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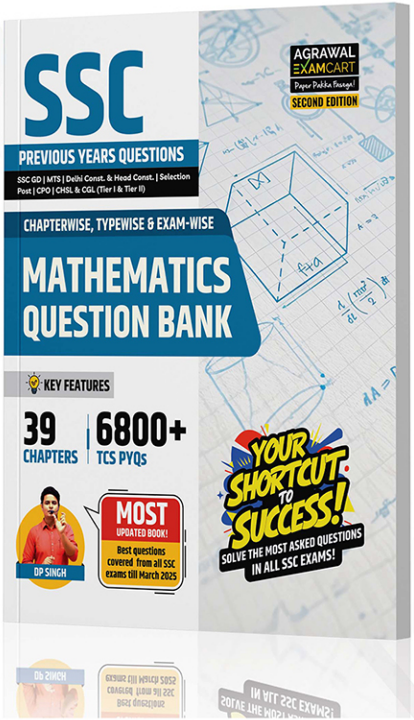

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Contents

Chapter

1

Number System

Solutions

1. (D) *a* and *b* are different prime numbers

Prime numbers = 2, 3, 5, 7, 11.......

28 = 23 + 5

10 = 7 + 3

15 = 13 + 2

Hence, it is clear from the above that the sum of a and b cannot be 6.

2. (D) Prime factors of 2310

= 2 × 3 × 5 × 7 × 11

Sum of factors

= 2 + 3 + 5 + 7 + 11
= 28

Required number

= 28 – 1 = 27

3. (C) The numbers 39 and 68 are relatively prime numbers.

4. (D) When the HCF of two or more numbers is 1 then the numbers are co-prime.
Hence, the pair (15, 94) represents co-prime numbers.

5. (A) The three prime numbers between 40 and 50 are 41, 43 and 47.

6. (D) Numbers divisible by 6 and 5 between number of 200 and 400
i.e. numbers divisible by (6 × 5 = 30) are 210, 240, 270, 300, 330, 360, 390.
Hence, required numbers = 7

7. (C)

```
    5 X 1
  + 6 Y 8
  + 3 Z 3
  1 4 7 2
```

Let the value of Y and Z is zero, then the maximum value of X will be 6.

8. (A) Given

5P9 + 3R7 + 2Q8 = 1194

On expanding

500 + 10P + 9 + 300 + 10R + 7 + 200 + 10Q + 8 = 1194

1024 + 10(P + Q + R) = 1194

10(P + Q + R) = 170

P + Q + R = 17

Hence, the maximum value of Q =

P + R = 8

Q = 9

9. (C) According to the question,
whole numbers between 20 and 36
= 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35
Whole numbers which are products of distinct prime numbers between 20 and 36.
Numbers = 21, 22, 26, 33, 34, 35
Number of values of *y* = 6
Hence, option (C) is correct.

10. (C) Let the 2 digit number = $x + 10y$
On interchanging the digits,
New 2 digit number = $10x + y$
Sum of both numbers = $x + 10y + 10x + y$
$= 11x + 11y$
$= 11(x + y)$
The required number will be 11.
Hence, option (C) is correct.

11. (B) All prime numbers except 2 are odd numbers.
So the difference between the sum of all prime numbers (x) and the sum of all odd prime numbers (y) is 2.

12. (D) Let, prime factors of 7387 = 89 × 83,
Difference = 89 – 83 = 6

13. (B) Let, smallest odd number = x
According to the question

$x \times (x + 2) \times (x + 4) = 693$
from the option,
putting the value of x as 7,

7 × (7 + 2) × (7 + 4) = 693

7 × 9 × 11 = 693

693 = 693

Hence, the required smallest odd number is 7.

14. (B) $4^{11} \times 5^5 \times 3^2 \times 13^2$
$= (2^2)^{11} \times 5^5 \times 3^2 \times 13^2$
$= 2^{22} \times 5^5 \times 3^2 \times 13^2$

Hence, total number of prime factors

= (22 + 5 + 2 + 2)

Power

= (22 + 5 + 2 + 2)

= 31

15. (D) 24 $\rightarrow 2^3 \times 3^1$

Positive factors = (3 + 1) × (1 + 1)

= 4 × 2 = 8

16. (A) 108 $\rightarrow 2^2 \times 3^3$

Number of prime factors = 2

17. (D) **I.**

```
2 | 72
2 | 36
2 | 18
3 | 9
  | 3
```

∴ $72 = 2^3 \times 3^2$

∴ Number of factors

= (3 + 1) × (2 + 1) = 12

II. Sum of first *n* odd numbers

$= n^2$

∴ Sum of first 20 odd numbers

$= 20^2 = 400$

III. 97 is the largest 2 digit prime number

Hence, all are true.

18. (B) According to the question,

Let *y* be divided by 225

Quotient = x

$y = 225x + 33$

Dividing the number by 15,

$\frac{225x + 33}{15}$ = Z (remainder)

Z = 3

Hence, the value of Z will be 3.

19. (D) Let the larger number = x

And smaller number = y

According to the question,

$x - y = 1086$

$x = 6y + 6$

Then

$x - y = 1086$ ...(i)

$x - 6y = 6$ ...(ii)

From (i)

$5y = 1086 - 6$

$5y = 1080$

$y = 216$

$x = 1086 + 216 = 1302$

Hence, the larger number will be 1302.

20. (A) Since 36 is completely divisible by 9, on dividing 12 by 9, Remainder = 3

Hence, option (A) is correct.

21. (D) Given,

Quotient = 16

Then, Divisor = 16 × 25

= 400

∴ According to the question,

$$\text{Remainder} = \frac{400}{5}$$

= 80

We know that,

Dividend = (Divisor × Quotient) + Remainder

(400 × 16) + 80 = 6480

22. (C) Since 899 is exactly divisible by 29, on dividing by 29,

required remainder,

29) 63 (2
58
5 remainder

Hence, on dividing by 29, remainder is 5

23. (C) According to the question,

Dividend = Divisor × Quotient + Remainder

Number = 119 × quotient + 19

Number = 17× 7 × quotient + 17 + 2

Number = 17[7 × quotient + 1] + 2

Dividing the number by 17 leaves a remainder of 2.

Hence, option (C) is correct.

24. (B) Given,

Remainder = 34

According to the question

Divisor = 7 × Remainder

= 7 × 34

= 238

Divisor = 14 × Quotient

238 = 14 × Quotient

$$\text{Divisor} = \frac{238}{14} = 17$$

Dividend = Divisor × Quotient + Remainder

= 238 × 17 + 34

= 4046 + 34

= 4080

Hence, option (B) is correct.

25. (B) Given, Remainder = 56

According to the question,

Divisor = 12 × Remainder

Divisor = 12 × 56

∴ Divisor = 672 ....(i)

And, Divisor = 32 × Quotient

672 = 32 × Quotient

∴ 21 = Quotient

{From (i)}

Dividend = Divisor × Quotient + Remainder

Dividend = 672 × 21 + 56

Dividend = 14,168

Hence, option (B) is correct

26. (D) Given, Remainder = 26

According to the question

Divisor = 26 × 9 = 234

∵ Divisor = 18 × Quotient

234 = 18 × Quotient

∴ Quotient = 13

∴ Dividend = Divisor × Quotient + Remainder

Dividend = 234 × 13 + 26

Dividend = 3042+26

Dividend = 3068

Hence, option (D) is correct.

27. (C) Let the larger number = x

And small number = y

According to question,

$x - y = 2507$

$x = 2507 + y$ ...(i)

∵ Dividend = Divisor × Quotient + Remainder

$x = 9y + 11$ ...(ii)

From equation (i) and (ii),

⇒ $2507 + y = 9y + 11$

⇒ $2496 = 8y$

⇒ $y = 312$

From equation (i),

∴ larger number (x) = 2507 + 312

= 2819

Hence, option (C) is correct.

28. (B) Let the smaller number = x

According to the question,

Larger number − Smaller number = 1627

Larger number − x = 1627

Larger number = 1627 + x

Dividend = Divisor × Quotient + Remainder

⇒ $(1627 + x) = x \times 7 + 157$

⇒ $1627 + x = 7x + 157$

⇒ $6x = 1470$

⇒ $x = 245$

∴ Smaller number = x = 245

Sum of digits of smaller number

= 2 + 4 + 5 = 11

Hence, option (B) is correct.

29. (A) **30.** (A)

31. (A) Given,

$d = 24 \times q = 24 \times 18$ ...(1)

$d = 8 \times r$ ...(2)

From (1) and (2)

d = 432 and r = 54

Dividend = Divisor × Quotient + Remainder

= 432 × 18 + 54

= 7,776 + 54

= 7830

32. (A) Let the larger number = x

Smaller = $x - 1146$

$x = 4(x - 1146) + 6$

$3x = 1146 \times 4 - 6$

$3x = 4578$

$x = 1526$

Hence, larger number = 1526

33. (A) We know,

(Divisor × Quotient) + Remainder = Dividend

Starting from the last digit, the number leaves a remainder of 5.

When the number is divided by 7,

⇒ $7x + 5$

If this number is divided by 4, the remainder is 3.

⇒ $[4 \times (7x + 5) + 3]$

If a number is divided by 3, the remainder is 2.

⇒ $[3 \times \{4 \times (7x + 5) + 3\} + 2]$

$= 3 \times \{28x + 20 + 3\} + 2$

$= 84x + 71$

Hence, number $(84x + 71)$ and the multiples of the number 84 are more than 71.

∴ Required remainder = 71

34. (A) Number = 38 × 24 + 13 = 925

35. (D) H.C.F. of (89 – 4), (125 – 6)

= H.C.F. of (85, 119) = 17

So the required value of a is 17.

36. (B) 13 × 1 + 8 = 21 which is exactly divisible by 7.

So it cannot be 21.
$13 \times 2 + 8 = 34$ which when divided by 7 gives remainder '6'.

So the number is 34.

37. (C) Dividend = Divisor × Quotient + Remainder

Dividend = 44 × 432 + 0 = 19008

From the question,

If $\frac{19008}{31}$ then remainder = ?

$\Rightarrow \quad 19008 = 613 \times 31 + 5$

$\therefore$ Remainder = 5

38. (C) Divisor − Remainder = 1

According to the question,

$10 - 9 = 1, 9 - 8 = 1,$
$8 - 7 = 1$

Hence, the required number
= (L.C.M. of 10, 9, 8] – 1
= 360 – 1 = 359

39. (A)

	Old	New
Dividend ⟶	$10x$	$11x$
Divisor ⟶	$4y$	$5y$

According to the question,

$10x = 4y \times 25$

$\frac{x}{y} = \frac{10}{1}$

Dividend 100 : 110

Divisor 4 : 5

Hence, the quotient obtained by Pranjal

$= \frac{110}{5} = 22$

40. (B) We know that the number $(a^n - b^n)$ is always divisible by $(a - b)$.

$\therefore$ Divisor of $(49^{15} - 1) = 49 - 1$
$= 48$
$= 8 \times 6$

So the required divisor is 8.

41. (B) Let the larger number and smaller number be a and b respectively.

