9:49 Bill: Okay, let me get some scratch paper there. Can we use that for scratch?

Ann: Yeah. Probably.

Bill: Let me see what it is. Looks to me like that's scratch paper. Okay, Let me get my stuff together here while that's coming up. Okay this is kind of like a…simulated race, in this over and back. It's a race between a turtle and a rabbit [*points to them on the computer screen*]. And to be able to make these things operate all we need to do is to come over here and press run turtle or run rabbit or run both [*points to the on-screen Buttons*]. We can do them individually like you see or we can run them both at the same time. The other things that are on the screen here, you see here's the turtle, an arrow going to the right, and a turtle with an arrow going to the left, and then the just plain rabbit, and then time [*points to these words in turn on the computer screen*]. What this means [*points to the Turtle-Over Box*] is that we can set the speed that the turtle is going to run in that direction only [*moves hand quickly over distance line*]. And we can set the speed [*points to the Turtle-Back Box*] for it to come back [*moves hand back along the distance line*], but for the turtle we have to set both speeds. For the rabbit we just have one. Whatever we're setting for he goes over and back at the same speed [*moves hand over and back*]. Okay? That's really all it is [*gestures to the computer*]. Pretty simple, huh [*Ann nods*]? So before we get on to that, I want to ask you though, we're going to be talking about speeds [*points to the Turtle Boxes*] here in feet per second, but…can you tell me what it means to you if you're riding in the car with your folks and they're driving at forty-five mph? What does that mean to you?

9:51 Ann: It means, like…it means, like, if you're going forty-five miles per hour that means that if you time yourself at an hour you would have gone forty-five miles from where you started.

Bill: Good. That's true. How about if you only went a half hour? Instead of driving for an hour you drove for thirty minutes.

Ann: For a half hour?

Bill: Yeah.

Ann: You would only go half of forty-five.

Bill: Very good. Umm…well, that's in effect what we're doing here [*points to the computer*] except the distances we have here are in feet [*points to 100 ft at the end of the distance line*] and instead of miles per hour here we're going to have feet [*points back to 100 ft and then quickly to the Time Counter*] per second. Okay?

Ann: Okay.

Bill: So, as an example, if we take the turtle here [*points to the Turtle-Over Box*], which it currently shows that he's set for thirty, what does that mean?

Ann: [*Short pause*] Thirty feet per second?

9:52 Bill: [*Nods*] Uh huh.

Ann: [*Pause*] So, he wouldn't go that far…right?

Bill: Yeah, but…and we were talking about miles per hour before, here we have thirty feet per second for the turtle [*again pointing to the Turtle-Over Box*]. What does that mean to you in terms of his speed?

Ann: He'll go thirty feet in one second.

Bill: Good. How far will he go in two seconds?

Ann: Sixty feet.

Bill: Very good. Pretty simple isn't it? [*Ann nods*] Okay. Well, let's start off, I can show you how to do these things [*reaches over and grasps the mouse*], but you see this arrow, I can comment that you've been using this before, I can either use the mouse to set those or I can use the tab keys. [*Taps the tab key three times*] You see I can move the tab key and it moves it to the different areas? And all I have to do is go up and put in the number [*types "20" into the Turtle-Over Box*] and I don't even have to hit enter, okay. So then I'm going to set the turtle for twenty going that way, and twenty…coming back [*types "20" into the Turtle-Back Box*]. Do you understand what I've done now, in effect?

Ann: [*Nods*] Yeah.

Bill: He's going to go this way at twenty feet per second, and when he hits the end he's going to turn around and come back [*moves finger over distance line, then back*]. Okay? [*Ann nods slightly*] If I've set him for that [*waves hand towards the computer*], can you tell me about how long it's going to take him to go over and back [*gestures over and back along the distance line*]?

9:53 Ann: At twenty feet per second?

Bill: Uh huh.

Ann: These are in tens aren't they [*points to random tick marks*]?

Bill: Well, let's see. If this in a hundred out there [*points to 100 ft on the distance line*], how do you think that [*moves hand back along distance line*] might be divided up?

