

12<sup>th</sup> Math Stats  
Classroom

Teacher: Good, we have 10 people. We're going to sit in groups of 5 today. Shall we do 5?

Students: (indistinct chatter)

Teacher: Okay. Are we ready? Good morning everyone. Today, what we are going to do is we are going to review and practice significance practicing, hypothesis testing, confidence intervals. All that fun stuff that we've been working on.

Students: (indistinct chatter)

Teacher: Whenever you see things in confidence intervals, you have to re-date it back to what does that mean? What is the true proportion? We've been practicing means a lot, so I wanted to do one with a proportion instead. Also, your test is coming up in 6 weeks, so we need to get started.

[00:02:00] Today is called Give Me a Kiss. You're each going to be dropping 5 Kisses at a time. What you're going to do is get a cup, shake around 5 Kisses, and drop it from some specified distance. If you want to specify that distance for your entire group, you can. That might be a bias, that might be some kind of flaw in your experimentation. We're going to see how many Kisses land upright. How many Kisses land straight upright. I think this is a known hypothesis for this is about .3. .3 time ... You can write that down. We'll see if that .3, that known hypothesis falls in our confidence interval that we're finding. Today we have cookies and cream, Hershey's, and we have the regular Easter color Hershey's Kisses.

Maybe there might be a difference. In your groups I'm going to have 1 group with cookies and cream, one group with the regular chocolate and we'll talk about if that changes. Whether the uniformity of chocolate changes how things fall.

You're just going to basically go through this. Do you want me to give you the Kisses now, will you be tempted to eat it? Will you work through the initial part?

Students: (indistinct chatter)

Teacher: It's not Skittles, yeah, okay. Get started with this. First of all, read through it. I'm going to give you all 5 each in your cup.

Students: We're in groups of 5.

Teacher: Feel free to move around the rooms as you need to. You can do groups of 5, you can do 4. 3? Okay. You can do a combination. Just get to your groups.

[00:04:00]  
Students: You all get ...

Teacher: You're all going to do it, you're going to be able to get more data. You all get ...

Students: (indistinct chatter)

I got 3.

I got 1.

Stop.

(indistinct chatter)

The next 5 in.

(sounds of Kisses falling and cups moving around)

(indistinct chatter)

Wait, we have to do it 50 times?

Teacher: I gave you 50 Kisses and you're doing it 10 times.

You could do it ...

Students: (indistinct chatter)

[00:06:00]

Teacher: You can determine whether using the data is the ...

If you got it maybe you shouldn't use that thing ...

Students: (indistinct chatter)

What the heck? I got 3 then 2.

(laughter)

(indistinct chatter)

Teacher: We're going to try it again.

5 and 5?

Students: Yeah.

(indistinct chatter)

It makes a difference.

Teacher: It does make a difference?

Students: I got 18 on this one.

(indistinct chatter)

(cups shaking)

That is getting way too consistent. It knows where it wants to be.

[00:08:00]

Teacher: Are you doing it the same way?

Students: Yeah. (indistinct chatter)

Teacher: Is it a vice that it's sitting in your hand?

Students: Yeah. That's going to be in the error.

(indistinct chatter)

You have 100?

I got all 5 of them.

Teacher: You got all 5?

Students: What the heck?

(indistinct chatter)

Teacher: Yeah, you're going to do them separately.

P is your proportion.

[00:10:00]

Students: 12 out of 10?

Teacher: Every one that you roll is 5 ...

Students: 24, holy shit that was so much more than last time.

50?

He said he could edit it.

It doesn't excuse you.

I know.

Teacher: Okay, let's continue. 10, 12. 12 out of 50. Population of interest and samples. What are you going to do?

Students: (indistinct chatter)

[00:12:00] 90 22.

Wouldn't our population interest be comparative though?

Teacher: There's different sides going on. They're not ...

Students: Oh, they're independent. Oh, okay.

Teacher: Sorry, I only gave you one space, I thought ... Concentrate.

Students: Who is ... So the number is ...

(indistinct chatter)

Teacher: Is that the sample? What's the sample size?

Students: Sample size, that one.

(indistinct chatter)

Teacher: So we get a ... They weren't actually chosen at random ... I know this is how the ... This is the kind of stuff that will ... We're assuming the SRS, that [inaudible 00:14:15] And what else?

Students: Cookies and cream, that's what it's called. They're delicious.

Teacher: The sample size should be.

Students: I got 13.

Teacher: Really?

Students: You got 30?

13.

I got 14.

13 what?

Total.

Are you showing off?

I was saying for both of those.

Teacher: That was pretty significant, though.

[00:16:00]

Students: Which means they're the same weight.

