



# IIT Madras

ONLINE DEGREE

**Computational Thinking**  
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**Lecture – 3.5**  
**Introduction to procedures and parameters**

So, when we were looking at these price a distribution issues, we said that we would look at the highest marks across subjects, but if we know the highest marks across subjects, surely the highest total should also be just the sum of the higher marks do not you think?

May not be like that because I mean I have seen at least when we looked at the cards, we saw that somebody when we did the pairing you notice?

Yes some people.

So, some people are.

in only one subject and.

So, then, maybe we need to (Refer Time: 00:43).

In fact, I would suspect that. That is usually the case I mean people who are very strong in physics and maths.

There is correlation between physics and maths I think.

Maybe.

People do well in maths, they do well in physics, but may not do well in chemistry.

So, maybe one thing would be to find out if there is a good kind of all-round student who has got. So, if there is a very high total for example.

Compared to the total in subjects. Then, there is one, but otherwise there will be a lot of variation in the class across subjects.

Correct.

So, supposing we want to find that out so, what we want to do is compare the highest total with the highest marks total of each subject added up.

So, which means that we find the highest physics mark.

Yes.

We find the highest chemistry mark.

Yes.

We find the highest maths mark.

Then we add these three highest marks.

Correct.

Right, we add these three highest marks. Now, these addition may not be the same as.

The.

The highest total.

Correct.

Right.

So, we have to then separately find the highest who.

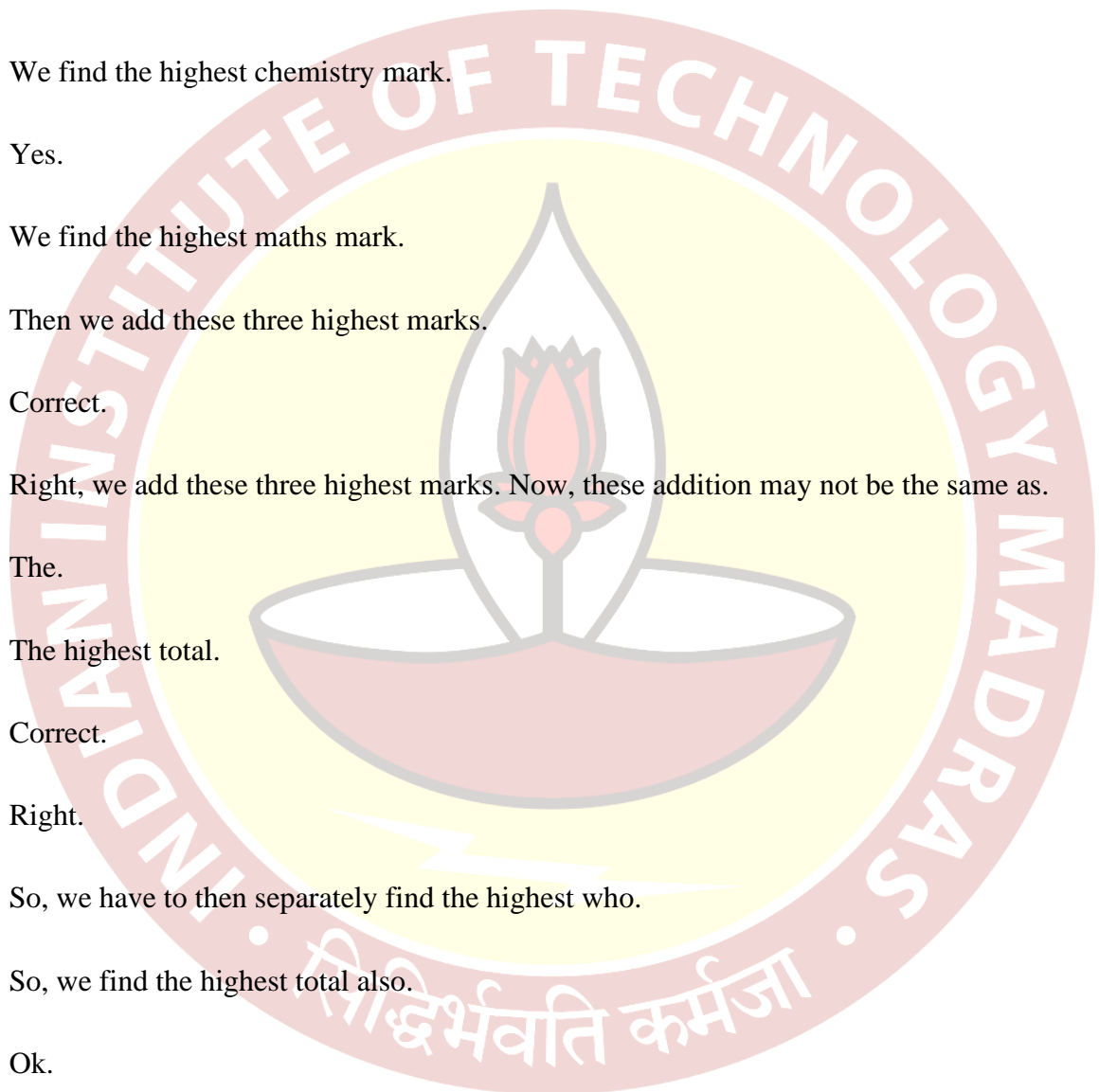
So, we find the highest total also.

