Model Design & Building Merit Badge

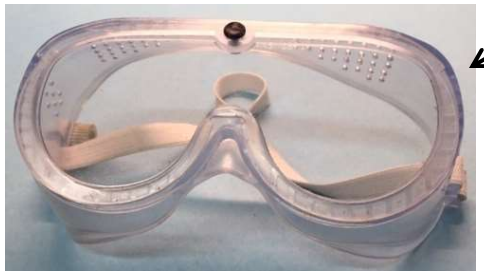
Tools

Model Design & Building Merit Badge

Tools

Safety equipment

- Safety glasses or goggles
- Gloves
  - Close fitting leather or heavy cloth for cutting and handling sharp materials
  - Plastic or rubber for handling chemicals (check usage instructions)



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Tools - Design and layout

Tape measure to measure real object and model pieces

Folding ruler to measure real object and model pieces

Calculator to convert real object dimensions to scale model dimensions

Easer to fix mistakes!

Pencils to draw plans

Ruler to measure model pieces

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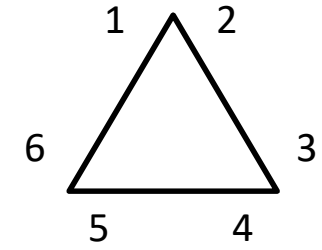
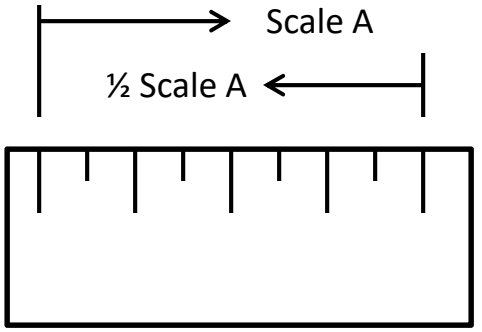
Tools - Design and layout

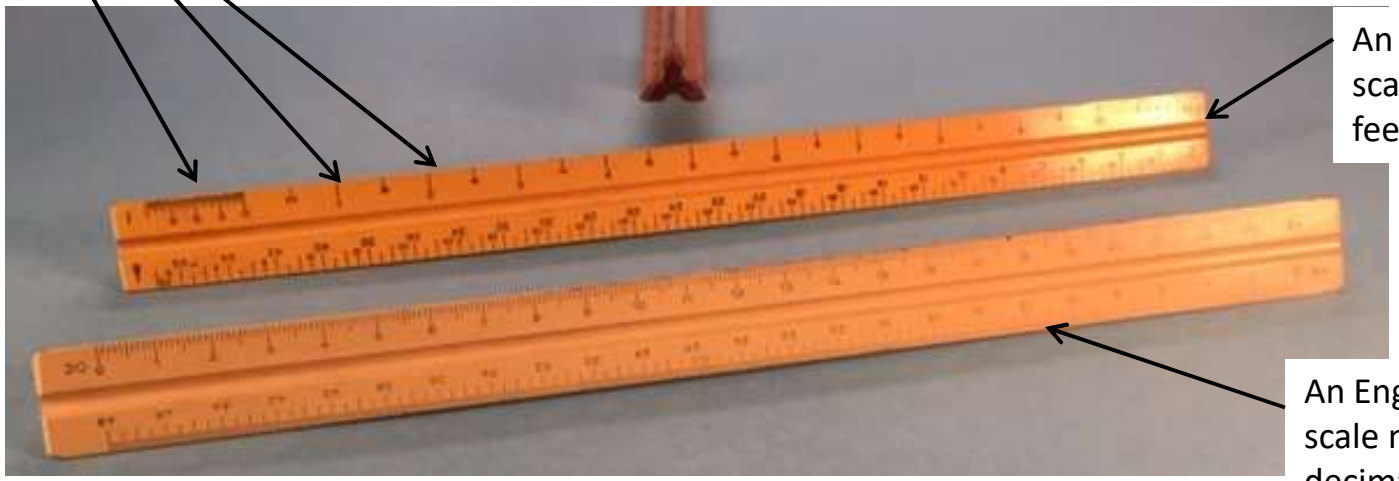
Scale rulers can be used to measure model parts directly in scale units



