

# PROJECT JIGNASA

## APPLICATION OF MATHEMATICS IN VALIDATION AND VERIFICATION OF CHECK DIGIT

By

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This Certificate is awarded to **K.Sri Koteswar Rao**, Assistant Professor of **Mathematics**, GDCWA Begumpet, in recognition of his Outstanding Role as a Supervisor for Jignasa- State Level Student Study Projects Presentation on the topic **Application of Mathematics in Validation and Verification of Check Digit in Mathematics** for the Academic Year 2021-22.

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**DEPARTMENT OF MATHEMATICS**

**JIGNASA – 2021  
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**SYNOPSIS**

# APPLICATION OF MATHEMATICS IN VALIDATION AND VERIFICATION OF CHECK DIGIT.

## CHECK DIGIT

A check digit is a form of redundancy check used for error detection on identification numbers, such as bank account numbers. With a check digit, one can detect simple errors in the input of a series of characters (usually digits) such as a single mistyped digit or some permutations of two successive digits.

## METHODOLOGY

Using Number theory (Addition Modulo  $m$ ) and Dihedral groups, we verify the given identification number

This procedure is used to generate a check digit to add to the end of a number. It uses the **Modulo-11 weighted check digit calculation**. This calculation is used for ISBN numbers on books.

- 1) Start with the original product number e.g., 185813415.
- 2) Weight each digit by its position in the string and add up the results. Note that the lowest weight used is 2 :

<b>Digit</b>	1	8	5	8	1	3	4	1	5	
<b>Weightings</b>	*10	*9	*8	*7	*6	*5	*4	*3	*2	Total
<b>Result</b>	10	72	40	56	6	15	16	3	10	228

- 3) Divide the total by 11 and then subtract the remainder from 11. The check digit is the result of this operation :

$$228 / 11 = 20 \text{ remainder } 8 \Rightarrow$$

If the remainder is 10 then the check digit is set to X. If it is 0 then the check digit is 0

As the remainder is neither 10 nor 0, the check digit is calculated like this :

$$\text{Check digit is } 11 - \text{remainder} = 11 - 8 = 3.$$

- 4) Add the check digit to the end of the original number to get the complete product number :  
1858134143

## DESIGNING

Check digit algorithms are usually designed to capture human transcription errors. We use unique algorithms based on modulo to generate a check digit.

In order of complexity, these include the following:

- letter/digit errors
- single digit errors
- transposition errors

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## REPORT

A check digit is a form of redundancy check used for error detection on identification numbers, such as bank account numbers, which are used in an application where they will at least sometimes be input manually. It is analogous to a parity parity bit used to check for errors in computer-generated data. It consists of one or more digits (or letters) computed by an algorithm from the other digits (or letters) in the sequence.

#### What is Check digit?

Check digit is the last digit in the number series of a number, through which data-entry errors can be eliminated to a large extent.

The purpose of check digits is simple. Whenever identification numbers (or letters) are manually entered via keyboard, errors happen. Unintentional transposition of digits can occur due to the misreading, misprint, or insertion. The most common example is of transposing phone numbers.

Check digits help to reduce the likelihood of errors by introducing a final digit that is calculated from the prior digits. Using the proper algorithm, the final digit can be determined.

Therefore, when a number is entered into the system, the system immediately or near-immediately can

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**REPORT**

2021-2022

# APPLICATION OF MATHEMATICS IN VALIDATION AND VERIFICATION OF CHECK DIGIT

Wouldn't it be great, that a simple math of addition subtraction can make our life simple and less painful, that by adding multiplying the right numbers can save you from wrong people or potentially harmful predicament?

Then, what we need is a check digit in our lives.

## CHECK DIGIT

A **check digit** is a form of redundancy check used for error detection on identification numbers, such as bank account numbers, which are used in an application where they will at least sometimes be input manually. It is analogous to a binary parity bit used to check for errors in computer-generated data. It consists of one or more digits (or letters) computed by an algorithm from the other digits (or letters) in the sequence input.

### What is **Checksum**?

The checksum is the last digit in the number series of a number, through which data-entry errors can be eliminated to a large extent.

The purpose of check digits is simple. Whenever identifiers (typically number +/- letters) are manually entered via keyboard, errors happen. Unintentional keystrokes or fatigue can cause digits to be rearranged, dropped, or inserted. The most common example is of misdialing phone numbers.

Check digits help to reduce the likelihood of errors by introducing a final digit that is calculated from the prior digits. Using the proper algorithm, the final digit can be calculated always. Therefore, when a number is entered into the system (manually or otherwise), the computer can