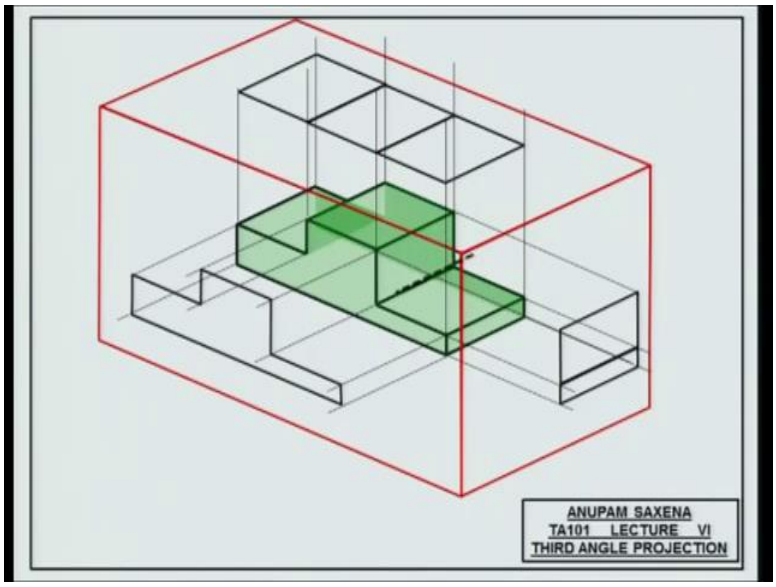
Technical Arts 101
Prof. Anupam Saxena
Department of Mechanical Engineering
Indian Institute of Technology, Kanpur

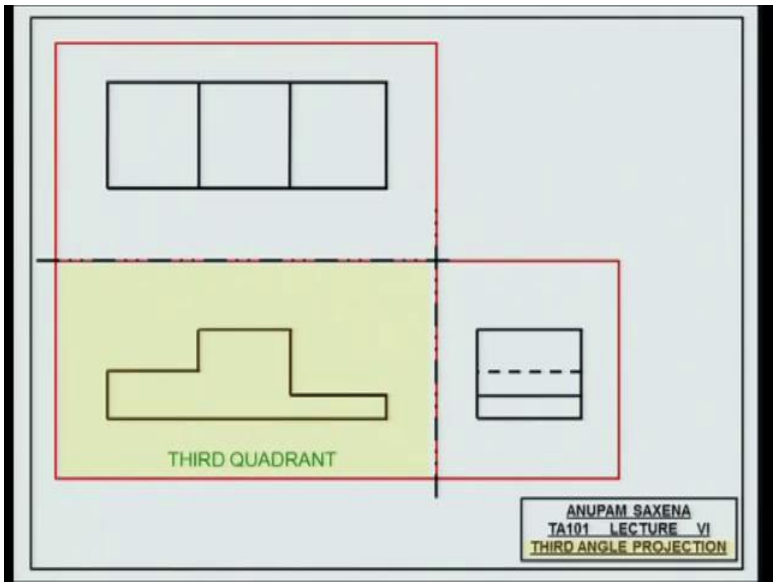
Lecture - 9
TA 101
Think and Analyze

(Refer Slide Time: 00:28)



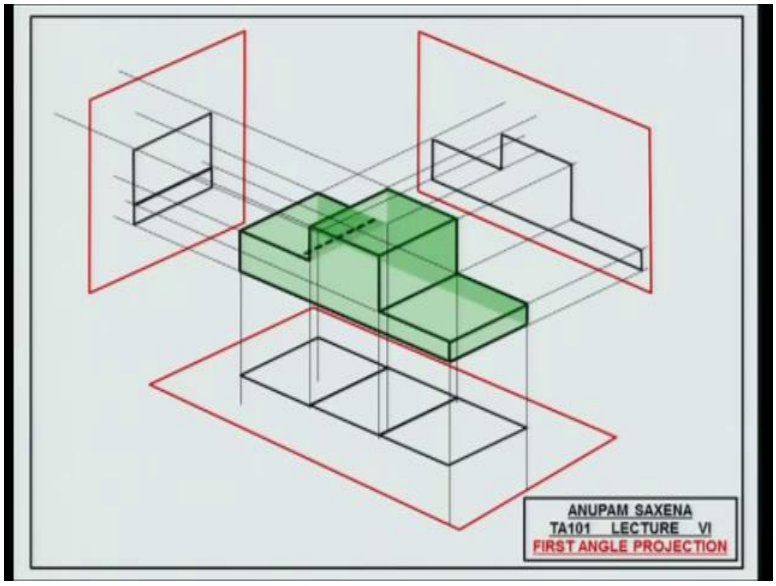
Today, I will introduce you to god all right. So, let us get started a familiar figure. So, let us say I have a plane in front of the object on the side and at the back, on the top; the rays from the object come out to the plane; we get the front view likewise we get the top view or the plan view. And, likewise you get the right hand side view something that you have seen before ok. If you flip open these planes above the hinges you get the third angle projection; something that you have seen; your frontal view happens to be in the third quadrant.

(Refer Slide Time: 01:13)



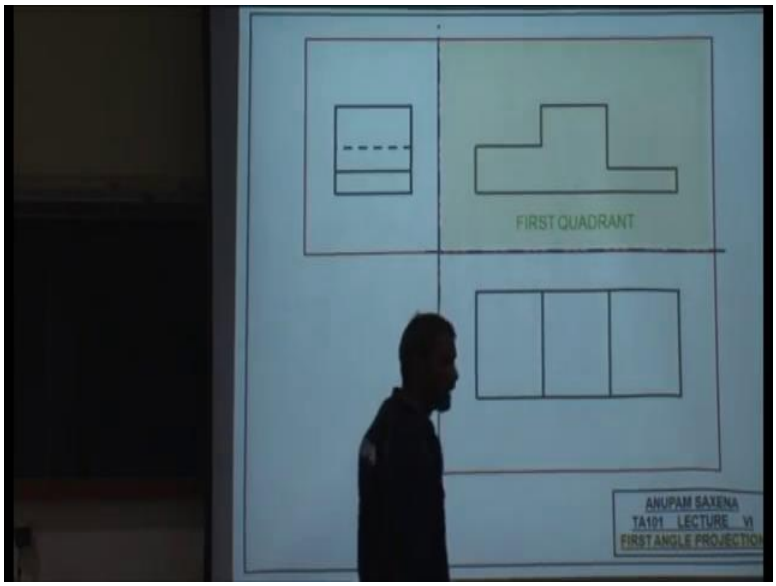
And I said well I mean if you are working with 3 views the front view, the top view or the plan view and the profile view which is the right hand side in this case; if you are working with 3 views. And, if it so happens that your frontal view happens to be in third quadrant, it is third angle projection.