Ann: Into tens.

Bill: Pretty good to me.

Ann: [*Pauses, staring at the computer screen*] Okay, so h-how long would it take him?

Bill: You can use paper by the way, too and the calculator [*picks up and puts back the calculator*]. Don't hesitate to use either one.

Ann: [*While Bill was saying the last two sentences, Ann was gesturing over and back on the table and asking:*] Go back ----? Go back and forth?

Bill: Yeah, how long will it take him to go over and back?

Ann: [*Stares at the computer. Then writes 100÷20 in long division form on her scratch paper. Then she writes "5" as her answer*] Five seconds.

Bill: To go both directions, or just one way?

Ann: Just one way.

Bill: Very good, how did you get that?

Ann: I divided twenty into a hundred.

9:54 Bill: [*Nods*] Super. Can you tell me then how long it would…see he goes…[*gestures with hand over and back*] the race is like a relay race except each person runs by themself. He runs all the way over, and he turns around and runs right back, too [*moves finger over and back*].

Ann: So, it would be ten seconds if he went…[*waves hand over and back*].

Bill: 10 seconds. And you got that by dividing twenty into…

Ann: A hundred.

Bill: In this case you got that [*glances down at Ann's paper*] by dividing twenty into one hundred, right? Very good. Should we try it and see?

Ann: Okay.

Bill: Let's run the turtle and see what happens. [*Ann activates the turtle*] There he goes. You see that little counter down here [*pointing to Time Counter*] is keeping track of our time. Bingo. Right on the money. Good job. Let me ask you this, if we set the rabbit for twenty-five meters per second [*types in "25" into the Rabbit-speed Box*], how long will it take him to go over and back?

Ann: [*Writes 100÷25 on scratch paper*] Hmmm… [*grabs calculator and types 25÷100*] Twenty-five hundredths of a second [*looking to Bill*]?

9:55 Bill: I don't think you divided right.

Ann: I didn't think so.

Bill: What you have on paper is probably correct. Twenty-five into one hundred. So here you'd put in one hundred divided by…[*Ann tries but fails to use the calculator for 100÷25*] there you go… you hit the wrong button.

Ann: One hundred divided by…[*successfully uses the calculator for 100÷25*] equals four? [*Looks quizzically at Bill, then at computer, then writes "4" above the long division*].

Bill: [*Pause*] So what does that tell you there? Twenty-five into one hundred is four.

Ann: That it would be four seconds…for…one way across

9:56 Bill: Okay. [*draws a distance line below her long division work*]. That seems to puzzle you. Why is that?

Ann: I don't know. [*Pause*].

Bill: Okay.

Ann: [*Counts the tick intervals by tapping pencil first three, then four times*] Yeah [*nods*].

Bill: Wha-what seems strange to you?

Ann: [*Shrugs shoulders*] I don't know. I just didn't understand.

Bill: You mean the twenty-five didn't sound right or what?

Ann: The four seconds.

Bill: Oh, four seconds.

Ann: Yeah.

Bill: Is it too long or too short, do you think?

Ann: [*Shrugs slightly, then lowers gaze*] I thought it was too short. Sounds too short.

Bill: Well, we are looking [*Ann says something unintelligible*] for the time it takes him to go both over and back, so how long is that going to take him?

Ann: That would take him eight seconds.

Bill: Eight seconds, do you want to give him a try? [*Ann activates rabbit, who finishes in eight seconds*]. You're right on the money. Very good. You had a frown on your face, what were you puzzled about there?

9:57 Ann: [*Shrugs, then pauses*] Just wondering [*moves the mouse back and forth while watching the computer screen*] how they can make him move back and forth so quickly.

Bill: Oh, how does the program do it?

Ann: Yeah [*laughing*].

Bill: You'll have to ask Dr. Thompson about that. I don't know. I didn't write the program. Let's take another step now. Hey, we're buzzing right along here. Let's say we leave the turtle going over at twenty meters per second, err, I'm sorry feet per second and you want to change that one [*note: Turtle-Back Box*] to fifty. Plug in fifty there [*Ann types "50" into the Turtle-Back Box*]. And then you know what I'm going to ask you. How long is it going to take the turtle to go over and back [*waves finger over and back*]?

