



ST. LAWRENCE HIGH SCHOOL



A JESUIT CHRISTIAN MINORITY INSTITUTION

SUBJECT :Arithmetic

CLASS 8 STUDY MATERIAL 2

Playing with numbers

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PLAYING WITH NUMBERS

Synopsis

- ◆ **General form of a number:** The general form of a number abc is
 $abc = a \times 100 + b \times 10 + c$.
- ◆ **Divisibility Rules:**

Divisibility factor	Conditions	Example
2	The last digit is 0 or an even number.	9340 3456 0 (Last digit 0) 6 (Last digit is an even number) \therefore 9340 & 3456 are divisible by 2.
3	The sum of all the digits of the number is divisible by 3.	4746 $(4 + 7 + 4 + 6) \div 3$ $= 21 \div 3 = 7$ \therefore 4746 is divisible by 3.
4	The number formed by last two digits of the number is divisible by 4 or are 00.	616 8900 $16 \div 4 = 4$ 00 (Last two digits are 00) \therefore 616 and 8900 are divisible by 4.
5	The last digit of the number is 0 or 5.	6041 <u>5</u> 7629 <u>0</u> 5 (Last digit is 5) 0 (Last digit is 0) \therefore 60 415 and 76 290 are divisible by 5.
6	The last digit is 0 or an even number, and the sum of all the digits of the number is divisible by 3.	7596 $(7 + 5 + 9 + 6) \div 3$ $= 27 \div 3 = 9$ \therefore 7 596 is divisible by 6.
7	The difference between the number formed by the digit/digits in front and the doubled value of the last digit is 0 (or) is divisible by 7.	406 8722 815 406 is divisible by 7 because $40 - (6 \times 2) = 28$ 28 is divisible by 7. \therefore 406 is divisible by 7. 8722 is divisible by 7 because $872 - (2 \times 2) = 868$ 868 is divisible by 7. \therefore 8722 is divisible by 7. 815 is not divisible by 7 because $81 - (5 \times 2) = 71$ 71 is not divisible by 7. \therefore 815 is not divisible by 7.
8	The number formed by the last three digits of the number is divisible by 8.	3568 $568 \div 8 = 71$ \therefore 3 568 is divisible by 8.

Divisibility factor	Conditions	Example
9	The sum of all the digits of the number is divisible by 9.	6048 $(6 + 0 + 4 + 8) \div 9 = 18 \div 9 = 2$ $\therefore 6\ 048$ is divisible by 9.
10	The last digit is 0.	931 <u>0</u> 0 (Last digit is 0) $\therefore 9\ 310$ is divisible by 10.
11	The difference of the sum of the digits in even places and the sum of the digits in odd places is 0 or is divisible by 11.	1364 $((3 + 4) - (1 + 6)) = 0$ 3729 $((7 + 9) - (3 + 2)) = 11$ $\therefore 1364$ and $3\ 729$ are divisible by 11. 25176 $((5 + 7) - (2 + 1 + 6)) = 3$ $\therefore 25176$ is not divisible by 11.
12	The number is divisible by both 3 and 4.	648 $(6 + 4 + 8 = 18$ and also $48 \div 4 = 12)$ $\therefore 648$ is divisible by 12. 916 $(9 + 1 + 6 = 16$ and $16 \div 4 = 4$ $\therefore 916$ is not divisible by 12 as it is not divisible by 3.