(Refer Slide Time: 01:36)



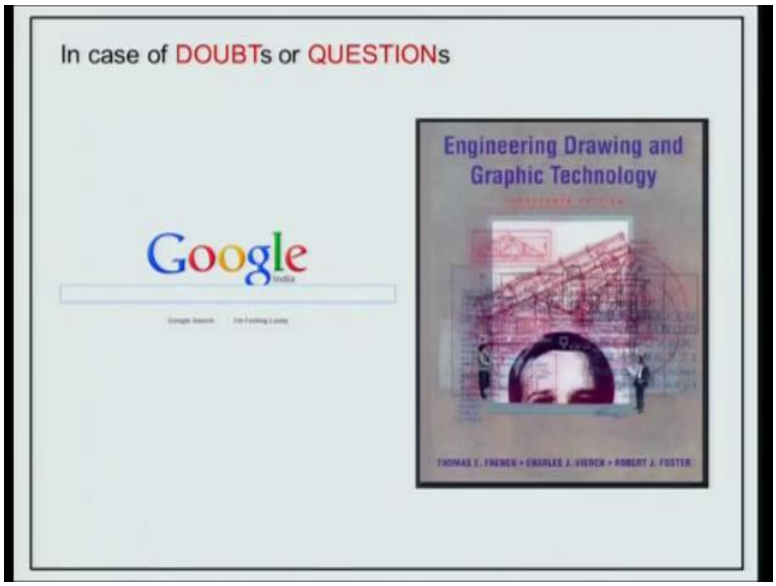
Same thing but in this case now the plane is at the back, bottom and on the left hand side you let the rays eminate from the object. And, let them fall on these respective planes you get the front view here, you get the plan or the top view here.

(Refer Slide Time: 02:12)



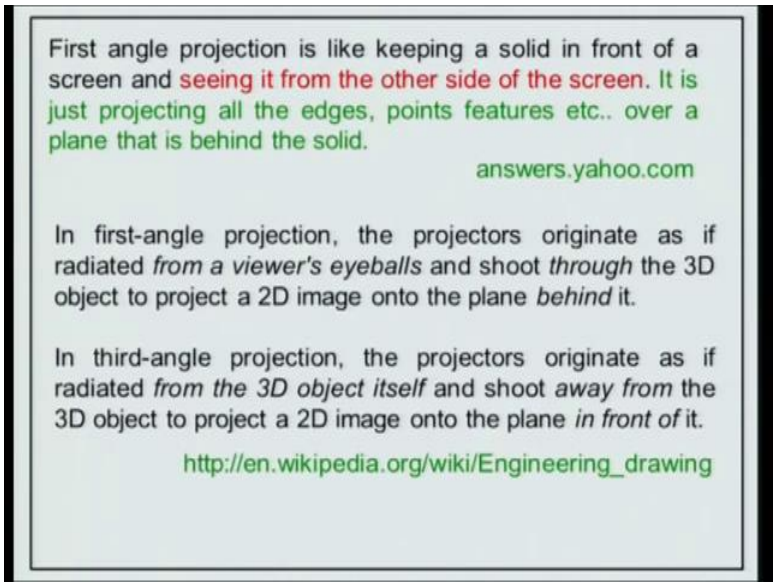
And likewise you get the side view; there again if you rearrange these planes your frontal view happens to be in the first quadrate ok. So, remember that you are working with 3 views frontal, top and right side view, right side view not the left, right side view. And, then I said that well in this case if your frontal view happens to be in the first quadrant; then this is the first angel projection. And, then my colleague professor Kishore he visited me; and he was like well it is I remember correctly, I learnt at slightly differently. And, I have to jog my memory back well back in 1991; did I learnt the same way or maybe I learnt at differently? So, and then I said yeah possibly I learnt at differently; I had doubts.

(Refer Slide Time: 03:07)



And, so in life when questions bother you, then you already seen god right, why did you say no to that? You either refer to your bible, your text and just in case you are not use to referring your bible; you pray, you pray to god; you may not be able to connect with the real god. In a sense that of course I mean you may be speaking to him or her but you may not be hearing his or her voice back. But this guy well tried to come up with an answer ok. The answer may not be the one that you are looking for but still he will try to be as closer as possible; to the answer that you are looking for. So, I did the same; I had doubts, I had doubts I went to my god; and I typed few things. And this is what it came up with different sources.

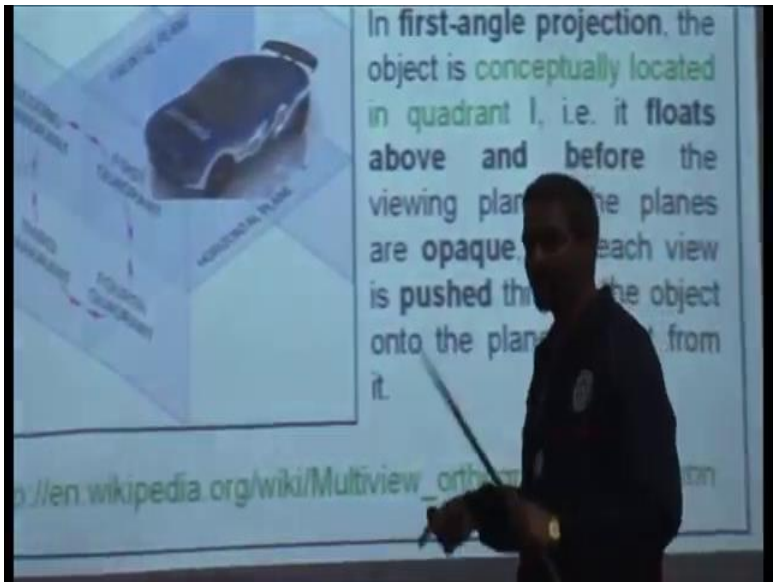
(Refer Slide Time: 04:15)



And, I am going to be reading this texts; first angle projection is like keeping the solid in front of a screen. And, seeing it from the other side of the screen; if I am the object I am in front of the screen. But I have to go back to look at myself from behind the screen; that is what it says a first angle projection; it is from answers dot yahoo dot com; that is not quite right. And, that is a reason why I marked this text in red; seeing it from the other side of this screen. If I am standing here and if I if an image of mind if an instance of mind C S E 101; if an instance of mind goes back and looks at myself from behind the screen ok; what will that instance of mind see my back side the mirror image; which is not quite right fine. It is just projecting all the edges points features etcetera over a plane; that is behind the solid features something that we have been doing which is ok.

