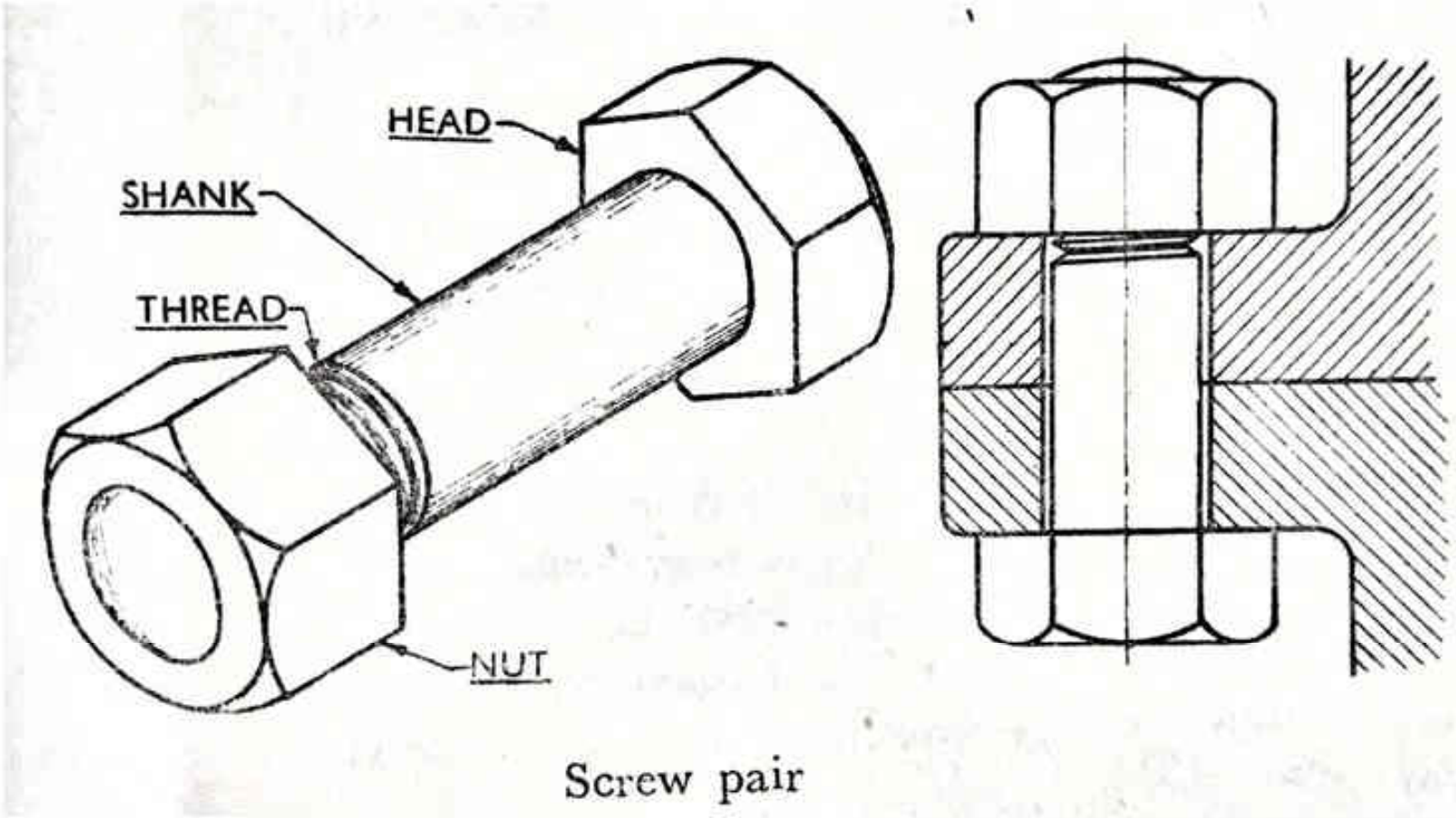
Mechanical Drawing I
Code: MAE217

Screwed Fastenings

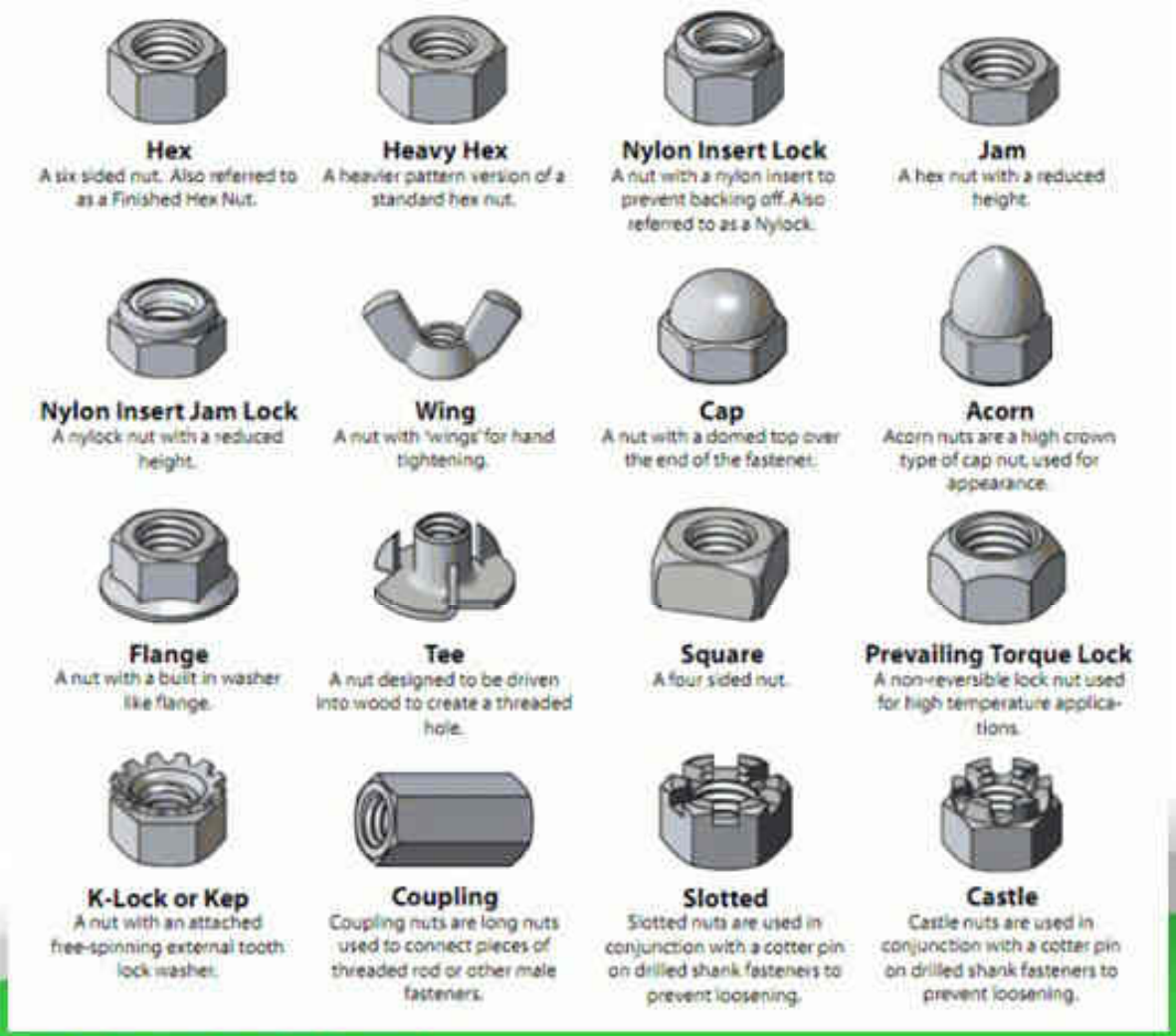
Screw pair



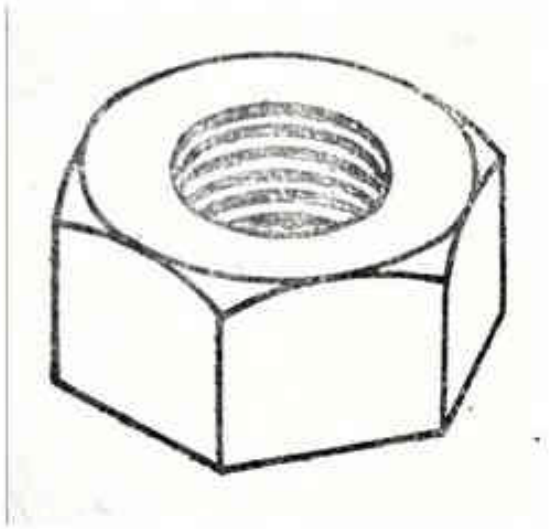
Screw pair

