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Preface

Dear Aspirants,

It gives me immense pleasure to present to you our latest publication, **Quantitative Aptitude,** tailored specifically **for SSC and Railway exam aspirants.** Over the years, quantitative aptitude has remained one of the most critical and challenging sections in competitive exams. With the ever-increasing competition, it is imperative to master the concepts and develop the ability to solve problems swiftly and accurately.

This book is a comprehensive resource, meticulously curated to meet the demands of the SSC and Railway exams. It includes a blend of previous years' questions, which provide insights into the exam patterns, and an extensive array of practice questions to help you hone your skills. Each question has been crafted and reviewed with care, ensuring alignment with the latest syllabus and trends.

Our objective is not just to help you solve problems but to develop a deeper understanding of the underlying concepts. To aid this, detailed solutions and shortcuts have been included, making it easier to approach even the most complex questions with confidence.

I sincerely hope this book becomes a valuable companion in your journey toward success. At Jayakrishnan EduTips, we are committed to your academic and professional growth, and this publication is yet another step in that direction.

Best wishes for your preparation and success in the upcoming exams.

Warm regards,

Jayakrishnan Ramachandran
Director, Jayakrishnan EduTips

QUANTITATIVE APTITUDE-1

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Number Series

Number systems provides a hierarchical structure to the different types of numbers we use in mathematics, as well as establishing rules and tests for divisibility. Here's a brief overview of the various types of numbers:

Natural numbers: These are the counting numbers we use in everyday life, which include numbers from 1 and extend indefinitely. They do not include 0, negative numbers, fractions, or decimals. For example, 528 is a natural number, but 0, -4, 3.6, and 1/4 are not.

Whole numbers: Whole numbers include all natural numbers and also add the number 0 into the mix. They still do not include negative numbers, fractions, or decimals. For instance, 0, 1, 2, 3 are whole numbers, while -1, -2, 3.2, and 1/7 are not.

Integers: The set of integers includes all whole numbers, but it also includes negative numbers. They still do not include fractions or decimals. Examples of integers include -7, -6, -5, 0, 1, 2, 3, 4. Numbers like √3, 0.12, -3.2, and 1/5, however, are not integers.

Rational numbers: Rational numbers are any numbers that can be expressed as the ratio of two integers where the denominator is not zero. This includes positive and negative whole numbers, fractions, and terminating or repeating decimals. Examples of rational numbers include 15, -32, 27/65, -2/11, and 0.

Irrational numbers: These are numbers that cannot be expressed as the ratio of two integers. They cannot be expressed as terminating or repeating decimals and often show up as roots of numbers that are not perfect squares or as transcendental numbers like pi. For example, √5 and 3 + √2 are irrational numbers.

Real numbers: The real number system combines both the rational and irrational numbers. These numbers can be plotted on the number line and include numbers like 3, -2, and √7.

Prime numbers: These are natural numbers greater than 1 that have exactly two distinct natural number divisors: 1 and the number itself. For example, 2, 3, 5, 7, and 11 are prime numbers. They do not include 0 and -1.

Composite numbers: These are natural numbers greater than 1 that have more than two distinct natural number divisors. For example, 6 is a composite number because it has four divisors: 1, 2, 3, and 6.

Co-prime Numbers: Two numbers are said to be co-prime if they do not have a common factor other than 1. Any two prime numbers are always co-prime, but two co-primes need not be both prime numbers. For example: 14, 15 are co-primes, while none of 14 and 15 is a prime number.

Tests of divisibility:

In addition to these classifications, there are also rules, known as tests of divisibility, that determine whether a number is divisible by another without having to perform the actual division:

1. A number is divisible by 2 if its last digit is even (0, 2, 4, 6, 8).
2. A number is divisible by 3 if the sum of its digits is divisible by 3.
3. A number is divisible by 5 if its last digit is 0 or 5.
4. A number is divisible by 9 if the sum of its digits is divisible by 9.
5. A number is divisible by 10 if its last digit is 0.
6. A number is divisible by 11 if the difference between the sum of its digits in even and odd places is a multiple of 11 or zero.

These rules and classifications form the basis of our number systems, providing a framework for us to understand the properties of numbers and perform mathematical operations.

Square Root:

The square root of a number is a value that, when multiplied by itself, gives the original number. It's denoted by the symbol '√'. For instance, the square root of 9 is 3 (because 3 × 3 = 9), and the square root of 25 is 5 (because 5 × 5 = 25).

