Study-Knight Research Centre Himachal Pradesh

TOPIC- NUMBER SYSTEM

1. Find the remainder when 73 × 75 × 78 × 57 × 197 × 37 is divided by 34

जब 73 × 75 × 78 × 57 × 197 × 37 को 34 से विभाजित किया जाता है तो शेषफल ज्ञात कीजिए।

A. 32

B. 30

C. 15

D. 28

Answer: Option A

Solution: Remainder,

$$\frac{73 \times 75 \times 78 \times 57 \times 197 \times 37}{34}$$

$$=\frac{5\times7\times10\times23\times27\times3}{34}$$

[We have taken individual remainder, which means if 73 is divided by 34 individually, it will give remainder 5, 75 divided 34 gives remainder 7 and so on.]

$$\frac{5 \times 7 \times 10 \times 23 \times 27 \times 3}{34}$$

$$=\frac{35\times30\times23\times27}{34}$$

$$=\frac{1\times-4\times-11\times-7}{34}$$

[We have taken here negative as well as positive remainder at the same time. When 30 divided by 34 it will give either positive remainder 30 or negative remainder -4. We can use any one of negative or positive remainder at any time.]

$$\frac{1 \times -4 \times -11 \times -7}{34}$$

$$=\frac{28\times-11}{34}$$

$$=-\frac{6\times-11}{34}=\frac{66}{34}$$

R=32

Required remainder = 32

2. Find the remainder when 6799 is divided by 7.

जब 6799 को 7 से विभाजित किया जाए तो शेषफल ज्ञात कीजिए।

A. 4

B. 6

C. 1

D. 2

Answer: Option C

Solution: Remainder of$\frac{〚67〛\ ^{\wedge}99}{7}$or,

$$R=\frac{(63+4)^{\wedge}99}{7}$$

63 is divisible by 7 for any power, so required remainder will depend on the power of 4

Required remainder

$\frac{4\text{^}99}{7}$==R==4^(96+3) /7

$\frac{4\text{^}3}{7} \Rightarrow \frac{64}{7} \Rightarrow$(63+1) /7

==R⇒1

Note: $\frac{4}{7}$remainder =4

(4×4)/7 =$\frac{16}{7}$

Remainder=2

$(4 \times 4 \times 4)/7 = \frac{64}{7}$=1

(4×4×4×4)/7=$\frac{256}{7}$

Remainder=4

(4×4×4×4×4)/ 7 =2

If we check for more power we will find that the remainder start repeating themselves as 4, 2, 1, 4, 2, and 1 and so on. So when we get A number having greater power and to be divided by the other number B, we will break power in (4n + x) and the final remainder will depend on x i.e. A x B

3. Let N = 1421 × 1423 × 1425. What is the remainder when N is divided by 12?

मान लीजिए N = 1421 × 1423 × 1425. जब N को 12 से विभाजित किया जाता है तो शेषफल क्या होता है?

A. 0

B. 9

C. 3

D. 6

Answer: Option C

Solution:Remainder,

1421×1423×142512=RR⇒5×7×912

[Here, we have taken individual remainder such as 1421 divided by 12 gives remainder 5, 1423 and 1425 gives the remainder as 7 and 9 on dividing by 12.] Now, the sum is reduced to,

$\frac{5\times7\times9}{12} = \frac{35\times9}{12}$

$=-\frac{35\times9}{12}$

= Remainder ⇒ -1 × -3 = 3 [Here, we have taken negative remainder.]

So, required remainder will be 3.

Note: When,9/12 it gives positive remainder as 9 and it also give a negative remainder -3. As per our convenience,we can take any time positive or negative remainder.

4. Three numbers are in ratio 1 : 2 : 3 and HCF is 12. The numbers are:

तीन संख्याएँ 1:2:3 के अनुपात में हैं और HCF 12 है। संख्याएँ हैं:

A. 12, 24, 36

B. 11, 22, 33
C. 12, 24, 32
D. 5, 10, 15
Answer: Option A
Solution: Since, the numbers are given in the form of ratio that means their common factors have been cancelled.
Each one's common factor is HCF.
And here HCF = 12,
hence, the numbers are 12, 24 and 36.
Alternatively, Let the numbers be x, 2x and 3x.
The HCF in x, 2x and 3x is x because 1, 2, 3 are prime.
Hence,
x = 12; then the other numbers are 24 and 36.