Second source this is from Wikipedia. In first angle projection the projectors originate as if radiated from a viewer's eyeballs and shoot through the 3 d object to project a 2 d image onto the plane behind it; I am just reading. In third angle projection, the projectors originate as if radiated from a 3 d object itself and shoot away from the 3 d object to project a 2 d image onto the plane in front of it; something that we have been doing consistent perfectly consistent. But from where does a first angle and the third angle these names come from not so very clear.

(Refer Slide Time: 06:16)



So, I was not satisfied; I kept asking god. And, then I got something; in first angle projection the object is conceptually located in quadrant 1. Now, here is where the different slides; so what I told you before was it was the front view that was located in the first quadrant. But this guy says that is the object which is located in the first quadrant ok; slight subtle difference I e it floats above and before the viewing planes. The planes are opaque and each view is pushed through the object onto the plane furthest from it.

And hence talking about the projection; same thing that we have been doing. Well, if you are not able to understand the text it is perfectly fine; I have a graph image the space divided in 4 quadrants; quadrant 1, 2, 3 and 4. You see the frontal plane, you see the horizontal plane and you see the profile plane; quadrant 1, 2, 3 and 4 frontal plane, horizontal plane, the right hand side plane or the profile plane. So, if you keep this object in quadrant 1. And, this is the important point if you look at this object from the right; this is the important assumption if you look at this object from the right. That means, from here; if you look at this object from here and if you led the projections immunate from this object. And, get back onto the frontal plane what we do get, what we do get louder?

Student: ((Refer Time: 08:14)).

Front view, likewise if you let the projections immunate from this object and hit the horizontal plane; flip it over what will we get? The top view. And, if you let the projections come out of this object; keep the profile plane what you get, which profile?

Student: ((Refer Time: 08:41)).

Who said left, who said right, which one is right, which one is?

Student: ((Refer Time: 08:54)).

Be careful where you looking. So, where you standing with respect to the object; left hand side or the right hand side?

Student: ((Refer Time: 09:06)).

You are standing here, you are standing here; what would you get on this profile plane?

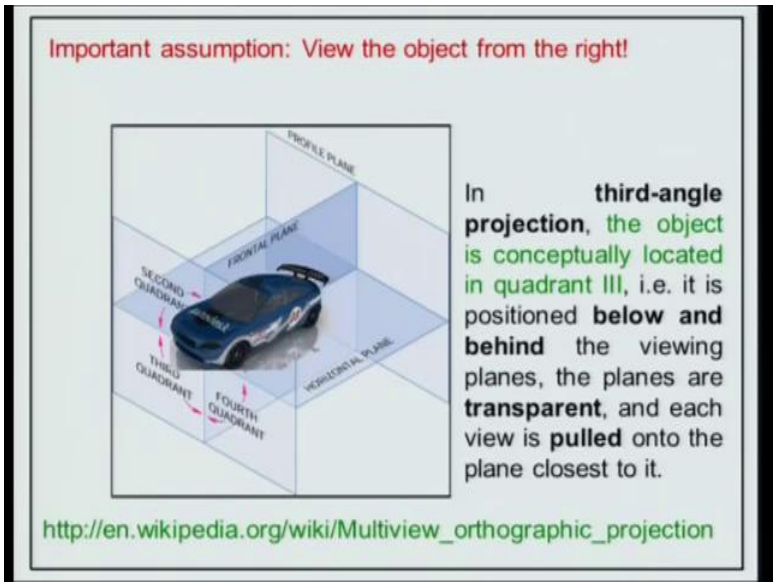
Student: ((Refer Time: 09:26)).

Left.

Student: Yes sir.

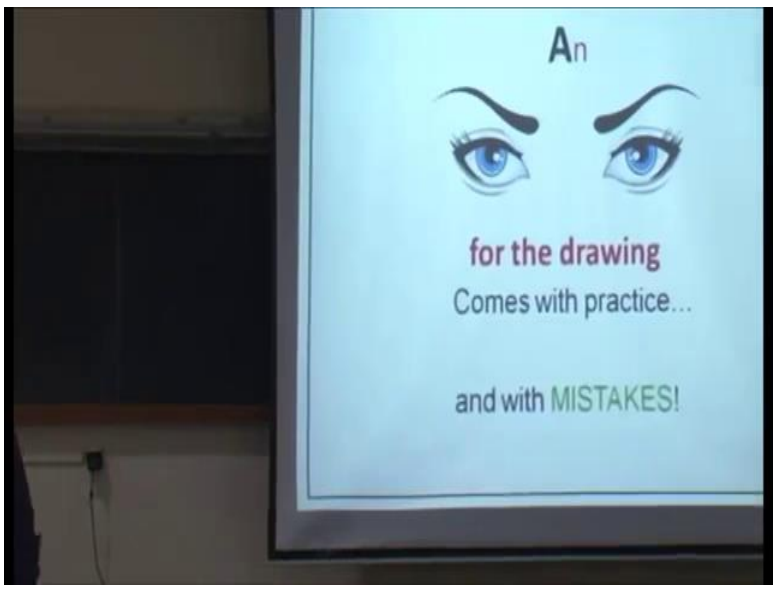
So, this where the nomenclature comes from. But if you realize you are smart if you realize; if you are in the first quadrant. And if you open up the views you will be essentially getting the frontal view in the first quadrant; similar subtle difference. One thing that you need to remember again is in this nomenclature you have to be standing or you have to be looking at the object from the right ok.

