



DRAFTING

is

FUN

with the

Draft-a-Plan Kit







DRAFTING IS FUN

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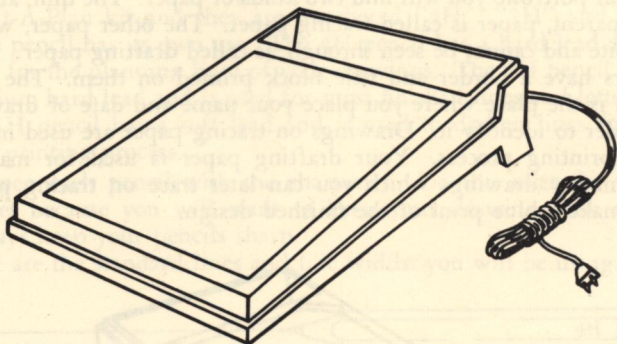
How would you like to explore the world of another language? You see, drafting is the picture language of industry. It's exciting and fun! Drafting is the language used by the designers of rockets, airplanes, automobiles, TV sets, houses, satellites and other things all around us. Drafting gives the designer an opportunity to think and plan. Most people employed in the designing, manufacturing and selling of an article must be able to understand the language. So come along with us and we will show you the universal picture language!



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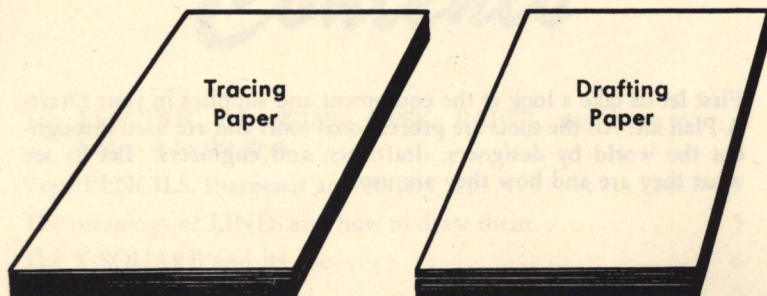
First let us take a look at the equipment and supplies in your Draft-A-Plan kit. All the tools are professional tools and are used throughout the world by designers, draftsmen and engineers. Let us see what they are and how they are used.



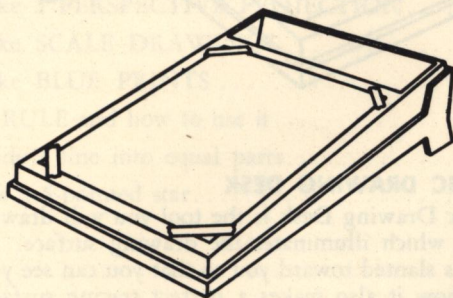
THE ELECTRIC DRAWING DESK

Your Electric Drawing Desk is the tool you will draw on. It contains a light which illuminates the drawing surface. The surface of the desk is slanted toward you so that you can see your drawing easier. See how it also makes a perfect tracing surface. Use the shallow well at the top to store your pencils and eraser.

PAPER and how to fasten it to the desk

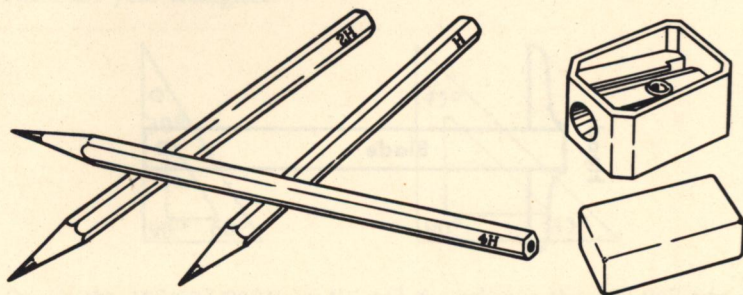


In your portfolio you will find two kinds of paper. The thin, almost transparent, paper is called tracing paper. The other paper, which is white and cannot be seen through, is called drafting paper. Both papers have a border and title block printed on them. The title block is the place where you place your name and date of drawing in order to identify it. Drawings on tracing paper are used in the blue printing process. Your drafting paper is used for making preliminary drawings which you can later trace on tracing paper and make a blue print of the finished design.



To fasten a sheet of paper on the Electric Drawing Desk. Use 4 one-inch strips of transparent tape or masking tape to fasten the corners of the paper to the desk. This will prevent the paper from shifting while you are working.

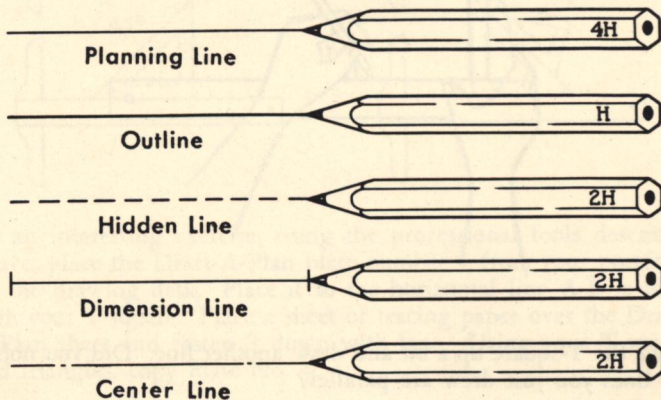
Your PENCILS, sharpener and eraser



Next we will look at the pencils. There are three pencils in your Draft-A-Plan kit and they are numbered "4H," "2H" and "H." Each pencil has its own use. The 4H pencil has a hard lead and is used for the planning lines of your drawings. The 2H pencil has a medium hard lead and is used for most finished lines and lettering. The H pencil has a soft lead and is used to darken lines for the blue printing process.

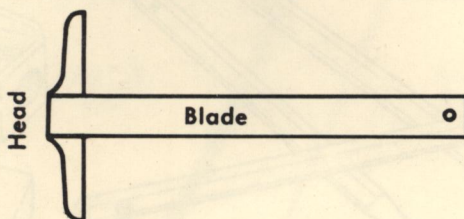
Sharpen each pencil with the sharpener. Do this over the waste basket because you will want to keep your drawing desk clean. Always keep your pencils sharp.