5. What is the least number of soldiers that can be drawn up in troops of 12, 15, 18 and 20 soldiers and also in form of a solid square?
सैनिकों की न्यूनतम संख्या क्या है जिन्हें 12, 15, 18 और 20 सैनिकों की टुकड़ियों में और एक ठोस वर्ग के रूप में भी तैयार किया जा सकता है?
A. 900
B. 400
C. 1600
D. 2500
Answer: Option A
Solution: In this type of question, We need to find out the LCM of the given numbers.
LCM of 12, 15, 18 and 20;
12=2×2×3;
15=3×5;18=2×3×3;20=2×2×5;
Hence, LCM =2×2×3×5×3
Since, the soldiers are in the form of a solid square.
Hence, LCM must be a perfect square. To make the LCM a perfect square, We have to multiply it by 5,hence,
The required number of soldiers
=2×2×3×3×5×5= 900

6. Find the least number which will leaves remainder 5 when divided by 8, 12, 16 and 20.
वह न्यूनतम संख्या ज्ञात कीजिए जिसे 8, 12, 16 और 20 से विभाजित करने पर शेषफल 5 बचे।
A. 240
B. 245
C. 265
D. 235
Answer: Option B

Solution: We have to find the least number, therefore we find out the LCM of 8, 12, 16 and 20.
8 = 2 × 2 × 2;
12 = 2 × 2 × 3;
16 = 2 × 2 × 2 × 2;
20 = 2 × 2 × 5;
LCM = 2 × 2 × 2 × 2 × 3 × 5 = 240;
This is the least number which is exactly divisible by 8, 12, 16 and 20
Thus,
Required number which leaves remainder 5 is,
240 + 5 = 245

7.76n- 66n, where n is an integer >0, is divisible by
76n- 66n, जहां n एक पूर्णांक >0 है, से विभाज्य है

A. 13
B. 127
C. 559
D. All of these
Answer: Option D
Solution: $7^{6n}-6^{6n}$
$= 7^6-6^6$
$= (7^3)^2-(6^3)^2$
$= (7^3-6^3)(7^3+6^3)$
$= (343-216) \times (343+216)$
$=127\times559$
$=127\times13\times43$
Clearly, it is divisible by 127, 13 as well as 559

8. After the division of a number successively by 3, 4 and 7, the remainder obtained is 2, 1 and 4 respectively. What will be remainder if 84 divide the same number?
किसी संख्या को क्रमिक रूप से 3, 4 तथा 7 से भाग देने पर शेषफल क्रमशः 2, 1 तथा 4 प्राप्त होता है। यदि उसी संख्या को 84 से विभाजित किया जाए तो शेषफल क्या होगा?

A.80
B.75
C.42
D.53
Answer: Option D
Solution: As the Number gives a remainder of 4 when it is divided by 7, then the number must be in form of (7x + 4)
The same gives remainder 1 when it is divided 4, so the number must be in the form of {4 × (7x + 4) + 1}

Also, the number when divided by 3 gives remainder 2, thus number must be in form of [3 × {4 × (7x + 4) + 1} + 2]
Now, On simplifying,
[3 × {4 × (7x + 4) + 1} + 2]
= 84x + 53
We get the final number 53 more than a multiple of 84 Hence, if the number is divided by 84,
The remainder will be 53

9. Find the remainder when 2256 is divided by 17.

2256 को 17 से विभाजित किया जाए तो शेषफल ज्ञात कीजिए।

A. 1
B. 16
C. 14
D. None of these
Answer: Option A
Solution: Given, 2^256/17
We can write it as : $(2^4)^{64}$

$$\frac{16^{64}}{17}$$

Individually, when 16 is divided by 17, gives a negative reminder of - 1.
Required Remainder, (−1)64 =1
Alternatively, 16^64/17, can be written as $\frac{(16\times16\times16\times16\times16\ldots\ldots64times)}{17}$
Now, we take the negative remainder of each ,16 divided by 17 gives negative remainder -1.So,the Remainder will be(−1×−1×−1×−1×−1.....64times)
=1

