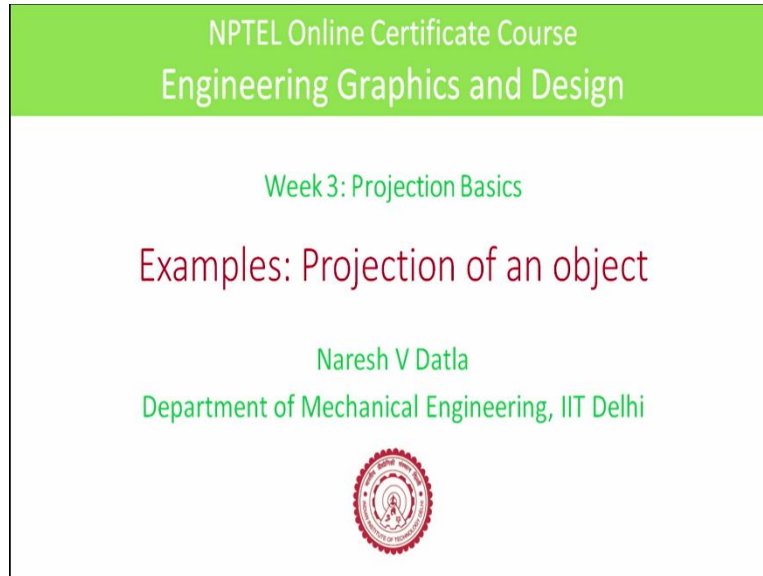**Engineering Graphics and Design**
Professor Naresh V Datla
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Indian Institute of Technology, Delhi
Lecture 7
Examples: Projection of an object

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Good morning. We are back. We are back after problem number 1. In problem number 1, we have seen the front and top view of a point, a line, a face and a whole cub but in problem number 2, the orthographic view for a simple object. For orthographic view, we will consider here the front view, top view and side view.

We can take other views also but to represent an object, to represent most of the object three view is almost sufficient. If not, we may go for rear view, bottom view or different side views or section view, if necessary. But for this case we will go only for three basic views.

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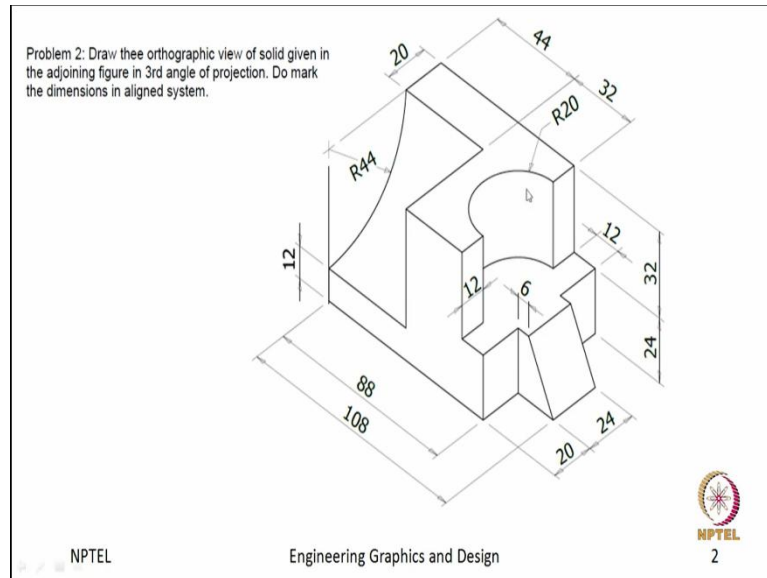
This is our problem number 2. A simple object. If you read the question, draw the orthographic view of solid given in the adjoining figure in third angle of projection and do mark the dimension in aligned system. One difference you will find here compared to question number 1 is, it is mentioned here that you have to draw the orthographic view in third angle of projection.

In your problem number 1 it was not mentioned, just by reading the question we had to understand that it is a first angle of projection but in this case, it is already mentioned it is a third angle of projection. So, we will directly we can start drawing in third angle of projection.

