Name _____ Date _____

Net Force Calculations: When Do Forces Balance, and When Do They Change Motion?

Directions: Every force in this activity acts along one straight line, such as up and down or east and west. Forces are measured in newtons (N). In number questions, type only the number; the unit is shown next to the box.

1. When two forces push in opposite directions along the same line, net force = the larger force − the smaller force, and it points the way the larger force points. Maria pushes a box east with 75 N, and Jamal pushes it west with 50 N. The box sits on a smooth floor, so ignore friction. What is the size of the net force on the box?

_____ N

2. Forces that point the same way add, and forces that point opposite ways subtract. Two students push a stalled go-kart east, one with 120 N and the other with 90 N. As the go-kart rolls, friction from the ground pushes on it 50 N to the west. What is the size of the net force on the go-kart?

_____ N

3. A skydiver with her parachute open falls straight down at a steady speed. Gravity pulls her down with 700 N, and air resistance pushes her up with 700 N. Which statement is true?

A. Gravity is pulling harder, so she must be speeding up.

B. Air resistance will soon stop her in midair.

C. The forces are balanced, so she must be hanging still in the air.

D. The forces are balanced, so she keeps falling at the same steady speed.

4. A backpack rests on a table and does not move. Which statement about the forces on the backpack is true?

A. The table pushes up harder than gravity pulls down, which is why the backpack stays put.

B. Gravity pulls it down, and the table pushes it up with a force of the same size, so the forces are balanced.

C. Only gravity acts on it; the table just gets in the way.

D. No forces act on it, because it is not moving.

5. Forces that point the same way add, and forces that point opposite ways subtract. Each choice lists every force acting on an object along one line. Which two objects have balanced forces?

☐ A. A raft: 30 N to the north, 10 N to the south and 20 N to the south

☐ B. A cart: 40 N to the east and 25 N to the west

☐ C. A bin: 35 N to the left and another 35 N to the left

☐ D. A wagon: 60 N to the east, 20 N to the east and 70 N to the west

☐ E. A desk: 50 N to the right and 50 N to the left

6. Forces that point the same way add, and forces that point opposite ways subtract. A sled is sliding north across the snow. Alex pulls it north with 70 N, Bea pulls it south with 40 N, and friction from the snow pushes it south with 50 N. What is happening to the sled's speed?

A. It is slowing down, because the net force is 20 N to the south, against the sled's motion.

B. It is speeding up, because the largest single force, Alex's 70 N pull, points north.

C. It is speeding up, because the sled is already moving north.

D. It stays the same, because forces are pulling it both ways.

7. When a push and friction point in opposite directions, net force = push − friction. Kim pushes a crate east across the floor. Friction from the floor pushes west on the crate with 60 N, and the net force on the crate is 25 N to the east. How hard is Kim pushing?

_____ N

8. When two forces act in opposite directions, net force = the larger force − the smaller force. A crane lifts a crate straight up. The cable pulls up on the crate with 5,300 N, and gravity pulls down on it with 5,000 N. Ignore air resistance. What is the size of the net force on the crate?

_____ N

9. Kofi tosses a ball straight up. At the very top of its path, the ball stops for an instant before it falls back down. Ignore air resistance. Which statement about the forces on the ball at that instant is true?

A. Only gravity acts on it, so the forces are unbalanced, and the ball starts to speed up downward.

B. The forces are balanced, because the ball is not moving.

C. No forces act on it, because it is not moving.

D. The upward force from Kofi's throw is still there and exactly balances gravity.

10. When an object moves at a steady speed in a straight line, the forces on it are balanced, so the forces pointing one way add up to the forces pointing the other way. A pickup truck tows a camper trailer east at a steady speed. Friction from the road pushes west on the trailer with 400 N, and air resistance pushes west on it with 600 N. How hard does the truck pull east on the trailer? Type your answer without a comma.

_____ N