5. Scaling

Scaling

- SCALE MEASUREMENT
- FULL SIZE
- HALF SIZE
- QUARTER SIZE

The ability to make accurate measurements is a basic skill needed by everyone who reads and uses blueprints. This section is intended as a review of the fundamental principles of measurement. Since some students have had little need to measure accurately, these exercises will provide the practice they need. Others, who have had more experience, may find these exercises a worthwhile review.

Whether or not you need to review these fundamentals, there is one important thing to remember about getting measurements from a print. If you need a dimension that is unclear or is not given, do not measure the print! Since prints shrink, stretch, and may not be drawn to scale, you can easily come up with some very inaccurate dimensions.

Scale Measurement

A drawing of an object may be the same size as the object (full size), or it may be larger or smaller than the object. In mo.st cases, if it is not drawn full size, the drawing is made smaller than the object. This is done primarily for the convenience of the users of the drawings. After all, who wants to carry around a full size drawing of a locomotive? Obviously, with an object as small as a wristwatch, it would be necessary to draw to a larger scale.

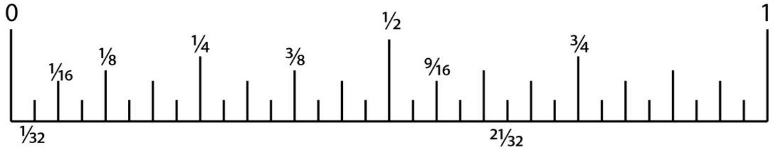
A machine part, for example, may be half the size (1/2”=1”); a building may be drawn 1/48 size (1/4”=1’-0”); a map may be drawn 1/200 size (1”=100’-0”); and a gear in that wristwatch may be ten-times size (10”=1”).

There are numerous scales for different needs. Since each occupational group has their own frequently used scales, some practice or basics review will help you to work with the scales used in your technology.

Full Scale

Full scale is simply letting one inch on a ruler, steel rule, or draftsman’s scale equal one inch on the actual object. Rules of this kind are usually divided into 1 /16” or 1 /32” units. The first measurement exercise will be with full size. If you can measure accurately in full scale, you may want to skip ahead.

Here is a “big Inch”. Each space equals 1/32”. If you have not worked with accurate measurement, spend some time studying it.



Measurement practice: on the scale above, locate the following fractions:

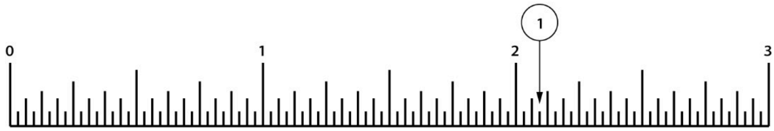
1. 5/8
2. 3/16
3. 7/32
4. 15/16
5. 25/32

1. 7/8
2. 11/16
3. 5/16
4. 31/32
5. 19/32

Directions:

Each of the fractions below is numbered. Write that number above the scale and point with an arrow where the fraction is located. Number 1 has been completed.

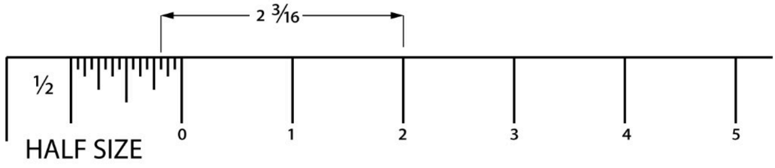
1. 2 3/32
2. 1/4
3. 9/16
4. 2 7/8
5. 1 15/32
6. 2 7/16
7. 1 9/32
8. 15/16
9. 2 5/8
10. 1 1/8
11. 25/32
12. 1 13/16



Half Size

The principle of half size measurements on a drawing is simply letting a unit, such as 1/2” on the scale, represent a larger unit such as 1” on the drawing. If the drawing is properly labeled, the words HALF SIZE or 1/2″= 1′ will appear in the title block.

Using the half-size scale is not difficult, but it does take some practice. To measure a distance of 2-3/16” you look first for the 2, then go backwards to the zero and count off another 3/16. You measure this way for each dimension that has a fraction. Whole numbers (numbers without fractions) are measured in the usual way.



1. 4-3/16
2. 2-1/2
3. 5-3/4
4. 4-3/16
5. 2-1/2
6. 5-3/4

Next, locate a half size scale (available in the lab) and measure the lines· below to the nearest 1 /32 of an inch. Write the length of the line in the space provided.

1. ________ ______________________________

2. ________ __________________

3. ________ _________________________

4. ________ ______________

5. ________ ______________________

6. ________ ____________________________

Because paper is dimensionally unstable due to humidity, exact answers to this half size measurement practice cannot be given. That is another reminder that it's poor practice to measure from a piece of paper.

Quarter Size

Quarter size is used and read in a similar way to half size except that each unit, such as a quarter of an inch, represents a larger unit, such as one inch. If the drawing is properly labeled the words QUARTER SIZE, QUARTER.SCALE, or 1/4″ = 1″ will appear in the title block.

The quarter size scale is used in a similar manner as the half size scale.

For quarter size practice, draw lines in the area provided to the required length. Have another student or the lab instructor check your lines for accuracy. (A ¼"=1" scale is available in the lab.)

1. 1”
2. 4”
3. 7 1/4”
4. 16 3/8”
5. 5 3/16”
6. 13”
7. 10 7/8”
8. 2 5/16”

Quiz

For this quiz, you will be given an object to measure with a ruler or tape measure. You will record measurements in full scale and then draw each length in ½ and ¼ scale.

6. Dimensioning

- Numerals
- Dimensions
- Extension Lines
- Arrowheads
- Dimension Figures
- Isometric Dimensioning
- Orthographic Dimensioning

If a drawing is to be complete, so that the object represented by the drawing can be made as intended by the designer, it must tell two complete stories. It tells this with ***views***, which describe the shape of the object, and with ***dimensions and notes***, which gives sizes and other information needed to make the object.

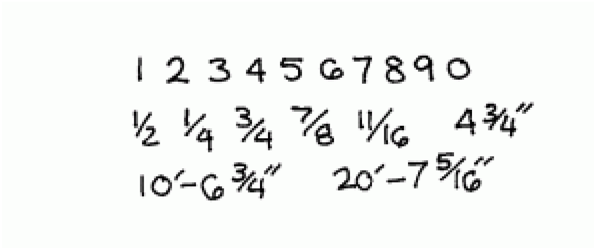
Therefore, your next step is to learn the basics of dimensioning. In that way you will understand not only how to interpret a drawing to get the information you need, but also how to dimension your sketches so that they can be used to communicate size information to others.

Numerals

It may seem a bit basic, but a few exercises with the shapes of numbers comes before dimensioning. The reason for such review is simply that incorrectly or carelessly made numbers on a drawing or sketch can easily be misinterpreted by someone on the job. That can be costly.

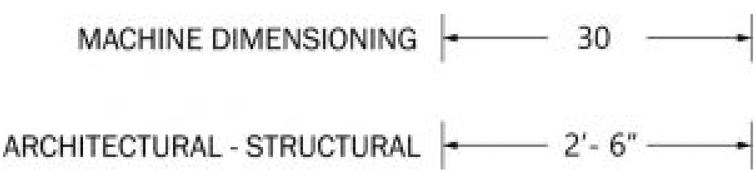
Therefore, the study of numbers forms is justified.

The number forms presented here have been determined to be the most legible, and are used by industry nationwide. The United States standardized 1/8" vertical numbers are correctly formed as follows:



Dimension Lines

The dimension line is a fine, dark, solid line with arrowheads on each end. It indicates direction and extent of a dimension. In machine sketches and drawings, in which fractions and decimals are used for dimensions, the dimension line is usually broken near the middle to provide open space for the dimension numerals. In architectural and structural sketches and drawings, the numerals are usually above an unbroken dimension line.

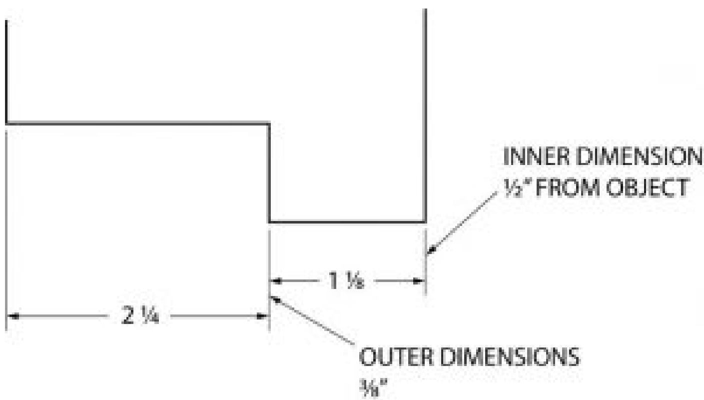


In either case, the dimension line which is closest to the object should be placed approximately

1/2″ away. The other dimensions beyond the first dimension (if any) should be approximately 3/8″ apart. You do not necessarily have to remember this, but you should remember not to crowd your dimension lines and to keep them a uniform distance apart.

The most important thing is that the drawing needs to be "clean" and dimensions need to be located in a space where they cannot be confused with a surface they are not intended to be used for.

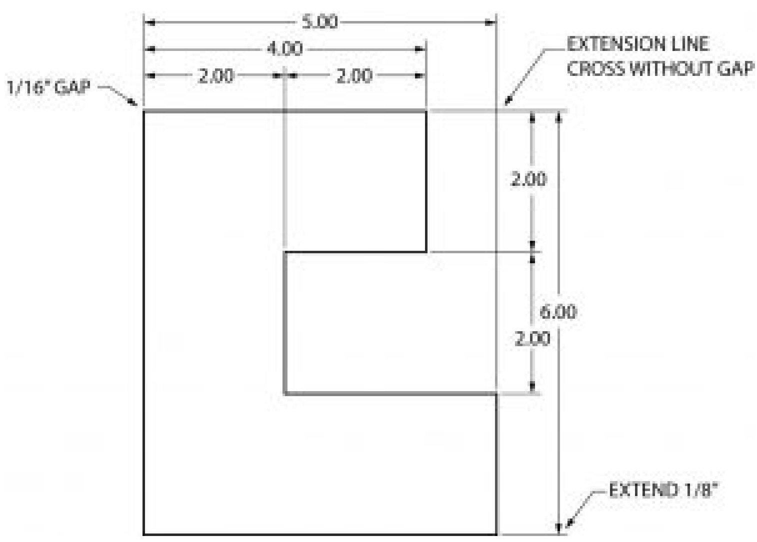
Here is how dimension lines should be sketched:



Note: Dimensions less than six feet (72 in.) are given in inches. Dimensions over six feet are usually shown in feet and inches. Be sure that it is clear how dimensions are called out. When calling out dimensions that are over 12", make sure ALL of dimensions are called out in total inches or feet inches throughout the entire drawing. Either 4'-5" or 53", they both mean the same thing but if there is a mix of dimensioning it can become easy to look at 4'-8" and see 48".

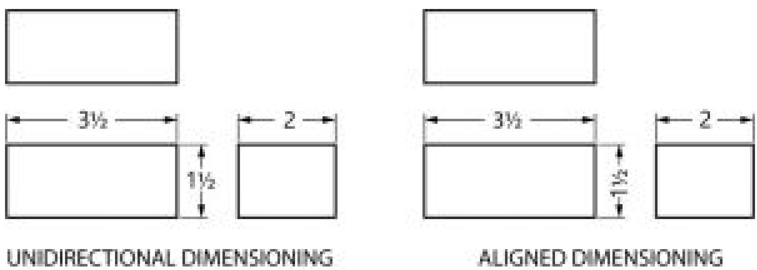
Extension Lines

Extension lines on a drawing are fine, dark, solid lines that extend outward from a point on a drawing to which a dimension refers. Usually, the dimension line meets the extension line at right angles. There should be a gap of about 1 / 16″ where the extension line would meet the outline of the object, and the extension line should go beyond the outermost arrowhead approximately 1 /8″. Also, there should be not gaps where extension lines cross. Notice in this example the larger dimensions are correctly placed outside, or beyond the shorter dimensions, and that the dimensions are preferably not drawn on the object itself. Sometimes, however, it is necessary to dimension on the object.

