

00:00:16:12 T All right, please take your exercise book.

00:00:35:24 T Lukas, put down the chair over there too. ... Claudio, put down the two chairs too, please.

00:00:46:05 S ( )

00:00:52:00 T Also put down the chair next to you, please

00:01:03:02 T All right, good morning everybody.

00:01:04:20 E Good morning.

00:01:07:15 T Well, let's imagine today to - -eh-, we come closer to Christmas-time -

00:01:11:22 T we want to send a present to our friends, a present that has a long and narrow shape.

00:01:20:13 T It could be a thin straw, it could be I don't know,

00:01:25:12 T has anybody an idea? I heard that- Joel you were about to say something?

00:01:28:08 SN No, no, no, nothing

00:01:29:26 T No idea? A long and narrow object. So we ask at the post office, has anybody noticed,

00:01:36:10 T at the post office there are boxes with different shapes and this are the six shapes you can see over there.

00:01:42:10 T There is the box number zero, the box number one, number two, three, four

00:01:48:26 T and five, and those boxes have different shapes decided by the post.

00:01:55:00 T Now ever- every group - you sit together in groups of three and one group of two -

00:01:59:28 T will receive a box. Start observing this box a little bit, there are

00:02:05:26 T some instructions in common that they give together with the box. Look what's

00:02:11:00 T your box number, the measurements, the dimensions of that box

00:02:15:09 T and then take one of these straws, try to find out the position in which the straw

00:02:22:20 T can be placed to obtain the longest straw. That means to insert the

00:02:27:25 T whole straw, it's very possible that it doesn't fit even in the biggest box,

00:02:31:18 T try to obtain the longest straw by cutting the straw from the start

00:02:38:20 T of the point in which you think you received the longest straw.

00:02:42:12 T That means to insert it that way, insert it horizontal. Try to find out which is

00:02:47:09 T the longest straw that you can thread into this box. Once you have found out

00:02:52:14 T the position in which the straw is the longest, cut it-

00:02:56:08 T cut it, you can keep the rest of the straw if it helps you for further observations you can

00:03:01:09 T also cut it. Measure it, you have a tape-measure, you have a ru'll have a mass.

00:03:13:10 T Check with the calculations if the found measure is correct.

00:03:21:01 T Doing, you have to observe the box a little bit and see how you can find

00:03:25:18 T the length of this straw. The calculations, do them -eh- one copy per group

00:03:33:02 T sketch your calculations a bit doing the reasonings that you need,

00:03:38:00 T then everybody will get a sheet of paper and can start completing the casket where you can find the number of your

00:03:44:25 T box and write the solution that you have found. After finishing, I'll pass by the groups and

00:03:52:08 T you will make a foil of the results you have found. Therefore the material that you

00:03:57:03 T need is: Calculator, -mhm- sheet for sheets per group and you work in

00:04:02:14 T groups by three or two. Only one person displacing with the chair, eh.

00:04:29:15 SN Thanks.

00:04:30:10 T You're welcome.

00:04:36:18 SN To do the calculations you have to find ( ) calculations in the way to find this measure of the straw?

00:04:40:20 T Yes.

00:05:08:15 SN Madam, but and when is not ( ).

00:05:11:01 T ( ).

00:05:46:20 T Also observe your instructions a little bit, eh?

00:06:03:20 S? Madam, can we already cut it?

00:06:05:16 T Of course you can already cut it, yes.

00:06:11:22 SN Madam, Madam, can we ( )?

00:06:15:10 T No.

00:06:23:00 T Cut the straw already. Have you found the best position?

00:06:26:06 SN -Eh- ( ).

00:06:31:23 T Well, cut it.

00:06:33:21 SN And if it's wrong?

00:06:34:10 T In case it's wrong you take another piece and then you use the rest of the straw.

00:06:45:20 SN -Eh- it's forty point five.

00:07:10:02 SN Well, well, this // is the length ( ).

00:06:51:00 SN // -Eh- [yes]

00:07:07:06 SN You do it that way?

00:07:07:18 SN Put it a little // ( )

00:07:08:18 SN // You measure forty?

00:07:09:22 SN Forty point five.

00:07:16:10 T Look, you have instructions -eh- that are already given.

00:07:19:00 SN -Ah- already.

00:07:24:05 T Try to cut it and then if it doesn't work you'll take another piece of straw and- try.

00:07:28:25 SN We only cut one piece.

00:07:31:00 T Find the longest straw that you can place in your box -mhm- [yes]..

00:07:34:07 SN Madam, like this it's longer ( ).

00:07:37:20 SN ( ) calculate it like this.

00:07:40:12 T Try to think about, it isn't that complicate.

00:07:58:15 T So did you already cut the straw?

00:08:00:10 Ss No.

00:08:02:05 T Go on, cut it and also if you'd fail, you can do it again. Look, you have already got the- the instructions.

00:08:08:22 SN Yes, yes, but we have already fou //nd.

00:08:10:12 SN // We have already found it.

00:08:11:25 T You have it already- then- ok: Complete the sheet.