Ok.

And then, we compare the highest total with the sum of the highest marks maths, physics and chemistry marks.

Yeah.

And assume that difference is very large, assume it is a large.



Yeah.

Then, it tells you basically that if the difference is very small, it means that the best student in the class is doing well.

Across all these.

Across all subjects.

Yeah.

But if there is a difference, it tells you basically that.

Some students are either.

Good in keep maths and physics.

Or they are focusing on some subject.

Some subject, they are focusing.

Ignoring other subjects.

Ignoring other subjects ok. So, it is worth finding that out.

But the only thing is that you say I am a bit tired; I do not want to do this four times right. So, supposing I do not have the energy to do this.

Right. So, I can so, it is really the same thing each time right except that I am looking for maths or.

In terms of finding maths you are saying.

Chemistry or physics or total.

We are going through this thing once and finding the maximum. So, maybe I can find somebody like a subcontractor.

So, I can outsource this to somebody.

Who will define the max?

You for example.

Who will do the max.

Who will do the max for me?

Ok.

So, I will tell you.

I am the max.

Which max I want.

I am the max finder.

I will tell you which max I want.

Max finder contractor.

And I will give you the cards.

You give me the cards.

And you return back the cards with the value that I am asking for and then, I will give it to you again with a different question and you return it, but for you, you are just doing the same.

Doing the same task.

Each time except you are looking for a different.

Since like you know I mean when you say subcontract, it is like these people who make things right so.

Yeah.

Somebody makes nuts or something like that.

Yeah.

You can give him make a bigger nut for me, make a smaller nut for me.

Yeah.

He makes a nut according to your specification.

Yeah or for example, it could be a tailor for example.

Tailor.

You make a yellow shirt for me,

Make.

Make a red t-shirt, you make a.

Or with the different sizes right.

Correct different size.

Different sizes.

Yeah.

Different measurements and so on, but he will always stitch a shirt, he knows how to stitch a shirt.

Yeah.

Cut the cloth.

Yeah.

Follow the same method for making the shirt.

I give you some guidelines as to what I want and then you adjust.

According to that and give it back.

Right I understand.

