CHAPTER 3

# BEARINGS

All of you have seen a bicycle and most of you may know how to ride it. With the help of paddles you may have driven it. It needs very little effort to run a bicycle. Do you know why a bicycle runs so smoothly and easily? The reason is that friction is greatly reduced by using bearings in the moving parts and you must have oiled/ greased these bearings from time to time.

In the industry also the bearings are used to help in smooth running of the shafts. As we all know that the friction is a necessary evil. The friction generates heat and opposes the free movement of the moving parts. We can not eliminate the friction together but we can reduce it to a large extent by using some suitable lubricant.

The meaning of bearing as given in the Dictionary is a part of a machine which support another part that turns round a wheel' or it can be defined as the support and guide for a rotating ,oscillating or sliding shaft, pivot or wheel' .

Bearings are used as a mechanical component to a certain part and this is done by utilizing the small frictional force of the bearings, which makes them rotate easily, all the while with the force and load acting against them.

## CLASSIFICATION OF BEARINGS

There are two types of bearings according to the type of motion:

1. Plain bearings and
2. Anti-Friction bearings or Rolling Bearings

We will learn that plain bearings are such that they primarily support sliding, radial and thrust loads and linear motions also.

### Plain bearings may further be classified as:

1. **Plain Journal Bearings:** These support radial loads at right angles to the shaft axis.
2. **Spherical Bearings:** These are used where the loads are not aligned and are radial.
3. **Thrust Bearings:** These bearings support axial and radial loads.
4. **Linear Bearings:** These bearings only help in linear motion.
5. **Pivot Bearings or Foot Step Bearings:** These bearings are used where the thrust is only axial.



## ANTI-FRICTION OR ROLLER BEARINGS

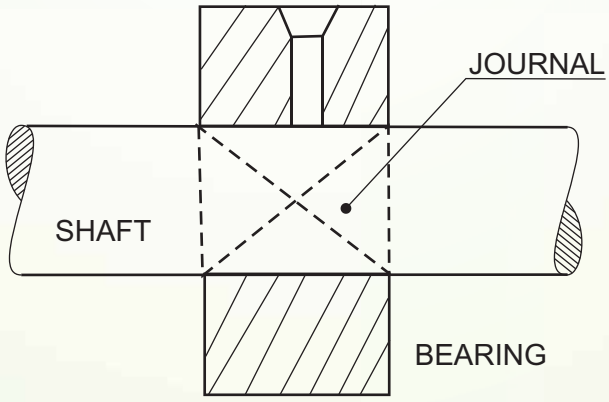
**These bearings can be:**

1. Needle Bearings.
2. Ball Bearings and
3. Roller Bearings.

**The bearings mentioned above can be rearranged according to the loading conditions as:**

1. **Journal Bearings:** In this bearing the bearing pressure is perpendicular to the axis of the shaft.
2. **Thrust Bearing or Collar Bearing:** In this bearing the pressure is parallel to the axis of the shaft.
3. **Pivot Bearing:** In this bearing the bearing pressure is parallel to the axis of the shaft and the end of the shaft, rests on the bearing surface.
4. **Linear Bearings**
5. **Spherical Bearings.**

In this chapter, we shall learn more about the Journal Bearings, which forms the sleeve around the shaft and supports a bearing at right angles to the axis of the bearing. The portion of the shaft in the sleeve is called the journal. The journal bearings are used to support only the perpendicular or radial load. i.e., the load acting perpendicular to the shaft axis.




**JOURNAL BEARING**
**Fig: 3.1**

**The examples of Journal Bearings are:**

1. Open Bearing.
2. Bushed Bearing.

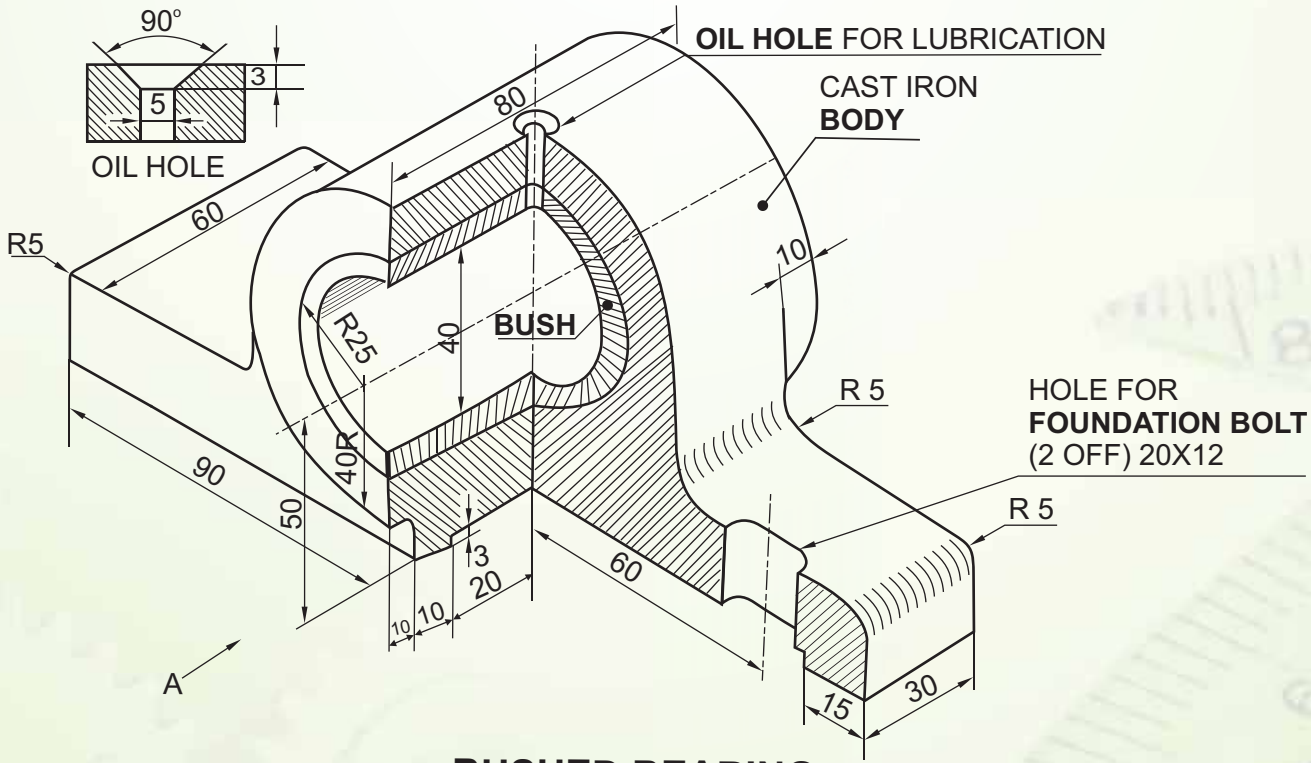
3. Plummer Block or Pedestal Bearing.

4. Pivot Bearing or Foot Step Bearing.

In our syllabus the Assembly and Dis-assembly of the following Bearings are prescribed, so let us learn more about these in detail:

## BUSHED BEARING

It is a journal bearing in which a bush made of some soft material such as: brass, bronze or gun metal is used. This bearing is useful for higher loads at medium speed. These brasses can be changed with the new brasses when worn out. These brasses (bushes) are tightly fitted into a bored hole in the body of the bearing. The inside of the bush is bored as a fit for the shaft. These brasses (bushes) are prevented from rotating or sliding by the use of a grub-screw or a dowel-pin inserted half inside the bush and half in the body of the bearing. The other method is the use of a snug. In this bearing the base plate or sole is recessed up to 3 mm leaving a standing material all around, known as padding which helps in the stability of the sole on the resting surface and also reduces the machining area. A counter bore sunk hole is drilled at the top of the body to hold the lubricant which facilitates to reduce the friction between the shaft and bush. Oval drilled holes are provided in the sole plate to facilitate any misalignment or lateral adjustments of bolts while fitting the bearing in position on base / floor. This bearing is generally placed only at or near the ends of the shaft, because in this the shaft can be inserted end wise only. (See fig: 3.2)




**BUSHED BEARING**

**Fig: 3.2**

Now let us solve some questions:

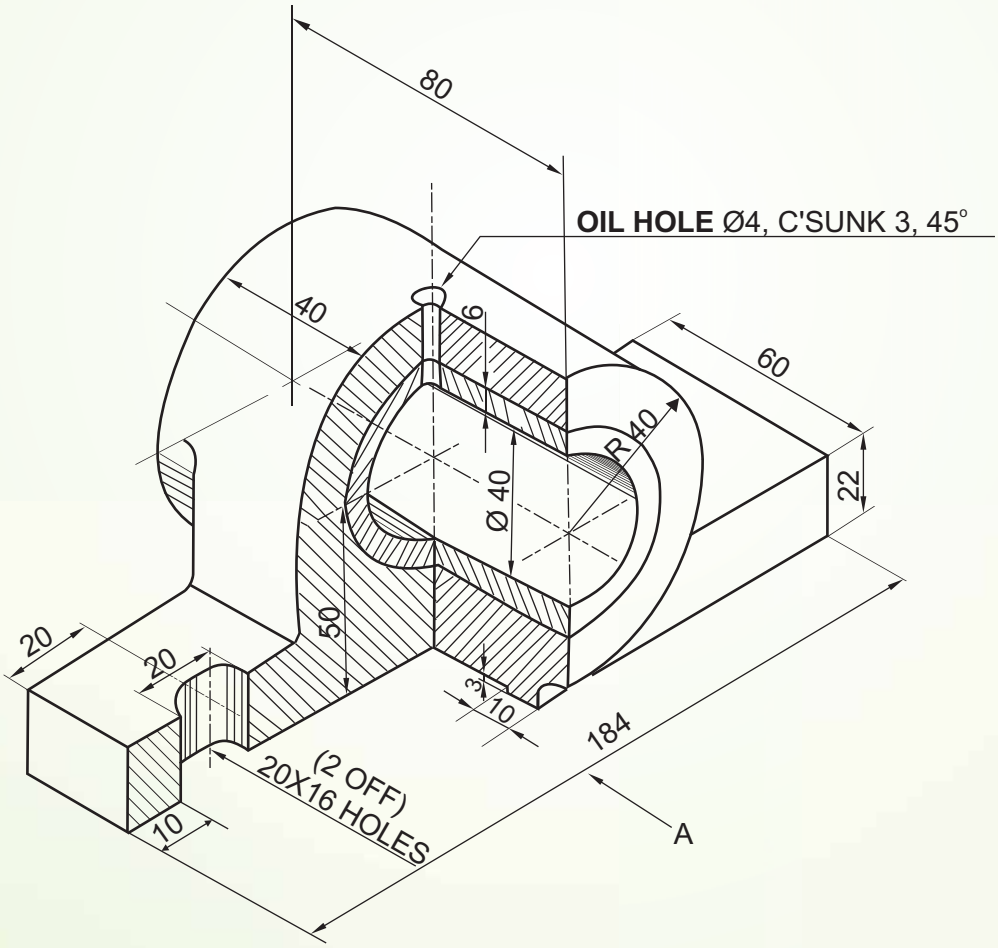
**Question:** The isometric view of a Bushed Bearing is shown below (fig: 3.3) Draw the following views to scale 1:1:-

a. Sectional front view, showing right half in section.

b. Side view as viewed from left.

c. Top view.

