MATHEMATICAL REASONING

1. The number $(10^n - 1)$ is divisible by 11 for____.
(a) $n \in N$
(b) Odd values of n
(c) Even values of n
(d) n is the multiple of 11

2. The values of A and B in the given addition respectively are ___.

$$\begin{array}{r} 2\,3\,A \\ +\,A\,3\,B \\ \hline 6\,B\,1 \end{array}$$

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

3. The greatest value that must be given to x so that the number 7713×8 is divisible by 4 is_____.
(a) 1
(b) 6
(c) 8
(d) 7

4. If $\begin{array}{r} 1\,A \\ \times\quad A \\ \hline B\,6 \end{array}$, where A and B are single digit numbers, such that B – A = 3, then the values of A and B respectively are _____.
(a) 4, 5
(b) 9, 6
(c) 5, 4
(d) 6, 9

5. Suppose that the division $N \div 5$ leaves a remainder of 4 and the division $N \div 2$ leaves a remainder of 1. What must be the ones digit of N?
(a) 7
(b) 3
(c) 9
(d) 4

6. Given that the number 148101a095 is divisible by 11, where a is single digit number, what are the possible values of a?
(a) 4
(b) 1
(c) 7
(d) 9

7. The largest natural number by which the product of three consecutive even natural numbers is always divisible, is _____.
(a) 16
(b) 24
(c) 48
(d) 96

8. If in a number, difference between the sum of digits at its odd places and that of digits at the even places is given 0, then the number is divisible by _____.
(a) 7
(b) 9
(c) 5
(d) 11

9. A 5-digit number xy235 is divisible by 3 such that $x + y < 5$, where x and y are single digits, then possible values of (x, y) are _____.
(a) (1, 1) or (4, 0)
(b) (1, 1) or (2, 0)
(c) (1, 1) or (0, 2)
(d) (2, 0) or (0, 2)

10. If $\begin{array}{r} 1\,A\,B \\ +\,C\,C\,A \\ \hline 6\,9\,7 \end{array}$ and there is no carry on addition, then the value of B is _____.
(a) 5
(b) 4
(c) 3
(d) 2

11. If N divided by 5 leaves a remainder of 3, then one's digit of N must be _____.
(a) Either 3 or 6
(b) Either 3 or 8
(c) Either 8 or 1
(d) Either 8 or 6

12. Given that the number 67y19 is divisible by 9, where y is a single digit, what is the least possible value of y?
(a) 3
(b) 9
(c) 7
(d) 4

13. A 3-digit number 'cba' is divisible by 3 if____.
(a) $a + 2b + c$ is divisible by 3
(b) $2a + b + c$ is divisible by 3
(c) $a + b + 2c$ is divisible by 3
(d) $a + b + c$ is divisible by 3

14. If
$$\begin{array}{r} A\ B \\ \times\ A\ 3 \\ \hline 5\ 7\ B \\ \hline \end{array}$$
, then the value of B is_____.
(a) 5   (b) 2
(c) 0   (d) 4

15. In a division, the divisor is 12 times the quotient and 5 times the remainder, if the remainder is 48, then dividend is _____.
(a) 240
(b) 576
(c) 4800
(d) 4848

ACHIEVERS SECTION (HOTS)

16. Which of the following statements is INCORRECT?
(a) All even natural numbers which are divisible by 3 are also divisible by 6.
(b) If a natural number is divisible by 21, then it is divisible by both 3 and 7.
(c) If $AB \times 4 = 192$, then A+B=10
(d) A number of the form $14 N + 2$ leaves the remainder 2 when divided by 7.

17. Fill in the blanks.
(i) If sum of 3-digit numbers xyz, yzx and zxy is divided by (x + y + z), then quotient is ___P___ .
(ii) The difference between 2-digit numbers ab and ba, (where a > b) is divided by 3. The quotient is ___Q___ .
(iii) Sum of a 2-digit number and the number obtained by reversing its digits is always divisible by ___R___ .

