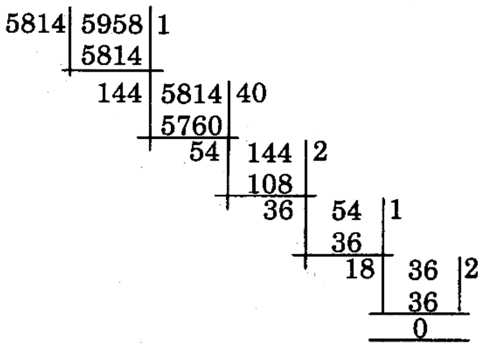
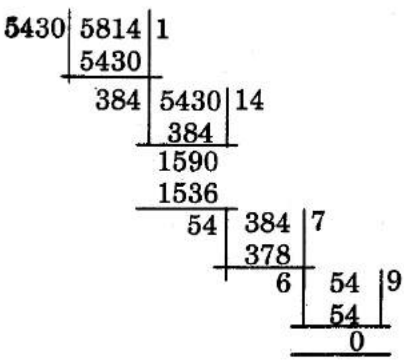
SECTION - I
Straight Objective Type

1.



18 is G.CD of 5814, 5958



G.CD of 5814, 598
= 6
12 is the largest possible value of n
Hence (b) is the correct option.

2. $\frac{x_1}{x_2} = \frac{x_2}{x_3} = \frac{x_3}{x_4} = ... = \frac{x_{15}}{x_{16}}$

If $x_1 + x_2 + x_3 + x_4 = 20,$

$x_5 + x_6 + x_7 + x_8 = 320$

$x_{13}+x_{14}+x_{15}+x_{16}=19680$

Hence (b) is the correct option.

3. Unit digit of $5^{2003}=5$

Unit digit of $\frac{1}{5^{2003}}=8$

Since

$\frac{1}{5}=0.2,\ \ \frac{1}{5^2}=0.04,$

$\frac{1}{5^3}=0.008,\ \ \frac{1}{5^4}=0.0016$

$\frac{1}{5^5}=0.00032,\ \ \frac{1}{5^6}=0.000064.......$

$2003=5\times 400+3$

Hence (b) is the correct option.

4. $S_n=1-2+3-4+5-6+7-8+............+n$ terms

$=\ \frac{n}{2}$ if n is even

$=\frac{n+1}{2}$ if n is odd

$S_{2002}\frac{2002}{2}=-1001$

$S_{2003}\frac{2003+1}{2}=-1002$

$S_{2004}\frac{2004}{2}=-1002$

$\therefore\ \ S_{2002}-S_{2003}+S_{2004}$

$=-1001-1002-1002$

$=-3005$

Hence (c) is the correct option.

5. Let $x = 121^2 - 25^n + 1900^n - (-4)^n$

by mathematical induction method $\forall n \in N\, x$ is divisible by 2000

$\Rightarrow$Remainder is zero

Hence (c) is the correct option.

6. Highest power of n that divides P!

$$= \sum_{k=1}^{\alpha}\left[\frac{P}{n^h}\right]$$

Highest power of 2003 that divides

$$2003! = \sum_{k=1}^{\alpha}\left[\frac{2003}{2003^k} = 101\right]$$

Hence **(c)** is the correct option.

7. The smallest positive integer *n* such

$\sqrt{n} - \sqrt{n-1} < 0.01$ is 2501

Hence **(c)** is the correct option.

8. $n^{200} < 5^{300}$

$$\Rightarrow \left(n^2\right)^{100} < \left(5^3\right)^{100}$$

$$\Rightarrow \left(n^2\right)^{100} < (125)^{100}$$

$$\Rightarrow n^2 < 125$$

$$\Rightarrow 125 > n^2$$

$121 = 11^2$ is nearest possible volume for n.

Hence **(d)** is the correct option.

9. Unit digit of $\left(3^{1001} \times 7^{1002} \times 13^{1003}\right)$

Unit digit of $3^{1001} = 9$

Unit digit of $7^{1002} = 3$

Unit digit of $13^{1003} = 1$

Unit digit of $13^{1001} \times 7^{1002} \times 13^{1003}$

$= \text{UD of } (9 \times 3 \times 1)$

$= \text{UD of } (27)$

$= 7$

Hence (d) is the correct option.

10. $1260x = N^3$

$\Rightarrow 1260 = 22 \times 32 \times 7 \times 5 \times x = N^3$

$\Rightarrow \quad x = 2 \times 3 \times 7^2 \times 5^2 = 7350$

Hence (d) is the correct option.

11.

$2^{13-1} \equiv 1 \pmod{13}$

$2^{12} \equiv 1 \pmod{13}$

$(2^{12})^{83} \equiv 1^4 \pmod{13}$

$2^{996} \equiv 1 \pmod{13}$

$2^4 \equiv 3 \pmod{13}$

$\Rightarrow \quad 2^{1000} \equiv 3 \pmod{13}$

Hence **(c)** is the correct option.

