Post-Primary School Booklet

# SCIENCE WEEK

#scienceweek

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# HOW YOUR BODY MOVES

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# HOW YOUR BODY MOVES

## So how does someone learn to understand how balance effects their performance?

The key to balance is the centre of gravity. This is what determines how you balance. By shifting your body weight, or your mass, around, you are also shifting the centre of that mass, and your body must compensate quickly.

This lesson is a series of demonstrations to emphasize the relationship between the centre of gravity and balance. Then the students will work in groups to attempt to define for themselves what "centre of gravity" means and how to locate it.

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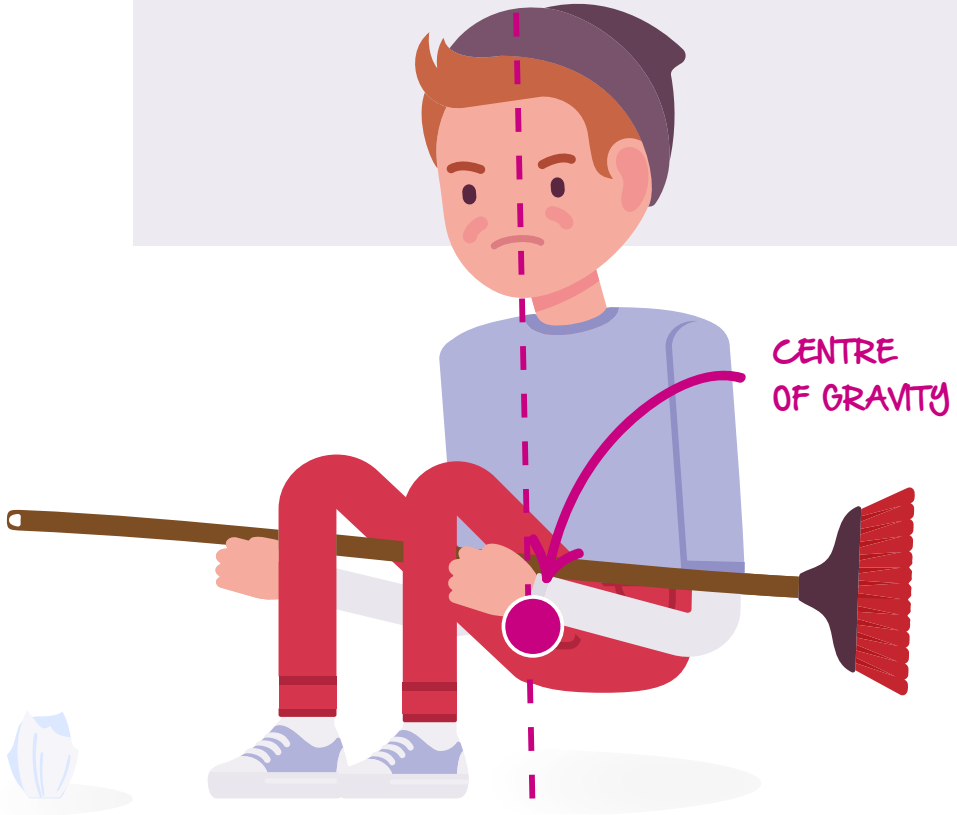
METHOD 1

# PICK IT UP

1. Squat down.
2. Place a broomstick under you bent knees and crook your elbows around it.
3. Now put a handkerchief on the ground in front of you.
4. Lean forward, using your hands for balance, and try to pick up the handkerchief with your teeth.
5. Try without the brush, is it easier?

As you rotate forward toward the handkerchief, the centre of gravity is shifting away from the stable position directly above your feet. Once it goes too far, you become unstable and you will fall on your nose.