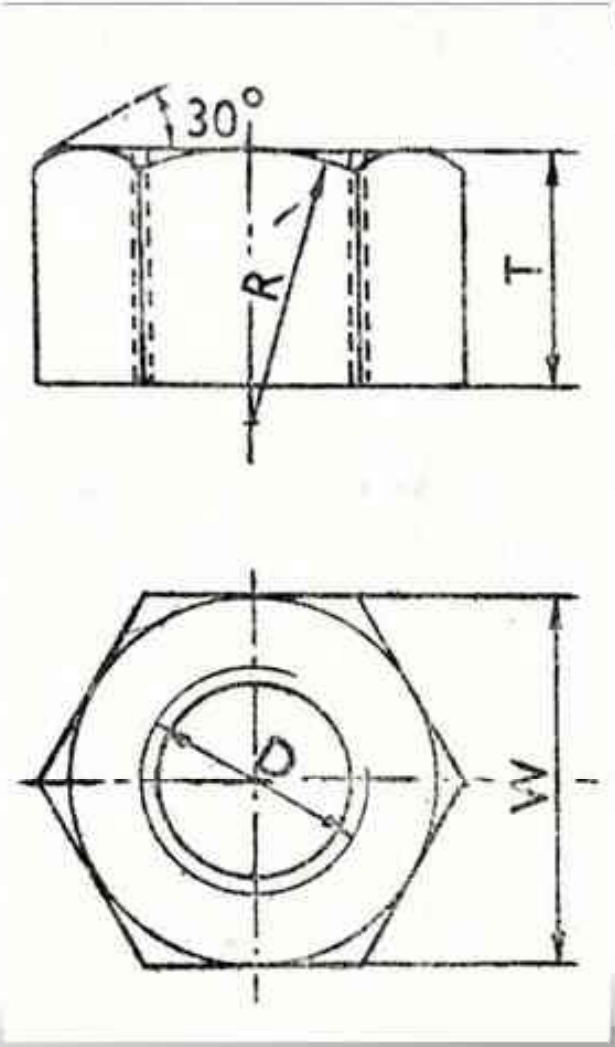
Nuts:

Nuts are generally in the form of hexagonal or square prisms. Beside these, cylindrical and other forms are also used suit particular requirements.



