APTITUDE MASTERY SERIES

MODULE 1 – NUMBER SYSTEM

1. A number when divided by 5 leaves a remainder of 4, when the double (i.e., twice) of that number is divided by 5 the remainder will be:

(a) 0 (b) 1 **(c) 3** (d) Can't be determined

Solution:

Let the number be N and the quotient be Q then N = 5Q + 4

Again 2N = 2(5Q + 4) = 10 Q + 8

or 2N = 5 x 2Q + 5 + 3

or 2N = 5(2Q + 1) + 3

Hence the remainder will be 3.

Alternatively

Since the number becomes double then the remainder will also be double but when the remainder will become twice it will exceed the divisor which is not possible so to get the correct remainder, we further divide the twice of the remainder by the divisor and in this way we obtain the required remainder which is admissible. For example in the given problem the divisor is 5 and the original remainder is 4. So this remainder will become twice i.e., 8 (since the number i.e., dividend become twice) but since 8 > 5 which is not possible so we divide 8 by 5 then we get the correct remainder 3.

2. If the sum of the three consecutive integers is 21, then the sum of the two smaller integers is:

(a) 11 (b) 5 (c) 12 **(d) 13**

Solution:

Let the three consecutive integers be (n-1), n and (n+1) then

(n-1) + n + (n+1) = 21

3n = 21 → n = 7

(n-1) + n = (7-1) + 7 = 13

3. Raja gets 3 marks for each correct sum and loses 2 marks for each wrong sum. He attempts 30 sums and obtains 40 marks. The number of sums solved correctly is:

(a) 10 (b) 15 **(c) 20** (d) 25

Solution:

Best way is to go through option. Consider option (c)

Correct answer = 20, marks for correct answer = 60

So wrong answer = 10, marks for wrong answer = -20

Therefore, Net marks = 60 – 20 = 40

Hence, presumed option is correct.

Alternatively

$30 \times 3 - x \times 5 = 40$

$90 - 5x = 40$

$x = 10$

Hence, the wrong answer = 10

Thus, the correct answer = 20

4. Find the unit digits of the expression: $78^{5562} \times 56^{256} \times 97^{1250}$.

(a) 4 (b) 5 **(c) 6** (d) 7

Solution:

We can get the units digits in the expression by looking at the patterns followed by 78, 56 and 97 when they are raised to high powers.

In fact, for the last digit we just need to consider the units digit of each part of the product.

A number (like 78) having 8 as the units digit will yield units digit as

$78^1 \rightarrow 8$ $78^5 \rightarrow 8$

$78^2 \rightarrow 4$ $78^6 \rightarrow 4$

$78^3 \rightarrow 2$ $78^7 \rightarrow 2$

$78^4 \rightarrow 6$ $78^8 \rightarrow 6$

$8^{4n+1} \rightarrow 8$

$8^{4n+2} \rightarrow 4$

Hence 78^{5562} will yield 4 as the unit digit

Similarly, $56^1 \rightarrow 6$

$56^2 \rightarrow 6$

$56^3 \rightarrow 6$

Hence 56^{256} will yield 6 as the unit digit

Similarly, $97^1 \rightarrow 7$

$97^2 \rightarrow 9$

$97^3 \rightarrow 3$

$97^4 \rightarrow 1$

$7^{4n+1} \rightarrow 7$

$7^{4n+2} \rightarrow 9$

Hence, 97^{1250} will yield 9 as the unit digit.