Scale rule is three sided, each side has 2 scales



Each scale has one scale left to right and another scale half that size right to left, 12 scales in total



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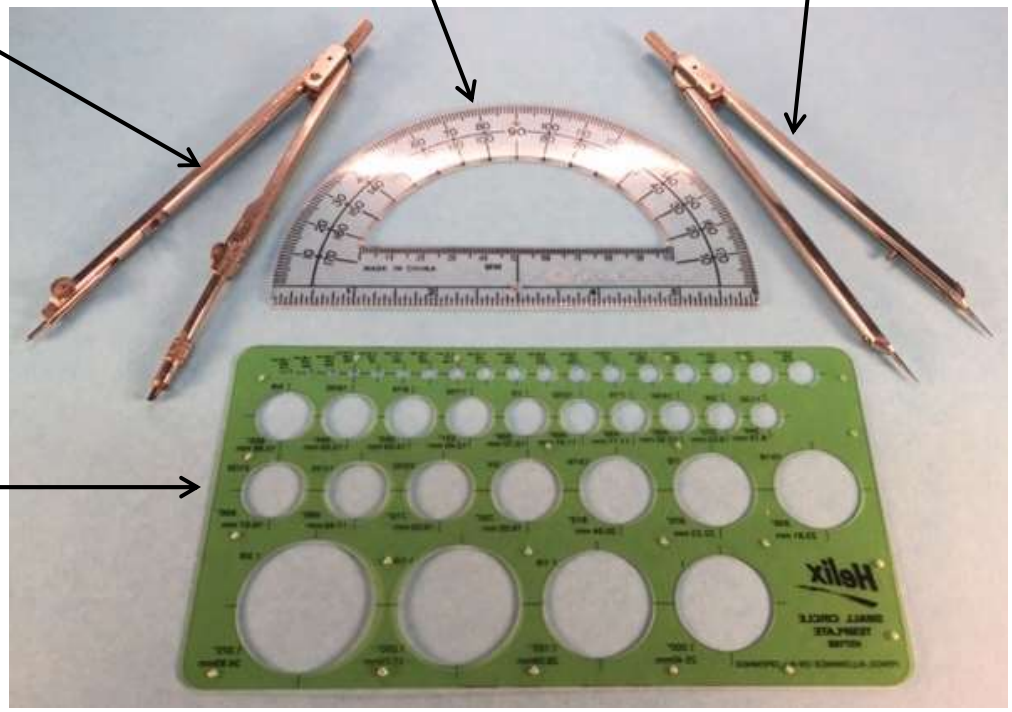
Tools - Design and layout

Compass, used to draw circles

Protractor, used to measure angles

Dividers, used to transfer measurements on a drawing or from a drawing to a model part



Circle template, used to draw circles

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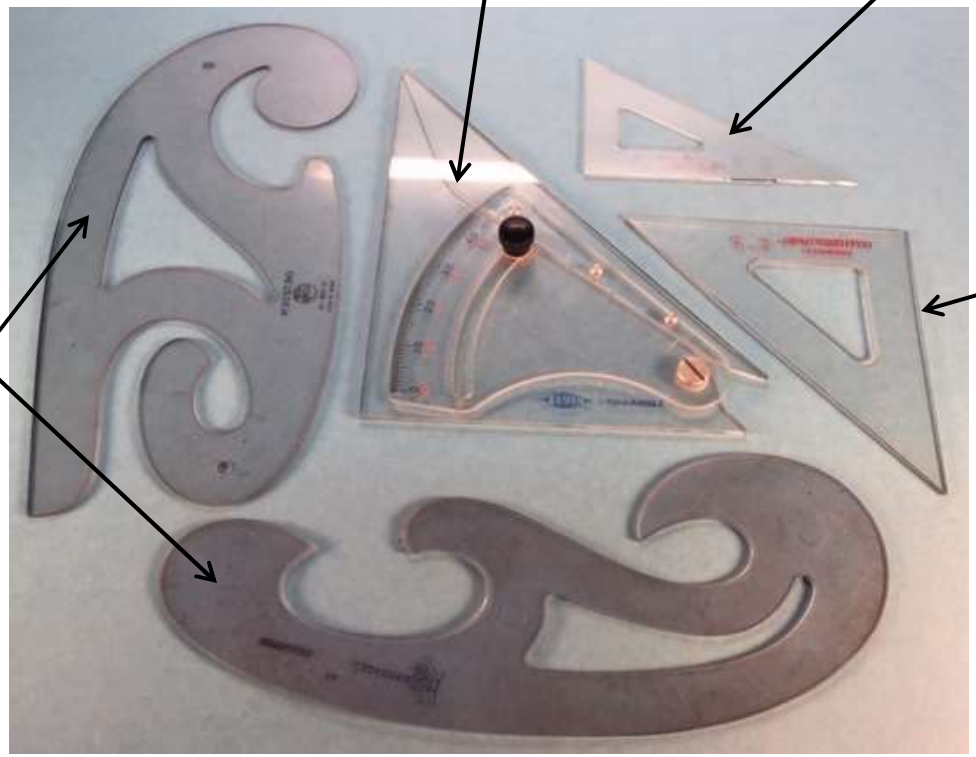
Tools - Design and layout