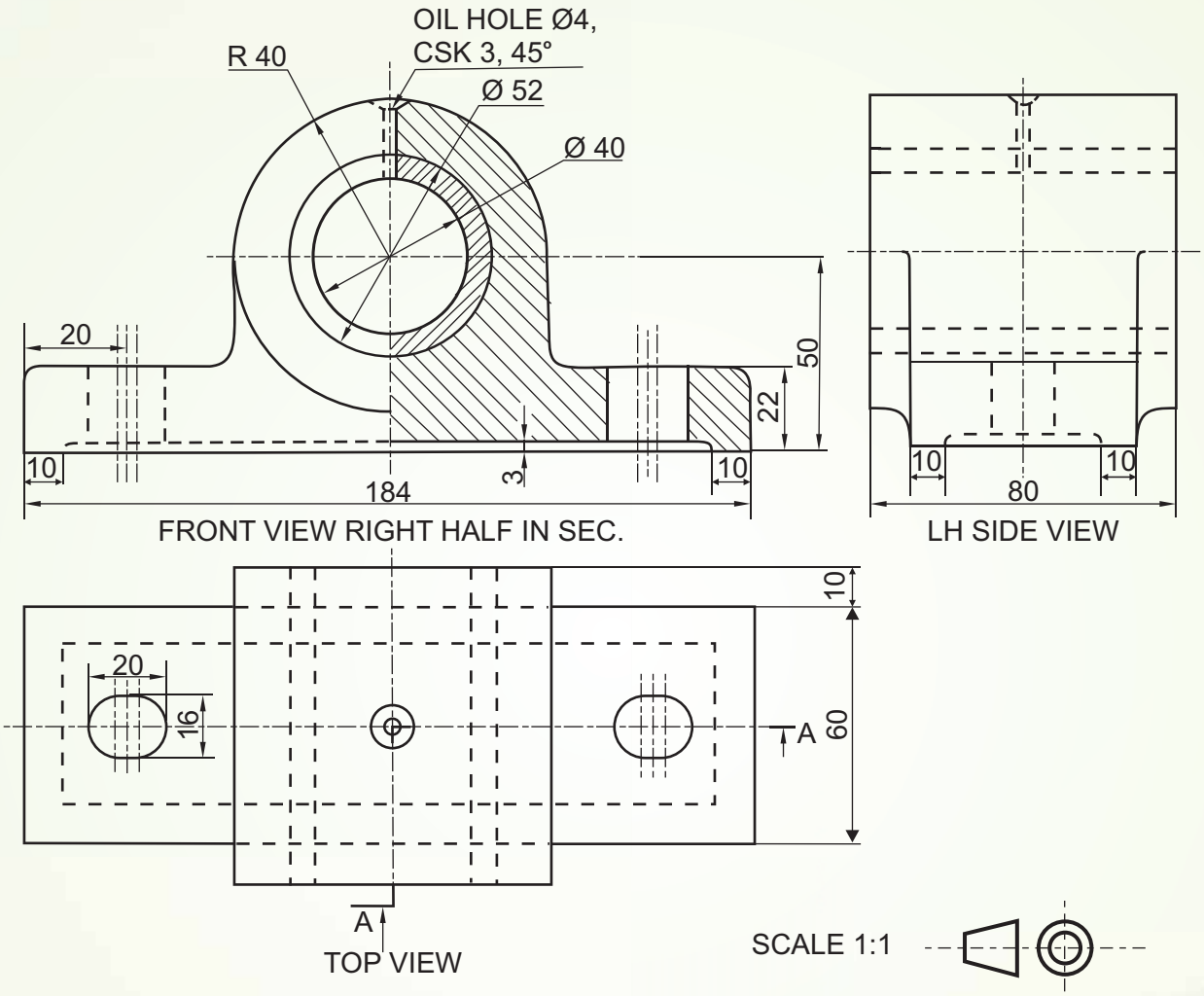
Print title and scale used. Give 8 important dimensions.




**BUSHED BEARING**

**Fig: 3.3**

**Answer of Fig. 3.3**




## BUSHED BEARING

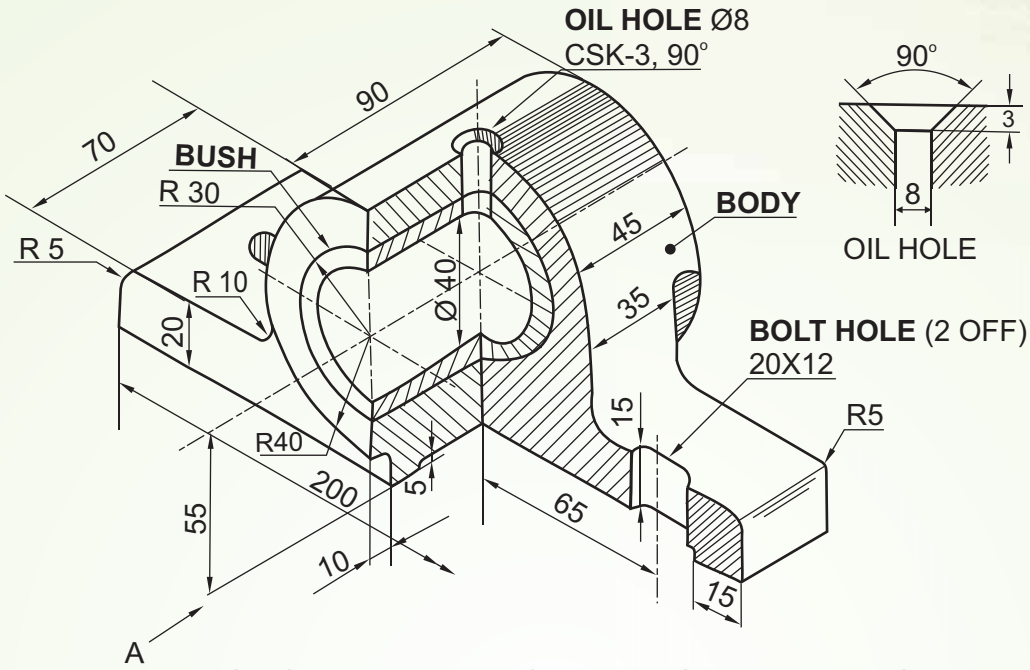
**Fig: 3.4**

**Question:** The isometric view of a Bushed Bearing is shown below (Fig. 3.5). Draw the following views to scale 1:1:-

a. Sectional front view, showing right half in section.

b. Top view,

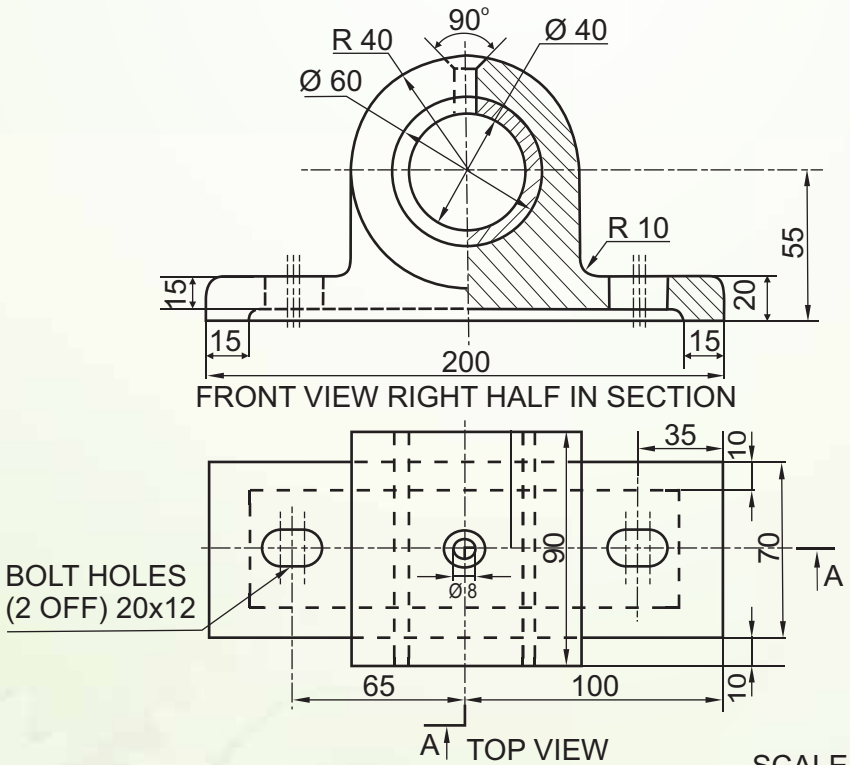
Print title and scale used. Give 8 important dimensions.




