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Natural Numbers - Numbers which are used for counting the objects are called natural numbers. They are denoted by N.

N = {1, 2, 3………………..}

All positive integers are natural numbers.

Whole numbers - When 'zero' is included in the natural numbers, they are known as whole numbers.

They are denoted by W.

W= {0, 1, 2, 3………………..}

Integers - All natural numbers, zero and negatives of natural numbers are called as integers.

They are denoted by I.

I = {………………..., -3, -2, -1, 0, 1, 2, 3………………}

Rational numbers - The numbers which can be expressed in the form of $\frac{p}{q}$ where P and Q are integers and $q \neq 0$ are called rational numbers

They are called by Q.

$$\text{E.g.}= \frac{1}{2}, \frac{12}{8}, -6 \left(\text{as } -6 = \frac{-6}{1}\right) \text{ etc.}$$

Irrational numbers - The numbers which cannot be written in the form of $\frac{p}{q}$ where P and Q are integers and $q \neq 0$ are called irrational numbers.

$$\text{e.g.- } \sqrt{3}, \sqrt{7}, \frac{2}{17} \text{ etc}$$

When these numbers are expressed in decimal form, they are neither terminating nor repeating.

$$\text{e.g.}= \frac{1}{7}, \frac{2}{17} \text{ etc.}$$

Real numbers - Real numbers include both rational as well as irrational numbers.

Positive or negative, large or small, whole numbers or decimal numbers are all real numbers.

e.g. = 1, 13.79, - 0.01, $\frac{2}{3}$ etc.

Imaginary numbers - An imaginary number is a complex number that can be written as a real number multiplied by the imaginary unit 'i' which is defined by its properly $i^2 = -1$

Note: Zero (0) is considered to be both real and imaginary number.

Prime numbers - A prime number is a natural number greater than 1 and is divisible only by 1 and itself.

e.g.2, 3, 5, 7, 11, 13, 17, 19 ………….etc.

Note: 2 is the only even prime number.

Composite Numbers - A number, other than 1, which is not a prime number is called a composite number.

e.g. 4, 6, 8, 9, 10, 12, 14, 15 ……….etc.

Note: 1. 1 is neither a prime number nor a composite number.

2. There are 25 prime numbers between 1 and 100.

To find whether a number is prime or not-

To check whether the number is prime or not,

1. We take an integer larger than the square root of the number. Let the number be 'k'.

2. Test the divisibility of the given number by every prime number less than 'k'.

3. If it is not divisible by any of them, then the given number is prime otherwise it is a composite number.

e.g.= Is 881 a prime number ?

Sol- The appropriate square root of 881 is 30.

Prime number less than 30 are 2, 3, 5, 7, 11, 13, 17,19, 23,29.

881 is not divisible by any of the above numbers, so it is a prime minister.

Co-prime numbers - Two numbers are co-prime of their HCF is 1.

E.g. (2,3), (3,4) , (5,7), (3,13) etc.

Even numbers - The number which is divisible by 2 is called even number.

E.g. – 2, 4, 6, 8…………….

Odd numbers – The number which is not divisible by 2 is called odd number.

e.g. = 3, 5, 7, 9…………..

Consecutive numbers - A series of numbers in which the succeeding number is greater than the preceding number by 1 is called a series of consecutive numbers.

i.e., Difference between two consecutive numbers is 1.

Some Rules on Counting Numbers

1. Sum of all the first n natural numbers

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

QUESTION

1. What is the digit in the unit's place of 2^{51}?
1. 2 2. 8 3. 1 4. 4

2. A hundred digit number is formed by writing first 54 natural numbers one after the other as 123456…………….5354. Find the remainder when this number is divided by 8.
1. 4 2. 7 3. 2 4. 0

3. If $n = 1 + x$, where x is the product of four consecutive positive integers, then which of the following statements is/ are true?
(1) n is odd (2) n is prime
(3) n is a perfect square
1. 1 only 2. 2 only
3. 3 only 4. 1&3 only

4. There is a set of *n* natural numbers. The function 'H' is such that it finds the HCF between any 2 numbers. How many times, does the function 'H' have to be applied to find the HCF of the given set of numbers?
1. n/2 2. n – 1
3. n 4. None of these