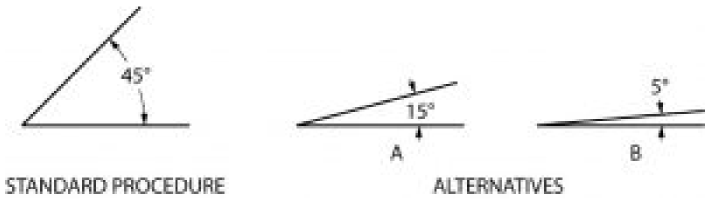


It is important to remember to place dimensions on the views, in a two or three view drawing, where they will be the most easily understood. Avoid dimensioning to a hidden line and avoid the duplication of dimensions. Use common sense; keep dimensions as clear and simple as possible. Remember, the person reading your drawing needs to clearly understand, beyond question, how to proceed. Otherwise, costly time and material will be wasted.

There are two basic methods of placing dimensions on a sketch. They may be placed so they read from the bottom of the sketch (unidirectional dimensions) or from the bottom and right side (aligned dimensions). The unidirectional system is usually best, because it is more easily read by workmen.



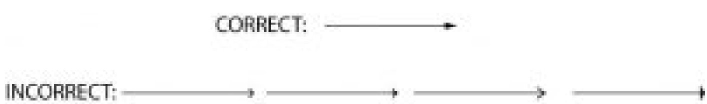
When dimensions will not fit in a space in the usual way, other methods are used to dimension clearly, when those crowded conditions exist.



Arrowheads

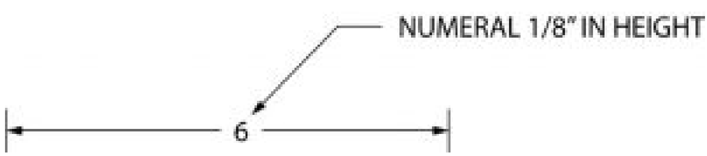
Arrowheads are placed at each end of dimension lines, on leader lines, etc. Correctly made, arrows are about 1/8" to 3/16" in length, and are about three times as long as they are wide. Usually they have a slight barb, much like a fishhook.

To make your drawing look clean, use the same style throughout your drawing or sketch.

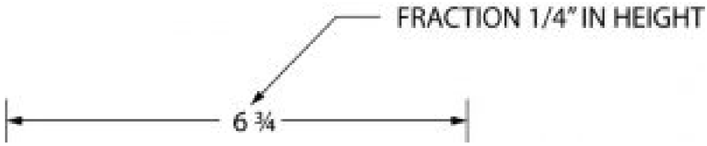


Dimension numerals

Numerals used to dimension an object are normally about 1/8" in height.



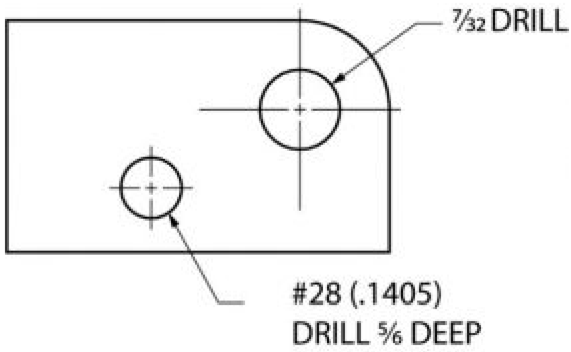
When a dimension includes a fraction, the fraction is approximately 1 / 4″ in height, making the fractional numbers slightly smaller to allow for space above and below the fractional line.

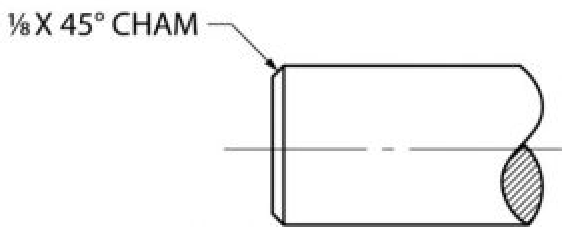


Again, it is particularly important that the numbers and fractions you may put on a sketch or drawing be legible. Sloppy numbers can cause expensive mistakes.

Notes

Notes are used on drawings to provide supplementary information. They should be brief and carefully worded to avoid being misinterpreted, and located on the sketch in an uncrowded area. The leader lines going to the note should be kept short. Notes are usually added after a sketch has been dimensioned to avoid interference with dimensions.



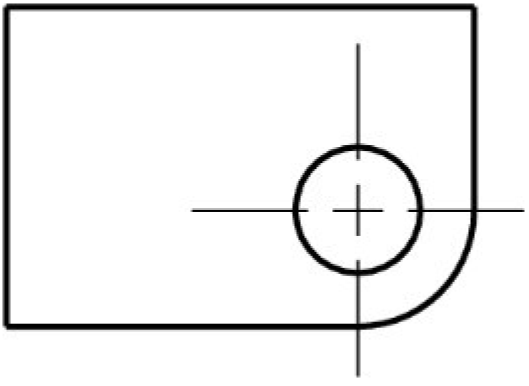


Quiz

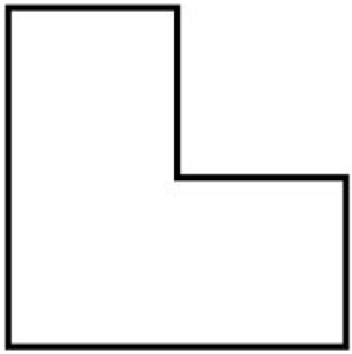
Directions: Dimension the examples as indicated.

Dimension this 3 ¼ x 6 15/32 rectangle unidirectionally on the top and right sides.

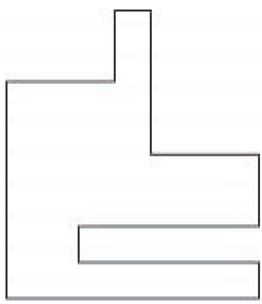
With a note, show a 5/16 drilled hole.



Dimension this object. The shorter lines are 3 inches in length.

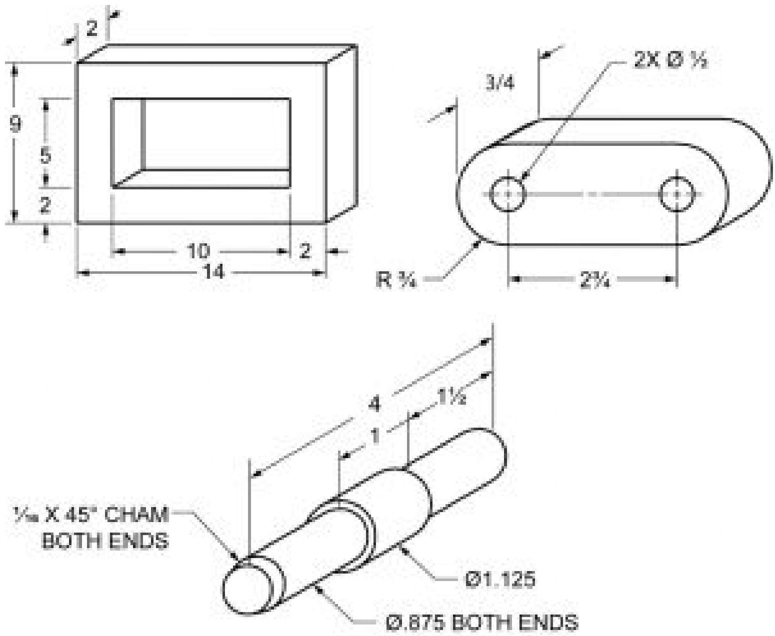


Dimension this object. Use a ruler or scale to determine the line lengths.



Oblique Dimensioning

Oblique dimensioning is mostly remembering to avoid dimensioning on the object itself (when possible) and the use of common sense dimensioning principles. It is also usually best to have dimensions read from the bottom (unidirectional) as shown here.

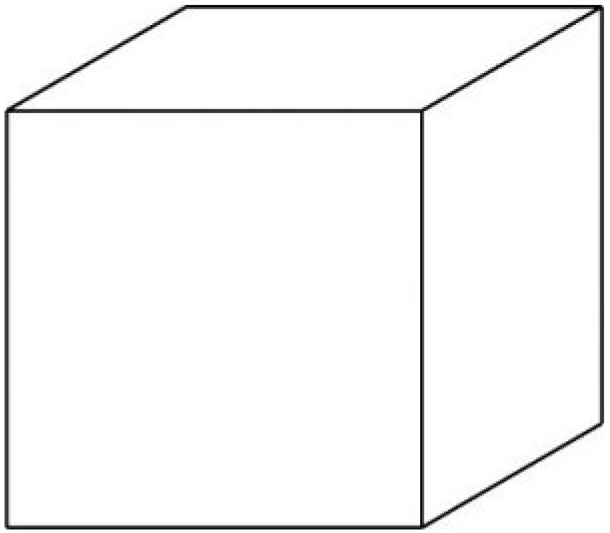


Although it is best not to dimension on the view itself, its usually accepted practice to place diameter and radius dimension on the views if space permits.

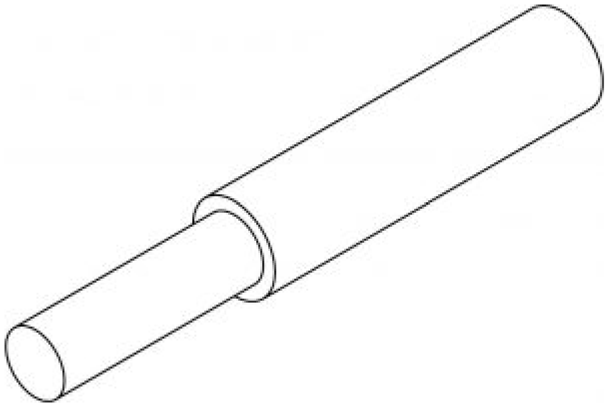
Sometime space and time is limited and you might have to bend the typical rules of drawing and dimensioning. The most important thing is to keep the drawing clean, concise, try to not a repeat dimensions but give all required ones.

Directions: Complete as indicated.

Dimension this three inch cube.

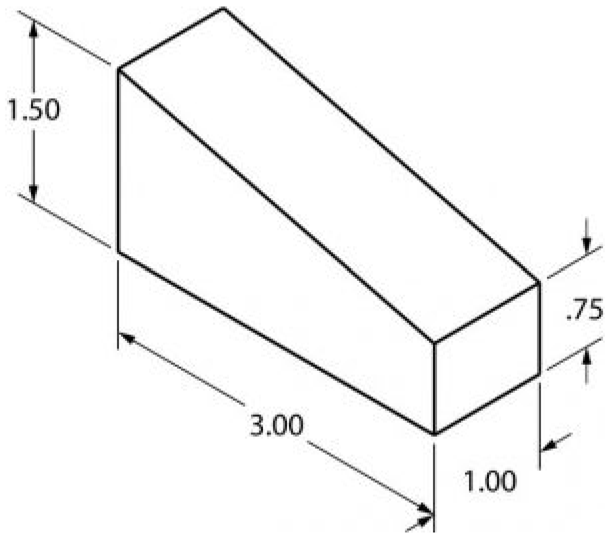


The shorter section of this rod is 5/8 inches in diameter by 2 1/8 inches long. The longer section is 7/8 inches in diameter by 3 ½ inches long. Dimension the drawing.

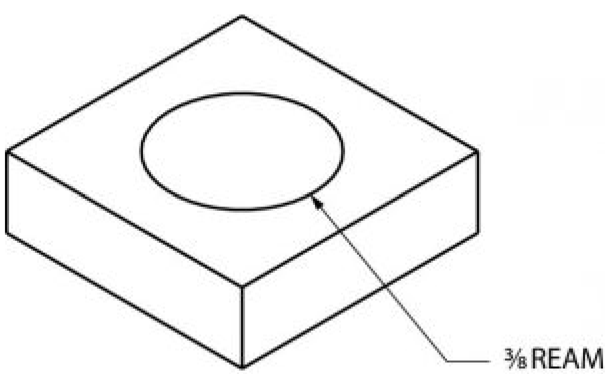


Isometric Dimensioning

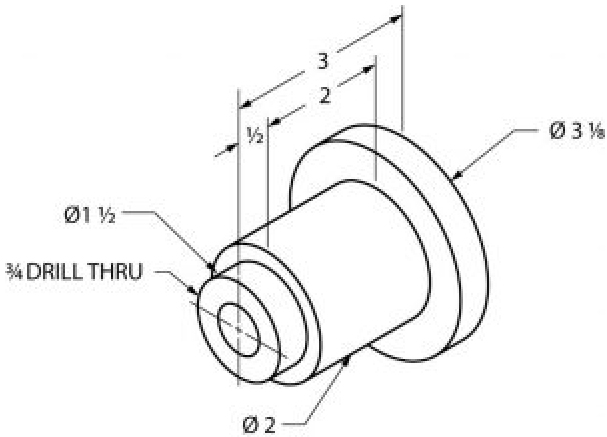
When dimensioning an isometric sketch, it is important to keep dimensions away from the object itself, and to place the dimension on the same plane as the surface of the object being dimensioned. You will probably find that to dimension well in isometric will take some practice.



