Name: _____ **Date:** _____

Edible Rovers Activity – High School – Edible Rover Worksheet – Algebra 2

Instructions

You have just been notified that NASA is planning to launch another Mars Rover Mission and you are going to design the rover. NASA has given you a budget of $1,450,000 and provided you with several required parts for the rover; however, you must design a new body and select the instruments that will be mounted on the body. The body must weigh less than 16 kilograms and be able to support the instruments you plan on using. You have been given a list of four material types (Table 1), each with unique strengths, weights, and costs, to choose from for the body. Use your knowledge of Mars Rovers and mathematics to construct a rover that can effectively study Mars while meeting all of these requirements.

Material	Price ($/sqr. m)	Strength (kg/sqr. m)	Weight(kg/sqr. m)
Funky Carbon	52500	8	4
Honeycomb Core	45000	8	4.75
Old School Steel	35000	6	5
Outer Space Aluminum	30000	5	4.5

Table 1: Available Materials for Body Construction

1. Describe a Mars rover's instrumentation. What scientific instrumentation can be found on a Mars rover and what does each instrument do?

_____

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2. Think about the Mars rover you are building. What will be the purpose of your rover? What capabilities should your rover have?

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3. What instruments are you planning on using? Give a brief description of why for each one. How much will these instruments cost?

   1. _____
   2. _____
   3. _____
   4. _____
   5. _____
   6. _____

   Cost:

4. Draw the body of your rover in the space below. Be sure to include dimensions in your design. Also, keep in mind the mission constraints and the strength required to support the instruments you plan on using.

5. Based on the dimensions of your design, how much material will you need for the body of your rover? (What is the area of the body of your rover)?

   _____

   _____

6. NASA has just informed you that you will not be receiving the funds for your rover for another ten years because of a change in the national budget. However, they want you to continue with the design and construction of your rover as planned. The problem is that you will have to go into debt with the companies selling the materials for the body of your rover. They require you to pay an annual interest on the money you owe. NASA has agreed to give you an additional $100,000 to pay for the accumulated interest. Using the information from Table 2, develop four equations (one for each material) that represent the total amount you will owe after ten years.

Material	Interest/yr	Quantity of Material Purchased (m^2)
Funky Carbon	7%	3
Honeycomb Core	4%	3
Old School Steel	5%	3
Outer Space Aluminum	2%	3

Table 2: Interest rates associated of purchased material

   1.

   2.

   3.

   4.

7. Create a graph of cost versus time containing each of your interest equations. Which material would be better to pick if you were not going to get any money for 50 years? 1 year? Discuss your graph to help you explain which material you will use for different year periods.

8. Which type of material will you use for the body of your rover (see Table 1)? Why? What is the total cost and weight of the body? How much weight can it hold?

   Material:

   Cost:

   Weight:

   Strength:

   Why: _____

   _____

   _____

9. What is the total cost of your rover?

   Cost Before Adjustments: _____

   Can the body of your rover support all of the instruments you planned on using? Can you still afford all of the instruments? If not, how will you alter your design plans to fit your constraints?

   _____

   _____

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_____

Cost After Adjustments: _____

10. There are 7 different types of optional instruments to choose from. However, there are only 5 spots on the body of the rover that can support an instrument. How many different combinations of instruments can you have? Note: it is considered a different combination if you use the same 5 instruments in different spots.

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11. Draw a complete design of your Mars Rover in the space provided. Use the body you designed as the base and determine where the instruments will attach, how the body will sit on the wheels, where the required components will go, etc. Label the parts of your Rover and the dimensions of the major parts.

12. What materials (candy) are you planning on using for your wheels, body, and instruments?

Component	Material (Candy type)
Body	
Wheels	

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Component	Material (Candy type)

13. What steps will you follow to build your rover?

_____

_____

_____

_____

_____

_____

_____

14. What was the most difficult part of the construction process and how would you do it differently next time?

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15. Describe any changes you would make to the design process if you were to build another rover.

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