PICTORIAL VIEW OF A BUSH BEARING
(RIGHT HALF IN SECTION)

**Fig: 3.5**

**Answer of fig. 3.5**




BUSHED BEARING

SCALE 1:1

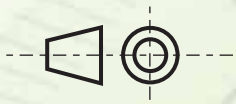


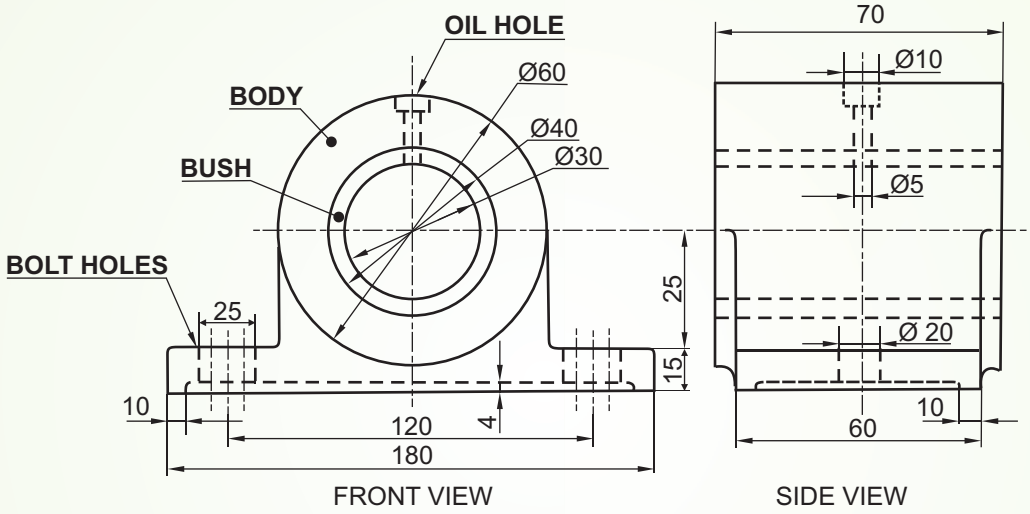
**Fig: 3.6**

**Question:** The figure given below shows the assembled front view and the side view of a Bushed Bearing. Disassemble (fig:3.7) the body and the bush and draw the following views to a scale 1:1, keeping the same position of both the body and the bush, with respect to H.P. and V.P.

a. Front view of the body, showing right half in section and its top view.

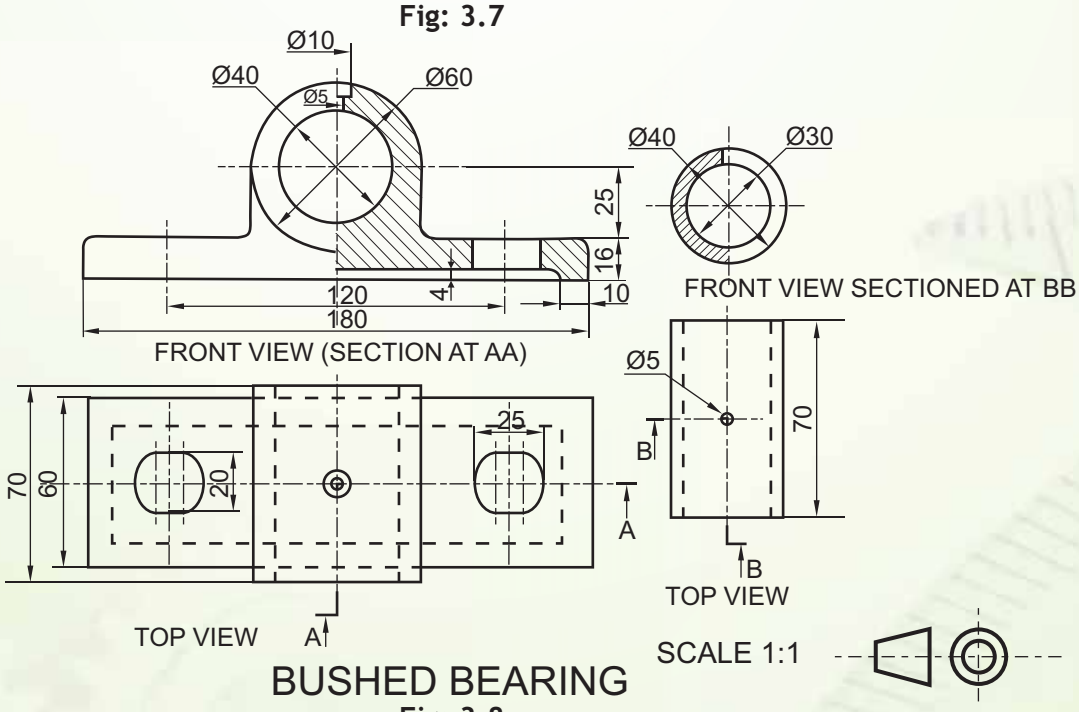
b. Front view of the bush, showing left half in section and its top view. Print titles of both and scale used. Draw the projection symbol. Give 8 important dimensions.

**Note :** Take: R4 Radius For All Fillets And Rounds




BUSHED BEARING

**Fig: 3.7**

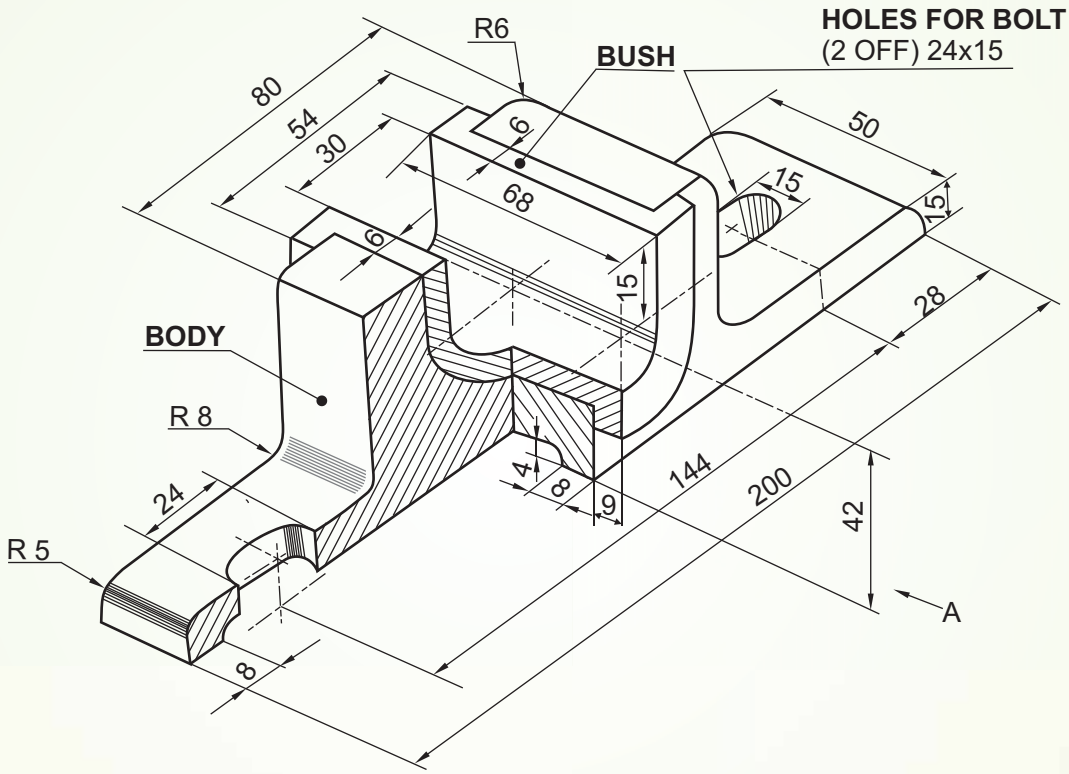



BUSHED BEARING

**Fig: 3.8**

## OPEN BEARING

This bearing consists of a 'U' shaped cast iron body with the similar shaped collared brass, bronze or gun metal bush. The sole is recessed for better stability on the surface. This bearing is used for linear and zigzag shafts. The holes for the bolts in the sole plate are elongated towards the width. This bearing is useful for shafts rotating at slow speeds. Now, let us understand the different parts shown in the (fig : 3.9)




OPEN BEARING

**Fig 3.9**

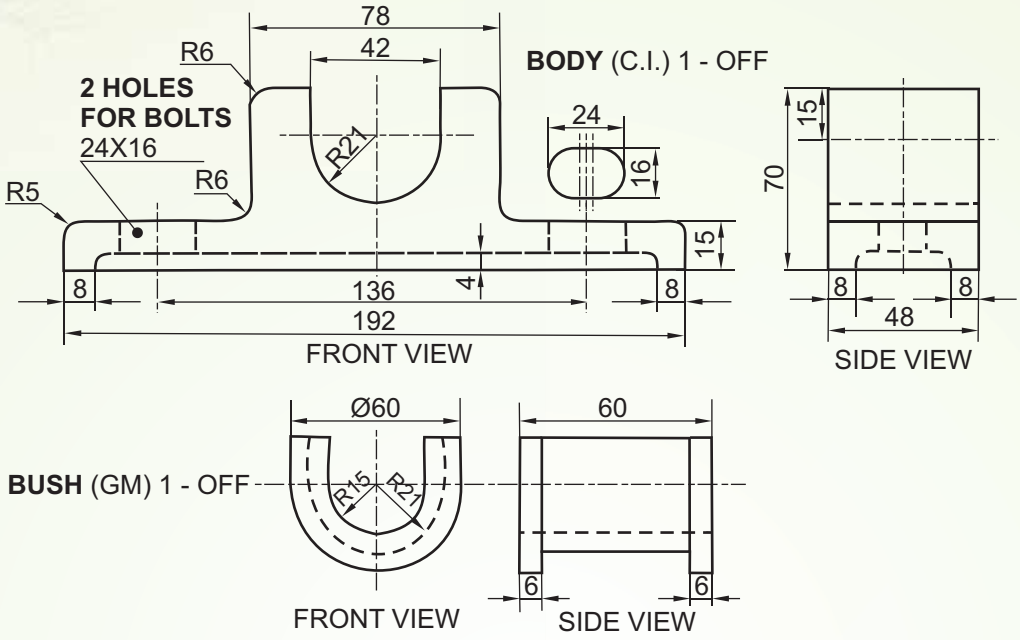
**Question:** The figure given below (fig:3.10) shows the details of an 'Open bearing'. Assemble these parts correctly and then draw its following views to scale1 :1 :

a. Front view, right half in section.

b. Top view.

c. Side view as viewed from left.

