Algorithms – GCD & LCM
Lesson Plan: Class 07 / ALG / 07

Overall goal of the lesson	Students learn about the Algorithm to determine GCD and LCM
Prior Knowledge Required	Prime Factorization

Goal:	Build an algorithm that can be used to determine GCD using Prime Factorization
Description:	Determine the GCD of 2 numbers using prime factorization. Closely follow the corresponding steps in building the algorithm
Material Required:	1. One copy of worksheet per student 2. Pen/Pencil, eraser. 3. Lesson Presentation
Procedure Summary :	1. Go through the presentation. 2. Determine GCD and follow the algorithm in the presentation. 3. Make sure every student is following the slides. 4. Provide the worksheets, once presentation is done. 5. Let the students solve them and help them with answers.
Procedure Details:	**Slide 1:** Title Slide **Slide 2:** Introduce the activity of this presentation by asking some questions related to determining GCD and LCM. Ask the students if they know the prime factorization method or are able to recollect it? Ask, if they know how to determine LCM and GCD (or HCF) using prime factorization. If required, review the prime factorization method. The activity of this lecture is to write an algorithm for – to determine the GCD **Slide 3:** Tell the students about the example problem, finding the GCD of 48 and 180. Using this example problem one can show how to write the algorithm. With each step of solving the GCD between 48 and 180 using prime factorization, follow onto a corresponding step of the algorithm Writing each step of solving the GCD problem will result in the algorithm flowchart which determines the GCD. **Slide 4:** Find the smallest prime factor for both the composite numbers 48 and 180. Write this down as the first step of the algorithm flowchart. Next, write the numbers in factor form using the smallest prime factor from the above. This is the second step of the algorithm. Once the numbers are written in factor form, check if all the factors are prime. This is the third step of the algorithm. Always follow this method, every step of a mathematical operation should have an algorithmic counterpart in the flowchart.

	Slide 5: If all factors are not prime, factorize the composite factors again. On checking the factors from previous slide, it is obvious that 24 and 90 are not prime factors. Hence, factorize the composite factors again. Go back to step 1 and repeat until step 3 of the algorithm. Hence, we obtain the next prime factor as 2 for both 24 and 90. Write them down in factor form. **Slide 6:** Check if all factors are prime from the previous slide. No the factors are not prime. Then factorize the composite factors again. Repeat from step 1 through step 3 of the algorithm The next factor is 2 for 12 and 3 for 45. Write them down in factor form. **Slide 7:** Repeat as above. The factors are not prime, hence follow step 1 through step 3 again. The factors are 2 for 6 and 3 for 15. Write them down in factor form. **Slide 8:** Check if all factors are prime. Yes all the factors are prime. When all factors are prime, the next operation is to find the common factors between the prime factor representation of both 48 and 180. This is step 4 of the algorithm. The final operation is to multiply all the common factors. Multiplying the common factors we obtain the GCD. This is the fifth and the final step of the algorithm to determine GCD using prime factorization. **Slide 9:** Tell the students about the difference between GCD and LCM, there is one additional step- multiply all the factors with the common factors and one can obtain the LCM. The LCM of 48 and 180 is 720. As an additional information for students, GCD can be also calculated using Euclidean Algorithm, Euclidean algorithm does not require factorization and is relatively faster. But there are no efficient algorithms to calculate LCM. **Slide 10:** Thank you. Get on with worksheets