(Refer Slide Time: 10:09)



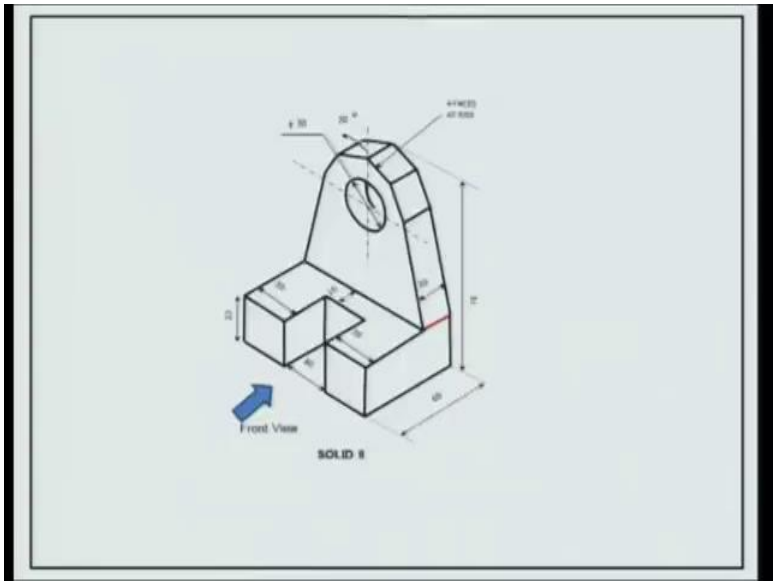
In third angle projection the object is conceptually located in quadrant 3; forget the rest of the text; look at the car. Once again you are looking at the object from the right; once again you are looking at the object from the right we are standing here. But it is this plane which is intersecting here view; in a sense that this plane is in between the object and yourself ok. You do the same exercise; you get the front view, you get the top view or the plan view and then you get the right hand side view, flip it open; what you will be getting will be the third angle projection. Once again in there if you are looking at 3 views front, top and right F T P your frontal view will be in the third quadrant fine.

(Refer Slide Time: 11:17)



This is which is again philosophical. But we respect to ((Refer Time: 11:27)); you have to have an eye for the drawing that comes with practice, that would not come straight forward on a plate view; it comes practice. You have to have an eye for the drawing; if you do not have it develop it. And, that is the reason why I call this course think and analyze. And, I encourage you to make mistakes like I do; I will tell you about some of my mistakes which you have absolutely no idea about. I encourage you to make mistakes because that is how you learn; that is how you develop the eye. You make mistakes, you realize that you have made mistake and then you say well fine. Next time when something similar happens I would not try to make a mistake or I would not try to repeat the same mistake; I encourage you to make mistakes and learn from it.

(Refer Slide Time: 12:32)



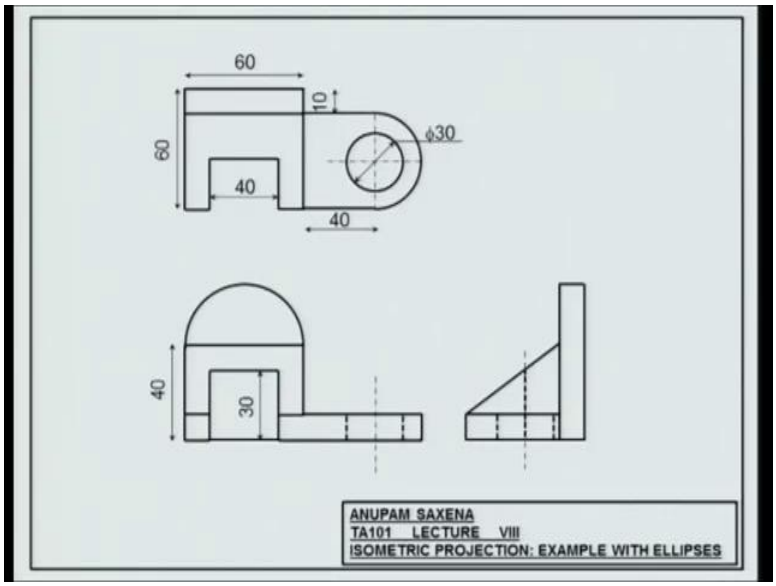
For example, you must have done this problem in lab 2; what is wrong with this; even I did not realize what is your name Shreya mention that there would be a line here. There would be a line here; would there be, would there not be? Because that represents the line of intersection between 2 planes; the plane at the bottom, the plane at the plane here and the plane here; do you agree or do you disagree?

Student: ((Refer Time: 13:15)).

Agree or disagree?

Student: ((Refer Time: 13:18)).

(Refer Slide Time: 13:24)



Good, first mistake which went this is the problem that you are doing currently. So, people in Mondays batch and people in Tuesdays batch; they are working on that. Well, the dimensions not there; so you can assume the dimension to be 10. So, for those who have done this problem they may assume this dimension to be 10; for those who do not take it as 10. But this is not what I am referring to I am referring to something more fundamental which Riya pointed me out, pointed out to me; she is one of the tutors in Mondays batch, right.

Student: ((Refer Time: 14:00)).

Thursdays batch; watch carefully do you see any mistake in this; you do what is that?

Student: One extra solid line.

One extra solid line which is where, where is it?

Student: ((Refer Time: 14:19)).

Front view; this one?

Student: ((Refer Time: 14:24)).

No. But this one are you are you referring to this one; yeah, any other mistake yeah?

Student: ((Refer Time: 14:39)).

This line should it be there or should not be there? These are certainties and which is very very difficult to kind of keeping mind; it is very easy for us to miss out on these certainties and yeah.

Student: ((Refer Time: 15:14)).

Which one?

Student: ((Refer Time: 15:17)).

Which of for the what?

Student: ((Refer Time: 15:23)).

Circle.

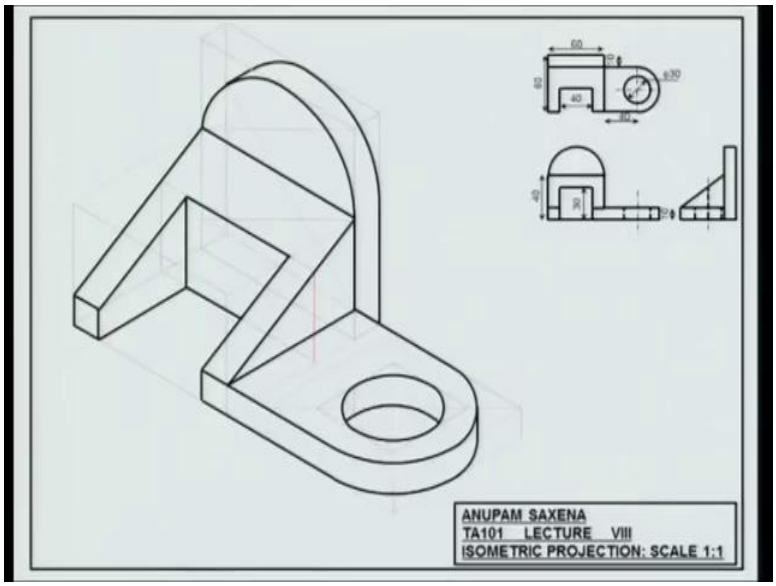
Student: ((Refer Time: 15:25)).