Given

$a - b = 1564$ ...(i)

According to the question

$a = 6b + 19$
$a - 6b = 19$ ...(ii)

On solving equation (i) and equation (ii)

$b = 309$

Hence, option (B) is correct.

42. (D) Let number = x

According to question,

$\frac{5(x+7)}{3} = -4 = 16$

$\frac{5x + 35 - 12}{3} = 16$

$5x + 35 - 12 = 48$
$5x = 25$
$x = 5$

Hence, the required value of x is 5.

43. (D) Let the numbers be x and y when $x > y$.

$\therefore \quad x - y = 2001$ ...(i)

Again

$\therefore \quad x = 9y + 41$

$\Rightarrow \quad x - 9y = 41$

$\Rightarrow \quad 2001 + y - 9y = 41$

From equation (i),

$\Rightarrow \quad 8y = 2001 - 41 = 1960$

$\Rightarrow \quad y = \frac{1960}{8} = 245$

$\therefore x = 2001 + 245 = 2246$

$\therefore$ Sum of digits $= 2 + 2 + 4 + 6$
$= 14$

44. (B) LCM of 12, 16, 18, 20 and 25

$\therefore$ L.C.M. $= 2 \times 2 \times 3 \times 3 \times 4 \times 5 \times 5$
$= 3600$

$\therefore$ Required number = 3600N + 4, which is divisible by 7.

3600N + 4 = 514x × 7 + 2N + 4

Here N = 5

2N + 4 is divisible by 7.

$\therefore \quad x = 3600 \times 5 + 4$
$= 18000 + 4$
$= 18004$

$\therefore$ Thousandth digit = 8

45. (D) According to the question, divisor = a and dividend = b.

Quotient $= \frac{a}{4}$

Remainder $= \frac{a}{2}$

$\therefore$ Dividend = Divisor × Quotient + Remainder

$\Rightarrow \quad b = \frac{a \times a}{4} + \frac{a}{2}$

$\Rightarrow \quad b = \frac{a^2 + 2a}{4}$

$\Rightarrow \quad 4b = a(a+2)$

$\Rightarrow \quad \frac{a(a+2)}{b} = 4$

46. (A) As given in the question,

Divisor = 2 × Remainder
= 2 × 80 = 160

Again 4 × Quotient = 160

$\Rightarrow \quad$ Quotient $= \frac{160}{4} = 40$

Now, Dividend = Divisor × Quotient + Remainder

$x = 160 \times 40 + 80$
$= 6480$

47. (C) According to the question,

Divisor (d) = $5r$ = 5 × 46 = 230

Again Divisor (d) = 10 × Quotient (q)

$\therefore \quad q = \frac{230}{10} = 23$

$\because$ Dividend = Divisor × Quotient + Remainder
$= 230 \times 23 + 46$
$= 5290 + 46$
$= 5336$

48. (D) Smallest number divisible by 4 and 9
= LCM of 4 and 9
= 36

According to the question,

$\frac{2x16}{36} = 9^2$

$\frac{2x16}{36} = 81$

$2x\ 16 = 81 \times 36$
$2x\ 16 = 2916$

On comparing both,

$x = 9$

49. (D) Divisibility rule of 3 ⇒

If the sum of the digits of a number is divisible by 3 then the number is also divisible by 3.

715 * 42324 $\Rightarrow \frac{27 + 1 + *}{3}$

= 1 * Remainder

Largest number in place of * = 8

$\Rightarrow \quad \frac{1+8}{3} = 3$

Hence, the largest whole number in place of * is 8.

50. (A) $3^5 + 3^6 + 3^7 + 3^8$
$3^5 (1 + 3 + 9 + 27)$
$= 3^5 \times 40$

Hence, the number will be completely divisible by 10.

51. (A) LCM of 3 and 2 = 6

Let the number $x = 6$

$2x^2 + 3x^2 = 2 \times 6^3 + 3 \times 6^2$
$= 2 \times 216 + 3 \times 36$
$= 432 + 108$

$= 540$

Hence, the number $2x^3 + 3x^2$ will be divisible by 108.

52. (A) Divisibility rule of 9 $\Rightarrow$

If the sum of the digits of a number is divisible by 9, then the number will also be divisible by 9.

$72\ 5x3 = 7 + 2 + 5 + x + 3$

$= 17 + x$

$\frac{17+x}{9} = \frac{17+1}{9} = \frac{18}{9} = 2$

Hence, the minimum value of x will be 1.

53. (C) According to the question,

If a number is divisible by 44 then it will also be divisible by 4 and 11.

Divisibility rule of 4 $\Rightarrow$ The last two digits are divisible by 4

Divisibility rule of 11$\Rightarrow$The difference between the sum of alternate digits of a number is divisible by 11.

$\frac{K2}{4} = 0$ (Remainder)

Hence, the value of K is 7.

54. (B) $\frac{a}{18}$ and $\frac{b}{12}$

Then, $a = 18$ and $b = 12$

So, $a^2 - b^2 = 18^2 - 12^2$

$= (18 + 12)(18 - 12)$

$= 30 \times 6$

Therefore $(a^2 - b^2)$ number will be divisible by 36.

55. (A) If a number is exactly divisible by 104, 78 and 260.

Then the LCM of 104, 78, 260 = 1560

P = 1560

According to question,

$P + 40 = Q^2$

$1560 + 40 = Q^2$

$1600 = Q^2$

$Q = 40$

Hence, the positive value of Q is 40.

56. (B) LCM of 3, 12, 24 and 36,

$3 = 3$

$12 = 3 \times 4$

$24 = 2 \times 3 \times 4$

$36 = 2 \times 2 \times 3 \times 3$

$\text{LCM} = 4 \times 3 \times 3 \times 2$

$= 72$

Largest three digit number = 999

Therefore = $\frac{999}{72} = 13\cdot875$

Hence, the required number of three digits

$= 13 \times 72$

$= 936$

57. (B) $89563x87y$

If a number is divisible by 72, it is also divisible by 9 and 8.

Divisible by 8 : If the last three digits of the number are divisible by 8.

$y = 2$

Divisible by 9 : If the sum of all the digits of the number is divisible by 9

$8 + 9 + 5 + 6 + 3 + x + 8 + 7 + y$

$= 46 + x + y$

$= 46 + x + 2$

$= 48 + x$

$\therefore x = 6$ (the next multiple of 9 is 54)

$\sqrt{7x - 3y} = \sqrt{7\times6 - 3\times2}$

$= \sqrt{36}$

$= 6$

58. (A) $5y97405x2$

$72 = 8 \times 9$

Divisible by 8$\rightarrow$ 8) 5x2 (

$x = 1, 5, 9$

$x = 9$ for large value of x

$5y9740592 \longrightarrow$ Divisible by 9

$y+5+9+7+4+0+5+9+2 = 41+y$

$\frac{41}{9} = 5$ Remainder

$y + 5 = 9$

$y = 4$

$(x - 2y) = (9 - 8) = 1$

59. (D) Number between 63 and 345 divisible by 8 = n

Here, $a = 64, l = 344, d = 8$

$\therefore \quad l = a + (n - 1)d$

$344 = 64 + (n - 1)8$

$280 + 8 = 8n$

$n = \frac{288}{8}$

$\Rightarrow \quad n = 36$

Hence, option (D) is correct.

60. (B) According to the question

```
59)744(13
   -59
   ---
    154
   -177
   ----
   - 23
```

Hence, on adding 23 to 744, it will be completely divisible by 59.

61. (A)

```
6 ) 100 (16
     6
    --
    40
    36
    --
     4
```

$\therefore$ Required number $6 - 4 = 2$

If 2 is added to 100 then the resulting number will be exactly divisible by 6.

62. (B) **63.** (B) **64.** (D) **65.** (A)

66. (C) The 8 digit number $342x18y6$ is divisible by 72.

Then the number $342x18y6$ will also be divisible by 8 and 9.

Rule of divisibility by 8 : The last three digits of the number are divisible by 8.

At $y = 1$

$\because$ 816 is divisible by 8.

Rule of divisibility by 9 : If the sum of the digits of the given number is divisible by 9.

$\therefore 3 + 4 + 2 + x + 1 + 8 + 1 + 6$

$= 25 + x$

Put the value of $x = 2$

$\therefore \quad 25 + 2 = 27$

$\because \quad$ 27 is divisible by 9.

$x = 2, y = 1$

$\therefore \quad \sqrt{2x + 5y} = \sqrt{2\times2 + 5\times1}$

$= \sqrt{4+5} = \sqrt{9} = 3$

Hence, option (C) is correct.

67. (D) **68.** (C) **69.** (D)

70. (C) If $84pp153p$ is divisible by 9, Then the sum of the digits of the number will be divisible by 9.

$\therefore\ 8 + 4 + p + p + 1 + 5 + 3 + p$, divisible by 9

$\Rightarrow \quad 21 + 3p$, divisible by 9

$\Rightarrow$ For $p = 2$

The number is $21 + 3p$

$= 21 + 3 \times 2 = 27$

27 which will be divisible by 9.

71. (C) $6m61$ is divisible by 11 then

$(6 + 6) - (m + 1) = 0$ or 11

$12 - m - 1 = 0$ or $11 \Rightarrow m = 0$

$\because$ 11 is a two digit number

$m = 0$

72. (D) $N = 4a\ 6b9c$ is divisible by 99

Divisibile by $99 = 9 \times 11$

Divisiblity rule by 11 :

$4 + 6 + 9 - (a + b + c)$

$19 - (a + b + c) = 0$ or multiple of 11

Putting the value of $a + b + c$ as 8
$19 - 8 = 11$ is divisible by 11.
Now for divisible by 9, sum of all digits will be divisible by 9
$4 + a + 6 + b + 9 + c$
$19 + 8 = 27$
Hence, the maximum value of N will be 27.

73. (B) Numbers between 501 and 701 which are divisible by 10

510, 520,........,700

Here $a = 510, d = 10, a_n = 700$

$\therefore \quad a_n = a + (n - 1)\, d$

$\Rightarrow \quad 700 = 510 + (n - 1)\times 10$

$\Rightarrow \; 10(n - 1) = 700 - 510 = 190$

$\Rightarrow \quad n - 1 = 19$

$n = 19 + 1 = 20$

Numbers between 501 and 701 which are divisible by 20—

510, 540,............,690

$\therefore \quad a = 510, d = 20, \ldots . a_n = 690$

$\therefore \quad a_n = a + (n - 1)d$

$690 = 510 + (n - 1) \times 20$

$\Rightarrow \quad 180 = (n - 1) \times 20$

$\Rightarrow \quad n - 1 = 6$

$\Rightarrow \quad n = 7$

Numbers which are divisible by 10 but not by 3.

$\therefore \quad 20 - 7 = 13$

74. (D) $48ab$ is divisible by 2, 5 and 7. To be divisible by 2 and 5, the last digit of the given number must be zero.