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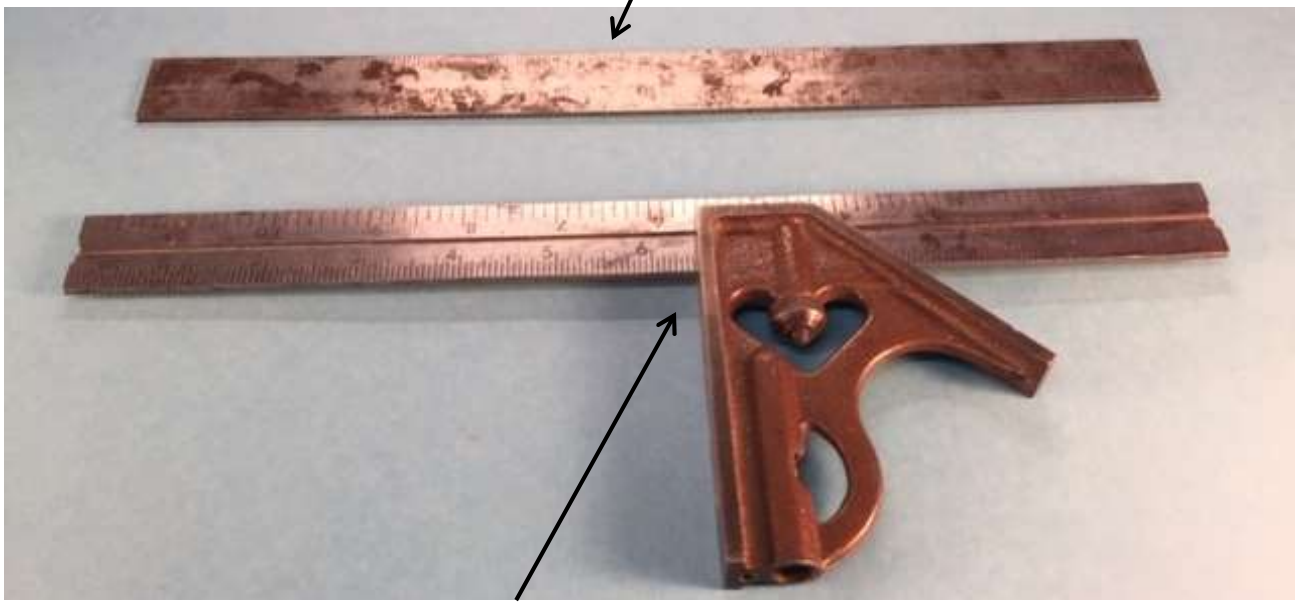
Tools - Design and layout

Straight edge, used to draw straight lines and also to guide straight cuts with a knife



