

# Frictional Forces

Grade 5 / Mrs. Smith

# Question

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- How does friction influence the distance traveled by cars on tracks with different surfaces?

# Hypothesis

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- If I make a track with different materials, then the car will go the furthest on the track with the least friction; because friction slows things down.

# Variables

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- Independent (the one you change):
  - Type of track material (polished wood, vinyl, carpet, ice)
- Dependent (the one that responds):
  - Distance traveled
- Control (the ones you keep the same):
  - Height of the track, distance the plunger is pulled, the sleigh

# Materials

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- Base of the track
- Track surfaces: polished wood, vinyl, carpet, ice
- Plastic sleigh
- Red handled plunger
- Yellow light marker
- Measuring tape

# Procedure

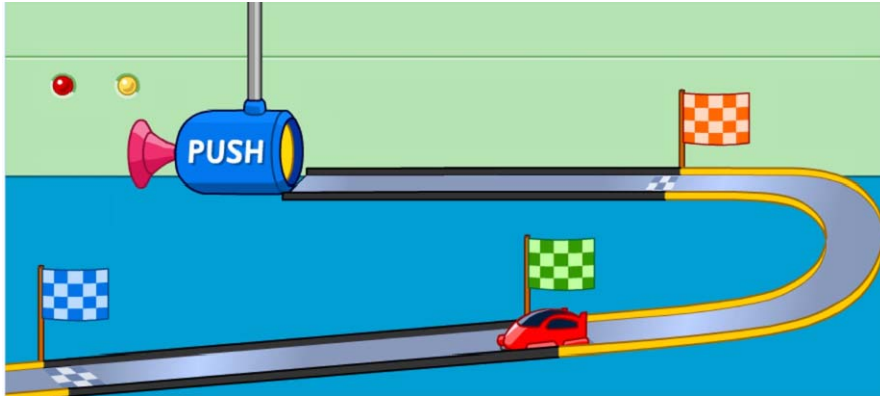
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1. Set up the track at a height of 30 cms.
2. Attach the red plunger at the beginning of the track.
3. Mark the starting point for the plunger with the yellow light marker.

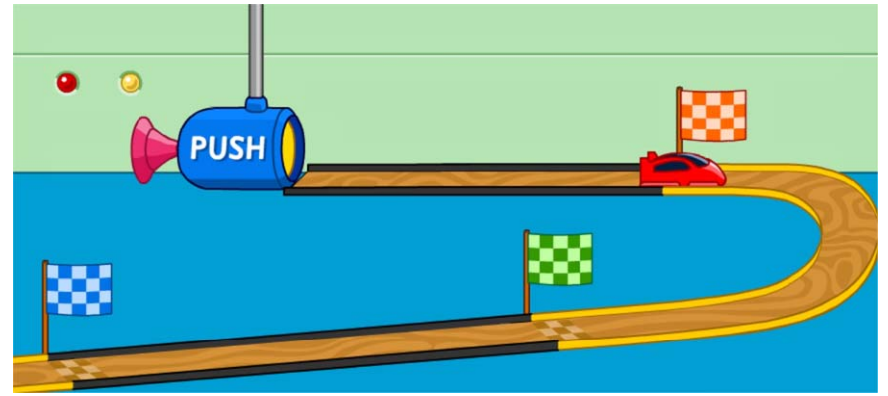
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4. For each different surface material (vinyl, polished wood, carpet, ice):
    - a. Apply the surface to the track and flatten it out.
    - b. Put the sleigh right in front of the red plunger.
    - c. Pull the handle of the plunger back to the yellow light marker
    - d. Watch how far the sleigh travels
    - e. Measure the distance traveled with the measuring tape
    - f. Repeat for a total of 10 times with each surface.

