Newton’s three laws seem to work perfectly on the white board, but in real life we find that surfaces are seldom frictionless and that few moving objects are truly predictable. This is because outside forces interfere with Newton’s perfect situations. Balloon racers rely on Newton’s third law of motion. As the air rushes backward out of the balloon it pushes the car forward in the opposite direction with an equal force. Your job is to make the most of this force! While building balloon racers we will discover how difficult it can be to make something work reliably.

The rules to this activity are simple:
- The car must be powered solely by a balloon.
- You can build the car out of anything.
- It must have at least three wheels.
  Wheels are defined as anything that is round and goes around.
- The wheels cannot be wheels from a toy car. They must be made out of something that was not originally meant to be used as wheels.
- The car may not leave the ground.
- The car must be capable of traveling five meters. (See rubric)

On race day we will set up a track. Cars that follow the rules will be eligible for awards. These awards will be given in three categories:

- Best Looking Car
- Fastest Car (in first 5 meters)
- Farthest Distance Traveled.

Good Luck!
There are several important things to keep in mind when designing and building your balloon racer.

- Choose the material to build the body of the car. It should be both light and sturdy. The length is also important. Short cars tend to spin out more often than longer ones.
- Build and mount the wheels. Wheels can be made out of anything that is round. The hard part, however, is getting them mounted straight with little friction. If the wheels are not mounted straight or are not free to spin smoothly, the car will not perform well.
- Now for the balloon. Affix the balloon in a manner that the air comes out smoothly.

If the car has a sturdy but light body, free moving wheels and a good power supply, you may well be on your way to being a balloon racer champion!
BRAINSTORMING....

Pictures and/or Diagrams:  Materials that could be used:

RESEARCH...

Search the web and find ideas that you think might work. Record pictures and materials below.
**PLAN A...**

1. What materials do I need?

2. What equipment is needed?

3. Where do I find/buy the needed supplies?

4. Sketches of built balloon racer using the above supplies:

**PLAN B...**

1. What materials do I need?

2. What equipment is needed?

3. Where do I find/buy the needed supplies?

4. Sketches of built balloon racer using the above supplies:
When: ____________________
Where: ____________________
Present: ____________________ ____________________ ____________________
Time spent working: ____________________
What went wrong:
_______________________________________________________________________
_______________________________________________________________________
What I (we) did to fix the problem:
_______________________________________________________________________
_______________________________________________________________________
What went right:
_______________________________________________________________________
_______________________________________________________________________

Parent Signature: ____________________
When: __________________
Where: __________________
Present: __________________
Time spent working: __________________
What went wrong:
_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________
What I (we) did to fix the problem:
_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________
What went right:
_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________

Parent Signature: ___________________
Summary

In 8-10 sentences, summarize your experience building and racing your balloon racer. Include observations that you recorded on your “Trials, Errors, and Triumphs.” How long did you spend working on your project? What costs were associated with your balloon racer? Did you recruit help from anyone else (brothers, sisters, parent)?
Name: ___________________________  Hour: __________

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**Balloon Racers - Rubric**

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Points</th>
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<tr>
<td>Completed “Brainstorming”</td>
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</tr>
<tr>
<td>Completed “Research”</td>
<td>5</td>
</tr>
<tr>
<td>Complete “Plan A and Plan B”</td>
<td>10</td>
</tr>
<tr>
<td>Completed “Trials, Errors, and Triumphs”</td>
<td>10</td>
</tr>
<tr>
<td>Car is powered solely by balloons.</td>
<td>10</td>
</tr>
<tr>
<td>Car has at least 3 wheels.</td>
<td>10</td>
</tr>
<tr>
<td>Wheels meet material requirements.</td>
<td>10</td>
</tr>
<tr>
<td>Car traveled 5 meters</td>
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<table>
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<th>Time</th>
<th>Speed</th>
<th>Points</th>
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First Attempt:
Distance ____________ meters
Time ________________ seconds
Speed ________________ m/s

2nd Attempt:
Distance ____________ meters
Time ________________ seconds
Speed ________________ m/s

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

Score: __________

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