Thursday Introduction

Part B:

CATHY HUMPHREYS: So our goal on Tuesday was to do all of our individual investigations. I realized that some of you may have more investigating you want to do because you all had questions on your card, but today we are going to have a different focus. We are going to use what you did, where ever your group happens to be to see if we can prove that these conjectures are actually true. So you have lots of ideas and now what we're going to do is we're going to try to synthesize what we know and prove it. So um, I thought what I would do is start with an example so you would know what it is that you're actually being asked to do; and so I would like you each to find…I want you to think about a parallelogram. Look through your notes and find anything you have written down about what kinds of diagonals um, guarantee a parallelogram – a parallelogram that's not a rectangle and not a rhombus and then as soon as you've done that, show me that you are ready to talk as a whole class.

STUDENT: The points are like this but they can't be perpendicular or parallel and that makes a parallelogram each time. And that's it right?

STUDENT: Yes.

STUDENT: Wait, wait. If it's like that, what about a trapezoid? Isn't it the same thing? Isn't a trapezoid…?

STUDENT: It has to be at the same point but not at the midpoint.

STUDENT: What do you mean? They have to both be like this?

STUDENT: They have to be the same distance from the end point?

STUDENT: Like this – do you have a ruler?

STUDENT: Yeah, I do.

STUDENT: So it's like this alright? It has to be the same...

STUDENT: Hole, hole.

STUDENT: Yeah, the same hole so that it'll make a trapezoid.

STUDENT: Oh okay, but these don't have to be in the middle right? So for a parallelogram, it can't be in the middle or parallel. It can be anything else so that will make it a parallelogram. Wait, it's both short and long sticks right…it's not…so it's like short, it's like the pen? Right, yeah! Yeah, because if it's like this I remember then it's a rhombus.

STUDENT: But it can't be perpendicular.

STUDENT: Yeah, it can't be perpendicular or parallel. Yeah!

STUDENT: For parallelograms? Yeah, I said that...I also said that it could be a square or a rectangle, so it could be at the center. So it would still be a parallelogram.

CATHY HUMPHREYS: So um, the first thing is we are going to write what we've learned as a conjecture. So what we're going to start...we have to make…how is a conjecture formatted? Excuse me.

STUDENT: "IF THEN."

CATHY HUMPHREYS: Good, "IF THEN." So "IF" – what we're going to end up with is "THEN" the figure is a parallelogram. So what we need to do is we need a list of the particular arrangement of diagonals that will create a parallelogram. So can anyone tell us one thing that they believe to be true about the diagonals that will create a parallelogram? Alright, I've got three hands up. I want everyone to talk to each other. I want you to plan the attributes together right now in your group.

STUDENT: A long and short stick fastens at the center.

STUDENT: Uh-huh.

STUDENT: So what do we know?

STUDENT: A small stick and a big stick. So we know it takes that. Isn't that at a ninety degree angle?

STUDENT: No, see…

STUDENT: It looks kind of close to it.

STUDENT: It's kind of off. I can do it on the back.

STUDENT: A square is also a parallelogram though.

STUDENT: But it's not a rhombus.

CATHY HUMPHREYS: Now who thinks that – I'm not going to call on you but who thinks you can tell me at least one thing...tell us at least one thing about the diagonals of a generic parallelogram? You're afraid I'm going to call on you huh? Alright, good I'm seeing these little hands. Come on, get your hands up so I can see; kind of get a sense. Alright, so it looks like quite a few and somebody in almost every group. Alright, who's willing to share one thing that the diagonals have to be? Let's hear from Ariel. Okay, if the diagonals…if the diagonals intersect at...Ariel, did you mean both of their midpoints?

STUDENT: Yeah, line A has to intersect with line B's midpoint and line B has to intersect with line A's midpoint.

CATHY HUMPHREYS: Okay, I'll put both of their midpoints. Does anybody know a different way that you may see that in a math book?

STUDENT: Written down? Another way that it's written down?

CATHY HUMPHREYS: Yeah. In other words when you are using this language of intersect at both of their midpoints. You know, how math books can be kind of hard to figure out exactly what it's saying, so this language we all understand. Edward, do you have an idea?

STUDENT: If the diagonals bisect each other?

CATHY HUMPHREYS: Yup, exactly. So that is what you would probably see in a math book. I'm not saying that I want you to write it that way, but what I am saying is that I want you to be familiar with the language that you are going to see in math books. Alright, is that enough to guarantee a parallelogram?

STUDENT: Wait, isn't that…

CATHY HUMPHREYS: What's the matter ...what's that Ryan?

STUDENT: I was just being stupid.

CATHY HUMPHREYS: You were what?

STUDENT: Being stupid for a second.

CATHY HUMPHREYS: No you weren't. What do you mean you were being stupid for a second? You had a thought right? What was your thought? Tell us what that was. See, the kind of thing that you are doing though is there's probably people thinking "what does that mean? Is that really right?" That's not being stupid; that's being smart because what you're doing is you're not letting...you're being a skeptic. You're being a skeptic and that's what you need to be. That doesn't mean that you're not going to change your mind immediately the minute the words come out of your mouth. That happened to me yesterday when I was talking to two teachers about Algebra 2. I started to question what they said and then it was two to one, so I backed down really fast but then I realized what I said was wrong. And you do feel a little bit stupid but it's smart; it's really smart to do that, to stick up for your ideas. Alright? Okay, is this enough for a parallelogram? Jerry, what else do we need?

STUDENT: And the diagonals cannot be perpendicular.

CATHY HUMPHREYS: Okay and the diagonals cannot be perpendicular. Okay, is that enough for a generic parallelogram?

STUDENT: No.

CATHY HUMPHREYS: No. People are saying no. What do you think Dorothy?

STUDENT: The diagonals need to be at different lengths.

CATHY HUMPHREYS: Does everyone agree with these things?

STUDENTS: Yes.

CATHY HUMPHREYS: And the diagonals need to be at different lengths. I'm going to just say "are different lengths" okay? When it says "and" and "and," that means we've got three things – three criteria that we have to meet in order for our statement to be true. Not one of them but all three of them. Now we have our "THEN" statement. Then what?

STUDENT: Then it's a parallelogram.

CATHY HUMPHREYS: Okay, when we say it's a parallelogram…the figure and let's actually...I think I'm going to qualify this a little bit and say then the quadrilateral is a parallelogram. Okay. This is the format of writing your conjectures and when we're done here what we are going...you are going to be writing conjectures for all the shapes that you have worked on so far. Alright, does anybody want to make any connections...different ways of saying something, corrections or is this okay with everyone because I just heard from a few people? Okay.