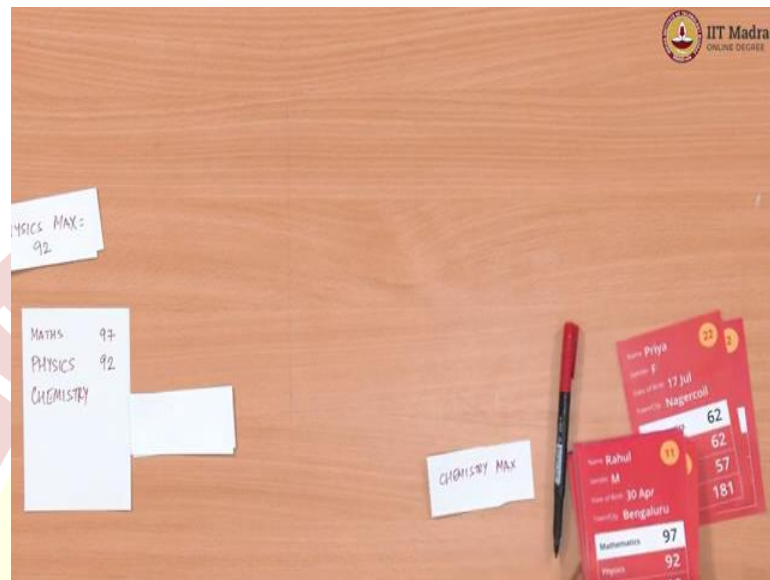
So, for instance I will.

So.

Start with let me start this.

So, I want for instance to start with the subject wise. So, let us start with maths.

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So, I give you the instruction saying that. So, I want the maths maximum marks.

So, I give you the cards.

And I say please give it back to me with this value filled out right so since.

I can do whatever I want to with the cards.

Now, I will just wait for you to come back maybe go and have a cup of tea or something and.

But meanwhile I can do this.

Yes.

I what do I need to give back to you? I give back to you the maths marks.

Give me back the cards and.

I have to give the cards back.

Yes.

And I can mess around with the cards.

Possibly I do not. I am not asking you to return the cards to me (Refer Time: 04:08).

Of course, I cannot tear it.

So, I need all the cards back.

You need in the Same.

But may be the order might be disturbed.

Order is disturbed.

Disturbed.

It is alright.

That is ok.

Let me work on this.

So, I will just sing a song or something may I.

While I do this ok.

Yeah.

So.

So, you will of course, follow the same procedure as before (Refer Time: 04:25).