5. A, B, C are three distinct digits. AB is a two digit number and CCB is a three digit number such that (AB)2 = CCB where CCB > 320. What is the possible value of the digit B?
1. 1 2. 0 3. 3 4. 9

6. If 146! is divisible by 5^n, then find the maximum value of *n*.
1. 34 2. 35 3. 36 4. 37

7. P is the product of all prime numbers from 1 to 100. Then the number of zeros at the end of the product is
1. 0 2. 1
3. 24 4. None of these

8. If N = 1421 × 1423 × 1425, what is the remainder when 'N' is divided by 12?
1. 0 2. 1 3. 3 4. 9

9. What is the 3 digit number, by which when we divide 32534 and 34069, we get the same remainders?
1. 298 2. 307
3. 431 4. Data Inadequate

10. Of 128 boxes of oranges, each box contains at least 120 and at most 144 oranges. The least number of boxes containing the same number of oranges is
1. 5 2. 103
3. 6 4. Data Insufficient

11. In a 4 digit number, the sum of first 2 digits is equal to that of the last 2 digits. The sum of the first and last digits is equal to the 3rd digit. Finally the sum of second and fourth digits is twice the sum of other 2 digits. What is the number?
1. 1854 2.4815 3. 1458 4. 4158

12. Find the unit's digit of the expression:
$55^{725} + 73^{5810} + 22^{853}$.
1. 4 2. 0 3. 2 4. 6

13. A number S is obtained by squaring the sum of digits of a two digit number D. If the difference between S and D is 27, then the value of the two-digit number D is
1. 24 2. 54 3. 34 4. 45

14. A number successively divided by 3, 4 and 7 leaves 2, 1 and 4 respectively as remainders.
What will be the remainder if 84, divides the same number?
1. 80 2. 76 3. 41 4. 53

15. What is the remainder when 4 96 is divided by 6?
1. 0 2. 2 3. 3 4. 4

16. Find the number of zeros in the product: 5 × 10 × 25 × 40 × 50 × 55 × 65 × 125 × 80.
1. 8 2. 9 3. 12 4. 13

17. Find the last two digits of the product: 15 × 37 × 63 × 51 × 97 × 17.
1. 35 2. 45 3. 85 4. 65

18. Find the last two digits of the product: 122 × 123 × 125 × 127 × 129.
1. 20 2. 50 3. 30 4. 40

19. The last 3 digits of the multiplication 12345 × 54321 would be
1. 865 2. 745 3. 845 4. 945

20. Find the last digit of the number N = 13 + 23 + 33 ……………. + 993.
1. 0 2. 1 3. 2 4. 5

21. Find GCD of the numbers 2*n* + 13 and *n* + 7, where n is a Natural Number.
1. 1 2. 2 3. 5 4. 4

22. Find the remainder if $18^{18^{16}}$ is divided by 7.
1. 4 2. 2 3. 1 4. 3

23. Find the remainder when $43^{101} + 23^{101}$ is divided by 66.
1. 2 2. 10 3. 5 4. 0

24. What is the total number of positive integral solutions of the form (*p*, *q*) that satisfy the equation 8*p* + 6*q* = 240?
1. 9 2. 11 3. 10 4. 8

25. From each of the two numbers, one fourth of the smaller is subtracted. Of the resulting numbers, the larger is twice the smaller. What is the ratio of the original numbers?
1. 3 : 1 2. 7 : 4 3. 3 : 2 4. 2 : 1

26. There are some fruits in containers A and B. If 10 fruits from container A are put in B, both containers will have an equal number of fruits. However, if 20 fruits from container B are put in A, then the number of fruits in A will be twice number of fruits in container B. What is the number of fruits in containers A and B respectively?
1. 70, 30 2. 60, 40 3. 100, 80 4. 60, 20

27. Find the larger of the two numbers, such that the sum of their cubes is 637 and sum of their squares is 49 more than the product.
1. 7 2. 8 3. 5 4. 6