10. Find the remainder when 496 is divided by 6.

जब 496 को 6 से विभाजित किया जाए तो शेषफल ज्ञात कीजिए।

A.0
B.2
C.3
D.4
Answer: Option D
Solution: 4^96/6,
we can write it in this form
(6−2)^96/6
Now, Remainder will depend only the powers of -2. So,
(−2)^96/6,
it is same as ([−2]^4)^24/6, it is same as
(16)^24/6
Now,

(16×16×16×16.....24times)/ 6

On dividing individually 16 we always get a remainder 4.

$$\frac{(4 \times 4 \times 4 \times 4 \ldots\ldots 24times)}{6}$$

Hence, Required Remainder = 4

11. What is the sum of all two digit numbers that gives a remainder of 3 when they are divided by 7?

उन सभी दो अंकों की संख्याओं का योग क्या है जिन्हें 7 से विभाजित करने पर 3 शेष बचता है?

A. 666

B. 676

C. 683

D. 777

Answer: Option B

Solution: The two digit number which gives a remainder of 3 when divided by 7 are:

10, 17, 24..... 94.

Now, these number are in AP series with

1st Term, a = 10;

Number of Terms, n = 13;

Last term,

L = 94 and

Common Difference, d = 7.

Sum, = {n×a+L/2}

=13×52=676

12. The remainder, when (1523 + 2323) is divided by 19, is

जब (15^{23} +23^{23}) को 19 से विभाजित किया जाता है, तो शेषफल होता है

A. 4

B. 15

C. 0

D. 18

Answer: 0

Solution: NOTE: a^n + b^n is always divisible by (a + b) when n is odd.

So, (15^{23}+23^{23}) always divisible by 38.

And 38 is a multiple of 19, so, the number which is divisible by 38, is divisible by 19 too.

(15^{23}+23^{23}) is divisible by 19.

So, $(15^{23} + 23^{23})$ /19== Remainder $\Rightarrow \frac{15+23}{19}$== Remainder $\Rightarrow \frac{38}{19}$== Remainder $\Rightarrow 0$

13. A heap of pebbles when made up into group of 32, 40, 72, leaves the remainder 10, 18 and 50 respectively. Find least number of pebbles in the heaps.

कंकड़ों के एक ढेर को जब 32, 40, 72 के समूह में बनाया जाता है, तो शेषफल क्रमशः 10, 18 और 50 बचता है। ढेर में कम से कम कंकड़ ढूँढ़ें।

A. 1440
B. 1420
C. 1418
D. 1422
Answer: Option C
Solution: In this type of problem we find the difference of divisors and their remainders.
Here difference,
32 - 10 = 22
40 - 18 = 22
72 - 50 = 22
Here, in each case difference is same i.e. 22
Then required number of pebbles is given by
[(LCM of 32, 40, 72) -22]
32 = 2 × 2 × 2 × 2 × 2
40 = 2 × 2 × 2 × 5
72 = 2 × 2 × 2 × 3 × 3
Hence,
LCM = 2 × 2 × 2 × 2 × 2 × 3 × 3 × 5 = 1440
Thus,
Required number of pebbles,
= 1440 - 22
= 1418

14. The sum of two numbers is 684 and their HCF is 57. Find all possible pairs of such numbers.

दो संख्याओं का योग 684 है और उनका HCF 57 है। ऐसी संख्याओं के सभी संभावित जोड़े ज्ञात कीजिए।

A. (57, 627) (285, 399)
B. (37, 575) (270, 390)
C. (45, 495) (30, 330)
D. (45, 575) (280, 890)
Answer: Option A
Solution: Since, HCF of two numbers = 57
Hence, numbers are multiples of 57
Let, the numbers be 57x and 57y, where x and y are prime to each other.
According to the sum,
57x + 57y = 684
Or, x + y = 12
Hence, required possible pair of values of x and y which are prime to each other are (1, 11) and (5, 7).
Thus, required pairs of numbers are,

{57 × 1 = 57 and 57 × 11 = 627}
{57 × 5 = 285 and 57 × 7 = 399}

15. Two numbers are in the ratio 3: 4. If their LCM is 240, the smaller of two number is
दो संख्याएं 3:4 के अनुपात में हैं। यदि उनका एलसीएम 240 है, तो दो संख्याओं में से छोटी संख्या कौन सी है?