Ann: Four seconds.

Bill: [*Looks to the computer screen, then to Ann*] Okay. How did you come up with that?

Ann: Because half of a hundred is fifty, so it would be two fifties to equal one hundred.

Bill: Okay.

Ann: And then two plus two is four.

Bill: Okay, but remember he's going over [*points to the Turtle-Over Box*] at twenty feet per seconds.

9:58 Ann: Yeah [*laughs*]. Okay, so it'll take him twenty to get back…or fifty. [*Writes "2 sec. get back" then looks at the computer screen. She then writes "+5" under the 2.*] Eight [*writes "8" under the addition column*]. It would take him eight seconds because it would take him five seconds to take him across [*moves pencil over in the air*] through twenty.

Bill: Okay [*nods*]. And how did you get the five…the five seconds?

Ann: Because I already did it up here [*circles the 100÷20=5 long division problem on the scratch paper*].

Bill: Ah, from earlier work. Okay, so our total time was going to be what?

Ann: Eight seconds.

Bill: And that's these two added together [*reaches over and points to 2+5*]?

Ann: Yeah. [*Note: The 2 could possibly be misinterpreted as a 3 due to the way Ann wrote the number*.]

Bill: Five plus two?

Ann: Seven [*Bill winks*]…eight same thing.

9:59 Bill: [*Looks surprised*] Oh, okay, the same thing.

Ann: Close [*scribbles a "7" over the 8*].

Bill: [*Chuckles*] All righty. Do you want to try it? Let's see [*Ann activates turtle*]. You said five seconds to get there right? Bingo, Looks like you're right on. Look at him go right back. Wee! How about that [*Ann nods slightly*]? Good, let's do this now. Let's skip one down and set the…turtle [*types "30" for the Turtle-Back Box*] for thirty…and have you do the same thing.

Ann: How long would it take him to get back?

Bill: Over and back.

Ann: Over and back. We already know it will take him five seconds with the twenty.

Bill: Okay.

Ann: So thirty into a hundred instead. [*Writes 100÷30 in long division form. Then uses the calculator. Looks at the calculator display, then to Bill*] I don't think I did that right [*giggles*].

Bill: Why? What did you come up with? What did you do and then what did you come up with?

10:00 Ann: [*Reading off of the calculator display*] 333333333.

Bill: [*Reaches over and looks at the calculator display*] Is there a decimal in there somewhere?

Ann: Yeah.

Bill: Yeah. So what…isn't this…what is this, seconds we're dealing with?

Ann: Yeah.

Bill: So how long would that be?

Ann: That would be…three seconds [*looks at the calculator display, counting the threes after the decimal point*] and ten million. Three thousand and ten millionth.

Bill: Oh, I see. No. Let's forget about all those other threes back there [*points to the calculator display*].

Ann: Three seconds.

Bill: Why don't we just say it's going to be…because here [*points to the Time Counter*] we're only measuring to the first decimal place.

Ann: Yeah.

Bill: The tenths place. So why don't we look only at the tenths place here [*again pointing to the calculator display*]. We'll round to that and call it 3.3.

Ann: 3.3 [*writes "3.3" over long division 100÷30*].

Bill: Okay. And then your total time over and back?

Ann: [*Writes 5+3.3 in column form. Rewrites the 5 so that the decimal points align. Then adds them and writes "8.3"*] 8.3 seconds.

10:01 Bill: Let's see [*Ann activates turtle*]. And again you got that by dividing thirty into the hundred, right?

Ann: Yeah.