$\therefore \quad b = 0$

Therefore, the number $48a0$ is divisible by 7,

Then $48a - 2 \times 0$

$= 48a$ will be divisible by 7

and $48 - 2a$ will be divisible by 7

Hence, the minimum value of a for which $48 - 2a$ will be divisible by 7 is—

$a = 3$

$\therefore$ Now $10a - b = 10 \times 3 - 0 = 30$

75. (C) Three-digit numbers which are divisible by 15—

105, 120, ... 990

This is an A. P. where $a = 105$, $d = 120 - 105 = 15, a_n = 990$

$\because \quad = a + (n - 1)\, d$

$990 = 105 + (n - 1) \times 15$

$885 = (n - 1)15$

$n = 59 + 1 \Rightarrow n = 60$

$S_{60} = \frac{n}{2}\,[105 + 990]$

$= \frac{60}{2}[1095] = 32850$

76. (C) 5A72B

To be divided by 11,

$(5 + 7 + B) - (A + 2) = 11$

$12 + B - A - 2 = 11$

$B - A + 10 = 11$

$\boxed{B - A = 1}$

77. (A) If the sum of the digits of a number is divisible by 9, then the number will be divisible by 9.

$3 + 4 + 2 + 7 + 8 + A + 2 + 5 + 9 + 7$
$= (47 + A)$

Put the value of A as 7,

$47 + 7 = 54$ which is divisible by 9.

$\therefore$ The value of A is 7.

78. (A) If a number is divisible by 72, then that number should also be divisible by both 9 and 8.

Number ($5P42978n6$) 8 and 5 can be put in place of n, because for a number to be divisible by 8, The last three digits should be divisible by 8 and n should be the second largest digit. As per the question.

$\therefore \quad n = 5$

and

$\Rightarrow \quad \frac{5 + p + 4 + 2 + 9 + 7 + 8 + 5 + 6}{9}$

$\Rightarrow \quad \frac{46 + p}{9}$

$\therefore \quad p = 8$

Hence, $2p - 1 = 2 \times 8 - 1 = 15$

79. (A) If a number is divisible by 360, then the last digit of the number must be zero and the sum of the digits of the number must be exactly divisible by 9.
The last two digits of the number must be divisible by 4.
From option (A),
The last digit of the number 171720 is zero and the sum of the digits of the number is divisible by 9 and the last two digits are divisible by 4.
Hence, the number 171720 is divisible by 360.

80. (D) In the number $259876p05$

sum of the digits at odd places

$= 5 + p + 7 + 9 + 2$

$= 23 + p$

sum of the digits at even places

$= 0 + 6 + 8 + 5$

$= 19$

Difference of digits in even and odd place $= 23 + p - 19$

$= 4 + p$

Divisibility rule by 11 : The difference between the sum of the digits at odd and even places in a number is 0 or a multiple of 11.

So, $\quad p = 11 - 4 = 7$

$\therefore \quad (p^2 + 5) = 7^2 + 5$

$= 49 + 5 = 54$

81. (B) Number 4A306 76 8 B2

If the number is divisible by 8, then the last 3 digits will be divisible by 8

$\therefore \quad B = 3$ or 7

If $\quad B = 3$

Therefore the number 4A30676832

Now, sum of even place digits

$= 2 + 8 + 7 + 0 + A$

$= 17 + A$

Sum of odd place digits

$= 3 + 6 + 6 + 3 + 4$

$= 22$

Difference between sum of even and odd place digits

$= 22 - 17 - A$

$= 5 - A = 0$

[$\because$ Number is divisible by 11]

The minimum value of A is 5.

Hence, the option (B) is correct.

82. (B) The number $4y6884805x6$ is divisible by 72. So the number will also be divisible by 2, 3, 6, 8, 9.
Divisibility rule of 3 : If the sum of the digits of the number should be exactly divisible by 3.

$\therefore \; 4 + y + 6 + 8 + 8 + 4 + 8 + 0 + 5 + x + 6$

$\Rightarrow \quad 49 + x + y$

The minimum number will be 54, which is divisible by 3.
If the number is divisible by 8, then the last three digits of the number will be divisible by 8.

$\therefore \quad x = 3$

Then $\quad y = 2$

$\therefore \quad \sqrt{xy} = \sqrt{3 \times 2} = \sqrt{6}$

83. (A) The number $1263487xy$ is divisible by both 8 and 5,

Divisibility rule of 5 : The last digit of the number must be 5 or 0.

Then the possible last digit will be 0

$\therefore \quad y = 0$

Divisibility rule of 8 : Last three digits of the number must be exactly divisible by 8, So the last 3 digits are

7×0

Put the value of $x = 2$ or 6,

Then maximum value of $x = 6$

$\therefore \quad x = 6$ and $y = 0$

84. (B) Number

5 8 3 p 2 3 1 0 q 2

Sum of odd place digits

$= 2 + 0 + 3 + p + 8$

$= 13 + p$

Sum of even place digits

$= q + 1 + 2 + 3 + 5$

$= 11 + q$

$\therefore 13 + p - 11 - q$

$2 + p - q = 0$

$q - p = 2$ (this condition is not possible)

$\because \quad p > q$

Now, $13 + p - 11 - q = 11$

$p - q = 9$

$\therefore \quad p = 9$ and $q = 0$

Hence, $\quad p \times q = 9 \times 0 = 0$

85. (C) Given, Number $672xy$

Sum of even place digits $= 7 + x$

Sum of odd place digits

$= 2 + y + 6 = 8 + y$

$\therefore 8 + y - 7 - x = 1 + y - x$

Possible values $x = 1, y = 0$ and $x = 2, y = 1, x = 3, y = 2, x = 4, y = 2$.....

Sum of digits $= 6 + 7 + 2 + x + y$

$= 15 + x + y$

So, $\quad x = 2, y = 1$

So the given number 672 is 21 which is divided by 7.

$\therefore \quad 6x + 5y = 6 \times 2 + 5 \times 1$

$= 12 + 5$

$= 17$

86. (B) $2^{18} - 1$

$262144 - 1 \quad [\because 2^{18} = 262144]$

$262143 \div 7 = 37,449$

262143 is exactly divisible by 7.

Hence, option (B) is correct.

87. (D) $225 + 226 + 227$ Divisible = ?

$2^{25} + 2^{26} + 2^{27} = 2^{25}(1 + 2^1 + 2^2)$

$= 2^{25}(1 + 2 + 4)$

$= 7 \times 2^{25}$

It is divisible by 7.

Hence, option (D) is correct.

88. (A) Numbers between 800 and 2000

Formula

$T_n = A + (n - 1)D$

$\because$ Here, A is the smallest number which is divisible by 13.

T_n is the largest number which is divisible by 13,

Here, $A = 806$, $D = 13$, $T_n = 1989$

$1989 = 806 + (n - 1).13$

$1989 - 806 = (n - 1)13$

$1183 = (n - 1).13$

$n - 1 = 91$

$n = 92$

89. (C) The number $342x18y6$ is divisible by 72. Then the number will be divisible by both 8 and 9.

By the rule of divisibility of 8 $y = 1, 5, 9$

So the largest value of y, $y = 9$ By the rule of divisibility of 9, $x = 3$

Now $\sqrt{9x + y} = \sqrt{9 \times 3 + 9}$

$= \sqrt{27 + 9} = \sqrt{36} = 6$

Hence, option (C) is correct.

90. (A) If the number $5y5888406x6$ is divisible by 72, then the number will also be divisible by 8 and 9–

By the divisibility rule of 8,

$x = 1,7$

Minimum value of $x = 1$

By divisibility rule of 9,

$$\frac{5 + y + 5 + 8 + 8 + 8 + 4 + 0 + 6 + 1 + 6}{9}$$

$$\frac{45 + 6 + y}{9} = \frac{51 + y}{9}$$

$\therefore \quad y = 3$

$\therefore \quad 9x - 2y = 9 \times 1 - 2 \times 3$

$= 9 - 6$

$= 3$

Hence, option (A) is correct.

91. (C) According to the question,

Number $= 100x + 10y + z$

Sum of digits $= x + y + z$

So, difference $= 100x + 10y + z - x - y - z$

$= 99x + 9y = 9(11x + y)$

So, the number is divisible by 9.

92. (C) Divisor = 198

Largest six-digit number

= 999999

Dividing by 198,

Quotient = 5050, Remainder = 99

Six-digit number is divisible by 198.

= 999999 – 99

= 999990

If the digits are rearranged, Then the sum of all the digits of the number

$= 9 + 9 + 9 + 9$

$= 36$

36 is divisible by 3.

The six-digit number which is divisible by 198.

999900 – 198 = 999702

If the digits are rearranged.

Sum of all the digits of the number

$= 9 + 9 + 9 + 7 + 2$

$= 36$

So, if the digits are rearranged, the number will be divisible by 3.

93. (B) Given,

Number $= 55p1067q9$

$99 = 9 \times 11$

For divisibility rule of 9,

$5 + 5 + p + 1 + 0 + 6 + 7 + q + 9$

$= 33 + p + q$

$33 + p + q =$ (divisible by $m = 9$)

$6 + p + q = m$

$p + q = m - 6$

$p + q = 3, 12$

By divisibility rule of 11,

$(5 + p + 0 + 7 + 9) - (5 + 1 + 6 + q)$

$21 + p - 12 - q = n$

$9 + p - q = n$

$p - q = -9$ or 2

$p + q = 12 \quad$ ...(i)

$p - q = 2 \quad$ ...(ii)

Adding equation (i) and equation (ii),

$p = 7, q = 5$

$pq = 7 \times 5$

$= 35$

Hence, option (B) is correct.

94. (C) If the number 8764 x 5 is divisible by 9, then the sum of the digits of the number must also be divisible by 9.

Divisibility rule of 9,

$$= \frac{8 + 7 + 6 + 4 + x + 5}{9}$$

$$= \frac{30 + x}{9}$$

From option (C), Put the value of $x = 15$

$$\Rightarrow \quad \frac{30 + 15}{9} = \frac{45}{9}$$

$\therefore \quad$ Remainder = 0

Hence, option (C) is correct.

95. (C) Given, 6336633P is divisible by 132,

$$132\overline{)6336633P}(480048$$

$$\begin{array}{l} \underline{-528} \\ 1056 \\ \underline{1056} \\ \quad 633 \\ \underline{-528} \\ \quad 105P \\ \underline{-1056} \\ \quad \times \end{array}$$

Hence, the required value of P is 6.

96. (D) If the sum of the digits of a number is divisible by 9, then the number will be divisible by 9.

$$\frac{8+x+5+2+1+5}{9}$$

$$\frac{21+x}{9}$$

Put the value of $x = 6$,

It will be divisible by 9.

Hence, the minimum value of x is 6.

97. (A) The number $72x8431y4$

Put the value of $y = 2$,

Now the sum of the digits in the number, $72x843124$

$= 7 + 2 + x + 8 + 4 + 3 + 1 + 2 + 4$
$= 31 + x$

Put the value of $x = 5$,

Now the value of $\left(\frac{x}{y} - \frac{y}{x}\right)$

$$\left(\frac{5}{2} - \frac{2}{5}\right) = \left(\frac{25-4}{10}\right)$$

$$= \frac{21}{10} = 2\frac{1}{10}$$

Hence, option (A) is correct.

98. (C) $785x3678y$

$$72 \to 8 \times 9$$

If the number is divisible by 72, then it will also be divisible by 8 and 9.

The sum of the last three numbers must be divisible by 8.

785 x 36 7 8 y

If the value of y is 4 then $78y$ will be divisible by 8

Divisibility rule of 9 : If the sum of the digits of a number is divisible by 9.