A.100
B.80
C.60
D.50

Answer: Option C
Solution: Let, these two numbers be 3x and 4x then their LCM = 12x
Now, according to question,
12x = 240
Or, x = 20
Thus, the numbers are (3x = 3 × 20) = 60 and (4x = 4 × 20) = 80
Then smaller in this two is 60

16. The HCF of two numbers, each having three digits, is 17 and their LCM is 714. The sum of the numbers will be:
तीन अंकों वाली दो संख्याओं का HCF 17 है और उनका LCM 714 है। संख्याओं का योग होगा:

A. 289
B. 391
C. 221
D. 731

Answer: Option C
Solution: Let the numbers be 17x and 17y where x and y are co-prime.
LCM = 17xy
Now, 17xy = 714
Or, xy = 42 = 6 × 7
→x = 6 and y = 7
Or, x = 7 and y = 6
1st number = 17 × 6 = 102
2nd number = 17 × 7 = 119
Sum = 102 + 119 = 221

17. The greatest number, which when subtracted from 5834, gives a number exactly divisible by each of 20, 28, 32, 35 is.
वह सबसे बड़ी संख्या है, जिसे 5834 में से घटाने पर 20, 28, 32, 35 में से प्रत्येक से पूर्णतः विभाज्य संख्या प्राप्त होती है।

A. 1120
B. 4714
C. 5200

D. 5600
Answer: Option B
Solution: LCM of 20, 28, 32, 35 will be the greatest number which is divisible by these numbers.
Firstly, we find LCM of 20, 28, 32, and 35
20 = 2 × 2 × 5
28 = 2 × 2 × 7
32 = 2 × 2 × 2 × 2 × 2
35 = 5 × 7
LCM = 2 × 2 × 2 × 2 × 2 × 5 × 7 = 1120
Required greatest number which subtract from 5834 are divide by 20, 28, 32 and 35
= 5834 - 1120
= 4714

18. Which among $2\frac{1}{2}$, $3\frac{1}{3}$, $4\frac{1}{4}$, $6\frac{1}{6}$ and$12\frac{1}{12}$ is largest?
इनमें से कौन सा सबसे बड़ा है?
A. $2\frac{1}{2}$
B. $3\frac{1}{3}$
C. $4\frac{1}{4}$
D. $12\frac{1}{12}$
Answer: Option B
Solution: LCM in power 2, 3, 4, 6, 12 is 12
We multiplied the LCM to the power of the numbers.
$2^{\frac{1\times12}{2}}$, $3^{\frac{1\times12}{3}}$, $4^{\frac{1\times12}{4}}$, $6^{\frac{1\times12}{6}}$and$12^{\frac{1\times12}{12}}$
We get,
= 2^6, 3^4, 4^3, 6^2, 12
= 64, 84, 64, 36, 12
Hence, greatest number would be
$3\frac{1}{3}$

19. LCM of two numbers is 936. If their HCF is 4 and one of the numbers is 72, the other is
दो संख्याओं का एलसीएम 936 है। यदि उनका एचसीएफ 4 है और एक संख्या 72 है, तो दूसरी संख्या है
A. 42
B. 52
C. 62
D. None of these
Answer: Option B
Solution : Let two numbers be N1 and N2.

Now, we have
HCF of the numbers × LCM of the numbers = Multiplication of the numbers.
936 × 4 = 72 × N1
Or, N1 = $\frac{936\times4}{72}$
Or, N1 = 52

20. The rightmost non-zero digit of the number 30^{2720} is
संख्या का सबसे दाहिना गैर-शून्य अंक 30^{2720} है

A.1
B.3
C.7
D.9

Answer: Option A
Solution: (30) ^2720, we can write it as [(30)^4] ^680
Or, [(10 × 3) ^4]^680
The right most non-zero digit depends on the unit digit of [(3)^4]^680
Unit digit of [(3)^4]680,
Or, (81)680
The unit digit of 81 is 1 so any power of 81 will always give its unit digit as 1
Thus, required unit digit is 1

21. When we reverse the digits of the number 13, the increases by 18. How many other two digit numbers increases by 18 when their digits are reversed?
जब हम संख्या 13 के अंकों को उलट देते हैं, तो संख्या में 18 की वृद्धि हो जाती है। अन्य कितनी दो अंकों वाली संख्याओं के अंकों को उलटने पर 18 की वृद्धि हो जाती है?

