Volleyball Machine Challenge

Instructions

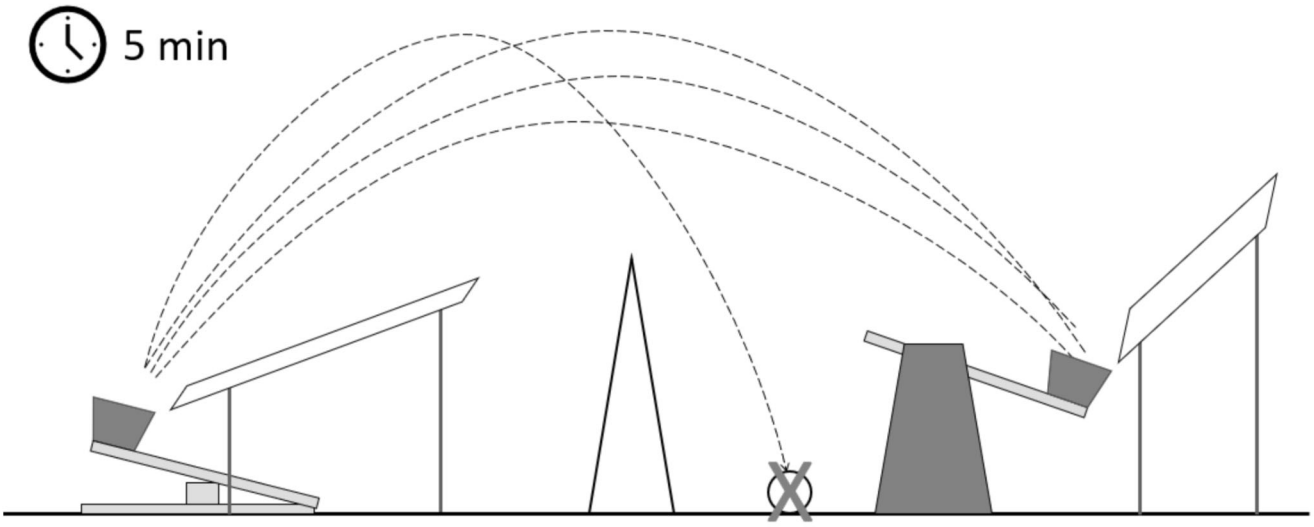
Name: _____

Date: _____

Overview: You will build machines that launch a ball over a net. You want to send the ball over the net as many times as you can. There is a 5 minute time limit, and the ball can not touch the ground.

Watch this video to learn about the project:
https://youtu.be/2awrEVrPpdI

Here is a drawing of some machines like the ones in the video. Can you think of your own ideas?



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Materials

Your teacher will give you these materials to build with. Each material has a cost. Using ***less*** materials means you will have a ***higher*** score.

Item	Point cost (each)
Cardboard	10
Cups	5
Paper	1
Pencils	1
Wooden craft sticks	1
Rubber bands	2
Tape	10

Scoring

You will find your score like this:

Total Score = 100 points for each time the ball went over the net ÷ total materials cost

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Rules

Follow these rules when building and testing your volleyball machine:

Building

1. Only use items listed in the Materials section.
2. Build two machines (one for each side of the net). The machines can be different from each other.
3. Either machine can be "active" (meaning it launches the ball) or "passive" (meaning it lets the ball roll back over the net, powered by gravity).
4. Both machines must be freestanding. They cannot be taped to the ground or supported by a person.
5. Your machines cannot touch each other or the net. The two machines have to be separated by the width of the net.

Testing

6. One person at a time can use both hands to operate a machine to launch the ball (two people total, one for each machine).
7. After the ball is launched, nobody can touch either machine until the ball has stopped moving completely.
8. The ball is allowed to touch the net.
9. After the ball has come to a complete stop, you cannot touch or move the ball, even if you do not touch it directly. You *can* use both hands to operate the machine to launch the ball back across the net.
10. The ball cannot touch the ground. It is allowed to touch another material (like a piece of paper or cardboard) that is sitting on the ground.
11. You continue launching the ball back and forth over the net until one of three things happens:
    a. The ball touches the ground.
    b. The ball gets "stuck" and you cannot relaunch it without touching or moving it first.
    c. Five minutes pass.
12. If you need to make repairs, you must start over counting the number of launches at zero.
13. You can do as many tests as you want to try and get a higher score, but you can only submit one high score per team.

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Student worksheet

Directions: Fill out this worksheet as you work on your project.

1. **Design**. Draw design ideas for three different machines.

2. **Build**. Share your ideas with other people in your group. Decide which machines you will build. They do not have to be the same! You can combine ideas from different people.

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Student worksheet

3. **Test**. Test your machines, following the rules on page 3. Write your answers to these questions after your test.

    a. Do the machines work like you thought they would?

    b. Did anything break? If so, what broke?

    c. How many times did you launch the ball over the net?

    d. Did you observe (notice) anything else?

4. **Try again**. Your machines probably did not work perfectly on the first try. That's OK! You might need to try again. What are two things you are going to make better about your volleyball machines?

5. **Final Design.**

    a. What are you most proud of about your volleyball machine?

    b. What could be improved (made better) if you had more time to work on it?

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Student worksheet

6. **Find your score.**

   a. How many times did the ball go over the net before it hit the ground, got stuck, or you reached the time limit?

   _____

   b. Fill out this table with how many of each material you used. Multiply by the "Points (each)" column to get the subtotal for each material.

Item	**Points**	**× number**	**= points**
Cardboard sheets	10		
Large paper or plastic cups	5		
Piece of paper	1		
Wooden pencils	1		
Wooden craft sticks	1		
Rubber bands	2		
Roll of tape	10		
		Total materials cost:	

   c. Find your total score.

100 x _____ ÷ _____ = _____

# of times ball went over net | total materials cost | total score