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TV

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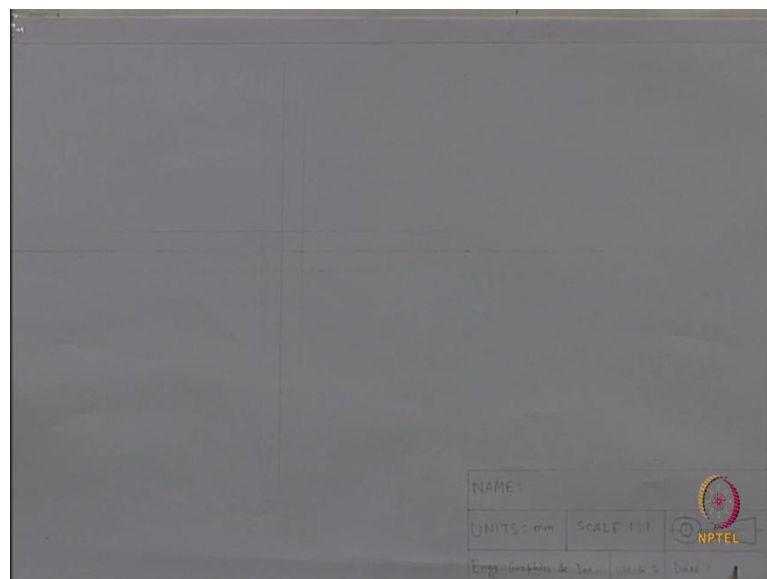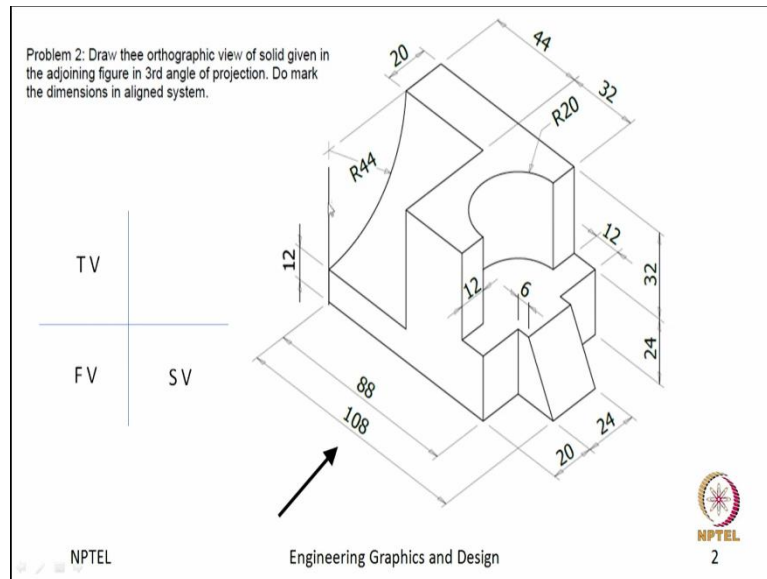
Before the drawing what I would like to mention is how to prepare a drawing sheet. For this drawing, we will be using A3 sheet and in the A3 sheet you have to make a box like this where you will keep your name, units, for this figure units are in millimetre. Scale is 1:1 and this is the sign of third angle projection.

The first thing in this problem is how to decide the front viewing direction. Someone may ask you to draw a front view but you might be thinking like what is the front viewing direction. It has already been covered in the lecture but still I would like to say the front view direction is that, from which you will be able to see maximum number of features.

Here, let us look at the features; this is one feature, this cavity is another, this is another and this is another feature. There are almost four features like major features in this. If we choose this as the front viewing direction, you will understand that we can see this curved surface, this plane surface as well as this part. So, at least we can cover three out of the four, if we consider this as a front viewing direction.

So, if we consider it as a front viewing direction our side view will be this and this will be a right side view. So, how will I draw the three orthographic view in my third angle projection? In third angle projection the front view will come here and the top view will be on top of the front view, it is intuitive in third angle projection top view will be on top of front view and this is the side view. Right side view, as this is the right side view right side view will be on the right side of front view.

This is what I will draw in my drawing sheet and another important thing you have to look at is the dimension because here see what is the dimension 108 is the length, the height is 24 plus 32, 56 and the width is 64, 20 plus 44.

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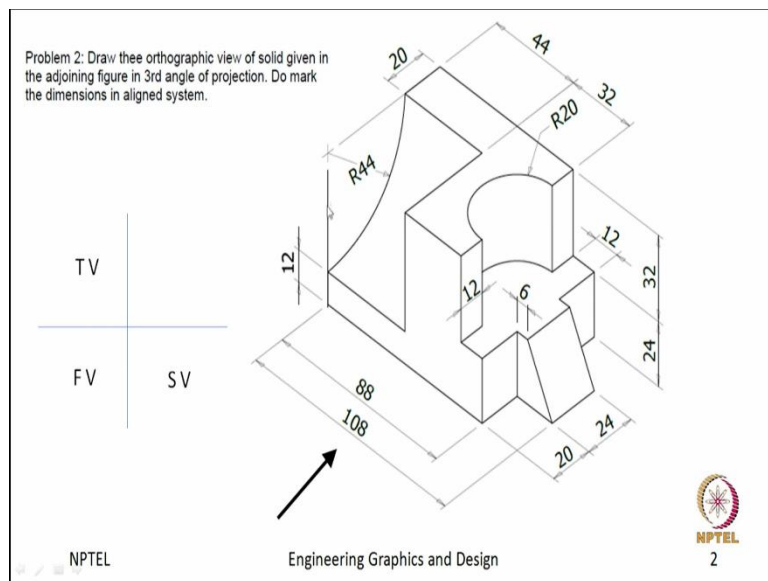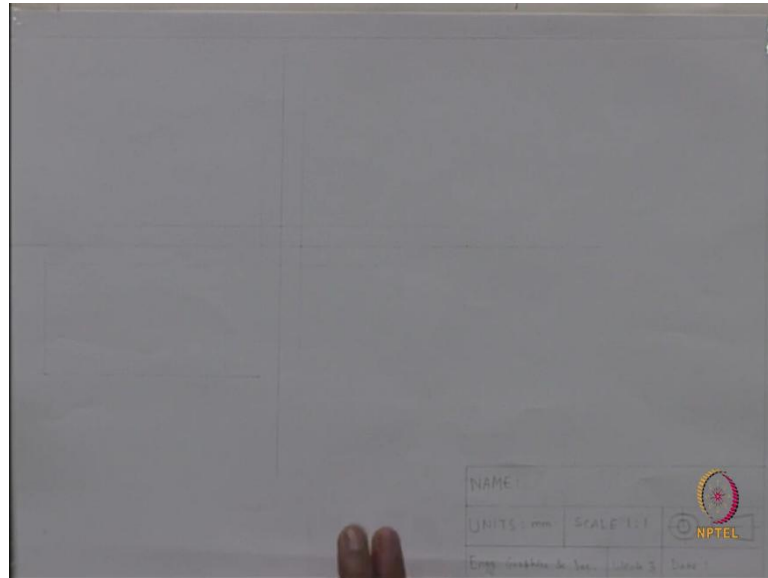
So, while making the drawing and while I have already made the reference line. One is vertical, one is horizontal reference line. I will maintain a distance at least a distance of 10 millimetre while making the views. The views will not be exactly on the reference line, I will maintain a distance of 10 mm or you may maintain 20 mm.