Here are the standard lines and line widths you will be using.

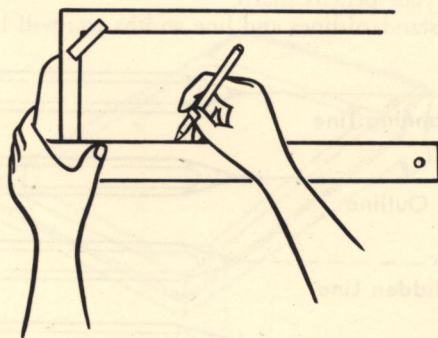


The T-SQUARE and its use

The next tool we will need to know about is the T-SQUARE.



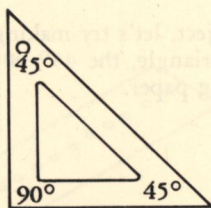
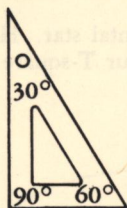
Place the T-square on the left side of the drawing desk. If you are left handed, place the T-square on the right side. Both sides of the drawing desk are made especially straight for this reason. Use your left hand to slide the T-square up and down. The T-square is used to draw straight and parallel horizontal lines. Place your pencil on the top edge of the T-square and draw a line from left to right. Always tip your pencil forward when you draw and ROLL the pencil on your finger tips as you draw. Your pencil will stay sharp longer.



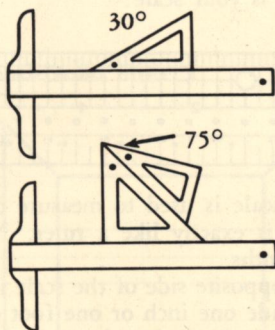
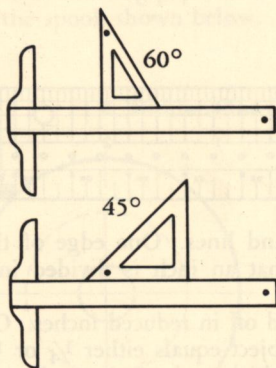
Move the T-square up a bit and draw another line. Did you notice the lines you just drew are parallel?

TRIANGLES and their use

These are your triangles:



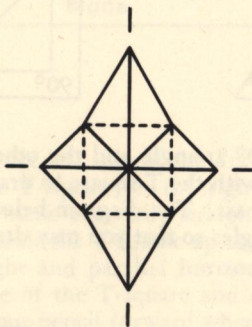
One is the 30° - 60° - 90° triangle and the other is the 45° - 90° triangle. They are used with the T-square to draw straight lines at all the angles of the compass. The diagram below shows some of the ways to place the triangles so that you may draw the lines necessary in drafting.



As an interesting exercise, using the professional tools described above, place the Draft-A-Plan plate number 1 from your portfolio on the drawing desk. Place it so the horizontal line A-B is level with your T-square. Place a sheet of tracing paper over the Draft-A-Plan sheet and fasten it down with tape. Using your T-square and triangles, copy Plate No. 1.

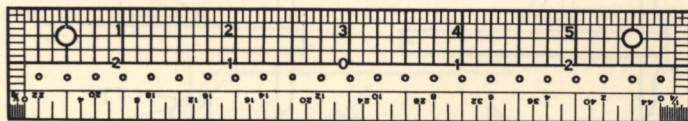
Each of the lines on the Draft-A-Plan sheet can be made with the use of the triangles and T-square. See if you can discover which triangles and combinations of triangles to use for each line.

For a project, let's try making this continental star. Hint: Use the 30° - 60° triangle, the 45° - 90° triangle, your T-square and a sheet of drafting paper.



The SCALE and its uses

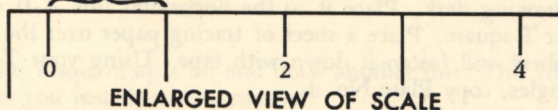
This is your scale:



The scale is used to measure objects and lines. One edge of the scale is exactly like a ruler. Notice that an inch is divided into sixteenths.

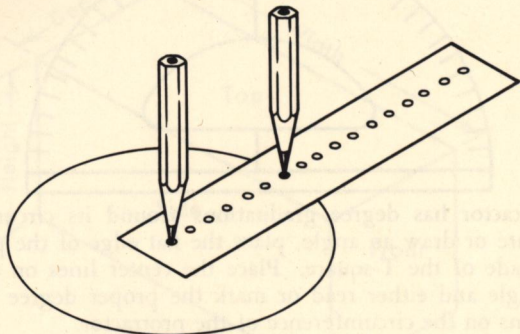
The opposite side of the scale is marked off in reduced inches. On this side one inch or one foot on an object equals either $\frac{1}{4}$ or $\frac{1}{8}$ inch on the scale (depending upon which end of the scale you measure from)

Equals One Foot or One Inch



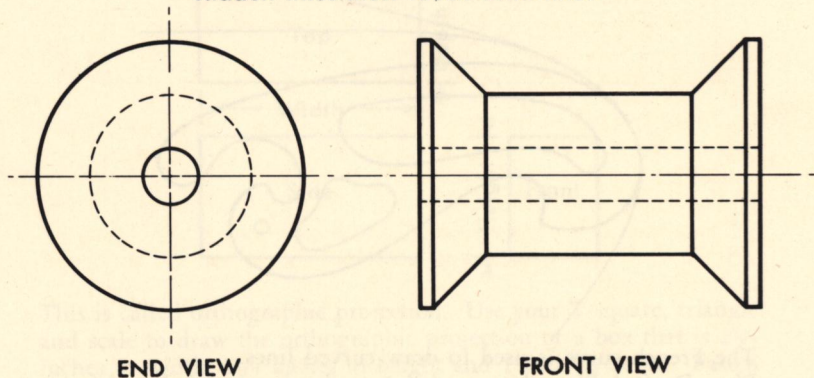
ENLARGED VIEW OF SCALE

The scale has a series of holes down its center. These are used to draw circles. Place a pencil in each of two holes. Hold one pencil in place and move the other pencil to draw a circle.



