

Tutorial Session Notes

Grade 7

Quarter #3 (Week 17-24)

About these notes:

- These notes are primarily for those who are acting as the tutor – either a parent or a class teacher.
- In the first year of JYMA, Maria (our JYMA tutor) and I met every week and talked about grades 5-8, and we made a list of suggested topics for the Friday tutorial session.
- In order to support those who are acting as the tutor for their child or a whole class, I am sharing these notes with those who are acting as the tutor.
- Of course, these tutorial sessions are also an opportunity for the students to ask their tutor questions.
- If you are acting as the tutor, it may be helpful to read the section of the JYMA Handbook titled “The Role of the Tutor”.

Week #17

- Quiz them on their percent flashcard facts
- Percents practice problems:
 - What is 10% of 73?
 - What is 20% of 75?
 - What is $83\frac{1}{3}\%$ of 180?
 - What is 200% of 17?
 - 12 is what % of 16?
 - 400 is what % of 600?
 - 9 is what % of 75?
 - 180 is what % of 120?
- Convert to a percent:
 - 0.045
 - 0.007
- Increase/decrease problems:
 - What is 80 increased by 25%?
 - What is 80 decreased by 25%?
- Word problems:
 - If you go to a store, and a pair of shoes are marked at \$55, if there is a 20% discount, how much do you pay for the shoes?
 - You buy a bicycle for \$350 and there is 7% tax, how much do you have to pay total?
- Go over the square root problems from the group assignment. Note the method used to get the answers is “Guess and Check”
- Go over the puzzle problems from the group assignment – Here are the problems listed again:

For Tuesday: Puzzles!

- 1) Jane and John started with a total of 30 cookies between them. John then ate 3 of his cookies, which left him with exactly twice as many cookies as Jane. How many cookies did Jane have? (Answer is 9.)
- 2) Lori is on the middle step of a staircase. She goes down 3 steps, up 6 steps, then down 11 steps. She is now on the bottom step of the staircase. How many steps does the staircase have? (Answer is 17.)
- 3) If Jill subtracts 7 from her favorite number, multiplies by 10, and adds 7, the result is 47. What is her favorite number? (Answer is 11.)
- 4) If Lexie takes her favorite number, adds 5, divides by 6, subtracts 7, multiplies by 73, and adds 8, she ends up with 8. What is Lexie’s favorite number? (Answer is 37.)

Week #18

- Practice C - F conversions

$$C = \frac{5}{9} \cdot (F - 32)$$

$$F = \frac{9}{5} \cdot C + 32$$

- Practice Gauss's formula.
 - Add up all the numbers from 1 to 56.
 - Add up all the numbers from 1 to 1,000
- Combining negative and positive numbers
 - With $7 - 3$, instead of thinking of "seven minus three", with algebra we think of it as: "positive seven combined with a negative 3."
 - Emphasize that $11 - 3$ is the same as $-3 + 11$
 - With $-6 + 8 - 12$ each sign is connected to the number to it's right. We are combining $-6, +8, -12$. There is a story connected to this involving three trips to the bank.
 - Make sure they got the correct answers from the Thursday group assignment.
 - Practice problems. Think of each one as a "Bank Account problem".
 - $-13 - 10$
 - $-13 + 10$
 - $-10 + 13$
 - $5 - 9 - 3 + 6 - 14$
- Galileo's *Law Of Falling Bodies*
 - $d = 16t^2$ (d in feet, t in seconds)
 - Make sure they understand it
 - Practice problems:
 - how far does something fall in 2 seconds
 - how far does something fall in 8 seconds. (1,024)
- Ask if they need help with their percents homework

Week #19

- Thoroughly understand Algebra Sheet #2 and #3 (p104-105).
 - Focus on signs, numbers, equations, and expressions.
 - If extra time, make up similar problems.
 - At this point, they are solving the equations by using guess and check.
 - Do formula problems only if there is extra time
- Ask if they need help with their percents homework

Week #20

- Make sure they understand Algebra sheet 6 & 7 and make up problems similar to that.
- if extra time, do the formula problems.

