

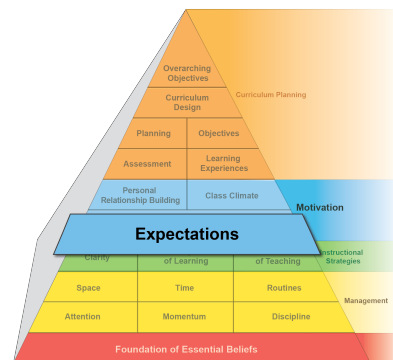
Expectations

Giving Help with Tenacity and Making Thinking Visible

“Rodolfo”

High School Mathematics

WITH RBT ANALYSIS



Clip #1

Script	Comments
<p>Mr. H: Let’s take a look at number...what are two angles here that make up the straight angle?</p>	
<p>Rodolfo: These two?</p>	
<p>Mr. H: Which two?</p>	<p>Probing for specificity.</p>
<p>Rodolfo: These two?</p>	
<p>Mr. H: Put an arc on it so I can be sure I know what one you’re talking about.</p>	<p>R has to respond to show he is in tune.</p>
<p>Rodolfo: You said the ones that make up the straight angle?</p>	
<p>Mr. H: Yeah. [Pause.] Is that a straight angle? This is the test, right? Is that a straight angle right here? Cause this straight...Is that a full straight angle?</p>	<p>Checking question.</p>
<p>Rodolfo: [Shakes his head no.]</p>	
<p>Mr. H: This is part of a straight angle. What other part do you need?</p>	<p>If he can show the supplementary angle, he understands. He does.</p>
<p>Rodolfo: There.</p>	
<p>Mr. H: So does that cover the entire straight angle?</p>	
<p>Rodolfo: Yeah.</p>	
<p>Mr. H: OK. So this is what it looks like. This is two angles.</p>	
<p>Rodolfo: Alright, so, you want me to do that too?</p>	
<p>Mr. H: So what do we know about those two angles?</p>	
<p>Rodolfo: They make up... they make up one straight angle.</p>	
<p>Mr. H: They make up one straight angle. How many degrees is one</p>	<p>Beside what it looks like,</p>



straight angle?

Rodolfo: 180.

Mr. H: 180. So how can you apply that idea here? [Turns paper over to the other side—long wait time.] Good...So now what's the next thing that we always do? What's going to help you see this situation better?

Rodolfo: Putting the 34 right there?

Mr. H: OK. Why is that going to help you?

Rodolfo: To show you that, that second angle is 34 degrees?

Mr. H: OK...Yeah. And when we have information like this...angle 1 and angle 2 are supplementary, and angle 1 equals 34, that's really hard for me to see what that looks like. But here it's saying the exact same thing. Angle 1 and angle 2, or in this case, angle 2 and angle 1, are supplementary. You've showed that both come together to form a straight angle, and that one of them is 34. This is another way to represent the same information. This makes more sense to me. So part of these problems is conveying this information in a way that makes sense. Now you want to find the other angle.

Rodolfo: You do the subtraction thing comes in? $180 - 34$?

Mr. H: Well, why would that make sense in the context of this problem?

Rodolfo: 'Cause you're trying to find what the measure of, of what angle 2 is.

Mr. H: And where is angle 2 in your problem?

Rodolfo: Right there. No, right there. I don't know.

Mr. H: Well, this is angle 1 and angle 2 are supplementary. So what does that mean again?

Rodolfo: It's 180. That it equals 180.

Mr. H: That when you add them up they equal 180. So where is angle 1 and angle 2 in your problem?

Rodolfo: Angle 1, angle 2?

Mr. H.: Show me angle 1 again, put an arc on angle 1.

does R know it's 180?

Walking him through applying the steps—here putting known quantities on the diagram.

Mr. H always asks for reasons.

Mr. H is emphasizing how important it is to represent the problem visually.

Mr. H always asks for reasons.

One of many points where R and students like him might give up without a persistent Mr. H.

Mr. H refocuses him on the diagram and the meaning.



[He does.]

Mr. H: OK, so you're saying this angle and this angle. OK, so this is one of them, 34. This is the other. Alright.

[Pause.]

Rodolfo: Is that right?

Mr. H: Is what right?

Rodolfo: That it's one angle and the other angle?

Mr. H: Well, do those two angles add up to 180?

Rodolfo: Yeah.

Mr. H: OK...So how do you find the other one?

Rodolfo: You subtract 34 from 180.

Mr. H: And why does that make sense?

Rodolfo: Because...you already know this is 34, and the whole thing is 180, so you gotta subtract what you already have to get what you don't have.

Mr. H: See that, that is an explanation. Do you see that? Instead of just saying "do we do that subtracting thing," words that didn't make any sense, this—you're looking at the problem and seeing what makes sense, what it makes sense to do. You're thinking about it. So that's exactly the process that you want to go through. What makes sense for me to do!

Checking to be sure.

R means that the two angles together do comprise a straight angle. But Mr. H won't know that he actually means and understands that unless R can say it fully in his own words.

Mr. H always asks for reasons. Now we know he gets it because he can explain it in words.

Mr. H emphasizes that thinking it through is the important thing, and that R can do it!