We needed a space of 108 is the length and the height is 56. So, 108 by 56 a space is needed. So, lengthwise 56, we will find here and check 56. For this kind of light lines or

construction line, I will use H pencil and length wise it will be 108. So, exactly at 108 I have to stop and then I will close this.

So, my front view will come in this zone and like from the space only, we can understand the top view will come here and the side view we can manage here. So, your first work is done. Dimension wise you are safe, if you start making the front view here, it will go out of the sheet your top view will go out of the sheet. That is not desirable at all. Initially you have to understand it.
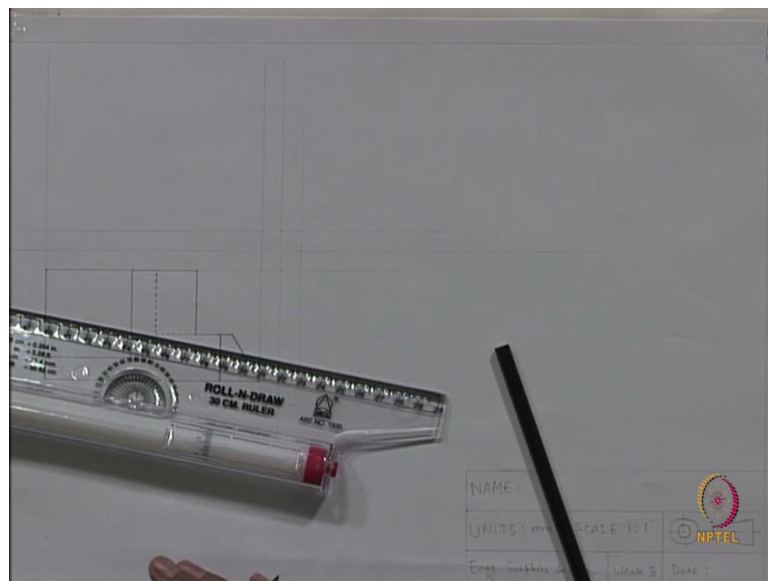
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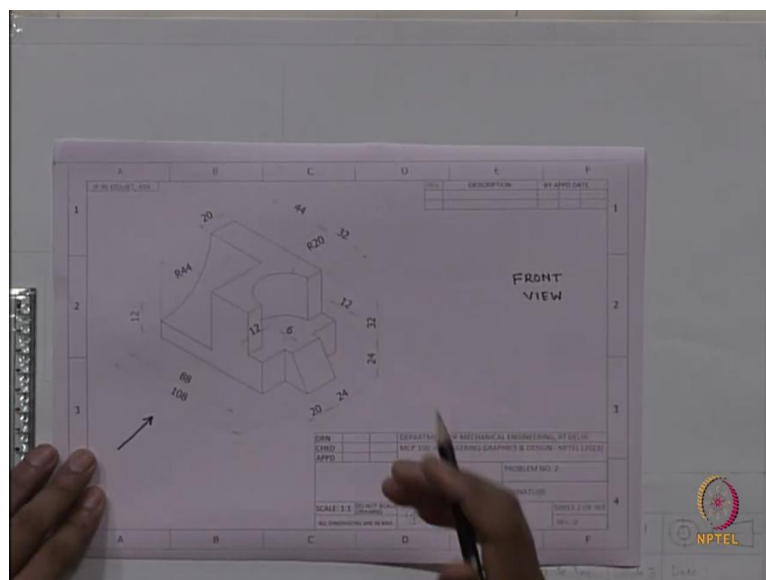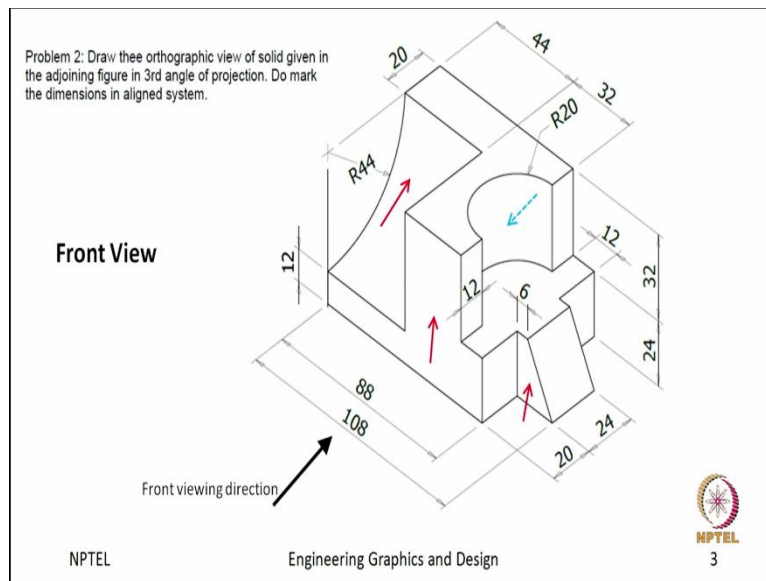
Now, let us go for the drawing front view. If we draw the front view, this is our front viewing direction. What are the features that you will look at? First, this surface. This
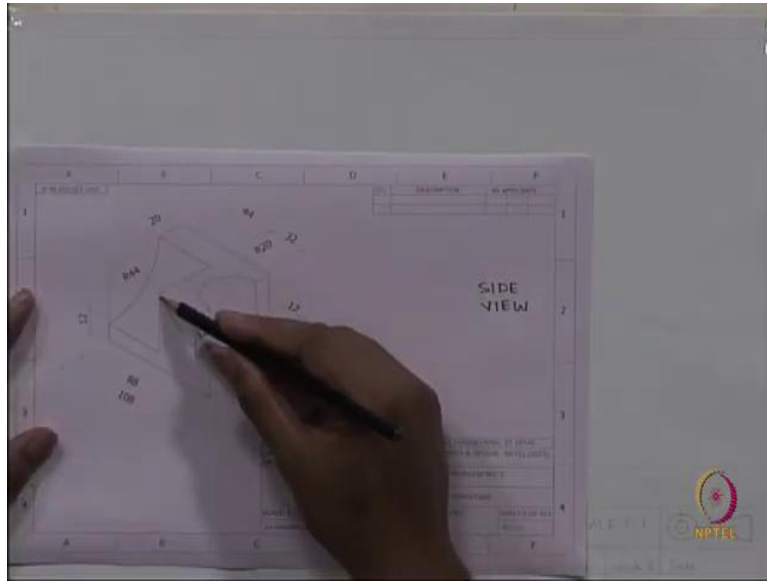
whole surface. Second, this you will see this part. Third, this curved surface you will also see and, is this fine? I mean these are the surface only you will see or anything else.

