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Inspiring Minds

Completly Revised Edition

Fast Track Objective ARITHMETIC

IAS CSAT | States' CSAT | SSC (10+2, CGL, CPO) SBI & IBPS PO/Clerk
LIC AAO | CDS | CMAT MAT & Other Management Entrances | Hotel Management
Railways | Paramilitary Forces | State Police Recruitments &
All Other Entrances, Recruitments and Aptitude Tests

Rajesh Verma

For Complete *Practice* and *Mastery* over **Arithmetic**

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Edition

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Inspiring Minds, Inspiring Lives

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Fast Track
objective **Arithmetic**

Today, there is a plethora of books available in the market on Objective Arithmetic which seems to be complete in their way, but are still unable to fully satisfy the aspirants.

LET US KNOW SOME OF THE REASONS

Lack of Understanding the Basic Concepts

Mostly, students face a competitive examination on the base of their knowledge about mathematical rules, formulae and concepts. Inspite of having the knowledge, he lacks behind when he faces questions in the examination. Does he realise this inability? Yes, he does but feels confused and blocked when he is unable to solve them and is left with a sense of grudge that he could solve it. The only reason behind this problem is the understanding of basic concepts. If he would have been clear with them, he could solve any of the questions because as a matter of fact, every question is based on a particular concept which is just twisted in the examinations to judge the overall ability of a student.

Inappropriate Use of Short Tricks

This is the second biggest problem in front of the aspirants. The number of questions asked in the competitive examination is much more than the time assigned for diem. This leads die aspirants to use shortcut mediods. Although, diese mediods prove to be beneficial in some cases, but due to time management problems, he gets bound to use these methods irrationally and inappropriately. As a result, he jumbles between all the shortcuts which lead to wrong answers which could have been solved if he knew when and where to apply the shortcut methods.

Inability to Distinguish Between the Applications of Formulae

We all are aware of the amount of stress and pressure a competitive examination creates on the mindset of an aspirant. Succumbed to such pressure, an aspirant is unable to decide the appropriate formula to be applied in a particular step. During the crisis of time, such confusion adds to the problems and squeezes in more time and results to an unsatisfactory score.

Keeping in mind all kinds of problems faced by an aspirant in a competitive examination, we have developed diis book with profound interest in a step-wise method to encounter all your queries and worries. This book named 'FAST TRACK ARITHMETIC is wordiy to fulfill your expectations and will help you as loyal guide throughout.

OUTSTANDING QUALITIES OF FAST-TRACK OBJECTIVE ARITHMETIC

Use of Fundamental Formulae and Method

In this book, all the fundamental formulae and methods have been presented in such a striking yet friendly and systematic manner that just going through them once will give you an effective grasp. They have been present in such a manner that they, will never let you get confused between fast track technique and basic method.

Appropriate Short Cut Methods

An important feature of this book is its short cut methods or tricks given in the name of "fast track formulae or techniques". Each technique is given with its basic or fundamental method. So, that a student can use these tricks according to their desire and save there precious time in exams.

Division of Exercises According to the Difficulty Level

Based on the standard and level of difficulty of various questions, the exercises are divided into two parts *i.e.,* 'Base level exercise' for relatively easier questions and 'Higher skill level exercise' for difficult questions. 'Multiconcept questions' which requires a use of different concepts in a single question have also been incorporated with important chapters.

Special Emphasise on Geometry, Trigonometry and Mensuration

Now-a-days, Questions from geometry, trigonometry and mensuration are asked in large numbers in different exams. So, a large variety and number of questions are provided for tiiese chapters.

Completely Updated with Questions from Recent Exams

This book is incorporated with die questions from all the recent competitive exams, held in year 2013-14.

This book is a brain child of Mr Deepesh Jain, Director, Arihant Publications (India) Limited. Richa Agarwal, Diwakar Sharma and Shivam Mittal have given their best and sincere efforts for die completion and final presentations of die book.

The entire project has been managed and supervised by Mr Mahendra Singh Rawat and Mr Amit Verma. Aas Mohammed and Pradeep are to be complemented for very apt designing to the book cover. Amit Bansal and Mayank Saini have given their expertise in the layout of *the* book. Everyone's contribution for tiiis book is very special and is worthy of great applause. Reader's recommendations will be highly treasured.

With best compliments

Rajesh Verma

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Chapter

01

Number System

A system in which we study different types of numbers, their relationship and rules govern in them is called as **number system.**

In the Hindu-Arabic system, we use the symbols 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9. These symbols are called **digits.** Out of these ten digits, 0 is called an **insignificant digit** whereas the others are called **significant digits.**

Numerals

A mathematical symbol representing a number in a systematic manner is called a numeral represented by a set of digits.

How to Write a Number

To write a number, we put digits from right to left at the places designated as units, tens, hundreds, thousands, ten thousands, lakhs, ten lakhs, crores, ten crores.

Let us see how the number 308761436 is denoted

It is read as

Ten crores	Crores	Ten lakhs	Lakhs	Ten thousands	Thousands	Hundreds	Tens	Units
10^8	10^7	10^6	10^5	10^4	10^3	10^2	10^1	10^0
3	0	8	7	6	1	4	3	6

Thirty crore eighty seven lakh sixty one thousand four hundred and thirty six.

