Year 8 Science: Balanced and unbalanced forces, and free body diagrams

Name: _____ Date: _____

Try these without your notes first, then check the answer key.

Practice

1. A skateboarder rolls along at a steady speed in a straight line. Are the forces on her balanced or unbalanced?

2. A tug of war team pulls left with 500 N and the other pulls right with 450 N. What is the net force, and which way will the rope move?

3. A free body diagram of a falling apple shows weight 2 N down and air resistance 0.5 N up. What is the net force, and what happens to the apple's speed?

4. A car goes round a roundabout at a steady 30 km/h. Is there an unbalanced force on it?

5. Why should each trial in a fair test be repeated three times?

Fix the mistake

6. Correct this statement: "If something is moving, there must be an unbalanced force pushing it along."

7. Correct this statement: "Balanced forces means the object is not moving."

8. Correct this statement: "If the speed stays the same, the motion has not changed."

9. Correct this statement: "On a free body diagram, draw all the arrows the same length."

Answer key (for parents and tutors)

1. A skateboarder rolls along at a steady speed in a straight line. Are the forces on her balanced or unbalanced?
   Balanced, because her speed and direction are not changing.
2. A tug of war team pulls left with 500 N and the other pulls right with 450 N. What is the net force, and which way will the rope move?
   50 N to the left, so the rope moves left.
3. A free body diagram of a falling apple shows weight 2 N down and air resistance 0.5 N up. What is the net force, and what happens to the apple's speed?
   1.5 N down, so the apple speeds up.
4. A car goes round a roundabout at a steady 30 km/h. Is there an unbalanced force on it?
   Yes; its direction is changing, so the forces on it are unbalanced even though its speed is steady.
5. Why should each trial in a fair test be repeated three times?
   Repeats show whether results are consistent and let you spot a trial that went wrong, and the mean is more trustworthy than one reading.
6. Correct this statement: "If something is moving, there must be an unbalanced force pushing it along."
   A steady speed in a straight line needs balanced forces; an unbalanced force is only needed to change the motion.
7. Correct this statement: "Balanced forces means the object is not moving."
   Balanced forces mean the motion does not change, so a moving object keeps moving at the same speed and direction.
8. Correct this statement: "If the speed stays the same, the motion has not changed."
   Turning is a change in motion too, so a change of direction also needs an unbalanced force.
9. Correct this statement: "On a free body diagram, draw all the arrows the same length."
   Arrow length shows the size of each force, so a 120 N force needs a longer arrow than an 80 N one.