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|  | TEAM:4 |
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| Smashing! Real-world clashes into physics classes | Italy | Gabriele Bartolotti, Redi Dedej, Antonio Palmieri |
| **EXPERIMENT: Collision of billiard balls** |

* ORIENTATION
* **Research question:**

What will happen with the billiard ball in rest, if another billiard ball hits it with speed?

**Sub-questions:**

- Does the angle matter?

- What is the speed of the ball?

- Which type of graph do you get?

**Hypothesis** The ball at rest is going to be moved at a certain angle.

If the ball at rest is hit in the middle, it will move straight forward. If you hit the left side of the ball at rest, it will move to the right and vice versa.

* PREPARATION
* **Material**:
* Two billiard balls,
* A fixed slope,
* A platform that resembles the one in billiard tables.
* **Method:**
* Rolling a ball from a fixed slope that hits another ball with a determined impact parameter. The two balls after the impact will continue on a platform that resembles the billiard tables.
* Make a series of collisions for different impact parameters. For example *b*=0, *0* = *R*/2, *b* = *R* and *b* = 3*R*/2, where *R* is the radius of the balls.
* Film and plot the y(x)-graph with Tracker.
* Study the scattering angle as a function of impact parameter and the final velocity of the second ball as a function of impact parameter.

 With this we want to analyze:

1. From tracker estimate *v*1i, *v*1f, *v*2f, and the scattering angles α and β (see figure).
2. For each impact parameter calculate the momenta an kinetic energies and verify the conservation of total momentum and of total kinetic energy.
3. For one impact parameter estimate the interaction time from the video. Use the Impulse-Momentum theorem to estimate the total force in the collision.





The collision of the two balls: The two balls are not in a line ,the white one is moved by the line with a distance *b*, called the impact parameter.

* DATA ANALYSIS and DISCUSSION
* **Observations and Measurements**:
* **Discussion:**
* REFLECTION
* **Conclusion**:
* **Comparison** of the results of the different countries
* **Reflection:**
* REFERENCES