Compound square, used to mark 90 degree and 45 degree lines

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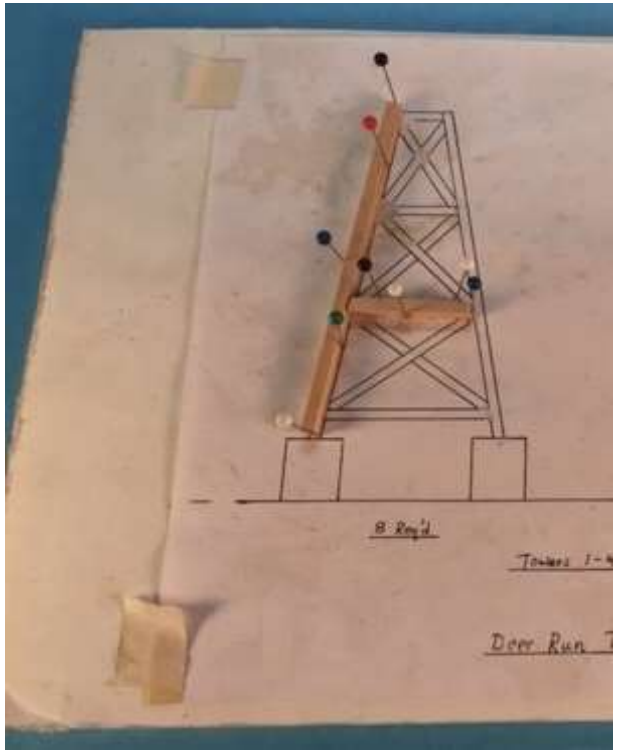
Tools - Design and layout

The use of a “breadboard” is a way to make precise structures from a plan



1. Draw the structure you want to build to actual scale size
2. Attach the drawing to a piece of foam board
3. Cut out the pieces, matching their size and shape to the drawing
4. Use pins pressed into the foam board to hold the pieces in place
5. Apply glue to the joints and allow to dry
6. Remove the pins

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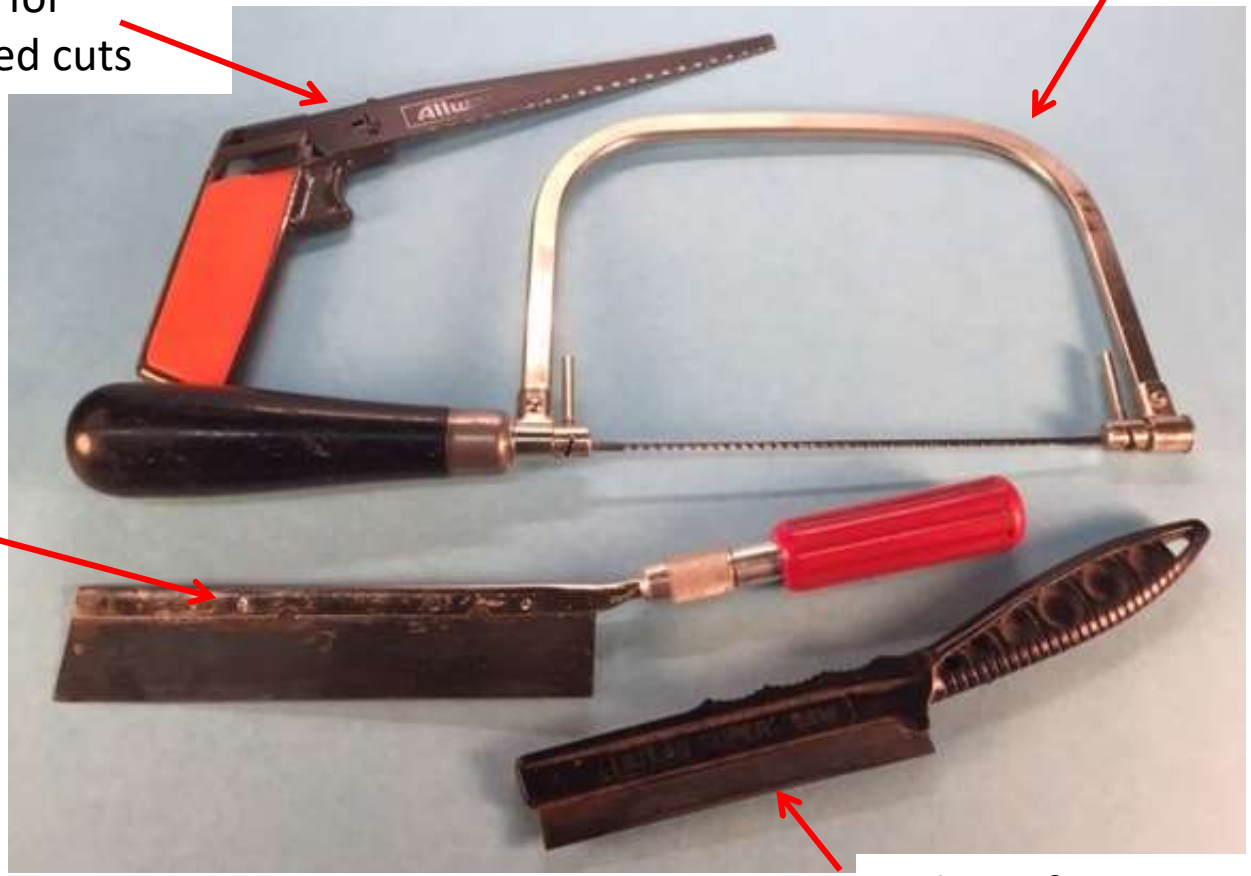
Tools - Cutting tools