The square root of a number x is denoted as √x or $x^{1/2}$. Note that every positive real number has two square roots. One is positive, and the other is negative because both of these numbers would square to give the original number. For example, the square roots of 9 are +3 and -3.

However, by convention, the "principal square root" of a positive real number is its positive square root. For instance, when we say the square root of 9, we usually mean +3, not -3.

Square Table:

$1^2 1 = 1$	$2^2 = 4$	$3^2 = 9$	$4^2 = 16$
$5^2 = 25$	$6^2 = 36$	$7^2 = 49$	$8^2 = 64$
$9^2 = 81$	$10^2 = 100$	$11^2 = 121$	$12^2 = 144$
$13^2 = 169$	$14^2 = 196$	$15^2 = 225$	$16^2 = 256$
$17^2 = 289$	$18^2 = 324$	$19^2 = 361$	$20^2 = 400$
$21^2 = 441$	$22^2 = 484$	$23^2 = 529$	$24^2 = 576$
$25^2 = 625$	$26^2 = 676$	$27^2 = 729$	$28^2 = 784$
$29^2 = 841$	$30^2 = 900$	$31^2 = 961$	$32^2 = 1024$
$33^2 = 1089$	$34^2 = 1156$	$35^2 = 1225$	$36^2 = 1296$
$37^2 = 1369$	$38^2 = 1444$	$39^2 = 1521$	$40^2 = 1600$
$41^2 = 1681$	$42^2 = 1764$	$43^2 = 1849$	$44^2 = 1936$
$45^2 = 2025$	$46^2 = 2116$	$47^2 = 2209$	$48^2 = 2304$
$49^2 = 2401$	$50^2 = 2500$	$51^2 = 2601$	$52^2 = 2704$
$53^2 = 2809$	$54^2 = 2916$	$55^2 = 3025$	$56^2 = 3136$
$57^2 = 3249$	$58^2 = 3364$	$59^2 = 3481$	$60^2 = 3600$
$61^2 = 3721$	$62^2 = 3844$	$63^2 = 3969$	$64^2 = 4096$
$65^2 = 4225$	$66^2 = 4356$	$67^2 = 4489$	$68^2 = 4624$
$69^2 = 4761$	$70^2 = 4900$	$71^2 = 5041$	$72^2 = 5184$
$73^2 = 5329$	$74^2 = 5476$	$75^2 = 5625$	$76^2 = 5776$
$77^2 = 5929$	$78^2 = 6084$	$79^2 = 6241$	$80^2 = 6400$
$81^2 = 6561$	$82^2 = 6724$	$83^2 = 6889$	$84^2 = 7056$
$85^2 = 7225$	$86^2 = 7396$	$87^2 = 7569$	$88^2 = 7744$
$89^2 = 7921$	$90^2 = 8100$	$91^2 = 8281$	$92^2 = 8464$
$93^2 = 8649$	$94^2 = 8836$	$95^2 = 9025$	$96^2 = 9216$
$97^2 = 9409$	$98^2 = 9604$	$99^2 = 9801$	$100^2 = 10000$

Cube Root:

The cube root of a number is a value that, when multiplied by itself twice (i.e., when cubed), gives the original number. It is denoted by the symbol '$\sqrt[3]{}$'. For instance, the cube root of 27 is 3 (because 3 × 3 × 3 = 27), and the cube root of 64 is 4 (because 4 × 4 × 4 = 64).

The cube root of a number x is denoted as $\sqrt[3]{x}$ or $x^{1/3}$. Unlike square roots, every real number has exactly one real cube root. For example, the cube root of -8 is -2, because (-2)(-2)(-2) = -8.

Cube Table:

$1^3 = 1$	$2^3 = 8$	$3^3 = 27$	$4^3 = 64$
$5^3 = 125$	$6^3 = 216$	$7^3 = 343$	$8^3 = 512$
$9^3 = 729$	$10^3 = 1000$	$11^3 = 1331$	$12^3 = 1728$
$13^3 = 2197$	$14^3 = 2744$	$15^3 = 3375$	$16^3 = 4096$
$17^3 = 4913$	$18^3 = 5832$	$19^3 = 6859$	$20^3 = 8000$
$21^3 = 9261$	$22^3 = 10648$	$23^3 = 12167$	$24^3 = 13824$
$25^3 = 15625$	$26^3 = 17576$	$27^3 = 19683$	$28^3 = 21952$
$29^3 = 24389$	$30^3 = 27000$	$31^3 = 29791$	$32^3 = 32768$
$33^3 = 35937$	$34^3 = 39304$	$35^3 = 42875$	$36^3 = 46656$
$37^3 = 50653$	$38^3 = 54872$	$39^3 = 59319$	$40^3 = 64000$
$41^3 = 68921$	$42^3 = 74088$	$43^3 = 79507$	$44^3 = 85184$
$45^3 = 91125$	$46^3 = 97336$	$47^3 = 103823$	$48^3 = 110592$
$49^3 = 117649$	$50^3 = 125000$	$51^3 = 132651$	$52^3 = 140608$
$53^3 = 148877$	$54^3 = 157464$	$55^3 = 166375$	$56^3 = 175616$
$57^3 = 185193$	$58^3 = 195112$	$59^3 = 205379$	$60^3 = 216000$
$61^3 = 226981$	$62^3 = 238328$	$63^3 = 250047$	$64^3 = 262144$
$65^3 = 274625$	$66^3 = 287496$	$67^3 = 300763$	$68^3 = 314432$
$69^3 = 328509$	$70^3 = 343000$	$71^3 = 357911$	$72^3 = 373248$
$73^3 = 389017$	$74^3 = 405224$	$75^3 = 421875$	$76^3 = 438976$
$77^3 = 456533$	$78^3 = 474552$	$79^3 = 493039$	$80^3 = 512000$
$81^3 = 531441$	$82^3 = 551368$	$83^3 = 571787$	$84^3 = 592704$
$85^3 = 614125$	$86^3 = 636056$	$87^3 = 658503$	$88^3 = 681472$
$89^3 = 704969$	$90^3 = 729000$	$91^3 = 753571$	$92^3 = 778688$
$93^3 = 804357$	$94^3 = 830584$	$95^3 = 857375$	$96^3 = 884736$
$97^3 = 912673$	$98^3 = 941192$	$99^3 = 970299$	$100^3 = 1000000$

Exercise

Number Series

1. The value of 1 + 3 + 5 + 7 + _____(2n - 1) is:
(A) (2n - 1) × (2n - 1) **(B)** $\frac{n}{2}$
(C) $\frac{n(n+1)}{2}$ **(D)** n × n

2. How many numbers between 800 to 2000 are divisible by 13?
(A) 90 **(B)** 92
(C) 93 **(D)** 91

3. Simplify the following.
$$\left[\left(1-\frac{1}{2}\right)\left(1-\frac{1}{3}\right)\left(1-\frac{1}{4}\right)\ldots\left(1-\frac{1}{100}\right)\right]^{-0.5}$$
(A) $\frac{1}{100}$ **(B)** $\frac{1}{10}$
(C) 100 **(D)** 10

4. How many numbers between 300 and 700 are divisible by 5, 6 and 8?
(A) 3 **(B)** 2
(C) 20 **(D)** 5

5. Find the value
$$\sqrt{(1+3+5\cdots+93)\left(1-\frac{1}{3}\right)\left(1-\frac{1}{4}\right)\left(1-\frac{1}{5}\right)\cdots\left(1-\frac{1}{2209}\right)}$$
(A) 3 **(B)** 4
(C) 2 **(D)** $\sqrt{2}\sqrt{2}$

6. How many numbers are there from 200 to 800 which are neither divisible by 5 nor by 7?
(A) 411 **(B)** 410
(C) 407 **(D)** 413

7. Evaluate:
$\frac{1}{15}+\frac{1}{35}+\frac{1}{63}+\frac{1}{99}+\frac{1}{143}$
(A) $\frac{4}{39}$ **(B)** $\frac{5}{39}$
(C) $\frac{7}{39}$ **(D)** $\frac{10}{39}$

8. Find the sum of 6 + 8 + 10 + 12 + 14 _____ + 40.
(A) 424 **(B)** 400
(C) 1600 **(D)** 414

Divisibility

9. If an 11-digit number 765y88436x6 is divisible by 72, and x assumes the largest value, then what is the value of (x - y)?
(A) 4 **(B)** 5
(C) 8 **(D)** 6

10. If the 8-digit number 7y9745x2 is divisible by 72, then the value of (2x - y) for the greatest value of x is:
(A) 18 **(B)** 11
(C) 14 **(D)** 16

11. If the 7-digit number x468y05 is divisible by 11, then the maximum value of (x + y) is :
(A) 1 **(B)** 10
(C) 18 **(D)** 12

12. If the 7-digit number 2y6810x is divisible by 88, then what is the value of the product of x and y?
(A) 20 **(B)** 35
(C) 10 **(D)** 15