00:08:15:07 S? But don't we have to do the calculations.

00:08:19:00 SN We, we've got it //

00:08:19:29 T // You have inserted, cut and measured it.

00:08:22:20 S? Yes.

00:08:22:28 T Voilà. Ok. Then now you can try with the calculations to check if this length correspond to what you have measured.

00:08:33:20 S? ( ) the diagonal like this so ( ).

00:08:41:20 T So complete: Here with your situation, with your straw, you have the box number two and you put it - do it again here //

00:08:54:08 SN // -Ah, we have to do//

00:08:54:20 T // and then start doing this, call me to have a look at it when you've finished.

00:08:57:20 SN Like this, Madam ( ).

00:09:03:00 T Now have you found the straw and have you measured it?

00:09:04:24 Ss Yes.

00:09:05:14 T Now observe the box then put it aside.

00:09:13:14 T Insert the straw: What- if I- so in your opinion what is the longest straw laying in the box?

00:09:24:00 SN No, no shorter.

00:09:25:02 SN Shorter.

00:09:31:00 T One that's shorter.

00:09:33:13 SN Like this.

00:09:35:00 T So in reality I could take a very shallow box, if I place the straw

00:09:39:27 T that way- a very shallow box, it's of no use that the box is that high.

00:09:44:15 T Could I have it low like this? ( ) a box this big but it's of no use.

00:09:51:25 T Try to think about if you somehow can use the fact that it  
00:09:55:02 T is high, that you have a box high like this.  
00:10:00:21 T If not I'll give you another straw, if you need one.  
00:10:05:21 SN We have finished.  
00:10:06:09 SN We have finished.  
00:10:07:05 T So, then. Try to complete this sheet. Everybody has its own.  
00:10:13:29 S That means together?  
00:10:14:25 T Try if you reach- yes, yes together. Here you write the calculations you've done ,  
00:10:19:03 T drawing the straw and then try to do the calculations from the other boxes too,  
00:10:25:10 T those that aren't yours. So in a few words, you, with the straw inserted like this,  
00:10:29:25 T in reality it isn't of any use that the box is high, it could also be a box very flat.  
00:10:39:00 SN Yes, \*good\*.  
00:10:39:25 T It's already very flat, yours // really.  
00:10:41:07 S? // Yes  
00:10:43:00 T But in reality you won't use the fact that- that it's high. Try to think about if you utilize the  
fact that this one is high.  
00:10:49:04 S? You can do it like this.  
00:10:49:22 SN Place it like this. Raise it, raise it.  
00:10:53:19 S? Like this, yes.  
00:10:54:24 SN No, like this it isn't // If it is, here.  
00:10:56:03 SN // ( )  
00:10:57:25 SN Like this.  
00:10:58:18 T So from you we won't make up for a lot, but in fact...  
00:11:04:03 T // this distance here.  
00:11:04:03 SN // ( )  
00:11:05:03 SN How do you do it? ... With the height?  
00:11:08:12 T -Eh- calculate now think- le- leave this like it is. Try to  
00:11:12:18 T do the other. Now you may have to replace it. Try now to cut  
00:11:16:18 T the right one here again. Like you said ( ).  
00:11:19:24 SN ( ) like this.  
00:11:20:17 T Try to cut it.  
00:11:22:10 SN Be careful.  
00:11:32:15 T It's a little bit too much. You have to cut a bit more.  
00:11:39:00 T Yes, without forcing it.

00:11:41:15 SN -Eh- ( ) like this ( ).

00:11:44:26 T Now how can I calculate the length of this straw?

00:11:51:05 S No, you do it, here.

00:11:52:10 T So, do you have the instructions of the box, where are the instructions?

00:11:55:08 S Here.

00:11:55:15 T Then you know how long it is, how wide it is, // how high it is.

00:11:57:24 S // ( ) we find.

00:12:00:10 T Now reason within the group, explain it to them.

00:12:06:00 SN Madam, in what sense this calculations ... ?

00:12:08:15 T Have you found // the longest straw?

00:12:09:10 S? // Yes, yes.

00:12:10:00 T So then, how is it?

00:12:10:20 S? Like this.

00:12:12:10 T Without bending it -eh- you can't bend the straw.

00:12:15:20 S We did it that way.

00:12:16:20 T No, no, no, without bending it -eh- without bending it. .

00:12:20:00 S -Aha-

00:12:23:10 T You haven't found it yet, try to thin- try to place it into this straw Ö without bend it, eh?

00:12:33:00 SN No. First ( ).

00:12:34:02 SN Once ( ) and once here ( ).

00:12:37:00 SN Why?

00:12:38:04 SN Because it's written here.

00:12:41:00 T So I- have you found the straw? How is the position?

00:12:43:28 S Like this.

00:12:44:17 T This one. Now are you calculating its length?

00:12:47:00 S Yes.

00:12:47:20 T How do you do it?

00:12:50:00 S We measure.

00:12:52:12 T Ok, measure, this was the first operation, now you have to calculate the length of the straw.