No, there is another surface which is this half cylindrical cavity. You may not look at it directly from the front viewing direction but it might be hidden to you in your front viewing direction but still you have to mention it in the drawing as a hidden feature, otherwise your drawing would not be completed. So, these are the four features in my front view.

So, I will start drawing. While drawing sometimes I will use the sheet so that you can I will use a printed sheet so that you can understand just to show the dimension and all. I think it is properly visible there are dimension and all so this is the front view, this is the front viewing direction. So, now we can start drawing the first we said, we will draw this surface, this surface. What is there like it has a distance of length of here from here it has a length of 88 and this vertical length is 24. So, we will draw that first.

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Problem 2: Draw thee orthographic view of solid given in the adjoining figure in 3rd angle of projection. Do mark the dimensions in aligned system.

Front View

Front viewing direction

For drawing the actual object, I will use 2H pencil. 88 is the length, 88. Then vertically I said 24 from here to a distance 24 then join the point. So, two lines we have already got. The next in the same feature there is again a horizontal line of distance 12, horizontal line of distance 12 then again, a vertical line of distance 32.

A horizontal line of 12 and a vertical line of distance 32 and if you have any problem with that like if it is parallel or not you can always check, you can bring it down. You can check if the lines are parallel or not and from here we will go back by 12. We will mark here 12, then 32. Now again we have a horizontal line of 32, a vertical line of what is this length?

This length is 44 because the radius is 44 this and this, this both are 44. So, we will go now 32 horizontal, 44 vertical, again 44 horizontal. Then we will close it. 32 here I will mark. 32, from here 44 towards down, from here again 44 the left side and this is 12. You do not have to measure because automatically, if you just draw it, it will be 12. Our first object is done. We said in front view, the first surface we will look at this surface. We are done. The second one was this. This has a length equal to this like 24.

Like this is already there 24, so while I look from the front, this edge and this edge will collide into a single edge that is what this then a horizontal line of 6 will come. This has a dimension 6 and here a horizontal line of 108 minus 88 means 20 will come here, 20 is this and 6 is this. Again, I will remind you for drawing, I will use 2H pencil. 20 and here 6. Then if I join this, I will get that inclined surface that you have seen in the drawing. Two features we have drawn. This and this are done, the third feature we will be drawing is the curved surface.

Curved surface it may look curved here but have you ever seen a cylinder or a circle from front? If you just watch a ball, football or some ball from the front, it is a sphere but if you look from any view, you will look a circle as a projection. Similarly, while it is a cylinder or any curved surface like this as a projection you will see a rectangle. So, for this curve surface we will draw the rectangle.

The projection will be a rectangular drawing but here the both the lengths are equal like this height, the radius is given as 44. So, it will be a square and it will actually start from this point, from this actually this point will be collided with this point in the projection. So, I will start making the drawing from here. From here 44 left side 44 down so that I will get the projection of this curved surface.

This is the 44 here and 44 down. We are done with the front view. We are not. I showed you that you have a hidden feature here, the hidden feature what it this again, a half cylindrical cavity and what I said what you will see in the half cylindrical cavity?

This generator there will be a generator of the cylinder, this generator you will see as a hidden line if you look from the front. This generator and the lower cavity part as a horizontal line. These two line we will be seeing as a hidden feature. So, as it is a cylinder, we will draw the view as a rectangular part and the dimension of the cylinder was radius 20 and we will start it from here because this point, this point, this and this are colliding into this point in the projection.

20 from here, from here, we have to come down by a distance of 32 and this we will draw as a hidden feature that means a dashed line. We will join this and this will be also a hidden line. So, our front view is done and as we know the top view will be exactly on top of front view.