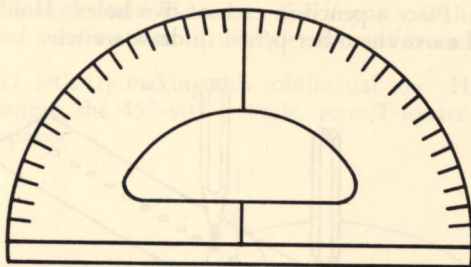
Another interesting exercise is the drawing of a spool. Fasten a sheet of drafting paper to the drawing desk and draw the two views of the spool, shown below.

Hidden lines must touch solid lines



2-VIEW DRAWING OF A SPOOL

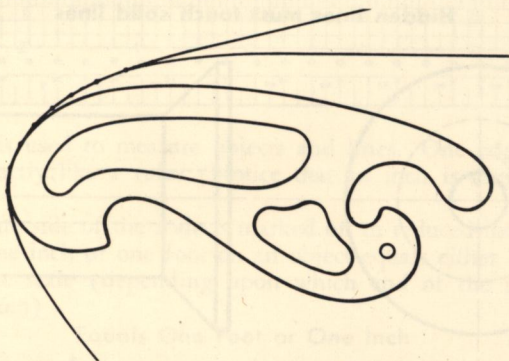
The PROTRACTOR and its use



The protractor has degree graduations around its circumference. To measure or draw an angle, place the flat edge of the protractor on the blade of the T-square. Place the center lines on the point of the angle and either read or mark the proper degree from the graduations on the circumference of the protractor.

Place Draft-A-Plan plate number 2 on the drawing desk so that the W-E line is level with the top edge of the T-square blade. Fasten the sheet in place. With the protractor check the angles of the compass.

The FRENCH CURVE and its use

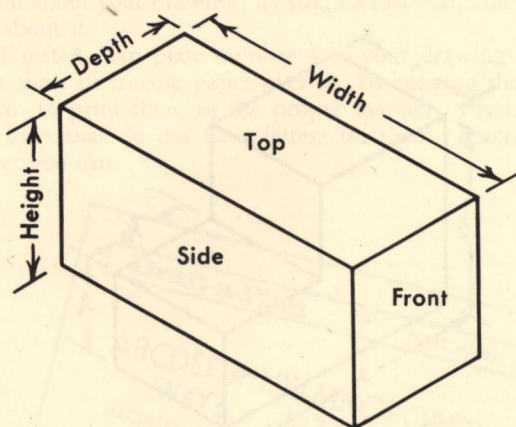


The French curve is used to draw curved lines.

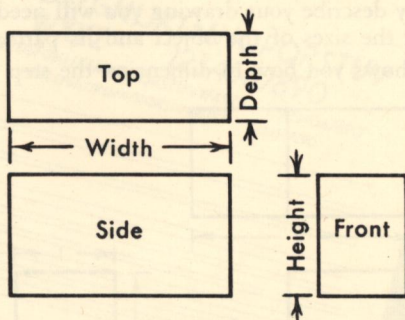
Place Draft-A-Plan plate number 3 on the drawing desk and fasten it in place. Use the French curve to draw a curving line from one point to the next. If possible, connect more than one point at a time.

THREE-VIEW PICTURE DRAWING

The most accurate way of describing an object is to draw a picture of it.

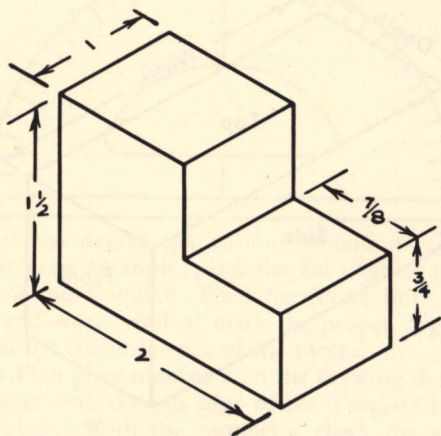


This is how an object is described. But the picture does not show it in its true shape or form. Therefore, we must draw each different view of the object like this:



This is called orthographic projection. Use your T-square, triangle and scale to draw the orthographic projection of a box that is $2\frac{1}{2}$ inches in width, $1\frac{1}{2}$ inches in height and 1 inch in depth. Fasten a sheet of drafting paper to the drawing desk. Use the 4H pencil to do the planning of your drawing. Later darken the outlines with the H pencil.

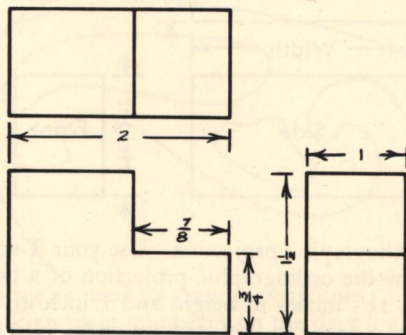
Another orthographic projection you will like to try is this "step block."



How to DIMENSION

In order to fully describe your drawing you will need to dimension it. That is, tell the sizes of the object and its parts.

This diagram shows you how to dimension the step block.