Hence, the required units digit is given by 4 x 6 x 9 → **6**

5. In Somnath Temple there are some magical bells which tolls 18 times in a day, simultaneously. But every bell tolls at a different interval of time, but not in fraction of minutes. The maximum number of bells in the temple can be:

(a) 18 **(b) 10** (c) 24 (d) 6

Solution:

Since these bells tolls 18 times in 24 hrs

So the min. time interval when they toll together = $\frac{24}{18}$ = 80 minutes

So the required number of bells = total number of different factors of 80

Now since $80 = 2^4 \times 5$

Therefore, Total number of factors = (4 + 1) (1 + 1) = 10

Thus the maximum number of bells = 10

6. How many natural numbers upto 1155 are divisible by either 5 or 7 but not by 11?

(a) 330 (b) 333 (c) 105 (d) None of these

Solution:

Numbers divisible by 5 upto 1155 = 231

Numbers divisible by 7 upto 1155 = 165

Numbers which are divisible by both 5 and 7 (i.e., 35) upto 1155 = 33

Therefore, Numbers which are exactly divisible by 5 or 7 = (231 + 165) – 33 = 363

Numbers which are divisible by 5 and 11 both (i.e., 55) = 21

Numbers which are divisible by 7 and 11 both (i.e., 77) = 15

Numbers which are divisible by 5, 7 and 11 simultaneously = 3

Therefore, Numbers which are only divisible by either 5 and 11 or 7 and 11 = 21 + 15 – 3 = 33

Hence, the total number of numbers which are divisible by 5 or 7 but not by 11 = 363 – 33 = 330.

7. If the sum and the product of two numbers are 25 and 144 respectively then the difference of the numbers must be:

(a) 3 (b) 5 **(c) 7** (d) 11

Solution:

$(x + y) = 25$ and $xy = 144$

$(x - y)^2 = (x + y)^2 – 4xy$

$(x - y)^2 = 625 – 576$

$(x - y)^2 = 49$

$x – y = 7$

8. Find the remainder when 1! + 2! + 3! + ………. + 77! is divided by 7:

(a) 0 **(b) 5** (c) 4 (d) can't be determined

Solution:

Note: Please remember that all the factorial numbers greater than or equal to *n* are divisible by *n*.

Hence, 7!, 8!, 9!, 10!,… etc are divisible by 7. So we have to check only 1! + 2! + 3! + 4! + 5! + 6!

= 1 + 2 + 6 + 24 + 120 + 720

= 873

Thus 873 leaves a remainder of 5 when divided by 7.

Therefore, 1! + 2! + 3! + ………. + 77! leaves remainder 5.

9. A number 'A' when divided by 'D' leaves the remainder 18 and if another number 'B' is divided by the same divisor 'D' it leaves the remainder 11. Further if we divide A + B by 'D' then we obtain the remainder 4. Then the common divisor 'D' is:

(a) 21 (b) 22 (c) 15 **(d) 25**

Solution:

$\frac{A}{D} \rightarrow$ Remainder 18

$\frac{B}{D} \rightarrow$ Remainder 11

$\frac{A+B}{D} \rightarrow$ Remainder 29, but the remainder is 4

Hence, the divisor = (29 – 4) = 25

10. Sanjay plants his garden with 5550 trees and arranged them such that there is one plant more per row as there are rows. The number of trees in each row is:

(a) 56 (b) 74 **(c) 75** (d) 76

Solution:

Let there be n rows, then the number of trees in each row = $(n + 1)$

Thus total number of trees = $n\,(n + 1)$

Therefore, $n\,(n + 1) = 5550$

Now, at this moment this problem can be solved in two ways.

First by finding the roots of quadratic equation. Second by using the values from options.

Again since the value of $(n + 1)$ is given in the options so consider option (d)

74 (75) = 5550

Hence, (c) is correct.

11. Four runners started running the race in the same direction around a circular path of 7 Km. Their speeds are 4, 3, 9 and 3.5 km/hr individually. If they have started their race at 6 o'clock in the morning, then at what time they will be at the starting point?

(a) 8.00 p.m (b) 8.30 p.m (c) 7.00 p.m (d) 9.00 p.m

Solution:

Time required by everyone to complete one revolution individually is $\frac{7}{4}, \frac{7}{3}, \frac{7}{9}, \frac{7}{3.5}$ hours.