Hexagonal Nut:

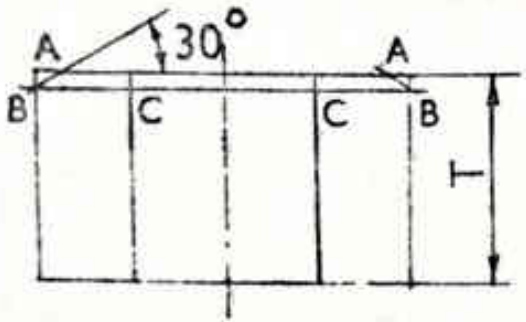




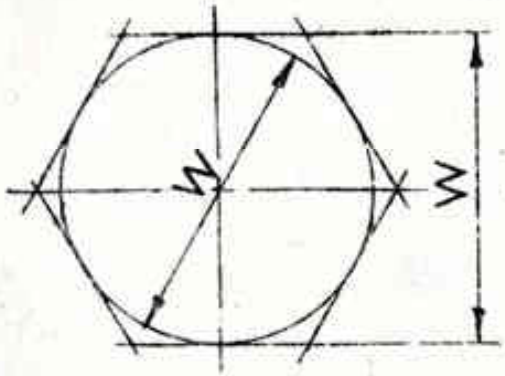
Hexagonal Nut:

To draw three views of a hexagonal nut for a bolt of diameter D.

1- Begin with the top view. Draw circle of diameter W equal to (1.5D+3mm).
Circumscribe a regular hexagon about this circle with two sides horizontal.



2- Project the front view of the hexagonal prism, taking T equal to D.
Project the circle to points A-A on the upper face.
Through points A-A, draw lines AB inclined at 30° to the upper face.
Draw the line BB cutting the edges of the central face at points CC.



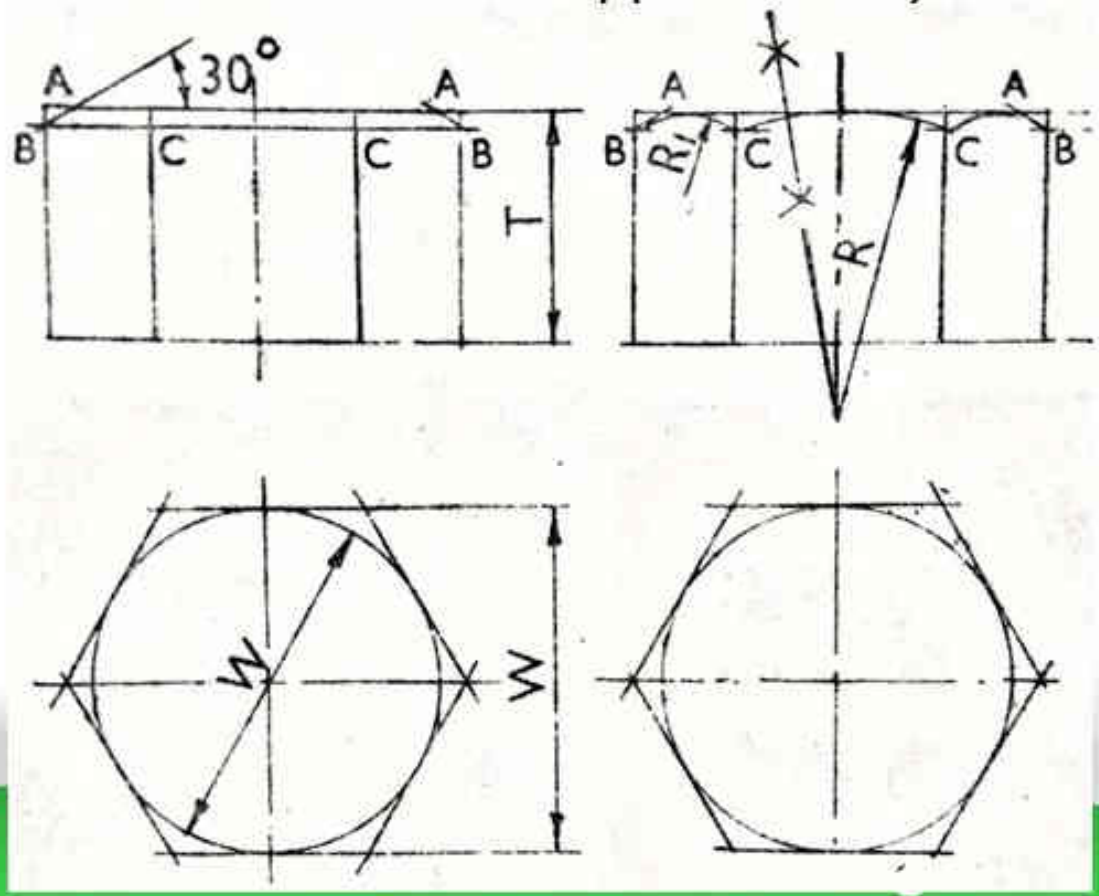
Hexagonal Nut:

To draw three views of a hexagonal nut for a bolt of diameter D.

3- Draw the central arc passing through points C-C and touching the line AA, as shown by construction lines. Its radius R will be approximately equal to 1.4D.

4- Draw arcs passing through points B and C and touching the line AA.

