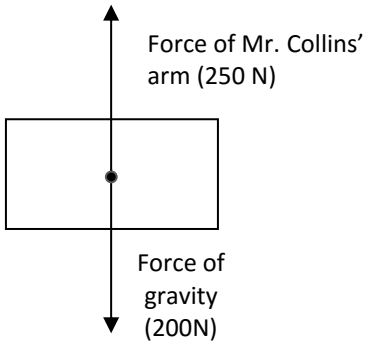
Name: _____ Period: _____ Date: _____

Forces and Free Body Diagrams

Directions: *Answer the questions based on your knowledge of forces and friction. For each example problem, calculate the net force on the object described in each situation. Draw a free body diagram for each and show the directions of forces as well as the total net force and direction of net force.*

Example: Mr. Collins lifts a heavy box over his head with one push of the arm and a force of 250 newtons. Gravity is pulling down the mass with 200 newtons. What is the net force and direction of the box?

Net force = 50 N upwards



1) What is a force?

2) What is meant by *unbalanced forces*, and what is the result? Draw an example:

3) What is meant by *balanced forces*, and what is the result? Draw an example:

4) A box is being pushed by two stellar science students, one on each side of the box. Peter is pushing the box with a force of 10 N to the left. Josh is pushing the box with a force of 15 N to the right. Who is the stronger individual and what is the net force and direction on the box?

5) During an epic round of Tug-of-War, Jared and James thought they'd be able to beat Mr. Collins no problem. Together, they applied a force of 300 N pulling to the left. But with one arm on the rope and the other at his side, Mr. Collins applied a 300 N force to the right. What is the net force and direction on the rope?

6) Mr. Collins finally decided to take this seriously and put both hands on the rope and applied a 500 N force to the left, while Jared and James still struggled with their 300 N force to the right. What is the net force and direction of motion?

7) Farah and Athena were attempting to push Kieran on the scooter with enough force so that Kieran would run into Mr. Collins. They figured out they needed a 50 N force to run the scooter into Mr. Collins. Farah and Athena were both applying force from the left, Farah applying a 20 N force and Athena pushing with a force of 15 N. Were they able to get Kieran to run into Mr. Collins? How can they get it to hit him?

8) In a 4th period battle, the girls were able to overcome the in Tug-of-War. Ten boys *each* pulled with a force of 30 N. Six girls were able to pull the rope toward them with a net force of 60 N. What was the minimum amount of force ***each*** of the six girls applied to the rope?

9) During 5th period Dylan was a beast. She resisted the forces applied by 13 other students in her class all at once. Her 13 classmates tried to knock Dylan over, *each* applying a force of 17 N, and she still didn't budge. How much force was Dylan pushing back with, and how many people would it take to push Dylan if she can withstand a force of 300 N?

10) Anna got fed up and decided to put some of her classmates in a big box. She shoved Riley, Justin, and Paul into the box and taped it shut. Anna couldn't overcome the force of friction by herself, so she asked some classmates to help push the box out the door. The force of friction of the floor on the box was 400 N. If Anna and her classmates can each shove with a force of 32 N, how many students would it take to make the box start moving out the door?