# Photos

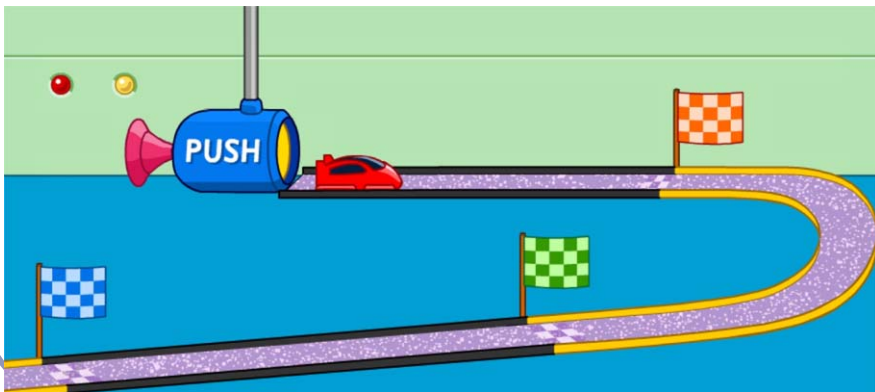
Vinyl



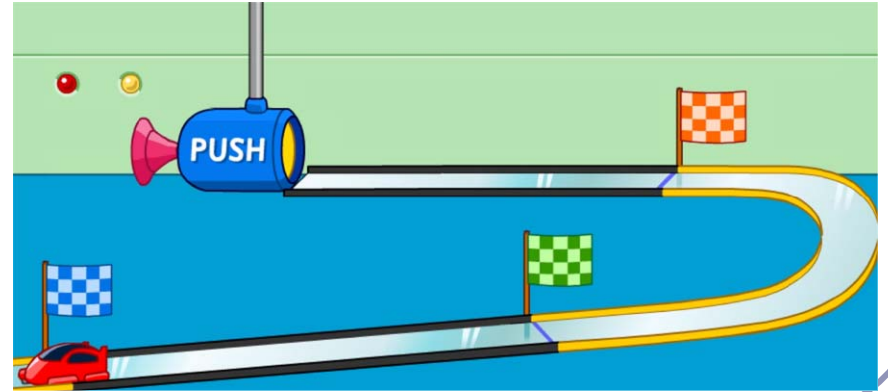
Wood



Carpet



Ice



# Results

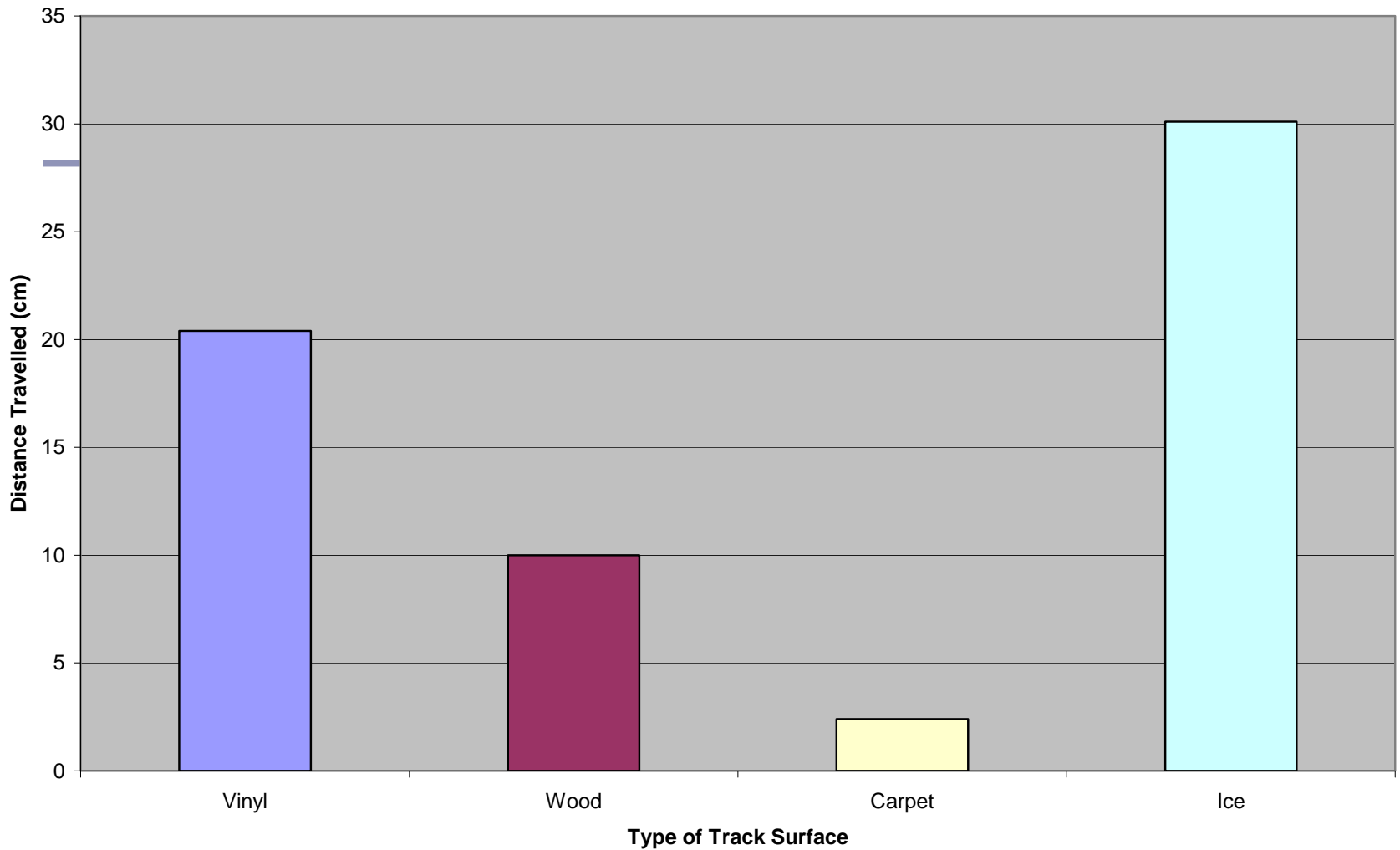
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Friction Experiment Data