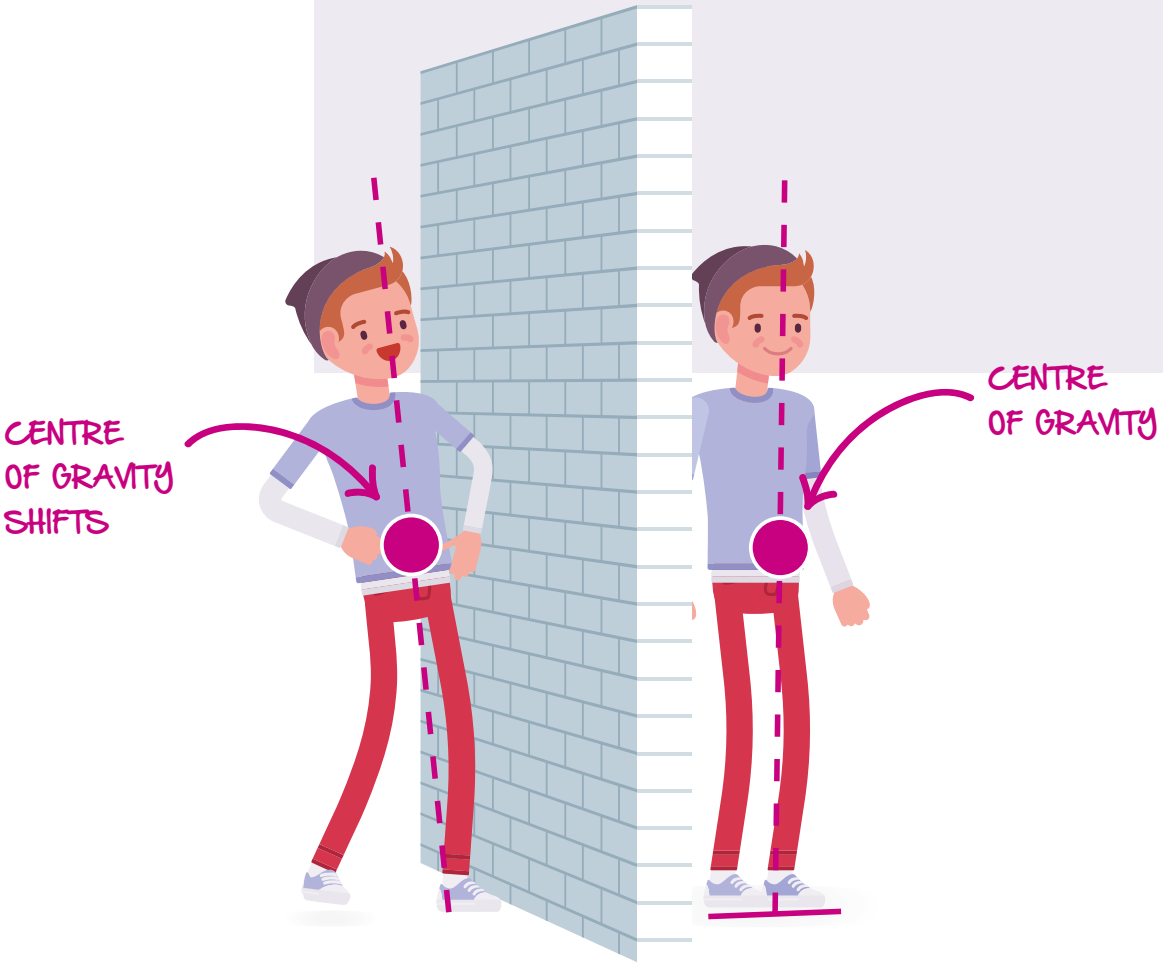
METHOD 2

# THE FOOT LIFT

1. Stand sideways along a wall with your foot, hip, shoulder, and arm all touching the wall.

2. Keeping all these parts on the wall, try to pick up your outside foot.
   - Can you do it? Why or why not?
   - Do you know any other ways to test the importance of the centre of gravity?
   - Where do you think your centre of gravity is?
   - Is this different when you are standing? When you are sitting?

