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Aptitude Test

Number System :→

1. Perfect number → sum of all the factors = number
2. Pairs of co-primes → numbers whose highest common factor is 1.

   For ex :→ (2,3), (8,9)
   HCF ⇒ 1   HCF = 1

3. Rational numbers :→ $\frac{p}{q}$ form, $q \neq 0$.

4. Irrational numbers :→ non-terminating decimal form.

   For ex :→ $\sqrt{2}, \sqrt{3}, \sqrt{5}, \sqrt{11}$

5. Condition for prime numbers :→ $n^2 \geq P$
   find smallest n.

   now check if p is divisible by any of the prime numbers which are $\leq n$.

6. Divisibility rules :→

   4 → last two digits divisible by 4.
   8 → last three digits divisible by 8.
   11 → (odd place digits) − (even place digits)

   (odd place digits) → sum kro odd ka
   (even place digits) → sum kro even ka

   if diff = 0 or 11 or divisible by 11 then original no is divisible by 11.

   25 → last 2 digits → 00 or 25 or divisible by 25 then original no is divisible by 25.

Some facts

1. $(x^n - a^n)$ divisible by $(x-a)$ $\forall$ n
2. $(x^n - a^n)$ divisible by $(x+a)$ $\forall$ even values of n
3. $(x^n + a^n)$ divisible by $(x+a)$ $\forall$ odd values of n.

// dividend = (divisor × Quotient) + Remainder.

Number System Questions :-

Q1. Check if this number is a prime number or not

1. 173   2. 437

Condition :- $n^2 \geq P$

1. $13^2 = 169$

$169 \ngeq 173$

So, $n = 14$

Prime numbers less than or = 14

2, 3, 5, 7, 11, 13

now check if P is divisible by any of the above prime numbers

So, it is not divisible by any of the PN.

So, 173 is prime number.

2. 437

$20^2 = 400$

$400 \ngeq 437$

$n = 21$

Prime number $\leq n \Rightarrow$ 2, 3, 5, 7, 11, 13, 17, 19

So, 437 is not a prime no.

Q2. If 197X5462 is divisible by 9. Find least value of X.

⇒ Divisiblity rule of 9 ⇒ Sum of all numbers should be divisible by 9.

~~197X5462~~

$1+9+7+x+5+4+6+2 \Rightarrow (34+x)$

now think of Least x.

here it will be 2

36 will be divisible by 9.

Q3. If M39048458N is divisibile by 8 & 11. Then find the value of M & N.

⇒ Divisibility rule of 8 → last 3 digits should be divisible by 8.

So, here 58N should be divisible by 8.

So, N should by 4

Divisibility rule of 11 → (sum of odd place digits) − (sum of even place digits)

0 or 11 or divisible by 11

$(3+0+8+5+N) - (M+9+4+4+8)$

$(3+0+8+5+4) - (M+9+4+4+8)$

$20 - (25+M)$

$20-25-M$

$-5-M$ or $-(5+M)$ → it should be 0 or divisible by 11

so to make it 11, M should be 6

$M=6$ & $N=4$.

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Q4. If 7^{126} is divided by 48, find the remainder.

Using the fact :→

$(x^n - a^n)$ is divisible by $(x-a)$ $\forall n$

$\Rightarrow 7^{126} = (7^2)^{63} \rightarrow \underset{\downarrow x}{(49)}^{63 \rightarrow n}$, $a = 1$

$\Rightarrow ((49)^{63} - 1)$ is divisible by $\underset{\downarrow 48}{(49-1)}$

So, remainder will be 1.

Q5. Find the remainder when $(257^{166} - 243^{166})$ is divided by 500.

Using the fact :→

$(x^n - a^n)$ is divisible by $(x+a)$ $\forall$ even values of n.

$x = 257$

$a = 243$, $x + a = 257 + 243 = 500.$

$n = 166$

So, $(257^{166} - 243^{166})$ is divisible by 500.

So, remainder will be 0.