00:13:00:20 S With the pythagorean theorem you can calculate ( ).

00:13:04:10 SN And because we placed it oblique

00:13:06:00 T But try to cut the straw corresponding to the diagonal and insert

00:13:09:23 T the straw correspondin to the diagonal.

00:13:15:20 SN Yes but.

00:13:16:08 SN It's from there to there to here.

00:13:19:25 SN No, wait, wait, wait.

00:13:32:00 SN Like this we see ( ). Let it go. \*Good\* cut it down here. No ( ).

00:13:45:00 T Ok. This is the diagonal, more or less, also if no- now however you, with pythagoras

00:13:50:00 T I can calculate this, ok, with this and this, you have also the measures.

00:13:54:01 T But now I'm interested in this. But it- I know //

00:13:58:13 S // -Ah- but now if I have this and this- if I have this and this I'll find it.

00:13:58:13 SN // I. I, I know that you need to do the- the- the- the- the

00:14:05:05 S But no, but because this one here is practically the diagonal, if you do her above ( ), that's it.

00:14:11:00 SN No, it's right..

00:14:11:15 T Listen to Boris and then try to observe this sheet and complete it.

00:14:16:20 S Ok, listen ( )

00:14:22:00 SN -Eh- the diagonal here ( ).

00:14:26:00 T -Mhm- [yes].

00:14:26:15 S Right?

00:14:27:12 T Yes.

00:14:45:15 T We try to be as exact as possible and not to loose the precision in our calculations.

00:14:57:00 T Or as we said: Instead of writing this, I can write?

00:15:01:12 SN This.

00:15:02:00 T Directly. -Mhm- [Yes].

00:15:06:26 T You can also write here afterwards.

00:15:19:20 T But now try-you are calculating other boxes //

00:15:22:20 SN // Yes but //

00:15:22:28 T // you are already at the second, after some time it seems to be the same thing.

00:15:25:15 S Only that ( ).

00:15:27:02 T Look a bit to the measurements. Look here, they have the same length ... .

00:15:33:25 T The width, indeed look at number zero, pay attention to number one.

00:15:40:06 T It's quite a lot wider -eh.

00:15:42:05 SN But indeed it's right?

00:15:43:18 T And then there's the- and then there is // the-

00:15:44:23 S // -Ah- already, because it's longer.

00:15:46:18 T Afterwards there is the height // which is different, but the- afterwards we will see that it's right.

00:15:47:24 S // But it's right indeed.

00:15:51:14 T Now try a bit- you already did two calculations- try to see if there is a faster way to calculate. It's correct -eh- what you

00:15:58:12 T are calculating but I'd like to see if you can shorten the calculation- also write the unity, eh.

00:16:05:11 SN Madam, we have found it.

00:16:06:24 T Found?

00:16:07:15 S Well we used- we have the pythagorean theorem ( ) //

00:16:10:24 T // -Mhm- [yes].

00:16:11:05 S ( ) that we know ( ) and now we got ( ).

00:16:21:15 T reason. ... If you cut that right one, go on - this one you can leave down like this.

00:16:28:09 T If you cut this one it's too short. You should have found- well, I won't tell you

00:16:34:20 T ah- I don't know if everybody failed, it doesn't matter, we will correct it later. So complete

00:16:40:03 T the sheets, this part here and- and it tells you what to do with your box, then here

00:16:47:06 T there are the dimensions of the other boxes, from the other groups, try afterwards to

00:16:52:05 T calculate those too- the diagonals that you got from the other groups.

00:16:56:06 SN Because here ( ).

00:16:57:27 T The? How do you complete the title? // What is it that you apply?

00:16:59:25 SN // ( ).

00:17:03:00 T By doing these calculations, what did you apply?

00:17:05:00 SN The pythagorean theorem.

00:17:06:00 T Pythagorean theorem, eh. Pythagorean theorem in solid geometry.

00:17:19:20 T So now complete your solution in your exercise book: The calculations in blue, the solutions in red // the middle

00:17:28:00 SN // ( )

00:17:28:26 T Yes.

00:17:29:10 SN Will you write it // or shall I write it?

00:17:29:17 SN // Madam.

00:17:30:11 T In your exercise book, eh.

00:17:33:05 S Do we have to fill in all of them?

00:17:36:08 T Start filling in your part, when you have finished yours, continue filling in from the other groups too, yes.

00:17:42:10 S ( ) in scribble or do we have ( )?

00:17:44:25 T No, no, there is space here.

00:17:50:00 T Voilà, now. You are at a good point, you only have to check if it's correct, complete this

00:17:58:00 T and draw and do your calculations which now Andrea has written here, everybody write it on his own sheet

00:18:03:18 T and then there you have the dimensions of the other boxes. There is the box zero, the box and start doing the calculations like this

00:18:09:05 T for the others, seeing what the others find with their boxes.

00:18:15:20 SN We are inexact.

00:18:17:00 T You are inexact, what do you mean?