28. Find the total number of factors of 888888.
1. 6 2. 64 3. 32 4. 128

29. What is the higher power of 2 in 1! + 2! + 3! …………………100!?
1. 24 2. 3 3. 0 4. 97

30. If *y* is a number such that *y* = *xx*, where *x* is a positive integer, what is the difference between the largest possible two-digit value of *y* and the smallest three-digit value of *y*?
1. 229 2. 336 3. 263 4. 521

31. If N is a positive odd number, find the value of *m* in 150! = 2^m × N.
1. 146 2. 145 3. 75 4. None of these

32. $2^{16} - 1$ is divisible by
1. 11 2. 13 3. 17 4. 19

33. If '*a*' is a whole number greater than 2 and '*a* – 2' is divisible by 3, the largest number that must necessarily divide (*a* + 4) (*a* + 10), is
1. 72 2. 9 3.36 4. 27

34. What will be the remainder, when 13 12 11 is divided by 9?
1. 1 2. 8 3. 7 4. 2

35. How may odd divisors does the number 1,000,000 have?
1. 5 2. 6 3. 7 4. 8

36. The HCF of two numbers is 28 and the HCF of two other numbers is 82. Find the HCF of all these four numbers.
1. 2 2.14
3. 7 4. Data Inadequate

37. For how many values of *a* are, *a*, *a* + 14, *a* + 26 prime numbers?
1. One 2. Two 3. None 4. Infinite

38. For how many values of *a* are, *a*, *a* + 2, *a* + 4 prime numbers?
1. One 2. Two 3. None 4. Infinite

39. For how many values of *a* are, *a*, *a* + 4, *a* + 7 prime numbers?
1. One 2. Two 3. None 4. Infinite

40. If last two digits of A, A^2 & A^3 are the same, then what is the digit at the unit's place of A?
1. 6 2. 5
3. 1 4. Data Inadequate

41. What is the remainder when $6!^{4!} + 4!^{6!}$ is divided by 10?
1. 0 2. 2 3. 4 4. 6

42. If a charismatic number '*n*' is defined in such a way that *n* = *m*2 and *n* = *p*3, then how many '*n*' are there which are less than 10000? (It being given that *n*, *m* & *p* are all natural numbers).
1. 2 2. 3
3. 4 4. More than 4

43. How many prime numbers exist in the factors of the product $6^7 \times 35^3 \times 11^{10}$?
1. 20 2. 27 3. 30 4. 23

44. On dividing a number by 5, 7 and 8 successively the remainders are respectively 2, 3 and 4.
What will be the remainders if the order of division is reversed?
1. 4, 5, 2 2. 5, 5, 2 3. 1, 2, 7 4. 4, 3, 2

45. A watch ticks 90 times in 95 seconds and another watch ticks 315 times in 234 seconds. If they are started together, how many times will they tick together in the first hour?
1. 8 times 2. 9 times 3. 7 times 4. 6 times

46. A vendor has 748 oranges, 408 apples, and 952 plums. If he packs the fruits into crates with an equal number of fruit without mixing them, what is the minimum number of crates?
1. 32 2. 31 3. 33 4. 30

47. The HCF of 2 numbers is 101 and their product is 61206. What is the bigger number, if one number is 1½ times the other?
1. 202 2. 404 3. 303 4. 606

48. The digit at unit's place of a 2 digit number is increased by 50% and the digit at tens place of the same number is increased by 100%. Now we find that the new number is 33 more than the original number. Find the original number.
1. 63 2. 42 3. 24 4. 36

49. A person divides his property into 2 halves. He then bequeaths one half to all his granddaughters and the other half to grandsons. He has 13 grandsons and 17 granddaughters. His grandsons equally divide their share between themselves only. Similarly granddaughters equally divide their share between themselves only. Each one gets some identical silver bowls. What could be the minimum property of the person?
1. 442 bowls 2. 221 bowls
3. 884 bowls 4. 1768 bowls

50. When a certain number is multiplied by 13, the product consists entirely of sevens. Find the smallest such number.

51. A certain number when successively divided by 3 and 5 leaves remainder 1 and 2. What is the remainder if the same number is divided by 15?
1. 5 2. 3 3. 7 4. 9

