

Use of the Combination Square for Project Layout

Name: _____

Date: _____

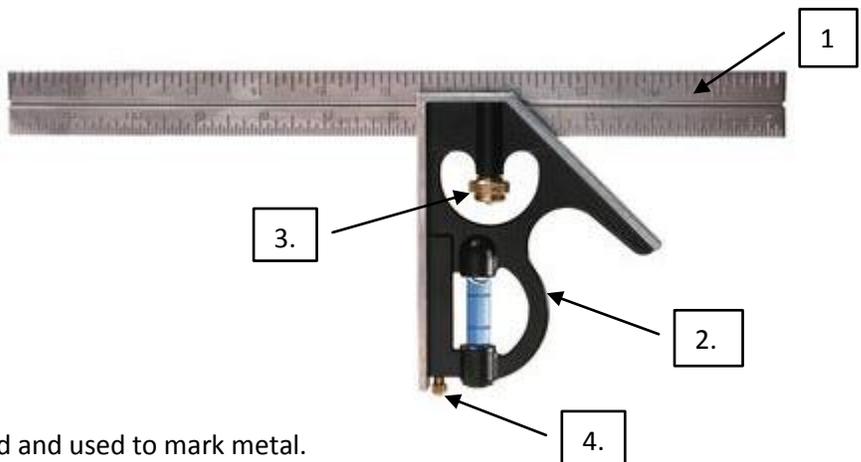
In 1877, Laroy S. Starrett designed and patented the combination square. His invention was a multipurpose layout and measuring tool for machinists and it was rapidly adopted in the trade. This tool is still in common use today and used in the layout of wood and metal projects.

The basic combination square includes a hardened steel graduated rule and movable combination square and miter head with a spirit level and scribe. The square heads have a precision ground 90° square face and a 45° miter face. It is a versatile and useful layout tool for scribing right angles and parallel lines, and a measuring tool that can be used as a try square, miter, depth gage, height gage, and a level. Common rules have 1/8", 1/16", and 1/32" scales. Also available are metric scales.

The process of layout is essentially a matter of copying the plan to the material. The square can be used to easily and accurately determine "construction" points on your material. For best results you must start with material that is cut square so you can measure from the square edges.

Square parts:

1. The "rule" or blade. This can be removed and used separately.
2. The head, fence, or level. This part slides on the rule.
3. The clamp is the nut, spring, and bolt that slides in to the groove of the rule.
4. The scribe is found in the head and used to mark metal.



Testing the Square:

To insure the square is actually square do the following:

- Set the square with 10" of the rule extending past the head and tighten the clamp.
- Using scrap of sheet metal with a straight edge (a 12" x 12" piece is fine) Scribe a line perpendicular to the straight edge of the metal.
- Now rotate the head on the metal 180 degrees and check that the square is aligned with the scribed line. If not the square is not "square" (or the sheet metal is not square).

Basic Setup of the Square:

1. Set the rule so the scale you wish to use is on the inside of the square.
2. Slide the rule so an even inch mark is aligned with the head (level).
3. Clamp the rule tight.

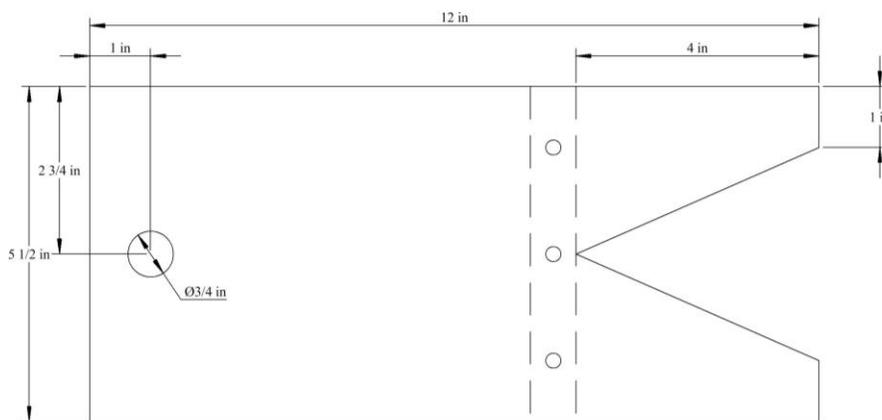
Marking:

Marks made during layout should be clean and as accurate as possible. Some tips:

- Use a scribe to mark metal. A marker makes a broad line and will be less accurate.
- Don't make multiple marks. A single clear mark is desired.
- Mark wood with a sharp pencil or a utility knife.

The "Working Edge":

A working edge is usually the bottom edge of the layout project in relation to the material as it is laid in front of you. It should be a suitable edge from which the majority of your measurements can be made. It is also helpful if this edge is square with the left or right edge.

**Locating a Center Point:**

Refer to the drawing above. The steps below describe how to mark the center of the left hand hole.

1. Select one edge as a "working edge".
2. After setting the square (as described above) place the head against the straight (lower) edge of the material in the approximate location of the hole.
3. Measure up the rule the desired distance and make a mark (horizontally). In this case $2\frac{3}{4}$ ".
4. Now place the head against the other edge of the material (left edge, 90° to the first edge) and align the rule with your mark. It's important that these two edges be perpendicular.
5. Now measure over on the rule to the second dimension (1") of the point and mark the center.

