Rocket Race!

Lesson Skill/Math Concept: Measuring, Division, Rate

Academic Vocabulary

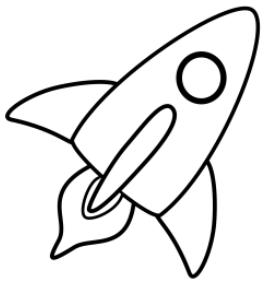
- **Average speed:** The typical speed of a group of things
- **Rate:** The speed of something expressed as a proportion in relation to a whole
- **Distance:** The length of space between two things
- **Time:** A period during which an action takes place
- **Volume (Air in Balloon):** The quantity of space enclosed by a closed surface
- **Tension (Track):** The force related to stretching or straining
- **Propel:** To push or drive something in a particular direction
- **Modify:** To change somewhat the form or qualities of something

Estimated Time: *40 minutes (60 minutes with extension)*

Materials List

Class materials:

- 5 pieces of twine (30 feet each)
- 5 stopwatches or cell phones
- masking tape
- 5 measuring tapes



Each team of 2 students:

- One balloon
- transparent tape
- scissors

Goal: To create a balloon rocket that can travel the length of a track in as little time as possible.

Background Knowledge: Students must know how to calculate average speed:

Average speed = distance/time.

Directions:

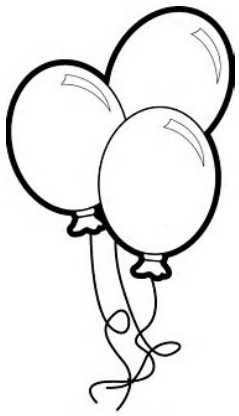
1. Clear the tables and chairs from the center of the classroom. On one end of the room, line up five chairs, side by side, with the backs of the chairs facing the open space.
2. Tie a piece of twine to the back of a chair and pull the twine toward the opposite end of the room. Repeat for the remaining four chairs.

3. Determine the starting line by pulling the twine towards the opposite side of the room. The length of the twine "track" will vary (20'-25') depending on the space available, but all twine tracks must be the same length. Tape a strip of masking tape to the floor at the end of each twine track. The strip of tape should be parallel to the line of chairs.
4. Working in pairs, students will make their balloon rocket. One student will blow the balloon to the desired size, **without** tying it. The second student may (or may not) cut the straw to an "ideal size." Working as a team, students will tape the straw to the balloon, without releasing any air from the balloon.
5. Half of the class will compete while the other half observes. Each team will select a track and carefully thread the track twine through the straw on their balloon rocket, being careful not to release any air. The untied side of the balloon must face **away** from the chairs. When all teams have successfully threaded their rockets, they will hold their rockets in the starting position, at the end of the twine track, over the masking tape on the floor.
6. One student will hold the untied end of the balloon while the second keeps tension on the track by pulling the twine. When the teams are ready, the instructor will count down for the teams to release their rockets. The observing students will determine which two teams' rockets traveled the farthest in the least amount of time. Rockets that do not reach the end of the track are disqualified.
7. When the first half of the class finishes racing, the second half will race their balloon rockets following the same procedure.
8. The two finalists from each half will race to determine the winning team.

Extensions

Students will modify their designs. Students may change the volume of air in their balloon, the method of taping the straw to the balloon, the size of the straw, or the tension of the twine track. After the students have completed their modifications, a second tournament is conducted.

Students will measure the rockets' travel time with stopwatches. They will measure the distance each rocket traveled with tape measures. Use the two values to calculate the average speed of each rocket. **(Average speed = distance traveled divided by the total time).**



Name: _____

Rocket Race!

1st Preliminary (First half of class):
1st place - _____
2nd place -_____

2nd Preliminary Round (Second half of class):
1st place - _____
2nd place - _____

Final Round (Top two teams from each round):
1st place - _____
2nd place - _____

Data Chart (Extension)

Team No.	Distance (d)	Time (t)	Work (Formula and substitution)	Average Speed
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Extension Finals

Team No.	Distance (d)	Time (t)	Work (Formula and substitution)	Average Speed

Reflection
Based on your observations of the balloon rocket races, what is the relationship between time and speed? Keep in mind that all twine tracks were the same length.

Rocket Race! Post-Activity Questions

1. Sketch the balloon rocket on the twine track.

2. Describe how each of the following helped propel the rocket forward.

    a. The balloon –

    b. The twine –

    c. The straw/tape –

3. If you made the track 4 times longer, how would you modify your balloon rocket so that it could travel the entire distance?

4. It took 4 seconds for a balloon rocket to travel 24 feet on a twine track.

    a. What was its average speed? Show work.

    b. If a second balloon rocket traveled the same distance (24 feet) at a slower speed, how would the times of the balloon rockets compare? Explain.