52. What is bigger: I. $9^{99} – 9^{98}$ or II. 9^{98}?
1. I. 2. II.
3. Both are equal 4. Can't be compared

53. A boy was set to multiply 10,056 by 469, but reading one of the figures in the question erroneously he obtained 4112904. Which figure did he mistake and he took which figure in that place respectively?
1. 4, 5 2. 0, 6 3. 6, 0 4. 5, 4

54. Four wheels, whose circumferences are 33, 42, 55, 63 cm respectively are set in motion at the same time. After how many revolutions of the first wheel will they all have simultaneously completed an exact number of revolutions for the first time?
1. 210 2. 6930 3. 6660 4. 33

55. A person had a number of toys to distribute among children. At first he tried giving 2 toys to each child, then 3 toys to each, then 4 to each, then 5 to each, then 6 to each, but was always left with one. On trying 7 he had no toys left with him. What is the smallest number of toys that he could have had?
1. 61 2. 121 3. 181 4. 301

56. Find the greatest number, which is such that when 76, 151 and 226 are divided by it, the remainders are all alike. Find also the common remainder.
1. 25, 1 2. 35, 3 3. 75, 1 4. 25, 3

57. A number when decreased by 3 becomes 108 times the reciprocal of the number. The number is
1. 6 2. 12 3. 9 4. 18

58. When 75% of a two-digit number is added to it, the digits of the number are reversed. Find the ratio of the ten's digit to the unit's digit in the original number?
1. 3 : 2 2. 1 : 4 3. 2 : 1 4. 1 : 2

59. The sum of the digits of a two-digit number is 1/11of the sum of the number and the number obtained by interchanging its digits. What is the difference between the digits of the number?
1. 2 2. 3
3. 7 4. Data inadequate

60. Z is defined to be equal to $32^{32} + 32$. What would be the remainder if Z is divided by 33?
1. 1 2. 32 3. 0 4. 2

61. What is the highest power of 44, which will divide P without any remainder? Given the value of P is 44! × 45?
1. 4 2. 20 3. 16 4. 1

62. The ratio between a two-digit number and the sum of the digits of that number is 4 : 1. If the digits in the unit's place is 3 more than the digit in the ten's place, find the number.
1. 36 2. 63 3. 48 4. 84

63. What is the remainder when $19^{6859} + 20$ is divided by 18?
1. 3 2. 17 3. 2 4. 0

64. F is the smallest natural number, which when multiplied by 7 gives a number made of 4's only. Sum of the digits of F is G. The last digit of G^{92} is
1. 4 2. 2 3. 6 4. 8

1. Divide 51 by cyclicity of 2 i.e. 4. Remainder = 3. Now you can find 23 = 8. Thus 2nd option.

2. We need to look at only the last three digits of this number.
So 354 divided by 8 gives remainder as 2. Thus 2 is the answer. Thus 3rd option.

3. Assume values of *x* to get the answer.
We can find that 1st and 3rd statements are always true. So answer is 4th option.

4. If we are given 2 numbers, we find the HCF only once. Similarly if we are given 3 numbers, we find the HCF twice and so on. So in order to find the HCF of n numbers, the number of times we need to find the HCF is 'n – 1'. Thus 2nd option.

5. The only number satisfying this condition is 21. As 21 × 21 = 441, so possible value of B is 1.

6. In 146!, number of 5s would be 29. Also number of 5^2 would be 5. The number of 5^3 would be 1.
Hence the maximum value of n would be 29 + 5 + 1 = 35. Thus 2nd option.

7. There is only one even prime number i.e. 2 and there is only 1 multiple of 5 i.e. 5.
Hence the number of zeroes will also be 1 only. Thus 2nd option.

8. N = 1421 × 1423 × 1425.
Remainders when these numbers are divided by 12 are 5, 7and 9.
Their product is 315. Divide it by 12 and find the remainder to be 3.

9. 34069 – 32534 = 1535 should be perfectly divisible by the number which is 307 as 1535 = 307 × 5. So answer is 307 which is given in 2nd option.

10. Since out of 128 boxes of oranges, each box contains at least 120 and at most 144 oranges i.e. 25 different number of oranges, the minimum number of boxes containing the same number of oranges is next integral value of {128\25} i.e. 6. Thus 3rd option.