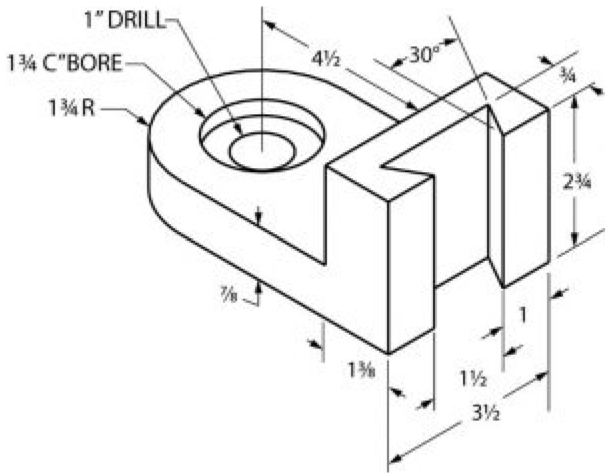
Place notes on an isometric drawing without regard to placing them on the same plane, as with dimensions. It is easier to do, and easier to read.



Isometric notes do not have to be on the same plane.



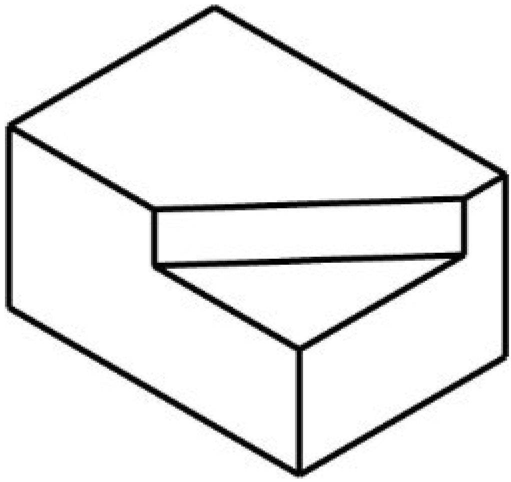
Notice in the example above that part of each leader line to the notes are sketched at an approximate angle of 15, 30, 45, 60 or 75 degrees. This is done to avoid confusion with other lines. **Never draw leader lines entirely horizontal or vertical**.



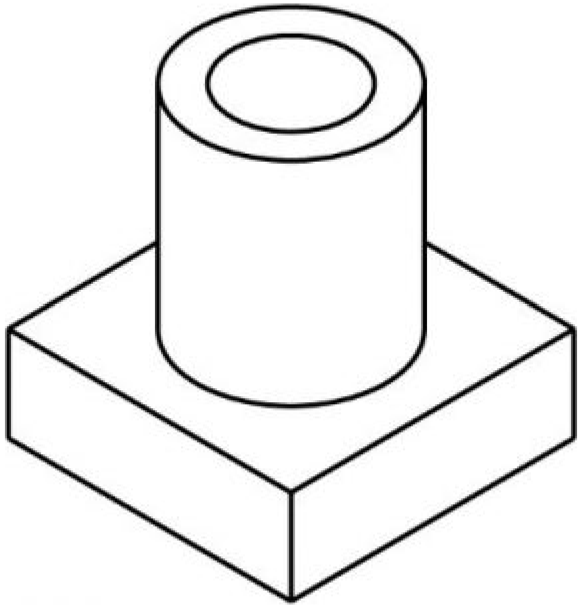
Quiz

Directions: complete as indicated.

Dimension this drawing. The dimensions are 3" long, 2 1/8" wide, 1 5/8" high with a 45◦ angle ½" deep. The angle begins as the midpoint of the 3" long dimension.



Dimension this drawing. The base is ½” x 1 ½” square. The cylinder is 1” ∅. x 1-1/8”
long. The drilled through hole is ∅5/8”.



Quiz

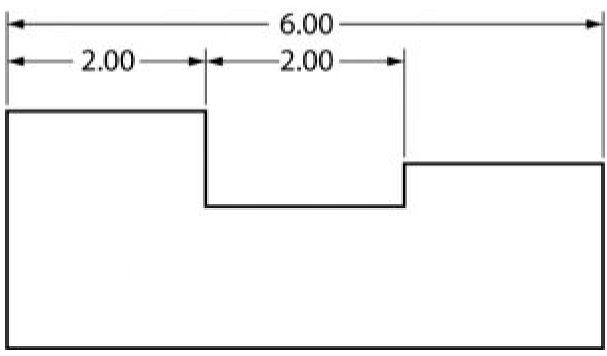
Directions: You will be given an object to sketch and dimension.

Orthographic Dimensioning

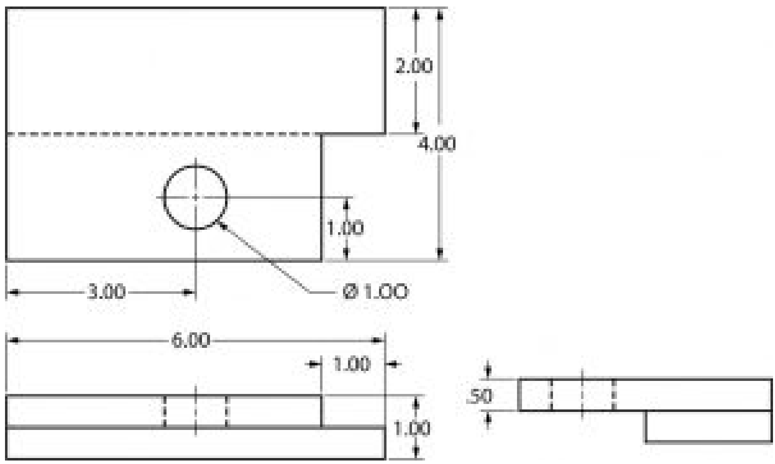
When you look at the dovetailed object several pages back, it is easy to see that an isometric sketch can quickly become cluttered with dimensions. Because of this, more complicated sketches and drawings are dimensional in orthographic. This method provides the best way to dimension clearly and in detail.

Here are seven general rules to follow when dimensioning.

- Show enough dimensions so that the intended sizes can be determined without having a workman calculate or assume any distances.
- State each dimension clearly, so it is understood in only one way.
- Show dimensions between points, lines or surfaces which have a necessary relationship to each other or which control the location of other components or mating parts.
- Select or arrange dimensions to avoid accumulations of dimensions that may cause unsatisfactory mating of parts. (In other words, provide for a buildup of tolerances, as in the example below.



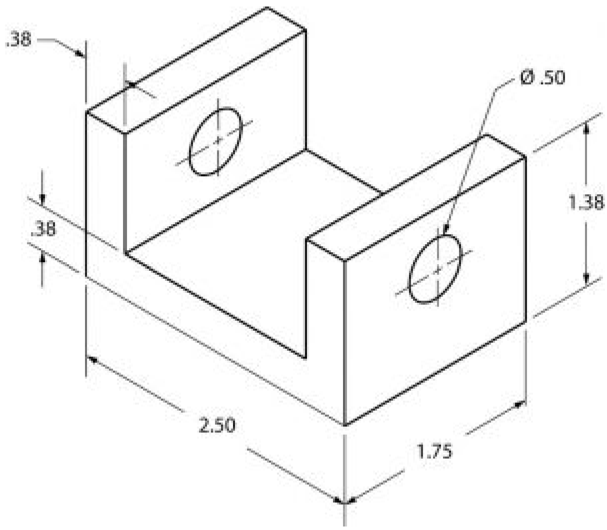
- Show each dimension only once. (Do not duplicate dimensions).
- Where possible, dimension each feature in the view where it appears most clearly, and where its true shape appears.
- Whenever possible, specify dimensions to make use of readily available materials, parts and tools.



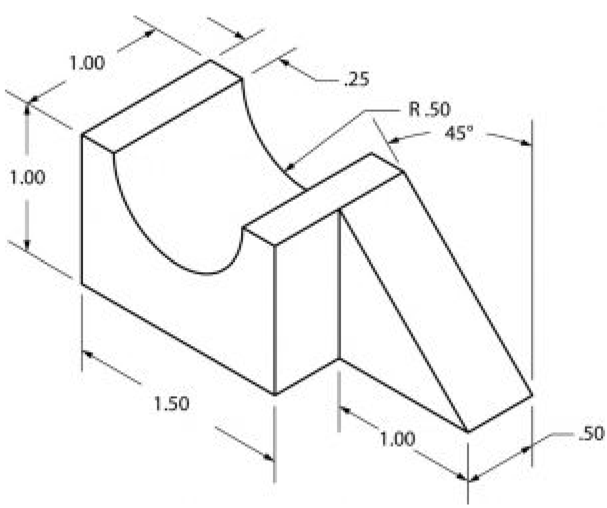
Notice the dimensions are correctly placed between the views, rather than around the outside edges of the drawing.

Quiz

Directions: one a separate piece of paper, make a dimensioned orthographic sketch of this object.



Directions: on a separate piece of paper, make a dimensional orthographic sketch of the object.



Quiz

Directions: You will be given an object to sketch and dimension.

7. Auxiliary Views

- FRONT VIEW AUXILIARIES
- TOP VIEW AUXILIARIES
- SIDE VIEW AUXILIARIES
- SKETCHING AUXILIARY VIEWS

When an object has a slanted or inclined surface, it usually is not possible to show the inclined surface in an orthographic drawing without distortion. To present a more accurate description of any inclined surface, an additional view, known as an auxiliary view, is usually required.

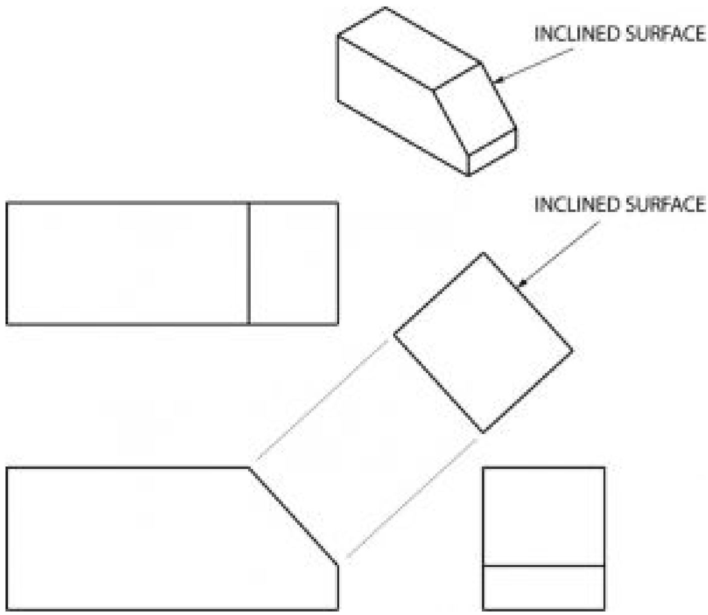
An auxiliary view is simply a "helper" view, which shows the slanted part of the object as it actually is. It turns, or projects, the. object so that the true size and shape of the surf ace (or surfaces) are seen as they actually are.

Auxiliary views are commonly found on many types of industrial drawings.