$7 + 8 + 5 + x + 3 + 6 + 7 + 8 + 4$

$\Rightarrow \quad 48 + x$

The number which is divisible by 9 after 48 is 54

$\therefore \quad 48 + x = 54$

$x = 6, y = 4$

$\therefore$ Required value of $(x + y) = 6 + 4$
$= 10$

Hence, option (C) is correct.

99. (A) If the number $5x2y6z$ is divisible by 7, 11 and 13, then the number will also be divisible by 1001.
6 digit numbers which are divisible by 1001. Those numbers are represented as $xyzxyz$.

So, comparing $5x2y6z$ with $xyzxyz$,

$x = 6, y = 5, z = 2$
$(x – y + z) = (6 – 5 + 3 \times 2)$
$= 1 + 6 = 7$

Hence, option (A) is correct.

100. (C) LCM of 5, 6 and 7 = 210

Therefore, numbers between 400 and 700 which are divisible by 5, 6 and 7

$= 210 \times 2, 210 \times 3$
$= 420, 630$

Hence, the required numbers = 2.

101. (C) If a number is divisible by 72, then it is also divisible by 8 and 9.

If $78y$ is divisible by 8 then the value of y will be 4

By divisibility rule of 9

$48 + x$

$x = 6$

$\therefore$ Required value of $(x – y) = 6 – 4$
$= 2$

102. (B) Divisibility rule of 3.
A number is divisible by 3 if the sum of its digits is divisible by 3.

Divisibility rule of 11.

A number is divisible by 11 if the difference between the sum of its digits at odd places and the sum of its digits at even places is either 0 or a number divisible by 11.

The sum of the digits of the number 15632412

34351 = 1 + 5 + 6 + 3 + 2 + 4 + 1 + 2 + 3 + 4 + 5 + 1 = 40

40 is not divisible by 3,

Now on checking the divisibility rule by 11—

(5 + 3 + 4 + 2 + 4 + 5) – (1 + 6 + 2 + 1 + 3 + 3 + 1)
= 23 – 17
= 6

We know that 6 is not a multiple of 11

So the number is not divisible by 11.

Hence, this number is neither divisible by 3 nor by 11

103. (B) Total numbers divisible by 5

$$= \frac{999}{5} = 199$$

Total numbers divisible by 7

$$= \frac{999}{7} = 142$$

Total numbers divisible by 5 and 7

$$= \frac{999}{35} = 28$$

Natural numbers less than 1000 which are divisible by 5 or 7 but not by 35

= 199 + 142 – 28
= 313

104. (B) Given, $479xyz$ is divisible by 7, 11 and 13.

($abcdef$) six digit number which is divisible by 7 and 13.

Then $(abc) \sim (def) = 0$

$\therefore \quad (479) \sim (xyz) = 0$

$xyz = 479$

This meaning $x = 4$
$y = 7$
$z = 9$

Now, $(7 + 9) \div 4 = \frac{16}{4} = 4$

105. (D) When an integer number n is divided by 7, the remainder is 3. Similarly, when we divide 5n by 7, Remainder $\frac{5 \times 3}{7} = \frac{15}{7} = 1$

When a number is multiplied 5 times then the remainder also becomes 5 times. 15 is greater than 7

Again,

On dividing 15 by 7 there will remainder 1.

106. (A) The number 106974 is divisible only by 2, 3, 6 and 7.

Divisibility rule of 2 : If the last digit of a number is 0, 2, 4, 6, 8, then it is divisible by 2.

Divisibility rule of 3 : If the digit sum of a number is divisible by 3, then the number is divisible by 3.

Eg. (1 + 0 + 6 + 9 + 7 + 4)/3 = 27/3 = 9

Divisibility rule of 6 : If a number is divided by 2 and 3, then the number is also divisible by 6.

Divisibility rule of 7 : The number is divided into pairs of 3 digits each.

| 106 | 974 |

974 –106 = 868

Which is divisible by 7.

107. (D) If the number $56x34y4$ is divisible by 72, then the number will also be divisible by 2 and 3.

If 2 and 3 are substituted in place of x and y,

$\frac{5633424}{72} = 78242$

The number is divisible by 72.

Hence, the minimum value of $x + y = 2 + 3 = 5$

108. (D) $\frac{46N}{18}$

Divisibility rule of 18 :

A number which is divisible by 18 must be divisible by both 2 and 9. Here

There will be 8 in place of N.

109. (D) (I) 337 is a prime number.

(II) Factors of $12 = 2^2 \times 3$

Power = $[(2 + 1) \times (1+1)] = 6$

(III) 32742 is divisible by 9.

Hence, all expressions, I, II, III are correct.

110. (C) $4^{11} + 4^{12} + 4^{13} + 4^{14}$

$4^{11}[1 + 4 + 4^2 + 4^3]$

$4^{11}[1 + 4 + 16 + 64]$

$4^{11} \times 85$

The number will be divisible by 17 because the factors of 85 are 17 × 5. Hence, 17 is given in the option.

111. (A) Divisibility rule of 11 :

A number is divisible by 11 if the difference between the sum of its digits at odd places and the sum of its digits at even places is either 0 or a number divisible by 11.

∴ 34 N
↓
1

$(3 + 1) - 4 = 0$

Hence, the correct answer is 1.

112. (D) Smallest six-digit number = 100000

On dividing 100000 by 108,

Remainder = 100.

So 108 – 100 = 8

Smallest six-digit number

= 100000 + 8

= 100008

113. (A) 334 × 545 × 7P ÷ 3340

P = ?

$\frac{334 \times 545 \times 7P}{3340} = \frac{545 \times 7P}{10}$

$= \frac{109 \times 7P}{2}$

Hence, the value of P will be 2.

114. (C) If the number 236953 x 876 is divisible by 11. Divisibility rule of 11

A number is divisible by 11 if the difference between the sum of its digits at odd places and the sum of its digits at even places is either 0 or a number divisible by 11.

$\therefore (2 + 6 + 5 + x + 7) - (3 + 9 + 3 + 8 + 6) = 0$

$20 + x - 29 = 0$

$\Rightarrow x = 9$

The value of x is 6.

115. (B) Numbers greater than 3 that are divisible by 7 = 7

Numbers smaller than 200 and divisible by 7 = 196

Here $a = 7, a_n = 196, d = 7$

$\therefore a_n = a + (n - 1)d$

$\Rightarrow 196 = 7 + (n - 1) \times 7$

$\Rightarrow n - 1 = \frac{196 - 7}{7} = 27$

$\Rightarrow n = 27 + 1 = 28$

116. (D) Divisibility rule of 11 :

A number is divisible by 11 if the difference between the sum of its digits at odd places and the sum of its digits at even places is either 0 or a number divisible by 11.

∴ (4 + 3 + 7 + 8) – (8 + 2 + *)

∴ 22 – 10 – *

∴ 12 – *

Hence, the value of * is 1.

117. (C) Given

$a * b = a + b - ab$

$\therefore 5 * 7 = 5 + 7 - 5 \times 7$

$= 12 - 35$

$= -23$

118. (B) Put the value of n as 2,

$(n - 1) \times n(n + 1)$

$= (2 - 1) \times 2 \times (2 + 1)$

$= 6$

Put the value of $n = 3$,

$(n - 1) \times n(n + 1)$

$= (3 - 1) \times 3 \times (3 + 1)$

$= 24$

The number that completely divides each number is 6.

119. (D) **120.** (B) **121.** (A)

122. (D) Divisibility rule of 3 :

If the sum of the digits of the number should be exactly divisible by 3.

$\therefore 6 + 7 + 4 + p + q + 0 = 24$

$p + q = 7$ ...(i)

Divisibility rule of 11 :

A number is divisible by 11 if the difference between the sum of its digits at odd places and the sum of its digits at even places is either 0 or a number divisible by 11

$\therefore (p + 7) - (10 + q) = 0$

$p - q = 3$ ...(ii)

On solving Eq. (i) and Eq. (ii),

$p = 5$

$q = 2$

123. (D) $3^{50} + 9^{26} + 27^{18} + 9^{28} + 9^{29}$

$= 3^{50} + 3^{52} + 3^{54} + 3^{56} + 3^{58}$

$= 3^{50}[1 + 9 + 81 + 729 + 6561]$

$= 3^{50}[7381]$

The number 7381 is completely divisible by 11.

The number 3^{50} (7381) will also be completely divisible by 11.

Hence, option (D) is correct.

124. (D) K = 42 × 25 × 54 × 135

= 2 × 3 × 7 × 5 × 5 × 3 × 3 × 3 × 2 × 3 × 3 × 3 × 5

$= 2^2 \times 3^7 \times 5^3$

Given, K is divisible by 3^a

$\therefore 3^a = 3^7$

Comparing powrs

$a = 7$

125. (C) 9m2365n48 is a nine-digit number which is exactly divisible by 88, If 9m2365n48 is divisible by both 8 and 9, then this number will also be exactly divisible by 88.

Divisibility rule of 8 :

If the last three digits of a number are divisible by 8, then that number will be divisible by 8.

Put the value of n as 2,

248 is exactly divisible by 8.

So $n = 2$

Divisibility rule of 11 :

A number is divisible by 11 if the difference between the sum of its digits at odd places and the sum of its digits at even places is either 0 or a number divisible by 11.

$(9 + 2 + 6 + 2 + 8) - (m + 3 + 5 + 4) = 11$

$27 - m - 12 = 11$

$m = 15 - 11$

$m = 4$

According to question,

$m^2 \times n^2 = 4^2 \times 2^2$

$= 16 \times 4 = 64$

126. (A) 48 k 2048 p 6 is a nine-digit number which is exactly divisible by 99.

Divisibility rule of 9 :

If the sum of all the digits of a number is divisible by 9 then the number is divisible by 9.

$\therefore\ 4 + 8 + k + 2 + 0 + 4 + 8 + P + 6$
$= 32 + k + P = 36$
$k + P = 4$ ...(i)

Divisibility rule of 11 :

A number is divisible by 11 if the difference between the sum of its digits at odd places and the sum of its digits at even places is either 0 or a number devisible by n

$(4 + k + 0 + 8 + 6) - (8 + 2 + 4 - P)$
$= 0$
$k - P = 4$ ...(ii)

Adding Eq. (i) and Eq. (ii),

$\boxed{\begin{matrix} k = 0 \\ P = 4 \end{matrix}}$

According to question,

$k \times P = 0 \times 4 = 0$

127. (C) 89x64287y is a nine-digit number which is exactly divisible by 72,

Divisibility rule of 8.

If the last three digits of a number are divisible by 8, then that number will be divisible by 8.

The possible value of y is 2.

Sum of digits of a number
$= 8 + 9 + x + 6 + 4 + 2 + 8 + 7 + y$
$= 44 + x + y$
$= 44 + x + 2$
$= 46 + x$
$x = 54 - 46$

The sum of the digits of the number must be divisible by 9.

$\therefore\ 3x + 2y = 3 \times 8 + 2 \times 2$
$= 28$

128. (A) Given, The 5-digit number 247xy is divisible by 3, 7 and 11.

$\therefore$ LCM (3, 7, 11)
$= 231$

The largest possible value of 247xy is 24799.