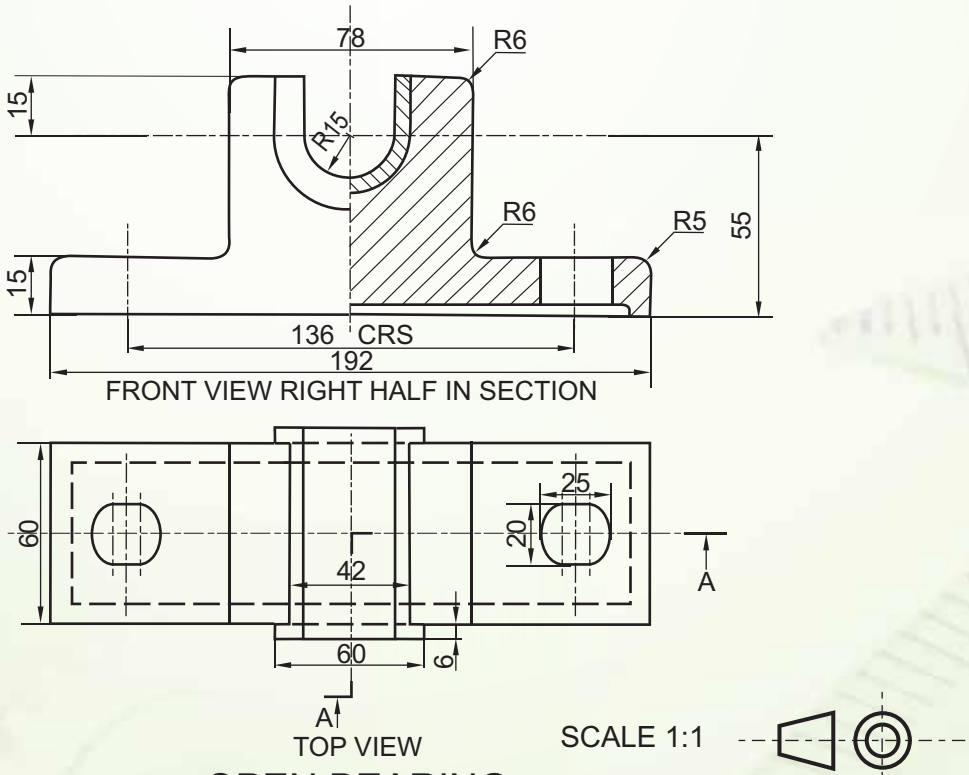
Write heading and scale used. Draw projection symbol. Give '6' important dimensions.




## DETAILS OF OPEN BEARING

**Fig: 3.10**

Answer of fig. (3.10)




## OPEN BEARING

**Fig: 3.11**

**Question:** The figure given below (fig 3.12) shows the assembly of an 'Open Bearing'. Disassemble the parts and draw the following views to scale 1:1 :

(a) BODY

(i) Front view, left half in section.

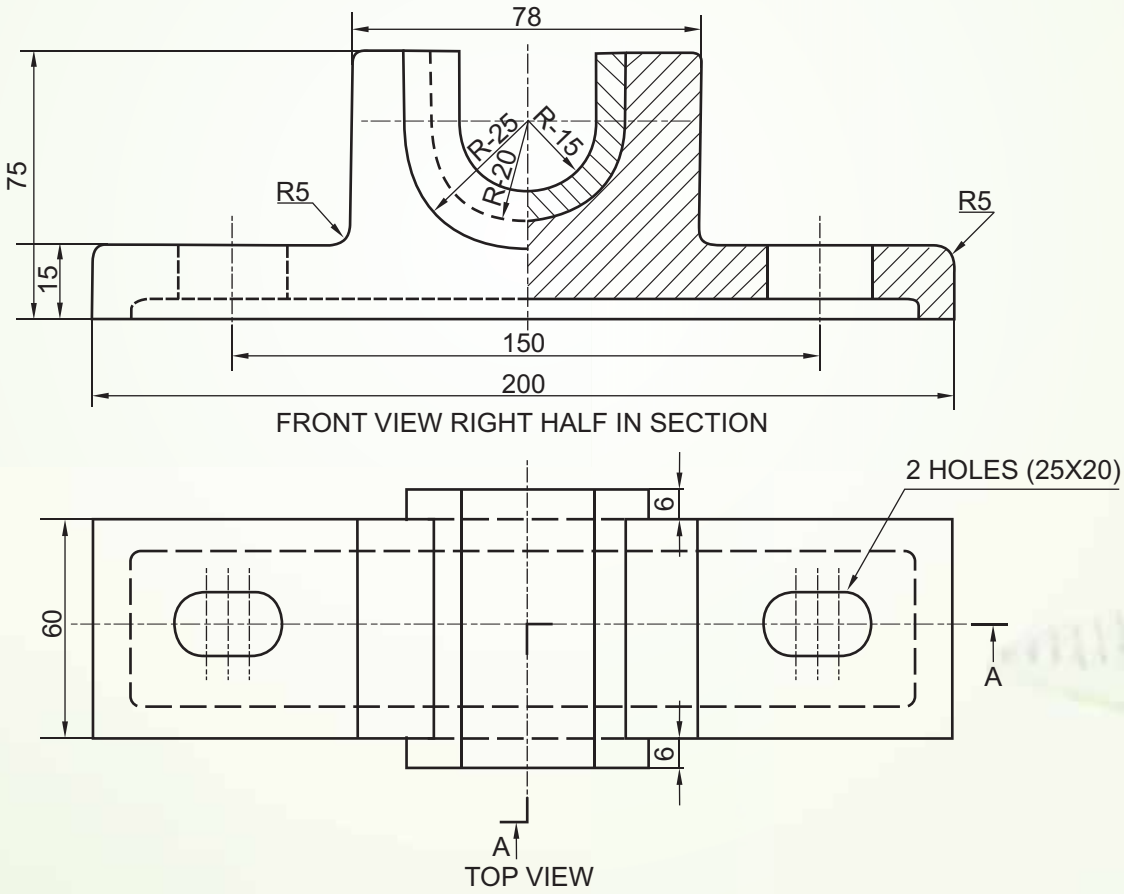
(ii) Top view, without section.

(b) BUSH

(i) Front view, left half in section.

(ii) Side view, viewing from left.

Print titles of both and the scale used. Draw the projection symbol. Give '6' important dimensions.




OPEN BUSH BEARING

**fig 3.12**

Answer of fig 3.12

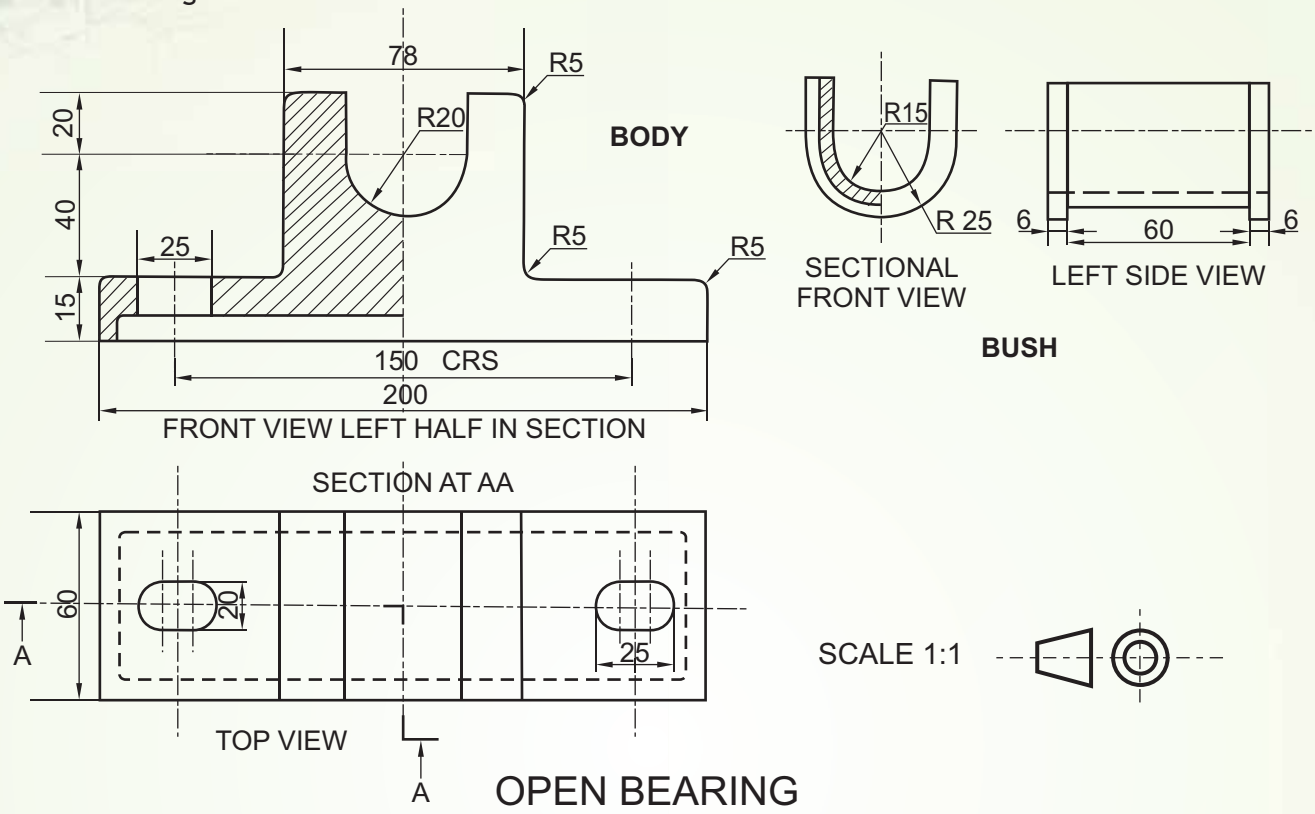
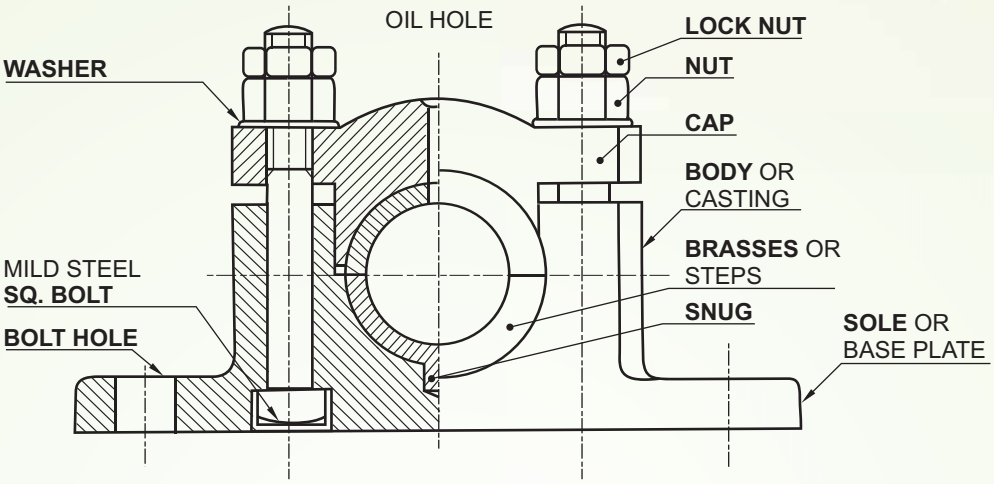