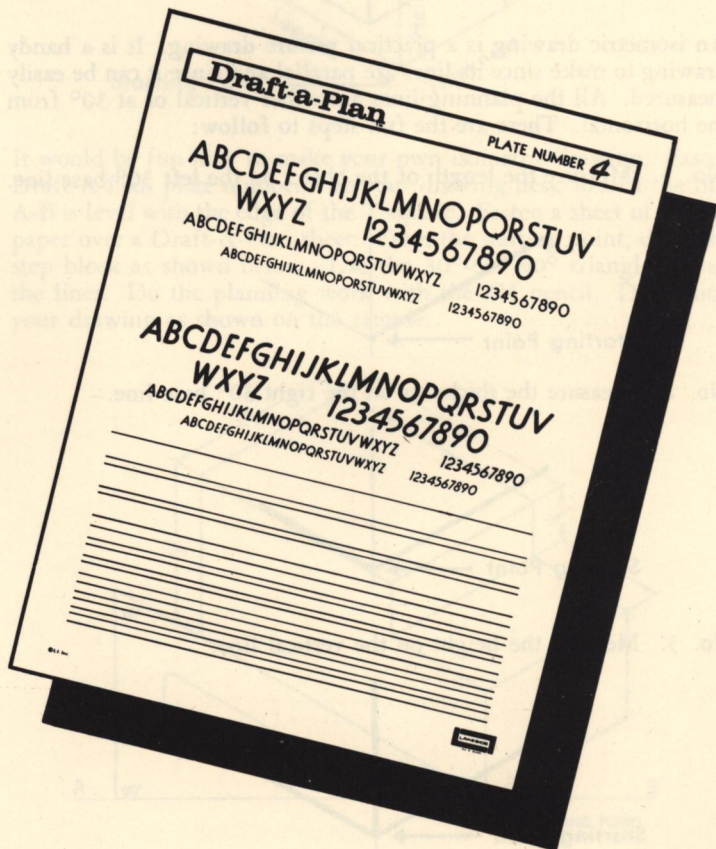
Use the 2H pencil to draw the dimension lines and arrow heads.



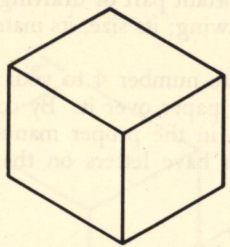
LETTERING

Lettering is another important part of drafting. You will use lettering to tell about your drawing; its size, its material, and other information about it.

Fasten Draft-A-Plan plate number 4 to your drawing desk. Next fasten a sheet of tracing paper over it. By copying the letters you will learn to print them in the proper manner. Practice lettering on the lines that do not have letters on them. Practice lettering whenever you can.

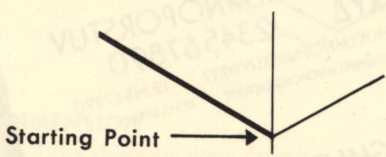


How to make an ISOMETRIC DRAWING

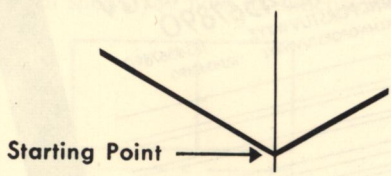


An isometric drawing is a practical picture drawing. It is a handy drawing to make since its lines are parallel and since it can be easily measured. All the planning lines are either vertical or at 30° from the horizontal. These are the fun steps to follow:

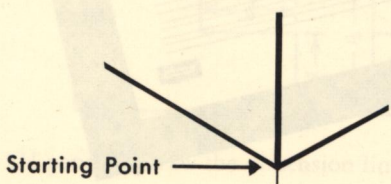
No. 1. Measure the length of the object on the left 30° base line.



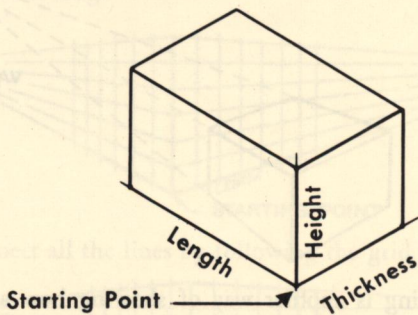
No. 2. Measure the thickness on the right 30° base line.



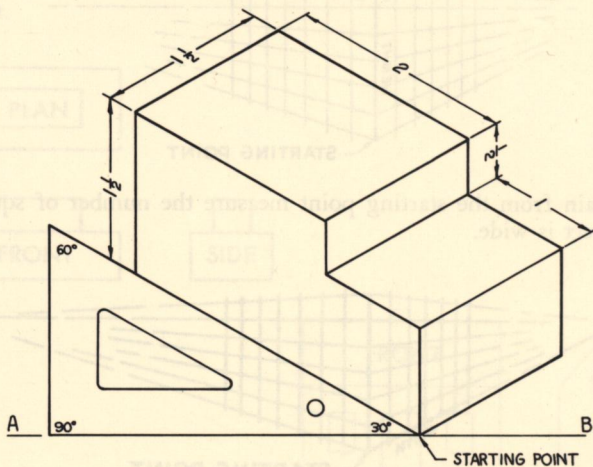
No. 3. Measure the height on the vertical line.



No. 4. Extend all the lines to where they meet other lines.

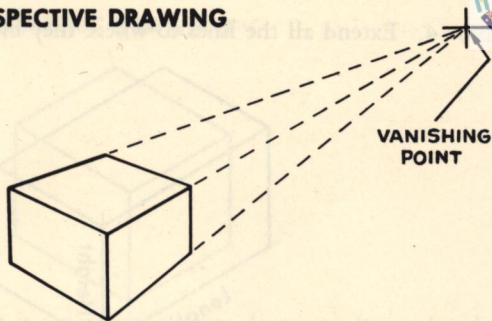


It would be fun now to make your own isometric drawing. Fasten Draft-A-Plan plate number 5 to your drawing desk so that the line A-B is level with the edge of the T-square. Fasten a sheet of tracing paper over a Draft-A-Plan sheet. From the starting point, draw the step block as shown below. Use the 30° - 60° - 90° triangle for all the lines. Do the planning work with the 4H pencil. Dimension your drawing as shown on the sample.





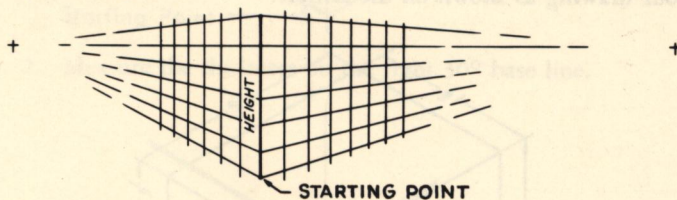
How to make a PERSPECTIVE DRAWING



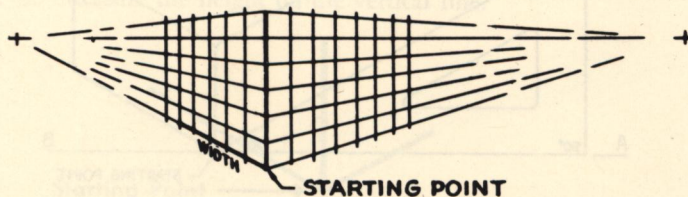
A perspective drawing is another way of showing how an object looks. An architect uses a perspective drawing to show how a house will look from a distance away. It will look very real because the sides will be smaller at the back just as in a photograph. Perspective drawings are much used in advertising and commercial art.