When we divide 24799 by 231 then the remainder is 82.

Required number
$= 24799 - 82$
$= 24717$

then, $x = 1$
$y = 7$

$\therefore\ 2y - 8x = 2 \times 7 - 8 - 1$
$= 6$

129. (A) Sum of digits of a number
$= 5 + 3 + 0 + 6 + 2 + p = 16 + p$

Divisibility rule of 3 :

Small value of p can be 2 and large value of p can be 8.

Required difference $8^2 - 2^2 = 60$

130. (C) If the number is divisible by 72 then the number will also be divisible by 8 and 9. (9y6) will be divisible by 8.

Then the possible values of y = 3, 7

Divisibility rule of 9 :

If the sum of the digits of a number is divisible by 9, then the number will also be divisible by 9

$9 + 4 + x + 2 + 9 + y + 6$
$\Rightarrow\ 30 + x + y$

If $y = 3$ then $x = 3$ (Given $x \neq y$)
$y = 7$ then $x = 8$

$\therefore\ 2x + 3y$
$= 2 \times 8 + 3 \times 7$
$= 37$

131. (C) $72 = 8 \times 9$

8 by, 3y4
$\Rightarrow\ y = 0, 4, 8$

Maximum value of y = 8

$8 + 8 + 8 + x + 5 + 3 + 8 + 4$
$= 44 + x$
$x = 1$
$\Rightarrow\ 7x + 2y = 7(1) + 2(8) = 23$

132. (D) LCM of 3, 7 and 11 = 231

The given number should be divisible by 231.

Maximum possible value of 688 xy
$= 68899$

When 68899 is divided by 231, the remainder is 61.

Number $= 68899 - 61$
$= 68838$
$\therefore\ x = 3$
$y = 8$

Hence, $5x + 3y = 5 \times 3 + 3 \times 8$
$= 39$

133. (C) LCM of 7, 11 and 13 = 1001

We know that when a three digit number is multiplied by 1001 then the number repeats its digits.

Let the three digit number be xyz.

$xyz \times 1001 = 823p2q$
$xyzxyz = 823p2q$

Comparing both the sides,

$\Rightarrow\ x = 8, y = 2, z = 3$
$\therefore\ p = 8, q = 3$

So the number is 823823.

Now required value
$= (p - q)$
$= (8 - 3)$
$= 5$

Required value 5

134. (D) x 35624 is divisible by 11, then

$-(x + 5 + 2) + (4 + 6 + 3)$
$= -(x + 7) + (13)$
$= 13 - x - 7$
$= 6 - x$
$\Rightarrow\ 6 - x = 0$
$\Rightarrow\ x = 6$

The number 1257y4 can be divided by 72. Then 1257y 4 will be divisible by 8 and 9.

And 1257y4 will also be divisible by 9

Then

$1 + 2 + 5 + 7 + y + 4 = 19 + y = 9$
$\Rightarrow\ 19 + y = 27$
$y = 27 - 19 = 8$
$\therefore\ 5x - 2y = 5 \times 6 - 2 \times 8$
$= 30 - 16 = 14$

135. (D) 1005x 4 is divisible by 8. Then 5x4, is divisible by 8.

So, putting $x = 0$,

504 is divisible by 8.

So, smallest integer of $x = 0$

136. (B) The number 687x29 is divisible by 9 if the sum of the digits of the number is divisible by 9.

$\therefore 6 + 8 + 7 + x + 2 + 9 = 32 + x$

Putting $x = 4$,

The number is divisible by 9.

32 + 4 = 36 which is divisible by 9.

$\therefore\ 2x = 2 \times 4 = 8$

Hence, option (B) is correct.

137. (A) The number 2365*4 to be divisible by 4, The last two digits of the number must be divisible by 4.

From option (A)

putting * = 8

........* 4 = 84 which is divisible by 4.

Hence, option (A) is correct.

138. (B) The given number is divisible by 72.

Then the number is also divisible by 4, 8 and 9.

Divisibility rule of 4 : The last two digits of the number are divisible by 4.

Possible number of $y = 0, 4, 8$

Divisibility rule of 8 : The last three digits of the number are divisible by 8.

$y = 4$

$9 + 8 + 5 + x + 3 + 6 + 7 + 8 + y$

$= 46 + x + y$

$= 50 + x$

A number divisible by 9 which is greater than 50.

That number will be 54.

54 is the number which is exactly divisible by 9.

So $4x - 3y = 16 - 12 = 4$

139. (A) The number $2094x\,843\,y2$ is divisible by 88. Number will also be divisible by 11 and 8.

$3y2$ is divisible by 8.

So $y = 1, 5$ or 9

$(2 + 9 + x + 4 + y) - (0 + 4 + 8 + 3 + 2)$

$= 0$ or 11

$\Rightarrow (15 + x + y) - 17 = 0$ or 11

$\Rightarrow \quad x + y - 2 = 11$

If $\quad y = 1$

Then, $\quad x + 1 - 2 = 11$ or 0

$\Rightarrow \quad x - 1 = 0$

$\Rightarrow \quad x = 1$

If $\quad y = 5$

Then, $\quad x + 5 - 2 = 11$

$\Rightarrow \quad x + 3 = 11$

$\Rightarrow \quad x = 8$

$\therefore \quad (5x - 7y) = (5 \times 8 - 7 \times 5)$

$= (40 - 35)$

$= 5$

140. (C) The number $2074x4y2$ is divisible by 88. Number will also be divisible by 11 and 8.

Divisibility rule of 8 : The last three digits of the number are divisible by 8.

The number 2074x4y2

4y2 is exactly divisible by 8,

Then the possible value of Y = 3 or 7

Divisibility rule of 11: A number is divisible by 11 if the difference between the sum of its digits at odd places and the sum of its digits at even places is either 0 or a number divisible by 11

$(2 + 4 + 4 + 0) - (y + x + 7 + 2)$

$= 0$ or 11

$x + y - 1 = 11$

When $\quad Y = 3$

$x + 3 - 1 = 11$

$x = 9$

$x = 9, y = 3$

$4x + 3y = 4 \times 9 + 3 \times 3$

$= 36 + 9 = 45$

141. (C) The number $15x1y2$ is divisible by 44. The number will also be divisible by 4 and 11.

Divisibility rule of 4 : The last two digits are divisible by 4

Put the value of $y = 3$

Divisibility rule of 11: The difference between the sum of alternate digits of a number is divisible by 11.

$[(1 + x + 3) - (5 + 1 + 2)]$

$= 0$ or 11

$[(1 + x + 3) - 8]$

$= 0$ or 11

$\Rightarrow (4 + x) - 8 = 0$

$-4 + x = 0$

$\Rightarrow \quad x = 4$

$\therefore \quad (x + y) = (4 + 3) = 7$

142. (B) According to the question,

```
66) 7251 (109
    66
    ---
     651
     594
     ---
      57
```

Required quotient = 109

143. (B) According to the question,

```
19) 4131 (217
    38
    ---
     33
     19
     ---
     141
     133
     ---
       8
```

Hence, remainder = 8

i.e., $8 + 11 = 19$

To completely divide 4131 by 19, 11 must be added to it.

144. (A)

145. (D) From option (D), 5214341

$(5 + 1 + 3 + 1) - (2 + 4 + 4)$

$= 10 - 10$

$= 0$

146. (C) Number 1254216

The last three digits of the number are divisible by 8.

Therefore, this number will also be divisible by 8.

147. (A) Number 5769116

From option (A),

The last two digits of the number are divisible by 4.

Hence, option (A) is correct.

148. (A) $5^{71} + 5^{72} + 5^{73} + 5^{74} + 5^{75}$

$\Rightarrow 5^{71}(1 + 5 + 5^2 + 5^3 + 5^4)$

$\Rightarrow 5^{71}(6 + 25 + 125 + 625)$

$\Rightarrow 5^{71} \times 781$

$\Rightarrow 5^{71} \times 71 \times 11$

149. (D) We know that

where n = odd number, $(a^4 + b^4)$ has a factor of the form $(a + b)$.

$\therefore \; 8^{2k} + 5^{2k} = 64^k + 25^k$

Required factor

$= 64 + 25$

$= 89$

150. (B) Divisible by 8 : If the last three digits of the number are divisible by 8.

From option (A)

5896

↓

Even

96 is exactly divisible by 8.

Option (B),

6044 is not exactly divisible by 8.

151. (D) Divisibility rule of 4 : The last two digits are divisible by 4.

From option (D)

73<u>48</u>

↓

48 is completely divisible by 4.

152. (A) Divisibility rule of 4: If a number is divided by both 4 and 9, then that number will also be divisible by 36.

From option (A) 3376

divisible by 4

$\frac{76}{4}$ = remainder (0)

3376 is completely divisible by 4.

Divisible by 9 :

Sum of digits = 3 + 3 + 7 + 6 = 19

3376 is not completely divisible by 9.

153. (B) Taking LCM of 36 and 45,

$36 = 4 \times 9$

$45 = 5 \times 9$

LCM = $4 \times 5 \times 9 = 180$

Largest 4 digit number = 9999

Hence, $\frac{9999}{180} = 55\frac{99}{180}$

Four digit number which is divisible by 36 and 45.

$= 180 \times 55 = 9900$

Required number = 10000-9900 = 100

154. (B) Smallest five digit number = 10000

Then,

476) 10000 (21
952
480
476
4 (remainder)

Hence, smallest 5 digit number
= 10000 + 476 – 4
= 10472

155. (A) On dividing the number 1056 by 23,

23) 1056 (45
92
136
115
21 remainder

Hence, numbers to be added
= 23 – 21
= 2

156. (C) **157.** (D) **158.** (B)

159. (B) $13^{123} = 13^{4 \times 30} \times 13^3$

Unit digits of 13^{123}
Unit digits of 13^3
Unit digits of 2197
= 7

Hence, the unit digits of 13^{123} is 7

160. (C) Unit digit of 22^{471}
= Unit digit of $22^{4 \times 117} \times 22^3$
= Unit digit of $(2)^3 = 8$

161. (B) Unit digit of 237 × 432 × 156
= Unit digit of 7 × 2 × 6
= Unit digit of 84
= 4

Hence, option (B) is correct.

162. (A) Unit digit of
$2^{194} + 7^{63}$
= Unit digit of $2^{(48 \times 4 + 2)} + 7^{(15 \times 4 + 3)}$
= Unit digit of 2^2 + Unit digit of 7^3
= Unit digit of 4 + Unit digit of 347
= Unit digit of 347

Hence, required unit digit = 7

163. (A) $x = (633)^{24} + (266)^{40}$

Unit digit of $(633)^{24}$ = Unit digit of $(3^4)^6 = 1$

And unit digit of $(266)^{40}$ = Unit digit of $(6)^{40} = 6$

Unit digit in the value of x
= 1 + 6 = 7

Hence, option (A) is correct.

164. (B) Unit digit in the number is 6 and 1

Unit digit of the number = 6 × 1 = 6

Hence, option (B) is correct.