Therefore everyone must reach at the starting point after the time of the LCM of the individual time period for one revolution.

So the LCM of $\frac{7}{4}, \frac{7}{3}, \frac{7}{9}, \frac{7}{3.5} = \frac{7}{4}, \frac{7}{3}, \frac{7}{9}, \frac{2}{1}$

$$= \frac{\text{LCM of } 7,7,7,2}{\text{HCF of } 4,3,9,1} = \frac{14}{1} = 14 \text{ hours.}$$

Hence, after 14 hours *i.e.,* at 8 o'clock in the evening of the same day they will meet at the starting point.

12. $1 \div \frac{1}{1 \div \frac{1}{1 \div \frac{1}{3}}}$ is equal to:

(a) $\frac{1}{3}$ (b) 1 **(c) 3** (d) $1\frac{1}{3}$

Solution:

$$1 \div \frac{1}{1 \div \frac{1}{1 \div \frac{1}{3}}} = 1 \div \frac{1}{1 \div \frac{1}{3}} = 1 \div \frac{1}{3} = 3$$

13. Find the value of x in $\sqrt{x + 2\sqrt{x + 2\sqrt{x + 2\sqrt{3x}}}} = x$.

(a) 1 **(b) 3** (c) 6 (d) 12

Solution:

The value of x should be such that the left hand side after completely removing the square root signs should be an integer. For this to happen, first of all the square root of $3x$ should be an integer. Only 3 and 12 from the options satisfy this requirement. If we try to put x as 12, we get the square root of $3x$ as 6. Then the next point at which we need to remove the square root sign would be $12 + 2(6) = 24$ whose square root would be an irrational number. This leaves us with only 1 possible value (x = 3). Checking for this value of x we can see that the expression is satisfied as LHS = RHS.

14. Three mangoes, four guavas and five watermelons cost Rs.750. Ten watermelons, six mangoes and nine guavas cost Rs.1580. What is the cost of six mangoes, ten watermelons and four guavas?

(a) 1280 (b) 1080 **(c) 1180** (d) Cannot be determined

Solution:

$3M + 4G + 5W = 750$ → (1)

$6M + 9G + 10W = 1580$ → (2)

Adding the two equations we get:

$9M + 13G + 15W = 2330$ → (3)

Dividing this expression by 3 we get:

$3M + 4.33G + 5W = 776.666$ → (4)

(4) – (1) → 0.33G = 26.666 → G = 80

Now, if we look at the equation (1) and multiply it by 2, we get: $6M + 8G + 10W = 1500$. If we subtract the cost of 4 guavas from this we would get:

$6M + 4G + 10W = 1500 - 320 = 1180$

Option (c) is correct.

15. Some birds settled on the branches of a tree. First, they sat one to a branch and there was one bird too many. Next they sat two to a branch and there was one branch too many. How many branches were there?

(a) 3 (b) 4 (c) 5 (d) 6

Solution:

When the birds sat one on a branch, there was one extra bird. When they sat 2 to a branch one branch was extra.

To find the number of branches, go through options. Checking option (a), if there were 3 branches, there would be 4 birds. (This would leave one bird without branch as per the question)

When 4 birds would sit 2 to a branch there would be 1 branch free (as per the question). Hence the answer (a) is correct.

HOME WORK

16. When the natural numbers 1, 2, 3, ……, 500 are written, then the digit 3 is used *n* times in this way. The value of *n* is:

(a) 100 **(b) 200** (c) 300 (d) 280

Solution:

5 x (3, 13, 23, 33, 43, 53, 63, 73, 83, 93) + 5 x (30, 31, 32, 33, 34, 35, 36, 37, 38, 39) + (301, 302, 303, 304, ….., 399)

= 5 x 10 + 5 x 10 + 100

=200

In every set of 100 numbers there are 10 numbers whose unit digit is 3. Similarly in every set of 100 numbers there are 10 numbers whose tens digit is 3 and there are total 100 numbers whose hundreds digit is 3.