Clip #2

Script	Comments
<p>Mr. H: So this x and this $-x$, they cancel each other out, so what are you left with?</p>	
<p>Rodolfo: 90.</p>	
<p>Mr. H: 90. Is that what wanted it to equal?</p>	
<p>Rodolfo: Yes. Oh, so this other one would be an x too?</p>	
<p>Mr. H: Well, let's try x. If I call this x and I add both of these up, what would that equal?</p>	
<p>Rodolfo: $2x$.</p>	
<p>Mr. H: $2x$. Does that equal 90?</p>	
<p>Rodolfo: Nah.</p>	
<p>Mr. H: It depends what x is, right? What about if we call this $90-x$, like you originally had! $X + (90-x)$. What does that add up to?</p>	
<p>Rodolfo: 90.</p>	
<p>Mr. H: 90.</p>	
<p>Rodolfo: Oh, right!!...So all you do is, $90-x$ right here because...Damn, I forgot what was I going to say. <i>[Pause.]</i> Um, yeah! No, I get it, I get it.</p>	
<p>Mr. H: Can you try to explain it to me?</p>	
<p>Rodolfo: Like...<i>[Long pause.]</i></p>	<p>Mr. H always asks for reasons.</p>
<p>Mr. H: I really liked some of the words you used explaining this one. Can you think back to the words you used to explain that one? <i>[Long pause.]</i></p>	
<p>Rodolfo: I musta got it...</p>	<p>He's asking R to connect to what he did in the previous problem.</p>
<p>Mr. H: The whole angle was what?</p>	
<p>Rodolfo: 180.</p>	
<p>Mr. H: 180. Now you said 34 is taken up. Or 34 is already here and you wanted to figure out what's the rest.</p>	



Rodolfo: Yeah.

Mr. H: What's this whole angle?

Rodolfo: 90.

Mr. H: 90. What's taken up here?

Rodolfo: X.

Mr. H: So another way of saying it is, the whole thing is 90. X is taken up. What's left over? Well, here when 34 was taken up, you did 180 minus the part that's taken up. 180-4. So here the whole thing is 90, x is taken up, so you'd subtract the part that's taken up. The whole thing's 90. X is taken up. 90-x.

If this angle is 34, you'd do 90-34. If this angle is 35 like you recommended, you'd do 90-35. If the angle is 10, you'd do 90-10. Whatever part's taken up, that's what you subtract from the 90 to figure out what's left over. That's how we can express that amount with this expression, 90-x.

Rodolfo: *[Pause. He's nodding.]*

Mr. H: Look at it this way: if I would have given you a number for this, if I instead of saying angle 3 equals x, I'd said angle 3 equals 15, what would you have done?

Rodolfo: Subtract it?

Mr. H: From what?

Rodolfo: From 90.

Mr. H: So you'd do 90-15?

Rodolfo: Yeah.

Mr. H: If I had said the angle was 3 degrees, what would you have done?

Rodolfo: The same thing.

Mr. H: OK. Now all I'm saying is that the angle's x. You do the same thing.

Mr. H is making a connection by analyzing the problem R just did correctly.



Rodolfo: Yeah.

Mr. H: The process is the same. The answer is going to be different just as it was for different for 10 as it was for 3. The answer's going to be different. But the process is the same.

Rodolfo: *[Nodding. Pauses.]*

Mr. H: So what do you think? *[Pause.]*

Rodolfo: **It's easy.**

Mr. H: Do you think you could convince someone why it's $90-x$?

Rodolfo: 'Cause...whatever you get here, whatever is taken out, that's what you have to subtract. That's like the magic number you have to find from the whole angle. You already know it's 90, you just have to subtract it and find what it actually is. And...

Mr. H: What *what* actually is?

Rodolfo: What x actually is...like, no, no, like what the rest of the angle like...

Mr. H: What the rest is...

Rodolfo: Yeah, what the rest is and by doing that you have to subtract, and in this case it would be $90-x$. Like in this case it was $34-180$.

Mr. H: There we go. You know how I'm convinced you know it? You made a connection to another problem. You weren't just describing this problem, you actually made a connection between how that is similar to this problem. That's what I try to do all the time. When I'm doing new problems, how does this relate to problems I've done before? What connection between the processes I've gone through before? What can I learn from this problem that helps me understand other problems?

So, that's how I'm convinced. Now, what I think sometimes happens is: you see a new problem and you say, "Oh, I haven't done this before. I don't think I can do it." **But as we've seen here, I didn't tell you anything for this one, I just asked questions...the same questions you could be asking yourself. Now you can ask yourself all the same questions.** "What does this question mean?" That's the first question I would ask if I did this problem. Can I draw a picture? Same question you can ask. Where can I mark this diagram? How can I convey this information? All these questions are just standard questions you can

It's seems easy now because he understands it!
The important question: Do you understand it well enough so you can explain it in your own words?

Mr. H is validating him as a thinking problem-solver.

This is the main point—for R to internalize questions he can ask himself in these problem-solving situations...inner dialogue.



continue to ask yourself. What else do I know? How can I use this? Where can I go from here? What does this tell me? What am I looking for? All of those are just standard math questions that I always ask myself.

So let's move on. Let's move on. I'm really glad that you came this morning. 'Cause I think this is going to be really good. I'm glad we're getting this time to really work through some of this stuff. So try the next one. Try asking yourself some of the same questions I was asking you. Try and have that inner dialogue with yourself.

Mr. H expresses confidence in R once again that he can “work through this stuff successfully.”