12. $51 + 61 + 71 + \ldots\ldots.. + 341$

$= \frac{29}{2}[51 + 34]$

$\left[s_n = \frac{n}{2}[a + l]\right]$

$= \frac{29}{2}[51 + 341]$

$= \frac{29}{2} \times 392$

$= 5684$

Hence (a) is the correct option.

13. The number of positive integral solution of

$2x+3y=763 \text{is} 128$

Hence (c) is the correct option.

14. 895

Hence (b) is the correct option.

15. !5 = 4 + 6 – 5 = 5

!12 = 11 + 13 – 12 =12

!23 = 22 + 24 - 23 = 23 then

!40 = 40

!41 = 41.......... !50 = 50

!40 + !41 + !42 +........... +!40 = 495

Hence (b) is the correct option.

16. $(a-1)^2+(\text{b}-2)^2+(\text{c}-3)^2+(\text{d}-4)^2=0$

$\Rightarrow a-1=0, b-2=0, c-3=0, d-4=0$

$\Rightarrow a=1, b=2.c=3, d=4$

$\Rightarrow a\times b\times c\times d+1$

$=1\times2\times3\times4+1=25=5^2$

Hence (c) is the correct option.

17. (29, 37)

Hence (d) is the correct option.

18. $422\times9=3798$

$\Rightarrow$ The sum of the digits of the number

$10^{422}-1=3798$

$\Rightarrow n=422$

Hence (c) is the correct option.

19. $29030=2\times3\times5\times7\times11\times13$

Hence (c) is the correct option.

20. Greater than 350

Hence (d) is the correct option.

21. $1260n = 2^2 = 32 \times 7 \times 5 \times n$ is a perfect cube

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

$\Rightarrow$ $1000 < n < 1000$

Hence (d) is the correct option.

22. $\sqrt{9-(n+2)^2} > 0$

$\Rightarrow$ $-(n+2)^2 > -9$

$(n+2)^2 < 9$

$n^2 + 4n + 4 - 9 < 0$

$n^2 + 4n - 5 < 0$

$(n+5)(n-1) < 0$

$\Rightarrow$ $-5 < n < 1$ and $n \in z$

$\Rightarrow$ $n = \{-4, -3, -2, -1, 0\}$

$\Rightarrow$ possible values for n is 5

Hence (b) is the correct option.

23. $99 | 7ab73$

$\Rightarrow 11 | 7ab73$ and $9 | 7ab73$

$(7+6+3)-(a+7) = 0$ or multiple of 11

$b - a + 3 = 0$	$17 + a + b$	= multiple of 9
$b - a = -3$	$17 + a + b = 18$	

$a + b = 1$

$-a + b = -3$

$a + b = 1$

$b = -1$

not possible

Let $17+a+b=21$

$a+b=4$

$-a+b=8$

$2b=12$

and $b-a+3$

$b-a+8$

$b=6$ and $a=-2$

Hence number of solution for (a, b) is zero.

Hence (c) is the correct option.

24. $x^n - y^n$ is divisible by $x-y$

$\forall n \in N$

$\Rightarrow$ $31|107^{90} - 76^{90}$

$\Rightarrow$ $62|107^{90} - 76^{90}$

Hence (b) is the correct option.

25. When $1^{2003} + 3^{2003} + ... + 2003^{2003}$ is divided by 2004 then the remainder is 1

Hence (b) is the correct option.

26. 18

Hence (c) is the correct option.

27. When 9999 is divided by 4, it leaves the remainder 3

$\Rightarrow$ the unit digit of 7^{9999}

= unit digit of 7^3

similarly = 3

Ten's digit of 7^{9999} = 2

Hundred's digit of 7^{9999} = 5

Hence (d) is the correct option.

28. The number of items the digit l acears in 123456 .... 979899100 is 20
Hence (c) is the correct option.

29. $n! = 1 \times 2 \times 3 \times .... \times n$ has four zero at the end
$\Rightarrow n! = 20! \text{or} 21! \text{or} 22! \text{or} 23! \text{or} 24!$
$(n+1)! = 25!$ has six zeros at the end
$\Rightarrow$ n =24
Hence (g) is the correct option.

30. Number of ordered pairs satisfying the equation
Hence (b) is the correct option.

SECTION - II
Assertion - Reason Questions

31. $17 | 5 | 17^8 - 5^8$
$\Rightarrow 12 | 17^8 - 5^8$
$\Rightarrow 3 | 17^8 - 5^8$
$13 + 2 | 13^7 + 2^7$
$\Rightarrow 15 | 13^7 - 2^7 \Rightarrow 3 | 13^7 + 2^7$
$\Rightarrow 3 | 17^8 - 5^8 + 13^7 + 2^7$
since $x - y | x^n - y^n \quad \forall n \in N$
and $x + y | x^n - y^n$ if n is odd
Hence (b) is the correct option.

