| --- | --- |
| **Set A** | |
| **d (m)** | **v (m/s)** |
| 1 | 1 |
| 4 | 2 |
| 9 | 3 |
| 16 | 4 |
| 25 | 5 |

1. Fill in the blanks using the **d α v2** relationship.

|  |  |
| --- | --- |
| **Set E** | |
| **d (m)** | **v (m/s)** |
| 1 |  |
| 9 |  |
| 25 | 5 |
| 36 |  |
| 64 |  |

|  |  |
| --- | --- |
| **Set D** | |
| **d (m)** | **v (m/s)** |
| 1 | 1 |
|  | 2 |
|  | 3 |
| 16 | 4 |
|  | 5 |