Coping saw for making sharp curved cuts

Keyhole saw for making curved cuts



Razor saw for cutting small, soft material pieces

Rail saw for cutting small, metal pieces

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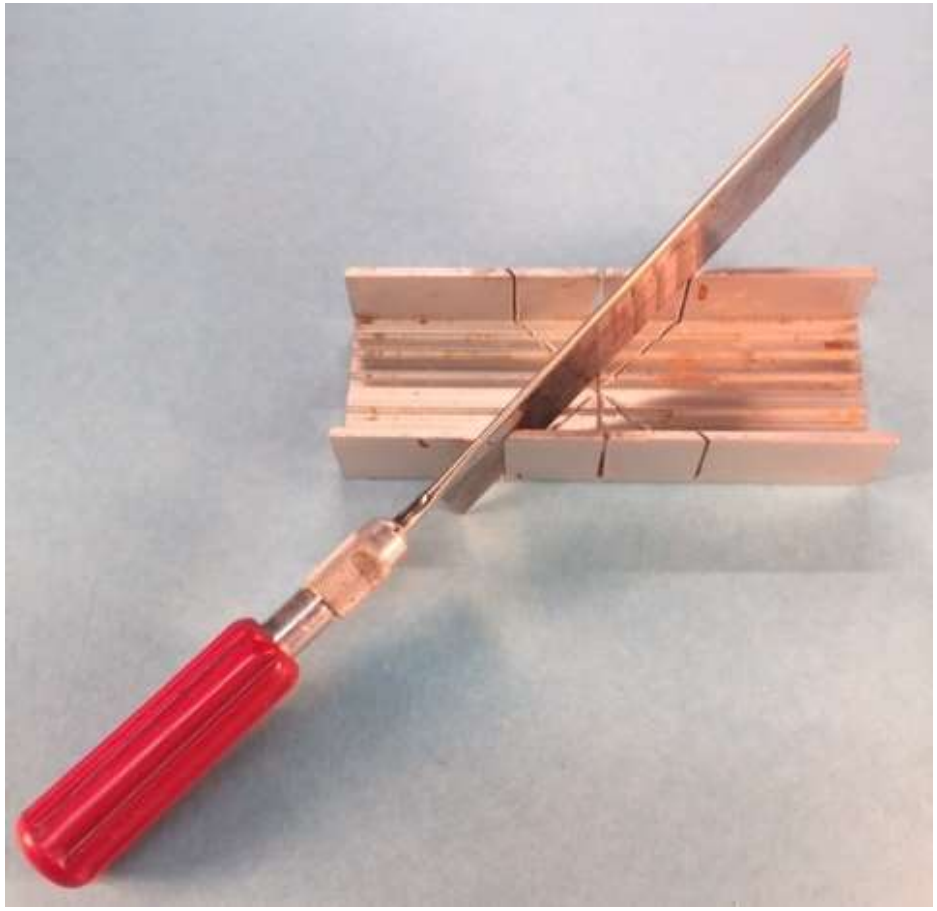
Tools - Cutting tools



Razor saw with a frame called a miter box, used to cut accurate angles. Larger miter boxes are made to use with a back saw. Many larger miter boxes are adjustable so you can cut any angle you need.

