

Analysis Tool – Force Diagrams

For the following description, it is useful to have an example to draw upon. The situation described below will provide a context for the description of drawing a force diagram.

A child pulls herself up a rope using only her hands.

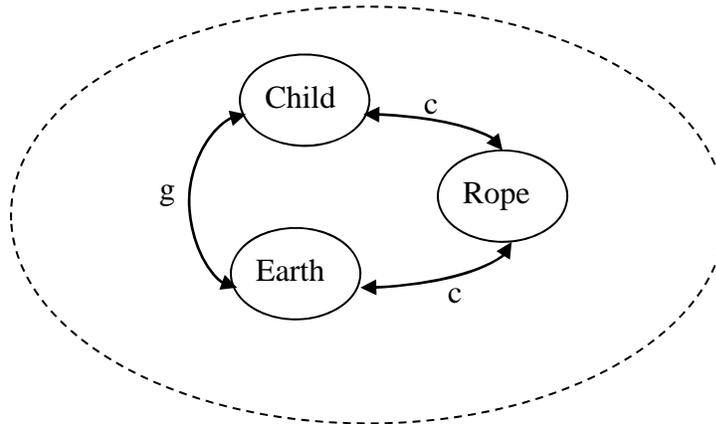
Following is a method that can be used to draw force diagrams.

1. Identify the object you are considering.

In our example, we will choose the child as the object of interest. We may have been tipped off by the fact that the child is moving.

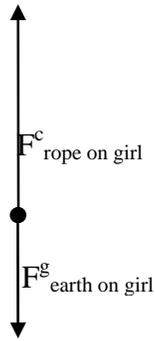
2. Use a dot to represent the object of concern.
3. Identify all interactions that the object is involved with.

This can be facilitated by drawing a system schema. Remember that for each interaction that an object is involved in, there is one force on the object. In our example, the system schema would look like this:



4. For each interaction on the system schema, draw and label a force, with the tail of the force vector coming from the dot, which represents the object.

In our example, there are two interactions that involve the child, so there are two forces on the child, a contact interaction with the rope, and a gravitational interaction with the earth. The gravitational force would pull the child down and the contact force with the rope points upward.



5. Check to make sure your force diagram agrees with Newton's Second Law if you can. There will be times when you do not know the direction of the acceleration of the object, so you can not check the force diagram with N2, but when you can, your diagrams should be consistent with Newton's Second Law.

In our example, we can not be sure if the girl is accelerating or not, she could be pulling herself up with constant velocity, in which case the F^c and the F^g vectors from the force diagram should be the same length, but as drawn above, they are not the same length, so this implies something about Newton's Second Law. What is the direction of the acceleration for the child according to the force diagram shown above?