00:18:17:20 SN Well we have practically found // that the longest straw is this

00:18:19:29 SN // The diagonal from here to here.

00:18:23:25 SN Yes.

00:18:24:19 SN We found it with the diagonal.

00:18:29:00 SN From here to here.

00:18:29:18 SN From here to here.

00:18:30:05 SN Mine worked, but the straw is this other one.

00:18:32:15 SN It's logical because if you put it from here to here it will get longer.

00:18:36:20 T That means that you haven't finished calculating yet. Means that what you calculated isn't the length of the straw.

00:18:42:05 SN So we, what //

00:18:42:26 T // But it's only the diagonal from the box- from- from the circumference of the base from the box, from the rectangle, let's say the base.

00:18:51:05 S? We have to find from here to here, many ( ).

00:18:53:05 T -Mhm- [yes]. ... Use this- the measure you have already found.

00:18:59:00 SN Thrity-nine point three.

00:19:04:20 T You can write it with the pen because I think you did it right.

00:19:12:04 T Do it like this, maybe: Cut the straw that you measured, the one placed on the base. Cut it. That way you can observe.

00:19:18:26 T So now is this one here the right one?

00:19:20:18 Ss Yes.

00:19:21:14 T Voilà, also cut the one placed on the base.

00:19:23:25 SN -Ah- that way?

00:19:24:25 SN That way?

00:19:25:27 T Yes, with the // but don't- the straw after, no-yes, -mhm- [yes].

00:19:27:10 SN // Cut.

00:19:28:24 SN This.

00:19:30:06 SN -Ah- that.

00:19:39:26 T Voilà, place it on the base. -Eh- cut it again a bit more, that ...

00:19:55:00 T -Ah- Still too long.

00:20:02:15 T Ok. It's good, it's good. Now place the other. ... It get placed in the same ...

00:20:08:21 SN Like this? // in the same trajectory.

00:20:10:06 T // In the same posit- eh.

00:20:15:17 T Now here you have already calculated?

00:20:17:27 SN This? Calculated this.

00:20:20:25 T Calculated this, now observe how to calculate the other.

00:20:25:07 SN Using the pyth//agorean theorem.

00:20:26:00 SN //Using the pythagorean theorem.

00:20:29:20 SN So it's thirty-nine point six squared.

00:20:32:11 SN Minus.

00:20:33:12 SN Plus.

00:20:34:07 SN Minus.

00:20:35:10 SN // Plus.

00:20:35:10 SN // You have to find the hypotenuse.

00:20:36:21 S? Plus twelve ( ).

00:20:38:24 SN ( ) this one ( ) here.

00:20:40:20 SN And then you have to // this plus this ( ).

00:20:41:15 SN // ( ).

00:20:43:00 S -Ah- it's true ( ).

00:20:46:00 T Voilà, your calculations, write it here so that you have more space. Afterwards you can also solve them // underneath it.

00:20:52:00 SN // -Ah- but ( )?.

00:20:53:12 T No.

00:20:54:06 SN But here -eh- here.

00:20:55:00 SN But it's right ( ) // ( ).

00:20:55:15 T // No, it's ok. Afterwards write it also here // but start- afterwards write it again.

00:20:57:00 SN // Madam, but here ( ) do we have to write the same things like here?

00:21:00:05 T Yes.

00:21:04:15 T Done?

00:21:05:06 SN Yes.

00:21:14:10 SN Madam.

00:21:21:20 T Completed the foil?

00:21:22:22 SN Yes. We didn't get as far as find what ( ) fast ( ) the fast calculations.

00:21:29:06 T It isn't because you're slow, but you can do // it with a single calculation, -eh-.

00:21:31:29 SN // Even faster?

00:21:34:17 S Madam, it's true that here ( ) the pythagorean theorem ( )?

00:21:37:20 T Yes. Think about it for a moment. You square it // plus square this

00:21:42:25 S? // Yes.

00:21:44:00 T and find a result. Then take this, and from the other didn't I tell you to do it like this yesterday // isn't it like I told you yesterday?

00:21:49:20 SN // -Ah- right.

00:21:51:00 S To already use the ( ).

00:21:52:08 T - Eh- I'll take that. I and then- in reality instead of writing this.

00:22:01:20 S? -Eh- but why we ( ) //

00:22:02:10 SN // have to take the square root of this.

00:22:04:22 T Try to think about what I have to write.

00:22:06:01 SN Madam, do we now have to check the boxes with the others?

00:22:09:01 T Wait, eh. Tell me.

00:22:11:05 SN We have found it.

00:22:12:09 T You have found it. Then put- take this papers. Now write well, everybody calculate your calculations.

00:22:21:28 T In this area here write your calculations, draw the straw, read what's written and start doing this-

00:22:29:29 T Tell me.

00:22:30:13 SN I've been thinking.

00:22:32:01 T Have you finished, have you completed- here you write me- here you haven't completed yet, eh?

00:22:37:08 S? -Ah- do we also have to do this too

00:22:38:10 T -Mhm- [yes].

00:22:46:16 SN Here.