11. Let the number be *abcd*, it is given that
$a + b = c + d$ -------(1)
$a + d = c$ ---------(2)
$b + d = 2(a + c)$ ---------------(3)
Now going by options, get the number as 1854. Hence 1st option.

12. Solving separately for the unit digit of each number, we get the unit digit of the 1st number as 5, unit digit of the 2nd number as 9 and unit digit of the 3rd number as 2. Adding these, we get the answer as 6. i.e. 4th option.

13. Work with options to get answer as 54. So number S will be (5 + 4)2 = 81.
Now the difference between 81 and 54 is 27. Hence 2nd option 54 is verified.

14. Let the 1st quotient be x.
So the number becomes $[3\{4(7x + 4) + 1\} + 2]$ which is equal to $84x + 53$.
Hence on dividing this by 84, we get the remainder as 53.

15. 4 ÷ 6, remainder is 4. 42 ÷ 6, remainder is 4. 43 ÷ 6, remainder is 4.
So checking the cyclicity, we get the answer as 4.

16. Multiply the last two digits at every stage and get the result as 35, which will be your answer.

17. The last two digits of multiplication can be achieved by dividing the number by 100 and finding the remainder. 125 divided by 100 gives us 5/4 (Cancellation by 25). Hence remainder obtained is 1.
(Usually speak you cannot cancel the terms while remainders, in case you do, then finally the remainder obtained is multiplied with the cancelling factor)
Also 122 divided by 4 gives remainder as 2, 123 divided by 4 gives remainder as 3, 127 divided by 4 gives remainder as 3, 129 divided by 4 gives remainder as 1.
So final remainder would be 2 × 3 × 1 × 3 × 1 = 18/4 gives us 2 as the answer.
Multiplying it back with the cancelling factor i.e. 25 gives us the final answer as 2 × 25 = 50. Hence answer is 50.

18. The last 3 digits of the multiplication 12345 × 54321 would be given the product 345 × 321, which is 745.

19. $1^3 + 2^3 + 3^3$ .... + 99^3 is the addition of cubes of 1st 99 natural numbers.
Using the formula of $\sum {}_3N$, we get the answer as $[(99 \times 100)/2]^2$ which would give the last digit as Zero

20. Put n = 1. So we get the numbers as 15 and 8. Hence GCD = 1.
Putting n = 2, we get the numbers as 17 and 9 whose GCD is again 1.
So for any value of n, we are getting two co-prime numbers whose GCD is always 1.
Hence answer is 1. So answer is 1st option.

21. We will find the cyclicity of 18 on being divided by 7. 18 ÷ 7, remainder = 4, 18^2 ÷ 7, remainder = 2, 18^3 ÷ 7, remainder = 1. Hence the cyclicity is 3.
So we have to find the remainder when 18^{36} is divided by 3.
Also we can see that 18^{36} is divisible by 3. So the final answer would be the third remainder in the original

sequence. Hence the answer is 1, which is the 3rd option.

22. As per the standard result that $x^n + y^n$ is divisible by $x + y$ if n is odd.
So remainder is this case would be 0.

23. Simplifying the equation you get $4p + 3q = 120$, given the integers are positive. Solving and finding the smallest possible value for q as 4 and the largest possible value comes out to be 36.
As q is always a multiple of 4, there are 9 such values. Thus 1st option.

24. We can see that the part in bracket is actually an infinite GP of 3 as the 1st term and ¼ as r.
So we can solve the given expression and get (0.0256)
$\log \frac{3}{1-\frac{1}{4}} \Rightarrow 0.0256 \log_{256} 4 = 0.0256/4.$

25. If the numbers are x and y (y < x), we get the equation as $x - y/4 = 2 \times 3y/4 \Rightarrow x : y = 7 : 4$.

26. Going by options and verifying the 3rd option: If A has 100 fruits and B has 80 fruits, then 10 fruits put from A to B will lead to 90 fruits in both A and B.
Also if 20 fruits are put from B to A, then A will have 120 fruits and B will have 60 fruits.
So A will have twice the number of fruits as compared to B.

27. If the numbers are x and y, then $x^3 + y^3 = 637$ and $x^2 + y^2 - xy = 49$. So $x + y = 13$.
Now going by options, we get the answer as 2nd option. The other number is 5.