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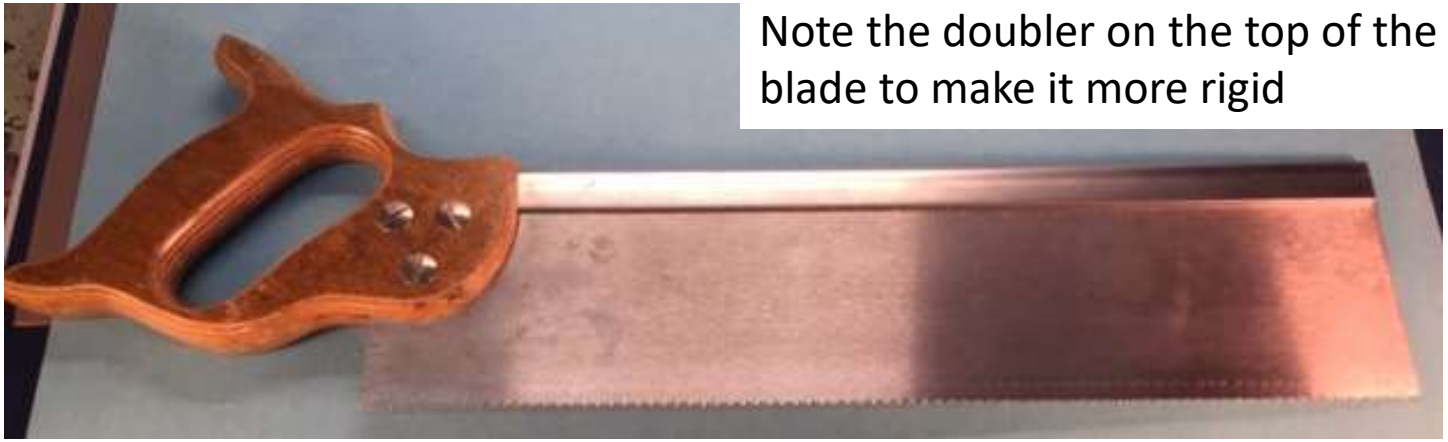
Tools - Cutting tools

Back saw, rigid saw used to make accurate square and angled cuts. Note the doubler on the top of the blade to make it more rigid



Hack saw, fine toothed blade for metal cutting

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Tools - Cutting tools

Hobby knife set

Scissors

Utility knife

Single edge razor blade

Pin vise and mini drill bits

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Tools - Forming tools

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Tools - Forming tools

Plane

Large files: flat, round, half round

Needle files, small, various shapes ideal for model making

Riffler files, small, various shapes with bent tips for access in tight corners

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Tools - Forming tools

Sandpaper

Wrap sandpaper around wood block or dowels for support to get an evenly sanded surface

Sandpaper is graded by grit size

- The smaller the number the coarser or larger the grit
- Common grades are:
  - 60 (coarse grit for rough finish)
  - 100 (intermediate grit for initial smoothing)
  - 150 & 220 (fine grit for finish sanding)
  - 300 and finer (very fine grit for polishing, especially for soft materials like plastic)
  - Very fine grit paper sometimes called emery paper