	P	Q	R
(a)	111	3(a + b)	11
(b)	99	(a + b)	7
(c)	111	3(a - b)	11
(d)	99	(a – b)	3

18. Match the following.

Column – I	Column – II
(P) If 213×27 is divisible by 9, then x=	(i) 2
(Q) If $2415x$ is divisible by 6, then $x =$	(ii) 8
(R) If $22135x$ is divisible by 4 and 3, then $x =$	(iii) 3
(S) If 7251×93 is divisible by 11, then x=	(iv) 6

(a) (P)→(iii); (Q)→(ii); (R)→(iv); (S)→(i)
(b) (P)→(ii); (Q)→(iv); (R)→(i); (S)→(iii)
(c) (P)→(iii); (Q)→(iv): (R)→(i); (S)→(ii)
(d) (P)→(ii); (Q)→(iii); (R)→(i); (S)→(iv)

19. How many 5-digit numbers of the form AABAA is divisible by 33?
(a) 1   (b) 3
(c) 0   (d) infinite

20. Find the value of A, B and C respectively.

(i)
$$\begin{array}{r} A\ 8\ 3 \\ \times\ \ C\ 9 \\ \hline A\ 0\ 4\ A \\ +1\ 5\ B\ B\ 0 \\ \hline C\ C\ A\ 0\ A \\ \hline \end{array}$$

(ii)
$$\begin{array}{r} 4\ 3\ A\ 4 \\ \times\ \ \ 3\ A \\ \hline B\ 7\ C\ 7\ 6 \\ +B\ C\ 0\ C\ 2\ 0 \\ \hline B\ 4\ 7\ 6\ 9\ 6 \\ \hline \end{array}$$

	(i)	(ii)
(a)	2, 6, 7	9, 5. 2
(b)	6, 7, 2	4, 3, 1
(c)	7, 5, 2	9, 2, 5
(d)	7, 6, 2	4, 1, 3

HINTS & EXPLANATIONS

1. (c) : $(10^n - 1)$ is divisible by 11 for even values of n as $10^2 - 1 = 99$, $10^4 - 1 = 9999$, $10^6 - 1 = 999999$ etc., are divisible fay 11.

2. (a) :

$$\begin{array}{cccc} & 2 & 3 & \boxed{4} \\ + & \boxed{4} & 3 & \boxed{7} \\ \hline & 6 & \boxed{7} & 1 \end{array}$$

3. (c) : 7713×8 is divisible by 4 if ifs last two digits is divisible by 4. So, we have $x8$ to be divisible by 4. Therefore, greatest value of x is 8.

4. (d) : We have, $\begin{array}{c} 1\boxed{6} \\ \times \boxed{6} \\ \hline \boxed{9}6 \end{array}$ and $\begin{array}{c} 1\boxed{4} \\ \times \boxed{4} \\ \hline \boxed{5}6 \end{array}$

Since, B-A = 3

∴ Possible values of A and B are 6 and 9.

5. (c) :

6. (a) : If 148101a095 is divisible by 11, then $(1 + 8 + 0 + a + 9) - (4 + 1 + 1 + 0 + 5)$ is either 0 or a multiple of 11
$\Rightarrow (a + 18) - 11$ is either 0 or a multiple of 11
$\Rightarrow a + 7 = 0$ or a multiple of 11
$\therefore a + 7 = 11 \quad \Rightarrow a = 4$

7. (c) : The required number would be the product of three smallest even natural number i.e. $2 \times 4 \times 6 = 48$.

8. (d) :

9. (b) : xy235 is divisible by 3 so sum of its digits is also divisible by 3,
∴ $x + y + 2 + 3 + 5 = x + y + 10$ is divisible by 3 and $x + y < 5$. So possible values of (x, y) are (1, 1) or (2, 0),

10. (c) :

$$\begin{array}{ccc} 1 & \boxed{4} & \boxed{3} \\ + \boxed{5} & \boxed{5} & \boxed{4} \\ \hline 6 & 9 & 7 \end{array}$$

11. (b) : N leaves remainder 3 when divided by 5.
$\Rightarrow (N - 3)$ is divisible by 5.
$\Rightarrow$ One's digit of $N - 3$ is either 0 or 5.
$\Rightarrow$ One's digit of N is either 3 or 8.