A. 5
B. 6
C. 7
D. 8

Answer: Option B
Solution: Let the numbers are in the form of (10x + y), so when the digits of the number are reversed the number becomes (10y + x)
According to question,
(10y + x) - (10x + y) = 18
Or, 9(y - x) = 18
→ y - x = 2
So, the possible pairs of (x, y) are (1, 3), (2, 4), (3, 5), (4, 6), (5, 7), (6, 8) and (7, 9)
But, we need the number other than 13.
Thus, there are 6 possible numbers i.e. 24, 35, 46, 57, 68, 79
So, total numbers of possible numbers are 6

22. The sum of four consecutive two-digit odd numbers, when divided by 10, become a perfect square. Which of the following can possibly be one of these four numbers?
चार लगातार दो अंकों की विषम संख्याओं का योग, जब 10 से विभाजित किया जाता है, तो एक पूर्ण वर्ग बन जाता है। निम्नलिखित में से कौन सा संभवतः इन चार संख्याओं में से एक हो सकता है?
A. 21
B. 25
C. 41
D. 67
Answer: Option C
Solution: Using options,
We find that four consecutive odd numbers are 37, 39, 41 and 43
The sum of these 4 numbers is 160, when divided by 10 we get 16 which is a perfect square.
Thus, 41 is one of the odd numbers
23. Consider four digit numbers for which the first two digits are equal and the last two digits are also equal. How many such numbers are perfect squares?
चार अंकीय संख्याओं पर विचार करें जिनके पहले दो अंक बराबर हों और अंतिम दो अंक भी बराबर हों। ऐसी कितनी संख्याएँ पूर्ण वर्ग हैं?
A.2
B.4
C.0
D.1
Answer: Option D
Solution: Any four digit number in which first two digits are equal and last two digits are also equal will be in the form 11 × (11a + b) i.e. it will be the multiple of 11 like 1122, 3366, 2244, ...
Now, let the required number be aabb.
Since aabb is a perfect square, the only pair of a and b that satisfy the above mentioned condition is a = 7 and b = 4
Hence, 7744 is a perfect square
24. In a 4-digit number, the sum of the first two digits is equal to that of last two digits. The sum of the first and last digits is equal to third digit. Finally, the sum of the second and fourth digits is twice the sum of the other two digits. What is the third digit of the number?
4 अंकों की संख्या में पहले दो अंकों का योग अंतिम दो अंकों के योग के बराबर होता है। पहले और अंतिम अंक का योग तीसरे अंक के बराबर है। अंततः, दूसरे और चौथे अंक का योग अन्य दो अंकों के योग का दोगुना है। संख्या का तीसरा अंक क्या है?
A.5
B.8

C.1
D.4
Answer: Option A
Solution: Let the 1st, 2nd, 3rd and 4th digits be a, b, c and d respectively.
Then,
a + b = c + d ---------- (i)
a + d = c ---------- (ii)
b + d = 2(a + c) ---------- (iii)
From eqn. (i) and (ii),
a + b = a + 2d
→b = 2d
And eqn (iii);
2d + d = 2(a + a + d)
→ 3d = 2(2a + d) → d = 4a
Or, a =d/4;
→ Now, from eqn. (ii),
a + d =d/4+ d =5d/4= c
Or, c =5/4d
The value of d can be either 4 or 8.
If d = 4, then c = 5
If d = 8, then c = 10
But the value of c should be less than 10
Hence, value of c would be 5

25. Two alarm clocks ring their alarms at regular intervals of 50 seconds and 48 seconds. If they first beep together at 12 noon, at what time will they beep again for first time?
दो अलार्म घड़ियाँ 50 सेकंड और 48 सेकंड के नियमित अंतराल पर अपना अलार्म बजाती हैं। यदि वे पहली बार दोपहर 12 बजे एक साथ बीप करेंगे, तो किस समय वे पहली बार फिर से बीप करेंगे?
A. 12:10 PM
B. 12:12 PM
C. 12:11 PM
D. None of these
Answer: Option D
Solution:They will ring together after,
LCM of 48 and 50 secs.
48 = 2 × 2 × 2 × 2 × 3;
50 = 2 × 5 × 5
LCM = 2 × 2 × 2 × 2 × 3 × 5 × 5 = 1200 secs
= 20 min.
They will beep together at 12:20

26. On a road three consecutive traffic lights change after 36, 42 and 72 seconds respectively. If the lights are first switched on at 9:00 AM sharp, at what time will they change simultaneously?