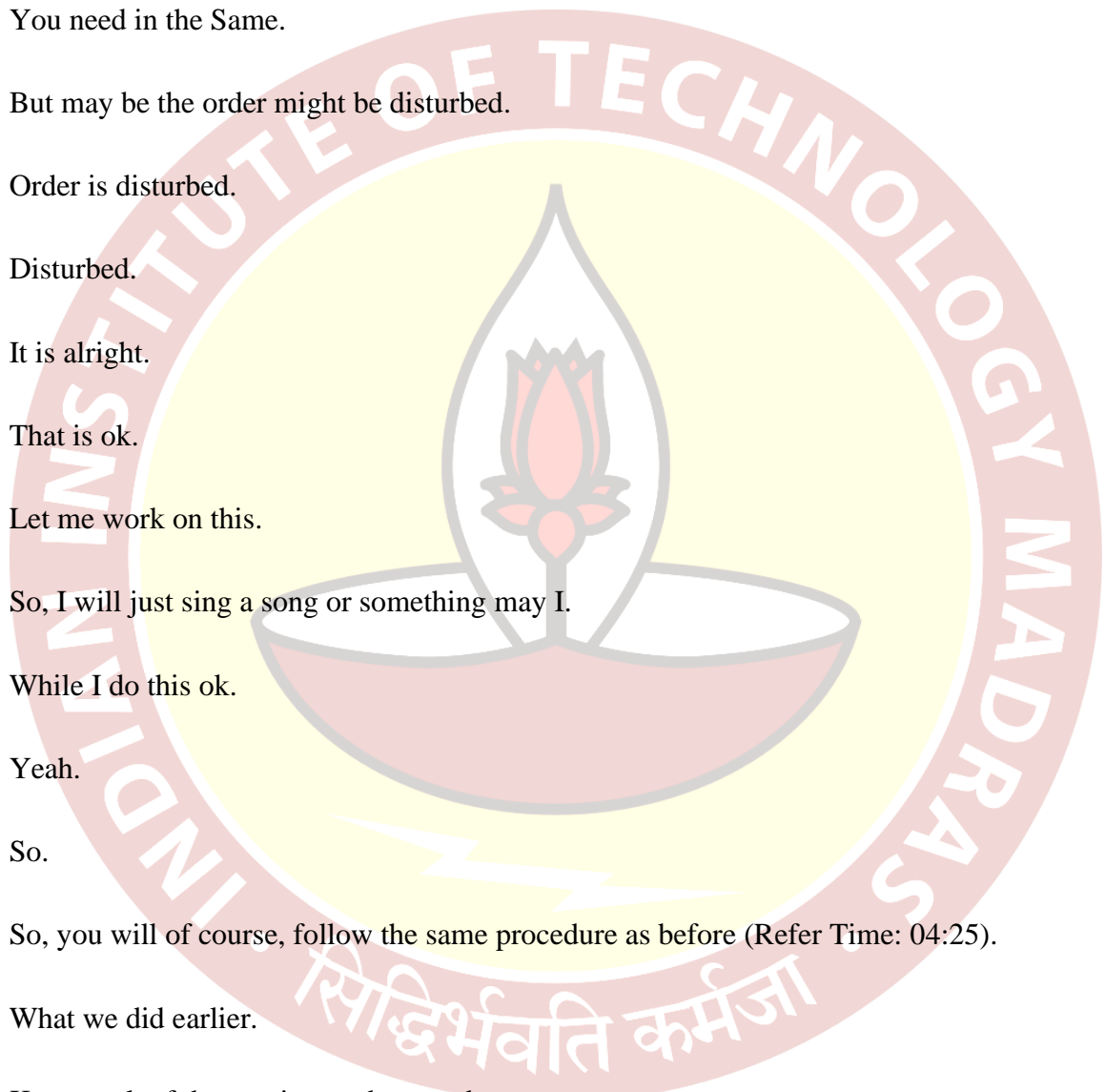
What we did earlier.

Keep track of the maximum that you have seen.

I keep track of the maximum that we have seen.

And keep updating.

And so, I have actually gone through the cards.





And now you have to write down.

And now I have the maximum mark which I found for maths which is 97 ok.

So, now you come back and tell me I have done my job.

So, I have done the job. Of course, I mess around with the cards.

Yeah.

Right its order may have changed, but I have written you the maths marks.

So, now I take this back from you.

Maths.

So, I have the first piece in my puzzle. So, I need it to find out the three maximum marks in the subjects and the maximum total overall.

So, I will say that for maths based on the answer that you have given me I will note down that it is 97 because that is what you told me.

Ok.

Now, I have to look at some other subjects. So, supposing my next subject that I want to look at.

Is physics.

Is physics, then I will change this instruction. So, I will give you like this is like the tailor getting a different size.

Ok.

So, I will tell you now please do the same thing, but this time give me the.

Physics max.

Physics max.

So, I do the same thing. I use follow the same procedure which means I keep track of.

Except you.

One maximum variable.

Yeah.

I keep updating it looking at all the cards right, comparing it with the maximum.

Exactly.

And updating it when I find a higher value and so on and I go through this procedure like this, I will see all the cards and I might disturb the order, but I have done that and the result I got is 92.

Ok.

Ok.

So, now you give it back.

Now, I give it back to you.

So, notice that from my perspective, I am just sitting idle I have really delegated this work to somebody else and I am trusting that the answer that comes back is what I have asked for. So, I have asked for something, I am giving the data with the question and I am getting back an answer with the data returned to me.