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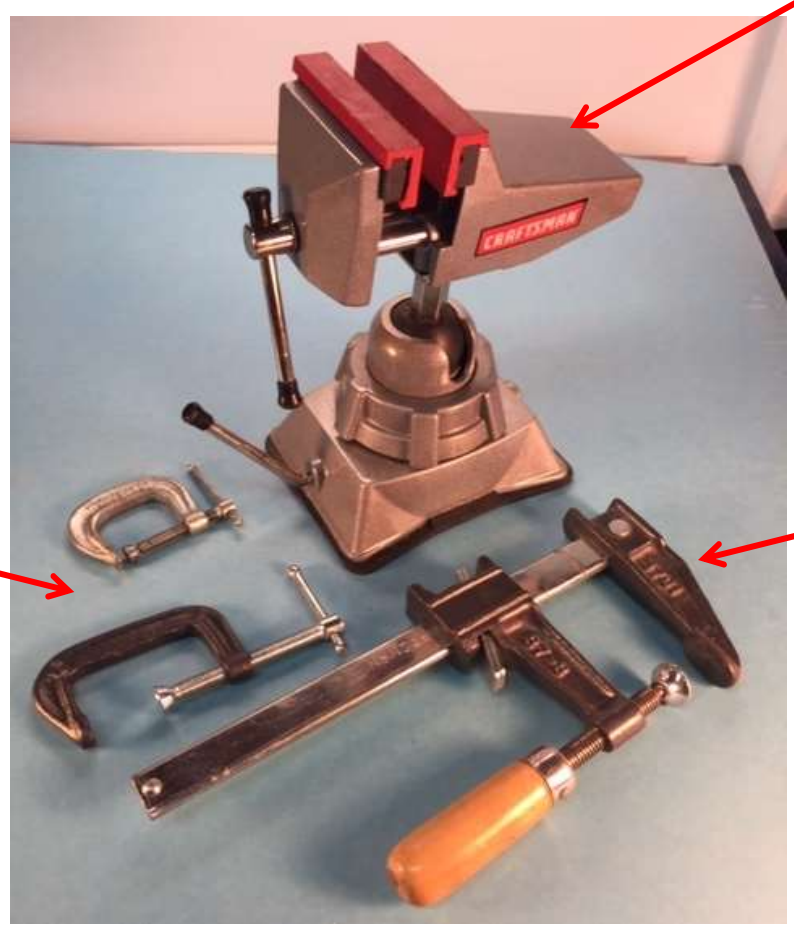
Tools - Holding and clamping tools

Vise, portable with suction clamp base plate



C-clamps

Adjustable bar clamp

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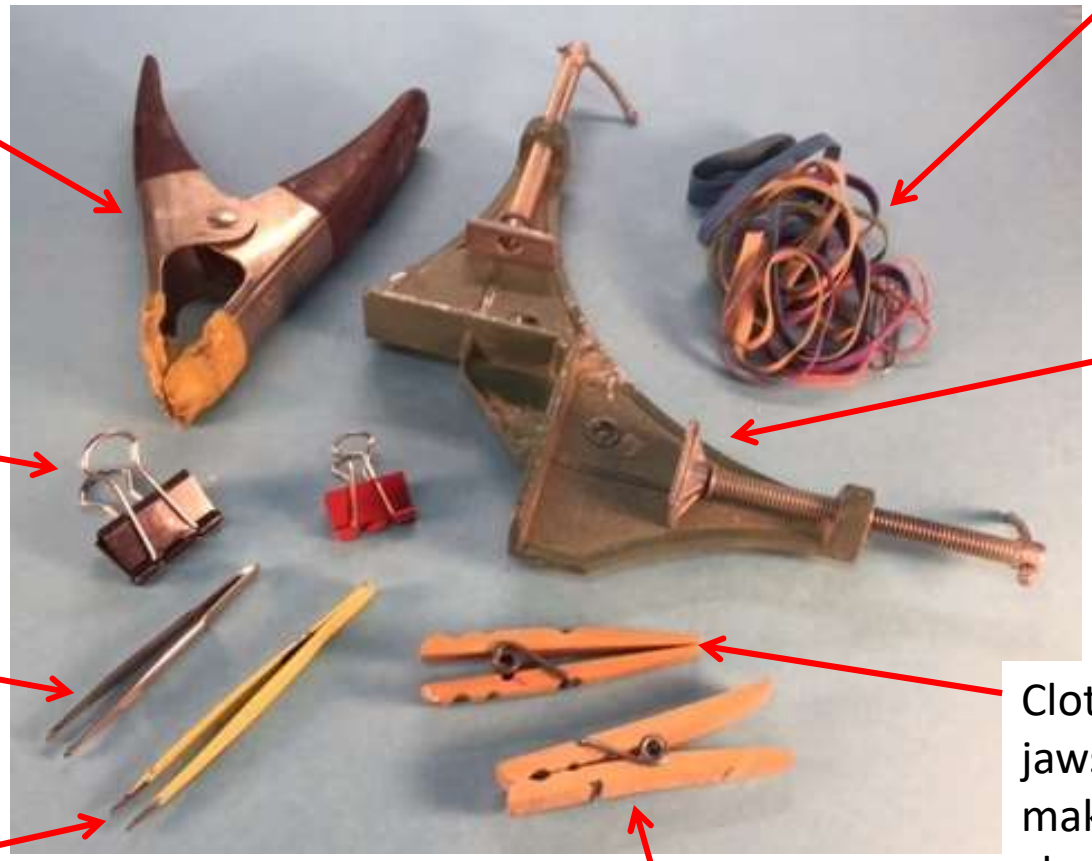
Tools - Holding and clamping tools