Both of these activities require you to shift your centre of gravity away from the support base. The first can't be done without falling over, and the second can't be done without moving the wall. The body maintains balance with little adjustments so automatic that we never think about them.



METHOD 3

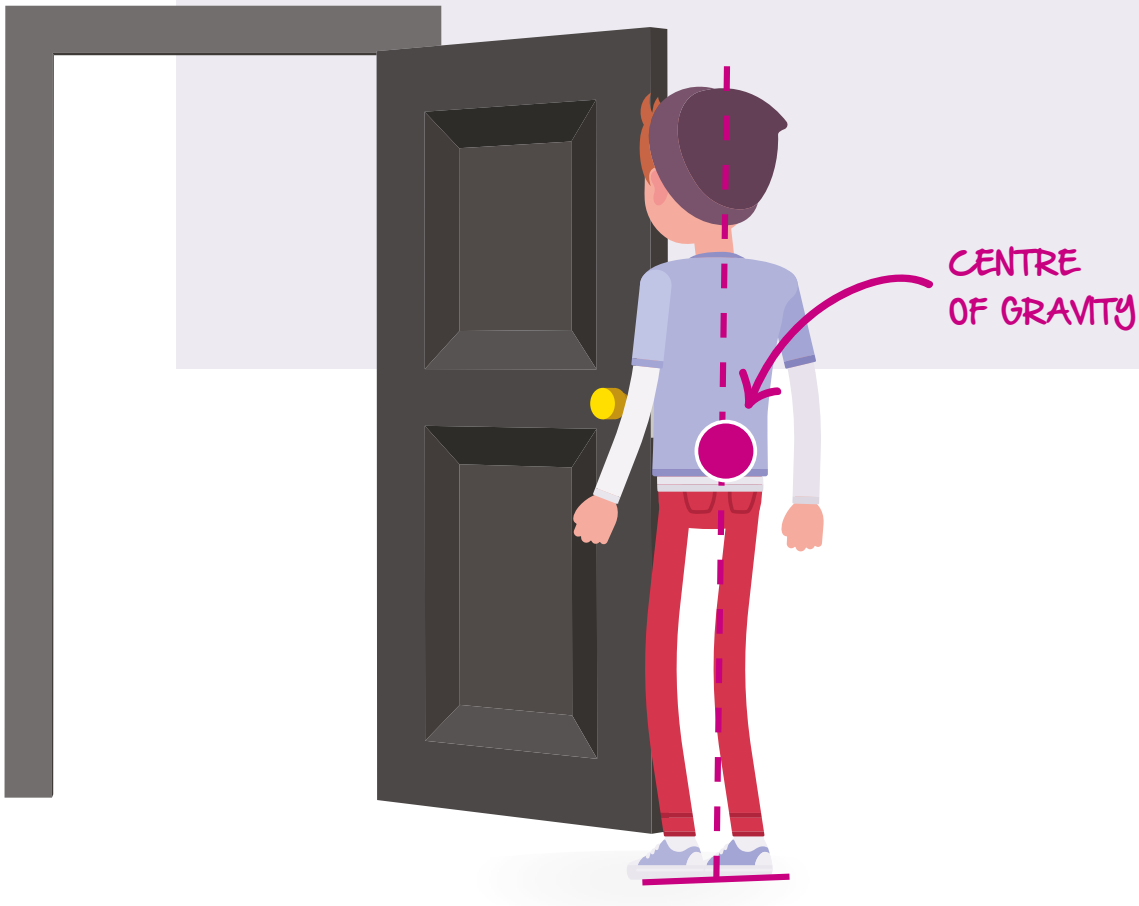
# ON YOUR TOES

1. Stand facing the edge of an open door.
   Your nose and stomach should just touch it.

2. Place your feet on either side of the floor slightly forward of the edge. Now try to rise onto your tiptoes.

3. It just won't happen unless you want to face plant the door.

You'll be caught flat-footed on this one. The reason you can't do this trick is because it moves your base of support out from under your centre of gravity. In order to stand on your toes, you must transfer the centre of gravity forward. To transfer the centre forward, you must lean over. The door prevents you from doing this.



