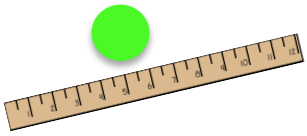
Name_____Date_____

Let's Investigate!



Question: How do balanced and unbalanced forces affect the motion of a ball?

1. Place the ball on the floor. What forces are acting on it?

2. Are the forces balanced or unbalanced? How do you know?

3. Push the ball gently with one finger while your partner pushes back gently with one finger in the opposite direction. What happens to the ball? What forces are acting on it?

4. Are the forces balanced or unbalanced? How do you know?

5. Push the ball gently when your partner is not pushing back. What happens to the ball? What forces are acting on it?

6. Are the forces balanced or unbalanced? How do you know?

7. What forces eventually cause the ball to stop?

8. Try balancing the ball on a ruler. What forces are acting on it?

9. Are the forces balanced or unbalanced? How do you know?

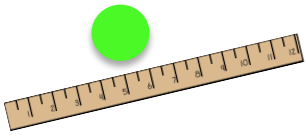
10. What changes when you tilt the ruler?

11. I can conclude that balanced forces cause a ball to _____,

    and unbalanced forces cause a ball to _____.

12. Think about the game of bowling. Explain an example of balanced and unbalanced forces that we could observe during a game of bowling. You may even draw a diagram if you choose.

Balanced and Unbalanced Forces Investigation



Materials:
a ball and a ruler for each set of partners (Any ball the size of a tennis ball or smaller will work, even a marble or bouncy ball.)

Overview:
Students will investigate the effect that balanced and unbalanced forces have on the motion of the ball. You want students to come away from this investigation understanding that when the ball is still, forces are balanced. Unbalanced forces cause the ball to move or change motion.

Teacher Background Knowledge:
The "push" of the floor or the ground is referred to as *normal force.* It is not a push in the way we typically think of push, but it is a force that is countering gravity and keeping the ball (and us) from sinking through to the core of the earth. A table exerts normal force if you rest your book on it. The table acts against gravity to keep your book from falling through the table to the floor.

Suggestions:
- This is designed to be an introductory lesson in balanced and unbalanced forces that is completed as a whole class. I encourage you to complete it step by step with your class so that you can discuss and explain the forces and make sure they are observing what they are supposed to be observing (i.e. that unbalanced forces cause the ball to move or change motion.)
- I suggest that you use the questions as more of a discussion guide. Students do not have to write the answers to each one.

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