

# **Introduction to Mathematics**

## **Week 1**

### **Review of Basic Arithmetic Operations & Algebra**

- **Unit 1.1**

**Basic Arithmetic including BODMAS, LCF, HCF.**

# Topics in this Unit

- BODMAS
- LCM
- HCF

# BODMAS

# Why do we need BODMAS?

- Suppose you have the following expression:

$$4 + 8^2 \times (30 \div 5) = ?$$

- What do you do first? Do you add? But what about the square on number eight? Should you square the number first? And what about the expression in the brackets?
- To have a methodical approach when solving expressions, BODMAS Rule is widely used.

# What is BODMAS Rule?

- BODMAS Rule decides the order of operations for adding, subtracting, multiplying and dividing etc.
- BODMAS stands for Brackets, Orders, Division, Multiplication, Addition, Subtraction
- B – Brackets (Do all operations contained in the brackets first)
- O – Orders (Powers and Square Roots etc. are dealt with next)
- D – Division (Perform Division Next)
- M – Multiplication (Next up is multiplication)
- A – Addition (Add the remaining expression)
- S – Subtraction (Last is subtraction)

# Example 1

Let's see how this BODMAS Rule works. We'll use the expression shown in the first slide.

$$4 + 8^2 \times (30 \div 5) = ?$$

- Start with the calculation inside the brackets.
- $30 \div 5 = 6$ .  
This gives you  $4 + 8^2 \times 6 = ?$
- Then calculate the orders - in this case the square of 8.
- $8^2 = 64$
- Your calculation is now  $4 + 64 \times 6$
- Then move to the multiplication  $64 \times 6 = 384$
- Finally perform the addition.  $4 + 384 = 388$
- The answer is **388**.

# Example 2

- Lets take another example

$$6 \div 2 + 7 \times 4 = ?$$

- You need to do division and multiplication first, but you have one of each.
- Start from the left and work across to the right, which means that you start with  $6 \div 2 = 3$ . Then do the multiplication,  $7 \times 4 = 28$ .
- Your calculation is now  $3 + 28$ .
- Complete the addition calculation to find the answer, **31**.

# Example

What about this one?

$$4 \times (3 + 2) = ?$$

- You need to do the operation, inside the brackets first,  $3 + 2$ , then multiply the answer by 4.
- $3 + 2 = 5$ .  
 $4 \times 5 = \mathbf{20}$
- If you ignored the brackets and did your calculation from left to right  $4 \times 3 + 2$  you would get 14. You can see how the brackets make a difference to the answer.



# Practice Makes Perfect

- Solve the following expressions:
- $10 + 6 \times (1 + 10)$
- $5(3 + 2) + 5^2$
- $(105 + 206) - 550 \div 5^2 + 10$
- Answers :
- 76
- 50
- 299

# LCM (Least Common Multiple)

# Multiple

- A Multiple of a number is the product of the number and any whole number.
  - Example:  $\text{number} \times \text{number} = \text{product (multiple)}$
- When you count by twos, fives or tens, you are using multiples.
- 2: 2, 4, 6, 8, 10, 12                      Multiples of two
- 4: 4, 8, 12, 16, 20                      Multiples of four
- 5: 5, 10, 15, 20, 25                      Multiples of five

# Least Common Multiple

- Used in solving fractions by helping in finding a common denominator
- Least Common Multiple is found between two or more numbers. Assuming we have two numbers, it is the number that is a common multiple of all the numbers in question.
- L - Least. The smallest possible
- C - Common. Both numbers have it
- M - A multiple of both numbers.
- Hint : The LCM of two numbers will always be equal to or greater than the larger number.

# Example 1

- For examples, the number 4 and 3.
- First step is to write down the multiples of 3, then 4.
- $3 = 3, 6, 9, 12, 15, 18, 21, 24 \dots$
- $4 = 4, 8, 12, 16, 20, 24, 28 \dots$
- Now, we find the smallest number this is common to both.
- In this case, it is 12.
- 24 is also common, but it is not the smallest.

# More Examples

- Find the LCM of 10 and 30
  - 10: 10, 20, 30, 40, 50
  - 30: 30, 60, 90
- So the LCM is 30 because 30 is the lowest number in the list of multiples.
  
- Find the LCM of 12 and 18
  - 12: 12, 24, 36, 48
  - 18: 18, 36, 54
- So the LCM is 36 because 36 is the lowest number in the list of multiples.

# HCF (Highest Common Factor)

# Factors vs Multiples

- In LCM, we discussed Multiples. Now in this section, we'll be discussing factors.
- Factor is a number that divides another number evenly (i.e. with no remainder).
- For example, 10 is divided evenly by 1,2 and 5. So 1,2 and 5 are factors of 10.
- HCF means Highest Common Factor. So like LCM, we'll be finding a number that is common to two numbers, but this time, we're dealing with factors and we'll be looking for the common factor that is the highest.



# Example

- Suppose we need to find the HCF of 10 and 15.
- We write down individually the factors of 10 and 15, then figure out which factors are common. Then we chose the largest common factor.
- 10 : 1, 2, 5
- 15 : 1, 3, 5
- So, 5 will be the HCF.
- 1 is also common, but 1 is not the largest.

# Example 2

- HCF of 24 and 36
- Prime factors of 24: 1, 2, 3, 4, 6, 8, 12
- Prime factors of 36: 1, 2, 3, 4, 6, 12
- HCF =12

**Thank you**

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