**fig 3.13**

## PLUMMER BLOCK OR PEDESTAL BEARING

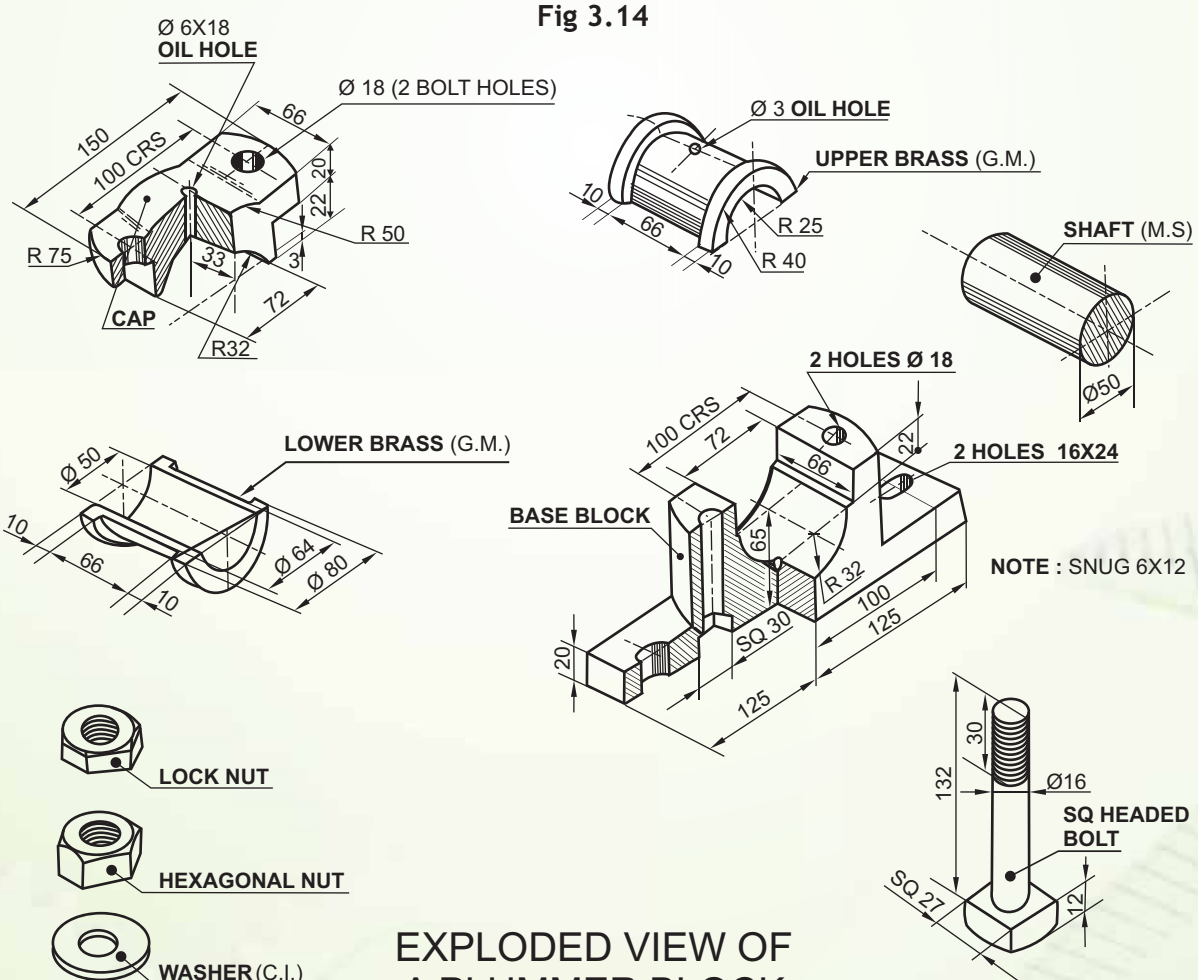
The Plummer Block is also known as Pedestal Bearing. This bearing is widely used in textile, marine and some other industries. This bearing is useful for long shafts requiring Intermediate supports; these bearings are preferred in place of ordinary bush bearings. It was named after its inventor 'PLUMMER'. This bearing can be placed any where along the shaft length. It is used for shafts rotating at high speed and needing frequent replacement of brasses (also known as steps) due to the wear and tear of the brasses, which are made up of brass, phosphor- bronze or gun metal having raised collars at two ends for the prevention of the brasses from sliding along the axis, with the shaft. The shaft is made of mild steel. These brasses are made into two halves just to facilitate the easy assembly and disassembly of brasses and shaft. A snug at the bottom, fitting inside a corresponding hole in the body, prevents their rotation. The body is made up of cast iron with rectangular sole plate having elongated holes for the adjustment. In two long holes square mild steel bolts with hexagonal nuts and check nuts are used to tighten the cap and brasses. The cap is made up of cast iron. The cap while resting on the upper brass fits inside the body with its body cap at its sides "but does not sit on it". These brasses are made into two halves and are prevented from rotating by the use of a snug in the middle of the brasses. A counter sunk hole is provided in the top cap and brass to hold lubricant which is necessary for reducing the friction between the shaft and the brasses, which are collared to avoid axial movement. Please examine the given figure for understanding these details.

