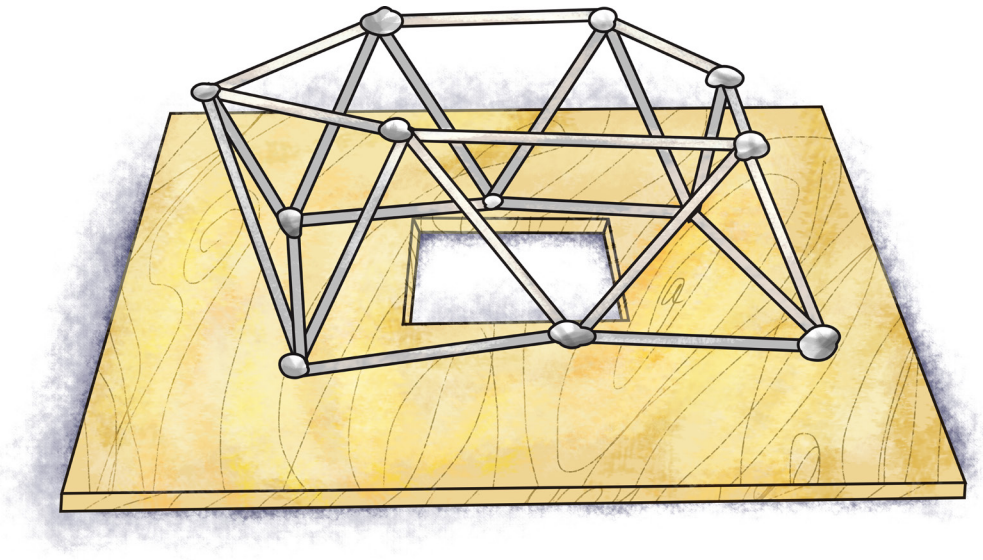
4.3 WEIGHTY PROBLEMS

What is the best design for a derrick to support the stress and weight of drilling?

MATERIALS

- 50 straws
- Small gram mass set (or weights)
- 10 paper clips
- 18 inches of tape
- String
- 1 test bucket to hold weights
- 1 board with a 6-inch square cut out of center
- Ruler
- Pencil and paper for data collection and drawings



DIRECTIONS

1. **Ask** if you are an oil and gas producer, and believe there could be oil and gas under the ground, how might you design a derrick that can support the stress and weight of drilling a deep well?
2. **Imagine** what shape and design might work. Work with these constraints: the structure must be at least two straws tall, must be portable, and should support a weight. Take into consideration the amount of materials are available and the 6" hole in the boards. Plan and draw at least two ideas before beginning construction.
3. **Plan** and **create** the structure then place it over the hole in the board. The board should be supported on two opposite sides by flat tables or desks.
4. Place a crossbeam (ruler) across the top of the structure and attach the string to the crossbeam. The string should hang down the inside of the derrick and through the 6" hole in the board. Attach the other end of the string to the bucket that hangs at least 5 inches off of the floor.
5. Test the structure by placing weights in the bucket one at a time until the derrick begins to bend. Subtract the last gram from the weight of the bucket. Record the data. Verify the results by re-testing.
6. Try to redesign and **improve** the derrick to support more weight. Test the idea and record the data. Verify the results with another test.

REFLECTION

1. What derrick design supported the most weight? Why?
2. What supplies would have been more helpful?
3. What geometric shapes were more successful? Why do you think this is true?
4. How are modern derricks designed? What materials are used?
5. Why are these materials used? Are there different derricks designed for water drilling?