Front View Auxiliaries

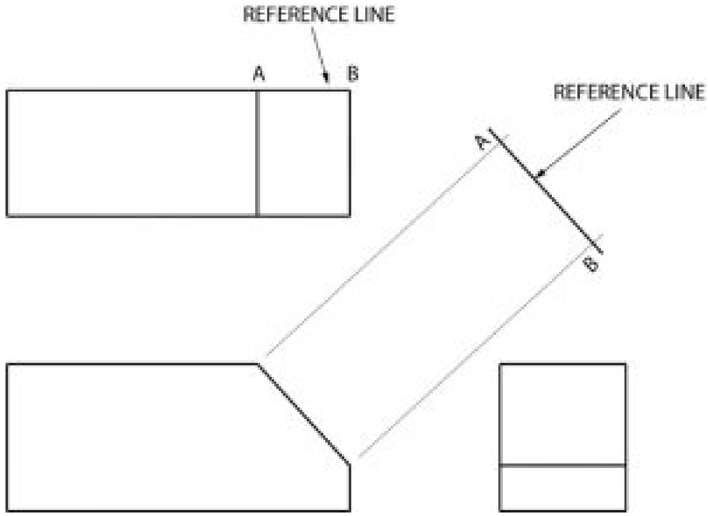
There are three basic type of auxiliary views. In the first type, the auxiliary view is projected from the front view of a three view (orthographic) drawing. In the second and third types of drawings, the auxiliary views are projected from the top and side views.

Here is a front view auxiliary of a simple object with an inclined surface.

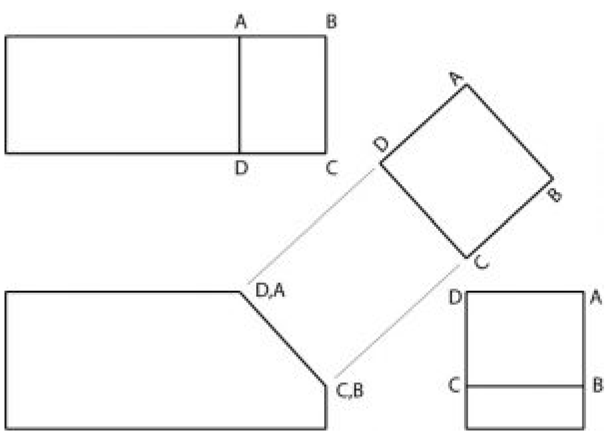


Notice that the projection lines are perpendicular to the slanted surface of the first view, and that only the slanted surface of the object is shown in the auxiliary view. · The rest of the object is omitted, however, for clarification portions of the adjacent· surfaces are sometimes shown. Also, notice that the slanted surfaces of the top and side views are shortened because of distortion, whereas the surface of the auxiliary view is true, or actual size.

To sketch an auxiliary view, you begin with orthographic. views of the object and add projection lines perpendicular (90°) to the slanted surface, adding a reference line any convenient distance from the view with the slanted surface.



Next, the distance CB on the auxiliary view is made the same length as the related distance in one of the orthographic views; in this example it's the side view. This completes the auxiliary view.

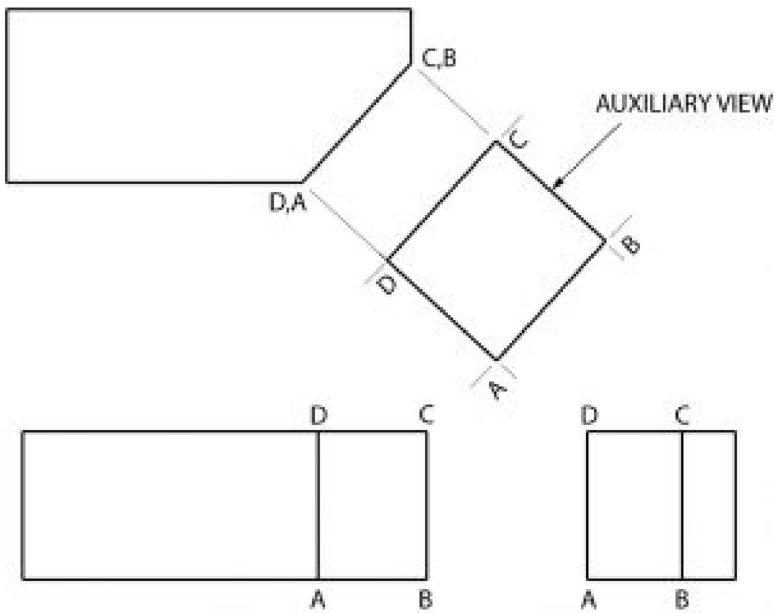


Top View Auxiliaries

A top view auxiliary is developed in the same way as a front view auxiliary, except that the auxiliary is projected from the top view.

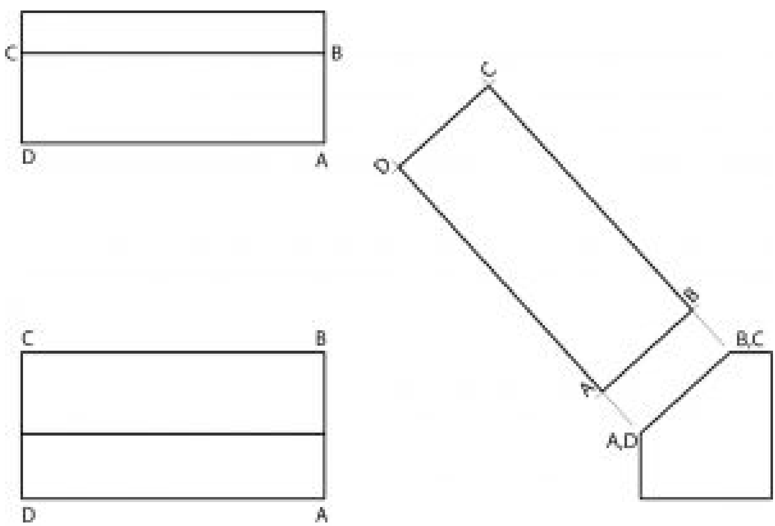
Whether the auxiliary view is to be projected from the front, top, or side view depends on the position of the object, or which surface of the object is slanted. In this example, the top view is slanted. Therefore the auxiliary view must be projected from the top view.

Again, notice how the angled surfaces shown in the front and side views are not shown in true length.



Side View Auxiliary

Side view auxiliaries are drawn in the same way as front and top view auxiliaries. Again, where the auxiliary view is to be projected depends upon the position of the object or which surface of the object is slanted.



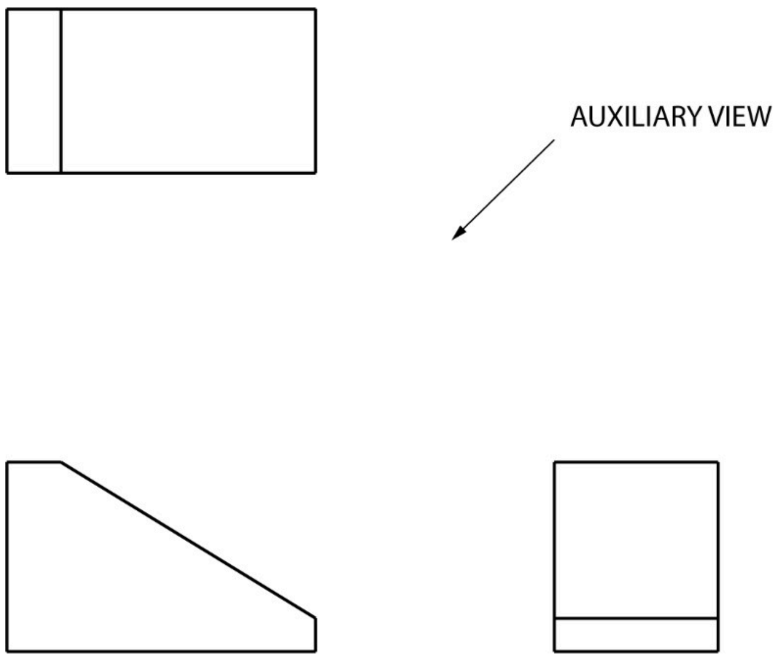
Obviously, these are very basic auxiliary view examples and are presented to introduce you to the concept of auxiliary views.

As objects with inclined surfaces become more complex, auxiliary views provide a means of presenting objects in their true size and shape.

Sketching Auxiliary Views

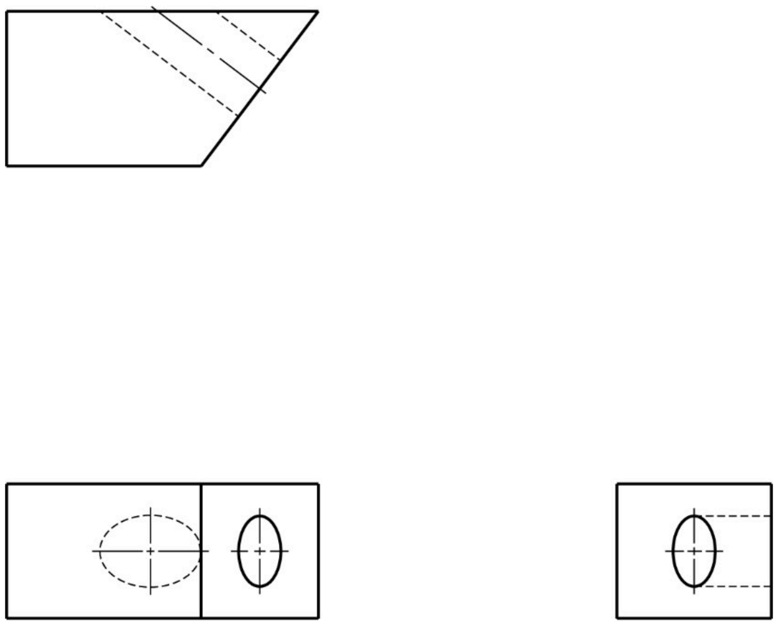
The following problems require and auxiliary view to be complete. Sketch the auxiliary views required in the spaces provided.

Drawing practice 1



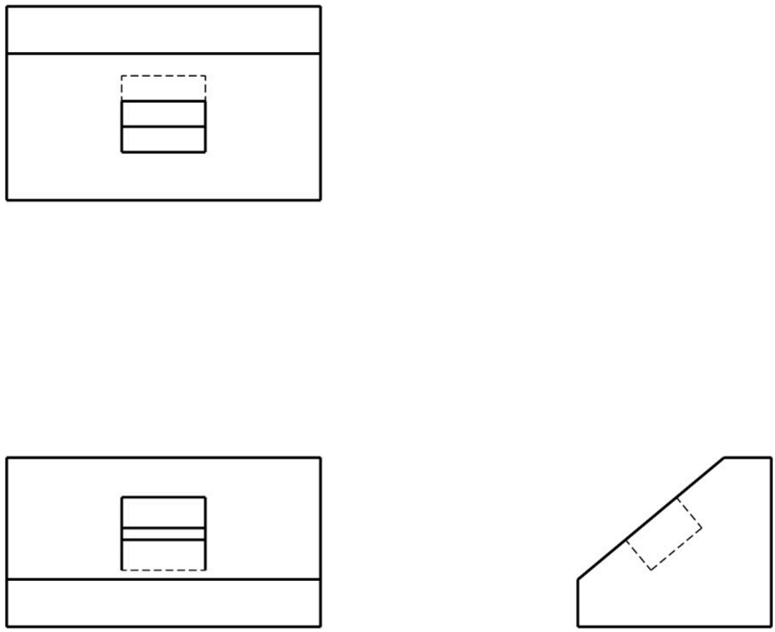
Drawing practice 2

In this problem, a round hole is centered on the slanted surface and drilled through the object. The hole appears elliptical in the. front and side views because of distortion. It will appear in its true shape on the auxiliary view. Remember that the auxiliary is developed from the view with the slanted surface. Complete the auxiliary view.