165. (B) $\underline{|1} + \underline{|2} + \underline{|3} + ... + \underline{|50}$

Unit digits of

$\underline{|1}$ = 1
$\underline{|2}$ = 2
$\underline{|3}$ = 6
$\underline{|4}$ = 4
$\underline{|5}$ = 0
: 0
: :
: 0
$\underline{|50}$ = 0

Unit digits
= 1 + 2 + 6 + 4 + 0 .... + 0 + 0
= 13

Hence, unit digits = 3

166. (A) $(29)^{136}$

∴ If the power of 9 is an even number, then unit digit is 1

Required unit digit =1

167. (D) $12^{123} = 2^{123}$

∵ $\frac{123}{4} = 30 \times 4 + 3$

⇒ $(2)^{30 \times 4 + 3}$

$= (2)^3$

∴ $2^3 = 8$ (unit digit),

Required unit digit = 8

168. (A) $3^{200} = (3^2)^{100} = (9)^{100}$

$2^{300} = (2^3)^{100} = (8)^{100}$

$7^{100} = (7^1)^{100} = (7)^{100}$

Hence, the largest number will be 3^{200}

169. (A) Unit digit of $x = [(433)^{24} – (377)^{38} + (166)^{54}]$

Unit digit of $[\{(433)^4\}^6 – \{(377)^4\}^9 \times (377)^2 + \{(166)^4\}^{13} \times (166)^2]$
= unit digit of [1 – 1 × 9 + 6 × 6]
= – 2
= 10 – 2
= 8

170. (C) $(3)^{61284} = (3^4)^{15321} = (81)^{15321}$ On dividing $(81)^{15321}$ by 5,

Remainder = 1 = x

[According to rule = $(a^x)^y = a^{x \times y}$]

And now,

Remainder after dividing 4^1 by 6 = 4
Remainder after dividing 4^2 by 6 = 4
Remainder after dividing 4^3 by 6 = 4

Hence, we can see that dividing an exponent of 4 by 6 leaves a remainder of 4.

∴ Remainder after dividing 4^{96} by 6.
= 4 = y

∴ $2x – y = 2 \times 1 – 4$
= – 2

171. (A) $N = 4^{11} + 4^{12} + 4^{13} + 4^{14}$
$= 4^{11} (1 + 4 + 4^2 + 4^3)$
$= 4^{11} (1 + 4 + 16 + 64)$
$= 4^{11} \times 85 = (2^2)^{11} \times 17 \times 5$
$= 2^{22} \times 17^1 \times 5^1$

[∵ Rule, $N = 2^a \times 3^b \times 5^c$ ....

Total number of factors
$= (a + 1) (b + 1) (c + 1)]$
$= (22 + 1) (1 + 1) (1 + 1)$
$= 23 \times 2 \times 2$
$= 92$

172. (B) The largest and the smallest 3-digit number divisible by 9 are 999 and 108 respectively.

∴ $a = 108, l = 999, d = 9$

Hence $l = a + (n – 1)d$
$999 = 108 + 9n – 9$
$9n = 900$
$n = 100$

Required sum
$= \frac{n}{2} (2a + (n – 1)d$
$= \frac{100}{2} (2 \times 108$
$+ (100 – 1) \times 9)$
$= 50 (216 + 891)$
$= 50 \times 1107$
$= 55350$

Hence, option (B) is correct.

173. (B) Let the multiples of 2 and 9 from 1 to 200 = 11

Taking L.C.M. of 2 and 9
= 18

Last number to be divided by 18
= 198

From Arithmetic progression,
∴ $a = 18$
$T_n = 198$
$(d) = 18$
∴ $T_n = a + (n – 1)d$
⇒ $198 = 18 + (n – 1)18$
⇒ $198 = 18 + 18n – 18$
∴ $n = 11$

Hence, option (B) is correct.

174. (D) 1830 = 2 × 3 × 5 × 61

The sum of the first numbers from 1 to 60 will be divisible by 61.

175. (B) Remainder of

$\frac{3126^{20^{21^{22^{23 ....}}}}}{5}$

Unit digit of 3126 = 6

The unit digit of all powers above 6 is 6.

So remainder $= \frac{6}{5}$

Remainder $= \boxed{1}$

176. (C) $\frac{3^{27}}{26} = \frac{(3^3)^9}{26} = \frac{(27)^9}{26} \because (a^m)^n = a^{mn}$

Remainder $(1)^9 = 1$

177. (A) $2^{305} + 303$

Here $= \frac{303}{9} = 33\frac{6}{9}$

Remainder = 6

$\frac{2^{305}}{9} = \frac{2^2 \times 2^{303}}{9}$

$= \frac{4(2^3)^{101}}{9}$

$= \frac{4(8)^{101}}{9}$

$= \frac{4(9-1)^{101}}{9}$

$= \frac{36m}{9} + \frac{4(-1)^{101}}{9}$

$= 4m - \frac{4}{9}$

Here remainder = – 4

Required remainder = 6 – 4

$= \boxed{2}$

178. (A)

179. (A) We know that,

Dividend = Divisor × Quotient + Remainder

$n = 9 \times q + 4$ ...(i)

On multiplying equation (i) by 15,

$15n = 135q + 60$

[where, q = quotient]

$15n = 9\,[15q + 6] + 6$

Hence, (A) is correct.

Dividing 15n by 9 leaves a remainder of 6.

Hence, option (A) is correct

180. (D) **181.** (A) **182.** (A) **183.** (A) **184.** (C)

185. (B) **186.** (B)

187. (A) Let $n = 9$

Then 7) 9 (1
 –7
 2 remainder

If 9n is divided by 7

7) 81 (11
 –7
 11
 –7
 4 remainder

Hence, the remainder will be 4.

188. (A) When n is odd, $(x^n + a^n)$ will always be divisible by $(x + a)$.

Here, $x = 71$, $a = 73$, $n = 83$

Then, $x + a = 71 + 73 = 144$

Now, 144 is divided by 36, then the remainder will be 0.

189. (B) When n is odd, $(x^n + a^n)$ will always be divisible by $(x + a)$.

$x = 31$, $a = 43$, $n = 47$

So $x + a = 74$

74 is exactly divisible by 37.

Remainder = 0.

190. (A) We can write,

$29 = 33 - 4$

$37 = 33 + 4$

$\frac{(33-4)^{41}}{33} + \frac{(33+4)^{41}}{33}$

33^41 will be divisible by 33

$= (-4)^{41} + (4)^{41}$

$= 0$

191. (B) According to the question,

If, $\frac{n}{5}$, then remainder = 3

Consider case (1)

$\frac{n-3}{5} = x$

$n - 3 = 5x$

$(n = 5x + 3)$

case (2)

If, $\frac{8n}{5}$ then remainder = ?

$\Rightarrow \frac{8(5x+3)}{5} = \frac{40x+24}{5}$

$\because$ $24 = 5 \times 4 + 4$

$= \frac{40x + 5 \times 4 + 4}{5}$

$= \frac{40x + 5 \times 4 + 4}{5}$

Remainder = 4

192. (B) In $(6n + 3)^2$ put $n = 1, 2, 3$

When $n = 1$

$(6 \times 1 + 3)^2 = (9)^2 = \frac{81}{9}$

$\Rightarrow$ Remainder = 0

When $n = 2$, $(6 \times 2 + 3)^2$

$= (15)^2 = \frac{225}{9}$

$\Rightarrow$ Remainder = 0

When $n = 3$

$(6 \times 3 + 3)^2 = (21)^2 = \frac{441}{9}$

$\Rightarrow$ Remainder = 0

For any value of n, dividing by 9 will give a remainder o f zero.

Hence, option (B) is correct.10

193. (A) **194.** (D) **195.** (D)

196. (C) 14331433 × 1422 × 1425

On multiplying the unit digits of the numbers,

$3 \times 2 \times 5 = 30$

Remainder = 0

197. (A) $\frac{141 \times 142 \times 143}{6}$

Remainder = $(1 \times 2 \times 3)/6$

$= 6/6$

Remainder = 0

198. (C) $\frac{252^{126} + 244^{154}}{10} = 47 \times 71 \times 143$

$\Rightarrow \frac{(2)^{126} + (4)^{154}}{10}$ [When a number is divided by 10 the unit digit of the number is remainder]

$\Rightarrow \frac{(2)^4 (4)^4}{10} = \frac{4+6}{10} = \frac{10}{10} = 0$

(Remainder)

Hence, required remainder = 0

199. (B) $\frac{(7^{19} + 2)}{6}$

$\Rightarrow \frac{(1)^{19} + 2}{6} = \frac{1+2}{6} = 3$

Hence, required remainder 3

200. (D) **201.** (A) **202.** (B) **203.** (D) **204.** (D)

205. (A)

206. (B) Remainder of $\frac{7^{42}}{48}$,

Remainder of $= \frac{(49)^{21}}{48}$

$= (1)^{21} = 1$

Hence, option (B) is correct

207. (A) We know that

Dividend = Divisor × Quotient + Remainder

$\therefore$ $n = 6m + 3$

[Let quotient = m]

$n^2 + 5n + 8 = (6m + 3)^2 + 5\,(6m + 3) + 8$

$= 36m^2 + 9 + 36m + 30m + 15 + 8$

$= 36m^2 + 66m + 32$

$= 36m^2 + 66m + 30 + 2$

$= 6(6m^2 + 11m + 5) + 2$

Hence, required remainder = 2

208. (D) When n is divided by 5, the remainder is 2.

$n = 5q + 2$ ...(i)

quotient = q

On multiplying by 7 in equation (i),

$7n = 35q + 14$

$7n = 35q + 10 + 4$

$7n = 5\,(7q + 2) + 4$

On dividing $7n$ by 5 the remainder will be 4.

Hence, option (D) is correct.

209. (B) On dividing n by 7, Remainder = 3

And quotient = q

Then, $n = 7q + 3$

$\therefore \quad 6n = 6(7q + 3)$

$= (42q + 14) + 4$

$= 7(6q + 2) + 4$

If $6n$ is divided by 7, the remainder will be 4.

210. (B) $n = 4x + 3$

Put $x = 1$

$n = 4 + 3 = 7$

$\therefore \quad 2n = 14$

Dividing $2n$ by 4 leaves a remainder of 2

211. (A) Given

$\frac{a}{13} \Rightarrow$ remainder = 9

$\frac{b}{13} \Rightarrow$ remainder = 7

$\frac{c}{13} \Rightarrow$ remainder = 10

$\left(\frac{a+2b+5c}{13}\right) \Rightarrow$ Remainder = ?

$\Rightarrow \quad \frac{9+2\times7+5\times10}{13}$

$= \frac{9+14+50}{13}$

$= \frac{73}{13} = 5\frac{8}{13}$

Remainder = 8

212. (D) Let, on dividing a number by 6,

Quotient = x

Number $r = 6x + 5$

on dividing a number by 5,

Quotient = y

Number = $5y + 3$

$6x + 5 = 5y + 3$

$\therefore \quad 6x = 5y - 2$

Putting $x = 3$ and $y = 4$,

Number = $6 \times x + 5$

$= 6 \times 3 + 5 = 23$

Two digits number = 23

LCM of 5 and 6 = 30

Required number = $30k + 23$

Where $k = 32$

If $k > 32$, then the digit will be 4.