METHOD 4

# SIT DOWN, STAND UP

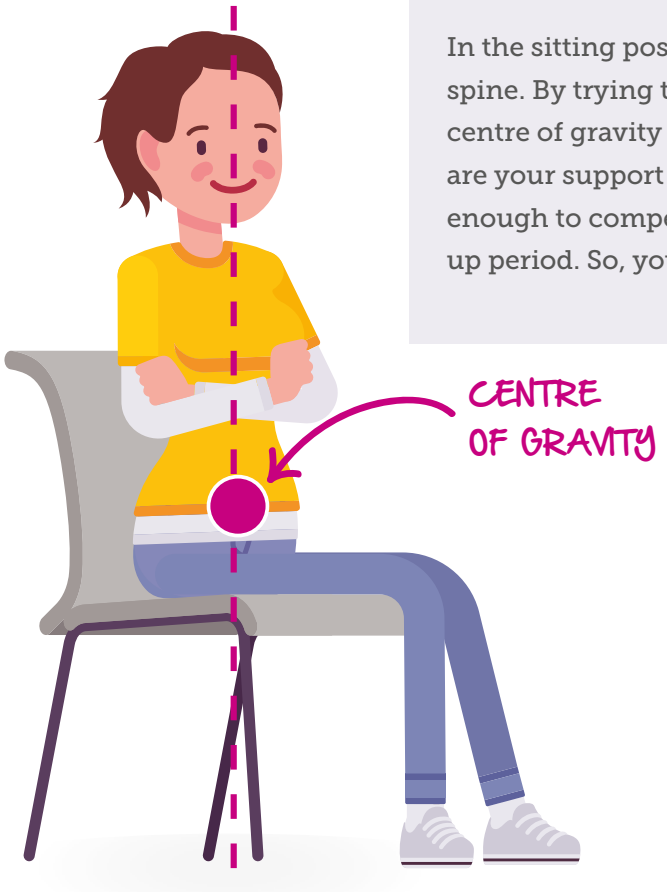
1. All you have to do to win is get up from a chair.
   Sit in a straight-backed armless chair. Keep your back against the back of the chair and put your feet flat on the floor.

2. Fold your arms across your chest.

3. Now, keeping your feet flat and your back straight, try to stand up.

4. Try to stand up again, bending a little forward at the waist, and keeping your back straight. Keep leaning forward until you are able to stand up.
   - How far forward did you have to bend in order to stand up?
   - What does this have to do with the centre of gravity?
   - What did you find helped you to stand up without bending as much?

In the sitting position the centre of gravity is at the base of your spine. By trying to stand up with your back straight, you prevent the centre of gravity from moving to a position above the feet, which are your support base. Human thigh muscles simply aren't strong enough to compensate for the balance problem during the getting-up period. So, you remain pitied to your chair.