Bill: Very good. [*Race ends*] Looks to me like you're pretty accurate. See what it says here [*pointing to the Time Counter*]? Let me show you also what we can do up here in the options menu, just to…make it a little bit interesting [*uses the mouse to add digits onto the Time Counter*]. See there's the additional 333333s. If I had more places I would continue to get them all the way across. Okay. So you're right on the money. That's very good Ann. Let's go back to that position [*uses the mouse to have the Time Counter display only to the tenths place*]. I want to set them now for the…turtle to go forty [*types "40" in the Turtle-Over Box*]. And that's forty over and he's going to go twenty back [*Bill types "20" in the Turtle-Back Box. Ann writes 100÷40 in long division form*]. And the rabbit now is going to race him, and we're going to set the rabbit for twenty-five…feet per second [*rabbit stays at 25*].

Ann: So how long would it take each of them to go over and back?

10:02 Bill: Who's going to win the race? [*Pause*] Why don't you go ahead [*points to extra scratch paper which Ann ignores*] and use a separate sheet if you want so we can kind of keep this stuff organized if you want.

Ann: [*Ann draws a box around the 100÷40. Then she uses the calculator for 100÷40.*] Aaagh [*makes a mistake and recalculates. She then writes "1st .025" and below that "2st 2.5"*]

Bill: Make sure your decimal points…you're reading them correctly off of the uh…calculator.

10:03 Ann: [*Moves the decimal to .25 on "1st." The she uses the calculator for 2.5+5.0 and writes, in an addition column labeled "T", 2.5+5.0=7.5 in column form. Then she writes "R" and under that "25" which she circles and boxes. Next to that, Ann writes 4+4=8 in column form, circles the problem, and draws and arrow to the 25.*] The turtle will win.

Bill: He'll win, by how much?

Ann: By…five tenths of a second [*she says it half answer, half question*].

Bill: Okay. Do you want to run them [*gestures to the mouse*]? Let's see [*Ann activates race*]. While they're running can you explain to me how you got your answer? How did you come about deciding that they would win by that much?

10:04 Ann: Okay…[*looking down at her work*] I tried to do a hundred into forty [*points with pencil to her 100÷40 in long division form*] for…for the first time for the travel…that the turtle [*gestures to the computer screen*] would travel.

Bill: Uh huh [*nods*].

Ann: And then, when I got…it took me two tries, but when I got 2.5 [*points to the column labeled T*], I added that plus the five that I knew I would already have, the same thing going back up [*draws a squiggly line from the T column to the first problem she worked on, 100÷20=5 in long division form*] to here again.

Bill: Yeah, okay.

Ann: And then for twenty-five…

Bill: So, you figured out the turtle's total time was seven and a half seconds?

Ann: Yeah.

Bill: I see that [*glancing over at Ann's paper*]. Yeah, okay.

Ann: And then I took the twenty-five [*draws a line from the 25 under the R to the second problem, 100÷25=4, and circles it*] and I went back to what…to the information I got up here.

Bill: Ah, good for you.

Ann: [*mumbles something*].

Bill: So it would take the rabbit eight. Unfortunately, I started you explaining that when they were running the race, but uh…looks like something came up to eight seconds [*gestures to the Time Counter*], but I'm not sure which one it was. Should we run them again just to see?

Ann: Okay.

Bill: I think it continues to run even after the turtle wins or the rabbit wins, but let's see [*Ann activates race again and they watch. The turtle wins by half a second*]. Yep, looks like you were right.

Ann: Yeah, ---- turtle.

10:05 Bill: Good for you. Okay, do you want to try one more of those?

Ann: Okay.

Bill: Let's try one with thirty for the turtle's speed going over and forty coming back. And this time we're gonna set… oops, I don't want thirty…forty, forty coming back and the rabbit we're going to set at thirty-five [*sets the Turtle-Over Box to 30, the Turtle-Back Box to 40, and the Rabbit-speed Box to 35. Ann writes, in the upper right portion of the scratch paper, 100÷30=3.4 and 100÷40=2.5 in long division form, and then writes 3.4+2.5=5.9 in column form. Her 100÷30=3.4 is only two inches from a previous problem, 100÷30=3.3*].

Ann: Forty, thirty-five?

Bill: Yeah, he's going to come over and back at thirty-five. [*Note: referring to the rabbit.*]

Ann: [*Writes 100÷35 in long division form. She then uses the calculator and writes "2.8" over the new division problem.*] This time the rabbit would win.