(indistinct chatter)

222.

Teacher: If we are observers of a study, are we able to make comments on stuff like that?

Students: No.

(indistinct chatter)

Teacher: Why, what are you decreasing?

You're using your own experiment to ...

What is this?

You wouldn't want that stuff.

[00:18:00]

Students: (indistinct chatter)

Teacher: Can you go sit over next to Student and Student to focus? Okay, go do it.

Students: (indistinct chatter)

Teacher: Your proportions.

Students: What was your results?

Oh.

(indistinct chatter)

Tell me the regular constant first, and then the ...

Oh, yeah.

What do I do?

(indistinct chatter)

Teacher: We're going to stay.

Students: Cole gets over ...

Teacher: What bet are we talking about?

Students: Wait, I have a question.

Teacher: Find this.

Students: (indistinct chatter)

Teacher: What do you do? Well, Student, what is ...

Students: I remember how ...

Teacher: Remember that we're doing our ...

Students: I think we had to do explaining.

(indistinct chatter)

Wait ...

It's the mean over the ...

Teacher: Not the mean, the proportion.

Students: Times 1, minus ...

[00:20:00]

Teacher: So it's 12 over here, times 1 minus ... Over 50.

Students: (indistinct chatter)

Teacher: I want you to be able to remember that.

Students: Got it.

(indistinct chatter)

Teacher: You should know where you're looking.

Students: (indistinct chatter)

When it says what was the normality and stuff?

Teacher: Well, that's normality. What did we do to determine the independent? What do we say?

Students: Oh, that they're random samples? Okay.

Is XY the number?

(indistinct chatter)

Teacher: What's your average?

Students: Average? Oh, so add 12 plus ... Right?

Teacher: To find the 8 you have to divide it by the 3.

Students: So this will be all the same?

Teacher: Yes. And now that I'm helping you guys, you're going to go back and do cookies and cream all by yourself. You're doing it. Uh oh, what happened?  
[00:22:00]

Students: This thing is [inaudible 00:22:07]

(indistinct chatter)

50 times .8.

Teacher: We're going to assume, because you're pretty close. For the sake of this study, you'll just go ... So close, only part of the way. What? Wait a second.

Students: (indistinct chatter)4

Teacher: Granted, I'm sure if you find your P's and got your average ...

Students: Yeah if I could find the P's I could just ...

What? When?

[00:24:00]

Teacher: Wait, did you start ...

Students: No.

(indistinct chatter)

Teacher: What's up?

Students: If we had the ...

Is it just asking to ...

Teacher: You're going to find [inaudible 00:24:16] as well. Find your average. And then all of these ... Are these fractions or separate?

Students: Yes, separate numbers.

Teacher: You're going to be going through this once, and then once with the ...

Students: I can't help the ...

Teacher: There's multiple pages.

Students: Okay. We still have to write this anyways so that it proves that it's constant.

Teacher: In case some people forget where you could look at the statistic.

Students: Hey, I did cookies and cream first too.

Did you see my milk chocolate?

Teacher: Nice. Great.

Students: (indistinct chatter)

Teacher: You're going to find ... How do you find ...

Students: I don't know.

Teacher: What are you finding? You're finding all of your average of ...



Students: (indistinct chatter)

Teacher: Keep going.

Students: (indistinct chatter)

Teacher: Yes.

You can ... Oh, you can get there. It's so simple, how did you guys ...

Students: (indistinct chatter)

Teacher: No.

Students: (indistinct chatter)

[00:26:00] Just square root this whole thing? N is 50.

Wait, what am I doing?

(indistinct chatter)

1 ...

Oh my god, you guys.

(indistinct chatter)

How would you find that in the book though? Inverse number ...

Teacher: Yeah. You go down and divide it by infinity ...

.95 upper value 50, mean is 0 ...

Students: Mean is 0?

(indistinct chatter)

N is 50?

(indistinct chatter)

Isn't it inverse normal plus .75?

Teacher: Yeah.

Students: (indistinct chatter)

Teacher: Yes, remember that number.

Students: I remembered it but I ...

(indistinct chatter)

In the end it was like 2.2 something, I can't remember.

Teacher: 99.

Students: Oh, okay.

Teacher: Are you doing question 24 right now?

Students: So this one would go first?

(indistinct chatter)

[00:28:00]

Teacher: So the confidence interval is  $\hat{P}$ . What is  $\hat{P}$ ?

Students: 3?

Teacher: Proportion. Did you find your proportion? What is your proportion here?

We're going to find that first. Go find the  $\hat{P}$ .