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Q6. Let n be natural no. such that $\frac{1}{2}+\frac{1}{3}+\frac{1}{7}+\frac{1}{n}$ is also natural number. (which of them is not true)

a) 2 divides n b) 3 divides n c) 7 divides n d) $n > 84$

→ Basically we have to find value of n.

$$\frac{1}{2}+\frac{1}{3}+\frac{1}{7}+\frac{1}{n} = \frac{41}{42}+\frac{1}{n}$$

So, for this no to be natural no.

n should be 42

So, $\boxed{n = 42}$

So, a) 2 divides 42 ✓
b) 3 divides 42 ✓
c) 7 divides 42 ✓
d) 42 > 84 ✗

So, answer is d)

Q7. The smallest value of natural no 'n' for which $2n+1$ is not a prime number.

So, $n = 1 \rightarrow 2(1)+1 \Rightarrow 3$
$n = 2 \rightarrow 2(2)+1 \Rightarrow 5$
$n = 3 \rightarrow 2(3)+1 \Rightarrow 7$
$n = 4 \rightarrow 2(4)+1 \Rightarrow 9$

So, n is 4 ✓

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Q8. A number divided by 6 leaves remainder 3. When the square of the same number is divided by 6, find remainder.

⇒ Dividend = (divisor × Quotient) + Remainder.

divisor = 6

Remainder = 3

Let Quotient = K.

So, number = 6 × K + 3 = 6K + 3

$(6K+3)^2 = 36K^2 + 36K + 9$

$\Rightarrow 36K^2 + 36K + 6 + 3$

$\Rightarrow 6(6K^2 + 6K + 1) + 3$

$\boxed{\text{remainder} = 3}$

Q9. $1! + 2! + 3! + \ldots\ldots 100!$. When divided by 5, remainder = ?

$\underbrace{5!, 6!, 7!, \ldots\ldots 100!}$

these all are perfectly divisible by 5.

Let's talk about factorials before these.

$1! + 2! + 3! + 4!$

$\Rightarrow 1 + 2 + 6 + 24$

$\Rightarrow 33$

~~33/6~~ 33 divided by 5 ⇒ 3

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Q10 When a certain no. is multiplied by 18, product consists of entirely of 2's. What is the minimum number of 2's in the product.

$$
\begin{array}{r}
12345679 \\
18 \,\big)\, 222222222 \\
\underline{18} \\
42 \\
\underline{36} \\
62 \\
\underline{54} \\
82 \\
\underline{72} \\
102 \\
\underline{90} \\
122 \\
\underline{108} \\
142 \\
\underline{126} \\
162 \\
\underline{162} \\
0
\end{array}
$$

So, at this instance
number of 2's are 222222222 ⇒ 9

Q11. A 99 digit number is formed by writing the first 59 natural numbers one after the other as;
123456789101112 .... 5859.
Find the remainder obtained when above No. is divided by 16.

Imp Divisity of 16 ⇒ last 4 digits dekho bs.

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last 4 digits divided by 16 will produce same remainder as the whole number.

last 4 digits are = 5859

$$
\begin{array}{r}
366 \\
16 \overline{)5859} \\
\underline{48} \\
105 \\
\underline{96} \\
99 \\
\underline{96} \\
3
\end{array}
$$

$\boxed{\text{Remainder} = 3}$

Q12. find the greatest no of 5 digits which is exactly divisible by 47.

⇒ Greatest 5 digit no = 99999

99999 / 47 ⇒ 30
↓ Remainder

99999 − 30 ⇒ $\boxed{99969}$ → Ans

Q13. find the smallest number of 5 digits which is exactly divisible by 476.

10000 / 476 ⇒ 4
↓ Remainder

476 − 4 ⇒ 472

$10000 + 472 \Rightarrow \cancel{100}$ 10472
↓
Ans

HCM and LCM

Q1. Find HCF & LCM of

a) $42 \Rightarrow 2 \times 3 \times 7$

b) $126 = 2 \times 3^2 \times 7$

c) $140 \Rightarrow 2^2 \times 5 \times 7$

HCF = Product of least common powers $= 2 \times 7 = 14$

LCM = Product of heighest powers $= 2^3 \times 3^2 \times 7 \times 5 = 1260$

Q2. Find HCF and LCM of

↳ $\frac{2}{3}, \frac{8}{9}, \frac{16}{81}, \frac{10}{27}$

HCF of fraction $\left(\frac{\text{H.C.F of numerator}}{\text{LCM of denominators}}\right)$