Possibly the data in the sense of cards is shuffled compared to what I gave. So, I cannot promise that the cards I gave are in the same order, but I get the answer I want. So, I have to believe that this is right. So, I have to believe this and write down 92 here and finally, I do the same thing for chemistry. So.

So, presumably if I follow the same method, I am not changing the method each time.

Yes.

The same method I am following. So, if the method is right the first time.

Yes.

Should hopefully it will be right the second time and should also be right the third time is not it?

Exactly, if provided it for.

Provided it is right ha to start with ok. So, I do the same thing. This time I am looking at chemistry. So, basically, I am comparing the chemistry, I have started with the value.

Yeah.

Initially 0 and then, I keep comparing the value and updating it.

Each time I find a card with a higher value, I update the value like what we have discussed earlier. I go through the entire list like this.

Right I might disturb the order.

Yes.

But they have done that the end of it I come with the answer 97.

Ok.

Yeah.

Very good. So, now, you return this all back to me.

So, now by doing this delegation three times, I have got these three totals for the three subjects. So, one interesting thing that we wanted was what would be the case if this a student had got all these highest marks.

Correct.

Right. So, if we add this up, we get 286. So, since these are the individual (Refer Time: 07:38).

You call it max total or something right. Let us call it something.

So, we will just call it.

Total of max.

I will call it max subject total; it is not a very high score.

Max subject total alright that is fine max subject total.

So, we know that nobody could have got more than 286.

Because they could not have got more than this in any one subject.

But the question is did anybody actually achieve this?

Actually get 286?

Right.

So.

Now, I want to ask you separately to look at just the total the last column in this and answer to me the maximum that you see for that.

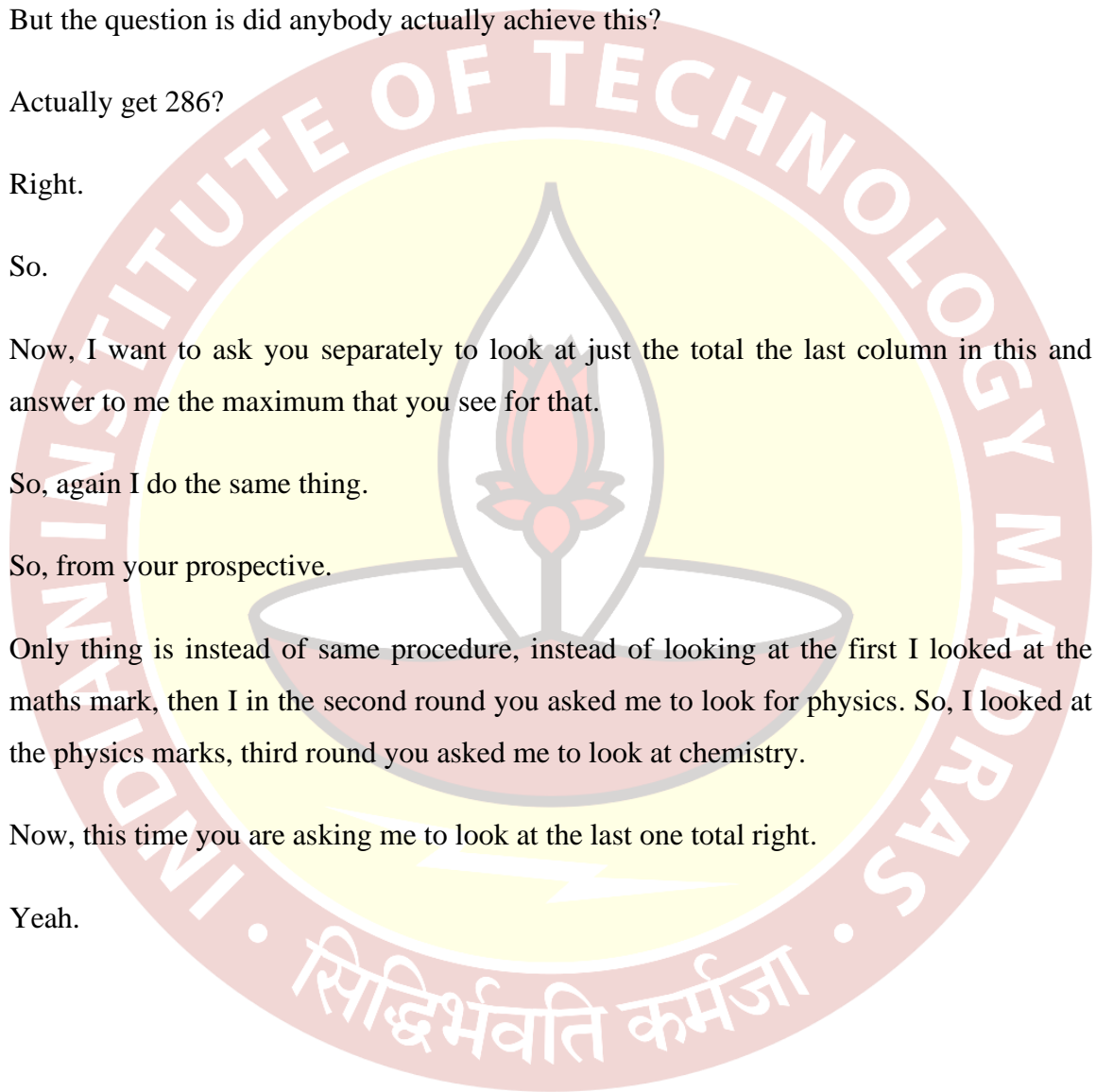
So, again I do the same thing.