This thing should be equidistant from where?

Student: ((Refer Time: 15:35)).

It is na from here and here; you mean this one ok. So, third mistake. So, the point of emphasizes that you have to develop and I further drawing, and I am so very glad that you are pointing these mistakes out helping; me learn helping yourself learn.

(Refer Slide Time: 16:14)



So, in this solution for example there was a mistake that I realized just today; which is what?

Student: ((Refer Time: 16:23)).

Ok. So, in the solution that I had discussed in the previous class I have shown this line; this line would not be there. So, there was this discrepancy I may have say something else and class. And, you guys when you are when you are doing the lab you probably read the question slightly differently. So, let me clarify that when I asked you to use isometric scale; I would do that when I ask you to work with isometric projection or view. So, isometric scale is something that you need to you need to be using when you are drawing isometric projection or view. But you are going to be using the true scale when you are drawing, the isometric drawing; I probably may have said other way around class last time right yeah ok.

(Refer Slide Time: 17:33)

So, today it is about missing lines and views; to help you develop an eye for the drawing. I want you guys to open up your sketch box and pens and start working with me yeah.

Student: ((Refer Time: 17:55)).

1 is to 2 by root 3.

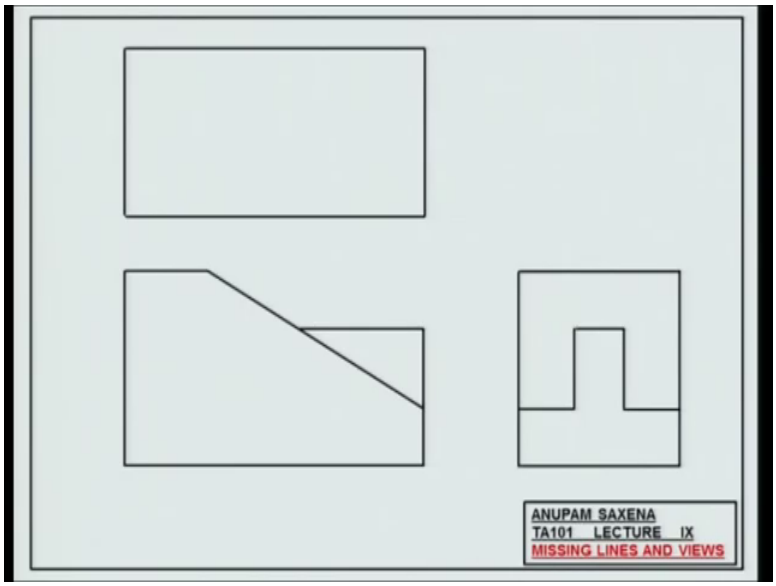
Student: ((Refer Time: 18:12)).

Under root.

Student: ((Refer Time: 18:16)).

That would be a smart way of ignoring the isometric scale want it, want it yeah. So, I do not expect that.

(Refer Slide Time: 18:33)



Let us take a look at this side of views; third angle projection draw them in your sketch books quickly; this is where you will also hopefully appreciate the importance or import of pictorial view or isometric drawing ok. So, let us say this is the object and somebody asked me a question here; yeah so something which is of importance to you no is this correct?

Student: ((Refer Time: 19:14)).

Good. Let me quickly draw the basic projection or construction lines. Now, I am trying to rectify these drawings; I look at this point here intersection of 2 lines I look at this point here. If I project this point want to the plan view or top view I will see something. And, if I project this point on to the right hand side view I will see something. Now, if I have a point in the one of the views; what would I see in the other 2 views? Lines, lines ha and are they going to be perpendicular to the hinge lines or are they going to be parallel to the hinge lines? They will be perpendicular to the hinge lines; I take a look at this point, I project this thing upwards; I take a look at the corresponding image of the this line this point over there which is the line in the right hand side view. So, what do I expect there in the top view? Straight line, horizontal, vertical, slanted?

Student: ((Refer Time: 20:50)).

Good ok. Simple exercise of correlating different features in different view which you will soon realize it is not that simple. So, I want you guys to be with me and glue your eyes on to the screen; one eye to me, the other one to the screen; how about this point here what do I expect to see?

Student: ((Refer Time: 21:24)).

Just a portion of the vertical line; I expect to see only a portion of the vertical line; why is that? Because if I took a look at the image of this point in this view I see only a portion of this line, I do not see the entire line. But only the portion of this line. So, I project this line upwards on to the left to the top view and then I get this good enough.

Student: Yes sir.

Ok, what do you propose?

Student: ((Refer Time: 22:04)).

Ha.

Student: ((Refer Time: 22:06)).

I am not ((Refer Time: 22:08)) yet man.

Student: ((Refer Time: 22:12)).

I mean I am not saying that figures is complete now. Now, look at this point here; image of this point in this view is horizontal line; what do you expect look at this point here, image of this point in this view is again a horizontal line; what do you expect there?

Student: ((Refer Time: 22:44)).

Am I done yet; yes would I see a line here yeah?

Student: ((Refer Time: 22:54)).

Done, how would my object look like?

Student: ((Refer Time: 23:01)).

How would my object look like; can you figure not straight forward yeah?

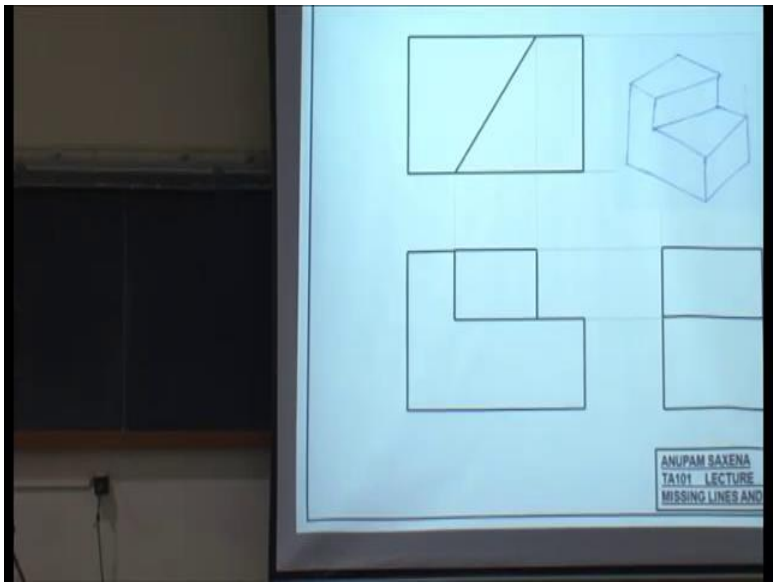
Student: ((Refer Time: 23:19)).