Here are the directions for the fun way of making a perspective drawing.

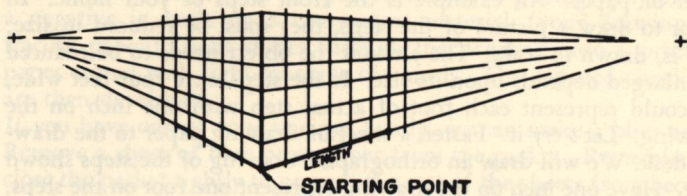
1. From the "starting point" measure the number of squares that the object is high.



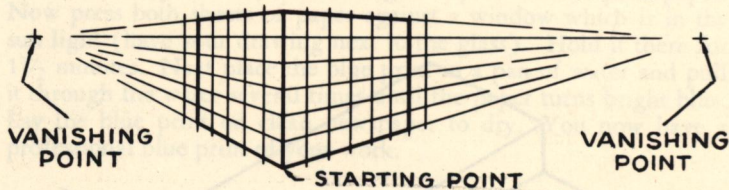
2. Again from the starting point measure the number of squares the object is wide.



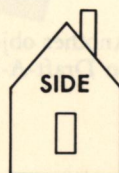
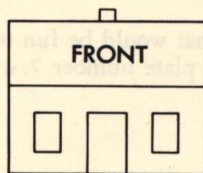
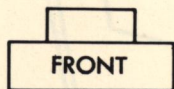
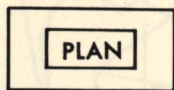
3. Again from the starting point measure the number of squares the object is long.



4. Connect all the lines by following the grid lines of the pattern.

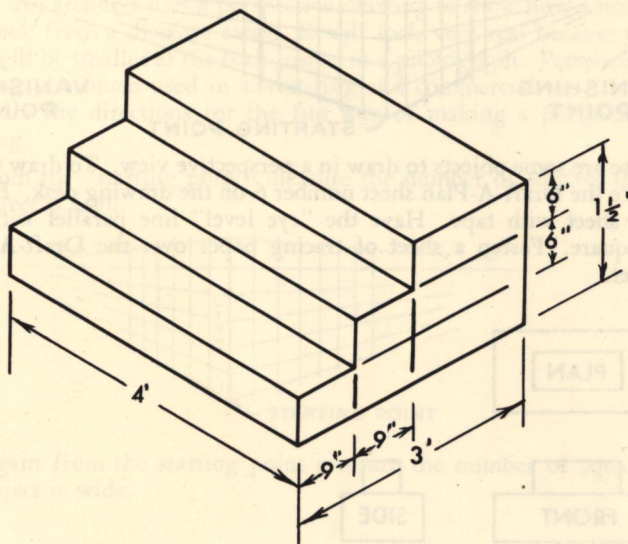


Here are some objects to draw in a perspective view. To draw them, place the Draft-A-Plan sheet number 6 on the drawing desk. Fasten the sheet with tape. Have the "eye level" line parallel with the T-square. Fasten a sheet of tracing paper over the Draft-A-Plan sheet.



SCALE DRAWINGS

Many times objects are too large to draw as they really are on a sheet of paper. An example is the front steps of your home. In order to draw a picture of the steps, they must be reduced in size; that is, drawn to scale. The amount the object needs to be reduced or enlarged depends upon its size. If the steps were four feet wide, we could represent each foot of actual step with one inch on the drawing. Let's try it. Fasten a sheet of drawing paper to the drawing desk. We will draw an orthographic drawing of the steps shown here. Have one inch on the drawing represent one foot on the steps.

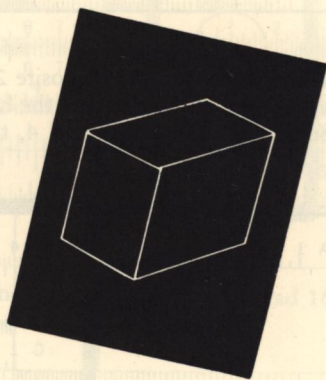
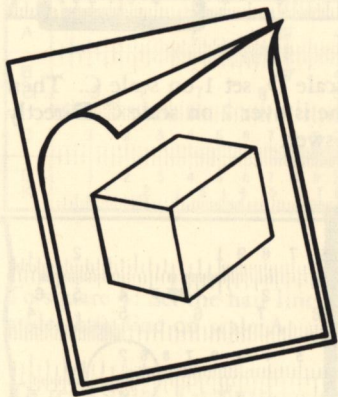


Another object that would be fun to draw to scale is the foot stool on Draft-A-Plan plate number 7.

How to make BLUE PRINTS

Of the many ways to duplicate drawings, the blue print process has been used the longest. It is a process similar to photography in that a negative is made on a transparent material (your drawing on tracing paper); light shines through the negative onto a printing paper coated with light-sensitive chemicals. The exposed chemicals are then developed.

If you have one of your tracings handy, we can make a blue print. Remove a sheet of blue print paper from the packet. Remember to close the packet tightly to prevent the rest of the sheets from becoming exposed. Lay the sheet of blue print paper on the table with the blue side up. Place your drawing on top of the blue print paper. Now press both sheets of paper against a window which is in the sun light (have your drawing next to the glass). Hold it there for $1\frac{1}{2}$ minutes. Next place the blue print in a pan of water and pull it through the water several times until the paper turns bright blue. Lay the blue print on clean newspaper to dry. You now have a professional blue print of your work.