$$\Rightarrow \frac{HCF(2, 8, 16, 10)}{LCM(3, 9, 81, 27)} = \frac{2}{81}$$

LCM of fraction $\Rightarrow \frac{\text{LCM of numerator}}{\text{HCF of denominator}}$

$$\Rightarrow \frac{LCM(2, 8, 16, 10)}{HCF(3, 9, 81, 27)} = \frac{80}{3}.$$

Q3. Find HCF & LCM of 0.63, 1.05, 2.1

↓	↓	↓
0.63	1.05	2.10
↓	↓	↓
63	105	210

H.C.F of (63, 105, 210) = 21.

So, HCF of (0.63, 1.05, 2.10) is 0.21

LCM (63, 105, 210) → 630
So, LCM of (0.63, 1.05, 2.10) → 6.30

Q Find LCM of 3, 2.7, 0.09
3.00 2.70 0.09
now remove the point
300 270 9

LCM (300, 270, 9) → 2700
LCM (3, 2.7, 0.09) → 27.00 ⇒ 27,

Q Find HCM of 1.75, 5.6, 7
1.75 5.60 7.00
remove decimals
HCF of (175, 560, 700) → 35
H.CF of (1.75, 5.60, 7.00) → 0.35

Q HCF of 2 nos is 11 and their LCM is 693. If one of the no. is 77. Find the other,

⇒ no1 × no2 = LCM × HCF

$77 \times x = 693 \times 11$

$x = \frac{\cancel{693}^{99} \times \cancel{11}^{1}}{\cancel{77}_{\cancel{7}\,1}}$, $x = 99$.

Q find largest no which divides 62, 132, and 237 to leave the same remainder in each case.

$\Rightarrow$ HCf $[(132-62), (237-132), (237-62)]$

$(70, 105, 175)$

$2\times5\times7$ $\quad 3\times5\times7 \quad 5^2\times7$

$\rightarrow \quad 5^1 \times 7^1 = 35$

min powers of common prime factors.

Q find the greatest number of 5 digit which is divisible by 15, 21 and 36.

99999

LCM $(15, 21, 36)$

$3\times5 \quad 3\times7 \quad 3^2\times2^2$

$\Rightarrow 2^2\times3^2\times5\times7$

$\Rightarrow 1260$

$99999/1260 \Rightarrow$ remainder $= 459$

$\boxed{99999 - 459 \Rightarrow 99540}$

Q find the smallest number of 5 digits exactly divisible by 16, 24, 36, 54

$\Rightarrow$ 10000

$\Rightarrow$ LCM $(16, 24, 36, 54)$

$2^4 \quad 2^3\times3 \quad 2^2\times3^2 \quad 2\times3^3$

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$34\overset{12}{\cancel{4}2}$
64
368

LCM $= 2^4 \times 3^3 \Rightarrow 432$

$100000/432 \Rightarrow$ remainder $= 64$.

$432 - 64 = 368$

Ans $\Rightarrow 10000 + 368 = 10368$.

Q. Find the largest no. of 5 digit, when divided by 16, 24, 30, 36 leaves the same remainder 10 in each case.

$\Rightarrow$ 99999

LCM $(16, 24, 30, 36) \Rightarrow$

$2^4 \quad 2^3 \times 3 \quad 2 \times 3 \times 5 \quad 2^2 \times 3^2$

LCM $\Rightarrow 2^4 \times 3^2 \times 5^1 = 720$

$99999/720 =$ remainder $= 639$.

$99999 - 639$

$\Rightarrow 99360$

$\Rightarrow \underbrace{99360 + 10}_{\text{for 10 remainder}} = \boxed{99370}$ ✓

Q. Find the least number which when divided by 20, 25, 35, 40 leaves remainder 14, 19, 29, 34.

$(20-14, 25-19, 35-29, 40-34)$

$6 \quad 6 \quad 6 \quad 6$

common difference

LCM(20, 25, 35, 40)

$\swarrow \quad \downarrow \quad \downarrow \quad \downarrow$

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

LCM $\Rightarrow 2^3 \times 5^2 \times 7^1 = 1400$

$1400 - 6 = 1394 \rightarrow$ Ans