I will come to that, I will come to that; possibly if you sketch it out your object will look like this; agreed, agreed ok.

Student: ((Refer Time: 23:40)).

Still thinking; example 2 let me quickly draw these construction lines.

(Refer Slide Time: 23:58)



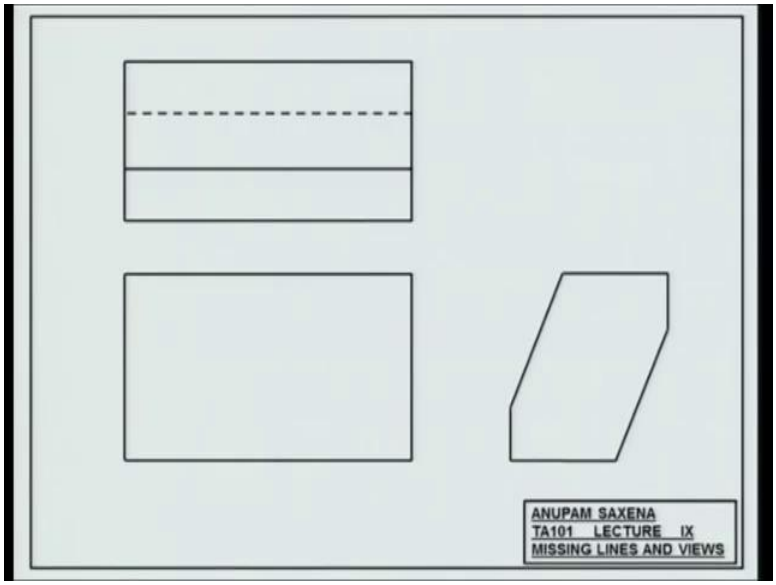
So, I am not showing these construction lines because they are quite obvious I am not showing these lines; they are quite obvious. So, the idea is you look at the 3 views; you look hard, you look harder and then you try to figure which of the features in which of the views are not relative ok. For example, this guy here, this point here; you do not see the corresponding image in the front view or possibly in the side view. What do you expect here?

Student: ((Refer Time: 24:50)).

No, no. So, let us break it down; so lines and rectangles so what do you actually expect here a line, yes no horizontal or vertical; this is slant line here. The image of this slant line here would be horizontal; convinced always, always not always when this case

maybe it is. So, you would see a vertical line and would see horizontal line, rectangle Some of you had mentioned that. These are at this is how the objects gonna look like.

(Refer Slide Time: 25:57)



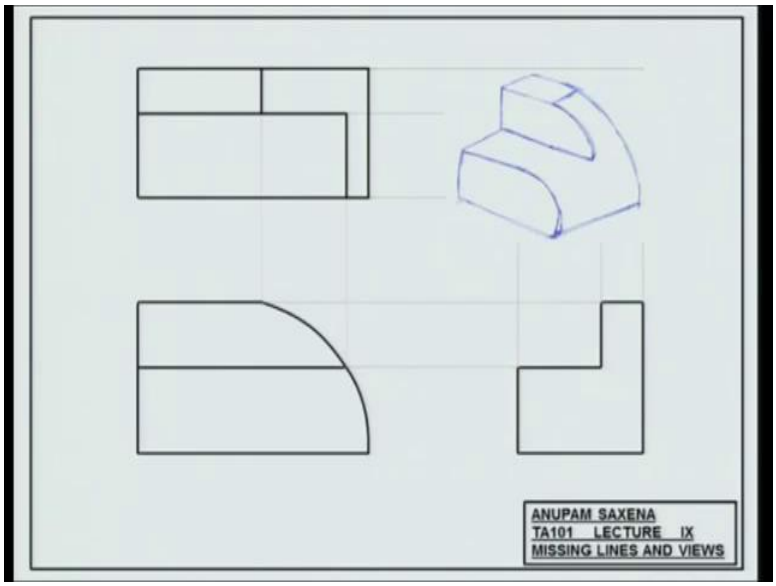
This one; let me quickly draw a projection lines again, construction lines; this feature here is related to this point; on the right side view, this dotted line in the top view is related to this point here at the bottom. So, far so good no changes in the 3 views; how about this guy?

Student: ((Refer Time: 26:37)).

A point image of which would be a horizontal line here; go up you already see a horizontal line here; this would be a solid line, how about this guy here dotted line. These are at this is how your solid is gonna look like in pictorial view, pictorial sketch. So, try to realize what I am trying to do here. So, I am just working with 3 views given to me. And, what I am trying to do is I am trying to correlate different features in different views with other views ok. And, then once I figure that fine I cannot go any further from there. And, I assume that the 3 views that I have constructed are and a correct; then I attempt to sketch this 3 dimensional solid ok.

But this approach is not always applicable; as in this approach we will not always work. You will have to draw the pictorial view as and when you are making revisions to your orthographic views; this one for example.

(Refer Slide Time: 28:19)



So, I need your help in this one work it out 2 minutes think about that. And, tell me which features are missing in which views; ready yes, no? How about this point here; what do you expect?

Student: A part of it.

A part of it would be a line; a part of this vertical line would be a line which part? I go from the right, this part would be a line what else?

Student: ((Refer Time: 29:06)).

There would be a horizontal line and this would correspond to what? So, you are suggesting that there would be a line here, horizontal line here and this would be the image of which feature in this view?

Student: ((Refer Time: 29:21)).

This arc.

Student: ((Refer Time: 29:22)).

Ok.

Student: ((Refer Time: 29:26)).

Complete horizontal line.

Student: ((Refer Time: 29:30)).

Hold on let me address this point here ok. So, this is intersection point here; would there be a vertical line? Yeah; yes or no?

Student: ((Refer Time: 29:52)).

Would this part of line be there?

Student: ((Refer Time: 29:55)).

Ok and then somebody says that there would be a horizontal line yeah.