So, from your prospective.

Only thing is instead of same procedure, instead of looking at the first I looked at the maths mark, then I in the second round you asked me to look for physics. So, I looked at the physics marks, third round you asked me to look at chemistry.

Now, this time you are asking me to look at the last one total right.

Yeah.



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So, again I start with 0, compare it with 276, 276 is higher update it, 254 is lower do not update it, 250 lower do not update it like that I do and I go through all the cards till I find the maximum and you know let us say I have done that and I found the maximum to be 280 something I think, I am just going to look for the card 281 this guy is best 281 is the maximum. So, 281 ok. So, I return the cards.

So, now, we have.

Messed up.

Done this.

Messed up.

Messed up.

But.

Perhaps but.

But I got you the answer 281 alright.

So, separately we have this.

Which is max total.

Just the max total.

Which is 281.

So (Refer Time: 09:20) it is different.

So as we suspect it, these two are not equal.

Not the same.

Not the same. So in fact, there is a difference of 5.

5.

Which on this scale of things is not bad.

Not bad.

So, this student who has got 281 is actually got 92 in chemistry whereas, the maximum is 97. So, he is done less than full, but not done very badly.

So, if this had been something like 250 or something, then it could have been.

A big difference.

Something we would have to investigate.

Right.

In terms of how the class is doing.

Why are people is three subjects too much, are they only able to focus on two of them at a time. So, these are questions that might come up if we find too much is slip inside (Refer Time: 09:54).

So, here I mean just let us reflect on what we have done here. What is the pattern that we are seeing here right. So, you are we have done four times we have called something.

Yes.

Four times. So, we have called. So, you said subcontract right. So, the subcontractor basically has done the same procedure.

Exactly.

Exactly the same thing.

Four times. First repeat it first they did it for physics, first did it for maths, then or whatever whichever order first we did it for maths.

Then.

Then, we did it for physics, then we did it for chemistry.

Yes.

And then, we did it for total.

Yes.

Now, the difference between these four times when we did these four times is each time we were looking at a different field in the card.

Exactly.

Right. The first time I looked at the maths field, next time I looked at the physics field, then chemistry field, then final round I looked at total field. Other than looking at a different field, everything else is exactly the same.