Large spring clamp

Rubber bands

Small paper clamps

Corner clamp, for making 90 degree joints

Angle tip tweezers

Clothespin clamp, jaws reversed to make a flat clamping surface

Needle tip tweezers

Clothespin clamp

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Tools – Assembly tools

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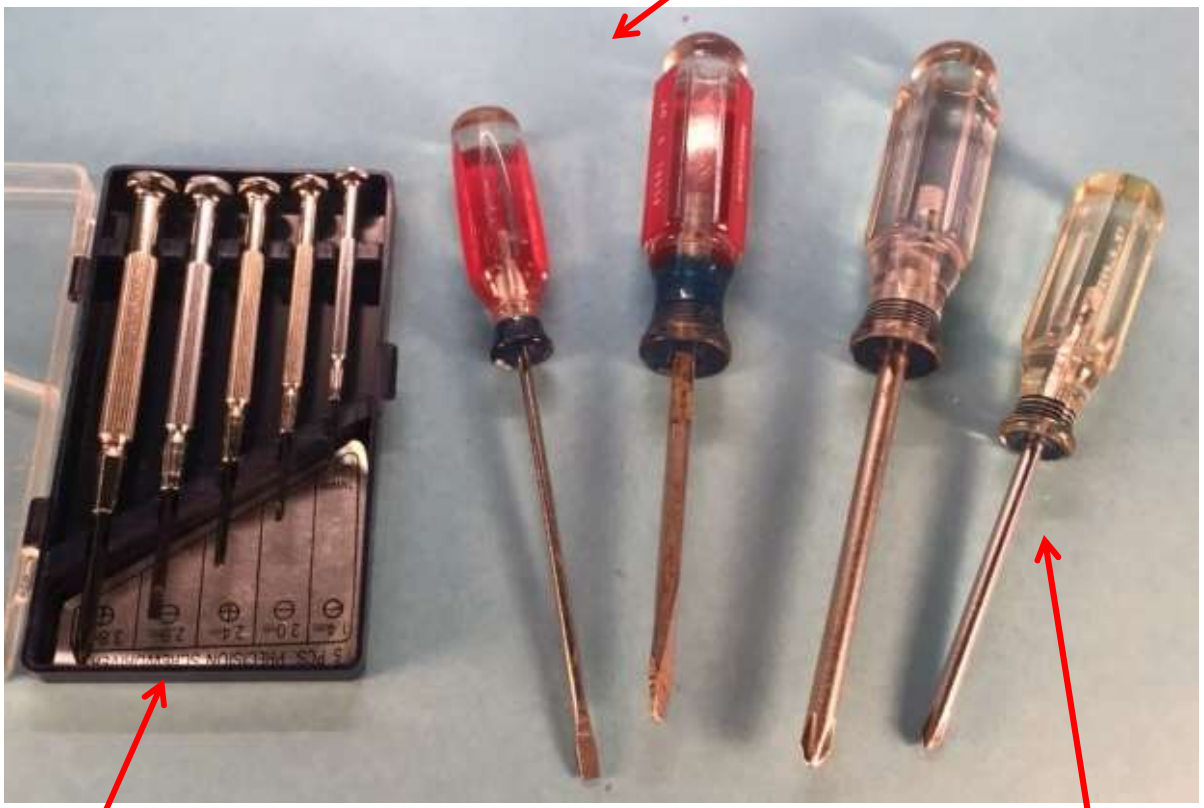
Tools - Assembly tools



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Tools - Assembly tools

Socket set with ratchet

Box end wrenches

Open end wrenches

Adjustable wrench

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Tools - Other tools

Close-up light source

Magnifier on articulated arm with light

Work surface to protect table

A model building work station

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Tools - Power tools

(Use only with experienced adult supervision)

- Table saw
- Band saw
- Drill press
- Power drill
- Saber saw
- Router
- Lathe
- 3D printer