32. Let X = A3640548981270644B
$99 | X \Rightarrow 9 | X$ and $11 | X$
$9 | X \quad \Rightarrow 71 + A + B$ = multiple of 9
$11 | X \quad \Rightarrow (37 + \text{A}) - (34 + \text{B})$
= either 0 or multiple of 11

71 + A + B = 81

A + B = 10

$$(37+A)-(34+B)=11$$
$$A-B+3=11$$
$$A-B=8$$

$\Rightarrow A+B=10$

$\underline{A-B=8}$

$\oplus 2\,A=18 \quad \Rightarrow A=9,\ B=1$

Statement 1 is correct

7 or 13 divideds a number which is n

The form ABC ABC

Hence Statement 2 is correct but

Statement 2 is not a correct e5cplination for Statement 1.

Hence (b) is the correct option.

33. Let

$X = 2222^{5555} + 5555^{222}$

$= 2222^{5555} + 4^{5555} - 4^{555} + 5555^{2222} - 4^{2222} + 4^{2222}$

$= 7 | 2222^{5555} + 4^{5555}$

$5555 - 4 | 5555^{2222} - 4^{2222}$ and $7 | 555|$

$\Rightarrow \ 7 | 5555^{2222} | -4^{2222}$

$-4^{5555} + 4^{2222} = -4^{2222}(4^{3333} - 1)$

$= -4^{2222}\left(\left(4^3\right)^{1111} - 1\right)$

$7 | 4^3 - 1 \Rightarrow 7 | \left(4^3\right)^{1111} - 1^{1111}$

$\Rightarrow \ 7 | -4^{2222}\left(4^{333} - 1\right)$

Hence 7 divides X

Statement 1 is correct

$x^n + y^n$ is divisible by x + y It n is odd is also true

Statement 2 is a correct explanation for
Statement 1.
Hence (a) is the correct option.

34. $5^{11-1} \equiv 1 \pmod{11}$

$3^{11-1} \equiv 1 \pmod{11}$

$\Rightarrow$ $5^{10} - 3^{10} \equiv 0 \pmod{11}$

$\Rightarrow$ $5^{10} - 3^{10}$ is divisible by 11

If P is a prime number, G. CD of $(a, \text{P}) = 1$

Them $a^{P-1} \equiv 1$ (mod P) is well known as formet theorem.

Statement 2 is a correct explanation for Statement one.

Hence (a) is the correct option

35. $3600 = 2^4 \times 3^2 \times 5^2$

The number of +ve integer ≤ 3600 that co-prime to 3600

$= 3600 \times \left[1 - \frac{1}{2}\right]\left[1 - \frac{1}{3}\right]\left[1 - \frac{1}{5}\right]$

=960

Hence (a) is the correct option.

36. The product of three consecutive integers is always divisible by 6

$n(\text{n}^2 - 1) = (\text{n} - 1)\text{n}(\text{n} + 1)$

$\Rightarrow$ $6 \mid n(\text{n}^2 - 1)$

Hence (a) is the correct option.

37. $9504 = 2^5 \times 3^3 \times 11^1$

Number of factors of

$9504 = (5+1)(3+1)(1+1)$

$= 6 \times 4 \times 2$

= 48

Hence (a) is the correct option.

38. $2160 = 2^4 \times 3^3 \times 5^1$

Sum of the factors of 2160

$$= \left[\frac{2^{4-1}-1}{2-1}\right]\left[\frac{3^{3+1}-1}{3-1}\right]\left[\frac{5^{1+1}-1}{5-1}\right]$$

$= 31 \times 40 \times 6$

$= 7440$

Hence (a) is the correct option.

39. The highest power of 7 contains in 1000!

$$= \sum_{k=1}^{\alpha}\left[\frac{1000}{7^k}\right]$$

$$= \left[\frac{1000}{7}\right] + \left[\frac{1000}{7^2}\right] + \left[\frac{1000}{7^3}\right] + \left[\frac{1000}{7^4}\right] + = 164$$

The highest power of 3 contains in 1000!

$$= \sum_{k=1}^{\alpha}\left[\frac{1000}{3^k}\right]$$

$$= \left[\frac{1000}{3}\right] + \left[\frac{1000}{3^2}\right] + \left[\frac{1000}{3^3}\right] + \left[\frac{1000}{3^4}\right]$$

$$+ \left[\frac{1000}{3^5}\right] + \left[\frac{1000}{3^6}\right] + = 498$$

Hence (b) is the correct option.

