Context: This is a 5th grade STEM activity for GT math students. Students have studied how to calculate circumference and have explored how it is one rotation of a tire. Students will now hypothesize which size wheel is best to go the farthest distance with the least full rotations by calculating the rotations based on distanced traveled and diameter of wheel.

Skills Needed: Ability to use tools for building a car. Students also need to understand how to measure and calculate distance and circumference.

Goals of Activity: To create a car/vehicle that moves the farthest distance with the least rotations. The must include all calculations and measurements in their write up to be submitted with their blueprint and concept statement.

Literature: Their textbook, online research materials as needed

Time Frame: Two 60 min periods

Group Size: 2 or 3 per group

Materials: Construction paper joists, bass wood, dowels, wheels, plastic beads/spacers, hot glue gun sticks.

Tools: saw, jig, router, hot glue gun, hand dill, vise

Safety Measures: Review use of safety procedures for provided materials

Classroom Set-Up: Materials and tools needed will be on the back counter/workbench for all to access. Students will work at tables, on the floor, or on the carpet. Teacher will assist students as they work esp at the saw/drill/glue station.

QUICK VIEW

Grade: 5

Time: two 60 minute sessions

Group: two or three

Safety: Review skills for materials provided

Goals:

- Critical thinking skills
- Research skills
- Problem solving skills
- Math- Circumference/rotation, measurement
- Science – motion

Standards: Math SOL

6.10, 6.15

Standards for Technological Literacy

STL17, STL18

Wheels for Cheeks

Background: We all know how to calculate circumference given the diameter of a circle and how that relates to Pi. Rotation of a tire is also the circumference and the size of wheels make a difference in rotation, speed, and power needed to move the vehicle. Cheeks, the science lab's pet hamster, has been injured preforming his signature daredevil acts on his wheel. He's been warned about the dangers but fancies himself the rodent Evel Knieval so is now in need of a vehicle to get around.

Challenge: Engineers and designers, your challenge is to design and create a car to help move Cheeks, whilst he convalesces, around the school. You are to build a car that goes the longest distance with the least amount of rotations. The lab has only one small motor so the less rotations the longer the motor will last. Please create a blueprint with concept statement, diagram with all dimensions labeled and materials listed. Your car can be as colorful and creative as you want, much like cheeks. All calculations should be done by hand and listed in a properly labeled chart for consideration to be the winning design.

Criteria:

- Car moves and can carry a furry passenger comfortably
- Chart is neat and calculations are accurate
- Blueprint is neat, materials are listed, and concept/ideas are clearly defined
- Neat and creative

Materials: Construction paper joists, bass wood, dowels, wheels, plastic beads/spacers, hot glue gun sticks.

Tools: saw, jig, router, hot glue gun, hand dill, vise

STL Standard 17	Processing info through tech can help humans make decisions
STL Standard 18	Use of trans moves objects/trans will lose efficiency if one part is missing or fails
SOL Math	Circumference helps solve practical problems and mean is a balance point
SOL Science	Force, Motion, Energy

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5th grade Design Brief
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Portfolio for: Wheels for Cheeks

Name: _____ **Date:** _____

1. **What is the challenge?**
   State the challenge in your own words.

_____

_____

_____

_____

2. **Brainstorm solutions. **You must also turn in a final blueprint and chart with all findings and calculations neatly done.**
   Sketch or describe possible ideas and solutions.

3. **Build your car.**

4. **What size wheels did you choose and why?**

_____

_____

_____

_____

5. **Notes for progress-test your vehicle 5 times and record all findings in chart .**

Trial 1		
Trial 2		
Trial 3		
Trial 4		
Trial 5		

6. **What issues did you come across while making your car and how did you solve them? Did you redesign or change your mind about any aspect of your design? What would you do differently next time?**

_____

_____

_____

_____

7. **Finally, what did you learn about wheel size, rotation and distance?**

_____

_____

_____

_____

_____

Name: _____ Date:_____

Rubric for: Wheels for Cheeks

Criteria Assessed	Beginner	Apprentice	Master	Expert
Blueprint				
Completion	Large portions are missing, work is messy	Only 1 area is incomplete and lacking some detail	All areas are included and neatly done.	All areas are included, detailed and accurately depicted.
Math Calculations/Chart	Measurements are missing, calculations are incorrect	Most measurements are listed and calculations are partially correct	All calculations are accurate and displayed in chart	All calculations are neat and accurate and clearly displayed in chart
Design	Drawing is missing dimensions, some materials are not listed and is messy.	Drawing is representative, almost all materials are listed and is somewhat neat	Drawing is accurate, all materials are listed, and is creative	Drawing is highly accurate, shows many angles, has all materials listed, and is innovative
Car				
Construction	Car is incomplete, poorly constructed and will only move slightly.	Car is complete, is satisfactorily constructed, and moves but not as far as expected because of execution.	Car is neat, competed, moves well.	Car is neat and accurate to the blueprint, moves efficiently and well.
Creativity	Lacking in creativity and little effort shown.	Shows some creativity but lacks neatness.	Shows creativity and neatness	Shows a higher level of creativity and neatness