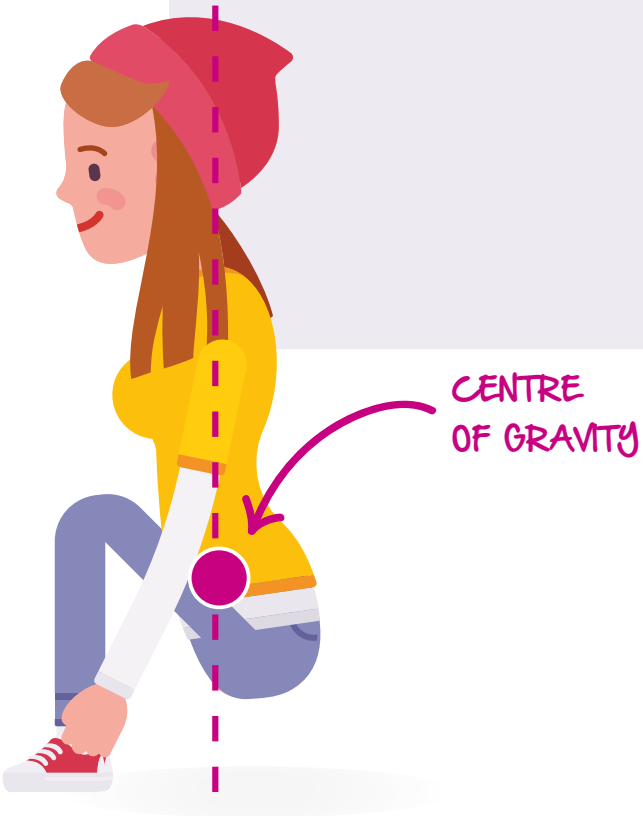


METHOD 5

# LEAP AHEAD

1. Hold your toes with your hands.
2. Keep your knees slightly bent.
3. Try to jump forward in this position.

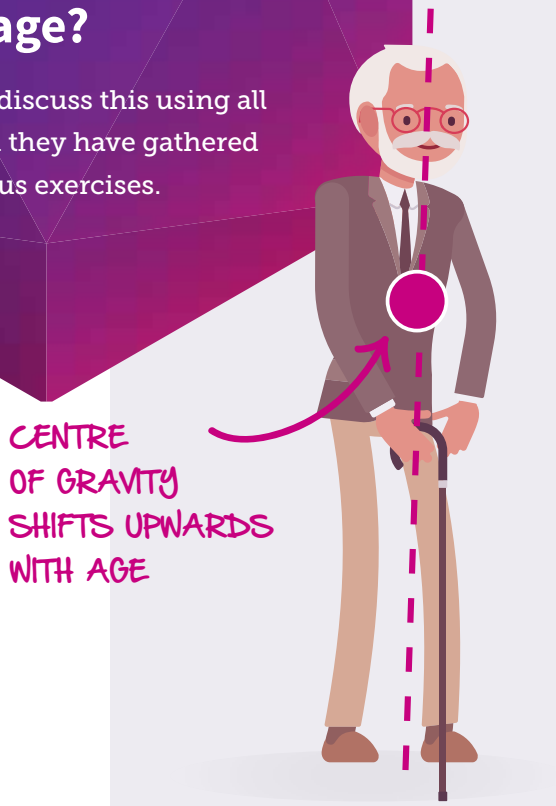
You can jump right around the block backward, but you'll not get one single bound forward. A backward jump is possible because the support base moves first, and the centre of gravity maintains a balanced state. To jump forward, your centre of gravity must move ahead of your base. Holding on to your toes prevents you from making the balance shift. Without shifting your centre of gravity, your leg muscles would have to be strong enough not only to lift your body off the ground but also to support the unbalanced position you would be in while jumping.



DEVELOPMENT QUESTION:

## How would your centre of gravity shift during pregnancy or with old age?

Get students to discuss this using all the information they have gathered from the previous exercises.




### ANSWER:

Your centre of gravity shifts upward during pregnancy, increasing your risk of tripping or miss-stepping. The centre of gravity for adults is the hips. However, as the person grows older, a stooped posture is common because of the changes from osteoporosis and normal bone degeneration, and the knees, hips, and elbows flex. This stooped posture results in the upper torso being the centre of gravity for the elderly person.