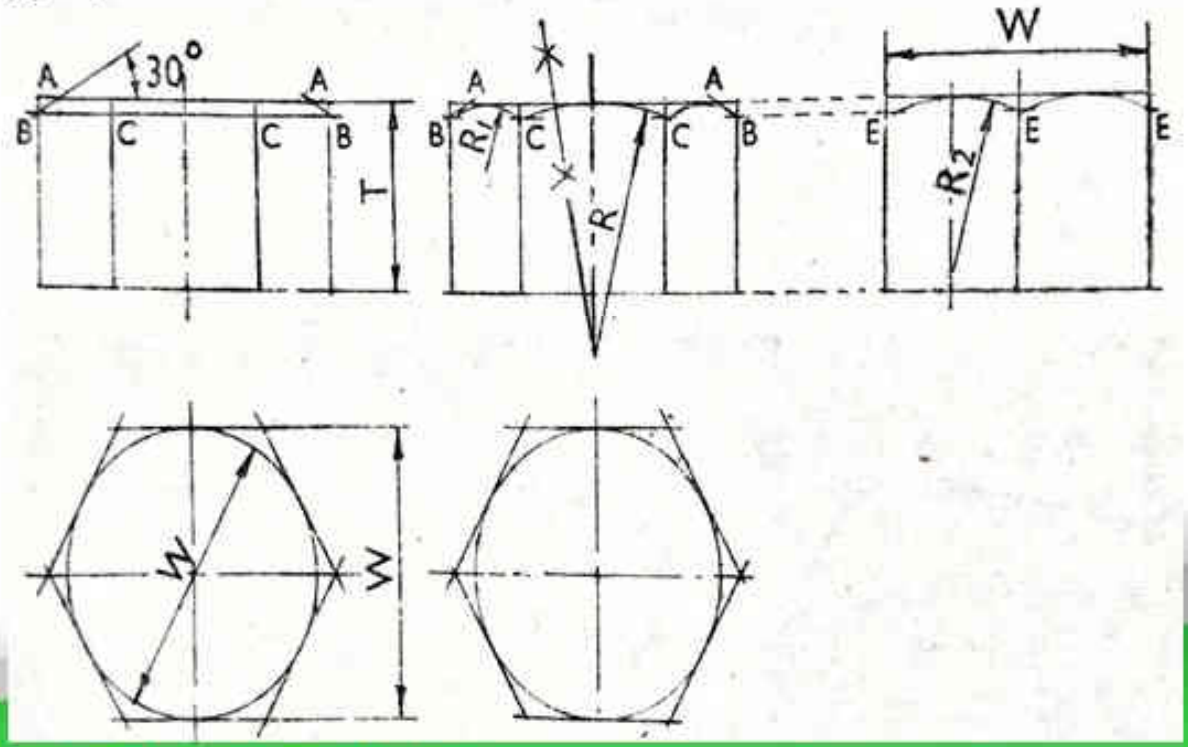
The radius R and R1 may be found by trial.



Hexagonal Nut:

To draw three views of a hexagonal nut for a bolt of diameter D.

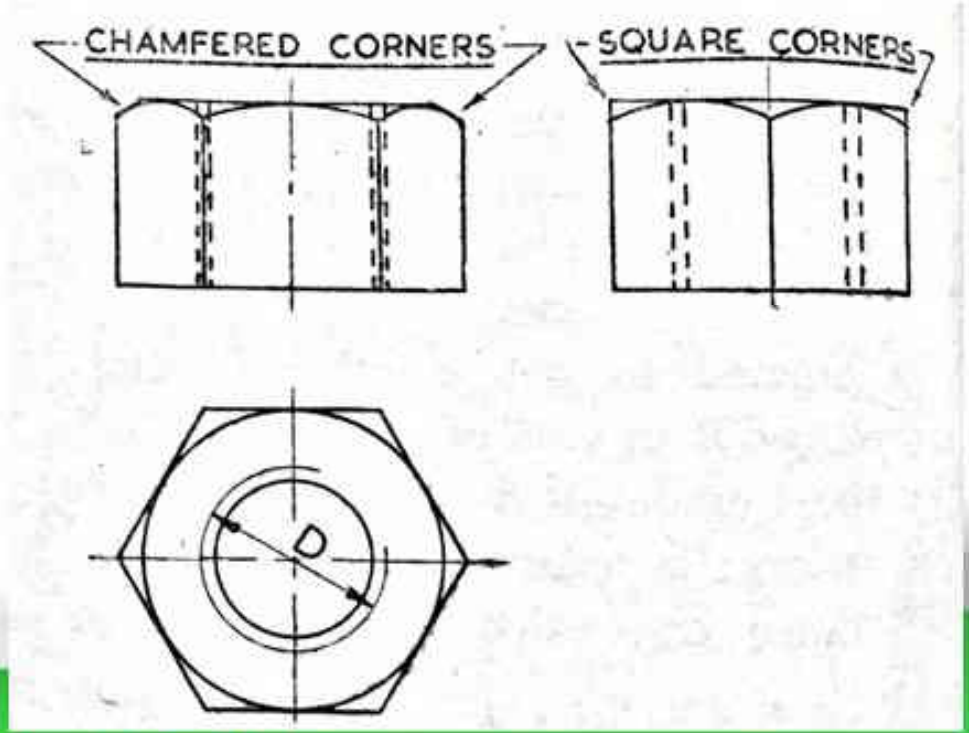
4- Project the side view. Only two faces of the nut will be seen. The distance between the outer edges will be equal to W. Project the line BB and obtain points E-E 0n the vertical edges. Draw arcs in each fact passing through points E-E as shown.