13. Which of the following is divisible by 88?
(A) 4987316 **(B)** 4897136
(C) 4987136 **(D)** 4978136

14. Which of the following is divisible by 99?
(A) 2776149 **(B)** 2767149
(C) 2767419 **(D)** 2776419

15. The 10-digit number 90457416xy is divisible by 9, and x - y = 3. What is the value of (5x + 3y)?
(A) 48 **(B)** 33
(C) 29 **(D)** 39

16. If the 6-digit number 479xyz is exactly divisible by 7, 11 and 13, then the product of the digits x, y and z will be:
(A) 1001 **(B)** 794
(C) 252 **(D)** 479

17. If a nine-digit number 43x1145y2 is divisible by 88, then the value of (2x - y), for the largest value of y, is:
(A) 1 **(B)** 5
(C) 0 **(D)** -1

18. Which of the following numbers will completely divide $7^{81}+7^{82}+7^{83}$?
(A) 389 **(B)** 399
(C) 387 **(D)** 397

19. Which of the following numbers is divisible by 4?
(A) 267834 **(B)** 954782
(C) 674536 **(D)** 897654

20. Which of the following numbers is divisible by 9?
(A) 734895 **(B)** 594327
(C) 346217 **(D)** 897342

21. Which of the following numbers is divisible by 2, 5 and 10?

(A) 720345 (B) 149
(C) 125372 (D) 19400

22. Which of the following options is divisible by 3?
(A) 3745932 (B) 4539763
(C) 2362735 (D) 6342589

23. Which of the following numbers is divisible by both 7 and 11?
(A) 16,425 (B) 12,235
(C) 16,257 (D) 16,324

24. Which number is divisible by both 9 and 11?
(A) 10,098 (B) 10,108
(C) 10,089 (D) 10,087

25. Which of the following options is completely divisible by 11?
(A) 809781 (B) 963391
(C) 107611 (D) 116571

26. Which of the following numbers is divisible by 6?
(A) 3,49,722 (B) 1,00,246
(C) 23,408 (D) 43,923

27. If the number 59a44b is divisible by 36, then the maximum value of a + b is:
(A) 14 (B) 16
(C) 12 (D) 10

28. If 2794p561 is divisible by 9, then the value of p is:
(A) 3 (B) 2
(C) 0 (D) 4

29. Which are the two nearest numbers to 19,596, divisible by 9?
(A) 19,593 ; 19,602 (B) 19,564 ; 19620
(C) 19,509 ; 19,611 (D) 19,611 ; 19,575

30. If the 8-digit number 1a765b12 is to be divisible by 72, the least value of (2a + 3b) is:
(A) 11 (B) 9
(C) 10 (D) 12

31. The largest five-digit number that is exactly divisible by 81 is:
(A) 99954 (B) 99876
(C) 99989 (D) 99991

32. If 7129p465 is divisible by 9, then the value of p is:
(A) 2 (B) 3
(C) 4 (D) 0

33. What is the least 5-digit number that is divisible 91?
(A) 10010 (B) 10192
(C) 10283 (D) 10101

34. Which of the following numbers is divisible by 3?
(A) 8703541 (B) 8703593
(C) 8703572 (D) 8765001

35. If 'a' is a natural number, then $(7a^2 + 7a)$ is always divisible by:
(A) 14 only (B) 7 only
(C) 7 and 14 both (D) 21 only

36. Given that $2^{20} + 1$ is completely divisible by a whole number, which of the following is completely divisible by the same number?
(A) 5×2^{30} (B) $2^{90} + 1$
(C) $2^{15} + 1$ (D) $2^{60} + 1$

37. If a positive integer 'n' is divisible by 3, 5 and 7, then what is the next larger integer divisible by all these numbers?
(A) n + 105 (B) n + 21
(C) n + 35 (D) n + 110

38. What should be the value of N to make 396258N divisible by 8 ?
(A) 2 (B) 8
(C) 4 (D) 6

39. If 4M37094267N is divisible by both 8 and 11, where M and N are single digit integers, then the values of M and N are:
(A) M = 5, N = 6 (B) M = 5, N = 4
(C) M = 5, N = 2 (D) M = 2, N = 5

40. If the 8 - digit number 43A5325B is divisible by 8 and 9, then the sum of A and B is equal to:
(A) 18 (B) 12
(C) 14 (D) 15