10:06 Bill: And his time is going to be?

Ann: His time would be 2.8.

Bill: Hmm. Okay…. You want to run them and see? [*Ann activates race*] You were right, the rabbit won.…But his time was a little bit different. How was that?

Ann: I just took the first two here [*points to the calculator display*].

Bill: [*A pause, then looks over to the display*] The other ones were just decimal places, right?

Ann: Yeah, they were just…

Bill: Yeah, so we just round those off, but how far did he run in [*points toward Ann's paper*] 2.8 seconds?

10:07 Ann: He…got all the way across [*moves finger over the distance line*] and he was coming back. He was about there…[*points to middle of the distance line*] when he stopped.

Bill: Ah.

Ann: When he got to 2.8.

Bill: [*Slowly*] Okay. [*Pause*] Why don't you run the rabbit just by himself, so that way we can kind of test, right? And see what goes on [*Ann activates rabbit*]. What did that tell you?

Ann: Oh, I get it. I didn't add it up.

Bill: Yeah.

Ann: I should have [*scratches out the 100÷35 long division*].

Bill: Why would that be?

Ann: Huh?

Bill: What was wrong with your calculations?

Ann: I needed to double it.

Bill: Why?

Ann: To get over and back.

Bill: Ah, you just calculated it over.

Ann: I went one way.

Bill: Okay, good. I'll tell you what, it looks like you've got this thing wired, so I want you to see if you can work these out [*hands Ann a problem set*] and you're welcome to write on this paper or on your own scratch paper if you want. Now what here I would like you to do is let's just start off at the top, you can probably already figure out some of these anyway. What's the rabbit's speed have to be to give me these times [*points to left and right columns on problem set with pencil*]? Over and back, now

remember. And we can test him on there [*gestures toward computer*], or you can test it on there if you like.

10:08 Ann: [*Pause*] Okay. [*Pauses. Writes what looks like 100÷5=2.8 in long division form [Note: perhaps in confusion over 100÷35?]. Draws a line over and back above a half-distance line she used previously, circles 100÷5, then scratches it all out. Writes 100÷5 in long division form again. Types on calculator 100÷, stops and looks to the paper, then back to the calculator.*] Ohhh. [*Scratches out the long division. Writes "100" and below that "5". Runs out of room on the scratch paper, so turns it over.*]

10:09 Bill: Here [*points to pile of scratch paper*], just grab another piece. There you go.

10:10 Ann: [*Spends much of her time staring at paper or tapping the desk with her pencil. Then she draws a number line, dividing it up into three tick intervals*]

Bill: Gotta give you some more room there, you're almost off the table [*moves the calculator, mouse and keyboard so that there is more desk space. Ann draws a new number line under the first, this time eleven tick intervals long*] You want to change one?

Ann: Yeah.

Bill: The rabbit? [*Ann nods*] Okay. All you've got to do is put in your number.

Ann: I'm almost sure I'm wrong, though.

Bill: What's an easy way to find out?

Ann: [*Chuckling*] I don't know [*Note: about the answer, not the "easy way to find out"*].

Bill: What speed do you think he should go at?

Ann: Fifty…probably [*types in 50 for the Rabbit-speed Box*].

Bill: Okay, and before you push the go line, why fifty? I mean, how did you come up with fifty?

Ann: It seemed logical? I don't know [*shrugs shoulders*]…It's a guess.

Bill: Did that [*note: the 50*] have something to do with your drawings [*points to Ann's scratch paper*] there?

10:11 Ann: No. I messed them up, I did it wrong.

Bill: Okay. Well, let's take a run at it. Let's see what it is. He really zips doesn't he?

Ann: Forty.

Bill; Why forty?

Ann: Because if it took four seconds at fifty, then if you subtract ten, it might take him a whole second longer to get back.

10:12 Bill: Okay, he hung up, we'll see if he goes, there he you go.

Ann: Smiley face, I do it a lot.

Bill: You got it, right?

Ann: Yeah.

Bill: Okay, we'll write that in here and go on to the next one.