K = 32

Required number

$= 30 \times 32 + 23$

$= 960 + 23 = 983$

On dividing 983 by 11, the remainder is 4

EXAMPLE :

11) 983 (89
– 88
103
– 99
4 remainder

213. (C) $\frac{35^{29}}{10}$

Power of $n = 1, 2, 3, 4, ... \infty$

$\because \quad \frac{5}{10} = 5$ (remainder)

214. (A) $\frac{36^{29}}{10}$

$\frac{6}{10}$ = remainder (6)

215. (B) $\frac{58^{29}}{5}$

$\Rightarrow \quad \frac{8^{29}}{5} = \frac{8^{4\times7+1}}{5}$

$= \frac{8^{1}}{5} = 3$ (remainder)

216. (B) $\frac{31\times32\times33}{5} = \frac{1\times2\times3}{5}$

$= \frac{6}{5}$

= remainder (1)

217. (B) Taking LCM of 18, 24 and 25

$18 = 2 \times 3 \times 3$

$24 = 2 \times 2 \times 2 \times 3$

$25 = 5 \times 5$

LCM $= 2 \times 2 \times 2 \times 3 \times 3 \times 5 \times 5$

$= 1800$

Smallest 6 digit number = 100000

$\frac{100000}{1800} = 55.55$

6 digit numbers divisible by 18, 24 and 25

$= 1800 \times 56$

$= 100800$

Sum of digits of a number

$= 1 + 8$

$= 9$

218. (A) LCM of 8, 16, 20 and 32.

2	8, 16, 20, 32
2	4, 8, 10, 16
2	2, 4, 5, 8
2	1, 2, 5, 4
2	1, 1, 5, 2
5	1, 1, 5, 1
	1, 1, 1, 1

LCM of 8, 16, 20 and 32

$= 2 \times 2 \times 2 \times 2 \times 2 \times 5$

$= 160$

Hence, option (A) is correct.

219. (D) 735 will not be a factor because its factor contains '3' which does not divide (5×7).

220. (D) According to the question,

Sum of three digit numbers rom 121 to 999 = 999 – 121 + 1 = 879

And the sum of four digit numbers from 1000 to 1346

$= 1346 - 1000 + 1 = 347$

Hence, required value

$= 879 \times 3 + 347 \times 4$

$= 2637 + 1388 = 4025$

221. (A) Number of zeros in 129! = ?

To find the number of zeroes in any factorial, divide it by 5 and then find the quotient then add all these quotient

Number of zeros in 129 ! = 31

5	129
5	25
5	5
	1

Sum = (25 + 5 + 1) = 31

222. (B) $17! = 17 \times 16 \times 15 \times 14 \times 13 \times 12 \times 11 \times 10 \times 9 \times 8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1$

There are three pairs of 5 and 2.

Hence, the number of zeros will be 3.

There are 0 in the hundreds of places in 17!.

223. (C) Let the prime numbers.

$a < b < c < d$

According to the question,

$abc = 255$

$bcd = 1955$

$\frac{bcd}{abc} = \frac{1955}{255}$

$\frac{d}{a} = \frac{23}{3}$

Hence, the largest prime number is 23.

224. (B) From the question, Multiple of 7 from 1 to 100

= 7, 14, 21, 28, 35, 42, 49, 56, 63, 70, 77, 84, 91, 98

There are a total 14 multiple

Hence, the statement (i) is false

Multiple of 19 from 1 to 100

= 19, 38, 57, 76, 95

There are a total of 5 multiples,

Hence, the statement (i) is true.

225. (B) $720 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5$

Required factors

= 2, 3, 4, 5, 6, 8, 9, 10, 12, 15, 16, 18, 20, 24, 30, 36, 40, 45, 48, 60, 72, 80, 90, 120, 144, 180, 240, 360

Total number of factors = 28

226. (B)

227. (A) Given,

6 red balls ≡ 12 white balls

∴ 1 red ball = $\frac{12}{6}$ white balls

∴222 red balls≡ $\frac{12}{6} \times 222$

= 444 white balls

Hence, 444 white balls are kept in the basket.

228. (B) Number of rotten eggs for 5 unusable eggs = 8

Number of rotten eggs for 10 unusable eggs = $\frac{8}{5}$ × 10 = 16

Out of 25 eggs, 1 eggs is rotten,
For 16 eggs,

Total number of eggs

= 25× 16 = 400

229. (A) Given :

The number (476 ** 0) is divisible by both 3 and 11.

From option (1),
Taking the numbers 8 and 5,
Number = 476850
Sum of digits = 4 + 7 + 6 + 8 + 5 + 0
= 30

30, which is divisible by 3.
By divisibility rule of 11,
Sum of digits at odd places
= 4 + 6 + 5 = 15
Sum of digits at even places = 7 + 8 + 0 = 15
Difference of two digits = 15 –15 = 0
Hence, it is also divisible by 11.
The digits at hundreds and tens place are 8 and 5 respectively.

230. (D) Three digit number = $100x + 10y + z$
If the last two places are interchanged,
Then new number = $100x + 10z + y$
According to the question,
$100x + 10y + z = 100x + 10z + y - 45$
$9y - 9z = -45z - y = 5$
Difference of last digits = 5

231. (D) Let the tens digit = x

Units digit = $x + 2$

Two digit number = $10x + x + 2$
= $11x + 2$ ...(i)

Again according to the question,

$$(11x + 2)(x + x + 2) = 144$$
$$(11x + 2)(2x + 2) = 144$$
$$(11x + 2)(x + 1) = 72$$
$$11x^2 + 2x + 11x + 2 = 72$$
$$11x^2 + 13x - 70 = 0$$
$$11x^2 - 22x + 35x - 70 = 0$$
$$11x(x - 2) + 35(x - 2) = 0$$
$$(x - 2)(11x + 35) = 0$$
$$x = 2, -\frac{35}{11}$$
$$x = -\frac{35}{11}$$

This is not valid.

Number = $11x + 2$
= 11 × 2 + 2 = 24

232. (A) Let the number be n.

1, 2, ... 20

Sum of numbers

$= \frac{n \times (n+1)}{2}$

$= \frac{20 \times 21}{2}$

= 210

= 215

The numbers added twice

= 215 – 210 = 5

Hence, the number is 5.

233. (B) Sum of natural numbers from 1 to 12

= 1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10 + 11 + 12 = 78

The numbers added twice
= 80 – 78
= 2

234. (D) Sum of natural numbers from 1 to 20

$= \frac{20 \times 21}{2} = 210$

$\left[\text{Formual } \frac{n \times (n+1)}{2}\right]$

Required difference = 210 – 190
= 20

235. (C) Here, $abc = 100a + 10b + c$
$bca = 100b + 10c + a$
$cab = 100c + 10a + b$

∴ $abc + bca + cab$
= $(100a + 10b + c)$
+ $(100b + 10c + a)$ +
$(100c + 10a + b)$
= $111a + 111b + 111c$
= $111(a + b + c)$

∴ $(a + b + c)$, 37 and 3 can be divide by 111 $(a + b + c)$

But, 31 doesn't divide these.

236. (B) Given,

25 students have 2, 4, 6......50 toffees respectively.

∴ Total sum of toffees

$= \frac{n}{2}[2a + (n-1)d]$

$= \frac{25}{2}[2 \times 2 + (25-1)2]$

$= \frac{25}{2}[4 + 48]$

= 25 × 26

The total number of toffees can be divisible by 5 and 13

237. (B) When a positive integer is divided by d, the remainder is 15.
When ten times the same number is divided by d, the remainder is 6.
10 times of 15 = 150
150 – 6 = 144
Remainder = 6
144 is exactly divisible by 16.
Hence, option (B) is correct.

238. (B) Prime numbers
= 13, 17, 31, 37, 71, 73, 79, 97
Sum of these numbers
= [13 + 17 + 31 + 37 + 71 + 73 + 79 + 97]
= 418

239. (B)

$p < q < r < s$
$pqr = 385$ and $qrs = 1001$
∴ LCM = qr

```
385) 1001 (2
    – 770
     231) 385 (1
         – 231
          154) 231 (1
              – 154
                 77) 154 (2
                    – 154
                        ×
```

∴ $qr = 77$
∴ $qrs = 1001$

∴ $s = \frac{qrs}{qr} = \frac{1001}{77} = 13$

240. (B) Let the distance between 2 trees = X units
Then, the distance covered to reach 13th tree = $12x$ units
Time taken to cover x units = 20/12 = 1.67 sec
Remaining distance to be covered = $36x - 12x = 24x$ units
Time taken to cover $24x$ units = 24 × 1.67 = 40 sec
$= \frac{(37-13) \times 20}{12} = 40$ sec

241. (D) $100000x + 10000y + 1000z + 100x + 10y + z$
$= 100100x + 10010y + 1001z$
$= 1001(100x + 10y + z)$
∵ 1001 is a factor,
Therefore, the number will be divisible by 1001.

7 × 11 × 13 = 1001

❑❑

Challenge Corner

1. (A) $P(n) = 2 \times 4^{2n+1} + 3^{3n+1}$

$= 2 \times 2^{2(2n+1)} + 3^{3n+1}$

$= 2^{4n+3} + 3^{3n+1}$

$P(1) = (2)^{4+3} + (3)^{3+1}$

$= (2)^7 + (3)^4$

$= 128 + 81$

$= 209$

which is divisible by 11.

2. (D) from option (D)

statement (iv)

$\frac{555555}{7} = 79{,}365$

$\frac{555555}{11} = 50{,}505$

$\frac{555555}{13} = 42{,}735$

Hence, statement (IV) is absolutely correct.

3. (B) Let n be such a number in set S which is defined according to the question *i.e.*, when n is divided by 2, 3, 4, 5, 6 leaves the remainders 1, 2, 3, 4 and 5 respectively.

So, the number $(n + 1)$ will also divisible by 2, 3, 4, 5 and 6, whose value will be in the form of LCM $60x$ of 2, 3, 4, 5 and 6 and value of n will be in the form of $(60x - 1)$, where x is a natural number.

Since, 59 is the only number between 0 and 100 which represents the above condition true.

So, the option (B) will be correct.

4. (A)

11	x	
7	$y \to 3$	(Remainder)
5	$z \to 2$	(Remainder)
	$1 \to 1$	(Remainder)

So, $z = 5 \times 1 + 1 = 6$

$y = 7z + 2$

$= 7 \times 6 + 2 = 44$

$x = 11y + 3$

$= 11 \times 44 + 3 = 487$

Again,

5	487	
7	$97 \to 2$	(Remainder)
11	$13 \to 6$	(Remainder)
	$1 \to 2$	(Remainder)

So, received the remainder of second student = 2, 6, 2

Again,

7	487	
5	$69 \to 4$	(Remainder)
11	$13 \to 4$	(Remainder)
	$1 \to 2$	(Remainder)

So, received the remainder of third student = 4, 4, 2

5. (C) $= \frac{(127^{97} + 97^{97})}{32}$

$= \frac{(128 - 1)^{97} + (96 + 1)^{97}}{32}$

Required remainder $= -1 + 1 = 0$

6. (A) Let, $x = k + 4$ is divisible by 7

and $y = k + 2n$ is divisible by 7

$\Rightarrow y - x = 2n - 4$ will also be divisible by 7

$\Rightarrow (2n - 4)$ will be equal to zero or in multiple of 7

So, for the minimum possible value of n,

$2n - 4 = 14$

or $n = 9$

7. (B) $500 = 5 \times 5 \times 5 \times 2 \times 2$

If $(a + b)^{a+b}$ is divisible by 500 then $(a + b)$ should be divisible by 10

Minimum possible value of $(a + b) = 10$

So, minimum possible value of ab

$= 9 \times 1 = 9$

8. (D) For $n = 1$, $S = \frac{2}{3}$

For $n = 2$, $S = \frac{20}{27}$

For $n = 3$, $S = \frac{1640}{2187}$

All the given options are different from the above number.