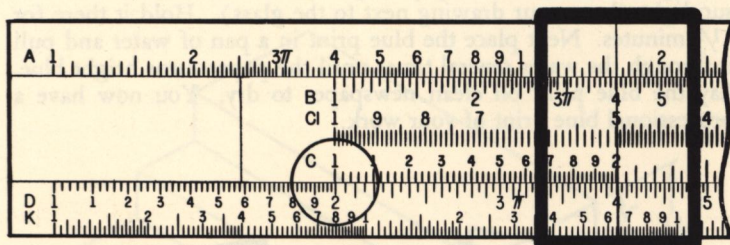


The SLIDE RULE and how to use it

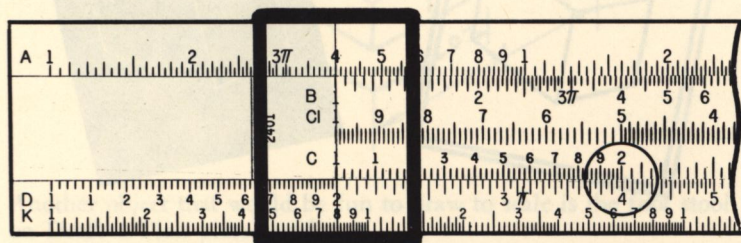
This slide rule is a precision made instrument of good construction. This insures more efficient and durable service.

The ability to read the graduations of the slide rule rapidly and correctly, which can be accomplished by actual practice, make this a practical and indispensable instrument.

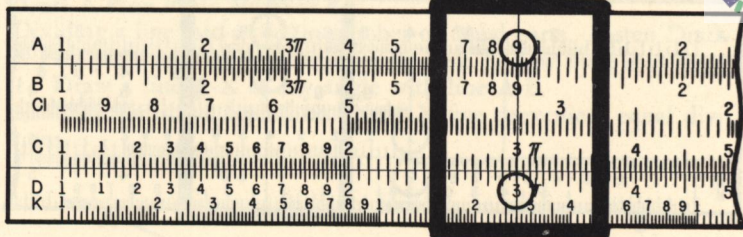
Scales C and D are identical and are numbered from 1 to 10, the spaces between the whole numbers decreasing steadily toward the right. The C and D scales are used in multiplication, division and their combinations. On scales C and D, if "1" at the extreme left is taken as unity or "1," then the "1" at the extreme right is 100, if taken as 100, then the "1" at the extreme right is 1,000.



To multiply 2×2 : Opposite 2 on scale D, set 1 on scale C. Then move the indicator so that the hair line is over 2 on scale C. Directly below this 2 you will find 4, the answer.

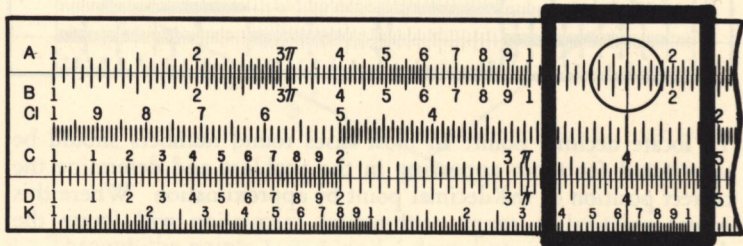


To divide $4 \div 2$: Opposite 4 on scale D, set 2 on scale C. Look along C to the left until you come to 1 at the end of the slide. Under this 1 you will find 2, the answer on scale D.



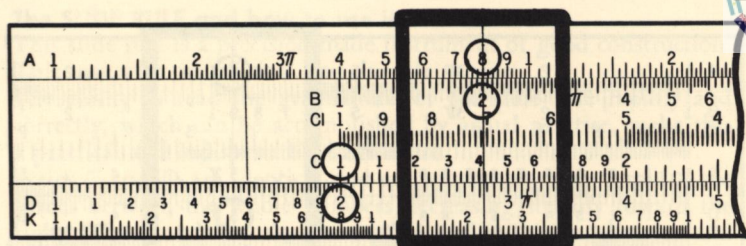
To find square root of 9: Set hair line of runner to 9 on scale A. Under hair line on scale D you will find the answer, which is 3.

A and B scales are identical. On scales A and B, if "1" at the extreme left is taken as unity or "1," then the "1" in the middle of the scales is 10 and the "1" at the extreme right is 100.

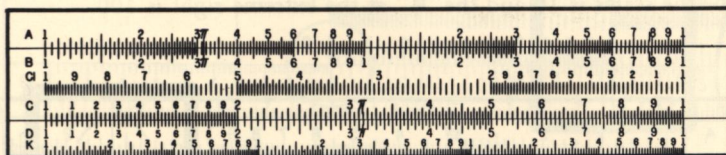


To square 4: Set the hair line of runner at 4 on scale D and read 16 under hair line on scale A.

To read scales: Graduations on the slide rule represent figures and not measures of length. To find a number, always read the first figure to the left on prime line, the second figure of the number on the secondary line to the right thereof, and the third figure on the subdivision. Thus to read 356, prime 3, secondary 5 and subdivision 6.



To find cube of 2: Set 1 of scale C over 2 on scale D. Opposite 2 on scale B read the result 8 on scale A.



To locate decimal point: In most cases round numbers should be substituted for those appearing in the problem and determine the correct position of the decimal point by approximation. Where this is not practical, a rough arithmetical calculation will locate the decimal point.

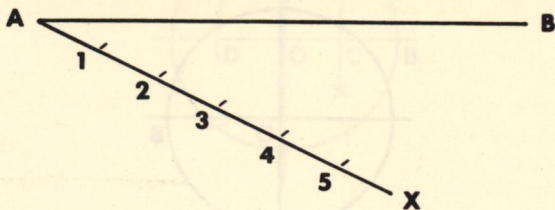
The C1 scale gives the reciprocal of any number on the scale C. This means that 1 divided by 5 on C scale equals .2 or 2/10 on the C1 scale or 1 divided by 2 on the C scale equals .5 or 5/10 on the C1 scale. This is a little complicated and is the least used or important function of your slide rule for the beginner.