Correct.

I had a variable which I kept which is the max variable, I compared that max variable with the value I am reading from the card that value could be different.

Because depends on whether it is maths, physics, chemistry or total and then, if it was higher than I update it so and then, repeat this till I finished the cards. So, this procedure is exactly the same in all the four rounds.

Yes.

So, we should be able to write this nicely right means in the sense what is this, what would this be in programming is this is there a name for it?

So, we could call this procedure.

It is a procedure.

Because we are talking about processes and procedure. So, let us just give it a name.

Procedure.

This is a procedure.

So, this is a procedure

Which we repeatedly execute.

But in each time we are doing different something different.

So, we have to pass I mean so, the procedure has some set of instructions.

It has a set of instructions which it follows.

Which it follows.

But obviously, if it does the same thing every time, it is useless.

Ok.

So, it must be adjusting to something.

Ok.

And in this case, we are adjusting to it by giving it a different.

The field name.

Field name. So, there is.

So, you are you are passing; you are passing the field name to this procedure.

Yes, to make it adapt to that particular.



So, this business of passing is there a name for this in programming when you call it something.

So, I think we normally call it a parameter.

Parameter.

Parameter.

So, the procedure has a parameter.

Yes.

Which is the field that you want to look at.

Yes.

And this parameter, you are giving me. So, you gave it to me by writing.

Yeah.

In your cards.

So, I wrote down.

You wrote chemistry, maths

The name of the subject.

You wrote chemistry or physics or whatever it is. So, you gave me the parameter to look at the field to look at as a parameter to the procedure.

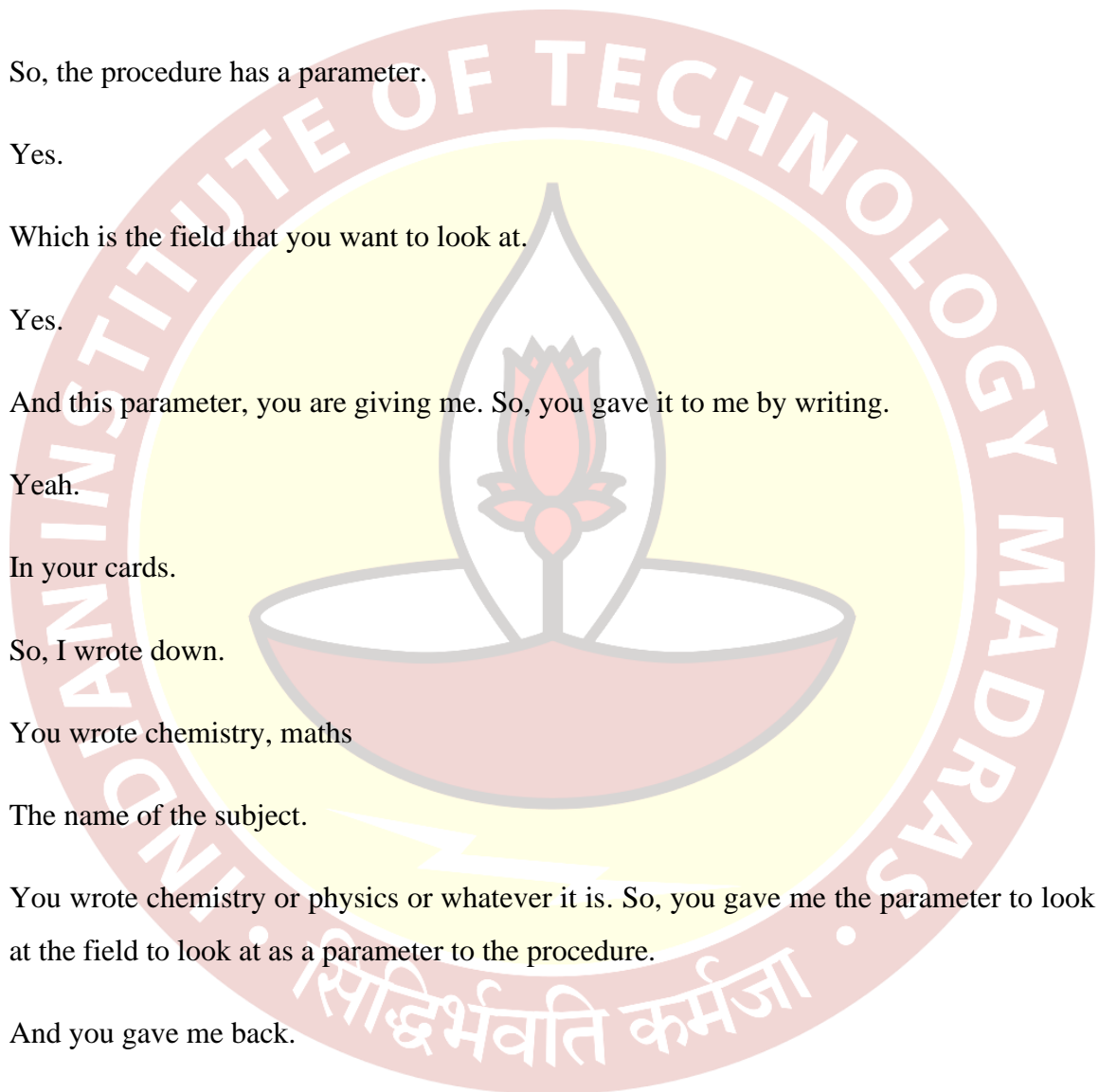
And you gave me back.