00:22:48:00 T Afterwards yes. Number three you can- you only have to fill in the same thing.

00:22:53:10 SN Madam ( )

00:22:54:10 T Yes.

00:22:54:20 SN All the calculations?

00:22:55:10 T -Mhm- [yes]

00:23:10:15 SN Madam, by doing the question we got a result that doesn't ( ). Why?

00:23:15:25 T Well, think there will be something wrong.

00:23:23:25 SN Done.

00:23:25:10 T Done. Then now complete in your exercise book where there is- what do you have? Box number? Two?

00:23:33:05 T Complete the case number two with your solution.

00:23:36:20 SN Yes.

00:23:39:01 T Shall I leave it here?

00:23:40:20 S Yes.

00:23:46:00 SN But here you can directly-

00:24:28:05 T Will you complete the title? What did you apply to find this measurements?

00:24:34:00 SN The pythagorean theorem.

00:24:35:00 T -Mhm- [yes], then the pythagorean theorem in solid geometry.

00:24:40:25 T Sit down correctly, please.

00:24:52:00 T And here write down the calculations of your box too, eh.

00:24:55:02 SN I've written it here.

00:24:56:03 T Never mind, you can transfer it- the idea was writing it above and transfer it down here ...

00:25:07:00 T Here, label it a certain I, maybe their- in the drawing- draw it. The I- Your I is only this one, isn't it?

00:25:13:10 SN The hypotenuse, which ( ).

00:25:14:15 T It's the hypotenuse. Draw it in and write the I.

00:25:20:00 S No, but then you won't understand well if I write.

00:25:22:10 T No, do it in colors.

00:25:24:00 S -Eh- [yes]

00:25:24:21 T No, here afterwards give it another name, also if there- this is also a hypotenuse, call it straw or call it //

00:25:29:00 SN // Is diagonale of the base ok?

00:25:30:00 T Or diagonale of the base, is the same, yes.

00:25:38:25 T Ready, Lucia?

00:25:41:00 SN Yes, yes, yes.

00:25:41:15 T Do you still need the box?

00:25:43:10 S? No.

00:25:43:25 T So box, tape-measure, instructions and scissors, bring everything to the table, then try to complete the rest of the table

00:25:51:14 T with the measurements from your partners.

00:26:01:10 T Have you finished yours, eh?

00:26:03:05 SN Yes.

00:26:04:00 T So in the foil you have the box number zero.

00:26:08:00 SN Madam, do we have to color them? All of the ( ).

00:26:11:25 T Yes, yes.

00:26:13:10 SN Madam, but ( ).

00:26:15:14 T What ( )?

00:26:16:00 S If we've made mistakes with the calculations?

00:26:18:00 T I don't know if it's wrong. {laugh} Complete and then we'll correct. Complete here with your calculations.

00:26:24:10 SN Here?

00:26:25:02 T There: In your exercise book, in zero. Then if you don't need it any more, bring box, scissor, tape-measure to the table.

00:26:34:20 SN \*Look\* how easy it is: Only changing all the measurements.

00:26:39:00 T Also the straws are to bring here -eh- not to play with.

00:26:52:15 SN Madam. Here I have this ( ) has this.

00:26:56:25 T -Mhm- [yes]. It's ok.

00:27:12:25 T Try to think a little bit while calculating. That means every time you square a measurement plus the square of the other, then the

00:27:20:20 T square root. Then you take this number here, it- square it again and add the third dimension in the square.

00:27:31:16 T Think a bit now if this result that I have here, I square it, if I can't instead of taking, he ...

00:27:39:11 T That ( ).

00:27:39:26 T Take the first calculation.

00:27:42:15 SN -Eh- but ... ( ).

00:27:46:00 T Now yes, but if you have finished bring me the material over there, straw a- and stuff like this, and do the measurements of the others.

00:27:54:05 T If you have already filled in the foil- no, I'll bring it to you now -eh- to fill in.

00:27:57:19 SN You need to ( )

00:27:59:20 T Now you do the same calculations with the other boxes.

00:28:02:20 SN We take ( ).

00:28:03:20 T No, don't take- look, as many measurements are written here, the reasoning is always the same.

00:28:08:15 T Bring the material over there, now I'll give you the foil to complete.

00:28:28:00 SN Do we have to do it in red?

00:28:29:15 T No, in blue.

00:28:33:00 SN No, not this. ...It's this.

00:28:36:25 SN Yes, (already).

00:28:38:15 SN And now how should I do?

00:28:40:11 T Doesn't matter, doesn't matter.

00:28:43:20 T Thanks.

00:28:47:15 T And then, Isabella, put the box in its place, eh. Wait, I'm coming. -Eh- you, complete in your exercise book

00:28:56:20 T ( ) the calculations ( ) similar...

00:28:59:19 T Tell me.

00:29:00:00 SN Is it right like this?

00:29:01:10 T Try to do it with your own and look: If you find the same result, it's right, if you don't find the same result, that means

00:29:07:11 T it's wrong.

00:29:12:16 T Have you done yours?