Face Value and Place Value of the Digits in a Number

Face Value

In a numeral, the face value of a digit is the value of the digit itself irrespective of its place in the numeral. *For example* In the numeral 486729, the face value of 8 is 8, the face value of 7 is 7, the face value of 6 is 6, the face value of 4 is 4, and so on.

Place Value (or Local Value)

In a numeral, the place value of a digit changes according to the change of its place.

Look at the following to get the idea of place value of digits in 72843016.

Crores	7	→ Place value of 7	→	$7 \times 10000000 = 70000000$
Ten Lakhs	2	→ Place value of 2	→	$2 \times 1000000 = 2000000$
Lakhs	8	→ Place value of 8	→	$8 \times 100000 = 800000$
Ten Thousands	4	→ Place value of 4	→	$4 \times 10000 = 40000$
Thousands	3	→ Place value of 3	→	$3 \times 1000 = 3000$
Hundreds	0	→ Place value of 0	→	$0 \times 100 = 0$
Tens	1	→ Place value of 1	→	$1 \times 10 = 10$
Units	6	→ Place value of 6	→	$6 \times 1 = 6$

It is clear from the above presentation that to obtain the place value of a digit in a numeral, we multiply the digit with the value of its place in the given numeral.

Types of Numbers

1. Natural Numbers

Natural numbers are counting numbers. They are denoted by N. *For example* $N = \{1,2,3,...\}$.

♦ All natural numbers are positive.

♦ Zero is not a natural number. Therefore, 1 is the smallest natural number.

2. Whole Numbers

All natural numbers and zero form the set of whole numbers. Whole numbers are

denoted by W.

For example W = {0,1,2,3,...}

♦ Zero is the smallest whole number.

Whole numbers are also called as non-negative integers.

3. Integers

Whole numbers and negative numbers form the set of integers. They are denoted by/.

For example / = {...,-4,-3,-2,-1,0,1,2,3,4,...}

Integers are of two types. (i) **Positive Integers** Natural numbers are called as positive integers. They are

denoted by *I* .

For example $I^+ = \{1,2,3,4,...\}$

(ii) **Negative Integers** Negative of natural numbers are called as negative integers. They are denoted by *I~*. *For example* *I~* ={-1,-2,-3,-4,...}

♦ '0' is neither +ve nor -ve integer.

4. Even Numbers

A counting number which is divisible by 2, is called an even number. *For example* 2, 4, 6, 8, 10, 12, ... etc.

♦ The unit's place of every even number will be 0, 2, 4, 6 or 8.

5. Odd Numbers

A counting number which is not divisible by 2, is known as an odd number.

For example 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, ... etc. ♦ The unit's place of every odd number will be 1, 3, 5, 7 or 9.

6. Prime Numbers

A counting number is called a prime number when it is exactly divisible by, 1 and itself.

For example 2, 3, 5, 7, 11, 13, ... etc.

♦ 2 is the only even number which is prime.

♦ A prime number is always greater than 1.

♦ 1 is not a prime number. Therefore, the lowest odd prime number is 3.

♦ Every prime number greater than 3 can be represented by $6n + 1$, where n is integer.

How to test a Number is prime or not?

If P = Given number, then

(i) Find whole number x such that $x > \sqrt{P}$.

(ii) Take all the prime numbers less than or equal to x.

(iii) If none of these divides P exactly, then P is prime otherwise P is non-prime.

For example Let $P = 193$, clearly $14 > \sqrt{(193)}$

Prime numbers upto 14 are : 2, 3, 5, 7, 11, 13.

No one of these divides 193 exactly.

Hence, 193 is a prime number.

7. Composite Numbers

Composite numbers are non-prime natural numbers. They must have atleast one factor apart from 1 and itself.

For example 4, 6, 8, 9, etc.

♦ Composite numbers can be both odd and even.

♦ 1 is neither a prime number nor composite number.

8. Coprimes

Two natural numbers are said to be coprimes, if their HCF is 1. *For example* (7, 9), (15, 16)

♦ Coprime numbers may or may not be prime.

9. Rational Numbers

A number that can be expressed as *p/q* is called a rational number, where p and *q* are inteqers and *a* ■*■ 0.

For example $\frac{3}{5}, \frac{7}{9}, \frac{8}{9}, \frac{13}{15}$ etc.

10. Irrational Numbers

The numbers that cannot be expressed in the form of *p/q* are called irrational numbers, where p and *q* are integers and *q* * 0.

For example -J2, V3, *-Jl,* VTT etc.

♦ 7C is an irrational number as 22 / 7 is not the actual value of *n* but it is its nearest value.

♦ Non-periodic infinite decimal fractions are called as irrational number.

11. Real Numbers

Real numbers include rational and irrational numbers both,

For example $\frac{7}{9}, \sqrt{2}, \sqrt{5}, \pi, \frac{8}{9}$ etc.

♦ Real numbers are denoted by *R*.