41. $2^{25} + 2^{26} + 2^{27}$ is divisible by:
(A) 9 (B) 6
(C) 5 (D) 7

42. If 8 - digit number 4432A43B is divisible by 9 and 5, then the sum of A and B is equal to:
(A) 12 (B) 5
(C) 7 (D) 8

43. $2^{18}-1$ is divisible by:
(A) 13 (B) 11
(C) 7 (D) 17

44. If the number 62783 xy is divisible by both 8 and 5, then the smallest possible value of x and y is:
(A) x = 2, y = 2 (B) x = 6, y = 0
(C) x = 2, y = 0 (D) x = 2, y = 5

45. What is the product of the largest and the smallest possible values of m for which a number 5m83m4m1 is divisible by 9?
(A) 16 (B) 40
(C) 80 (D) 10

46. If the number A9257B684 is divisible by 11, then what is the least value of A - B?
(A) 14 **(B)** 0
(C) -8 **(D)** 3

47. If a nine-digit number 1263487xy is divisible by both 8 and 5, then the greatest possible values of x and y, respectively, are:
(A) 2 and 0 **(B)** 6 and 0
(C) 2 and 5 **(D)** 6 and 5

48. What is the least 6-digit number that is divisible 71?
(A) 100039 **(B)** 100037
(C) 100041 **(D)** 100035

49. If the number 579683pq is divisible by both 5 and 8, then the smallest possible values of p and q will be:
(A) P = 2,q = 2 **(B)** P = 2,q = 0
(C) P = 4,q = 3 **(D)** P = 3,q = 0

50. n = 475AB is a positive integer whose tens and units digits are A and B, respectively. If n is divisible by 5, 8 and 9, then what is (10A + B) ?
(A) 60 **(B)** 20
(C) 15 **(D)** 35

51. Which of the following is divisible by 88?
(A) 2776408 **(B)** 2776400
(C) 2767416 **(D)** 2767440

52. If an eleven-digit number 6578x43267y is divisible by 72, then the value of $\sqrt{x+6y}$ will be:
(A) 5 **(B)** 3
(C) 4 **(D)** 6

53. The six-digit number 537xy5 is divisible by 125. How many such six-digit numbers are there?
(A) 2 **(B)** 5
(C) 3 **(D)** 4

54. If the nine-digit number 48x4923y8 is divisible by 88, then the value of (6x + 5y) for the maximum value of y, will be:
(A) 76 **(B)** 72
(C) 65 **(D)** 71

55. If a number 54k31m82 is divisible by 11, what will be the maximum value of (k + m) ?
(A) 13 **(B)** 11
(C) 12 **(D)** 23

56. If the number 583p2310q2 is divisible by 11, then what is the value of p × q. where p > q?
(A) 0 **(B)** 4
(C) 6 **(D)** 2

57. If the nine-digit number 23541y49x is divisible by 72, then (3x + 5y) : (5x + 3y) is equal to:
(A) 7 : 9 **(B)** 4 : 3
(C) 9 : 7 **(D)** 3 : 4

58. In 87659_21 what is the least number that can be filled in blank to make the number divisible by 11.
(A) 7 **(B)** 1
(C) 3 **(D)** 2

59. Find the greatest number of 4 digits which is exactly divisible by 12.
(A) 9994 **(B)** 9999
(C) 9996 **(D)** 9998

60. If the 5-digit number 457xy is divisible 3, 7 and 11, then what is the value of (2x + 5y)?
(A) 48 **(B)** 21
(C) 17 **(D)** 46

61. If the number 556743A57B is divisible by 8 and 9, then find the value of A - B.
(A) 0 **(B)** 3
(C) 2 **(D)** 1

62. If a nine-digit number 785x3678y is divisible by 72, then the value of (x - y) is :
(A) 0 **(B)** -2
(C) -1 **(D)** 2

63. If six - digit number 5x2y6z is divisible by 7, 11 and 13, then the value of (x – y + 3z) is:
(A) 9 **(B)** 0
(C) 7 **(D)** 4

64. How many numbers between 400 and 700 are divisible by 5, 6 and 7?
(A) 20 **(B)** 10
(C) 2 **(D)** 5

65. If a nine-digit number 785x3678y is divisible by 72, then the value of (x + y) is:
(A) 5 **(B)** 12
(C) 10 **(D)** 20

66. If the number 1005x4 is completely divisible by 8, then the smallest integer in place of x will be:
(A) 0 **(B)** 4
(C) 2 **(D)** 1

67. What should replace × in the number 94×2357, so that number is divisible by 11?
(A) 8 **(B)** 7
(C) 3 **(D)** 1

68. If the 6–digit numbers x35624 and 1257y4 are divisible by 11 and 72, respectively, then what is the value of (5x – 2y)?