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Inches and Centimeters. Daniel measured several things in inches and in centimeters and he made the following table:

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He conjectured that "inches over centimeters" is a constant, which is approximately equal to 0.39.

Liana said this is wrong, because the conversion table in her book says 1 inch = 2.54 centimeters. Therefore, dividing both sides by centimeters, we get:

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Please help Daniel and Liana figure out why they can't agree.

Daniel & Liana could not agree because of the following reasons:

① Daniel was ~~stating~~ referring to an operation (division), Liana was simply stating a conversion rate.

② Daniel came up with inches per centimeter while Liana stated the centimeter per inch.

③ Daniel used inches and centimeter as an adjective or with quantitative value, Liana was simply referring to it as a noun.

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Daniel and Liana can not agree on this because they are looking at the problem in two different ways. Daniel is addressing the problem in terms of .39 of an inch is about one centimeter. This statement represents a statement of magnitude. Liana is looking at it in terms of a number statement or value of length statement.

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Liana is referring to an actual number. That is inches measured by centimeters is 2.54 (as seen in (1)).

Daniel (in (2)) is referring to the conversion factors/ magnitudes. As in $\frac{1\text{ in}}{2.54\text{cm}} = 0.39\ldots$ which would convert inches to cm. and vice versa with $\frac{2.54\text{ cm}}{1\text{ in}} = 2.54$.

Though they have the same left side of the equation, their right sides are different because they are representing different ideas - one a number, the other a quantity.

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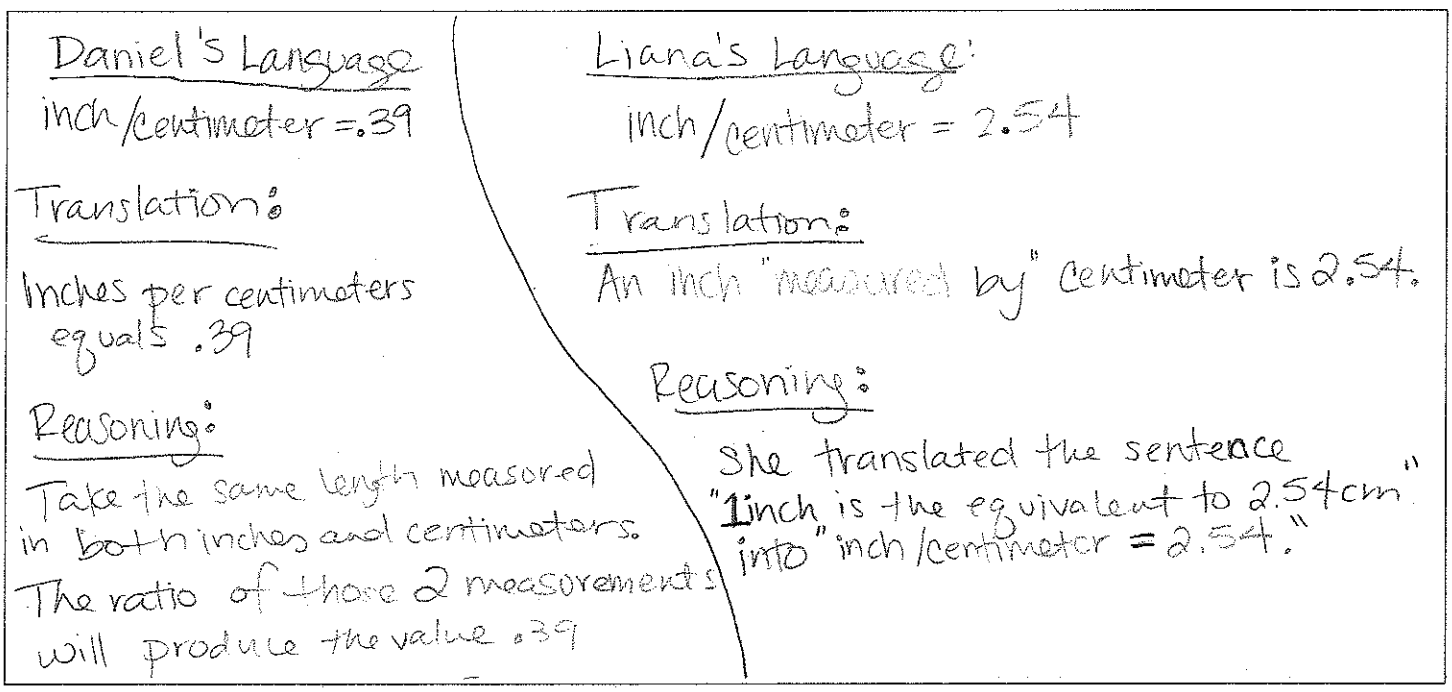