QUESTION BANK

- 18 Z is a three digit even number less than 200, and more than 190 that is divisible by 7. Find Z.
(A) 196 (B) 193 (C) 199 (D) 197
- 19 Identify the even prime number.
(A) 132 (B) 102
(C) 284 (D) 2
- 20 How many prime numbers are there between 100 and 200?
(A) 25 (B) 19 (C) 21 (D) 20
- 21 Identify a factor of 261111.
(A) 8 (B) 3 (C) 4 (D) 2
- 22 30 is expressed in terms of prime numbers. Which of the expressions is incorrect?
(A) $30 = 12 + 18$ (B) $30 = 11 + 19$
(C) $30 = 13 + 17$ (D) $30 = 2 \times 3 \times 5$
- 23 Identify the incorrect statement.
(A) The sum of two odd numbers is always odd.
(B) The product of two odd numbers is always odd.
(C) The sum of two even numbers is always even.
(D) The product of two even numbers is always even.
- 24 $x^2 + x + 11$ is a prime number. Which of the following is not a value of 'x'?
(A) 1 (B) 3 (C) 4 (D) 2
- 25 If $a - b$ is a multiple of 7, which of the following is also a multiple of 7?
(A) $b - a$ (B) ab
(C) $a + b$ (D) $\frac{a+b}{2}$
- 26 The units digit of a two digit number is 3 times the tens digit. If the digits are reversed, the resulting number is 36 more than the original number. What is the original number?
(A) 26 (B) 36 (C) 93 (D) 39
- 27 If 'r' and 's' are both odd integers, which of the following must be an even integer?
(A) $\frac{r+s}{2}$ (B) $2rs$ (C) $\frac{rs}{2}$ (D) $3rs$
- 28 When 'n' is divided by 5, the remainder is 4. When 'n' is divided by 4, the remainder is 3. If $0 < n < 100$, what is a possible value of 'n'?
(A) 9 (B) 14 (C) 19 (D) 24
- 29 If 'n' is an even integer, which of the following must be an odd integer?
(A) $3n - 2$ (B) $n - 2$
(C) $3(n + 1)$ (D) $\frac{n}{3}$
- 30 If $a = 4b + 26$, and 'b' is a positive integer, which of the following does not divide 'a'?
(A) 2 (B) 5 (C) 4 (D) 6
- 31 If a, b, c and d are consecutive multiples of 5 and $a < b < c < d$, what is the value of $(a - c)(d - b)$?
(A) 100 (B) -100
(C) 25 (D) -25
- 32 The remainder when 'x' is divided by 5 equals the remainder when 'x' is divided by 4. Which of the following could not be a value of 'x'?
(A) 20 (B) 24 (C) 21 (D) 22
- 33 If 'q' is an integer between 50 and 70 which can be expressed as $7j + 3$, for some integer j what is a possible value of 'q'?
(A) 59 (B) 53 (C) 64 (D) 68
- 34 What is the remainder when the sum of three consecutive even integers is divided by 6?
(A) 4 (B) 1 (C) 0 (D) 3
- 35 How many numbers between 1 and 200 are multiples of 5 and are divisible by 3?
(A) 100 (B) 50 (C) 95 (D) 93

- 36 Find the value of P, Q, R and S respectively.

$$\begin{array}{r} P Q R S \\ \times 9 \\ \hline S R Q P \end{array}$$

(A) 1, 0, 8, 9 (B) 8, 1, 0, 9
(C) 1, 0, 9, 8 (D) 1, 9, 0, 8

- 37 Find the value of P, Q, R and S respectively.

$$\begin{array}{r} R S \\ Q R S \\ + Q P R S \\ \hline 1 9 8 9 \end{array}$$

(A) 6, 1, 7, 3 (B) 1, 7, 3, 6
(C) 7, 1, 6, 3 (D) 1, 6, 3, 7

- 38 Find $D + E + F$ from the following.

$$D E F \times D = 10 D F$$

(A) 12 (B) 4 (C) 3 (D) 5



Previous Contest Questions

- 1 X is the sum of the digits of a 3 digit number subtracted from the number. Which of the following is true?
(A) X is divisible by 5.
(B) X is not divisible by 6.
(C) X is divisible by 9.
(D) X is not divisible by 9.
- 2 If $X + X + X = YX$, find the respective values of X and Y.
(A) 6, 1 (B) 5, 1 (C) 1, 5 (D) 1, 6
- 3 Which of the following is the usual form of $100 \times 8 + 10 \times 5 + 9$?
(A) 985 (B) 895 (C) 809 (D) 859
- 4 Which of the following integers has the most divisors?
(A) 88 (B) 91 (C) 99 (D) 101
- 5 Which of the following numbers is exactly divisible by 99?
(A) 114345 (B) 135792
(C) 3572404 (D) 913464
- 6 Which is the expanded form of 407?
(A) $4 \times 100 + 7 \times 10$
(B) $4 \times 100 + 0 \times 10 + 7 \times 1$
(C) $4 \times 10 + 7$
(D) $4 \times 10 + 0 \times 10 + 7 \times 1$
- 7 In the product $BA \times B3 = 57A$, what are the respective positional values of B and A?
(A) 6, 7 (B) 5, 2 (C) 7, 4 (D) 2, 5
- 8 In which of the following pairs of numbers is it true that their sum is 11 times their product?
(A) 1, 1/11 (B) 1, 1/10
(C) 1, 1/12 (D) 1, 10
- 9 X is a prime number greater than 50 but less than 70. What is the greatest possible value of X?
(A) 53 (B) 61 (C) 67 (D) 59
- 10 M is a composite number between 70 and 90. Which of the following is the greatest possible value of M?
(A) 70 (B) 88 (C) 72 (D) 90
- 11 Which of the following is true?
(A) 7 is the least composite number.
(B) 53 is the only prime number between 50 and 60.
(C) 97 is the only prime number between 90 and 100.
(D) 1 is the least prime number.
- 12 Which of the given statements is false?
(A) 47 is the largest prime between the numbers 1 and 50.
(B) 89 is the only prime between 85 and 95.
(C) 99 is the largest composite number less than 100.
(D) There are 10 prime numbers between 1 and 20.