Hexagonal Nut:

To draw three views of a hexagonal nut for a bolt of diameter D.

5- Finalise the three views by adding two circles in the top view and dashed lines for the screwed hole in the front and side views.
The diameter of the inner circle will be equal to the core diameter.
The outer circle is kept thinner and partly cut according to convention.

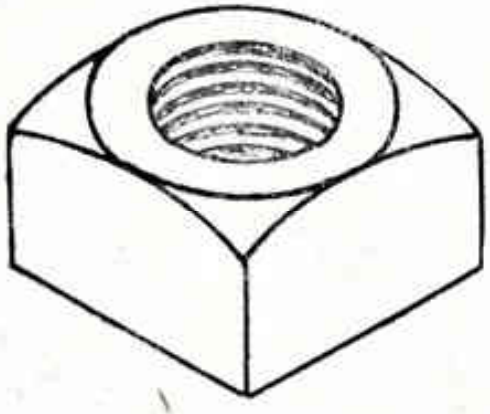


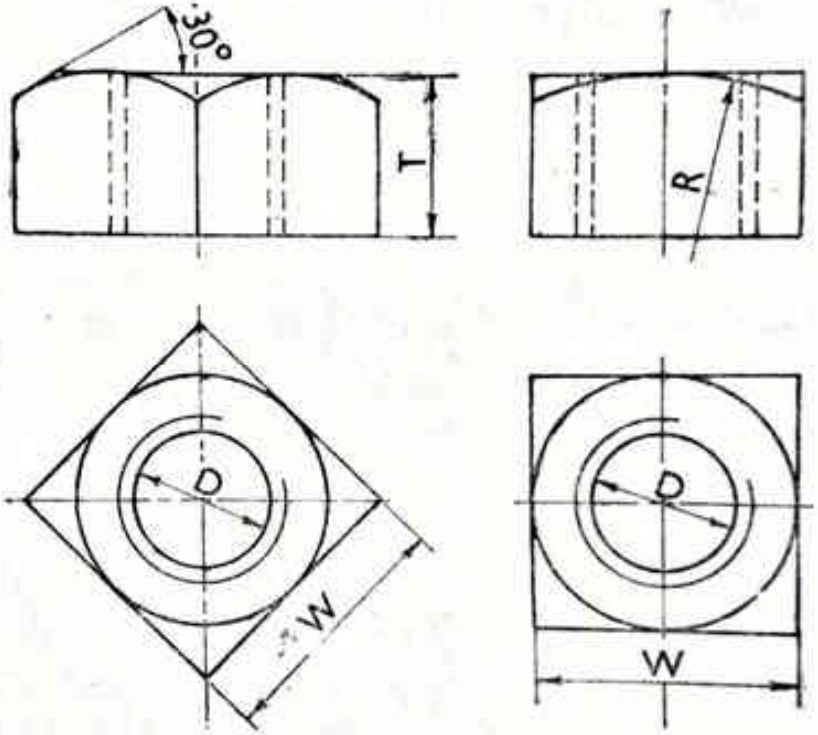
Square Nut:

To draw three views of a Square nut for a bolt of diameter D.

1- Draw a square in the top view with a side equal to W, W equal to (1.5D+3mm), and all sides equally inclined to the horizontal. Complete the top view by drawing the chamfer circle and circles for the screwed hole.

Project the two faces in the front view and complete the view as explained in case of the hexagonal nut