00:29:13:11 Ss Yes.

00:29:19:10 T But it gives you a straw of eight hundred and eighty // centimeters?

00:29:22:00 S // -Eh- yes

00:29:23:05 T But was it that long? ... Was- which one was it? This here?

00:29:27:10 SN Yes

00:29:28:00 SN No.

00:29:28:14 SN No, this.

00:29:30:00 SN Here inside.

00:29:33:25 T This one here? But take it out.

00:29:37:25 T But also if you take it out a bit, this one here is eight hundred and eighty centimeters?

00:29:42:12 T There's something that doesn't work.

00:29:45:05 SN We try to do the calculations again, try to do this piece here, it equals forty-eight.

00:29:49:15 T But take care that- Let's look to your- what did you do before, explain it to me in words, Marisa, what did you do.

00:29:55:26 SN Ok, thirty-eight point five squared plus twenty-five squared ( ) to find this diagonal here.

00:30:01:20 T -Mhm- [yes].

00:30:04:25 SN Now it's more.

00:30:08:00 T But what did Pythagoras say? Having a rectangular triangle?

00:30:16:03 SN 'Kathete', 'Kathete' ( )

00:30:21:18 T -Eh- in that triangle which is the 'Kathete'? Which is the hypotenuse?

00:30:25:09 S The hypotenuse is this one.

00:30:26:15 T -Eh- [yes]

00:30:27:00 SN And these are the other two sides.

00:30:29:00 T But this triangle here.

00:30:29:25 SN No. This is a side and this is the other.

00:30:33:10 T This is a side, that is a side and this is the hypotenuse. So if you have found this, you already have calculated it.

00:30:40:01 S Yes.

00:30:40:08 T It's fifty-five //

00:30:41:22 SN // squared plus ( ) sixteen squared and then extracting the root of everything.

00:30:48:20 T Do you agree?

00:30:49:05 SN -Mhm- [yes]

00:30:49:25 SN We have found it.

00:30:51:00 SN Is it right like this?

00:30:55:00 SN I get an expression.

00:30:57:01 T And where can I simplify again?

00:30:59:15 S No. {laugh}

00:31:00:07 T {laugh}

00:31:02:10 T Is it right or can you simplify something else? ... Are you done with the foil?

00:31:06:23 SN Yes.

00:31:09:10 T This goes ahead, two remains. Have you already completed the foil?

00:31:14:25 SN ( ), -ah- no, the foil not yet.

00:31:16:14 T The foil. You have to complete with- are you number three or number four?

00:31:19:14 Ss Three.

00:31:20:08 T Three. Complete with your solution. If you have finished with the box, put it back over there, box, scissors. What?

00:31:28:16 SN ( ).

00:31:29:16 T No, put it over there- put it over there.

00:32:22:10 T Found?

00:32:23:04 SN Eh, yes, I think so.

00:32:25:05 T And some of you bring back the box, please. In the meanwhile, Andrea.

00:32:28:22 SN Madam, may I ask you ( ).

00:32:31:00 T In the meanwhile put them away, later I'll give them to you. Go on, put it inside, Claudio ( ).

00:32:45:00 SN Wait.

00:32:49:20 SN Assio, it's your pen.

00:32:51:15 T No, mine.

00:32:52:20 S No, why ( ).

00:33:03:10 T Finished? ... Now try to think a while, to see if you find a faster way to do- to find

00:33:13:03 T the same result, instead of doing two calculations every time, do one calculation only.

00:33:20:19 SN ( ).

00:33:22:00 T What do I do? Square this plus fourteen point seven squared, root.

00:33:29:15 S -Ah- I can use the properties of powers.

00:33:31:25 T Take care, I square- //

00:33:33:05 SN // Plus -eh- you can't use the properties of powers.

00:33:36:20 T Barbara is right. Here is the square root, now the sum, then extract the root, I square.

00:33:46:00 SN But first ( ).

00:33:48:00 T First we extract the root, then we square it.

00:33:52:12 SN -Ah- so you can take away the root, it's this.

00:33:55:10 T Which root can I take away?

00:33:56:24 S This.

00:33:58:10 SN No. This, because square- take away the square root and then square it isn't of any use.

00:34:04:04 SN But the ( ).

00:34:06:11 T No, pay attention, eh. Here I extract the root of all and then I square it again.

00:34:13:02 SN Divide two doesn't make sense.

00:34:16:15 T Try to write the simplified version. Have you done?

00:34:20:00 SN Here we have to do it in the simplified way or //

00:34:22:00 T // Now what have you found? The measurement corresponds to? Have you measured it?

00:34:24:10 SN Yes.

00:34:24:20 SN Yes.

00:34:25:05 T Ok. So now write here in your- you are the box number four? Write the solution here on the foil.

00:34:31:17 T The result you found.

00:34:32:20 SN The same thing that we wrote down here.

00:34:33:25 T Yes, exactly.

00:34:34:13 SN Now here you extend the same scheme.

00:34:35:20 T Yes, and afterwards try to do what the others have done with the other- other boxes.