28. The number 888888 can be written as $2^3 \times 3 \times 7 \times 11 \times 13 \times 37$.
Applying the formula of total number of factors, we get the factors as $(3 + 1)(1 + 1)(1 + 1)(1 + 1)(1 + 1)(1 + 1) = 4 \times 2 \times 2 \times 2 \times 2 \times 2 = 128$.

29. The given expression can be written as {1!} + {2! +3! …………………100!}
The first bracket contains an odd number and the second an even number.
Also Odd + Even = Odd.
As final answer is an odd number, so there is no power of 2 in this expression.
Hence required answer is 0.

30. The smallest possible value for a three-digit y is 256 and the largest possible value for a two-digit y is

31. The value of m is basically the power of 2 in 150!.
So answer is 75 + 37 + 18 + 9 + 4 + 2 + 1 = 146.

32. $2^{16} - 1$ can be rewritten as $(2^4 - 1)(2^4 + 1)(2^8 + 1)$. So out of the given options, it is divisible by 17.

33. Take a = 5, 8 etc. Clearly $(a + 4)(a + 10)$ would be divisible by 9.

34. We will find the cyclicity of 11 on being divided by 9. 11 ÷ 9, remainder = 2, 11^2 ÷ 9, remainder = 4, 11^3 ÷ 9, remainder = 8, 11^4 ÷ 9, remainder = 7, 11^5 ÷ 9, remainder = 5, 11^6 ÷ 9, remainder = 1.
Hence the cyclicity is 6. So we have to find the remainder when 12^{13} is divided by 6. Also we can see that 12^{13} is divisible by 6.
So the final answer would be the 6th remainder in the original sequence. Hence the answer is 1.

35. 1000000 can be written as
$2^6 \times 5^6$. So number of odd divisors of 1000000 is 6 +1 = 7.

36. Required HCF = HCF (28, 82) = 2, thus answer will be 2. So answer is 1st option.

37. a could be 3 or 5 or 17----------------- So answer is infinite.

38. a = 3 is the only one value satisfying this condition. So only one value.

39. No value satisfies the given condition as for a + 7 to be prime, a has to be even.
As a result a + 4 will never be prime.

40. For 76 and for 25, the last two digits always remain same i.e. 76 raised to power anything ends in 76 only and 25 raised to power anything ends in 25 only. As we cannot get a unique answer, so data is not adequate to answer the question.

41. $6!^{4!}$ is divisible by 10 and $4!^{6!}$ gives remainder 6 (using cyclicity). So answer is 6.

42. If any number is simultaneously a perfect square and a perfect cube, then that number must be 6th power of any other number.
So the values of n are $1^6 = 1$, $2^6 = 64$, $3^6 = 729$ and $4^6 = 4096$.
So answer is 3rd option.

43. $6^7 \times 35^3 \times 11^{10} = (2 \times 3)^7 \times (5 \times 7)^3 \times 11^{10} = 2^7 \times 3^7 \times 5^3 \times 7^3 \times 11^{10}$
∴ No. of prime factors = addition of powers of prime nos. = 7 + 7 + 3 + 3 + 10 = 30.

44. 5, 7 and 8; remainders are 2, 3 and 4. ∴ The no. can be calculated as 8 + 4 = 12 (1st divisor).
(12 × 7) + 3 = 87 (2nd divisor). (87 × 5) + 2= 437 (Final no.).
So 437 is divided successively by 8, 7 and 5. We get remainders as 5, 5 and 2.

45. 7 times

46. Max. items in a crate = HCF of 748, 408 and 952 is 68.

So minimum number of crates is $\frac{748}{68} + \frac{408}{68} + \frac{952}{62}$

$\Rightarrow 11 + 6 + 14 = 31$

47. Let smaller number be x and the larger be $1.5x \Rightarrow x \times 1.5x = 61206 \Rightarrow x^2 = 40804 \Rightarrow x = 202$.
$\therefore$ Bigger no. = $1.5 \times 202 = 303$.

48. Let xy be the 2 digit no. Net increase in the no. after 2 different increases of 50 % & 100 % = 33.
Unit's digit is increased by 50 % and on increase it becomes 3. $\frac{50}{100} y = 3. \Rightarrow y = 6$.
Similarly 100 % increase makes the value more by 3.
$\therefore \frac{100}{100x} = 3. \Rightarrow x = 3.$ $\therefore$ Number is 36.