Student: ((Refer Time: 30:06)).

Is this how your solid is gonna look like?

Student: ((Refer Time: 30:15)).

Small mistake, where?

Student: ((Refer Time: 30:19)).

It is there?

Student: ((Refer Time: 30:37)).

This one?

Student: ((Refer Time: 30:44)).

This, this can you come up.

Student: Sir, there should be a line.

Avikalp suggest that there should be a line here.

Student: ((Refer Time: 30:58)).

You sure thinking, you sure are analyzing and I am very happy about that; which is what I want you guys to ok; those who say no, those who say no, raise your hands? And, can somebody stand up and tell me why?

Student: ((Refer Time: 31:21)).

It is a smooth, it is there is there is no region of discontinuity in surface. So, you said at this.

Student: ((Refer Time: 31:43)).

It obvious to be like that who says yes ah? Come up, come up, come up.

Student: Sir this line is here; so there should be a line here.

What Shourav says is this; since there is line here there should be a line here; did I, did I get right is he right, is he correct?

Student: Yes sir.

What is this line signifying? Line of intersection between 2 surfaces which once; this plane here and this guy here right. So, if there is line here, would there be a line here?

Student: ((Refer Time: 32:42)).

Ok, who disagrees? Good.

Student: Sir, yeah? Cylinder is not going ((Refer Time: 33:02)).

From here to here. So, there 2 parts; one part is getting truncated over here corresponding to which there would be a line here. The other part is going straight out and it is getting truncated over here. So, this arc focus try to understand this; so this arc emanates from here gets truncated here ok goes flat. And, that constitutes this horizontal surface; the other part of it goes up over here or gets truncated over here and that corresponds to this plane here. So, there would be a line here.

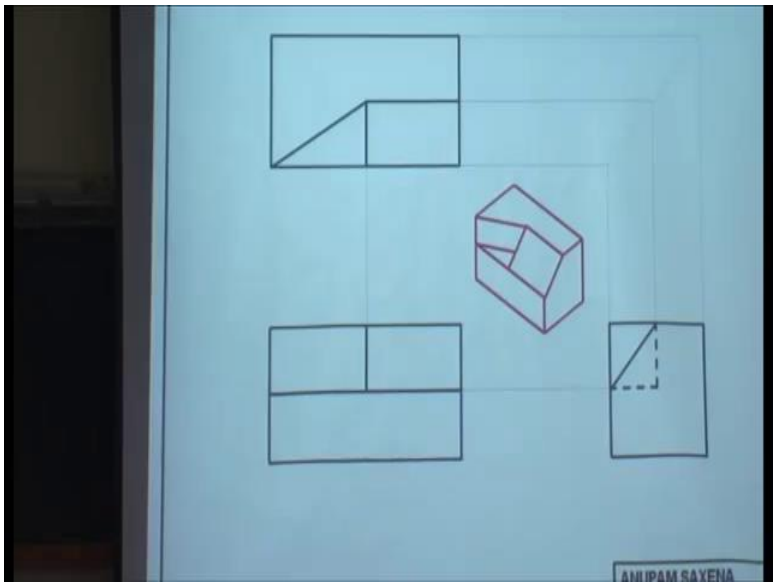
Student: ((Refer Time: 33:45)).

I am allowed to make mistakes; if I do not make mistakes many of you guys will be dosing of. The fact that I make mistakes keeps you guys vigilant and active; right or wrong.

Student: ((Refer Time: 34:06)).

Ok this is tricky.

(Refer Slide Time: 34:16)



And, what is your name yeah?

Student: Chirag.

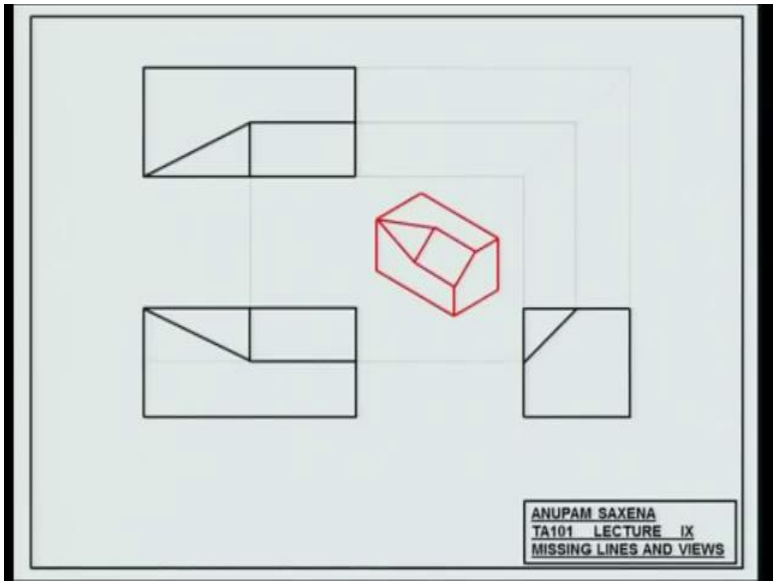
Chirag; your question will be answered now. This is an example where just correlating different features in different views will not help; you will have to draw the pictorial view of the object. I will need some more time I will need about 10, 15 minutes ok. Now, this what we will do; I would not say anything from now ok. You will just see a line either a grey line or a dark line on your screen and you have to say yes or no ok? Here, it goes yes or no?

Student: No sir.

Ok, assuming that it is a yes; assuming that it is a yes? If this is a yes; then these 2 lines are possibilities. And, if these 2 lines are possibilities then this is how your solid will

look like ok. Let me retract these steps. Chirag and others; line number 1, line number 2, line number 3; if I draw these 3 lines I get to see a solid which looks like this.

(Refer Slide Time: 37:14)



However, if I draw this line instead can I do not need these 2 inner lines; in which case the solid is gonna look like this. In case 1, I have to work with 3 lines, in the second case I can just work with 1 line. So, there multiple possibilities but the understanding is that you have to work with minimum possible number of lines; this is what the understanding is minimum pa there is one more.

Student: ((Refer Time: 37:58)).

One more possibility with same number of lines ok; yeah how about Avikalp has another Avikalp.

Student: ((Refer Time: 38:21)).

(Refer Slide Time: 38:31)

Student: ((Refer Time: 38:35)).

Ha.

Student: ((Refer Time: 38:38)).

No, all 3 should be complete assuming that the 3.

Student: ((Refer Time: 38:46)).

