

**Pasta Car Challenge**

BACKGROUND INFORMATION: From the atoms and molecules that make up our cells to the galaxies that make up the universe, all matter is in motion. Even when an object appears to be stationary, such as a stalled car, it is in motion because the Earth is spinning on its axis. Objects are continuously under the influence of forces, but it is an unbalanced force that causes objects to speed up, slow down, or change direction. Variables that affect the change in motion are the amount of force exerted on the object and the mass of the object.

LESSON GOALS: You will design a race car made from various types of pasta.

The goal is to create a car that will travel down a ramp and roll 150 centimeters across the floor in the fastest time. Your car must also be built within the allowed budget or you will be penalized points.

**THE CHALLENGE:** Jeff Gordon (#24) is tired of losing to Tony Stewart (#14), Kyle Busch (#18), Brad Keselowski (#2), and Jimmie Johnson (#48). With only

3 races left in the Sprint Cup series, Jeff is seeking assistance in designing a race car worthy of competing in the next race. Jeff wants a car that has the speed and handling to potentially beat all of his competitors. Because you like racing and have an academic thrill seeking personality you decide to accept Jeff Gordon’s challenge.

Due to the expense of auto parts and the cost of race track rental fees, you decide to design a model race car made from inexpensive materials; pasta and

hot glue, and use a wooden ramp to simulate a race track. Your budget for building the racecar is $1,000. Parts and prices are listed on the next page.

Before you and your team begin construction of your pasta car model, you need to develop a design and drawing of your model. Once your drawing is complete, you must show it to the track officials along with a preliminary budget showing the expenses incurred when you build your pasta car. Upon completion and testing of your pasta car, you will present your car and results in a poster. Jeff is very excited and anxious to see your finished product and presentation, so teams START YOUR GLUE GUNS!! Sketch your model and complete the budget sheet on the next page to show to race officials before starting to build.

**SKETCH of CAR**

**PASTA PARTS and PRICES**

|  |
| --- |
|  |

|  |  |  |
| --- | --- | --- |
| TIRES | wagon wheel pasta | $100 |
| AXLES | spaghetti | $50 |
| AXLE HOUSING | penne, rigatoni | $25 |
| FLAT CHASIS | lasagna | $100 |
| TUBULAR CHASIS | manicotti, shells | $70 |

YOUR EXPENDITURES

|  |  |  |  |
| --- | --- | --- | --- |
| part | # purchased | price per part | total spent |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

GRAND TOTAL SPENT \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

MATERIALS:

* Graph paper for scale model drawing and graphing data
* Pasta (lasagna, spaghetti, manicotti, rigatoni, penne, wagon wheels, etc.)
* Glue guns and glue sticks
* Rulers, metric tape measure to determine distance car travels
* Timers
* Calculators

DIRECTIONS:

1. Once your sketch and expenditures are approved by race officials, you can now begin building and testing your car. You may make modifications on your original design if you see a need to. Remember your goal is for your car to travel at least 150 centimeters in the fastest time.
2. At any time you may test your car using the practice ramp to see if you are meeting the distance goal.
3. While you wait for all teams to complete their cars use the graph paper to make a scale model drawing of your car. This drawing should be neat and labeled with the exact measurement (cm.) of each part of the car.
4. Once all the cars are complete, we will have the official timed races. Each team will have 3 trials to record the distance their car traveled and the amount of time it took. Use the data table below to record all the data .

DATA TABLE 1 – Speed of Pasta Car Models Speed = distance

Time

|  |  |  |  |
| --- | --- | --- | --- |
| Trial | Time (sec.) | Distance (cm.) | Speed (cm/s) |
| 1 |  |  |  |
| 2 |  |  |  |
| 3 |  |  |  |

Average Speed \_\_\_\_\_\_\_\_\_\_\_

DATA ANALYSIS:

5. Use 2 sheets of graph paper to graph the data for the class. For your individual results put distance on the Y axis and time on the X axis. Plot the points and connect each one back to the origin, making a line graph showing your speeds for each trial. Make a bar graph for class results. Put average speed (cm/s) on the Y axis, and the names of the teams on the X axis.

6. Look at the data for your team’s car compared to the other teams. Look at the designs of the other teams’ cars. How would you change your car now?

CHECKERED FLAG QUESTIONS:

1. In Data Table 1 and Graph 1 showing speed, what is the dependent variable?

2. What term describes the pasta car as it is speeding up?

3. If there is no force acting on the pasta car it will

a. move at the same speed

b. move in the same direction

c. move with the same speed and direction

d. eventually slow down and stop

1. What would it take to change the direction OR speed of your pasta car?

a. more than one force

b. an unbalanced force

c. a balanced force

d. no force

1. Looking at the data for your team from data table 1, what happened to the speed and distance in each heat? Why do scientists and mathematicians calculate average speed?
2. Use the information from your sketches, drawings, data table and graphs to analyze and make connections between the speed (and distance) and the pasta car designs. Use as many physics vocabulary terms (acceleration, distance, force, friction, mass, momentum, speed) as you can in your answer.

1. Your task for this activity was to design a pasta car model within a budget of $1,000 that would win an upcoming Sprint Cup race. Provide sound evidence that could be used to convince Jeff Gordon’s racing team that you have produced a pasta car model worthy of racing in the Sprint Cup race.