Hint: It is faster to count the marks on the rule than to calculate a distance. For example if the 10" mark on the rule is aligned with the head and you want to measure in $4\frac{1}{4}$ " you could calculate the measurement at $5\frac{3}{4}$ " or simply count in 4 inch marks plus $\frac{1}{4}$ ".

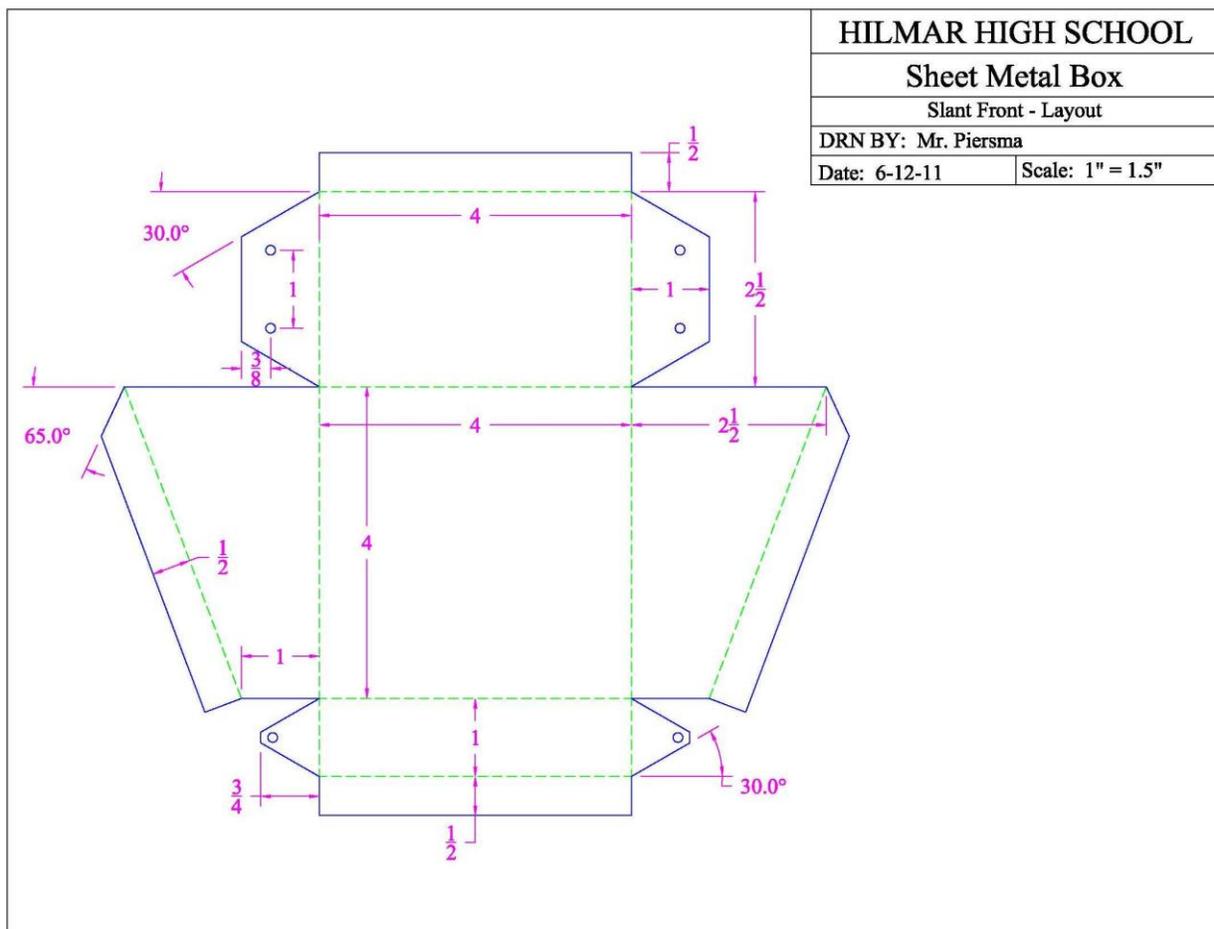
Locating Construction Points:

Commonly you will want to locate points (end) of a cut that is not square. This process is simply a matter of locating two points then connecting them using the rule. The directions below refer to layout of the "V" shape in the above drawing.

1. After setting the square (as described above) place the head against the straight (lower) edge of the material in the approximate location of Point 1. (the center of the "V")
2. Measure up the rule the desired distance and make a horizontal mark (in this case $2\frac{3}{4}$ " from the lower edge).
3. Now place the head against the other edge of the material (right, 90° to the first edge) and align the rule with your vertical mark.
4. Now measure over on the rule the second dimension of Point 1 and mark the location (4").
5. Repeat the process for Point 2 (upper point of the "V") and Point 3 (lower point of the "V").
Note: Since Points 2 and 3 are on the edge of the project there is no need to measure in from the edge.
6. Now using just the rule draw or scribe a line that connects Points 1 and 2, then connect Points 1 and 3.

Activity:

1. Set your square with the 10" mark aligned with the head and the $\frac{1}{8}$ " scale on the inside of the square (rule extends to your left).



2. Using a file folder and sharp pencil layout the project shown above using the procedure described.