**Lesson 3**

## Force Diagram

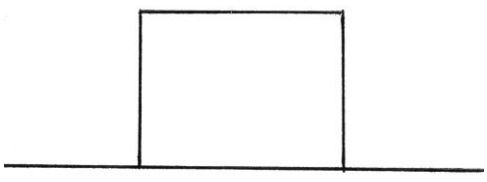
We covered how to deal with scalars and vectors in Lesson 2, and we learned that we need to handle vectors very carefully. This is one of the reasons that accurate diagrams become very helpful (inaccurate diagrams will do more damage than not having a diagram at all!). An accurate diagram helps you to visualize and to establish correct equations when you solve problems. We highly recommend you to follow the steps discussed in Lesson 2 and of course, you need to practice to be comfortable with the steps. We want to cover force diagrams to help you "see" forces acting onto a point in this lesson. However, we need to cover some terminologies before we proceed. In physics (or any other science), it is very important to know definitions of terms because we have crafted physics precisely and there is no room for ambiguity. Lots of teachers and students do not pay attention to this resulting "chaos". We will cover definitions time to time and those are the exact definitions used in physics. If you learn those now, it will make Physics 230 much easier when you take it. Please learn exact definitions of terms we use in physics (in English) so that you can construct logic correctly and hence, solve problems correctly.

| **Terms** | **Definitions** |
|---|---|
| Equilibrium | |
| Static Equilibrium | |
| Dynamic Equilibrium | |
| Free Fall | |
| Terminal Speed | |

Draw all the forces applied.

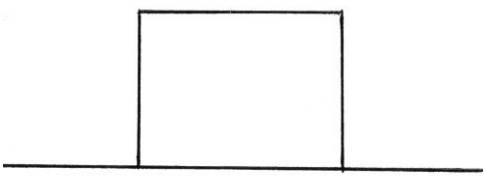
**Case 1 : v = 0 m/sec, a = 0 m/sec$^2$**

**(No horizontal Force)**



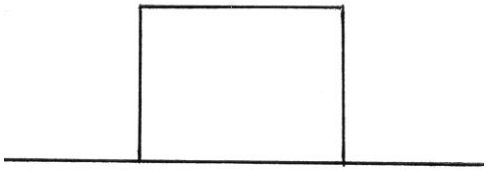
**Case 2: v = 0 m/sec, a = 0 m/sec$^2$**

**(Someone is pushing horizontally)**



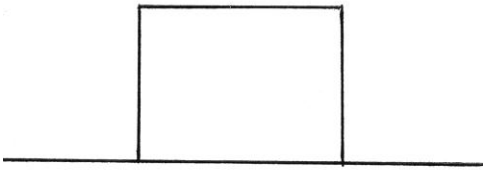
**Case 3: $v \neq 0$ m/sec, $a = 0$ m/sec$^2$**

**(No horizontal Force)**

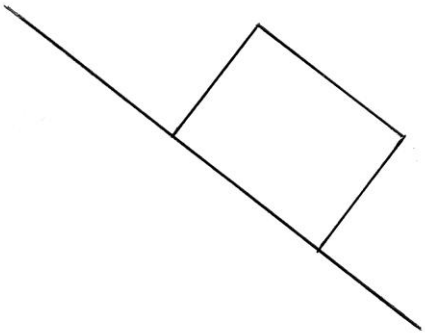


**Case 4: $v = 0$ m/sec, $a = 0$ m/sec$^2$**

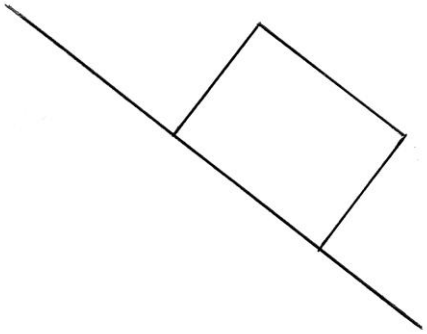
**(Someone is pushing horizontally)**



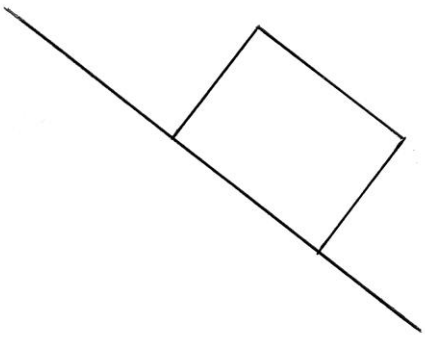
**Case 5: With no friction**



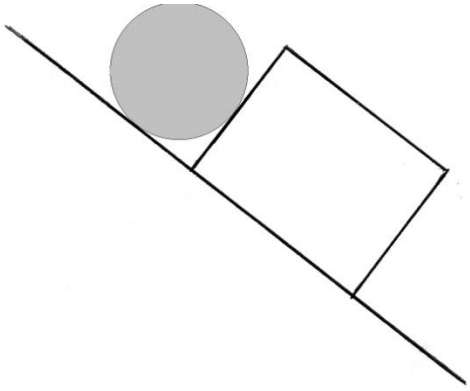
**Case 6: With friction, $a \neq 0$ m/sec$^2$**



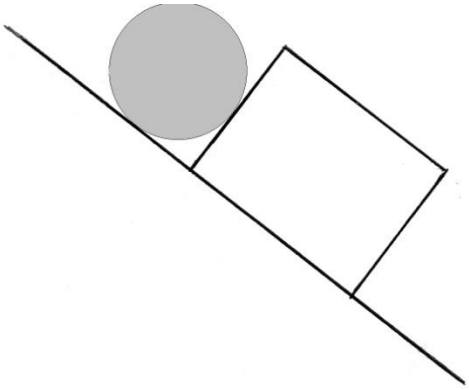
**Case 7: $a = 0$ m/sec$^2$**



**Case 8: Focus on the ball, $a = 0$ m/sec$^2$**



**Case 7: Focus on the block, a = 0 m/sec$^2$**



**Case 8: Free fall**

**Case 9: Terminal Speed**

**Case 10: Between Free fall and Terminal speed**