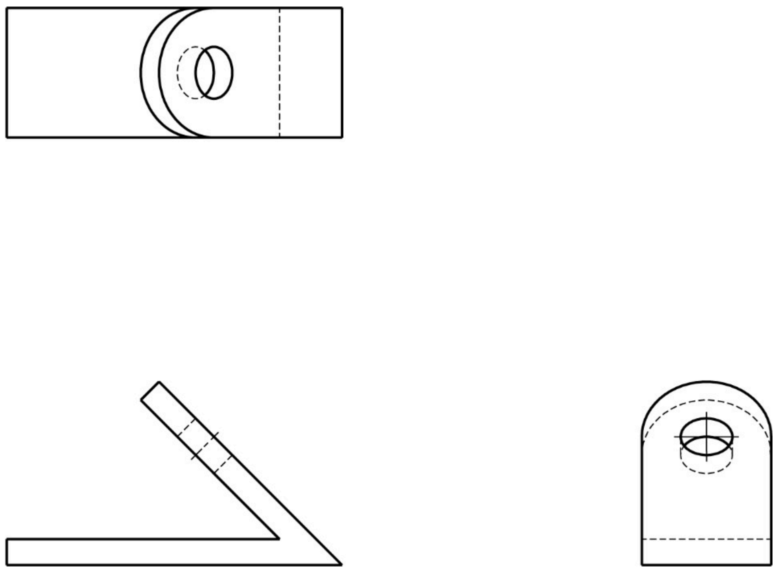
Drawing practice 3

In this problem, a square hole has been cut part way into the object. Complete the auxiliary view.



Quiz

Directions: Complete the auxiliary view in the space provided.



8. Sectional Views

Sectional Views

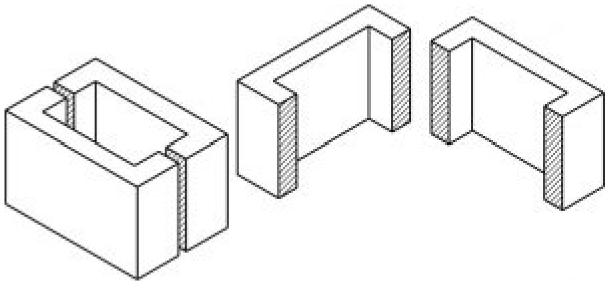
- CUTTING PLANE
- CUTTING PLANE LINE
- SECTION LINING
- FULL SECTIONS
- HALF SECTIONS
- BROKEN OUT SECTIONS
- REVOLVFD SECTIONS
- OFFSET SECTIONS
- REMOVED SECTIONS

You have learned that when making a multiview sketch, hidden edges and surfaces are usually shown with hidden (dash) lines.

When an object becomes more complex, as in the case of an automobile engine block, a clearer presentation of the interior can be made by sketching the object as it would look if it were cut apart. In that way, the many hidden lines on the sketch are eliminated.

The process of sketching the internal configuration of an object by showing it cut apart is known as sectioning. Sectioning is used frequently on a wide variety of Industrial drawings.

In this example, blocks A and B result after the block in figure 1 has been "Sectioned". When you cut an apple in half you have sectioned it. Just as an apple can be sectioned any way you choose, so can an object in a sectional view of a drawing or sketch.

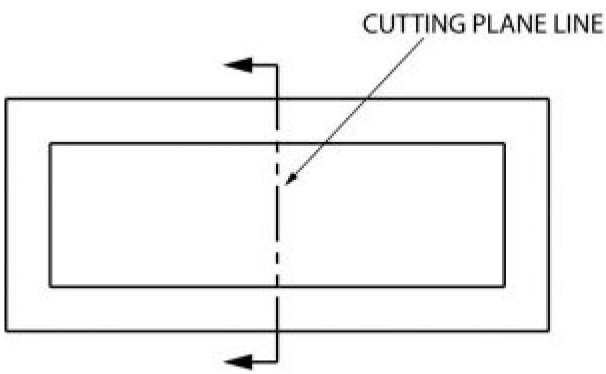


Cutting Plane

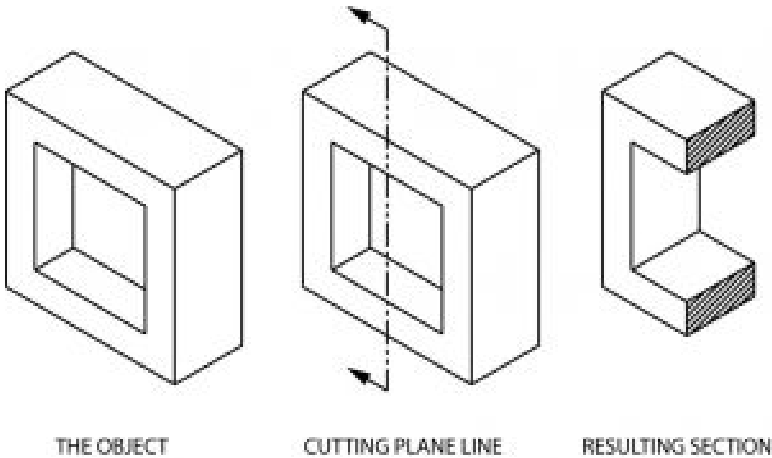
A surface cut by the saw in the drawing above is a cutting plane. Actually, it is an imaginary cutting plane taken through the object, since the object is imagined as being cut through at a desired location.

Cutting Plane Line

A cutting plane is represented on a drawing by a cutting plane line. This is a heavy long-short-short-long kind of line terminated with arrows. The arrows in show the direction of view.



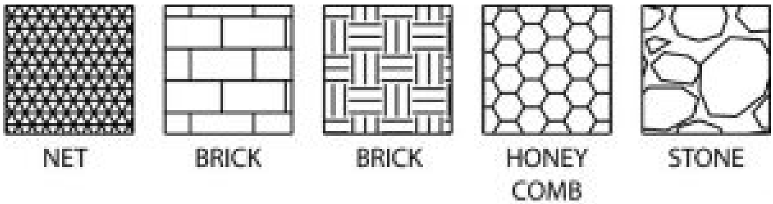
Once again, here is an graphic example of a cutting plane line and the section that develops from it.



Section Lining

The lines in the figure above, which look like saw marks, are called section lining. They are found on most sectional views, and indicate the surface which has been exposed by the cutting plane. Notice that the square hole in the object has no section lining, since it was not changed by sectioning.

Different kinds of section lining is used to identify different materials. When an object is made of a combination of materials, a variety of section lining symbols makes materials identification easier. Here are a few examples:

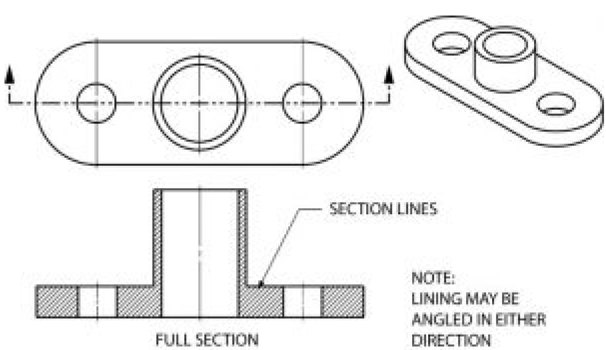


Section lines are very light. When sketching an object or part that requires a sectional view, they are drawn by eye at an angle of approximately 45 degrees, and are spaced about 1/8” apart. Since they are used to set off a section, they must be drawn with care.

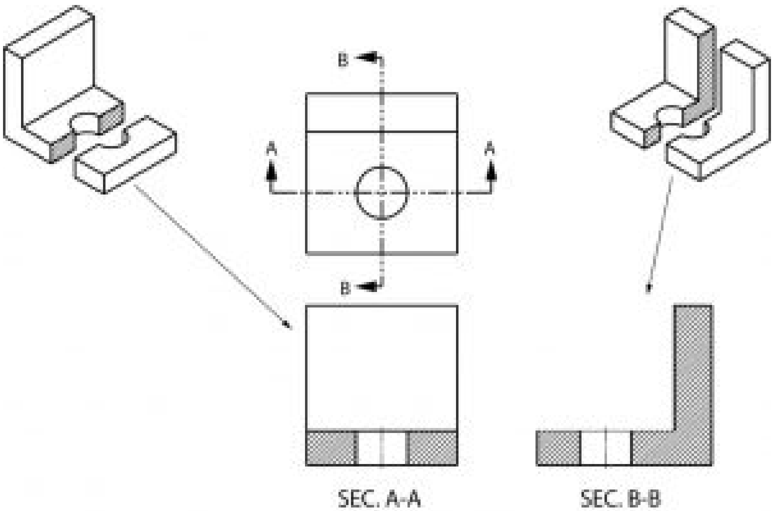
It is best to use the symbol for the material being shown as a section on a sketch. If that symbol is not known, you may use the general purpose symbol, which is also the symbol for cast iron.

Full Sections

When a cutting plane line passes entirely through an object, the resulting section is called a full section Fig. 7 illustrates a full section.



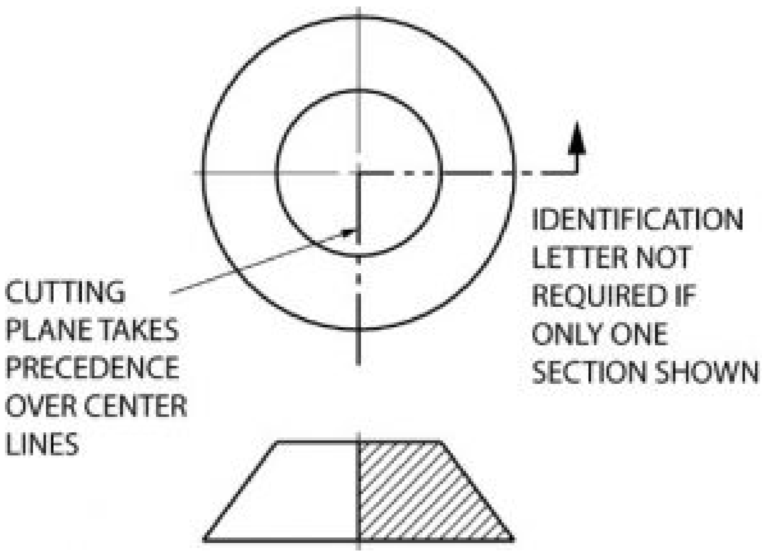
It is possible to section an object whenever a closer look intentionally is desired. Here is an object sectioned from two different directions.



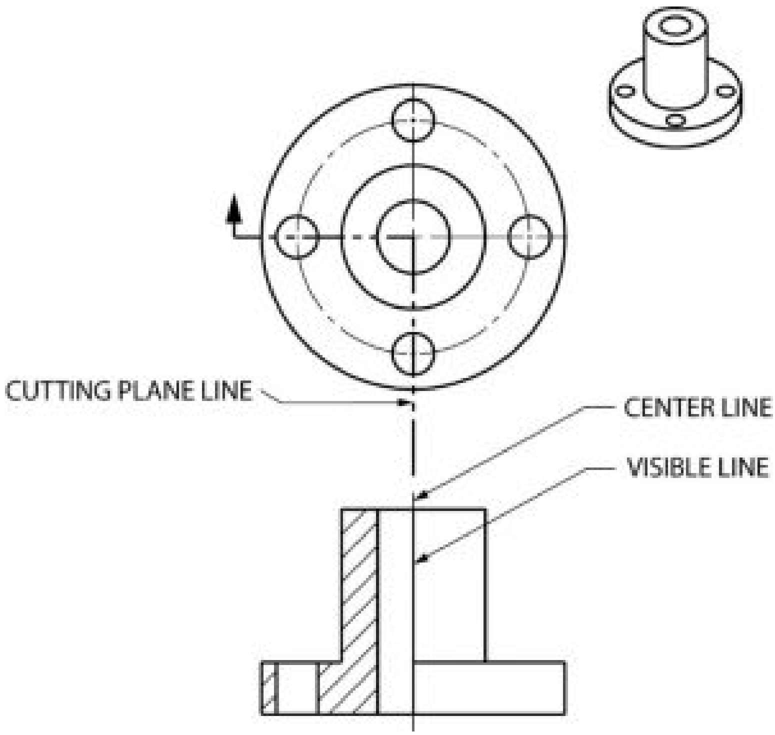
Half Sections

If the cutting plane is passed halfway through an object, and one-quarter of the object is removed, the resulting section is a half section. A half section has the advantage of showing both inside and outside configurations.

