

# BUILD A VOLLEYBALL MACHINE

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## Take the 2019 Fluor® Engineering Challenge



### Build devices to play a volleyball game!

(How many times can you get the ball back and forth over the net without it touching the ground?)

#### Construction Materials (but not necessarily needed!):

- Corrugated cardboard base (12"x12")
- Paper or plastic cups
- Wooden craft sticks
- Printer paper
- Wooden pencils
- Rubber bands
- Roll of clear adhesive tape

#### Tools and Testing Materials:

- Paper and pencil
- Scissors
- Sheet of paper
- Tape
- Ruler
- Ping Pong Ball

## Rules

### 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.

### Source:

Finio, Ben. "Volleyball Machine Challenge." *Science Buddies*, 2 Feb. 2019, [https://www.sciencebuddies.org/science-fair-projects/project-ideas/ApMech\\_p054/volleyball-challenge](https://www.sciencebuddies.org/science-fair-projects/project-ideas/ApMech_p054/volleyball-challenge). Accessed 4 Feb. 2019.