## DETAILS OF PLUMMER BLOCK OR PEDESTAL BEARING.




PLUMMER BLOCK

**Fig 3.14**

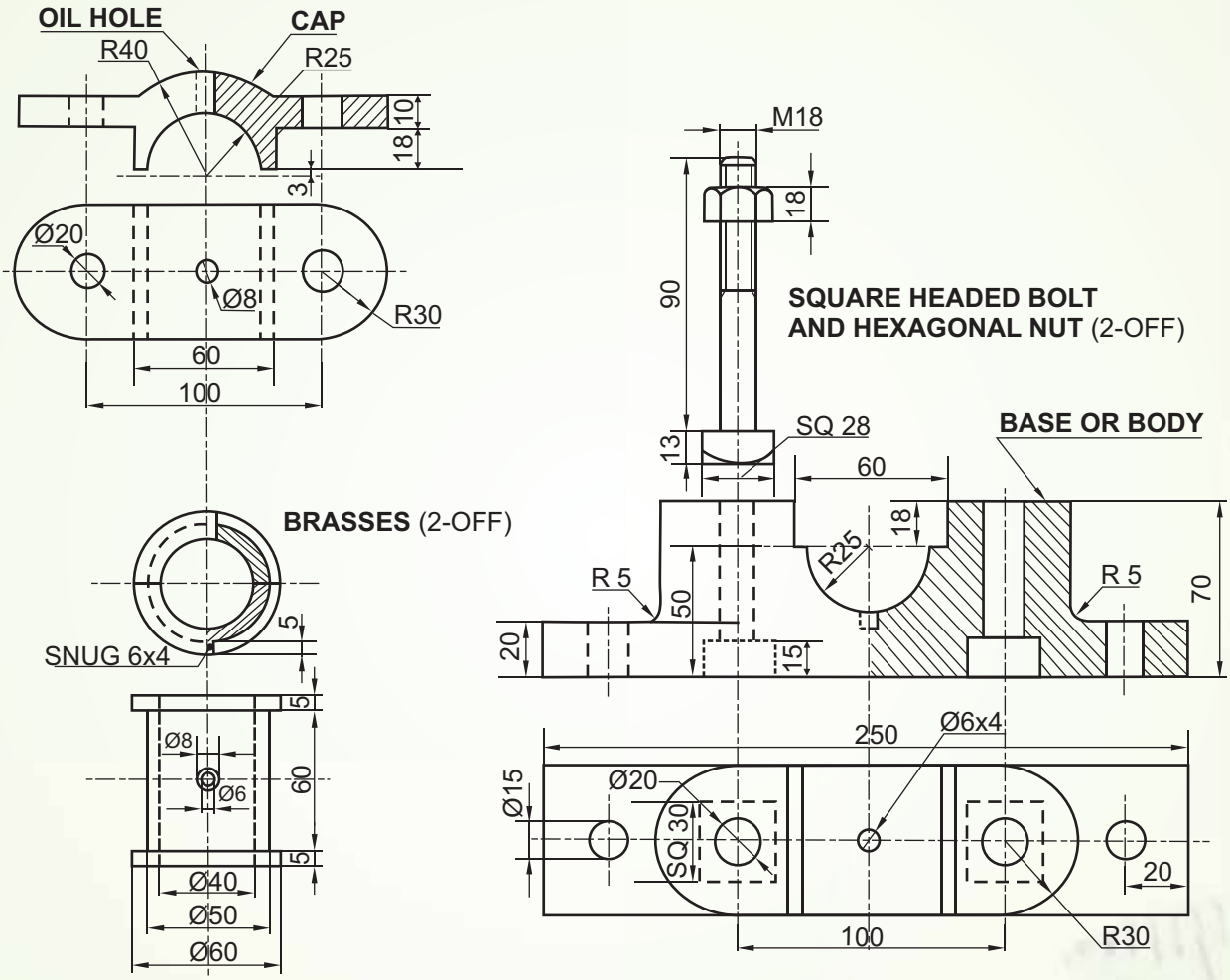



EXPLODED VIEW OF A PLUMMER BLOCK

**Fig 3.15**

**NOTE :** As per our syllabus, we are going to only draw the front view of the Plummer Block.

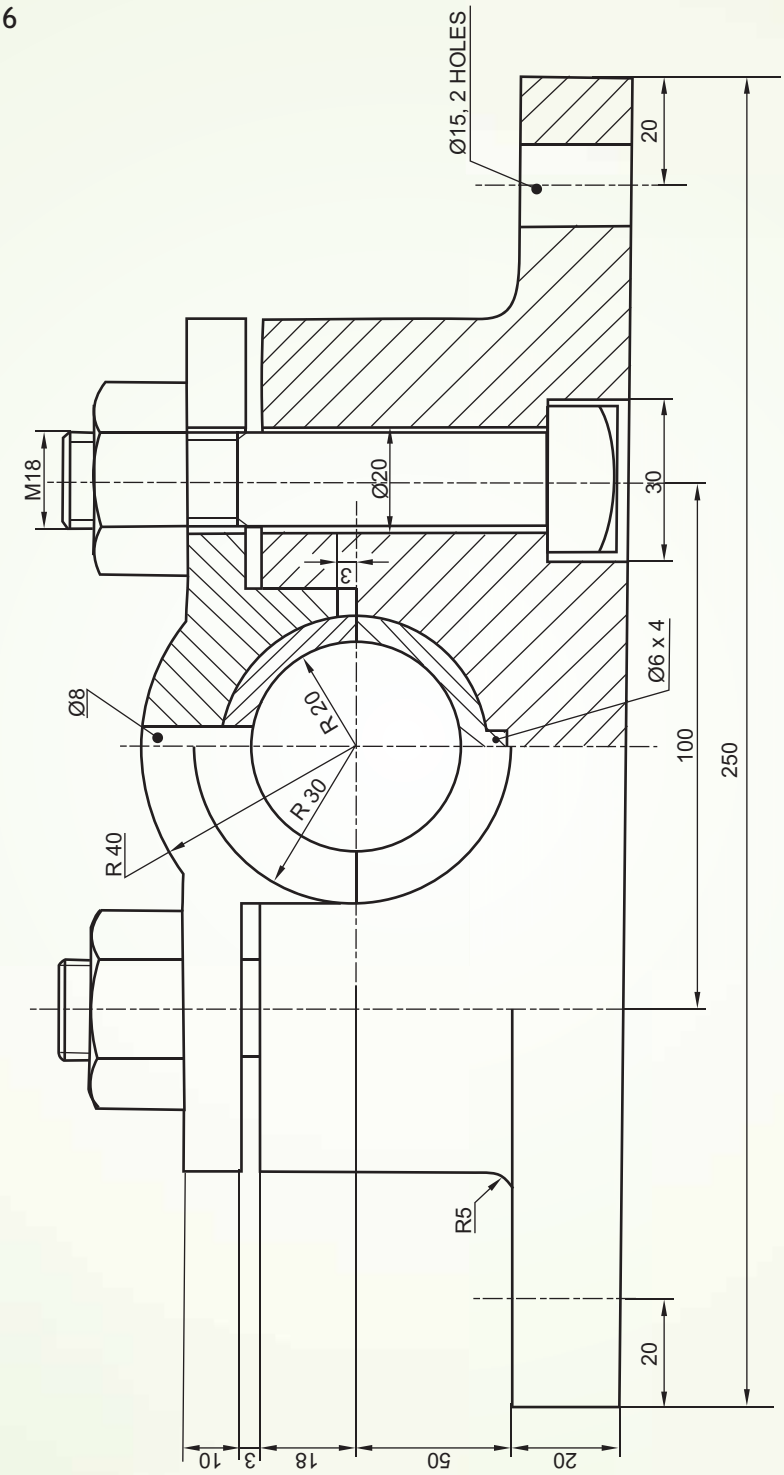
**Question:** The figure given below (fig : 3.16) shows the details of a Plummer Block. Assemble the parts correctly and then draw to scale 1:1, the front view, right half in section. Print title and scale used. Give '8' important dimensions.




PLUMMER BLOCK

**Fig 3.16**

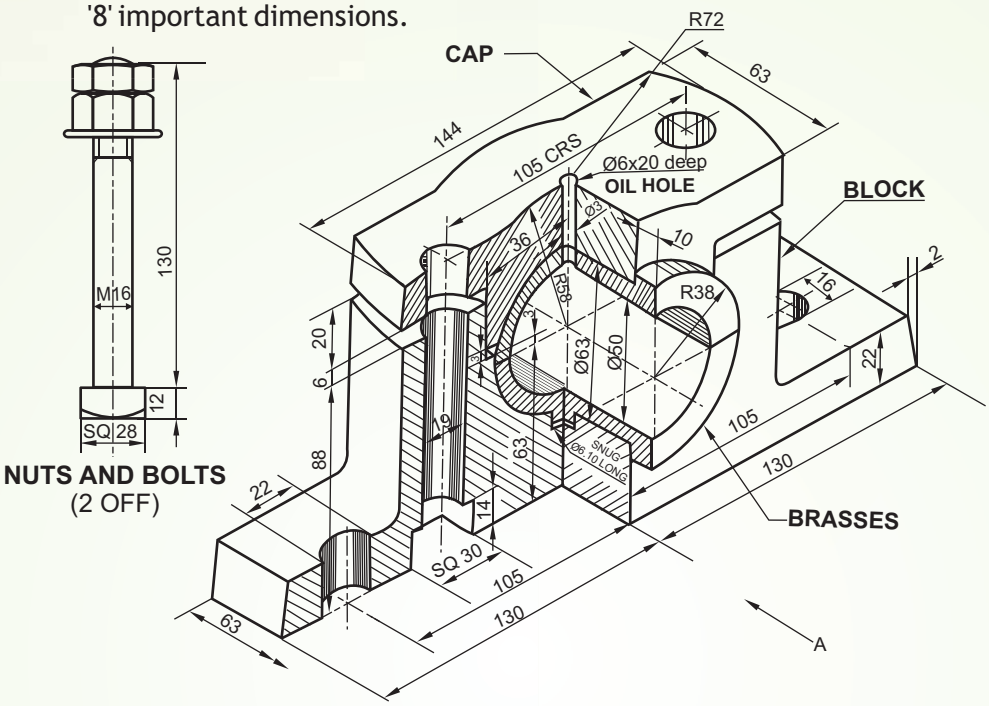
Answer of fig. 3.16




FRONT VIEW (RIGHT HALF IN SECTION)
PLUMMER BLOCK (ASSEMBLY)

**FIG: 3.17**

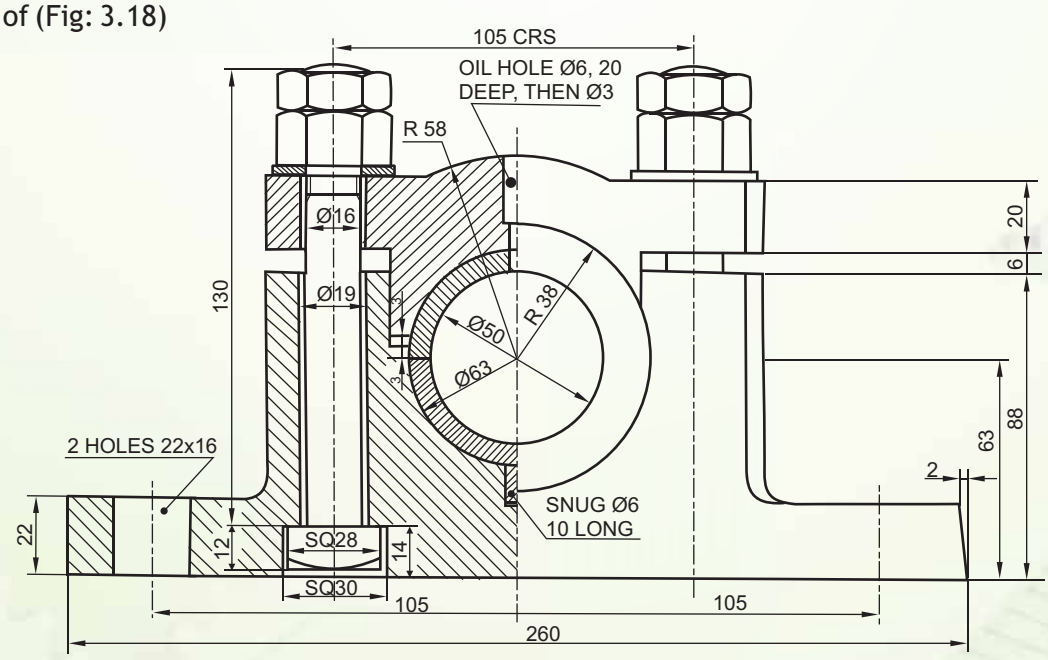
**Question:** The figure given below (fig:3.18) shows a Pictorial view of a Plummer Block. Draw the sectional front view showing left half in section. Print title, scale used and give '8' important dimensions.




PLUMMER BLOCK

**FIG: 3.18**

Answer of (Fig: 3.18)