And max I guess is the name of the procedure.

Yeah.

Max is the procedure.

Yeah.



Max is the name of the procedure.

Yes.

Chemistry is the name of or physics or.

Yeah.

Total is the name of the.

Parameter.

Yes, so, we could write it like this. So, we could say that I ask you to compute the total.

And like we have in maths, we use these arguments right. So, we say square of  $x$  or  $\sin$  of  $x$  or something. So, I can write the parameter inside. So, I will say total of maths. So, this is like.

OR in this case, you are doing max, but the procedure is max.

Sorry max of.

So, you can say max of maths.

Max of maths.

And then, you come back to me with an answer.

With an answer.

So, 92 or 97 in this case.

Similarly, you can ask max of physics,

Yes.

Max of chemistry.

Yeah.

Or max of total.

Correct.

So, max is the it is like; it is like a function in what we have seen in.

So, you can think of it to be a function except that the what you are operating on so, if I say max of physics right. So, what you are operating on normally when you are doing a function is that you are looking for a over a range of inputs. So, here our inputs are the cards and the parameter is telling.

So, there is some data set on which you gave me. You are a contractor.

You have a data set. You shared this data set with me.

Yes.

As a subcontractor, I got access to your data set.

So, and you have delegated this work to me. So, it is a delegation right.

Yes.

You delegated this work to me as a subcontractor, I have access to your data set.

Yes.

You gave me access to your data set. If you did not give me access to the dataset I cannot do anything and, but then, I have when you wrote this contract with me, I we also agreed basically that if I mess up with this data set of course, I cannot tear it, I can mess up with the order.

Yes.

You do not have problem with that.

Yes.

So, if I return it to you in a different order, you do not complain and say.

As long as you do not damage a card or change any of the fields or anything, you do not update anything in that its fine.

Its fine.

So, we agreed on this how I will return this data set which we share how I will return, what state I will return it we agreed on that and then, we agreed basically that there will be a parameter you will keep changing.

Yes, and for that you will.

In this case, there is only one parameter.

And you will.

Which is the field.

Give me a value which represents.

And I will return the value, one value.

Yeah.

Which represents.

Which we agree what it means.

What it means we agree.

Yeah.

So, this is a procedure with a parameter.

Yes.

So, parameterized procedure ok.