## POSSIBLE EXTENSION:

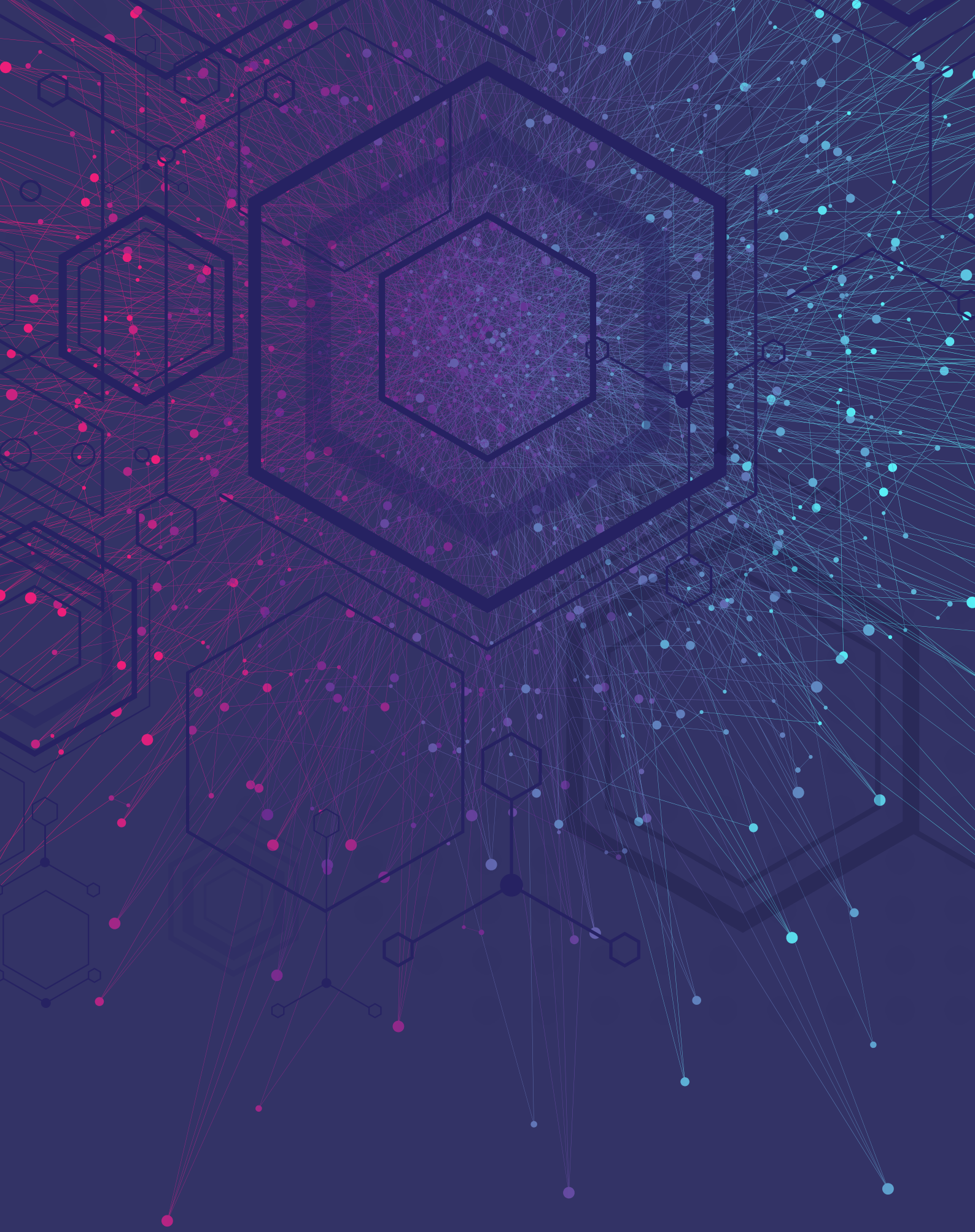
**Divide the class in to groups and give them a sport to discuss:**

- Gymnastics
- Swimming
- Surfing
- Football

Get them to draw a diagram of the person and where they think the centre of gravity is located. This may involve two to three diagrams. The students can then discuss what would happen if you changed the technique.

**Design an information poster based on what you have learned for the following:**

- Lifting and carrying heavy objects.
- Best sitting position for doing homework.
- Implications for a particular sporting activity.



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