

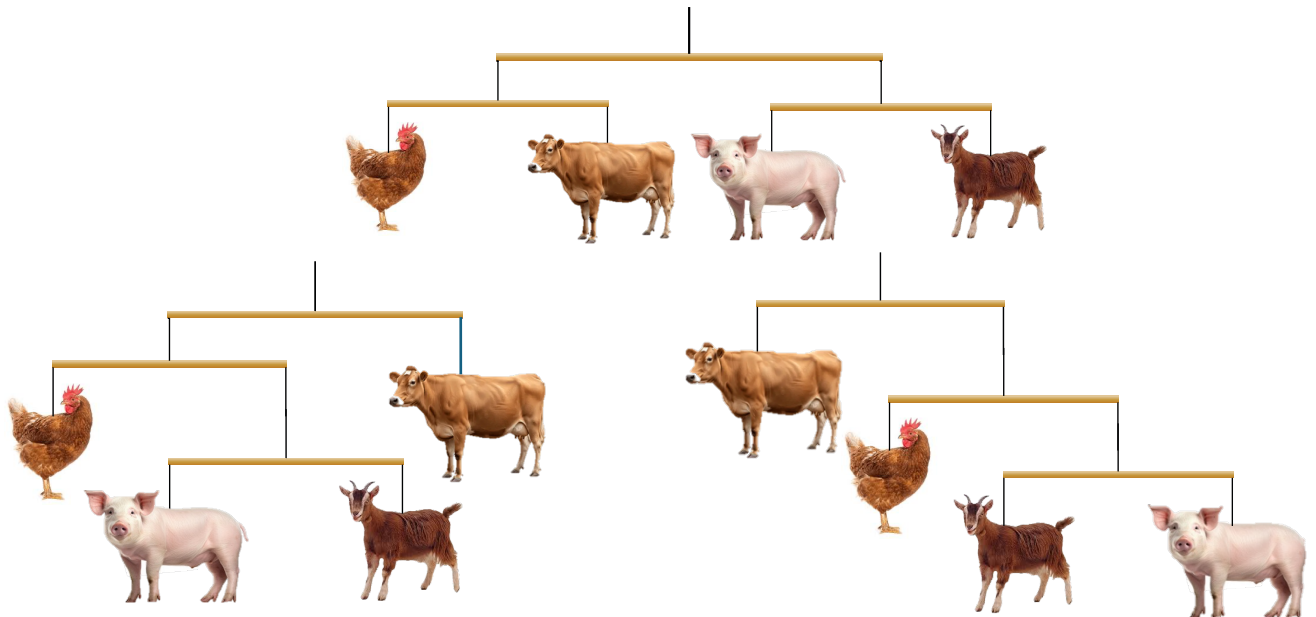
The Mobile CAD/CAM Project

Name _____

Mobiles, a type of moving sculpture, were invented in the early 1930s. Building on the work of Man Ray and others who were experimenting with kinetic art, Alexander Calder designed the first complex balanced work. For this project, you will design and build a themed mobile. The items hanging from your structure will be 3-D printed or laser-cut from designs you create in OnShape. The theme will be something you pick that will connect the different items. The layout of your figures may further the connection between the pieces and/or may be guided by their size and the nature of the balance you want your shape to have. That said, mobiles move! So, there won't be a fixed position or perspective that viewers will necessarily see.

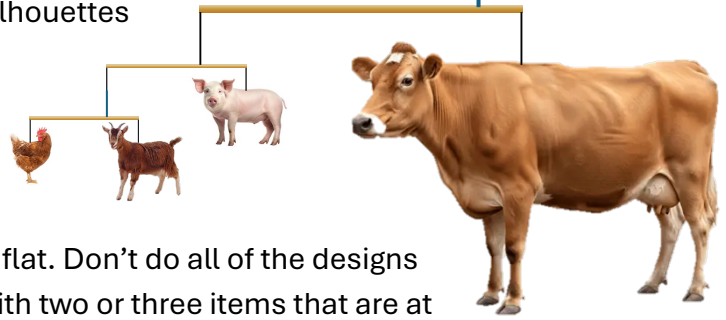
Here are stages for designing your mobile:

1. Pick your theme. This can be a playful or serious topic or a favorite hobby or interest.
2. Choose the shapes that fit the theme and how they should be arrayed in the mobile. If there is a natural hierarchy to the forms by size, relationship (e.g., members of your family in a family tree), or actual physical position (e.g., items in a tree arranged vertically), you can build that into the level each item is placed on. Shown below are two ways – even and staggered – to arrange a cow, pig, goat, and rooster. Note that the two staggered examples are actually equivalent (mobiles can move about!).



The number of possible configurations grows as the number of elements in a mobile grows and you can experiment with the different aesthetic results.

The farm animals above were made roughly equal-sized. A more realistic mobile would involve 3-D printed animals or laser cut silhouettes that are accurately scaled to the real animals as shown here at right.



3. If the pieces are to be 3-D printed, they can be designed with three-dimensional forms. If they are to be laser cut, they can be flat. Don't do all of the designs before you start to cut or print them. Begin with two or three items that are at the bottom of your mobile. Once you have these components designed in OnShape, cut or print them out and make a mini-mobile that balances.
4. As you design and produce more shapes, you can build up your mobile from the bottom up refining your techniques as you go.
5. Along with your mobile, you will submit a lab report that covers the following items:
 - a. An introduction to your theme and why you chose it.
 - b. A list of the figures you will make.
 - c. A first design of the layout of your mobile.
 - d. As you produce your figures, weigh them and record their masses in grams in a table.
 - e. The string that holds up a cross beam is a *supporting string* and where it is placed on the beam is the *attachment point*. Show the calculations that tell you where on a cross beam to place the attachment point so that the beam will balance (hang reasonably horizontally).
 - f. When you balance the beam measure the lengths on each side and show the calculations to show how close the actual torques match what you predicted it should be above.
 - g. A photograph of your finished mobile.