So, what we can do using the H pencil or light line construction pencil, we can simply extend the outline of front view so that automatically the length of the front view will be captured in the top view as well. The top view will be in this boundary, the top view will be here and already I have taken the 10 millimetres gap from the reference line.

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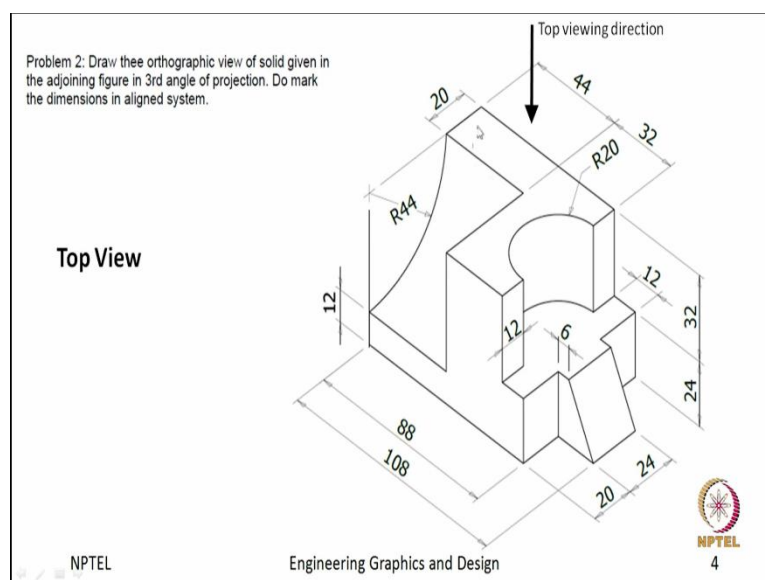
So, while drawing the top view, this is our top viewing direction. So, what we will see in the top view? We will see the length of 108 and we will see the width of the object, the width is 20 plus 44, 64.

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Problem 2: Draw thee orthographic view of solid given in the adjoining figure in 3rd angle of projection. Do mark the dimensions in aligned system.

Top viewing direction

Top View

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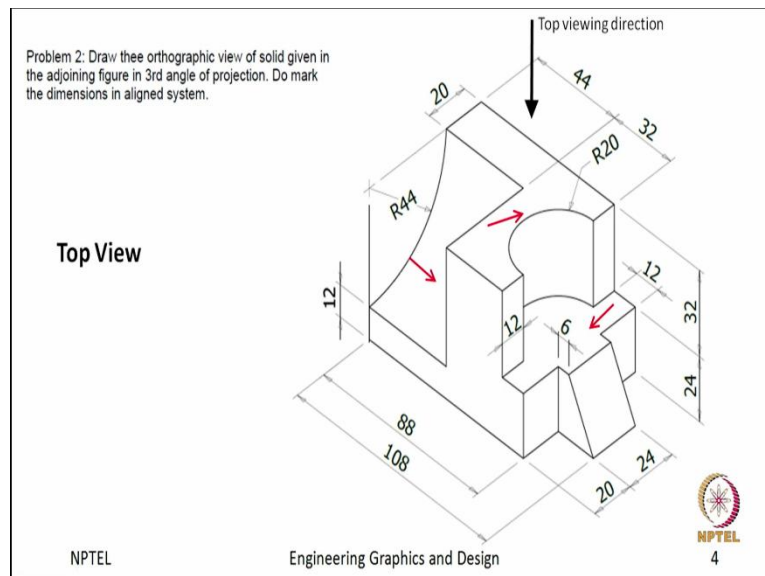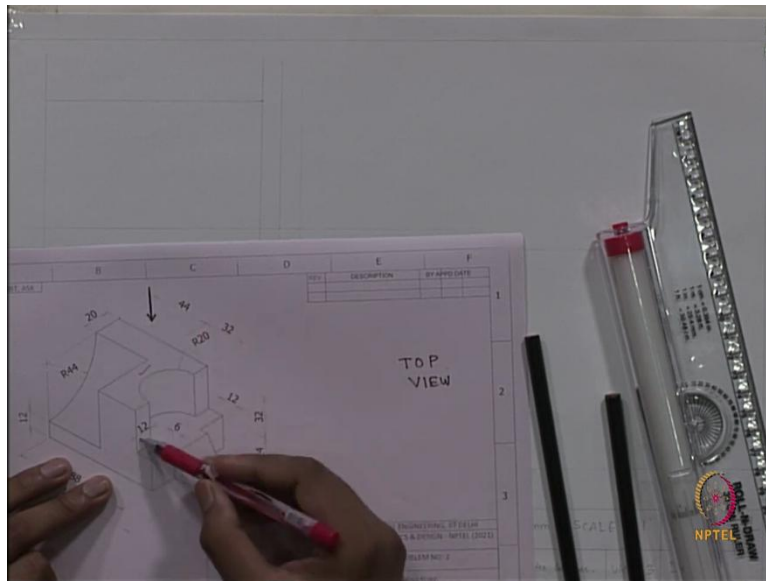
So, the length wise we are done. We have a space of 108 in length direction. In this direction I have to find a space of 64. Within this construction lines or within this projection site, our top view will come. What are the major features in our top view? If we look from the top, first we will see this surface. This whole surface. What is the next feature?

This area, this whole zone with the curved face with this whole area we will see from the top view. Again, this curved surface, the curved surface is in such a way that we look it from the top view as well as the from the front view we can look at it. These are the three features and also this inclined surface also we will be able to look at it from the top view, that is not shown here but I will do.

