

Twisted newspaper bridge.

Task:

Design and construct a bridge using twisted newspaper beams. The bridge must span a distance of 35 cm, be elevated 1 meter above the floor, and support a 300g load for as long as possible.

Research:

Find and depict pictures of the six main types of bridges.

Strategy and modeling:

1. Decide on the type of bridge you will construct.
2. Prepare the necessary twisted newspaper beams.
3. Assemble the bridge.
4. Conduct a load-bearing test.

Results:

1. Make picture of your bridge.
2. If the bridge maintained the required load, but not long enough, suggest improvements.
3. Make improvement, document in pictures and test again.
4. Prepare main points for sharing your results with classmates.

For the teacher:

Materials students may need:

Newspapers all sizes from various types of papers. 300 g load –e.g. some chocolate or box of sweets, dried fruit, that the team will share after completing the task.

Ask students what they have learned about balance of forces.

You may ask them to build the highest possible tower, you know the interest of your students best.

Cardboard chair.

Task:

Design and construct a chair using only cardboard and glue. The chair should feature a seat and a sturdy backrest capable of supporting the weight of a team member.

Research:

Investigate literature or online sources for information on cardboard furniture and its relationship with ergonomics. Include relevant pictures.

Strategy and modelling:

Create a drawing of your chair design and explain the construction process.

Proceed to construct the chair.

Results:

Test the chair and assess its performance.

Reflect on potential enhancements.

Make necessary improvements.

Retest the chair and share your results.

For the teacher:

Materials students may require:

Various types of cardboard materials.

Glue.

Encourage students to discuss design and ergonomics. Prompt them to consider what constitutes the ideal chair for comfortable extended periods of sitting, especially in a school setting. Ask students whether they are content with the chairs they currently use at school and solicit suggestions for improvements. Also, bring the discussion to the importance of understanding the concept of the center of mass in designing stable structures.

Seesaw game

Materials: pencil, ruler, 10 and 50 cent coins

Procedure:

1. Work in couples.
2. Place the pencil horizontally on a table.
3. Position the ruler across the pencil, so that it balances at its midpoint.
4. Place 5 coins at any point (mark) on the ruler.
5. Your classmate's task is to rebalance the ruler within 5 seconds.
6. It is now your classmates turn to place 5 coins at any mark, and you must rebalance it.
7. Earn one point for each successful task completion.
8. Adjust the placement of the ruler so that the arms have different length

9.Repeat the procedure from point (4-6).

You can use the coat hanger with bottles for the game as well.

Center of gravity.

Following are some simple exercises that will help you understand more about the center of gravity in people. The center of gravity in an individual is where the most of his or her mass is concentrated. Since females typically having a larger pelvis than men, this leads to them having a lower center of gravity.

Exercise 1

Stand against a wall with your right side facing the wall, then place your right foot and cheek against the wall. Lift your left foot off the floor. (You can do it also with reverse sides).

Your comments, questions, observations

In order to move your left leg while your right side is against a wall, you need to shift your center of gravity over your right foot. You cannot do this without moving the wall.

The same goes for walking along the wall, placing the edges of your feet close to the wall.

Your comments, questions, observations

Exercise 2

Place a 5 Euro banknote 50 cm away from the wall. Ask your classmate to pick it under following conditions. If he succeeds he can have it.

He should stand with his back against the wall, feet together and heels against the wall. Then he should pick up money from the floor without moving his feet or bending his knees.

Your comments, questions, observations

Standing straight against the wall, his center of gravity is over his feet. When he bends forward, his center of gravity shifts forward. In order to keep his balance, he must either move his feet forward or his buttocks backwards. In that way his center of gravity is right above his feet to maintain stability. But the rules do not allow to move feet and the wall is behind. There is no way to shift center of gravity to maintain balance while trying to pick up the money.

Exercise 3

Sit in a straight-back armless chair, keeping your back against the backrest and your feet flat on the floor. Fold your arms across your chest.

While keeping your feet flat and your back straight, try to stand up.
Your comments, questions, observations

While sitting on a chair with your back against the chair and your feet on the floor, your center of gravity is supported by the chair. When you try to stand up with your back straight, you prevent the center of gravity from moving to a position above your feet, as you would need to, to stand up.

Exercise 4:

While standing, bend over and hold your toes with your hands, your knees are slightly bent. Try jumping forward and backward while holding your toes.
Your comments, questions, observations

When you want to jump, you first shift center of gravity in the direction of the jump, and then move your support base in the same direction to regain balance. When you hold your toes, jumping backwards is not a problem because you can use your heels to shift your weight. But to jump forward, you would have to use your toes. But your fingers prevent you to do it.

Exercise 5:

This experiment was popular on the Internet. The task was to find out why women succeed in some tasks better than men. Conduct a survey in the class. Ask your parents to do the test and then compile the statistics.

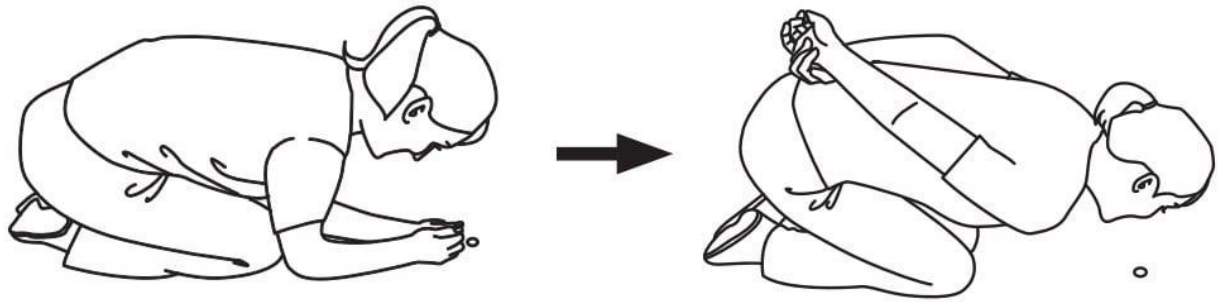
Here is the task:

Kneel on the floor with your knees together.

Crouch down with your arms in front of your knees, elbows snug against your kneecaps.

Place some candy at the tip of your outstretched fingers.

Then while kneeling upright with your arms behind your back, lean forward to touch your nose to the candy.



Your comments, questions, observation.

The result of survey on the Internet show that individuals who do not touch candy without falling over, have a high center of gravity (above the belly button). When the center of gravity is high, it will shift over the base (between the knees and toes) when leaning over. If they succeeded in touching the candy, it means they have a low center of gravity. Even when leaning over, the center of gravity remains above the base. Due to their physique women have their center of gravity situated lower, which is why they are more successful in this quest.

What is the result of your survey?