17. In a mobile shop $\frac{7}{12}$ mobiles are imported and rest are manufactured in India. Further $\frac{1}{5}^{th}$ Indian mobiles are coloured while $\frac{5}{17}^{th}$ imported mobiles are black and white. If there are a total of 150 coloured mobiles in the shop, then the total number of mobile phones in the shop is:

(a) 500 **(b) 600** (c) 800 (d) data insufficient

Solution:

Go through alternatives. Consider option (b)

Total mobiles = 600

Indian mobiles = 600 x $\frac{5}{12}$ = 250

And imported mobiles = 600 x $\frac{7}{12}$ = 350

The coloured mobiles of Indian origin = 250 x $\frac{1}{5}$ = 50

The coloured mobiles of which are imported

$$= 350 \times \frac{2}{7} = 100$$

Thus total coloured mobiles = 50 + 100 = 150, which is same as given in the problem. Hence the presumed option is correct

18. If 4 is added to the numerator of a fraction, it becomes 1/3 and if 3 is added to the denominator of the same fraction it becomes 1/6. The sum of the numerator and denominator is:

(a) 32 (b) 7 (c) 4 (d) 3

Solution:

Let $\frac{x}{y}$ be the fraction, then

$\frac{x+4}{y} = \frac{1}{3}$ and $\frac{x}{y+3} = \frac{1}{6}$

➔ $3x + 12 = y$

and $6x = y + 3$

➔ $x = 5$ and $y = 27$

Thus $x + y = 32$

19. Reynolds offers a total of 150 pens to its customers. As per the scheme, one pen will be offered on the purchase of a "Quantitative Aptitude" book. Out of 150 pens, the cost of some pens is Rs. 3 and the cost of rest of the pens is Rs. 5. At the most, how many customers can avail a pen of Rs. 5 as an offer from the company if the total cost of the pens cannot exceed Rs. 745.

(a) 45 (b) 120 **(c) 147** (d) none of these

Solution:

Option (a) and (b) are wrong since the maximum cost of total pens is nearly Rs. 745. Now, to maximize the number of pens of Rs.5, we have to minimize the number of pens of Rs. 3 and the total cost cannot exceed Rs. 745.6

So by hit and trial get the required result. As:

Number of pens of Rs. 3 each	Number of pens of Rs. 5 each	Total cost
1 x 3 = 3	149 x 5 = 745	748
2 x 3 = 6	148 x 5 = 740	746
3 x 3 = 9	147 x 5 = 735	744

Hence the maximum number of pens of Rs. 5 is 147.

20. In how many ways can 2310 be expressed as a product of 3 factors?

(a) 41 (b) 23 (c) 56 (d) 46

Solution:

2310 = 2 x 3 x 5 x 7 x 11, Now since 2310 has to be expressed as a product of 3 factors, as 2310 = a x b x c. Now we exclude one prime factors say 'a' then we find the rest part as a product of 2 factors.

Thus when a = 1, then b x c can be expressed as

$\frac{(1+1)(1+1)(1+1)(1+1)(1+1)}{2}$ = 16 ways

Now, if a = 2, then

b x c = $\frac{(1+1)(1+1)(1+1)(1+1)}{2}$ = 8 ways

When a = 3, then

b x c = $\frac{(1+1)(1+1)(1+1)(1+1)}{2}$ = 8 ways

Similarly, when a = 5, 7, 11 the value of b x c = 8 ways

But when a =2, then the (b x c) = 8 – 1 = 7 since one way of expression has been included in the case of a = 1.

Similarly when a = 3, 5, 7 and 11 then the number of ways will be 6 (= 8 – 2), 5 (= 8 – 3), 4 (= 8 – 4), 3 (=8 – 5) respectively.

Thus the total number of ways in which 2310 can be expressed as the product of 3 factors = 16 + 7 + 6 + 5 + 4 + 3 = 41 ways.