First, we will start with this top surface. This is the first surface we will be drawing. We will start from the left top corner and we will, we have to come this much length 44 plus 32, a length of 76. 76 then this length, 12. This has a distance of 12, first we will do that.

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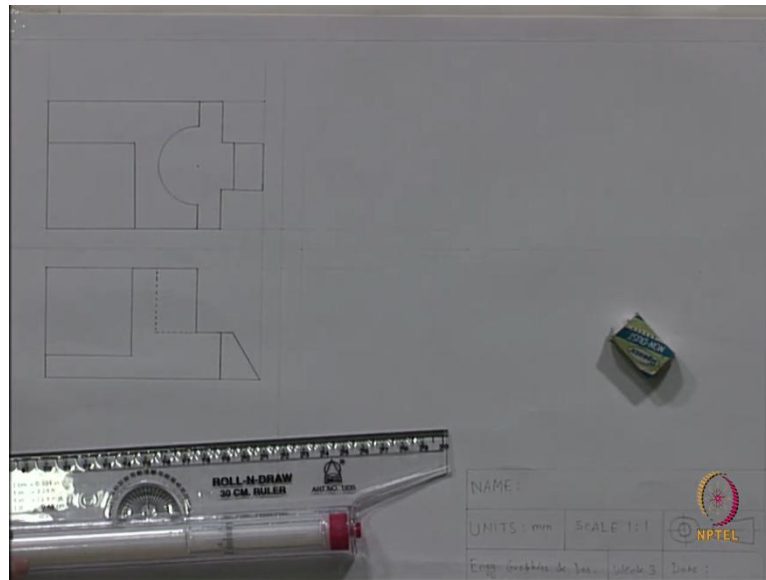
Drawing again 2H pencil. We said from this corner we will come as 76, this is the point, from here we have to come down and by a distance of 12. 12 is this, then, after that we have curved surface this half circle we are having with a radius of 20. So, that we will draw but before that actually I want to draw this particular line and this line. This line and this line. This line has a distance of 44 from the left and has a length of 32.

And again 12 here, these three things I will draw first. 44 here after 44, I have to draw a line of 32, till 32. And this line has a length of 12, 10 and this is the point in between these two lines the curved surface is there which has a radius of 20. First, I have to choose the centre. I have to select the centre first. So, from there to here, the circle will be there half circle and this is the centre point.

We will use the compass, first you have to select the distance of 20 that you will do, not inside the drawing but outside the drawing. 20 is fixed here and I will draw the rest of the parts, the rest of the parts of the top face is this line and this line, they both have a length of 44. So, from this left corner I have to come here as 20, come down as 20 then 44. Along this length up to 4 to 6, 20 I will come down then 44 here. 44 and I have to come down automatically it will be 44.

The next part I will draw is this part, this whole area, this whole round area and this. How to draw this part? In your drawing from here it will start at a length of first a length of 12, then a length of 20. Then a length of 6. We will draw that 12 here, 12 here, 20 here, you remember 20 and again 6 in this direction.

The same thing I have to do in this side also. 12, 20 and 6. If I look from the top, I will look at this edge, I will look at this edge. This slant surface has a different length but once I look from the top, I will see a projection. The projection will have a shorter length than the actual inclined plane length.

So, I will look at his line, I will look at this line and these two extension that I will draw. This will be the first line of the inclined surface which has a length of 24 you can check and what will be the projected length of the inclined surface, that we will directly get from the construction line of front view. We already know like what is the construction front view and from there we will directly just will join these surfaces, make it.

Still another feature is left for the top view that is this curved feature. Again, similar to the front view, if we look from the top also, we will see this and this 44 by 44 that we have already drawn and this whole curved surface we will see it as a line. Instead of this curved surface we will see a line of 44. This is that representing the curve surface, this one 44. This and then we will simply join the another edge of 44. So, our top view is completed. 2 view is done, the front view and the top view.

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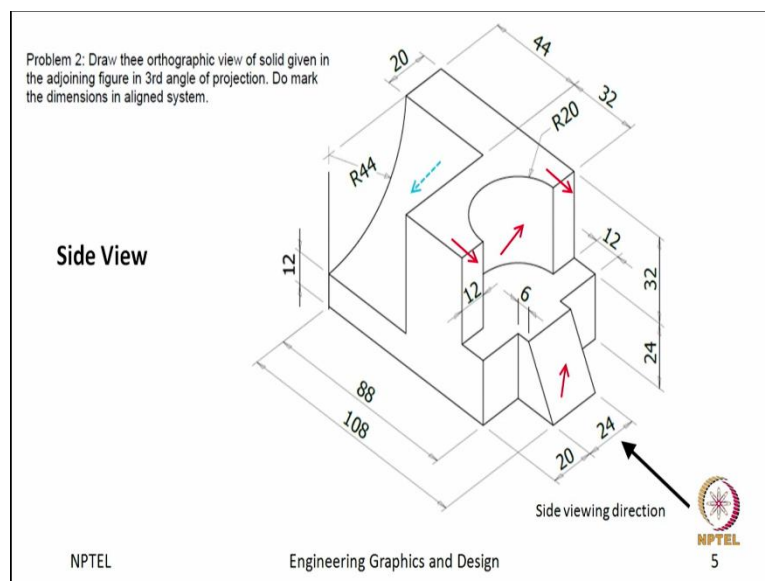
The third is the side view. For side view this is the side view. This was the front and this is the right side view. The features we will be looking at from side. This is the first, this whole three this as well as these two surfaces of the both side.
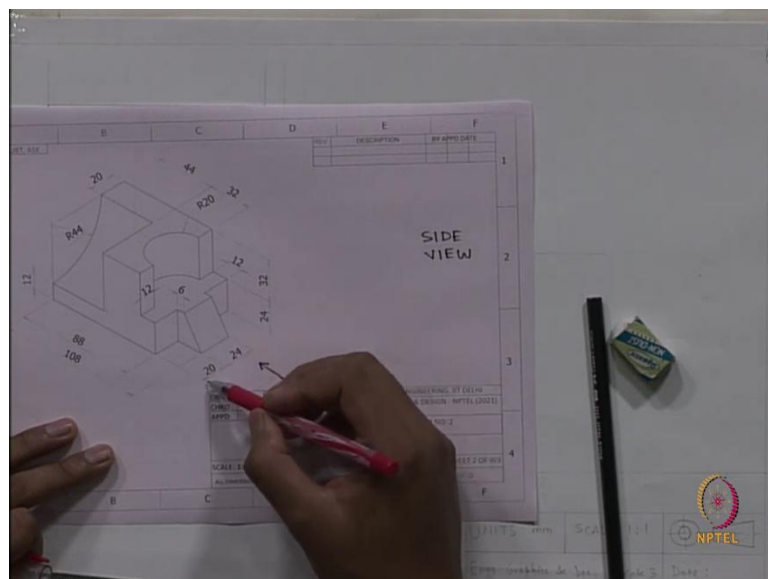
This feature, this cavity this is not a hidden feature anymore this time. These two sides we will look from the side and another feature will be there. This will be a hidden feature from the top and from the front we could look at it but from the side view we will not be able to see that. This will be this curved area will be a hidden feature.