The greatest use of a slide rule is confined to multiplication and division. If the beginner will master this phase of its operation he will have no difficulty in solving the many other intricate problems.

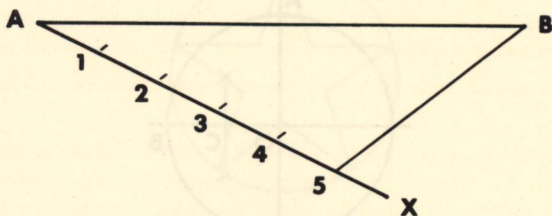
Draft-A-Plan Plate Number 8

Dividing a line into a certain number of equal parts. Fasten Draft-A-Plan plate number 8 to the drawing desk. Follow these easy steps.

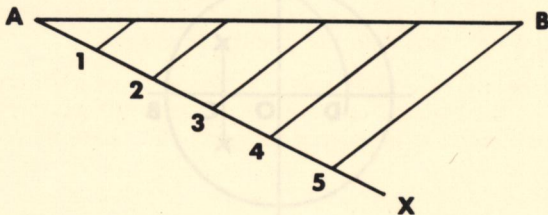
1. Draw a line A-X at any angle with line A-B.
2. With the scale, lay off on line A-X five convenient equal divisions.



3. Connect point number 5 to point B with a straight line.

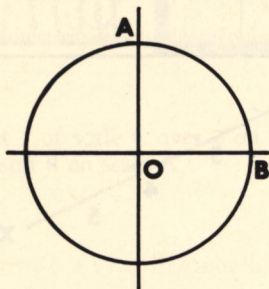


4. Through the points 1, 2, 3, and 4 draw lines parallel to the line 5-B. This will cut the line A-B into 5 equal parts.

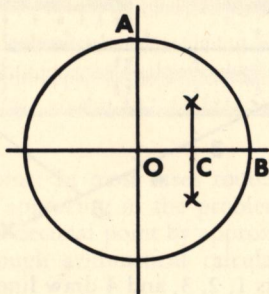


Draft-A-Plan Plate Number 9

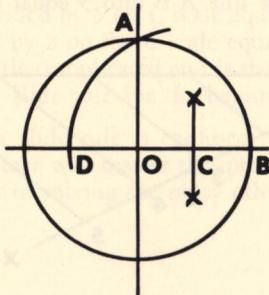
Have you ever wished that you knew how to draw a star? Here is how. Fasten Draft-A-Plan plate number 9 to the drawing desk. With the T-square draw a horizontal line through the center point O of the circle. Next draw a vertical line through the center point O. Label the points A and B.



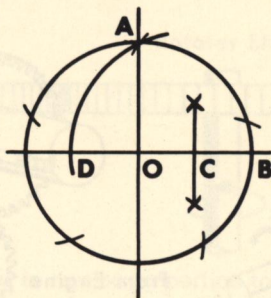
Next bisect the line O-B to find point C.



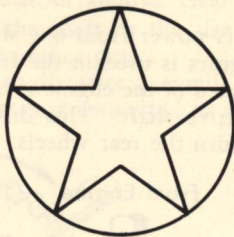
With C as a center draw the arc A-D



Measure off the distance A-D on the circumference of the circle.
Five times the distance A-D will equal the circumference.

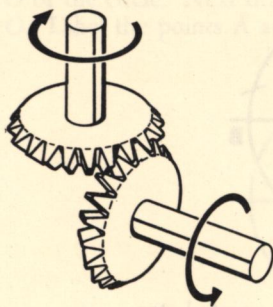


Connect the points and you will have a 5-pointed star.

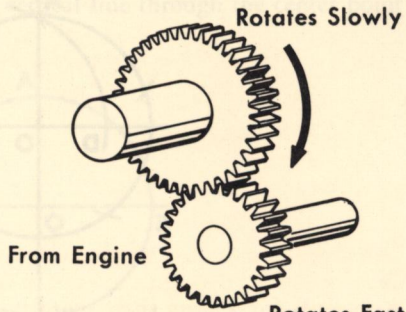


GEARS

Gears are designed to give positive action to axles and shafts. They transmit power and speed.

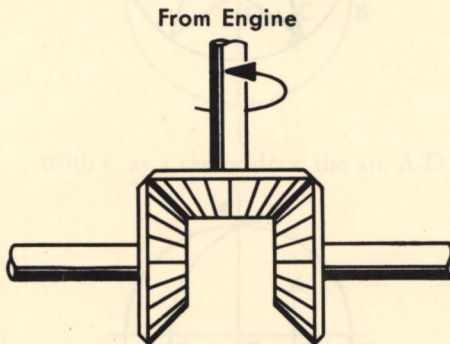


Bevel Gear

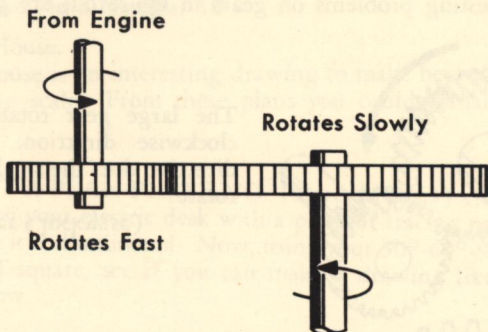


Spur Gear

The spur gear transmits power from one shaft to another parallel shaft. A set of spur gears is used in the transmission of an auto. In this case the high speed of the engine is transmitted to the much slower speed of the drive shaft. This difference of speed gives much more power to turn the rear wheels.



The bevel gear transmits power from one shaft to another which is at right angles to it. As an example, a set of bevel gears is used in an auto where the drive shaft connects to the rear axle.