Operations on Numbers

Addition

When two or more numbers are combined together, then it is called addition. Addition is denoted by ' + ' sign. *For example* 24 + 23 + 26 = 73

Subtraction

When one or more numbers are taken out from a larger number, then it is called subtraction.

Subtraction is denoted by '-' sign.

For example 100-4-13=100-17=83

Division

When D and d are two numbers, then $\frac{D}{d}$ is called the operation of division, where

u is the **dividend** and d is the **divisor.** A number which tells how many times a

divisor (d) exists in dividend *D* is called the **quotient** Q.

If dividend *D* is not a multiple of divisor d, then *D* is not exactly divisible by *d* and

in this case **remainder** *R* is obtained.

Let us see the following operation of division

Let $D = 17$ and $d = 3$

Then, $\frac{D}{d} = \frac{17}{3} = 5\frac{2}{3}$

Here, 5 = Quotient (Q),

3 = Divisor (d)

and 2 = Remainder (R)

We see,

3 (Divisor) × 5 (Quotient) + 2 (Remainder) = 17 (Dividend)

Hence, we can write a formula,

Dividend = (Divisor × Quotient) + Remainder

Multiolication

When *'a!* is multiplied by '£>', then *'a'* is added *'b'* times or *'b'* is added *'a'* times. It is denoted by 'x'.

Let us see the following operation on Multiplication If *a* =2 and *b* = 4, then 2x4=8

or (2+ 2+ 2+ 2) =8 Here, *'a!* is added *'b'* times or in other words 2 is added 4 times. Similarly, 4x2=8 or (4+ 4) =8 In this case, *'b'* is added *'a!* times or in other words 4 is added 2 times.

Divisibility Tests

Divisibility by 2 When the last digit of a number is either 0 or even, then the number is divisible by 2. *For example* 12, 86, 472, 520, 1000 etc., are divisible by 2.

Divisibility by 3 When the sum of the digits of a number is divisible by 3, then the number is divisible by 3. *For example* (i) **1233** 1 + 2 + 3 + 3 = 9, which is divisible by 3, so 1233

must be divisible by 3. (ii) 156 1 + 5 + 6 = 12, which is divisible by 3, so 156 must be divisible by 3.

Divisibility by 4 When the number made by last two-digits of a number is divisible by 4, then that particular number is divisible by 4. Apart from this, the number having two or more zeroes at the end, is also divisible by 4. *For example* (i) 6428 is divisible by 4 as the number made by its last two

digits *i.e.,* 28 is divisible by 4. (ii) The numbers 4300, 153000, 9530000 etc., are divisible by 4 as they have two or more zeroes at the end.

Divisibility by 5 Numbers having 0 or 5 at the end are divisible by 5.

For example 45, 4350, 135, 14850 etc., are divisible by 5 as they have 0 or 5 at the end.

Divisibility by 6 When a number is divisible by both 3 and 2, then that particular number is divisible by 6 also.

For example 18, 36, 720, 1440 etc., are divisible by 6 as they are divisible by both 3 and 2.

Divisibility by 7 A number is divisible by 7 when the difference between twice

the digit at ones place and the number formed by other digits is either zero or a multiple of 7.

For example 658 is divisible by 7 because 65 - 2 X 8 = 65 - 16 = 49. As 49 is divisible by 7, the number 658 is also divisible by 7.

Divisibility by 8 When the number made by last three digits of a number is divisible by 8, then the number is also divisible by 8. Apart from this, if the last three or more digits of a number are zeroes, then the number is divisible by 8. *For example* (i) **2256** As 256 (the last three digits of 2256) is divisible by

8, therefore 2256 is also divisible by 8.

(ii) **4362000** As 4362000 has three zeroes at the end. Therefore it will definitely divisible by 8.

Divisibility by 9 When the sum of all the digits of a number is divisible by 9, then the number is also divisible by 9. *For example* (i) 936819 9+3 + 6 + 8 + 1 + 9= 36 which is divisible by

9. Therefore, 936819 is also divisible by 9.

(ii) **4356** 4 + 3 + 5 + 6 = 18 which is divisible by 9. Therefore, 4356 is also divisible by 9.

Divisibility by II When a number ends with zero, then it is divisible by 10.

For example 20, 40, 150, 123450, 478970 etc., are divisible by 10 as these all end with zero.

Divisibility by 1' When the sums of digits at odd and even places are equal or differ by a number divisible by 11, then the number is also divisible by 11. *For example* (i) 2865423 Let us see

Sum of digits at odd places (A) = 2 + 6+4 + 3 = 15 Sum of digits at even places *(B) = 8 + 5 + 2 = 15 =>A = B* Hence, 2865423 is divisible by 11.

(ii) 217382 Let us see

Sum of digits at odd places (A) = 2 + 7 + 8 = 17

Sum of digits at even places (B) = 1 + 3 + 2 = 6

A- B = 17-6 = 11 Clearly, 217382 is divisible by 11.

Divisibility by 12 A number which is divisible by both 4 and 3 is also divisible by 12.

For example 2244 is divisible by both 3 and 4. Therefore, it is divisible by 12 also.