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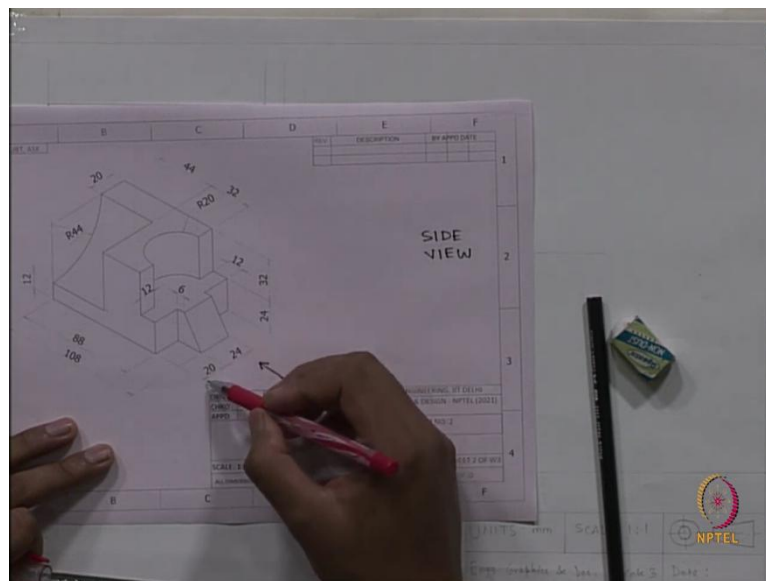
So, let us go for the drawing and another important thing is this time we won't make it separately, we will make it with the help of front view and top view because if you look at the side view, for your side view what is the length? The length here is 64, the 64 length you will get from the width of the top view and the height in side view is same as front view. So, already the height and already that height and width we have drawn in case of front view and top view.

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Problem 2: Draw thee orthographic view of solid given in the adjoining figure in 3rd angle of projection. Do mark the dimensions in aligned system.

Side View

Side viewing direction

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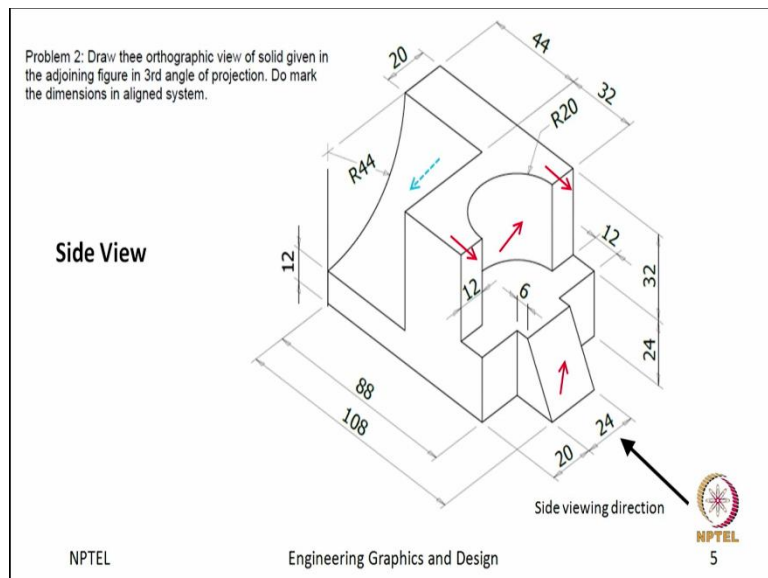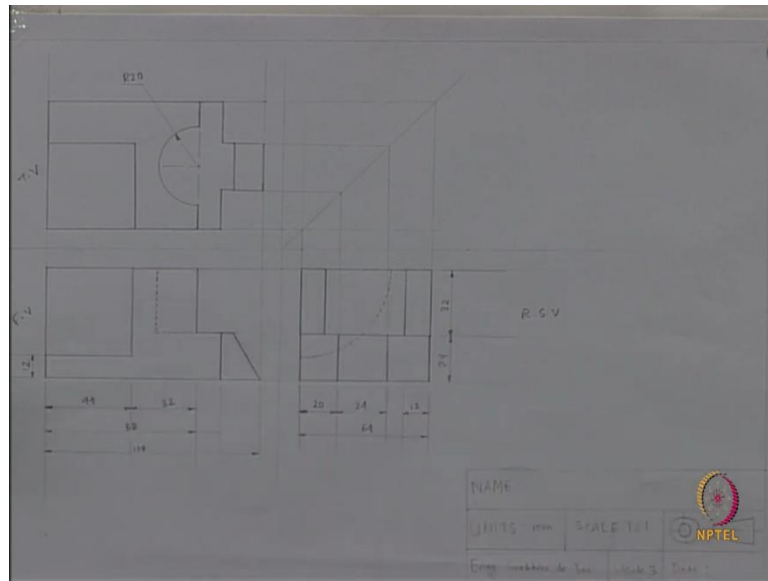
So, whatever height is there in front view that will simply come as the height of the side view also. I will extend that line, I will extend this line also. So, this is the height of the side view automatically we are getting from the front view height.