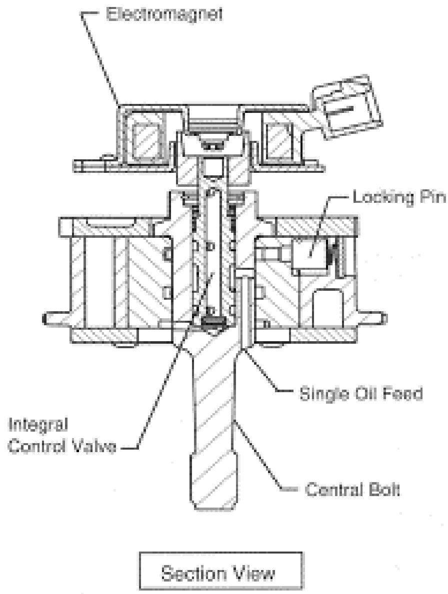
It is frequently used for symmetrical objects. Hidden lines are usually not shown on the un-sectioned half unless they are needed for clearness or for dimensioning purposes. As in all sectional drawings, the cutting plane take precedence over the center line.



Here is another example of a half section. Remember that only one fourth of the object is removed with a half section, whereas half of the object is generally removed with a full section.

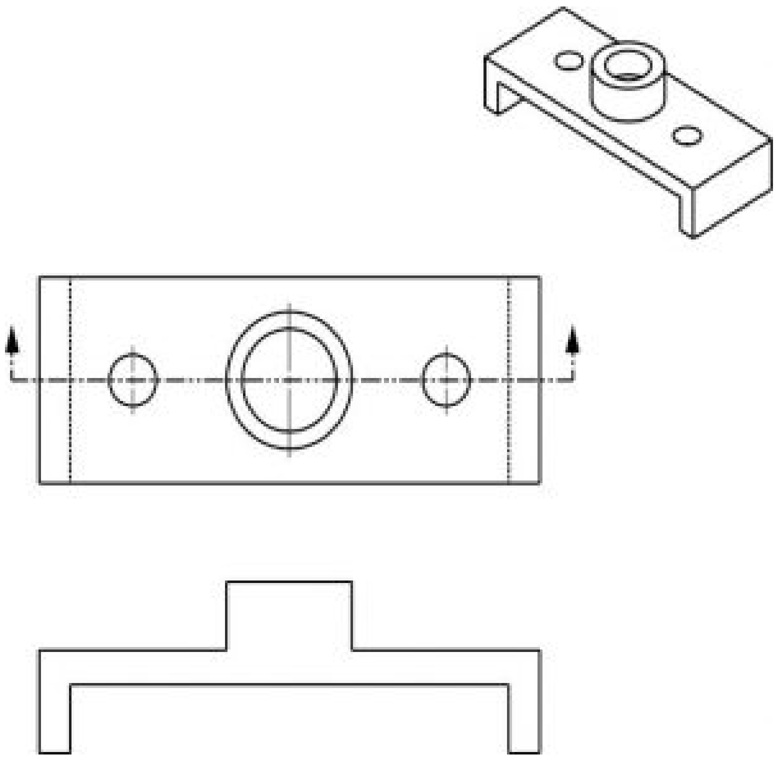


This manufacturer's drawing, using both full and half section, illustrates the advantages of sectional views. The different line directions indicate different parts and materials used in the assembly of this valve.



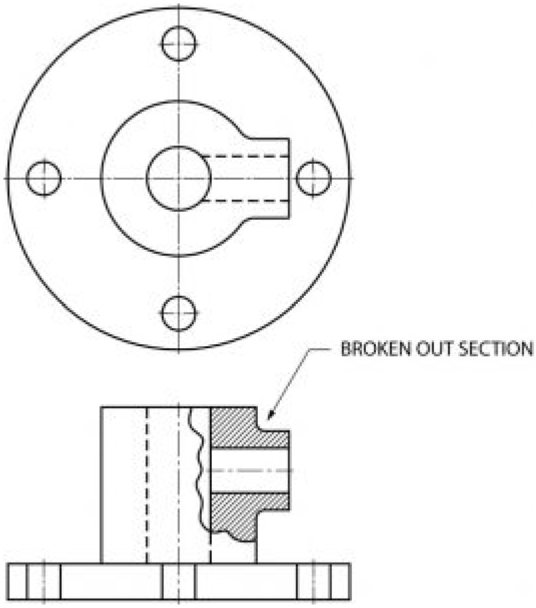
Quiz

Directions: On a separate sheet of paper, complete the section view.



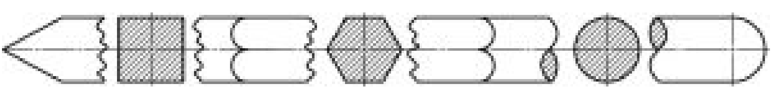
Broken Out Sections

In many cases only a small part of a view needs to be sectioned in order to show some internal detail. In the figure below, the broken out section is removed by a freehand break line. A cutting plane line does not need to be shown, since the location of the cut is obvious.



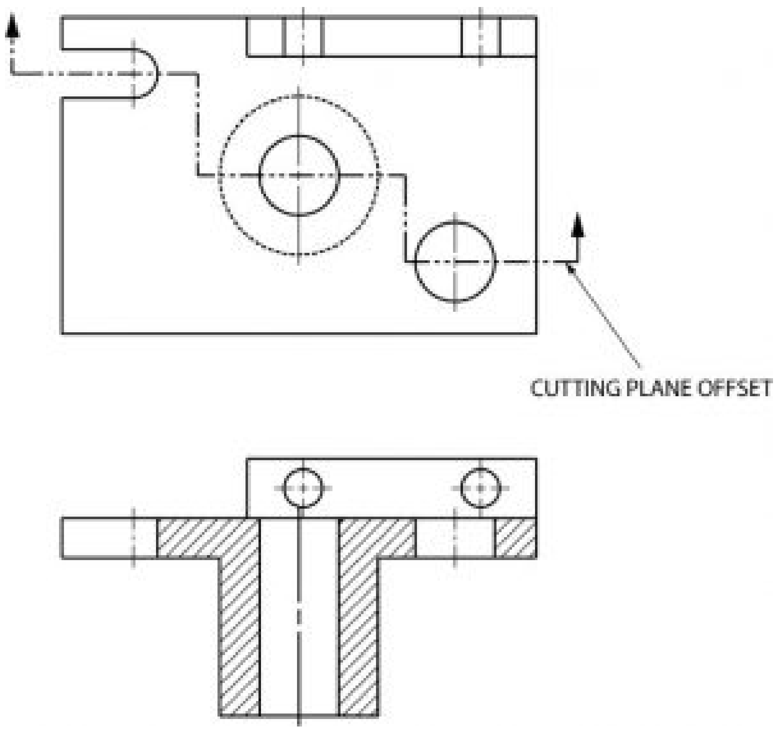
Revolved Sections

A revolved section shows the shape of an object by rotating a section 90 degrees to face the viewer. The three revolved sections illustrated in the spear-like object of figure 12 show the changes that take place in its shape.



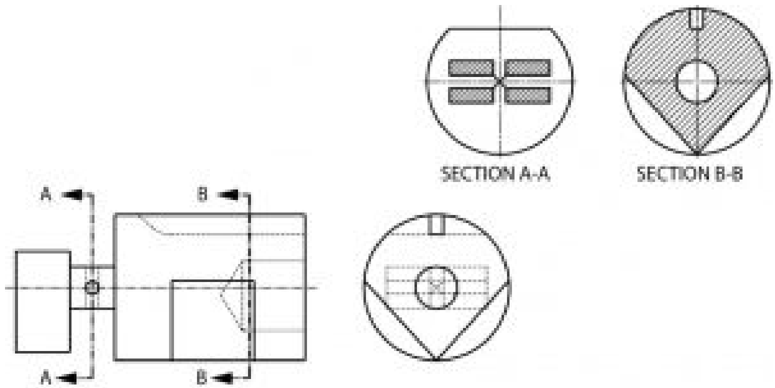
Offset Sections

An offset section is a means of including in a single section several features of an object that are not in a straight line. To do this, the cutting plane line is bent, or “OFFSET” to pass through the features of the part.



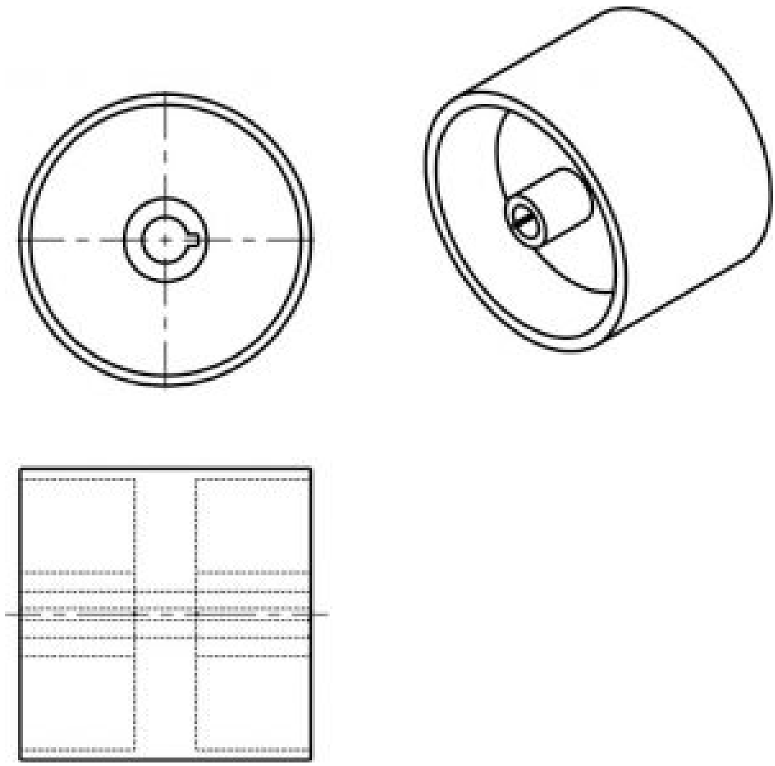
Removed Sections

A section removed from its normal projected position in the standard arrangement of views is called a "removed" section. Such sections are labeled SECTION A-A, SECTION B-B, etc., corresponding to the letter designation at the ends of the cutting plane line. Removed sections may be partial sections and are often drawn to a different scale.



Quiz

Directions: Complete the half section view of a separate sheet of paper.



9. Machined Features

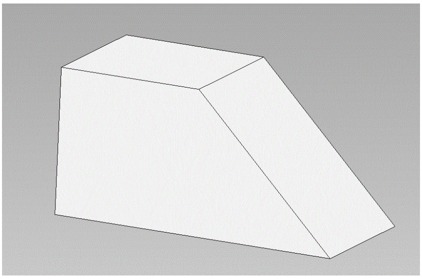
Machined Features

- BEVEL
- BOSS
- CHAMFER
- COUNTERBORE
- COUNTERSINK
- DOVETAIL
- FILLET
- KERF
- KEYWAY
- KEYSEAT
- KNURL
- LUG
- NECK
- PAD
- ROUND
- SPLINE
- SPOTFACE
- T-SLOT

The machined features in this section are common terms related to basic industry processes. These terms are often found on prints. For a better understanding of these processes, look at the models of machined features in the Print Reading Lab.

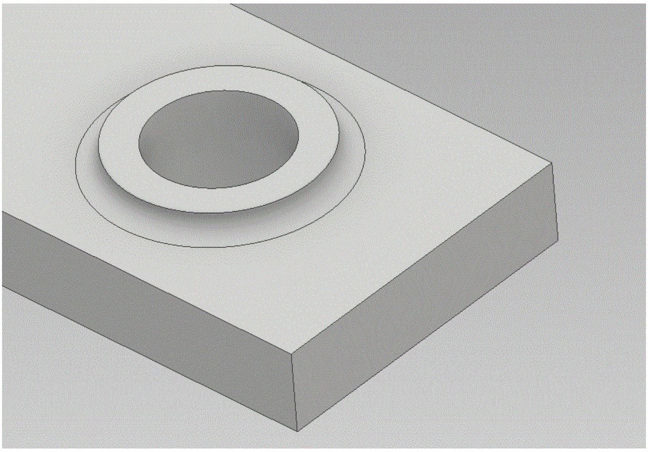
Bevel

A surface cut at an angle. In regard to welding, a bevel will normally end up being a surface prep for a weld.