एक सड़क पर लगातार तीन ट्रैफिक लाइटें क्रमशः 36, 42 और 72 सेकंड के बाद बदल जाती हैं। यदि लाइटें पहली बार सुबह ठीक 9:00 बजे चालू की जाती हैं, तो वे एक साथ किस समय बदलेंगी?

A. 9:08:04
B. 9:08:24
C. 9:08:44
D. None of these
Answer: Option B
Solution:LCM of 36, 42 and 72,
36 = 2 × 2 × 3 × 3
42 = 2 × 3 × 7
72 = 2 × 2 × 2 × 3 × 3
LCM = 2 ×2 × 2 × 3 × 3 × 7 = 504 seconds.
LCM of 36, 42 and 72 is 504
Hence, the lights will change simultaneously after 8 minutes and 24 seconds.

27. The HCF of 2472, 1284 and a third number 'N' is 12. If their LCM is 23 × 32 × 5 × 103 × 107, then the number 'N' is:

2472, 1284 और तीसरी संख्या 'N' का HCF 12 है। यदि उनका LCM 23 × 32 × 5 × 103 × 107 है, तो संख्या 'N' है:

A. 22 × 32 × 7
B. 22 × 33 × 10
C. 22 × 32 × 5
D. None of these
Answer: Option D
Solution: We have,
HCF of the numbers × LCM of the numbers = Multiplication of the numbers.
(12) × (2^3 × 3^2 × 5 × 103 × 107) = 2472 × 1284 × N
Hence,
$N = \{(\frac{12)\times(23\times32\times5\times103\times107}{2472\times1284})\}$
Or, N = 3 × 5

28. Find the LCM and HCF of 2.5, 0.5 and 0.175

2.5, 0.5 और 0.175 का एलसीएम और एचसीएफ ज्ञात करें।

A. 2.5
B. 5
C. 7.5
D. 17.5

Answer: Option D

Solution: $2.5=\frac{25}{10}$

$0.5=\frac{5}{10}$,

$0.175=\frac{175}{1000}$

Now, LCM of two or more fractions is given by:

LCM of Numerators/ HCF of Denominators Thus,

LCM of 25, 5,175/ HCF of 10,10,1000

=175/10=17.5

29. Find the HCF of (3125-1) and (335-1).

(3125-1) और (335-1) का एचसीएफ ज्ञात कीजिए।

A. 3^4 - 1

B. 3^5 - 1

C. 3^12 - 1

D. None of these

Answer: Option B

Solution :The solution of this question is based on the rule,

The HCF of (a^m - 1) and (a^n - 1) is given by (aHCF of m, n - 1)

Thus for this question the answer is (35 - 1)

Since, 5 is the HCF of 35 and 125

30. The last digit of the number obtained by multiplying the numbers 81 × 82 × 83 × 84 × 86 × 87 × 88 × 89 will be

संख्याओं को 81 × 82 × 83 × 84 × 86 × 87 × 88 × 89 से गुणा करने पर प्राप्त संख्या का अंतिम अंक होगा

A.0

B.6

C.7

D.2

Answer: Option B

Solution : The last digit of multiplication depends on the unit digit of (81 × 82 × 83 × 84 × 86 × 87 × 88 × 89) which is given by the remainder obtained on dividing it by 10.

($\frac{81\times82\times83\times84\times86\times87\times88\times89}{10}$) We take individual remainder of each digit ,$\frac{(1\times2\times3\times4\times6\times7\times8\times9)}{10}$Numbers multiplied,($\frac{24\times42\times72}{10}$) Individual Remainder has been taken, ($\frac{4\times2\times2}{10}$) Or,($\frac{16}{10}$) Or,6 Remainder=6

So, the last digit will be 6