Ann: [*Reading off of problem set, whispering:*] 10 seconds.

Bill: The next one is ten seconds, right?

Ann: Oh, um,…I know how you get the answer, but [*chuckling*] I don't know how fast [*presses "clear" on calculator repeatedly*].

Bill: How would you get it?

Ann: You would, umm…see if these [*points to the tick marks*] were split up in ten sections it would take a second to get over each [*moves hand over and back*].

Bill: Okay, remember now we're talking over and back [*moves hand over and back*].

10:13 Ann: So, it would take five seconds. So, it's [*writes 5+5 in column form. Draws a number line with five tick marks, and the tick intervals labeled one through five and the last tick has 100 over it. Writes three squiggly lines along number line. Then writes "10" and circles it. Types 10 into Rabbit-speed Box and activates it. Counts the seconds it takes the rabbit softly to itself.*] Yep, that's too slow. [*Writes "+10" next to the circled 10. Writes "20" and puts scratch marks around it.*]

Bill: How long is it going to take?

10:14 Ann: Twenty, twenty seconds. [*Writes "20" again, this time boldly, and circles it.*] …Okay.

Bill: [*Pause*] You're exactly right. Is there some relationship here [*Ann yawns*] …that you, say, remember the first ones that we were doing when we had a set speed, and you were calculating the time? All we're doing is the reverse of that now [*flips hand around and shows its backside*]. Do you have any ideas as to how you might approach getting these, figuring out what speed it has to be?

Ann: [*Quickly*] No [*shakes head slightly and chuckles*].

Bill: Okay. That's all right. [*Ann types in 20 and activates rabbit*] So twenty is your bet today, right? He's off and running. [*They watch it go. Before it's done, Ann writes 20 on the answer sheet*]. You knew that one for sure, right?

10:15 Ann: Yeah. As soon as it went half way…

Bill: [*Interrupting*] Let me ask you before you do this next one, let's say he's running it at uh…40 feet per second. How long is it going to take him to go over and back?

Ann: [*Looking down at the problem sheet*] Forty feet per second?

Bill: Yeah. [*Pause*] It's not one of them listed there [*gestures to problem sheet*], I don't think. From the others we were doing earlier, you know, we were setting the speed and seeing how long it took him. How long should it take if you set it for forty feet per second?

10:16 Ann: Forty feet per second…[*Searches through scratch paper. Pauses. Uses calculator for 100÷40*] 2.5 seconds to get there and 2.5 seconds to get back.

Bill: Yeah [*nods*] You see, that was this one right here [*points to one of the previous problems Ann did*]. Let's go on with the next one, I wanted to go back and make sure

that you understood about what we were doing before and you do so that's fine. How about eight seconds? How long is it going to take him, or what speed, I mean, shall he have to race at to get there and back in eight seconds.

10:17 Ann: [*Long pause while searching through scratch paper*] Twenty-five.

Bill: Okay, let's set him and see [*Ann puts 25 into the Rabbit-speed Box*]. Now how did you come up with that?

Ann: I-I looked back here [*holds up old scratch paper*] and this is, we're talking about eight seconds, four plus four is eight, and I got that when I was trying to figure out how long it would take the speed of twenty-five.

Bill: [*Looking at Ann's paper*] Ah, okay [*nods*], all righty. [*Pause*] Okay, you want to run the rabbit [*Ann activates rabbit*]. I wonder what it would do if we just ran it with the turtle's [*points to Turtle-Over Box*] saying zero speed over and forty back [*chuckles*]. Maybe that's why it's giving us that smiley face. [*They watch the race end*] What are we aiming for?

Ann: Eight seconds.

Bill: Eight seconds, right on the button. Good for you. [*Ann writes "8" on the answer sheet*]

Six is next [*meaning give Rabbit a speed that would make him go over and back in 6 seconds*]

Ann: We didn't do that one.

Bill: Huh?

Ann: We haven't done that one [*meaning that six seconds was not a previous result from Activity 1*].

Bill: Uh uh [no].