40. The number of zero at the end

$$= \sum_{k=1}^{\alpha}\left[\frac{4000}{5^k}\right]$$

$$= \left[\frac{400}{5}\right] + \left[\frac{400}{5^2}\right] + \left[\frac{400}{5^3}\right] + \left[\frac{400}{5^7}\right] + ..$$

$= 80 + 16 + 3 + 0 + \ldots\ldots\ldots\ldots$

$= 99$

Hence (a) is the correct option.

41. $2^{7-1} \equiv 1 \pmod 7$

$\Rightarrow$ $2^{6} \equiv 1 \pmod 7$

$2^{18} \equiv 4 \pmod 7$

$2^{2} \equiv 4 \pmod 7$

$\Rightarrow$ $220 \equiv 4 \pmod 7$

Hence (a) is the correct option.

42. $3^{23-1} \equiv 1 \pmod{23}$

$3^{22} \equiv 1 \pmod{23}$

$3^{3} \equiv 4 \pmod{23}$

$(3^{3})^{3} \equiv 4^{3} \pmod{23}$

$\equiv -5 \pmod{23}$

$3^{9} \equiv -5 \pmod{23}$

$3^{18} \equiv 2 \pmod{23}$

$\Rightarrow$ $3^{40} \equiv 2 \pmod{23}$

Hence (b) is the correct option.

43. $2^{3} \equiv 0 \pmod 8$

$(2^{3})^{19} \equiv 0 \pmod 8$

$2^{57} \equiv 0 \pmod{18}$

Hence (c) is the correct option.

44. The last three digit of $25^{63} \times 63^{25}$ are 3 and 7

Hence (b) is the correct option.

45. The last three digit of $25^{63} \times 63^{25}$ are 4, 7 and 5

Hence (c) is the correct option.

46. $56789 \equiv -11 \pmod{100}$

$(56789)^2 \equiv 21 \pmod{100}$

$(56789)^4 \equiv 41 \pmod{100}$

$(56789)^6 \equiv 61 \pmod{l00}$

$(56789)^{10} \equiv 1 \pmod{100}$

$(56789)^{40} \equiv 1 \pmod{100}$

$(56789)^{41} \equiv 89 \pmod{100}$

Hence (c) is the correct option.

47. When the number

$10^{10} + 10^{10^2} + \ldots\ldots + 10^{(10^{10})}$

is divisible by 7 it leaves the remainder 4

Hence (a) is the correct option.

48. $13^{73} + 14^3$ is divided by 11 it leaves the remainder 5

Hence (c) is the correct option.

49. $(2000)^{13-1} \equiv 1 \pmod{13}$

$(2000)^{12} \equiv 1 \pmod{13}$

$(2000^{12})^{83} \equiv 1 \pmod{13}$

$2000^{996} \equiv 1 \pmod{13}$

$2000 \equiv 1 \pmod{13}$

$2000^2 \equiv 11^2 \pmod{13}$

$2000^2 \equiv 4 \pmod{13}$

$2000^4 \equiv 4 \pmod{13}$

$2000^{1000} \equiv 3 \pmod{13}$

Hence (c) is the correct option.

50. $4^{4n}-5^{3n}=(256)^n-(125)^n$

$256-125|4^{4n}-5^{3n}$

$=131|4^{4n}-5^{3n}$

Hence (a) is the correct option.

51. $2^{4n}1-|$ $=\left(2^4\right)^n-1^n$

$=16^n-1^n$

$16-1|16^n-1^n \Rightarrow 15|16^n-1^n$

Hence (b) is the correct option.

52. $3^{2n}+7$ is divisible by 16

Hence (d) is the correct option.

53. $\left[\frac{1}{2}\right]+\left[\frac{1}{2}+\frac{1}{100}\right]+\text{.........}\left[\frac{1}{2}+\frac{99}{100}\right]$

$=45$

Hence (c) is the correct option.

54. The number of zeros at the end of

400! $=\sum_{k=1}^{\alpha}\left[\frac{400}{5^2}\right]+\text{........}$

$=80+16+3+0$

$=99$

Hence (b) is the correct option.

55. $\left[\frac{n+1}{2}\right]+\left[\frac{n+2}{4}\right]+\left[\frac{n+4}{8}\right]+\text{.........}$

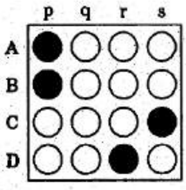
$=\left[\frac{n}{4}\right]$

Hence (c) is the correct option.

SECTION - IV

Matrix - Match Type

56.



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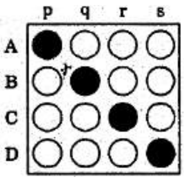

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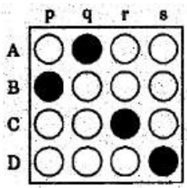

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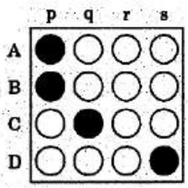

60.