No, no what is given to you it is but again all 3 projections they should be complete. Assuming that the three projections are uniquely representing a solid; all 3 should be complete. And, how do we know you have to develop an eye.

Student: ((Refer Time: 39:06)).

Minimum possible line are to be introduced; this is the un said understanding un said statement. I can introduce theoretically I can introduce the square here, a square there, a square there and you get the block. I can do that I can do that as many number of times as possible; no body stops me from doing that. But then I am not looking at multiple possibilities; I am looking at focus. So, guys in the in the C S E there 2 things happening in parallel; there 2 things happening in parallel; one is Avikalp is sharing another Avikalp with you. And, second is I am speaking with Anshuman and I want you guys to people at in patient. So, can you take your seat?

Student: ((Refer Time: 40:23)).

Curved plane.

Student: ((Refer Time: 40:28)).

2 address Anshuman end the rest of you; once again the understanding the unstated understanding is you have to work with minimum number of lines; adequate enough to complete of the 3 views ok. And, to address another Avikalp of Avikalp this is the plane hold on, hold on, hold on; this is the plane defined by 4 points which are coplanar or not?

Student: ((Refer Time: 41:18)).

They are not coplanar ha a plane is defined by 3 points.

Student: ((Refer Time: 41: 25)).

It is a ((Refer Time: 41:28)) plane.

Student: ((Refer Time: 41:31)).

Twisted, yeah.

Student: ((Refer Time: 41:33)).

It is what yeah that is that is that is something which is not allowed. So, something that you need to keep in mind, something that you need to keep in mind try to avoid these possibilities. Because this is the plane which Avikalp says it is what; these 4 points they do not lie on the same plane it make sense, because it is 3 points that define a plane uniquely, yeah.

Student: ((Refer Time: 42:10)).

What is the principle?

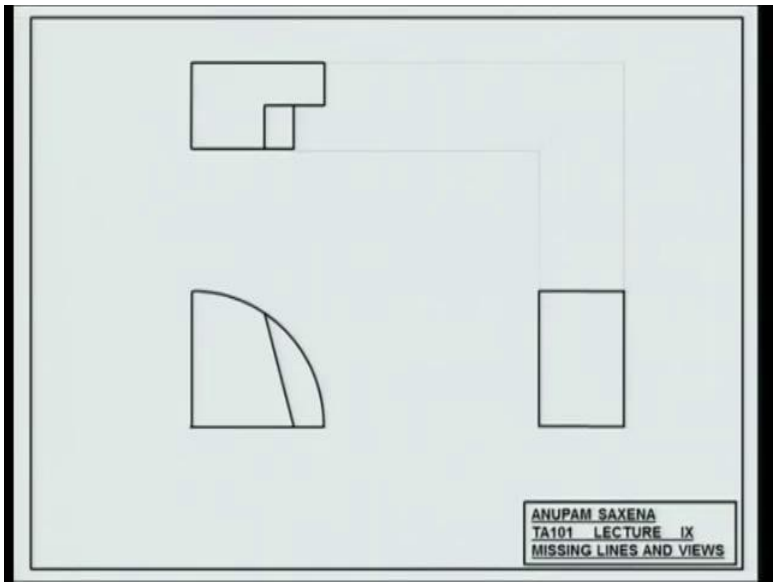
Student: ((Refer Time: 42:21)).

Ok. So, Kevin I will are you guys with me so far; who is not who is not with me so far? Everybody with me?

Student: Yes sir.

Good, I will answer this question later after class. Let me proceed; it does help if you are drawing the pictorial view of the object along side when you are in process of correcting the 3 orthographic views.

(Refer Slide Time: 43:26)

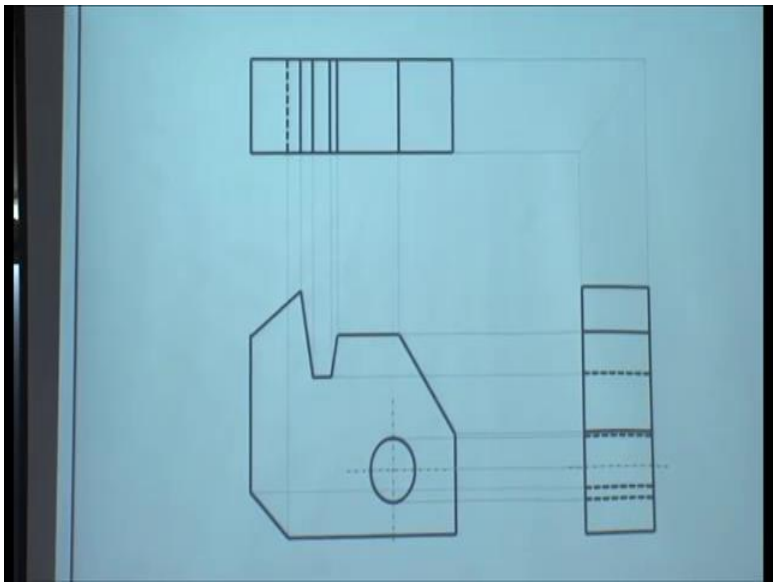


This one once again I will start drawing; all you need to do is give your consent or give your decent, decent, decent say yes or no?

Student: ((Refer Time: 43:47)).

Ok good enough. So, try to figure out the drawing later on I mean try to figure out the object later on.

(Refer Slide Time: 43:54)



This one is quite straight forward, quite straight forward. So, you have given you have been given the front view 2 squares as the top and the right; do not think loudly, do not think loudly just say yes or no stay with me? Yes, yeah.

Student: ((Refer Time: 44:33)).

Solid hidden, solid hidden.

Student: ((Refer Time: 44:40)).

What?

Student: ((Refer Time: 44:47)).

Ha?

Student: ((Refer Time: 44:48)).

What you saying?

Student: ((Refer Time: 45:06)).

What you saying?

Student: ((Refer Time: 45:08)).

I am lost, I am not with you; you are with me I am not with you; what you saying again?

Student: ((Refer Time: 45:22)).

This thing?

Student: ((Refer Time: 45:27)).

Ok all right; so are you with me?

Student: Yes sir. ((Refer Time: 45:43)).

Center line

Student: ((Refer Time: 46:05)).

Done.

Student: ((Refer Time: 46:07)).

Do not miss out on even the center lines when you are completing your views; this example is there on the web page. So, if you want you can take a look; so I am done. Thank you.