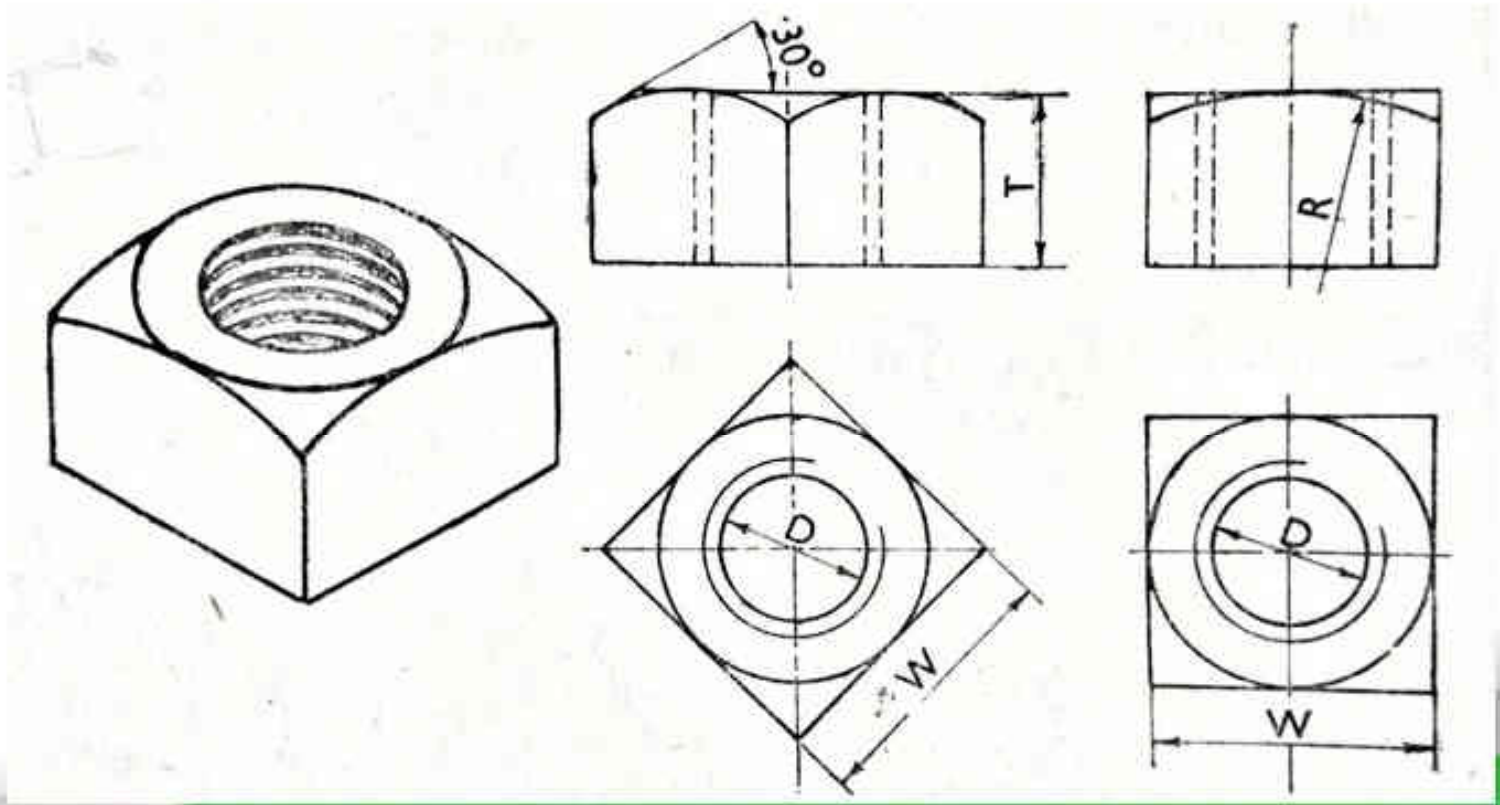




Square Nut:

To draw three views of a Square nut for a bolt of diameter D.

1- Project the side view. Only one face of the nut will be seen.
Project the rectangle in the side view and draw chamfer arc with radius R.



Other Forms of Nut:

Full details id found in page 76-77

Flanged Nut

Cap Nut

Dome Nut

Capstan Nut

Ring Nut

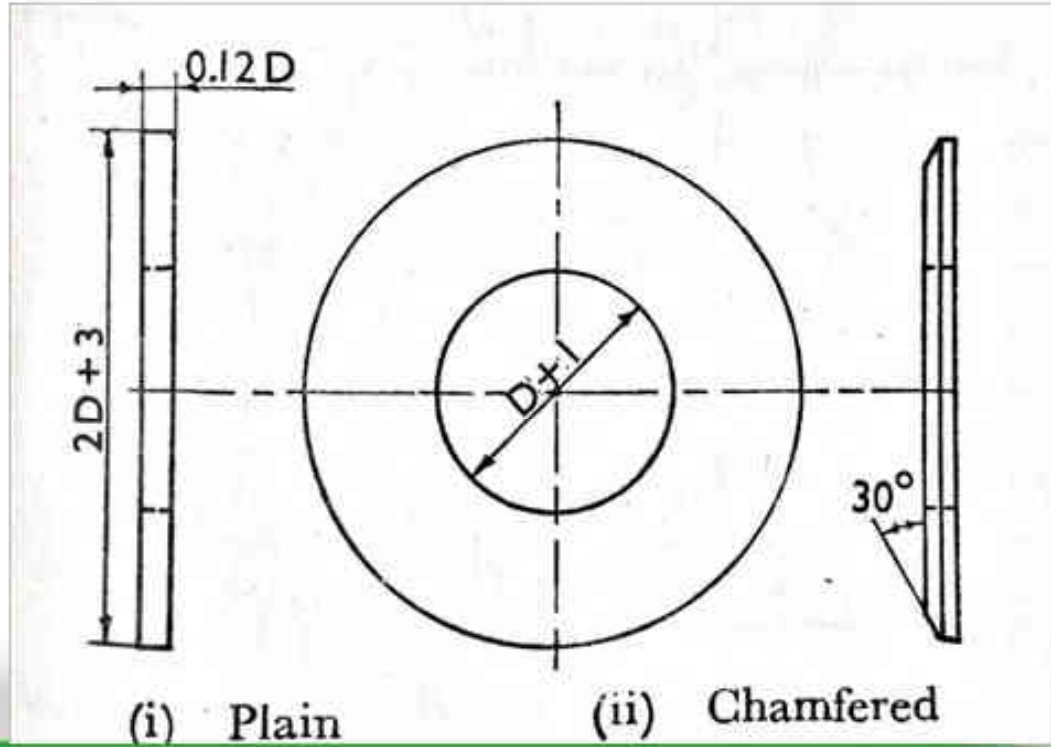
Wing Nut

Washers:

A washer is a cylindrical piece of metal placed below the nut to provide smooth bearing surface for the nut to turn on. It spreads the pressure of the nut over a greater area. It also prevents the nut from cutting into the metal and thus, allows the nut to be screwed-on more tightly.