The width of top view is similar as the length of side view that we have to get. How to get this that is where that 45° angle construction line will come into picture. It has already been taught in your class also that you have to draw a 45° projection line. These all I will be drawing using H pencil because these are construction lines, for the construction only we are using. Later when the drawing is finished you can actually delete it or you can keep it also. I mean not an issue and how to capture the width?

So, let us capture from here. This, so one is we have already drawn this line from here, from top view we have drawn a horizontal line wherever it will intersect that 45 degree line we will draw a vertical line from there and from the top also similar. We will just draw a vertical line there and where it intersects with the construction line from front view, these four points will give us the exact position of side view within this area.

Now, we can check that actually the we can check actually for assurance see. It becomes 65, a bit more than 64 but we can say almost it's proper. But if you do it properly with proper dimension, you will always, you will always get it at 64 only but we will not redo it, we will just go with that. These lines also these features we do not need to draw actually separately, we can just take their, we can just extend the construction line and from here actually we can, okay and from this place also, we can actually extend the line so that we will get the position of the features exactly.

Now, we will start doing the side view. The first part, we will be drawing is this side, this slant surface and this, this slant surface we will look it as a rectangle. So, what will come in our picture this line, this line of length 24 and width 20. It will come first. This is the line of 24 and then this three line I will actually I think you missed that some part like I just drawn this line, this line, this and the top of the three line in the side view and these two incline line also if I look from the front that will come here and here.

The length will definitely be different because it was inclined surface, this lower part is done. Now, I will look at this and this and this. First, I will draw this length and this length, this has a height of 32 and 12. Height of 32 and 12, the same feature is there on the right side also so I will draw that too 32 and 12. The next part is this half cylindrical cavity. If I look from the front this whole curved surface as I said before I will look it as

a line, like this. This curved surface in the lower place also I will look like it will look like this.

So, instead of the half cylindrical cavity, I will look at a rectangle of 40 by 32. So, 32 will be the length and the lower line is already there. We will just join the top line and this line will be actually collided with these three and is already here. So, our side view is done. Is it? No, it is not done. We had one hidden features, this is the feature which we have to draw also. This is a hidden feature but still we have to show in the side view.

So, while look from the front this one-fourth cylindrical cavity we have to show this has a radius of 44 from both side at a distance of 12 from the left, at a distance of 20 from the right top. At a distance of 20 from the right top. At a distance of 12 from the left corner and if we draw a circle actually and it will be with the dashed lines because it is a hidden feature. See now drawing wise we are done still one important thing is left which is dimensioning.

Dimensioning is very important, the aligned dimensioning system is mentioned here for our dimensioning. So, we will do that too. For our dimensioning we will use the normal H pencil because it will be light lines.

Do, first we will draw some extension lines from the figure. It I will, it will not touch the figure but I will just, the first length is this whole length is 108, this length is 88. This length is 44, this length is 32 and this length is 12. So, we have to make the arrow heads the arrow head should be at a ratio of 3 is length and 1 is the width.

So, this is the aligned system of dimensioning. So, I will write the dimension on top of the dimension line and it will be aligned in the direction. 108, 88, 44, 32 this is 12. Some of the dimension like hidden features, hidden features we do not show dimension. So, if the feature is, can be seen in any another view there we will put the dimension, this circular feature is can be viewed in the top view.

So, we will just, oh we forgot to maintain those centre lines for circular features, centre line we just forgot to draw. So, you can add it so while making the dimension for the, this has a radius of 20, R 20 and we have to put an arrowhead here and again in side view also we have to show the dimensions. If you have already shown some dimension in your front view or top view, you do not need to repeat those actually in your another

views. It should not touch them here. First draw total length then for this, for this, this is 20, this is 24, this is 12 and this is again 32 and 24.

You have to make the arrows this 20, this 24, this 12, this is 64. I have to write like this this is 24, this is 32. So, we are finally done with the problem number 2, a simple object in third angle projection. We have drawn the front view, sorry front view, top view and right-side view.

This FV, TV and RSV, I just wrote so that you can understand. While you will be making the drawing your drawing should be neat and clean you should not write these things and there are some mismanagement while doing this but while you will be making this I will expect you to do it properly and correctly. Thank you, we will meet again in next week examples while doing next week examples.