| Material | Trial 1 (cm) | Trial 2 (cm) | Trial 3 (cm) | Trial 4 (cm) | Trial 5 (cm) | Trial 6 (cm) | Trial 7 (cm) | Trial 8 (cm) | Trial 9 (cm) | Trial 10 (cm) | Mean (cm) | Median (cm) | Mode (cm) |
|----------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|---------------|-----------|-------------|-----------|
| Vinyl    | 20           | 21           | 20           | 19           | 20           | 21           | 20           | 22           | 20           | 21            | 20.4      | 20          | 20        |
| Wood     | 10           | 10           | 10           | 9            | 10           | 10           | 11           | 10           | 10           | 10            | 10.0      | 10          | 10        |
| Carpet   | 2            | 3            | 2            | 3            | 3            | 2            | 2            | 2            | 3            | 2             | 2.4       | 2           | 2         |
| Ice      | 30           | 29           | 27           | 28           | 31           | 32           | 31           | 30           | 31           | 32            | 30.1      | 30.5        | 31        |

The sleigh went the farthest on the ice (30.1 cm). It went the next farthest on the vinyl (20.4 cm), Then the next farthest on the wood (10 cm) and the least distance on the carpet (2.4 cm). I completed 10 trials for each material.

## Average Distances Across Different Track Surfaces



This graph shows that the sleigh went the furthest (30.1 cm) on the track made with ice.

# Conclusion

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I predicted that “If I make a track with different materials, then the car will go the furthest on the track with the least friction; because friction slows things down.” My prediction was verified by the experiment. The surface with the least friction was the ice and the car went the furthest (30.1 cm) on that surface. Likewise, the surface with the next least amount of friction was the vinyl and the car went the second furthest (20.4 cm) on that surface. Furthermore, the surface with the next least amount of friction was the polished wood and the car went the third furthest (10.0 cm) on that surface. Finally, on the surface with the most friction (carpet), the car went the least distance (2.4 cm).

I infer that cars slide easily on ice, because there is not much friction. To make it easier to stop, substances that have more friction (for example, sand) could be put on roads and/or sidewalks.

As I did the experiment, I had one problem. When I put the carpet on the track, there was a bump and that stopped the sled. To be fair, I had to make sure I smoothed down each track completely. Next, I'd like to investigate if the kind of tire on a car impacts how far it goes. Since friction is caused by materials touching each other, I wonder what kind of tire causes the most/least amount of friction.