If the D is the nominal diameter of the bolt:
Diameter of the washer = 2D+3mm

Thickness = 0.12 D
Angle of chamfer = 30°
Diameter of the hole = D+0.5mm

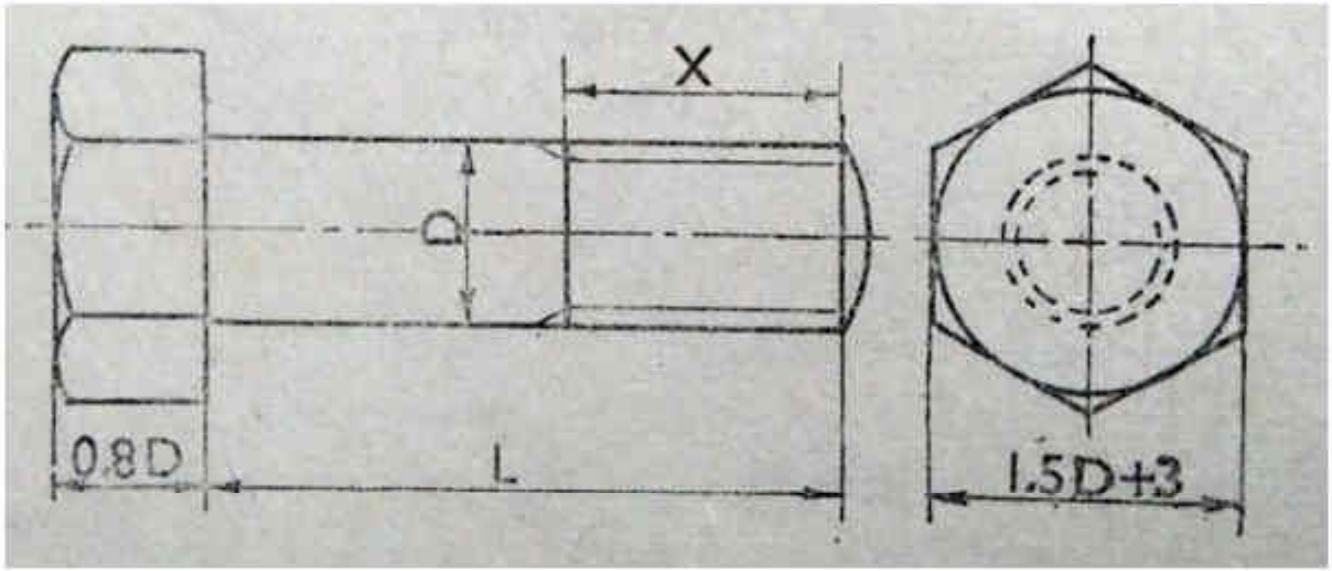


Bolts:

A bolt comprises of two parts, a shank and the head.

Hexagonal Bolt:

The dimensions of the bolt head are the same as those of the hexagonal nut, except for the thickness.
(the thickness is taken as 0.8D)

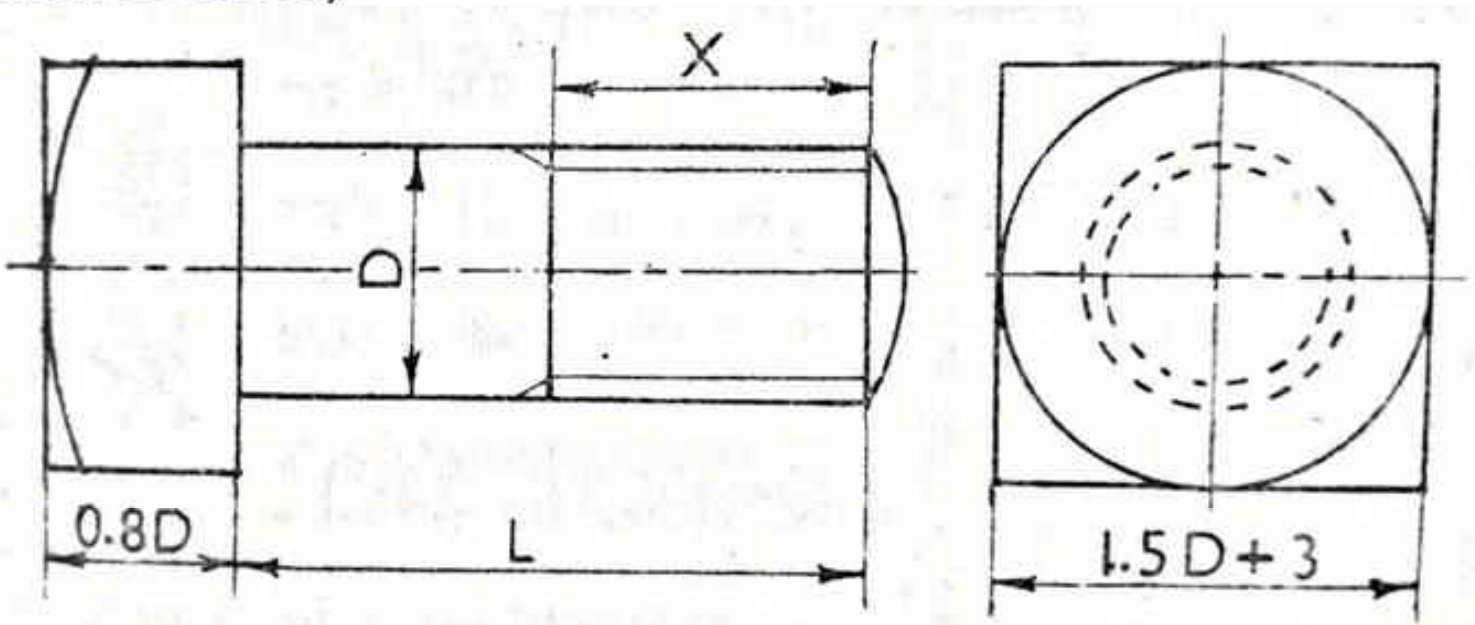


Notes:

1. X = 0.4 L
2. Hole size = 1.25 D
3. Extend the bolt by 2mm beyond the nut.

Square Bolt:

The dimensions of the bolt head are the same as those of the Square nut, except for the thickness.
(the thickness is taken as 0.8D)

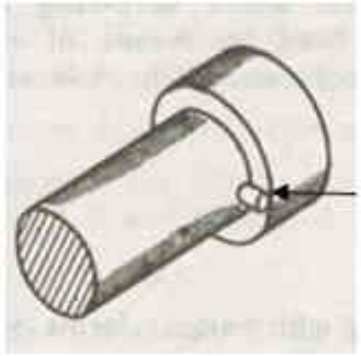


Notes:

1. X = 0.4 L
2. Hole size = 1.25 D
3. Extend the bolt by 2mm beyond the nut.

Other Forms of Bolts:

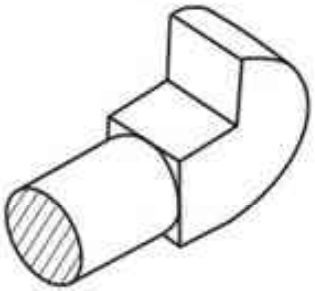
square neck bolt



cheese headed bolt

cup headed bolt with nib

countersunk headed bolt with nib

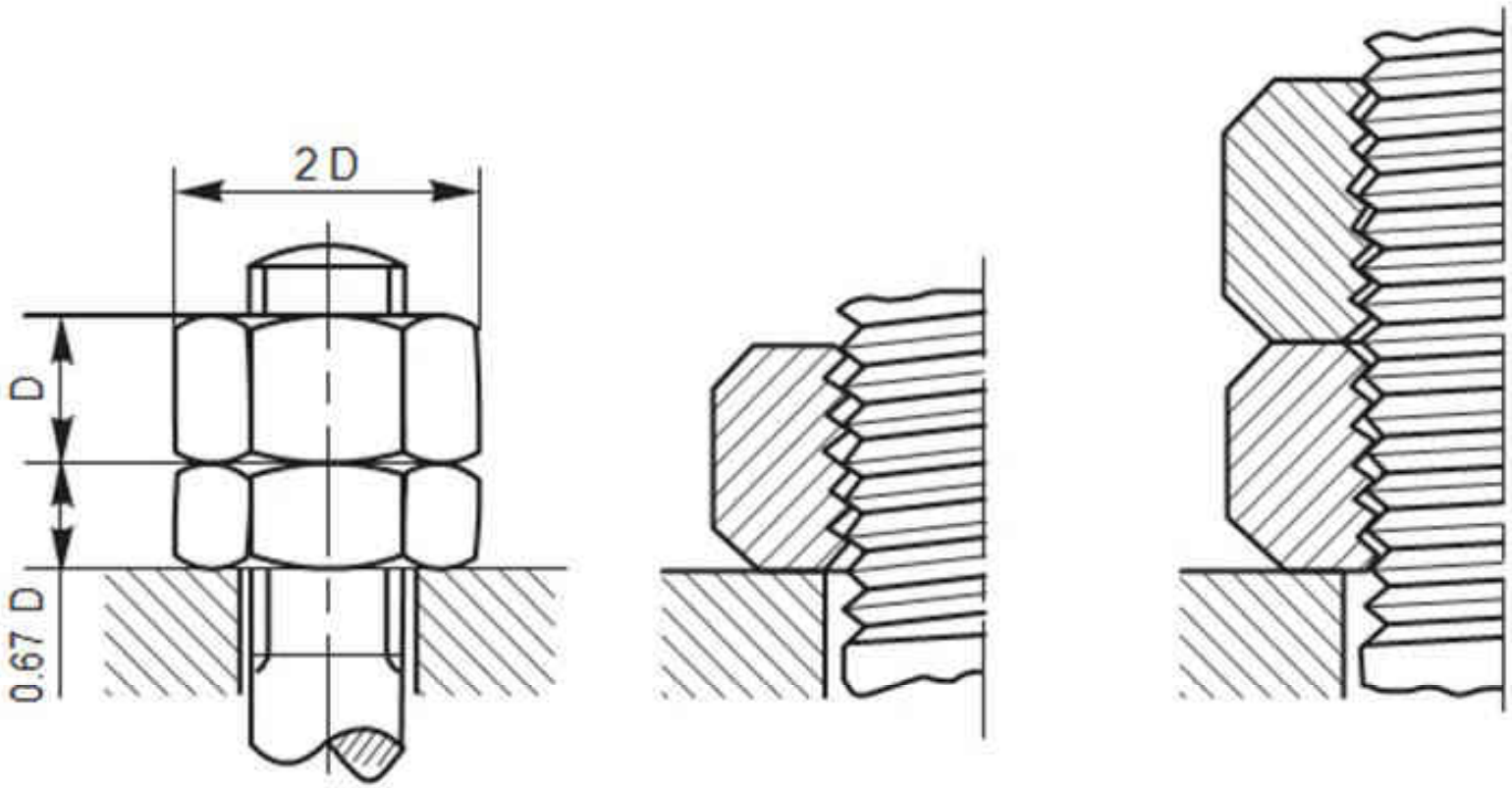


Hook bolt

Eye Bolt

Stud Bolt

Lock nut:



Lock nut

Lock nut:

Split pin nut

Castle nut

Slotted nut