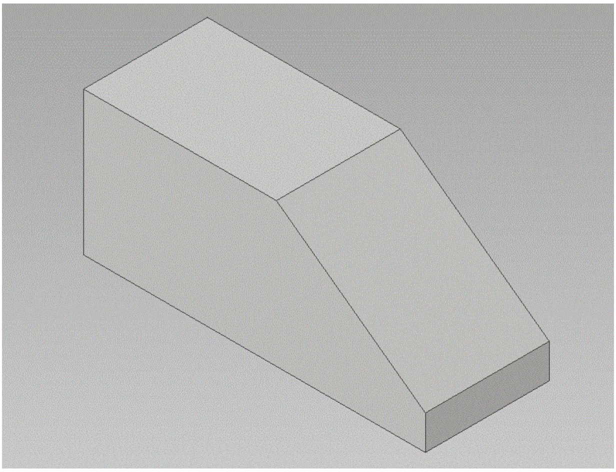
Boss

A circular pad on forgings or castings, which project out from that body of the part. The surface of the boss is machined smooth for a bold head to seat on and it has a hole drilled through to accommodate the bolt shank.



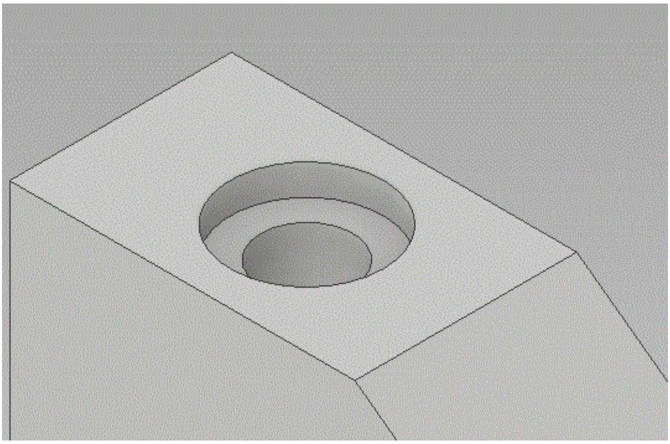
Chamfer

A process of cutting away a sharp external corner or edge. Not for welding.



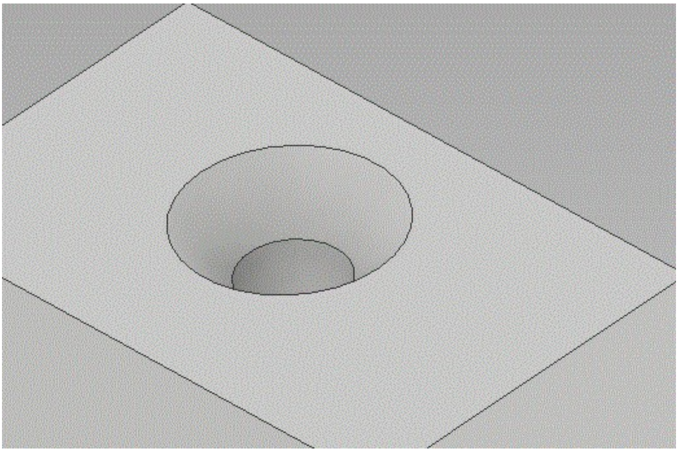
Counterbore

To enlarge drilled hole to a given diameter and depth. Usually done for recessing a bolt head.



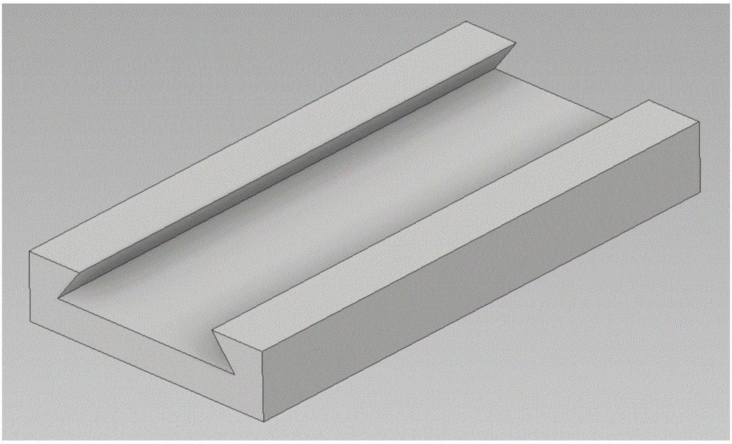
Countersink

To machine a conical depression in a drilled hole for recessing flathead screws or bolts.



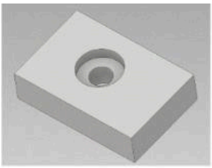
Dovetail

A slot of any depth and width, which has angled sides.

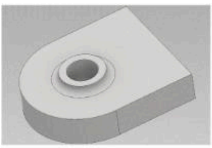


Quiz

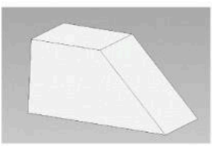
Directions: Name the machined features shown below.



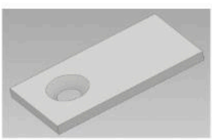
1. ______________________________



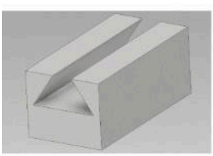
2. ______________________________



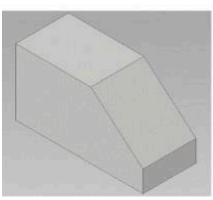
3. ______________________________



4. ______________________________



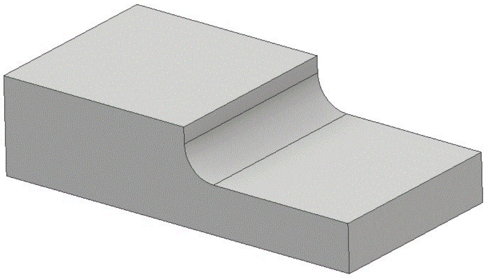
5. ______________________________



6. ______________________________

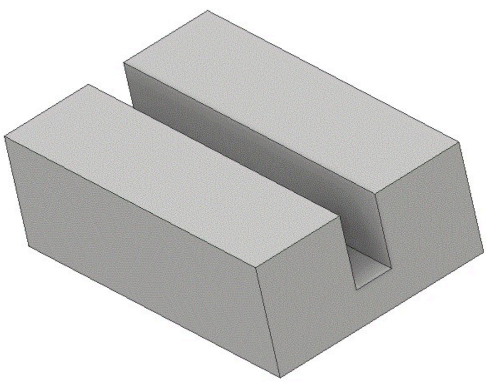
Fillet

A small radius filling formed between the inside angle of two surfaces.



Kerf

The narrow slot formed by removing material while sawing or other machining.

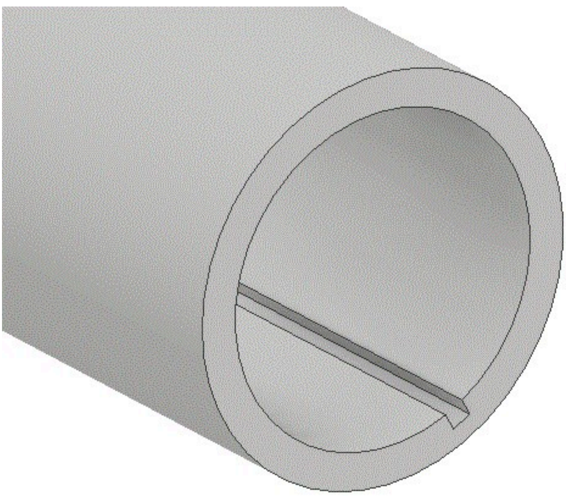


Keyway

A narrow groove or slot cut in the shaft hole of a sleeve or hub for accommodating a key.

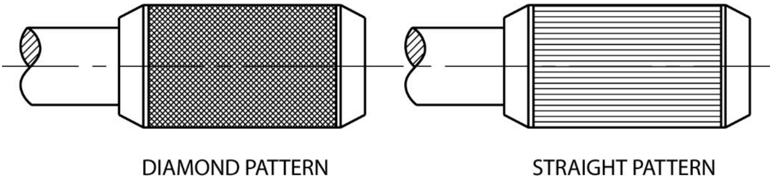
Keyseat

A narrow groove or slot cut in a shaft for accommodating a key.



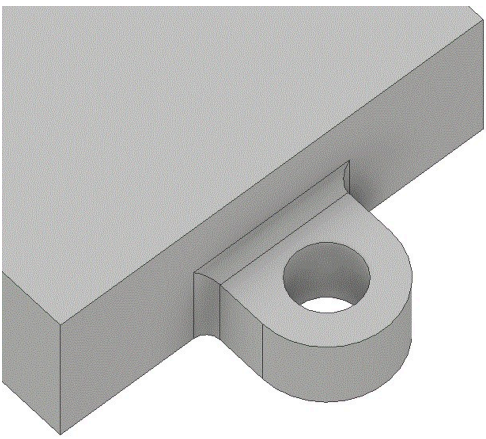
Knurl

To uniformly roughen with a diamond or straight pattern a cylindrical or flat surface.



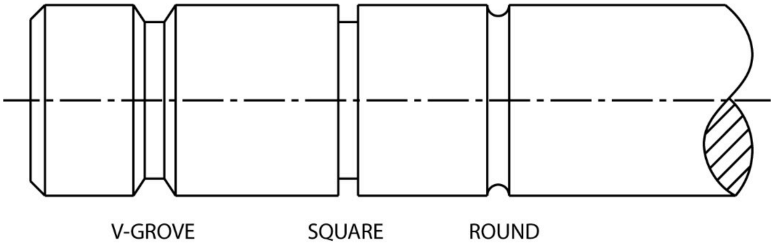
Lug

A piece projecting out from the body of a part. Usually rectangular in cross section with a hole or slot in it.



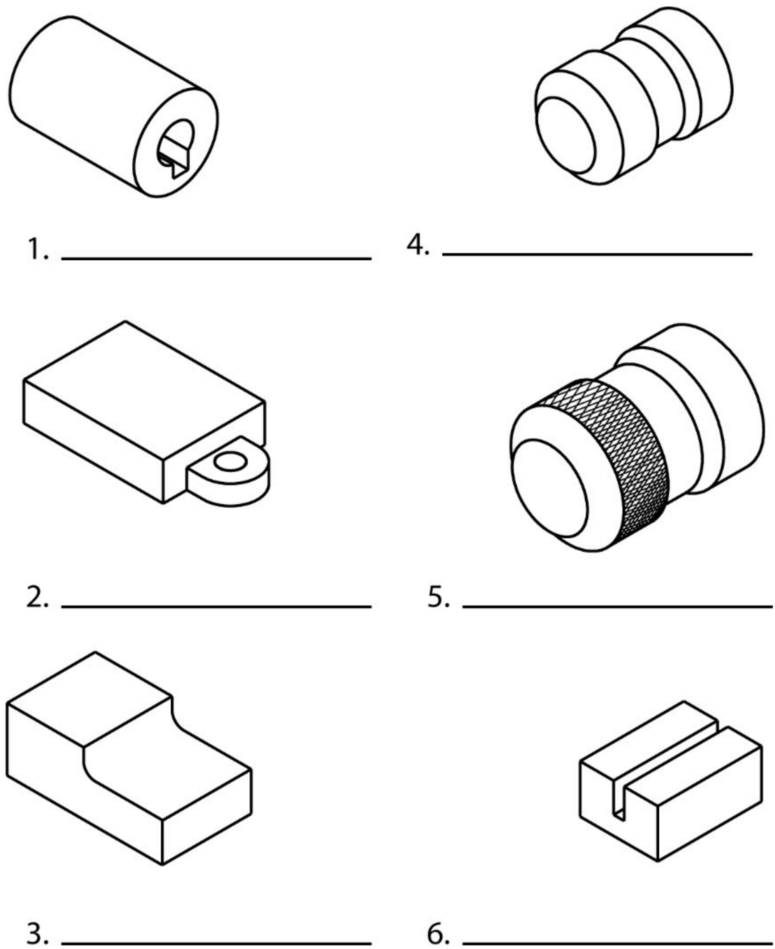
Neck

To machine a narrow groove on a cylindrical part or object.



Quiz

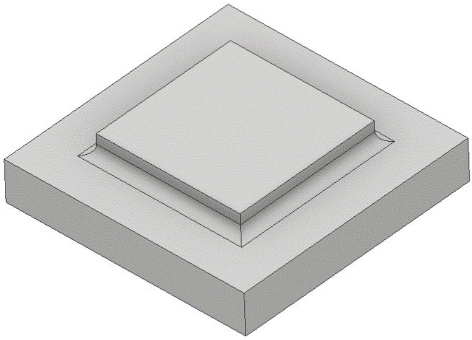
Directions: Name the machined features shown below. Check your answer.