SOLUTIONS

Multiple Choice Questions

- (C) The last digit is 5, the number is divisible by 5.
Since $311636 - 10 = 311626 + 7 = 44568$, the number is divisible by 7 also.
- (D) A number divisible by 3 and 4 is divisible by 12.
- (A) Adding the digits at odd places of the given number $653 \div 47$, we get 13. Now if the number is divisible by 11, the sum of digits at even places should also be 13, so that $13 - 13 = 0$ is divisible by 11.
We have $7 + * + 5 = 13$.
 $\therefore * = 13 - 12 = 1$ is the required value.
- (D) 1001 is divisible by 13, as $1001 = 13 \times 77$.
- (A) 6. (B) 7. (A) 8. (A)
- (B) The prime number after 32 is 37 which is got by adding 5 to 32.
- (C) $153 = 3 \times 51$. So, 153 is not prime.

Previous Contest Questions

- (C) Consider an example 452
 $4 + 5 + 2 = 11$ is the sum of the digits.
 $X = 452 - 11 = 441$
 $4 + 4 + 1 = 9$ is divisible by 9.
So, option (C) is correct.
- (B) $X + X + X = YX$
Consider 5, 1 for the respective values of X and Y.
Then $5 + 5 + 5 = 15$ is correct.
- (D) $100 \times 8 + 10 \times 5 + 9 = 859$
- (A) 57. (D) 6. (B) 7. (D) 8. (B)
- (C) The prime numbers that lie between 50 and 70 are 53, 59, 61 & 67.
Therefore, the greatest possible value of X is 67.
- (B) The composite numbers between 70 and 90 are 72, 74, 75, 76, 77, 78, 80, 81, 82, 84, 85, 86, 87 and 88.
Thus, $M = 88$.
- (C) The only prime number between 90 and 100 is 97.
- (D)

- (B) $147 = 7 \times 21$ is a composite number.
- (D) The prime numbers between 30 and 60 are 31, 37, 41, 43, 47, 53 and 59. The greatest of these is 59.
- (D) The statement in option (D) is true according to the test of divisibility by 8.
- (C) According to the problem, a five-digit number between 10000 and 10010 divisible by 5 is 10005.
- (B) $672 \div 8 = 84$
 $\therefore 505672$ is a multiple of 8.
- (B) 17. (D) 18. (A) 19. (D)
- (C) The prime numbers between 100 and 200 are 101, 103, 107, 109, 113, 127, 131, 137, 139, 149, 151, 157, 163, 167, 173, 179, 181, 191, 193, 197 and 199 which are 21 in number.
- (B) 22. (A) 23. (A)
- (B) For $x = 3$, $x^2 + x + 11 = 9 + 3 + 11 = 33$ is not a prime number.
- (A) 26. (A) 27. (B) 28. (C)
- (C) Consider $n = 10$ (Even)
 $\Rightarrow 3(n+1) = 3(11) = 33 \rightarrow$ Odd
- (C) $a = 4b + 26$
Consider $b = 1$. Then $a = 4(1) + 26 = 30$, which is divisible by 2, 5 and 6, but not 4.
Hence option (C) is the answer.
- (B) 32. (B) 33. (A) 34. (C) 35. (D)
- (A) Consider $P = 1$ and $S = 9$.
Then $\begin{array}{r} 1\ Q\ R\ 9 \\ \times 9 \\ \hline 9\ R\ Q\ 1 \end{array}$
 $Q = 0$ (else there will be regrouping in the thousands place) and $R = 8$.
 $\begin{array}{r} 1\ Q\ R\ 9 \\ \times 9 \\ \hline 9\ R\ Q\ 1 \end{array}$
So, $\begin{array}{r} 1\ Q\ R\ 9 \\ \times 9 \\ \hline 9\ R\ Q\ 1 \end{array}$ is correct.
- (C) 38. (A)