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Please help Daniel and Liana figure out why they can't agree.

Daniel's conjecture which is inches / centimeters = 0.39 simply means that an inch measured in terms of centimeters is 0.39. It is not really dividing the no. of inches by the no. of centimeters rather, it is the length of a certain object which is measured by a unit inch in terms of another unit which is in cm.

Liana's conjecture is simply saying that it is just a conversion or she just used it as a number. The difference bet. Daniel's and Liana's is the way they used it as a noun and as an adjective. (conversion)

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Please help Daniel and Liana figure out why they can't agree.

Lorena and Daniel are having two different conclusions because they are defining the problem 2 different ways. Lorena defines that "inch/cm" is inch measured by centimeters. Daniel on the other hand defined a conversion factor which can be used in an equation to translate from one unit to the other.

$\frac{1 \text{ inch}}{2.54 \text{ cm}} = .39$

$2.54(I) = 1C$

$2.54(9) = 1(22.8)$

$22.86 \approx 22.8$ ✓

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Please help Daniel and Liana figure out why they can't agree.

Daniel and Liana are both right, they just couldn't agree on the language of math they are using.

1 inch = 2.54 cm is a conversion which explains the magnitude of an inch converted to cm.

While Daniel's arguments of an inch/cm = 0.39 is right if you take the number of each unit but not their magnitude.

or more logical way of writing

Thus 2.54 centimeter/inch is better, than centimeter per inch = 2.54.

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Please help Daniel and Liana figure out why they can't agree.

Daniel and Liana are thinking of the problem in two different ways. Logically 1 inch does equal 2.54 centimeters. If you are to work this as an equation, in order to plug in numbers for unknowns (variables), it must be written $\frac{\text{in}}{\text{cm}} = 0.39$ or $\frac{i}{0.39} = \frac{0.39 \cdot c}{0.39}$ or $\frac{i}{0.39} = c$. That is the way Daniel first sees it. Liana sees the problem more verbally. $\frac{\text{inch}}{\text{centimeter}} = 2.54$ this is not really division. 1 inch = 2.54 cm She is using the inch + cm as nouns (can't sub #'s)

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Please help Daniel and Liana figure out why they can't agree.

Daniel and Liana can't agree because they are using the same terms to represent two different concepts. Daniel is using the words "centimeter and "inches" to represent quantities from his measurements. Liana is using the words "inch" and "centimeter" to represent numbers. When they are able to clarify what they are discussing, the quantities used versus numbers used and why they made their conclusions then they will be able to agree.

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Please help Daniel and Liana figure out why they can't agree.

Daniel and Liana can't agree because they are using differing interpretations of the basic equations. Daniel is using the terms "cm" and "in" as variables and Liana is using them as nouns. Both are correct. Daniel says 2.54 i = c (or .39c = i) allowing him to substitute the number of inches into the variable i to obtain the equivalent magnitude in centimeters (c). Liana is stating that there are 2.54 centimeters in 1 inch with her statement "one inch measured by centimeters is 2.54"

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Please help Daniel and Liana figure out why they can't agree.

