Homework – Ratchets, Drives and Gearing

1. Fill in the blanks for the following (20%)

    A. Cams turn _____ rotary motion into an upward and downward motion
    B. _____ is difference between a cam's minimum and maximum radii
    C. Eccentricity means to be _____
    D. Unlike cranks, cams have the ability to store _____
    E. Cams are the _____ version of computer programs
    F. A _____ crank converts up-down motion to side-to-side motion
    G. A 3-bar (linkage) is for _____ motion
    H. A slider-crank with a _____ increases lever sway
    I. Levers move in a _____ arc
    J. A _____ can be used to keep the lever against the cam so it follows the profile
    K. Springs in cam-followers increase _____, so tensioners are used

2. Refer to the lecture notes on Cams; Springs, and Linkages. When giving explanations, use bullets from these notes (no need to reference external materials). Provide your own sketches; don't cut-and-paste from the lecture notes or external sources (10%).

    A. List, sketch and give examples of the 4 types of springs
    B. Explain how cams examples of memory and storage
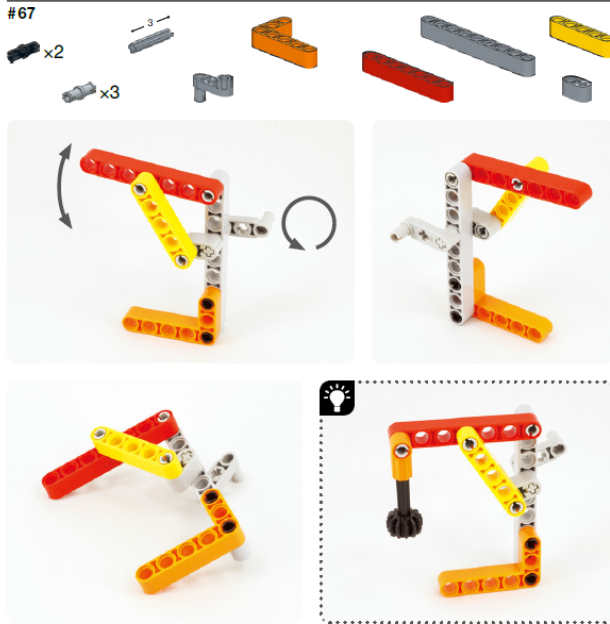
3. Refer to the lecture notes on Cams; Springs, and Linkages. Define (1 to 2 sentences), describe (with bullets) and provide sketches to support you definitions and descriptions for the following. When giving explanations, use bullets from these notes (no need to reference external materials). Provide your own sketches; don't cut-and-paste from the lecture notes or external sources (10%)

    A. Lobe Cams
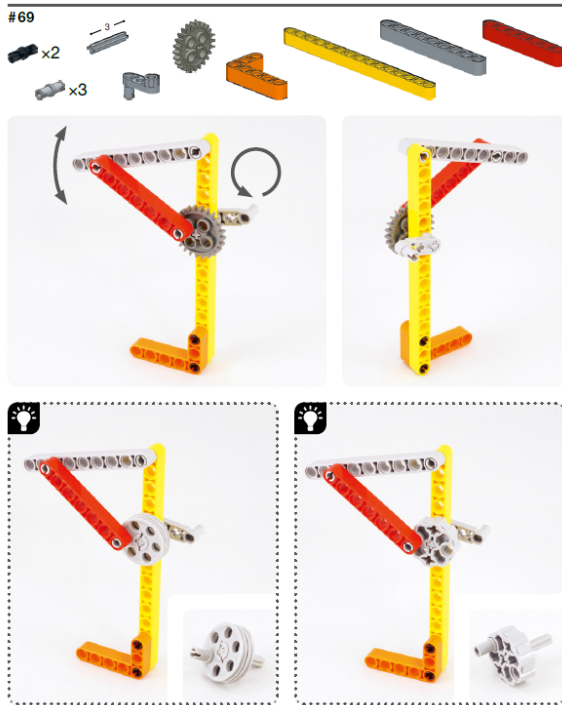   B. Dwell (or Pause)
    C. 3-bar linkages

4. Refer to the lecture notes on Cams; Springs, and Linkages. Sketch and describe (with bullets) the 4 cycles of a 3-bar linkage. In your sketch show where the straight line motion is and in your description, explain how the straight motion arises Provide your own sketches; don't cut-and-paste from the lecture notes or external sources (10%)
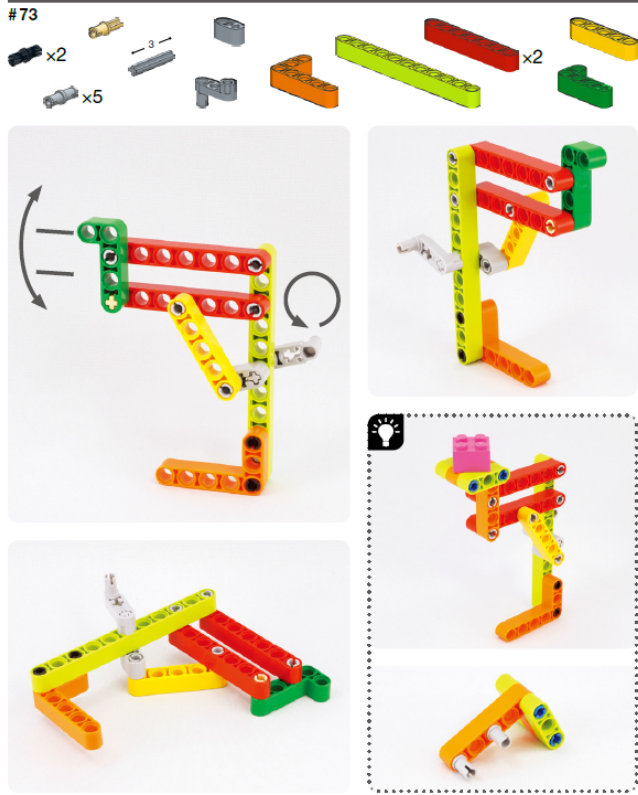
5. Studio exercise. Pick 2 oscillating mechanisms. Create the step-by-step build plan and BOM. Physically build the mechanism and provide a YouTube video (URL) demonstrating it working. Additionally: search for real-world applications that mimic and/or are similar to the motions of the mechanisms you constructed. Include a photo and/or video demonstrating the real-world application you found (50%).

    Note: to improve your Build Plan, use Studio's Page Layout options. This allows one to align 2 or more steps in a single page. One can also change the resize the graphic as well as the perspective (e.g. angle view). For the BOM, use Studio's feature: hover over left pane which has the pages of your build-plan, and right click to insert a New Page. Then below the ribbon bar, click Insert – Bill of Materials).

Oscillating Mechanisms

#67

#68

#70

×4 ─3─ ×2 ─4─ ×2 ×2

#69

×2 ─3─ ×3

#73

#74

#75