Homework Week 03  
Due Week 04

1. Fill in the blanks for the following (20%)  
A. A ____________ is something that modifies force 
B. A ____________ is when force comes from an outside source 
C. The mechanical action of the machine produces __________ 
D. All machines (almost) always employ at least one __________
E. Mechanical ____________ is the ratio of load versus effort 
F. Leverage is the ratio distances of the _________ and load to the fulcrum 
G. A lever of the second order is also known as a force __________ 
H. A lever of the third order is also known as a force __________ 
I. Part with the hole that supports the shaft is called the ___________
J. A ___________ converts rotation to reciprocation

2. Answer the following (10%)  
A. State Newton’s 3 Laws of Motion 
B. List, sketch and give examples of the 5 simple machines 
C. Name, sketch and give examples of the 3 levers 

3. Define (1 to 2 sentences), describe (1 to 3 paragraphs) and provide sketches to support you definitions and descriptions for the following (10%)  
A. Shafts and Bearings 
B. Cams 
C. Cranks 

4. Sketch and describe the 4 cycles of a simple crank-lever and slotted crank-lever (10%) 

5. Recall that a walker was configured using a single NXT motor and 4-bar linkage. Write an NxC program where the walking speed is proportional to values reported by an ultrasonic sensor; when the sensor is close to (far away from) an object, it walks slowly (quickly). (25%) 

6. Some examples of common folding chairs are shown. Study how it works and then construct a scaled Lego-based version that mimics the chair’s function. Your Lego structure should fold flat and unfold to act like a chair. Create Build Instructions with photos: showing all parts (and annotated by their part number), and 4-step build plan (see example on right) (25%)