We're going to do that for all of them, so you're going to take the average times 13 and 18 and 15. That's going to be your  $\hat{P}$ . You should all be getting the same answers, so you guys can check ... Working alone and figuring out an answer.

[00:30:00]

Students: (indistinct chatter)

That?

Teacher: Mm-hmm (affirmative).

You're going to do the average first. Now what? Now what do you divide it by?

Students: [inaudible 00:31:04]

(indistinct chatter)

Teacher: Now you have that. Here we go. The  $\hat{P}$ , do we know what that is?

Students: Yeah. .05.

Teacher: Okay, we do plus or minus. Do we know the Z?

Students: Yeah.

Teacher: Okay, what is this sigma P?

[00:32:00] Do you know all those numbers? You don't know that one? You didn't find it here?

Students: Yeah, never mind.

Teacher: Okay, so you can do it. Yeah? Okay.

Students: (indistinct chatter)

Teacher: What is your P hat?

Students: The average.

Teacher: Finish your work first, not the game, I know you're ...

Students: What is it? 15 point what?

Oh, wait ...

You need a decimal to figure it out?

2.3 out of 15 would be ...

15.3 is our ...

(indistinct chatter)

Teacher: What are you doing?

Students: Conferencing.

Teacher: That's why it's wrong ... We're doing proportions, yeah?

Students: (indistinct chatter)

[00:34:00] Can we just double it and put a decimal there?

Teacher: No, tell me why.

Students: (indistinct chatter)

Teacher: You're making your intervals one for the Hershey's Kisses, one for the cookies and cream, and we can see how that matches up, okay?

Students: (indistinct chatter)

Teacher: If you want to go, we'll go.

Students: Where are we going?

(indistinct chatter)

[00:36:00]

Teacher: What I want is, I want this as a 3rd page, as a group discussion. Just finish up 2nd page right now. I want to do 3rd page as a group discussion.

Students: This dot sticker thing?

Teacher: What?

Students: This dot sticker.

So like a range kind of thing?

Teacher: Yeah, that's your 95%.

Students: (indistinct chatter)

[00:38:00]

Teacher: You guys should all have the same. If you don't have the same then ... If you're ... I was hoping to see the difference between the regular ...

Students: Yeah.

(indistinct chatter)

That's the reason they're infamous.

Either way, that would be ...

Teacher: Be specific.

Students: The P Hat would be the true ...

(indistinct chatter)

Teacher: Once you're done with that, you can read through page 3, but I want to talk about ...

Students: No, it's point 29.

My brain sees something bigger than the other one.

Teacher: And theirs is much smaller.

Students: What did you do?

We have this, we have the same ...

(indistinct chatter)

On this one, instead of doing it as ...

(indistinct chatter)

Are we doing just the first chapter?

Yeah.

(indistinct chatter)

Teacher: You're negative let's see what happened.

Oh, I see.

Students: (indistinct chatter)

[00:40:00] Do you have the which ...

It's stuck.

Teacher: Do you guys feel that the cookies and cream and the regular are the same? And your picture ...

Students: No.

Teacher: That's what I want you to write.

Students: Do we all agree that the cookies and cream landed just about right ...?

Yeah.

Oh, yeah.

(indistinct chatter)

Can I go back to training camp?

These are harder than this one.

Teacher: Good?

Students: They taste good. Better than that one.

[00:42:00] I also think because the cookies and cream are at the bottom?

Teacher: So the cookies hold it together?

Students: No, I mean maybe the cookies are heavier.

The density ...

(indistinct chatter)

Teacher: Okay.

Students: (indistinct chatter)

Teacher: Are you okay?

Almost there guys?

Okay.

[00:44:00] So read over the 3rd page. You guys have thoughts that you would like to share on A, B, C, and D.

Students: I think we're way ahead of you on the third page.

Teacher: You're ahead of me?

Students: Yeah.

Teacher: I'll bring you Skittles next time. I'm sorry, but it's hard to figure out whether a Skittle will fall on it's head.

Students: If it's on the S or not.

Teacher: The ink on the S would make it heavier, so it goes down?

Students: (indistinct chatter)

[inaudible 00:45:06]

You're so picky.

Teacher: Oh my goodness. Are we good?

[00:46:00] On the second one I want you to just compare whether you think the proportion of the milk chocolate and the ... Would be the same, would fall the same. Proportions of each ...

[inaudible 00:46:28]

Students: (indistinct chatter)

Teacher: You guys have to know over that. Then we're going to talk about it.

Students: (indistinct chatter)

Teacher: Okay, 2 minutes. 2 minutes more.

Students: (groans)

(indistinct chatter)

Teacher: Well you could have just eaten ...