SELF ASSESSMENT EXERCISE

MATHEMATICAL REASONING

- 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
- The values of A and B in the given addition respectively are _____.
 (A) 4, 7
 (B) 7, 4
 (C) 5, 6
 (D) 6, 5

$$\begin{array}{r} 23A \\ + A3B \\ \hline 6B1 \end{array}$$
- The greatest value that must be given to x so that the number $7713x8$ is divisible by 4 is _____.
 (A) 1 (B) 6
 (C) 8 (D) 7
- If $\begin{array}{r} 1A \\ \times A \\ \hline B6 \end{array}$, 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
- 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
- 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
- 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
- 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
- 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)
- If $\begin{array}{r} 1AB \\ + CCA \\ \hline 697 \end{array}$ 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 \overline{AB} , then the value of B is _____.

$$\begin{array}{r} \times A3 \\ \hline 57B \end{array}$$

 (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 $14N + 2$ 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 $213x27$ is divisible by 9, then $x =$ | | (i) 2 |
| (Q) If $2415x$ is divisible by 6, then $x =$ | | (ii) 8 |
| (R) If $23245x$ is divisible by 4 and 3, then $x =$ | | (iii) 3 |
| (S) If $7251x93$ is divisible by 11, then $x =$ | | (iv) 6 |
- (A) (P) \rightarrow (iii); (Q) \rightarrow (ii); (R) \rightarrow (iv); (S) \rightarrow (i)
 (B) (P) \rightarrow (ii); (Q) \rightarrow (iv); (R) \rightarrow (i); (S) \rightarrow (iii)
 (C) (P) \rightarrow (iii); (Q) \rightarrow (iv); (R) \rightarrow (i); (S) \rightarrow (ii)
 (D) (P) \rightarrow (ii); (Q) \rightarrow (iii); (R) \rightarrow (i); (S) \rightarrow (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.

$$\begin{array}{r}
 \text{(i)} \quad \begin{array}{r}
 A83 \\
 \times C9 \\
 \hline
 A04A \\
 +15BB0 \\
 \hline
 CCA0A
 \end{array}
 \end{array}$$

$$\begin{array}{r}
 \text{(ii)} \quad \begin{array}{r}
 43A4 \\
 \times 3A \\
 \hline
 B7C76 \\
 +BC0C20 \\
 \hline
 B47696
 \end{array}
 \end{array}$$

- (i)
- (A) 2, 6, 7
 (B) 6, 7, 2
 (C) 7, 5, 2
 (D) 7, 6, 2

- (ii)
- 9, 5, 2
 4, 3, 1
 9, 2, 5
 4, 1, 3



Darken your choice with HB Pencil

1.	(A) (B) (C) (D)	6.	(A) (B) (C) (D)	11.	(A) (B) (C) (D)	16.	(A) (B) (C) (D)
2.	(A) (B) (C) (D)	7.	(A) (B) (C) (D)	12.	(A) (B) (C) (D)	17.	(A) (B) (C) (D)
3.	(A) (B) (C) (D)	8.	(A) (B) (C) (D)	13.	(A) (B) (C) (D)	18.	(A) (B) (C) (D)
4.	(A) (B) (C) (D)	9.	(A) (B) (C) (D)	14.	(A) (B) (C) (D)	19.	(A) (B) (C) (D)
5.	(A) (B) (C) (D)	10.	(A) (B) (C) (D)	15.	(A) (B) (C) (D)	20.	(A) (B) (C) (D)

ANSWERS: 1-C, 2-A, 3-C, 4-D, 5-C, 6-A, 7-C, 8-D, 9-B, 10-C, 11-B, 12-D, 13-D, 14-A, 15-D, 16-C, 17-C, 18-C, 19-B, 20-D

INDRANIL GHOSH