49. No. of grandsons = 13. No. of granddaughters = 17.
Now the total share of both grandsons and granddaughters has to be a multiple of 13 & 17 both (because the totals should be equal and there are 13 grandsons and 17 granddaughters)
LCM of 13 & 17 = 221 × Minimum no. of bowls
= 221 × 2 = 442

50. 13x = 77_____. Go on adding 7 in the dividend.
When you reach 777777, you will see that this no. is divisible by 13.
On dividing 777777 by 13, get the quotient as 59,829.

51. Product of 2 numbers = HCF × LCM. HCF^3 = HCF × 1225 × HCF = 35.
Let nos. be $35x$ and $35y \times 35x \times 35y = 35 \times 1225 \times xy$ = 35.
Co-prime factors of 35 are 5 and 7 × Nos. are 35 × 5 = 175 and 35 × 7 = 245.
The smaller number is thus 175, hence 2nd option.

52. 3 and 5 ----remainders are 1 and 2. Therefore no. will be of the form $5k+2$. Hence number is $(5k + 2) \times 3 + 1 = 7 \times 3 + 1 = 22$ (Assuming $k = 1$). Hence remainder when same no. is divided by 15 is 7.

53. $9^{99}-9^{98}$ or 9^{98}. Taking 9^{98} common we get $9^{98}(9-1) = 8\times 9^{98}$
$\therefore$ It is bigger than 9^{98}. Thus first option.

54. 10056 × 469. One figure is wrong. He obtained 4,112,904.
If we multiply 10000 by 470, we get 4,700,000 i.e. app. 600,000 more
He must have written 409 instead of 469.
So 6 is the possible mistake that he could have made.

55. 181

56. LCM of 2, 3, 4, 5, 6 = 60. Toys would be of the form $60K + 1$.
We put various values to K so as to make it divisible by 7. Start from K =1, and check unless you get a multiple of 7. K = 5 makes it 301, which is the answer.

57. Greatest no. will be HCF of (151 – 76, 226 – 76, 226 – 151) i.e. HCF of 75, 150, 75, which is 75.
The common remainder is 1.

58. Let us assume the no. to be n. Thus as per the statement, $(n - 3) = 108 \times^{\frac{1}{n}}$
Solving this you get a quadratic equation, so it is better to use options. Putting n as 12 you get both the sides as 9. Thus 2nd option i.e. 12 is the answer.

59. Let the unit's digit of the no. be u and ten's digit be t. The original number becomes $10t + u$.
Now making the equation $(10t + u) \times 7/4 = 10u + t \Rightarrow 66t = 33u \Rightarrow \frac{2}{1} = \frac{u}{t}$ thus 4th option is the answer.

60. Z can be rewritten as $32 (32^{31} + 1)$. Now applying the basic property $x^n + y^n$ is divisible by $x + y$, provided n is odd and n remains odd here.
Here because the internal part is divisible by 32 + 1 = 33, the remainder will be equal to zero.
Thus 3rd option is the answer.

61. The prime factors of 44 are 2 × 2 × 11, out of which 11 is a bigger prime number. The multiples of 11 in 44! are 4 in number (i.e. 11, 22, 33 and 44) and thus 4 i.e. 1st option will be the answer. There is no need to calculate the multiples of 2 because they will definitely be much more than the multiples of 11.

62. Converting M into fractions you get 999
Now in order to convert into a natural number it has to be multiplied with a multiple of 999. Check all the options, only the second option given i.e. 3996 is a multiple of this and hence it is the answer.

63. 19 raise to power anything when divided by 18, remainder will be 1. Now after that when 20 is divided by 18 the remainder is 2. Thus the final remainder will be 1 + 2 = 3 i.e. the first option.

64. The smallest such number is 63492, which when multiplied with 7 gives 444444.
Now the sum of the digits of F is 6 + 3 + 4 + 9 + 2 = 24. The last digit of 24^{92} will be 6 because 4 raise to power any even number always ends in a 6. Thus 3rd option is the answer.