NAME: _____

The Pasta Rover Challenge

Create a rover that can travel the farthest using the engineer design process

Engineers create things like our cell phones, televisions, and light bulbs. From the computer games we play to the bridges we cross, engineers are the builders and designers of our societies. In exploring space, engineers are needed in all different subjects. Organizations like NASA needs engineers that study geology, manufacturing, biology, electricity, and many different sciences to solve the problems they face in traveling through our solar system and beyond.

Be a Rover Planner: The Rover Planners are engineers that design rovers to successfully drive and collect information on Mars. They define their criteria for success–what the rover must do for the drive to be considered a success. They also must take into consideration the constraints that may limit the rover's ability to complete a drive. What obstacles are in the way? Is there a slope to drive down? Is it too steep for the rover to safely drive? Does the terrain change part way through the drive?

PART I: Build your rover

Challenge: Using limited materials, can you design a rover that can travel the furthest after going down a ramp?

Materials:

-1 piece of lasagna	- 6 rigatoni	- glue gun
-1 manicotti	- 6 ziti	- glue
-6 wheels	- 10 ditali	
-4 pieces of spaghetti	- 4 mints	

1. Take **5 minutes** and draw a model of your rover. Note what types of pasta make up the different parts. Give your rover a name.
2. Using **ONLY** glue and the pasta provided build a rover that can roll down a ramp. You have only **25 minutes** to build.

PART II: Test your rover

3. Once you are done with your design, test your rover by running it down a ramp. You will measure the distance (centimeters) the rover travels and the amount of time it travels (seconds). Work with a partner to measure the time when testing your rover. Mark how far the rover went using tape and write your rover's name on it. Measure the distance it travelled from the starting point and record in Table 2. Run the rover down the ramp two more times. Calculate the average distance travelled

TABLE 2: Rover Rate Table			
	Distance (d) *centimeters*	**Time (t)** *seconds*	**Rate (d/t)** *centimeters/seconds*
TRIAL 1			
TRIAL 2			
TRIAL 3			
AVERAGE			

4. Determine your rover's rate of travel by dividing the distance (d) by the time (t). Write the rate in Table 2.

Rate = Distance/Time

5. Calculate the average distance travelled, average time and average rate and record in Table 2.

PART III: Evaluate your rover

Evaluate your design. What worked best? What didn't work?

What were the constraints of your design? How did it affect your decision making?

If you could re-design your rover, what would you change?

Compare your rover's speed to the speed of a car. Convert your speed into miles per hour (mph). First, convert your distance, centimeters to inches. Second, calculate the miles per hour.

1cm=0.39 inches **63,360 inches = 1mile**

PART IV: PASTA BUDGET

In the real world, engineers must budget. In creating a design, engineers balance the innovation of their design with the cost of creating it. NASA was provided with a 60-million dollar budget to make this rover. Using the table below, calculate how much your rover costs to build.

TABLE 1: Planetary Pasta Rover Budget			TOTAL BUDGET = $60,000,000
ITEM	COST *each*	NUMBER USED	TOTAL COST
LASAGNA	$10,000,000		
WHEELS	$6,000,000		
MINTS	$5,000,000		
SPAGHETTI	$2,000,000		
RIGATONI	$5,000,000		
MANICOTTI	$8,000,000		
ZITI	$4,000,000		
DITALI	$200,000		
		TOTAL COST =	

Was your budget under $ 60 million? What changes can you make to keep it under budget?