00:34:41:00 S Ok.

00:35:06:00 T And pay attention, extract the root but you have to extract // What else?

00:35:08:14 SN // -Eh- ( ).

00:35:09:29 SN I told you.

00:35:11:04 T Yes.

00:35:27:00 T Why do you take the box?

00:35:28:05 SN To do the faster thing.

00:35:30:05 T I told you that- how ever it's enough to look at the calculations -eh- not - the calculations you are doing, try to reason with some of the numbers you take

00:35:37:10 T if you couldn't do it in an easier way.

00:36:06:15 T If you would have to write a title. What did you apply in solid geometry?

00:36:11:15 SN -Boh- [I don't know]

00:36:12:05 Ss The pythagorean theorem.

00:36:13:10 T The pythagorean theorem. So you can write it. ... Finished?

00:36:27:00 SN ( ) square root direct.

00:36:29:03 SN And that without // -eh- without.

00:36:30:20 T // direct square root, what- what is that?

00:36:32:20 SN What is the direct square root?

00:36:33:24 SN // Is the ( ) and then you have to square it and immediately extract the root.

00:36:33:24 SN // This ( ) the last time.

00:36:39:01 SN -Ah-

00:36:39:26 SN Do you remember?

00:36:41:22 T -Eh- yes and no. Yes, it hits a bit. But instead of doing two calculations try to see if you could do it with a single one.

00:36:49:21 SN It's enough to do ( ).

00:36:51:04 SN Put it a bit // ( ) below.

00:36:52:00 T // Try to write

00:36:56:21 T Try to write it.

00:36:57:20 SN Let's do it here, go on.

00:36:59:00 SN What ( )?

00:37:00:10 T What you just told me now.

00:37:01:20 S? Now here, I'm going to write the same ( )?

00:37:05:16 T Yes, now you do more then the rest, in the meantime the others, you have to write the same thing here.

00:37:09:00 T If no the- try to do- from now on let's continue all together.

00:37:17:10 T Ok, stop, interrupt -sshssshhh- [silence] Andrea. Interrupt the things you are doing. All of you have found

00:37:26:26 T the length of the straw longer then it was in the real box. Now there is- who has already finished calculating,

- 00:37:33:23 T all the others who are still calculating. Now please go back to your seats, not in groups anymore, and then look forward.
- 00:38:40:05 T All right, first of all let's complete the title, not everybody has done that. What have we applied in solid geometry
- 00:38:48:21 T that we haven't ever done, Neluca?
- 00:38:50:10 SN The pythagorean theorem.
- 00:38:51:20 T The pythagorean theorem. So who hasn't written it yet can add it.
- 00:39:09:00 T The pythagorean theorem in solid geometry. ... Ok, now we observe the foil that you have completed.
- 00:39:17:19 T It seems to me that all groups have understood what the method was, let's say to apply. Let's start with box number zero,
- 00:39:27:11 T which was the most shallow box. ... To find the longest straw that was the straw ... let's call it diagonal
- 00:39:42:03 T and now not anymore the diagonal of a area, but the diagonal of the box. I did it like this, first of all I calculated the diagonal
- 00:39:50:29 T of the base's surface and then by using the heigth I found the diagonal of the box.
- 00:40:00:00 T So all of you- look- looking at the foil, what do you have? First you calculated the diagonal of a surface and then
- 00:40:09:24 T by taking this diagonal, you have, with the heigth of the box, you have found the length of the diagonal of the box.
- 00:40:17:09 T All the groups did it this way. For those who have completed the sheets, you can see the various measurements.
- 00:40:31:15 T Everybody used the same method: Always the diagonal of the base and then the diagonal of the box.
- 00:40:42:17 T Now someone of you was finished a bit earlier. He tried to find a single calculation to find the length
- 00:40:51:29 T of the diagonal, so that instead of doing one calculation and then do the second, he has found a single possible calculation to find
- 00:41:02:25 T this length. Now let's take the example- so Barbara and Andrea were able to find it, you had the box number?
- 00:41:08:20 SN -Eh- one.
- 00:41:09:20 SN One.
- 00:41:11:20 T One or two?
- 00:41:12:11 Ss One.
- 00:41:13:05 T Box number one. So their calculation here, first diagonal of the base and then diagonal of the box.
- 00:41:24:09 T Well Barbara, would you like to try to come and explain it at the blackboard? Do it at the blackboard.
- 00:41:35:05 SN Yes. So, first -eh- in practise we put together the two calculations. Do I have to write down the two calculations here,