12. (d) : 67y19 is divisible by 9 so sum of its digits is also divisible by 9
$6 + 7 + y + 1 + 9 = 23 + y$ is divisible by 9.
So, least possible value of y = 4.

13. (d) :

14. (a) :

$$\begin{array}{cccc} & & \boxed{2} & \boxed{5} \\ \times & & \boxed{2} & 3 \\ \hline & & 7 & 5 \\ + & 5 & 0 & 0 \\ \hline & 5 & 7 & \boxed{5} \end{array}$$

15. (d) : Remainder = 48
∴ Divisor $= 48 \times 5 = 240$
Quotient $= \dfrac{240}{12} = 20$
∵ Dividend = Divisor × Quotient + Remainder
$= 240 \times 20 + 48 = 4800 + 48 = 4848$.

16. (c) :

17. (c) : (i) As, $xyz = 100x + 10y + z$ ...(i)
$yzx = 100y + 10z + x$ ...(ii)

$zxy = -100z + 10x + y$ ...(iii)

Adding (i), (ii) and (iii), we get

$xyz + yzx + zxy = 100x + 10y + z + 100y$

$\qquad +10z + x + 100z + 10x + y$

$\qquad = 111x + 111y + 111z$

$\qquad = 111(x + y + z)$

On dividing by $(x + y + z)$, we get

Quotient = 111.

(ii) ab = 10 a + b and ba = 10 b + a

ab - ba = 10 a + b – (10 b + a)

$= 9a - 9b = 9(a - b)$

On dividing by 3, we get

Quotient $= 3(a - b)$

(iii) Let two digit number be $10x + y$.

On reversing the digits, number becomes $10y + x$.

Sum $= 10x + y + 10y + x = 11x + 11y = 11(x + y)$

Which is always divisible by 11

18. (c) : (P) Since, 213×27 is divisible by 9. So,

$2 + 1 + 3 + x + 2 + 7 = 15 + x$ is divisible by 9.

$\therefore$ x = 3

(Q) $2415x$ is divisible by 6, if it is divisible by both 2 and 3.

$\therefore x = 6$

(R) $23245x$ is divisible by 4 and 3

$\Rightarrow 5x$ is divisible by 4

$\therefore$ Possible values of x are 2, 6

Also, $2 + 3 + 2 + 4 + 5 + x = 16 + x$ is divisible by 3.

$\therefore$ Possible values of x is 2.

(S) We have, 7251×93 is divisible by 11

$\therefore [(7 + 5 + x + 3) - (2 + 1 + 9)]$ is divisible by 11

$\Rightarrow 15 + x - 12 = 3 + x$ is divisible by 11

$\therefore x$ can be equal to 8.

19. (b) : We have AABAA is divisible by 33.

So, it is divisible by both 3 and 11.

$\therefore$ A + B + A - (A + A) = B is divisible by 11.

$\Rightarrow B = 0$

Also, A + A + B + A + A = 4A + B is divisible by 3.

$\Rightarrow 4A$ is divisible by 3 $\qquad (\because B = 0)$

$\Rightarrow A$ is divisible by 3

Hence, possible values of A are 0, 3, 6, 9

But A can't be equal to zero.

$\therefore$ Number of possible 5-digit numbers are 3.

20. (d) :

(i)

$$\begin{array}{r} \boxed{7}\ 8\ 9 \\ \times\ \boxed{2}\ 9 \\ \hline \boxed{7}\ 0\ 4\ \boxed{7} \\ +\ 1\ 5\ \boxed{6}\ \boxed{6}\ 0 \\ \hline \boxed{2}\ \boxed{2}\ \boxed{7}\ 0\ \boxed{7} \\ \hline \end{array}$$

(ii)

$$\begin{array}{r} 4\ 3\ 4\ \boxed{}\ 4 \\ \times\ 3\ 4\ \boxed{} \\ \hline \boxed{1}\ 7\ \boxed{3}\ 7\ 6 \\ +\ \boxed{1}\ \boxed{3}\ 0\ \boxed{3}\ 2\ 0 \\ \hline \boxed{1}\ 4\ 7\ 6\ 9\ 6 \\ \hline \end{array}$$