Students: No, he said not even once.

Teacher: Not even once?

Students: Not even once.

It's not meth.

Teacher: Actually, it might be, that's why they give it this ... Figure. Too much sugar for you?

Students: You're getting tired right now. Or you're just laughing at everything.

Teacher: Are you ready? You look a A, B, C, and D? Do you think A: There is a 95% probability that the true proportion will fall into your interval. Is that true? Would you circle that if you saw that on an AP test?

Students: Yes.

Teacher: Why? Because that would be grouped? Is the wording correct.

Students: This is the one that messed me up.

(indistinct chatter)

[inaudible 00:47:41]

Teacher: You're saying that you would circle that or not?

[00:48:00] Being 95% common, is that the same thing as being 95% probability?

Students: No.

Teacher: Okay, so we'll leave that there for now, we'll just leave that sitting. B: There is a 95% probability that your interval will include the true proportion. Does that feel better to you?

Students: Yes.

Teacher: Why? It's the same thing.

Students: (indistinct chatter)

Teacher: Two different words. Is there a difference between A and B?

Students: The organization of the sentence.

Did we already say that the ...

Is it the same thing?

Teacher: Is it the same thing? And is it wrong?

(indistinct chatter)

What about C? Before we take the sample, there is a 95% probability that the confidence end goal that we create will include the true proportion.

Students: (indistinct chatter)

Teacher: Can we say something about the before?



Students: No, because we don't know what they've been through.

Teacher: So we can't make any predictions before we do something? C is obviously out versus A and B which are still in?

Students: False.

Teacher: After we take a sample, there is a 95% probability that the confidence interval we created does include the true proportion?

Students: Yes.

Teacher: Okay. So D you feel the best about? A and B were iffy. If we saw that on a test, but there was no better answer, would we choose it?

Students: (collectively) Yes.

Teacher: Okay.

Students: Is there a forecast?

[00:50:00]

Teacher: That's just a conversation. On the AP test, have you been noticing that A and B are very similar to each other, there's one word off? You don't know what to do sometimes? What?

Students: (indistinct chatter)

Teacher: However, if you were to state that kind of stuff in the AP test, showing that you're at least thinking about true proportion and ... They're going to give it to you. They're going to see that you're getting it, this wording may not be perfect, but they're understanding.

Students: What if there's a multiple choice, what is the best one?

D?

Teacher: I would like D. Now that you have read the second part of the paper, that is your homework tonight. You are going to create a study in which someone else in the class will enact.

Students: (indistinct chatter)

Teacher: You're going to take it home tonight and figure a study in which it will be set up just like this. We're going to trade papers and then someone else is going to have to do it over the weekend.

Students: (indistinct chatter)

[inaudible 00:51:09]

Teacher: Don't be like ... Let's look at 100 dogs, because that would be impossible for someone. How about a rock? Rocks we can look at. As long as you can think of something that is measurable. It always has to be measurable. Whether it's proportion or mean, it has to be measurable and doable in a financially sound and timely sound way.

Students: (indistinct chatter)

Teacher: Don't create something that has 1000 steps. [inaudible 00:51:37]

Yes.

Students: (indistinct chatter)

You're just going to come to my house and be like, "What the heck is this?"

Teacher: Exactly, don't do that, be nice. Think about someone you might want to give this to, but make it meaningful. Once you start writing these questions, you're going to feel more comfortable answering them.  
[00:52:00]

Students: [inaudible 00:52:04]

Teacher: You like that? That's your homework tonight, but be mindful of when Student and Student have to leave. You'll have to leave soon.

Students: I'm on the tennis team.

(indistinct chatter)

Teacher: Yes you can. If you would like to offer who you want to give this to, go ahead.

Take this home so you can write on the paper.

Students: What am I going to do?

(indistinct chatter)

I will give you something ...

Teacher: You can do running, something interesting. Make like race and run.

Students: I don't know.

Teacher: You have to do it as a repetition.

I'm going to be grading on the ability to do an observation also.

That's what you're going to be thinking about tonight. We will talk about it later during class. While everyone else leaves and does what they do.

Students: (indistinct chatter)

For real?

Teacher: Yeah. You're just going to get ...

We good? Understand what the task is? Due Friday. What's your [inaudible 00:53:43]

Students: (indistinct chatter)

We don't have ...

[00:54:00]

Teacher: No one cares. Let's just see even ... What's the task tonight?

Students: Create another ...

(indistinct chatter)

Teacher: Good job, guys. Trash in the trashcan. If you didn't drink out of your cup, I will reuse it.

Students: Sorry.

Teacher: If there's weird stuff like trash and saliva, I don't want it back.