**LEFT HALF SEC. FRONT VIEW**

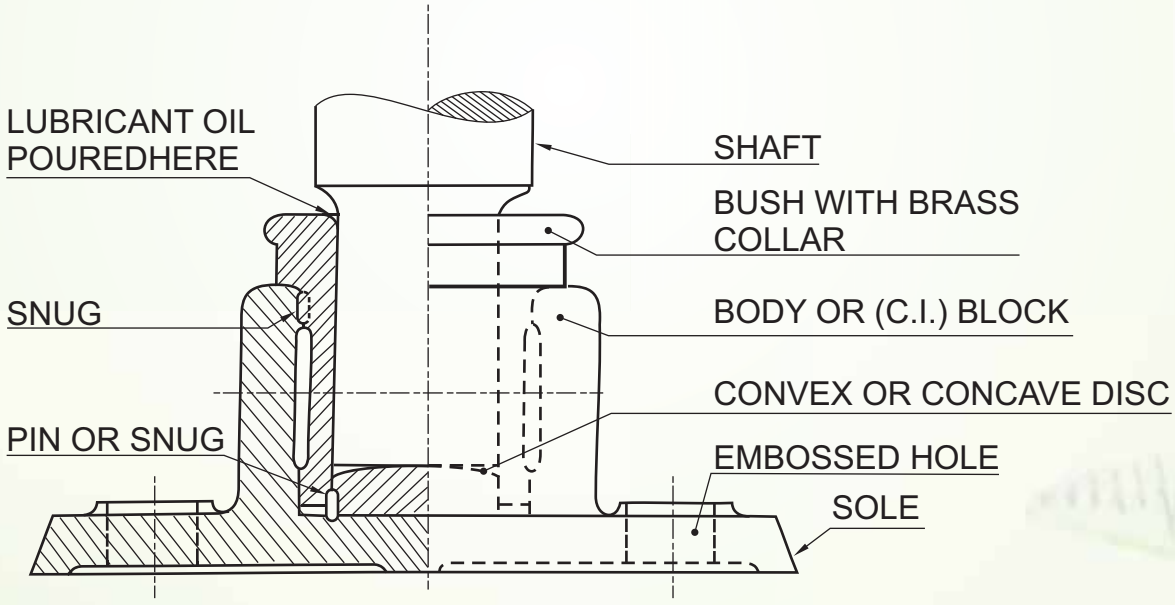
SCALE 1:1

PLUMMER BLOCK

**Fig. 3.19**

## FOOTSTEP BEARING OR PIVOT BEARING

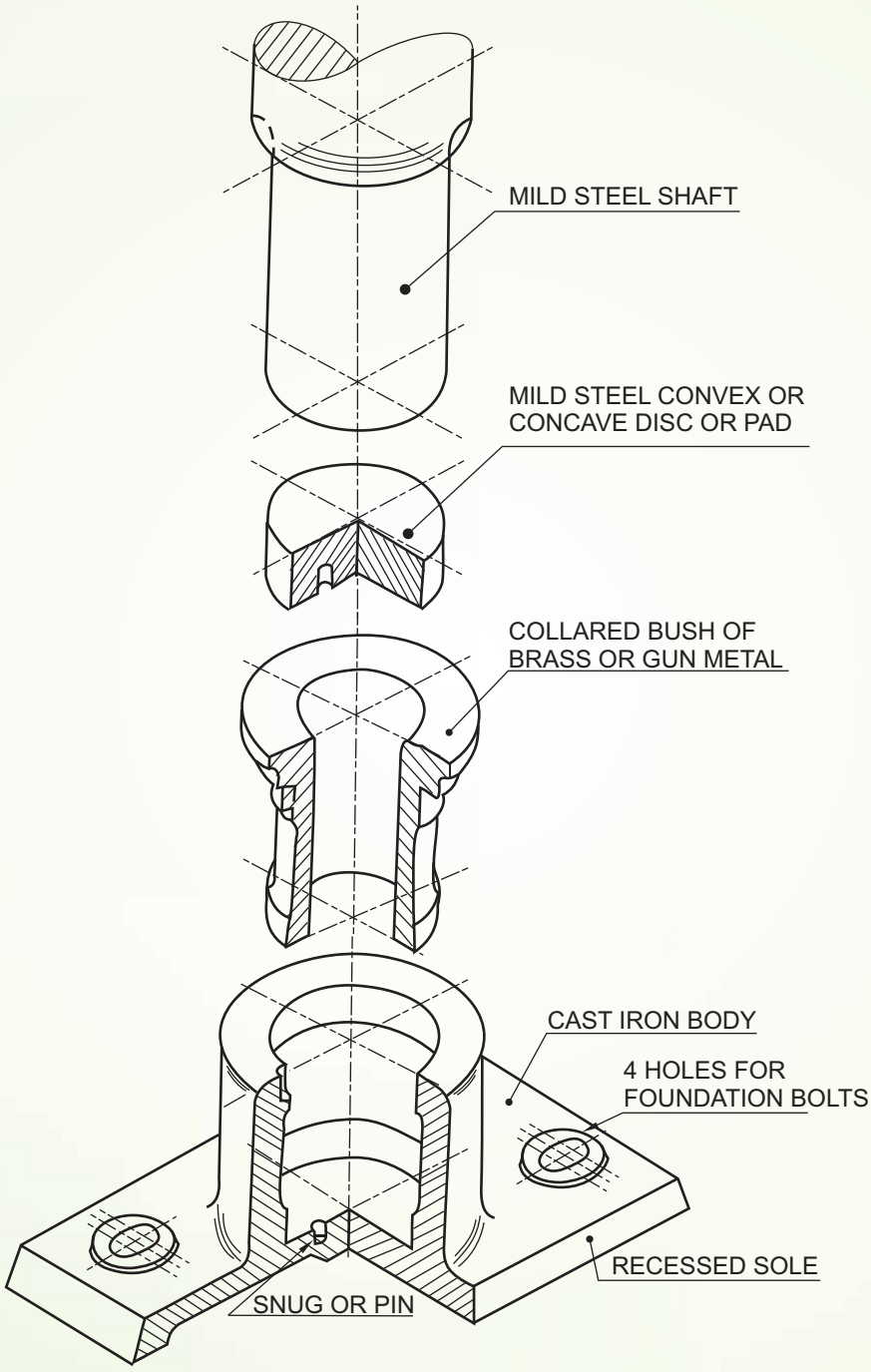
This bearing is used for supporting the lower end of the vertical shaft. This bearing is made up of a cast iron body with a rectangular or square recessed sole to reduce machining area. Generally, the sole is provided with four oval or elongated holes for the adjustment of the bearing. A Gun Metal hollow bush having a collar at its top end is placed and is prevented from rotation by the use of a grub screw or a snug just below the neck of the collar. This collar serves two purposes, one it prevents the hollow round bush to go further down in the body of the bearing and secondly it provides a round vessel at the neck of the round bush to hold lubricant. The bearing body and the hollow bush are recessed so as to form fitting strips. A concave or convex hardened steel disc is placed below this round hollow bush to support the shaft. This disc is also prevented from rotation by the use of a snug or a pin which is half inserted in the body of the bearing and half in the disc but away from the centre. The only draw back of this bearing is that there is no proper lubrication, thus unequal wear and tear is there on the bottom round disc. Examine the details as shown below.