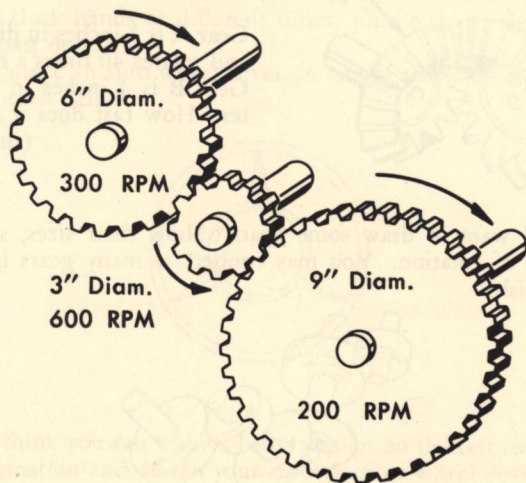


The speed of a shaft is in reverse proportion to the size of the gears. That is, the smaller gear always turns faster than the larger gear. A formula for finding shaft speed is:

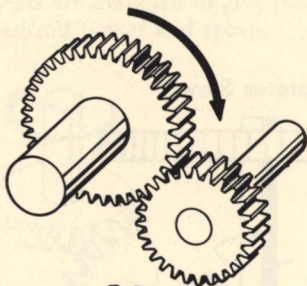
$$\frac{\text{Speed} \times \text{Size of one Gear}}{\text{Size of another Gear}}$$

Multiply the speed of the shaft by the size of the gear and then divide by the size of the other gear.

As an example, a six-inch diameter gear will rotate only half as fast as a three-inch diameter gear connected to it.

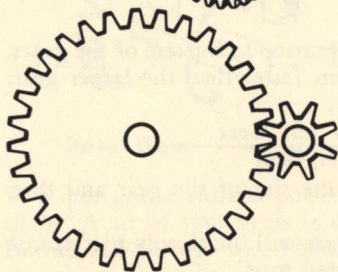


Some interesting problems on gears to figure out are given here:



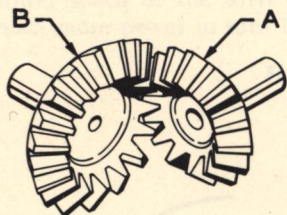
The large gear rotates in a clockwise direction. Which direction does the smaller gear rotate?

(Counter Clockwise)



The smaller gear is 2 inches in diameter and rotates 600 times a minute. The larger gear is 8 inches in diameter. How fast does it rotate?

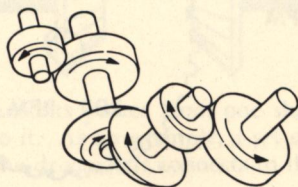
(150 rpm)



Gear A is 3 inches in diameter and rotates 40 times a minute. Gear B is 4 inches in diameter. How fast does it rotate?

(30 rpm)

You will want to draw some gears. Show their sizes, speed and direction of rotation. You may connect as many gears in a series as you wish.



Draft-A-Plan Plate Number 10

The Bird House.

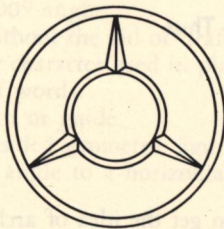
The bird house is an interesting drawing to make because it should be drawn to scale. From these plans you could actually build a bird house.

On DRAFT-A-PLAN PLATE NO. 11 are three (3) circles. Place this plate on your electric desk with a piece of tracing paper over it and be sure it is illuminated. Now, using your 30° - 60° - 90° triangle and your T-square, see if you can make a drawing like the clock shown below.



Draw the clock hands at different times: nine o'clock, six o'clock, and half past one.

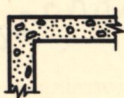
Now let's make an auto wheel cover on one of the other circles like the one shown below.



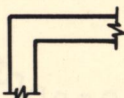
You may think you can make a better design on the last circle. Use your imagination and design your own clock or wheel cover.

Every draftsman should know how to draw a simple floor plan. A plan is always laid out with the front of the building at the bottom of the sheet.

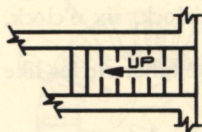
On PLATE NO. 12 you will find a simple house plan drawn to the scale of $\frac{1}{8}$ inch = one foot. Walls, doors, and windows are shown by using architectural symbols. Some of the most often used symbols are shown below.



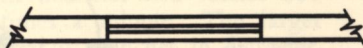
Indicates Masonry Wall



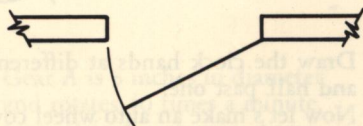
Indicates Frame Wall



Stairways Are Shown Thus



Indicates a Window



Indicates a Door Opening

Trace the house plan to get the idea of architectural drafting, then measure your own room and draw a plan of it at the scale of $\frac{1}{4}$ inch = one foot.

Drafting is fun and we know you will find many interesting things to draw and trace and blue print as you become expert in using this Draft-A-Plan set.



A GLOSSARY of drafting terms

ACUTE ANGLE — angle less than 90° .

ANGLE — figure formed by two lines coming together to a point.

ARC — a portion of a circle.

AXIS — center line of a view.

BLUE PRINT — a reproduction of a drawing that has a bright blue background with white lines.

CASTING — an object made by pouring molten metal into a mold.

CIRCUMFERENCE — perimeter of a circle.

⌀ — symbol used to represent a center line.

CONTOUR — the outline of an object.

DIAGONAL — a line running across from corner to corner.

DIAMETER — the length of a straight line running through the center of a circle.

EQUILATERAL — a figure having equal sides.

HEXAGON — a six-sided figure with each side forming a 60° angle.

OBTUSE ANGLE — an angle more than 90° .

OCTAGON — an eight-sided figure with each side forming a 45° angle.

PENTAGON — a five-sided figure with each side forming a 75° angle.

PERIMETER — the boundary of a geometric figure.

PERPENDICULAR — a line at right angles to a given line.

PLATE — another name given to a drawing.

PROJECT — to extend from.

RECTANGLE — a geometric figure with opposite sides equal in length and each corner forming a 90° angle.

RIGHT ANGLE — a 90° angle.

SKETCH — to draw without the aid of drafting equipment.

SYMBOL — a figure or character used in place of a word or group of words.

TEMPLATE — a pattern or guide.

TRIANGLE — a three-sided geometric figure.

VERTICAL — at right angle to a horizontal line or plane.



Reference Notes