Week #21

- Algebra:
 - Solve $4X - 8 - 6X = -7 - 3X - 3$ (ans = -2)
- Go over the puzzles from group assignment, which came from puzzle book #96, #87.
- Make sure they understand all their percents homework – especially #7 and #8 and #10
- Percent increase/decrease:
 - What number is 30% greater than 60?
 - What number is 30% less than 60?
- Using the formula $\frac{\text{amt of inc/decr}}{\text{starting point}}$
 - Example: 450 is what percent greater than 360?
 - reword: going from 360 to 450 is what percent increase?
 - Amt of increase = 90 $\rightarrow \frac{90}{360} \rightarrow \frac{1}{4} \rightarrow 25\%$
 - Example: 360 is what percent less than 450?
 - reword: going from 450 to 360 is what percent decrease?
 - Amt of decrease = 90 $\rightarrow \frac{90}{450} \rightarrow \frac{1}{5} \rightarrow 20\%$
- If time, do a compound interest problem (similar to p47, #9)

Week #22

- Ask how they did with the group assignment puzzles
- Really make sure they understand the percents work – Sheet #6
- Some additional practice problems:
 - 120 is what % greater than 80? - reworded as starting at 80 and going to 120 is what percent increase?
 - 80 is what % less than 120?
 - 200 is what % of 320?
 - 320 is what % of 200?
 - If a store has a sale, and everything is 25% off, how much do you pay on an item originally marked \$72?
 - If you go into a store and the original price is \$80, and the discounted price is \$64, what percent discount is it?

Week #23

- Work on percents practice test, and sheet #7.
- Ask if they made progress with the 4 variations of Nim, as explained in the lectures. If they wish, then play the game and try to develop the strategy to beat the Nim machine! Here are the 4 variations:
 - *One-Pile Nim*. Each turn, you can take 1, 2, or 3 gems (but the Nim machine may change this number at the start of the game).
 - You can play that the person who takes the last gem wins, or you can play that the person who takes the last gem loses.
 - *Two-Pile Nim*. Each turn, you can take as many gems as you wish, but from only one pile.
 - You can play that the person who takes the last gem wins, or you can play that the person who takes the last gem loses.
- If extra time, go over math tricks (back of 7th grade workbook) – all 6th grade tricks, and every 7th grade trick except #11, 12, 13.

Week #24

- Go over 6th grade and 7th grade math tricks, except 7th grade tricks #11 and #13.
 - Make up problems, and make sure they can do all of them.
 - Start by asking which ones on the list do you not know that you want to learn?
- Practice playing Nim. The goal for the students is to figure out the unbeatable strategy.
 - It may be best for the students to practice against you, where you play the role of the flawless “NIM Machine”. When a student, or group of students is fully confident, they can challenge you. You get to choose the number of gems to begin the game. The student(s) then choose whether they would like to go first, or have the teacher go first. If the students execute the unbeatable strategy without any mistake, then they should win every time. But if they make a mistake, they will lose – presuming that you don’t make a mistake!
 - Note to tutor: You have to learn the perfect strategy before doing this.
 - Here are the unbeatable strategies for the four variations:
- The unbeatable strategy for One Pile NIM “winner takes the last gem” (and each turn you can remove 1, 2, or 3 gems). Fairly quickly, students realize that if they leave their opponent with 4 gems, then they will win. They will also win if they leave their opponent with 8, 12, or 16 gems – any multiple of four – assuming, of course, that no mistakes are made. Lastly, we need to know who should go first. If given the choice, a player should have their opponent go first if the beginning number of gems is a multiple of 4. Otherwise (if the beginning number of gems is not a multiple of 4), the player should elect to go first and then leave the opponent with a multiple of 4.
- The unbeatable strategy for One Pile NIM “loser takes the last gem”. The strategy is nearly the same as above. However, in this case, we realize that we will win if we leave our opponent with 1, 5, 9, 13, etc., gems. In other words, our goal is to leave our opponent with one more than a multiple of 4.
- Note: At the highest skill level, with each version of One-Pile NIM (shown above), we can change the rule (before we start playing) so that with each turn you can remove up to 4 gems (or a different number) – and still the student should be able to win.
- The unbeatable strategy for both versions of Two-Pile NIM. Surprisingly, whether the rule states that the last player to remove a gem wins or loses, the strategy is essentially the same. Either way, if we can leave our opponent with two gems in each pile, we will win. If we begin with an equal number in each pile, then we want our opponent to go first. Otherwise, we will go first and leave our opponent with an equal number in each pile until it gets down to two gems in each pile.