SCALE 1:1

**DETAILS OF A FOOTSTEP BEARING**

**FIG: 3.20**

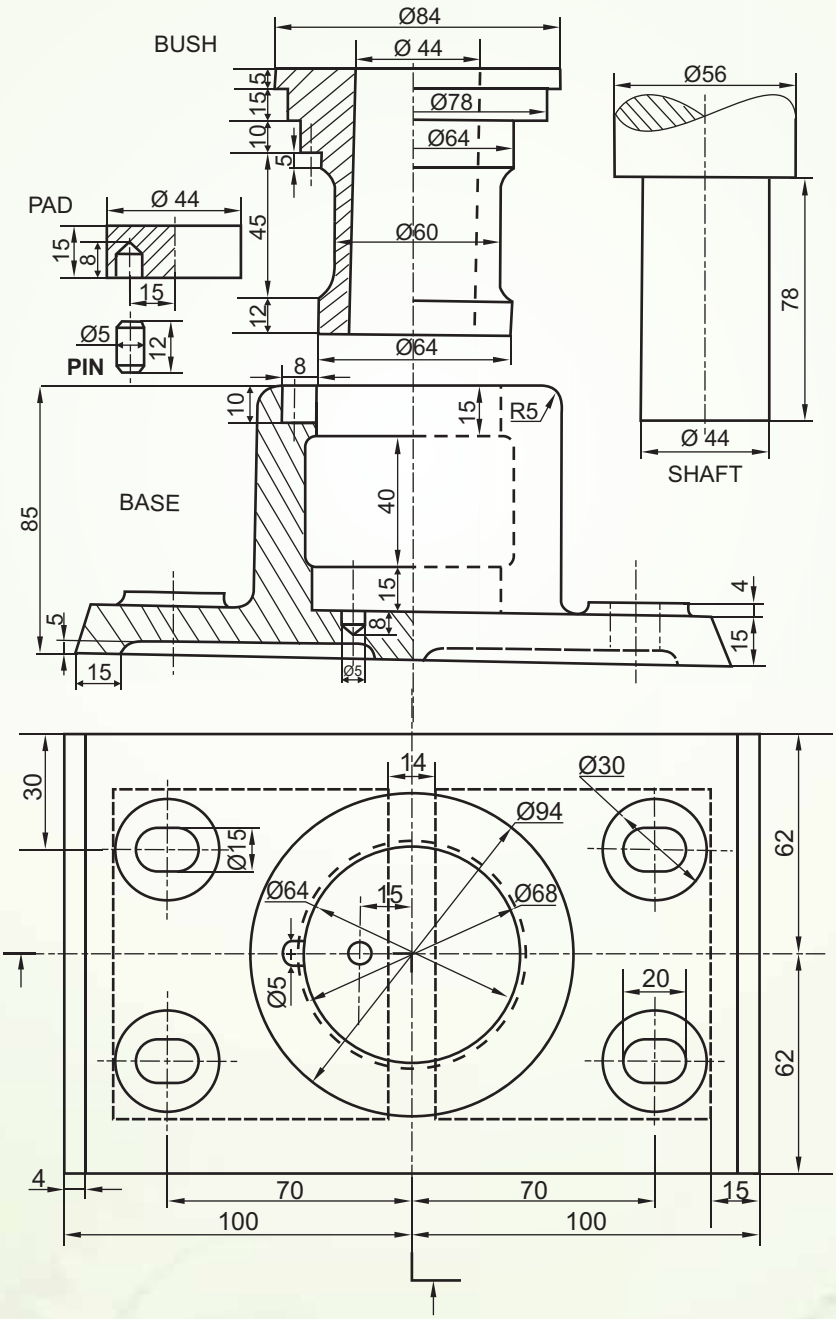



**EXPLODED VIEW OF A FOOT STEP OR PIVOT BEARING.**

**FIG. 3.21**

**NOTE:** As per our syllabus guide lines, we are supposed to draw the front view of the assembly of Foot Step Bearing'.

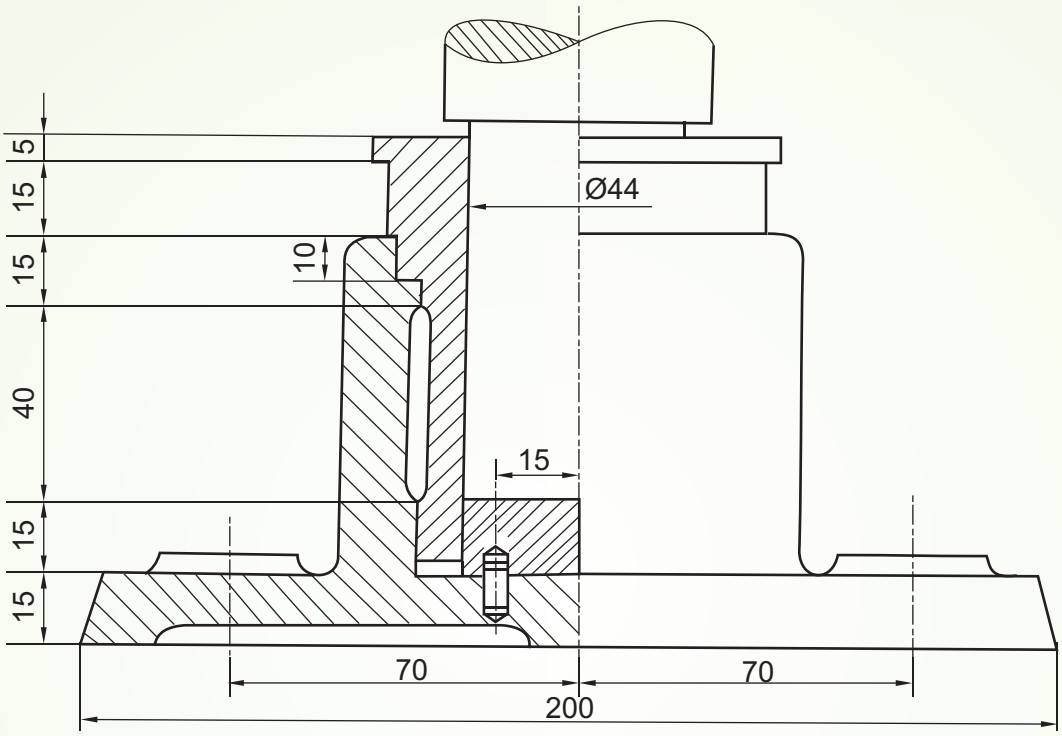
**Question:** The figure given below (fig: 3.22) shows the parts of a Foot Step Bearing. Assemble these parts correctly and then draw the Front View, left half in section to a scale full size. Print title and scale used. Give '8'important dimensions.




**FOOT STEP BEARING**

FIG. 3.22

**Answer of (Fig: 3.22) FRONT VIEW**



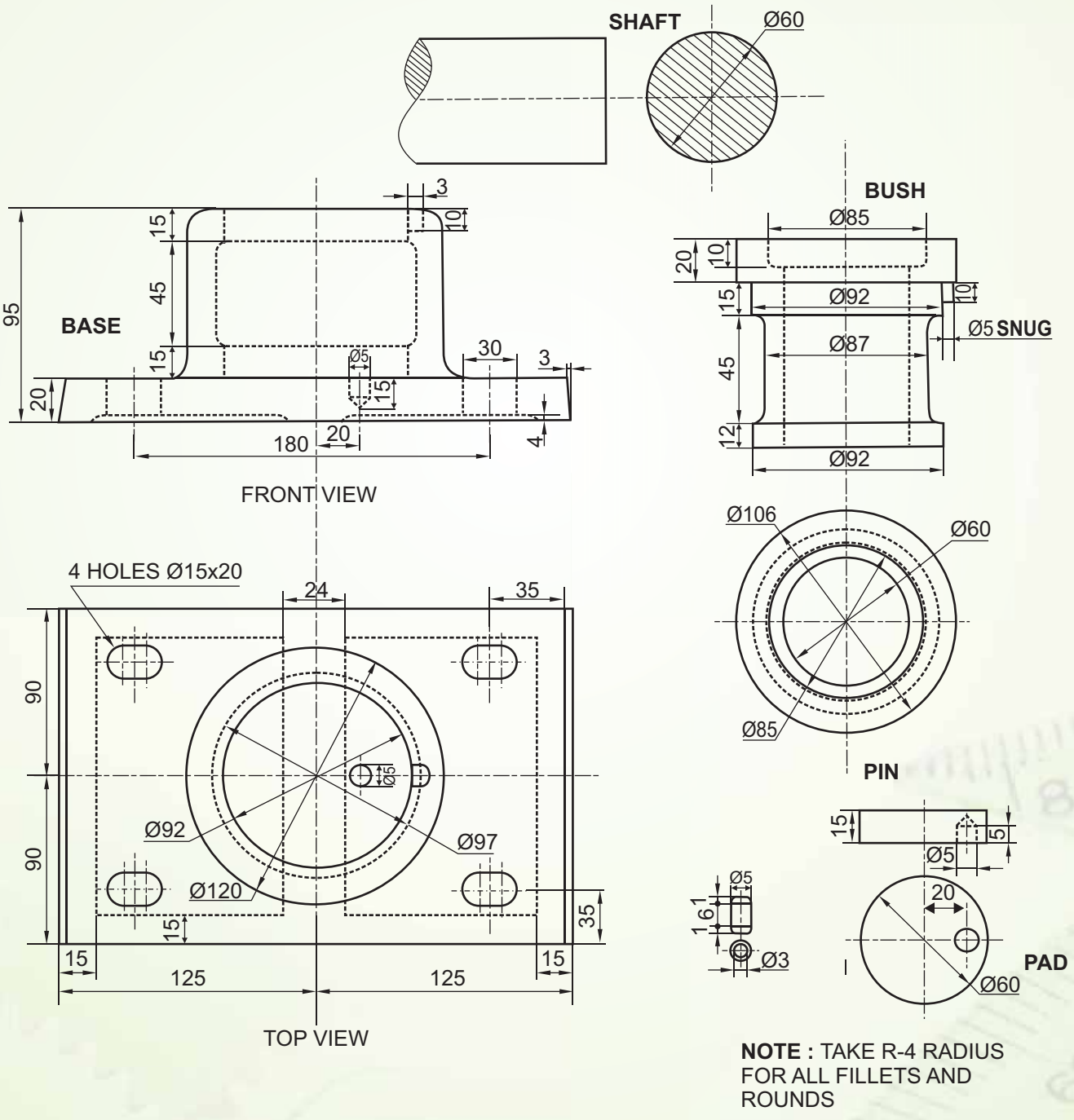

FRONT VIEW (LEFT HALF IN SEC.) SCALE 1:1

**FOOTSTEP BEARING**

**Fig 3.23**

**Question:** The figure given below (fig:3.24) shows the parts of a Foot Step Bearing. Assemble the parts correctly and then draw the Front View, showing right half in section, using the scale 1:1;

Print title and scale used. Give '8' important dimensions.




## DETAILS OF A FOOT STEP BEARING

**Fig 3.24**

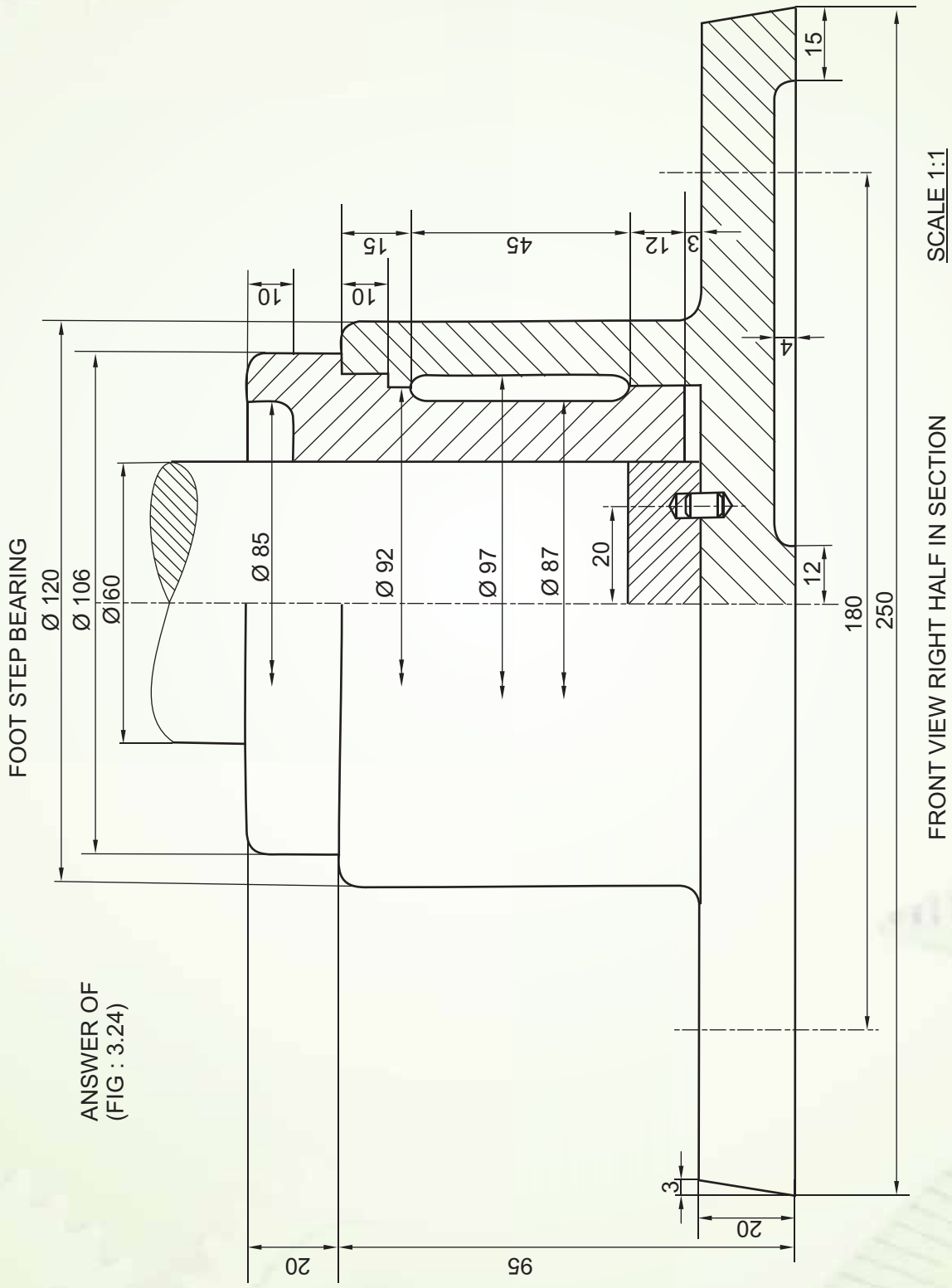

FOOT STEP BEARING
Ø 120
Ø 106
Ø 60
Ø 85
Ø 92
Ø 97
Ø 87
20
15
45
12
3
10
10
4
12
180
250
15
SCALE 1:1
FRONT VIEW RIGHT HALF IN SECTION
ANSWER OF
(FIG : 3.24)
3
20
20
95

Fig 3.25