Additional features and shapes.

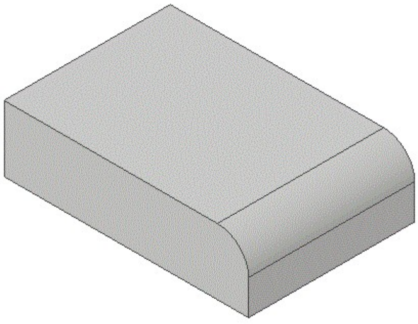
Pad

A slightly raised surface projecting out from the body of a part. The pad surface can be of any size or shape. (Remember, bosses can only be round)



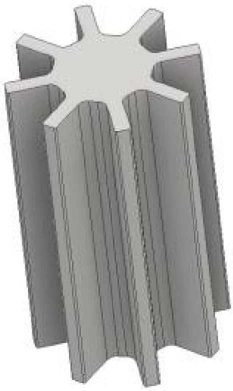
Round

A small radius rounded outside corner formed between two surfaces.



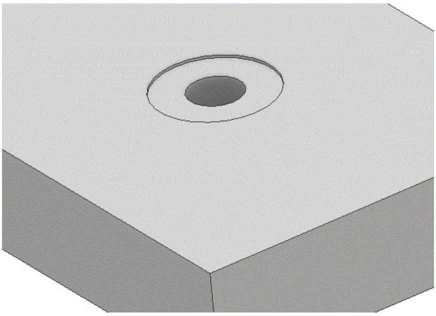
Spline

A gear-like serrated surface on a shaft. Take the place of a key when more torque strength is required.



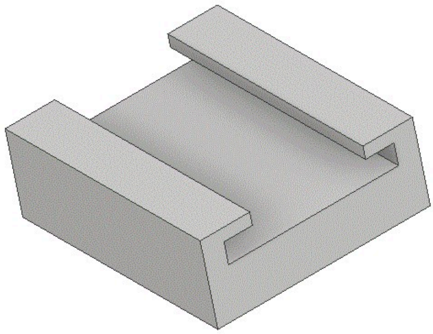
Spotface

A round surface on a casting or forging for a bold head. Usually about 1/16" deep.



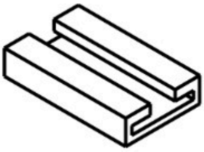
T-Slot

A slot of any dimensions to resemble a "T".

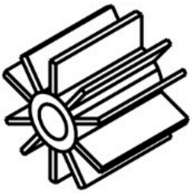


Quiz

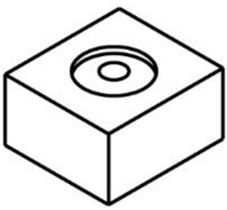
Directions: Name that machined features shown below. Check your Answers.



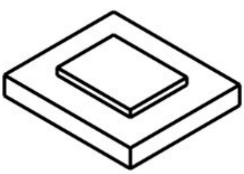
1. ______________________________



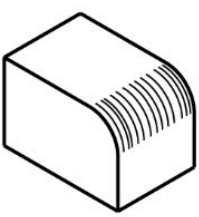
2. ______________________________



3. ______________________________



4. ______________________________



5. ______________________________

10. Print Interpretation

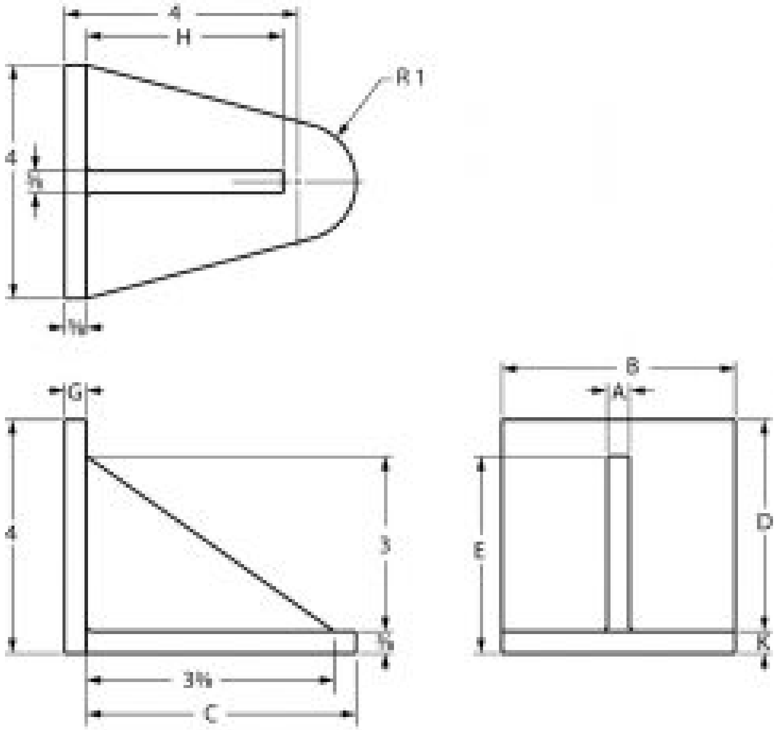
Print Interpretation

This final section introduces basic print reading. Because machine drawings are used to some extent in nearly every trade, the working drawings used in this section are all machine drawings.

The purpose of this package is to provide an opportunity to put your fundamental knowledge of print reading to use before you go on to more specialized and advanced print reading activities.

Exercise 1

Study the print below and fill in the related dimensions.



A = ____________

B = ____________

C = ____________

D = ____________

E = ____________

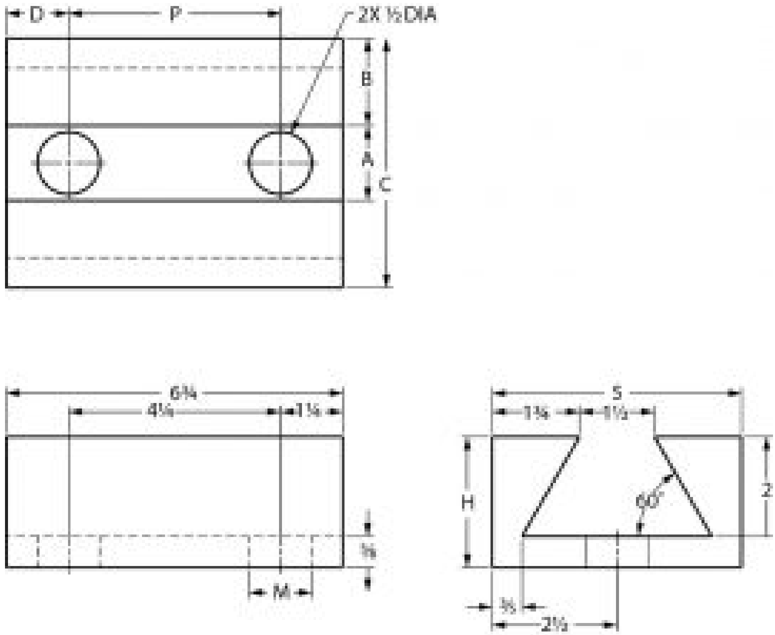
G = ____________

H = ____________

K = ____________

Exercise 2

Study the print below and fill in the related dimensions.



A = ____________________

B = ____________________

C = ____________________

D = ____________________

H = ____________________

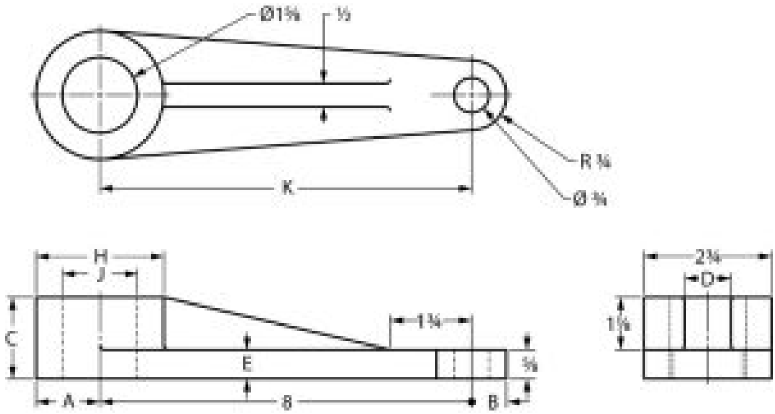
K = ____________________

M = ____________________

P = ____________________

Exercise 3

Study the print below and fill in the related dimensions.



A = ____________________

B = ____________________

C = ____________________

D = ____________________

E = ____________________

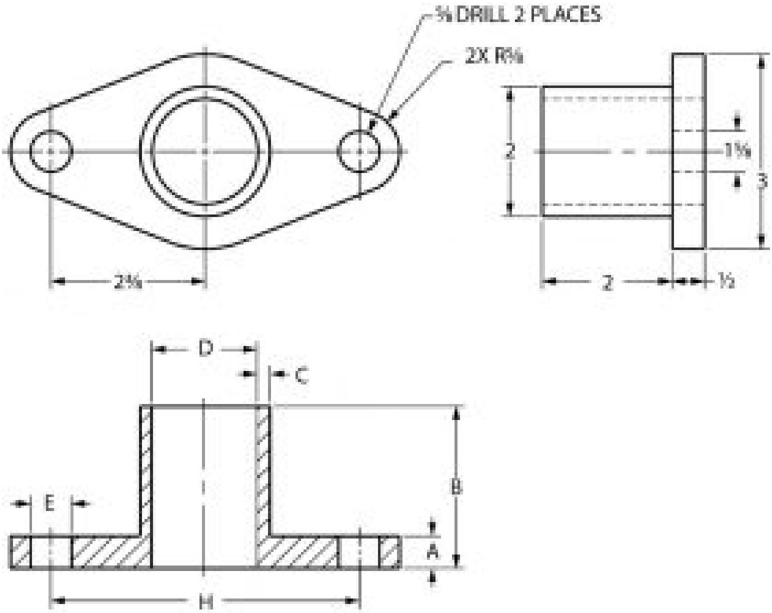
H = ____________________

J = ____________________

K = ____________________

Exercise 4

Study the print below and fill in the related dimensions.



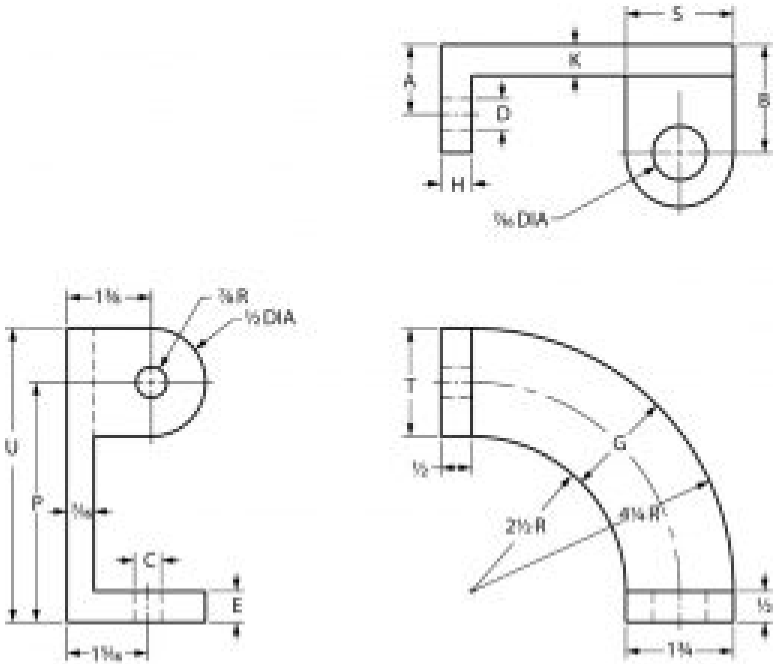
A = ________________ D = ________________

B = ________________ E = ________________

C = ________________ H = ________________

Exercise 5

Study the print below and fill in the related dimensions.



A = ____________________ H = ____________________

B = ____________________ K = ____________________

C = ____________________ P= ____________________

D = ____________________ S = ____________________

E = ____________________ T = ____________________

G = ____________________ U = ____________________