

Newton's 1st Law of Motion

1. A force is... (select all that apply)
 - A an energy field that consists of a light side and a dark side that connects all living things
 - B a push or a pull that acts on an object
 - C a vector quantity
 - D something that is required to keep an object moving
2. The SI unit of force is...
 - A m
 - B kg
 - C N
 - D m/s^2
3. Which of the following would be categorized as a contact force? (select all that apply)
 - A The tension force acting on a box that is pulled by a rope
 - B The gravitational force pulling an object down
 - C The friction force acting on the surface of a book sliding across a table
 - D The normal force acting upwards on a person sitting in a chair
4. Which of the following should be included in a free body diagram? (select all that apply)
 - A The object that we're focusing on, or a dot that represents the object as a particle
 - B All of the forces acting on the object that we're focusing on, represented as vectors
 - C The objects that are causing the forces on the object that we're focusing on
 - D A coordinate system (the direction of the positive x and y axes)
5. Newton's 1st law of motion states that an object at rest will remain at rest if...
 - A there are no forces acting on the object
 - B the object is sitting on the ground
 - C the object has zero energy
 - D there is no net force (no unbalanced force) acting on the object
6. According to Newton's 1st law of motion, an object that is moving at a constant velocity...
 - A must have one force acting on it in the direction of the velocity
 - B must have no forces acting on it
 - C must have a net force acting on it in the direction of the velocity
 - D must have no net force acting on it
7. Inertia is... (select all that apply)
 - A an object's tendency to remain at rest
 - B an object's tendency to remain in motion
 - C an object's tendency to resist changes to its motion
 - D related to an object's mass

8. A block is sliding on a surface and is accelerating as shown in Figure 1. Which of the following statements about the block is true? (Select all that apply)

- A There must be one force acting on the block
- B There are no forces acting on the block
- C There must be a net force acting on the block
- D There is no net force acting on the block

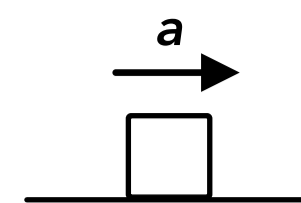


Figure 1

9. A box has 4 forces acting on it as shown in Figure 2. Which of the following statements is true about the forces acting along each direction?

- A The horizontal forces are balanced and the vertical forces are balanced
- B The horizontal forces are balanced and the vertical forces are unbalanced
- C The horizontal forces are unbalanced and the vertical forces are balanced
- D The horizontal forces are unbalanced and the vertical forces are unbalanced

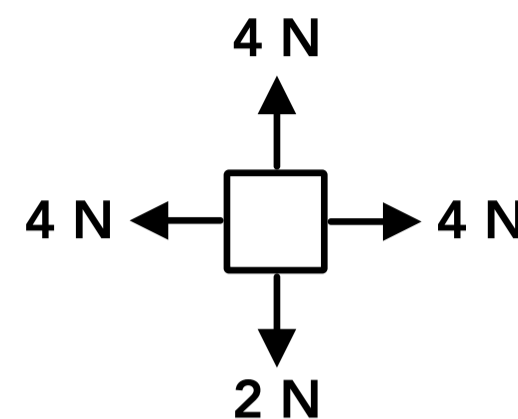


Figure 2

10. A block is sitting at rest on a surface as shown in Figure 3. Which of the following statements about the block is true? (Select all that apply)

- A There may be horizontal forces acting on the block
- B There must be no horizontal forces acting on the block
- C There may be only one horizontal force acting on the block
- D There must be no net horizontal force acting on the block

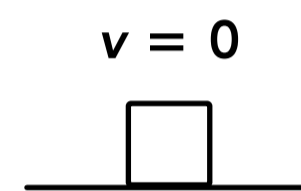


Figure 3

Answers

1. B, C
2. C
3. A, C, D
4. A, B, D
5. D
6. D
7. A, B, C, D
8. C
9. B
10. A, D

Answers - Newton's 1st Law of Motion

1. **Answer: B, C**

A force is a push or a pull that acts on an object and is caused by something else. Forces are vector quantities which means they have a magnitude and a direction. Although forces are related to an object's motion, Newton's 1st law of motion states that an object will keep moving if there are no forces acting on it.

2. **Answer: C**

The SI unit for force is the Newton (N) which equivalent to $\text{kg}\cdot\text{m}/\text{s}^2$.

3. **Answer: A, C, D**

Tension, friction and normal forces are contact forces because they act on object through direct contact. Gravitational force is a non-contact force because the earth applies the force on an object without direct contact.

4. **Answer: A, B, D**

A free body diagram is used to illustrate all of the forces acting on a single object. It should include the object we're focusing on, all of the forces acting on that object (represented as vectors), and the choice of coordinate system so we know which are the positive x and y directions. A free body diagram should not include any other objects or the environment.

5. **Answer: D**

Newton's 1st law of motion specifically states that an object at rest will remain at rest if there is no net force (or no unbalanced force) acting on the object. There may be forces acting on the object and it still remains at rest if those forces are balanced in opposite directions (the net force is zero).

6. **Answer: D**

Newton's 1st law of motion states that an object that is moving with a constant velocity must have no net force acting on it. There may be forces acting on the object, but they would be balanced in opposite directions. An object does not require a force to continue moving at a constant velocity.

7. **Answer: A, B, C, D**

All of these accurately represent the concept of inertia as described in Newton's 1st law of motion. An object's inertia is proportional to its mass, which is further described in Newton's 2nd law of motion.

8. **Answer: C**

The block is accelerating (its velocity is changing) so there must be a net force acting on the block according to Newton's 1st law of motion.

9. **Answer: B**

The forces are balanced in the horizontal direction because the two forces have the same magnitude and act in opposite directions so the net force is zero in the horizontal direction. The forces are unbalanced because the 4 N acting upwards is greater than the 2 N force acting downwards, so there is a net force of 2 N acting upwards.

10. **Answer: A, D**

The block is at rest and it is not accelerating, so there must be no net force on the block (in any direction) according to Newton's 1st law of motion. There may be horizontal forces acting on the block, but they must cancel out (they must have equal magnitudes in opposite directions) so that the net force is zero.