Both students are right and both are wrong. They are arguing different points. Daniel says inches/centimeters = 0.39. What he meant was $\frac{9\text{ in}}{22.8\text{ cm}} = \frac{0.39\text{ in}}{1\text{ cm}}$ (which is actually saying 1 cm/1 in = 0.39). Liana is arguing that 1 in/1 cm = 2.54 which is correct. The major difference between the two is that Liana is comparing two different magnitudes while Daniel is comparing two measures of the same magnitude.

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Please help Daniel and Liana figure out why they can't agree.

Daniel and Liana have different perspectives. Liana seems to be saying, "If you divide an inch by cm units, you will have 2.54 cm in each inch." Daniel is using his setup as a ratio: $\frac{\text{inch}}{\text{cm}} = \frac{9}{22.8} = 0.39\ldots$ using the data from his table, he came up with this ratio, as well as $\frac{\text{cm}}{\text{in}} = \frac{22.8}{9} = 2.54$. He calculated the unit rate per of inches per cm.

Permission to view not granted.

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He conjectured that "inches over centimeters" is a constant, which is approximately equal to 0.39.

Liana said this is wrong, because the conversion table in her book says 1 inch = 2.54 centimeters. Therefore, dividing both sides by centimeters, we get:

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Please help Daniel and Liana figure out why they can't agree.

There are two ways to look at a problem. We can measure and deduce a conversion Rate which will have magnitude like Daniel did in his scientific experiment.

OR we can form an equation which will be used as a ratio like Liana. When we use the ratio 1 inch for every 2.54 centimeters, we know that for any number of inches will be a larger number of centimeters.

Daniel's statement: "$\frac{\text{inches}}{\text{cm.}} = 0.39\ldots$" is magnitude it should include $\frac{0.39\text{ in}}{\text{cm}}$ at the end. It's saying there are 0.39 inches for every centimeter. Both are correct but need to take a class with Dr. Madden to learn how to communicate better.

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Please help Daniel and Liana figure out why they can't agree.

The two cant agree because they are not being clear in thier unit conversions and their use of number statements. when you set up a ratio the units must cancel. Liana and Daniel also must differentiate between using their units as a noun or an adjective. That will also effect how the problem is set up. 2.54 is a unit of conversion, as .3947. They just need to more effectively communicate the way they are setting the problem up

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Liana said 1 inch = 2.54 cm

$\frac{1\text{ inch}}{1\text{ cm}} = \frac{2.54\text{ cm}}{1\text{ cm}}$

$\frac{1\text{ inch}}{1\text{ cm}} = 2.54$ and not this

$\frac{\text{inches}}{\text{cm}} = 0.39$

* Liana conclude that in every 1 in there is exactly 2.54 cm based on their magnitude statement.

Daniel said:

Value of inches/cm = 0.39

$\frac{1}{2.54} = 0.3937$ actually dividing the numerical value of inch to cm.

∴ Both of them is actually correct in their own understanding. Daniel is correct when you want to know the exact numerical value when the # of inches is divided by the # of cm. and the unit will be in/cm. However Liana is also correct if we want to convert 1 inch into a centimeter and the unit will either be inches or cm of the resulting conversion.

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Daniel used actuall number relating bach their magnitudes respectively so when he divides inches by rentimeters he gets .39... Daniel uses finches and rentimeters as adjectives.

Liana is using inches and rentimeters as a noun and relate inches by centimeters by a proportion of 2.54 rentimeters per inch.

Both are correct with what they are saying but the use of the word inches and rentimeters are different. Daniel use numbers to represent a number and Liana uses magnitudes to represent a number. This is the big problem communication.

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Liana → Number statement;
in measured by cm = 2.54

Daniel → magnitude statement;
≈ 0.39 inches per cm.

} confusion lies in equating the 2 statements correctly.

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When converting from inches to centimeters the conversion we use is $\frac{1\text{in}}{2.54\text{cm}}$.
Daniel used this by dividing the fraction and keeping the units. He viewed units as an adjective. Liana was viewing this conversion as a noun. This is why she divided to get in/cm=2.54. She viewed it as cm measured by an inch.

Daniel viewed the conversion as inches measured by a centimeter.