

# Student Worksheet

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You are a team of engineers who have been given the challenge of building a small elevator system to deliver cars to a three story toy car garage. Your elevator must be able to securely stop at each floor and lift a toy car of a set weight.



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## **Research/Preparation Phase**

1. Review the various Student Reference Sheets.

## **Planning as a Team**

1. Your team has been provided with some “building materials” by your teacher. You have glue, string, paperclips, paper, pencils, cardboard, cardboard tubes (such as from paper towel or toilet paper rolls), markers, pulleys or thread spools (3), thin rope, string or fishing line, cardboard box to serve as elevator room (shoe box, large milk carton), small toy cars and other resources.
2. Start by meeting with your team and devising a plan to build your elevator. Think about how you will incorporate the pulleys and affix materials to the elevator room which could be a small milk carton, pasta box, or other grocery container.
3. Write or draw your plan in the box below, including your projection for the materials you’ll require to complete the construction. Present your design to the class, and explain your choice of materials. You may choose to revise your teams’ plan after you receive feedback from class.

Materials Needed:

**Construction Phase**

- 5. Build your elevator!
- 6. Evaluate your teams' different results, complete the evaluation worksheet, and present your findings to the class.

Use this worksheet to evaluate your team's results in the Engineering Ups and Downs lesson:

1. Did you succeed in creating an elevator that could deliver cars to three stories of the toy car garage? If not, why did it fail?

2. Did you need to request additional or different materials while building your elevator? If so, what happened between the design (drawing) and the actual construction that changed your material needs?

3. Do you think that engineers have to adapt their original plans during the manufacturing process? Why might they?

4. If you had to do it all over again, how would your planned design change? Why?

5. What designs or methods did you see other teams try that you thought worked well?

6. Did you find that there were many designs in your classroom that met the project goal? What does this tell you about engineering plans?

7. Did you find there was an advantage to working in a team for this project? Explain...

8. Do you think that the expectations of riders have impacted the designs of elevators? For example, how has the design been adjusted to accommodate riders with disabilities?

9. What safety considerations do you think engineers must integrate into new elevator designs? For example, many elevators have telephones on board in case of emergencies. What else can you identify?

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