So, option (D) is correct.

9. (D) Let three digit number $= abc$

2 digit number ab is divisible by 9.

Then 2 digit number ab

= 18, 27, 36, 45, 54, 63, 72, 81, 90, 99

And 2 digit number ac is divisible by 13

Then 2 digit number ac

= 13, 26, 39, 65, 78, 91.

Again, 2 digit number bc is divisible by 7.

Then 2 digit number bc

= 28, 35, 42, 49, 91

Rearranging the 3 digit number abc

= 183 ×
276 ×
369 ×
542 ✓
635 ✓
728 ✓
901 ×
991 ✓

(a, b and c are not all distinct)

The product of 3 digit number abc

$= 6 \times 3 \times 5 = 90$

$= 7 \times 2 \times 8 = 112$

10. (A) Let the numbers be the form $10x + y$

According to question,

$10x + y = x + y + xy$

$9x = xy$

$\therefore \quad y = 9$

The numbers are 19, 29, 39, 49, 59, 69, 79, 89 and 99 total to 9 numbers

Hence, the required fraction $= \frac{9}{91}$

$= 0.099 = 0.1$

11. (A) Let $N = xyz$ be a digit a number

Then N can be expressed as

$N = 100x + 10y + z$

And is reverse of x

$M = 100z + 10y + x$

$M - N = 100z + 10y + x$
$\quad - 100x - 10y - z$

$= 99z - 99x$

$= 99(z - x)$

As, M – N is divided by 7, and 99

$\therefore \quad (z - x) = 7$

Also x cannot be zero

$x = 1, 2$ and $z = 8, 9$

$M - N = 99 \times 7 = 693$

Smallest value of N can be 108

Largest value of N can be 299

Corresponding value of M are

$108 + 693 = 801$

And $299 + 693 = 992$

Thus $106 < N < 305$ will be correct option.

12. (C) If k and p are integers divisible by 5

Let, $k = 15$ and 20

Then each one of k and p is divisible by 5.

But $(k + p)$ is not divisible by 10.

$\because (k + p)$ is divisible by 10 is not true.

13. (A) Let, some suitable values for example

$a = 1, b = 3$ and $c = 2$

Now substitute in the options and check

Option (A)

abc^2 is odd

$= 1 \times 3 \times 2^2$

$= 1 \times 3 \times 4$

$= 12$ (even) (wrong)

Option (B)

$(a - b)^2 c$ is even

$= (1 - 3)^2 \times 2$

$= 4 \times 2$

$= 8$ (even) (correct)

Option (C)

$(a - b)(b + c)(a + b - c)$ is odd

$= (1 - 3)(3 + 2)(1 + 3 - 2)$
$= -2 \times 5 \times 2$
$= -20$ (even) (correct)

Option (D)
$(a + b - c)(a + b)$ is even
$= (1 + 3 - 2)(1 + 3)$
$= 2 \times 4$
$= 8$ even (correct)

Hence, option (A) is false.

14. (B) Since all the factorials except 1! Is even number hence required summation must be odd.

15. (D) A. $(a \times a) - 3a - \sqrt{4a^2} = -6$

$a^2 - 3a - 2a + 6 = 0$
$a^2 - 5a + 6 = 0$
$(a - 3)(a - 2) = 0$
$a = 3$ and 2

B. $b^2 - \sqrt{81b^2} = -4 \times 5$

$b^2 - 9b + 20 = 0$
$(b - 5)(b - 4) = 0$
$b = 5$ and 4

C. $\frac{c^2\sqrt{625c^6}}{5c^3} + (4 \times 7) = 39c$

$\frac{c^2 \times 25c^3}{5c^3} + 28 = 39c$

$5c^2 - 39c + 28 = 0$
$5c^2 - 35c - 4c + 28 = 0$
$5c(c - 7) - 4(c - 7) = 0$
$(5c - 4)(c - 7) = 0$
$c = 0.8$ and 7

D. $d^2 - (3 \times 5)d = 7 \times (-8)$
$d^2 - 15d + 56 = 0$
$(d - 8)(d - 7) = 56$
$d = 8$ and 7.

Larger roots of A, B, C and D are 3, 5, 7 and 8 respectively.
there, LCM of 3, 5, 7 and 8 $= 3 \times 5 \times 7 \times 8 = 840$

16. (D) Difference in roots in
A $= 3 - 2$
$= 1$
Difference in roots in
B $= 5 - 4$
$= 1$
Difference in roots in
C $= 7 - 0.8$
$= 6.2$
Difference in roots in
D $= 8 - 7$
$= 1$
Therefore, Only A, B and D has difference of 1.

17. (B) Possible cases of such prime number :
(1) For prime number starting from 1, there are only two valid = 13, 17
(2) Similarly for 3, 7, 9, there are 31, 37, 71, 73, 79, 97 prime No. repsectively.
So, total prime numbers are : 8
i.e., (13, 17, 31, 37, 71, 73, 79, 97)
Total sum $= [13 + 17 + 31 + 37 + 71 + 73 + 79 + 97]$
$= 418$

18. (B) Consider the four consecutive prime numbers as p, q, r and s, where
$p < q < r < s$
$pqr = 385$ and $qrs = 1001$
$\therefore$ HCF $= qr$

```
385) 1001 (2
    – 770
      231) 385 (1
          – 231
           154) 231 (1
               – 154
                  77) 154 (2
                     – 154
                        ×
```

$\therefore qr = 77$
$\therefore qrs = 1001$
$\therefore s = \frac{qrs}{qr} = \frac{1001}{77} = 13$

19. (A) N = 12345678AB
Here, N is divisible by 9.
i.e., $1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + A + B$ is divisible by 9.
$\Rightarrow \frac{36 + A + B}{9}$ $\therefore$ Remainder is 0.
(A + B) must be divided by 9 .
$\therefore$ Statement I is correct.
If A + B = 9 or 18 .
Take A = 5, then B = 4
$\Rightarrow 5 + 4 = 9$, but B is not odd.
$\therefore$ Statement II is incorrect.

20. (D) $x^{8k+3} + x^{8k+6} + x^{8k+9} + x^{8k+12}$ is divided by
$(1 + x^3)(1 + x^6)(1 + x^3)(x^1 + x^6) = 1 + x^6 + x^9 + x^3$
$= x^9 + x^6 + x^3 + 1$

Now, $\frac{x^{8k+3} + x^{8k+6} + x^{8k+9} + x^{8k+12}}{(1 + x^3 + x^6 + x^9)}$

$= \frac{x^{(8k+3)}(1 + x^3 + x^6 + x^9)}{(1 + x^3 + x^6 + x^9)} = x^{8k+3}$

Hence,
$x^{8k+3} + x^{8k+6} + x^{8k+9} + x^{8k+12}$ is divided by $(1 + x^3)(1 + x^6)$
$= x^{8k+3}$
$\therefore$ (D) is the correct option.

21. (B) Here, $d(n)$, denotes the number of positive divisors of a positive integer n
$\therefore d(5) = 2$, $d(11) = 2$
$d(55) = d(5 \times 11) = 2 \times 2 = 4$
$d(16) = (4 + 1) = 5$
$\therefore$ $d(5) = d(11)$ Ist is true.
$d(5)\, d(11) = 2 \times 2 = 4$
$\therefore$ $d(55)$ II is true
$d(5) + d(11) = 2 + 2$
$= 4\, d(16)$ ... IIIrd is false .
$\therefore$ I and II are correct .

22. (D) Given, $A_n = P_n + 1$, where P_n is the product of first n prime numbers
P_n is always an even number.
[$\because P_1 = 2$]
$\therefore A_n$ is an odd number.
$\therefore A_n + 1$ is always an even number.
$\therefore A_n + 2$ is always an odd number.
Hence, statements II and III are correct.

23. (A) I. Let $p = 4$, $q = 3$, $r = 5$
Here, p is relatively prime to q and r.
The product of $qr = 3 \times 5 = 15$
In this case also p is relatively prime to product of qr.
II. Let $p = 4$, $q = 8$ and $r = 3$
Here , product of $qr = 8 \times 3 = 24$
p divides the product of qr but cannot divide r.
Let $p = 4$, $q = 8$ and $r = 12$
Product of $qr = 96$
p divides the product of qr and also divide r.
We cannot say that p will divide r .
Hence, statement I is correct and Statement II is incorrect .

24. (C) Every prime number is of the form $(6n - 1)$ or $(6n + 1)$
but every number which is of the form $(6n - 1)$ or $(6n + 1)$
not necessarily prime .

25. (B) According to the question,
$2^m - 1 = 2^k + 2^n - 1$
$\Rightarrow 2^m = 2^k + 2^n$
By taking option (B), $m = n + 1$
$\therefore 2^{n+1} + 1 = 2^k + 2^n$
$\Rightarrow 2 . 2^n = 2^k + 2^n$
$2^n(2 - 1) = 2^k$
$2^n = 2^k$
$\therefore$ $n = k$, which is possible.

26. (A) I. $S_n = \frac{n(n+1)}{2} = 861$

$\Rightarrow n^2 + n - 861 \times 2 = 0$
$\Rightarrow (n + 42)(n - 41) = 0$
$\therefore n = 42, 41$
Hence, Statement I is correct.

II. Given, $S_n = S_{-(n+1)}$

If $S_n = m$, then we have two values of n if and only if m is positive integer.

Hence, Statement II is incorrect.

27. (A) Given numbers, 11, 111, 1111, 11111, ...

I. Here, $4m + 3$ ... (i)

On putting $m = 2$

$4 \times 2 + 3 = 11$

Again , put $m = 27$

$4m + 3 = 4 \times 27 + 3 = 108 + 3 = 111$

Hence, the given number is the form of $4m + 3$.

II. It is not true, as square of any number are of the form $4m$ or $4m + 1$.

Hence, Statement I is correct and Statement II is incorrect.

28. (C) Value of p may be 3, 7, 11, 13

$\frac{1}{3} = 0.\overline{3}$, Period = 1

Here, $p - 1 = 2$ and 1 is a factor of 2.

$\frac{1}{7} = 0.\overline{142857}$, Period = 6

Here, $p - 1 = 6$ and 6 is a factor of 6.

$\frac{1}{11} = 0.\overline{09}$, Period = 2

Here, $p - 1 = 10$ and 2 is a factor of 10.

Hence, the decimal will be a pure recurring decimal and its period will be some factor of $(p - 1)$.

29. (C) Since , D is a point of BC. As BC is rational so BD must be rational but AD need not be rational.

❑❑