Ann: Notes don't help [*chuckles, rearranging her scratch paper.*]

Bill: But that's all right. There's plenty of paper there. We've got plenty of space to write.

Ann: Okay. Six … [*writes 100÷15 in long division form, then uses the calculator to find the result*][1]

Bill: So, what did you do, divided fifteen into a hundred?

Ann: [*Looks quizzically at the result*]. That's wrong. [*Responding to Bill's question:*] Yeah.

Bill: That was for a guess-and-test kind of thing?

Ann: Yeah. [*Writes "6.6"*].

Bill: Okay. And what did you come up with for that?

Ann: Six point six, that's over already, and that's for just one way.

Bill: Ah.

[1] We use an ellipsis (…) within excerpts to indicate a pause. It does not indicate omitted text.

Ann: [*Pause. Then she mumbles:*] 100 divided by 10 seconds…[*writes 100÷10 in long division form in the upper left corner of the scratch paper. Then she looks like she might solve it by hand, but then she uses the calculator for the result. Looks at the display for a moment, then hits the "clear" button on the calculator.*]

10:19 Bill: That hundred divided by ten gave you ten? [*Pause*] Is that right?

Ann: [*Uses calculator again for 100÷10*] Yeah.

Bill: That's right. Ten times ten is a hundred. Can you think of a more efficient way, rather that having to go down and guess and check and guess and check… This would work. There's nothing wrong with it [*shrugs shoulders*]. But is there a quicker or more efficient way of doing it do you think?

Ann: Yeah. [*Begins to scribble on page aimlessly*] There is, but I can't do it that way.

Bill: Oh, what way is that? Oh, 'cause you don't know what it is yet?

Ann: Look at the answer book.

Bill: Oh [*chuckling*]

Ann: We don't have an answer book [*puts pencil down*].

10:20 Bill: No, there isn't an answer book for this stuff.

Ann: So…

Bill: That's true. [*Ann uses the mouse and keyboard to enter 5 in the Rabbit-speed Box and activates it.*] Now if you…From before, if you set him for five miles, err five feet per second, how long would it take him to get over there [*gestures with hand over*]?

Ann: [*To self :*] Five feet per second. [*To Bill :*] Over six seconds.

Bill: Yeah.

Ann: Well over six seconds [*nervously plays with hands*].

Bill: But the way you were doing it before [*gestures to scratch paper*], you know, the first, the first things we were working on here. How did you figure out how long it would take him?

Ann: We didn't do it … last time. [*meaning 6 seconds*]

Bill: I know we didn't do it with five seconds, but how did you figure out how long it would take him if he has a set speed [*points to Rabbit-speed Box*], in this case of five feet per second?

Ann: I … added. I think. I don't know.

Bill: On all the first problems you were doing, all these [*points to first piece of scratch paper having Ann's calculations*]?

Ann: No, I divided.

Bill: Yeah.

Ann: For the [*inaudible*], for the time ones, to find out the time.

