Understanding Force

Background
When you ride a bike, your foot pushes against the pedal. The push makes the wheels of the bike move. When you drop something, it is pulled to the ground by gravity. A push or a pull is a force. So, a good definition for force is a push or pull in a particular direction. Forces affect how objects move. They may cause motion; they may also slow, stop, or change the direction of motion of an object that is already moving.

Forces can affect motion in several ways:
• They can make objects start moving
• They can make objects move faster
• They can make objects move slower
• They can make objects stop moving
• They can make objects change direction

Since force cause changes in the speed or direction of an object, we can say that forces cause changes in velocity.

FORCE FACTS:
→ Forces are measured in Newtons (N)
→ Forces usually act in pairs
→ Forces act in a particular direction
→ Forces many times cannot be seen, but their effects can

More than one force can act on an object at a time. The forces can push or pull in any direction. What happens to the object when the forces act depends on two things:
1. How strong the forces are
2. The direction of the forces

When more than one force acts on an object, the forces combine to form a net force. The combination of all the forces acting on an object is the net force.

Forces may work together or they may be opposite forces. Two or more opposite forces are balanced forces if their effects cancel each other and they do not cause a change in an object's motion. If two forces of equal strength act on an object in opposite directions, the forces will cancel, resulting in a net force of zero and no movement. If the effects of the forces don't cancel each other, if one force is stronger than others, the forces are unbalanced forces. Unbalanced forces cause a change in motion; speed and/or direction. When two forces act in the same direction on an object, the net force is equal to the sum of the two forces. When two unequal forces act in opposite directions on an object, the net force is the difference of the two forces. The final force and its direction are called a resultant.
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Background
When you ride a bike, your foot pushes against the pedal. The push makes the wheels of the bike move. When you drop something, it is pulled to the ground by ______________. A ______________ or a pull is a force. So, a good definition for force is a push or pull in a particular direction. Forces affect how objects move. They may cause motion; they may also ________________, ________________, or change the ______________ of motion of an object that is already moving.

Forces can affect motion in several ways:
• They can make objects start moving
• They can make objects move faster
• They can make objects move slower
• They can make objects stop moving
• They can make objects change direction

Since force cause changes in the speed or direction of an object, we can say that forces cause changes in ________________

FORCE FACTS:
→ Forces are measured in _________________ (N)
→ Forces usually act in pairs
→ Forces act in a particular direction
→ Forces many times cannot be seen, but their effects can

More than one force can act on an object at a time. The forces can ______________ or ______________ in any direction. What happens to the object when the forces act depends on two things:
1. How ______________ the forces are
2. The ______________ of the forces

When more than one force acts on an object, the forces combine to form a ______________ ______________. The combination of all the forces acting on an object is the net force. Forces may work together or they may be opposite forces. Two or more opposite forces are ______________ ______________ if their effects cancel each other and they do not cause a change in an object's motion. If two forces of equal strength act on an object in opposite directions, the forces will cancel, resulting in a net force of zero and ________________.

If the effects of the forces don't cancel each other, if one force is stronger than others, the forces are ______________ ______________. Unbalanced forces cause a change in motion; speed and/or direction. When two forces act in the ______________ on an object, the net force is equal to the ______________ of the two forces. When two unequal forces act in opposite directions on an object, the net force is the ______________ of the two forces. The final force and its direction are called a ______________.
Circle the best answer:

1. The forces shown above are PUSHING / PULLING forces.
2. The forces shown above are WORKING TOGETHER / OPPOSITE FORCES.
3. The forces are EQUAL / NOT EQUAL.
4. The forces DO / DO NOT balance each other.
5. The resultant force is 1000 N TO THE RIGHT / 1000 N TO THE LEFT / ZERO.
6. There IS / IS NO motion.

Circle the best answer:

7. The forces shown above are PUSHING / PULLING forces.
8. The forces shown above are WORKING TOGETHER / OPPOSITE FORCES.
9. The forces are EQUAL / NOT EQUAL.
10. The forces DO / DO NOT balance each other.
11. The stronger force is pulling to the RIGHT / LEFT.
12. The weaker force is pulling to the RIGHT / LEFT.
13. Motion is to the RIGHT / LEFT.
SHOWING FORCES:
A force can be shown with a vector. A vector is a line with an arrow. It begins with a dot.
→ The dot shows where the force begins
→ The length of the arrow shows the amount of force
→ The arrows shows the direction of the force

Example:

Each square represents force of ONE NEWTON. This vector shows a 5 n force to the right.

Fill in the chart on the right with the information found in the figure on the left. Each square represents 1 n of force.
When two or more forces are combined you can use vectors to determine the resulting force. This force is called the **resultant**.

The figure to the left shows two opposite forces. There is a 5 kg force to the right and a 7 n force to the left. Subtract 5 from 7. The resultant is a 2 n force to the left. The resultant vector is shown.

This figure shows two forces in the same direction. They are both 5 n forces. Add 5 and 5. The resultant is a 10 n force to the right.
Six sets of vectors are shown below. Draw the resultant vector next to each set. Start at the dot. One has been for you.

Use the above information to fill the chart:

<table>
<thead>
<tr>
<th></th>
<th>Total number of forces</th>
<th>Amount of force (n)</th>
<th>Resultant</th>
<th>Movement? (yes, no)</th>
<th>Direction (right, left, up, down)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td>6</td>
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</tbody>
</table>

Additional questions:
1. Define force
2. What unit is used to measure force?
3. What do unbalanced forces cause?
4. What do balanced forces cause?
5. What is a resultant?