- 00:41:43:10 T write it again here? Yes. ... So, observe the difference between the written calculation on the overhead and the calculation that she writes now to the blackboard.
- 00:42:23:19 S In practise we put together -eh- the first calculation that- that we have- eh- we have put together the two calculations
- 00:42:23:19 S -eh- but simplify because in practise the calculation was like this at the beginning. Only extracting the root and then squaring it,
- 00:42:34:20 S isn't of any use. So we simplified, we- we took away the root and we squared it.
- 00:42:47:00 T Result?
- 00:42:48:00 S The result is the same.
- 00:42:56:18 T Good, thanks. Now I don't know if it's clear for everybody, so that instead of writing here- look the second passage of the foil:
- 00:43:04:15 T On the second passage, what did we write? Twenty-seven point two squared plus nine point five squared.
- 00:43:12:07 T Now instead of writing twenty-seven point two here, they wrote the calculation that allowed me to find twenty-seven
- 00:43:22:00 T point two. instead of writing the number directly, they wrote the calculation that allowed me to find
- 00:43:29:05 T twenty-seven point two. Then Barbara correctly said: I do the root and then I square it, I can annul because
- 00:43:38:15 T one is the inverse operation of the other. Therefore the shorter way to find this diagonal is length of the box squared
- 00:43:46:25 T plus width of the box squared plus height of the box squared and at the end extract the root.
- 00:43:58:00 T They are right -eh- also all of the ways that you all did, this one here makes it easy to understand the reasoning I did:
- 00:44:03:28 T That I first have to find the diagonal of the base, then the diagonal of the box. You can find this method after doing some
- 00:44:10:27 T calculations , at the beginning it isn't that evident to find this- this calculation.
- 00:44:16:13 T So now, who -eh- still has to finish the sheet, complete this sheet with the measurements of the other boxes
- 00:44:25:14 T that your partners had. On the other hand who's finished, I'll give to everybody a sheet of exercises, try to work with your partner
- 00:44:32:12 T I leave the solutions here, who- come to correct the solutions as usual.
- 00:44:38:23 T But first complete this, without looking, then -eh- check if it's right.
- 00:45:11:00 T Yes -eh- ... Yes, I'm raising it now.
- 00:45:14:02 SN Thanks.
- 00:45:14:15 T First do it without looking, that means first complete the sheet, then ...
- 00:45:21:00 T The overhead projector doesn't work well.
- 00:45:23:13 SN But can we?
- 00:45:25:12 T Have you finished?

00:45:26:09 SN Yes.

00:45:27:00 T Checked? Are they correct?

00:45:28:00 S? Yes, yes.

00:46:07:20 T Have you understood the shorter version? I saw you looking with // the face a bit

00:46:13:00 S ().

00:46:14:28 T -Mhm- [yes], yes. Now I say if you have understood how you did this, do the others. You can always use this method, can't you?

00:46:20:24 T You don't have to do the other, don't ()- start doing this, afterwards, in case, we'll see next time to- to work on it again.

00:46:27:07 S Well I didn't under- well I didn't untersta- I didn't understand () how to arrange ().

00:46:31:00 T Practically, what did you do here? This number here // you transfered here.

00:46:34:00 S // -Mhm- [yes],

00:46:37:10 S Yes.

00:46:38:00 T Agree? This number, you transfered here. On the other hand if you have to transfer this number here, I can transfer the

00:46:44:02 T calculation that allowed me to find this number.

00:46:48:15 T And that to find // this number here

00:46:49:14 S // Yes.

00:46:50:27 T which calculation did I do? I did // this, which in reality was this.

00:46:52:08 S // This.

00:46:54:15 S -Mhm- [yes].

00:46:55:08 T Instead of writing this number, I could write this calculation.

00:47:02:23 S -Mhm- [yes]

00:47:03:10 T It's the same thing because this calculation gives me the same result. So I can // instead of writing two thousand one hundred fourteen point five

00:47:08:14 O // {bell}

00:47:12:01 T I can write this squared plus this squared.

00:47:19:05 S And then?

00:47:20:00 T () plus one hundred sixty-six which would be thirteen squared.

00:47:26:27 S () Ok, I'll do it that way ().

00:47:29:15 T -Mhm- [yes] yes.

00:47:30:10 SN Madam ().

00:47:34:18 T Why?

00:47:35:12 S ().

00:47:45:17 T But it's the same you told me last time ( ) is two thousand. Do you remember that you had told // me already last time that there

00:47:50:28 S // Yes.

00:47:52:10 T was this problem with your calculator?

00:47:53:15 S ( )

00:47:58:12 T -Eh- ....

00:47:59:20 S What am I doing wrong? I should extract the root.

00:48:05:10 SN -Ah- it's true ( ).

00:48:07:04 T Now you have to extract the root, yes. ( ) the result down here, if you extract the root..

00:48:11:03 S And the root ( ).

00:48:30:15 T Did you understand well here? ... Do it on a sheet by side, on a squared sheet of paper.

00:48:39:15 T Vera, got it all right?

00:48:53:00 T Boris, got it?

00:48:53:21 SN Yes.

00:48:54:13 T Cinzia?

00:48:59:00 T Is it right now?

00:48:59:26 SN Yes. But down here? Yes.

00:49:03:25 T Two plus eight, then it depends on how you approximate.

00:49:18:00 T When do I have to finish the lesson?

00:49:45:00 T Now stop what you are doing, put away everything and we'll continue next time.

00:49:52:21 T You can put everything away.