451		Bill:	Okay. So if I divide the … What is this time [*points to the Rabbit-speed Box*] going to come up with? Can you tell?
453		Ann:	Umm [*looking to the computer screen*] About forty seconds, probably.
454		Bill:	Yep [*nods*] Does that sound right to you?
455		Ann:	No [*chuckles*]. That's way too far.
456		Bill:	True. [*Pause*] So, what is it … [*Ann plays with the mouse*] Let's go back and review again. What is the target time we're aiming for here?
458		Ann:	…Umm…Six seconds.
459		Bill:	Okay [*nods slightly*]. And we know five is moving way too slow, right?
460		Ann:	[*Nods*] Yeah.
461		Bill:	Was ten moving too slow?
462		Ann:	…Yeah.
463		Bill:	Yeah. [*Pause*] And fifteen was too fast. Or was that too slow?
464		Ann:	[*Looks down to the scratch paper*] I don't know. No, it was too slow.
465		Bill:	We're aiming for six seconds now, [*points it on the scratch paper*] right?
466		Ann:	Uh huh [*looks back to scratch paper then to the problem set three times*]
467		Bill:	And how long did you calculate that it would take him to go over…running at fifteen feet per second? Your calculation's right down there [*points to it on the scratch paper*].
470	10:22	Ann:	It's 6.6 just to go one way.
471		Bill:	So,…that's still too slow, isn't it?
472		Ann:	Yeah.
473		Bill:	[*Nods*] Okay. So which direction do we have to go, above or below?
474		Ann:	Above [*pointing up*].
475		Bill:	[*Nods*] Okay. And if he ran twenty feet per second…[*Ann immediately types 20 in the Rabbit-speed Box*.] You already figured that one out what he's going to get, right [*Ann activates the rabbit, and waits for it to give her the result*]?
478		Ann:	He would get…five seconds, no.
479		Bill:	Five over…, [*waiting for a response*].
480		Ann:	…five back [*rabbit finishes*].
481		Bill:	And that's still too slow, isn't it?
482		Ann:	[*Pause, then tries 30 for the rabbit, watching it go*] It's too fast. Maybe. Maybe not. [*Rabbit finishes*] Too slow. [*Tries 31 for the rabbit. It still comes in too slow*]
484	10:23	Bill:	You're getting closer though. [*Ann pauses while thinking. Then she types 32 and tries to change it*] You have to go to backspace, I think, to erase the two [*referring to the second digit of 32*].

10:24 Ann: [*Changes the Rabbit-speed to 33. Watches the rabbit go.*] That would be right. [*Rabbit finishes*] How can you minus this one-tenth of a second?

Bill: Does he have to run right at thirty-three? Or twenty? Or twenty-five? Can he run a part of a feet per second in terms of speed? Like 33.1?

Ann: Probably.

Bill: Yeah [*nods*], we can go in there and see. [*Both move forward to type on the keyboard*] Well, go ahead [*Ann types 33.1 and activates the rabbit. They watch it go.*] Good shot. Now, we're almost out of time, we've only got about a minute left, it looks like [*Ann writes "33.1" in the ft/sec. column next to 6 sec. on the problem set page*]. Ann, what I'd like you to think about…there's no assigned homework on this tonight. Umm…but you know the way we were going [*moves hand over the distance line*] first of all, we had a set speed and you were trying to figure out what the time was. And now we're going the other way around, and what I'd just like you to think about over the evening: Is there a more efficient way to do this [*points to the problem sheet*], this reverse process, instead of having to guess and check? And we'll pick up where we left off tomorrow [*Ann nods*]. Anything else you want to try on the thing [*Note: computer*] while we've got a few minutes or seconds left?

10:25 Ann: Yeah.

Bill: What do you want to do? [*Ann types ".1" for the Rabbit-speed Box and activates the Rabbit.*]. Oh, you want to be here for a long time.

Ann: I want to see how long this will take.

Bill: Well, you should be able to calculate it out can't you do that the way you were doing the first ones?

Ann: Yeah, but I just want to see. I like… He's not going to get back very quick.

Bill: No, I think the bell's going to ring before he even gets down there [*Note: to the 100 ft tick mark*] to be honest with you. From that [*gestures toward the computer screen*] can you calculate how long it should take him? You've got the calculator there. Feel free to use it.

Ann: Over forty seconds.

Bill: Forty?

Ann: Over forty.

Bill: Over, I would believe that. How far has it gone so far?

Ann: Not even a foot and it's at twenty seconds.

Bill: Each one of these [*points to a tick mark*] are how far?

10:26 Ann: That's ten feet.

Bill: Okay, so he hasn't even gone ten feet yet and it's twenty-five seconds so far. So can you figure out ho-how long it's going to take him.

Ann: Maybe.

Bill: Give it a try, 'cause we're out of time anyway.

Ann: Fifty seconds. No. Sixty, sixty seconds.

Bill: No. It's going to be a lot more that that. He hasn't even gone ten feet and it's already [*points to the Time Counter*] up to thirty-five. Thirty, sixty, ninety, it's going to be whole bunches.

Ann: I know! Um, two hundred seconds. Two hundred.

Bill: Well, maybe we'll find out when we come back next time. But right now you've got to go to class.