CHAPTER -2

PROPERTIES OF WHOLE NUMBERS

When we look into various operations on numbers closely , we notice several properties of whole numbers. These properties help us to understand the numbers better. Moreover , they make calculations under certain operations very simple.

Closure *Property* of Addition and Multiplication

The sum of any two whole numbers is a whole number.

Examples 7 + 4 = 11

The product of any two whole numbers is a whole number.

Examples 5 x 6 = 30

Whole numbers are closed under addition and multiplication.

The whole numbers are not closed under subtraction. Why ?

7 – 5 = 2 whole number

10 – 12 = ? not a whole number

The whole numbers are not closed under division. Why ?

6 ÷ 3=2 , a whole number

10 ÷ 3 = will be a decimal number not a whole number.

Division by Zero (0)

We cannot divide any number by 0 because division by 0 is not defined.

Commutative Property of Addition and Multiplication

Addition and multiplication are **commutative :** changing the order of two numbers being added or multiplied does not change the result.

Examples 100 + 8 = 8+ 100 = 108

100 x 8 = 8 x 100 = 800

Associative Property

Addition and multiplication are **associative :** Multiplication and addition numbers can be done in any order.

Example (2 + 10) + 6 = 2 + (10 +6)= 18

(2 x10) x 6 = 2 x (10 x 6) = 120

Distributive Property

3 x (4 + 1) = 3 x 5 = 15

Also, 3 x 4 + 3 x1= 15

This is known as **distributive of multiplication over addition.**

Exercise 2.2

1. **Find the sum by suitable rearrangement:**
   a. **837 + 208 + 363**
   This sum could be solved either using associative property or commutative property.
   But whichever property you apply in solving the sum, you have to mention the same with the sum.
      i. **Applying associative property-**
      837 + (208 + 363) = 837 + 571= 1,408 Ans
      ii. **Applying commutative property-**

LHS(left hand side)		**RHS(right hand side)**
837 + 208 + 363		**837 + 363 + 208**
1,408		**1,408**
RHS	**=**	**LHS**

   b. **1962 + 453 + 1538 + 647**
      i. **Applying associative property-**
      (1962 + 1538)+(453 + 647) = 3,500 + 1,100 = 4,600
      ii. **Applying commutative property-**

LHS(left hand side)		**RHS(right hand side)**
1962 + 453+ 1538 + 647		**1962 + 1538 + 453 + 647**
4,600		**4,600**
LHS	**=**	**RHS**

2. **Find the product by suitable rearrangement:**
   a. **2 x 1768 x 50**
      i. **Applying associative property**
      1768 x (2 x 50) = 1768 x 100 = 176800
      ii. **Applying commutative property**

LHS		**RHS**
2 x 1768 x 50		**1768 x 2 x 50**
3,536 x 50		**1768 x 100**
1,76,800		**1,76,800**
LHS	**=**	**RHS**

   b. **4 x 166 x 25**
      i. **Applying associative property**
      166 x(4 x 25) = 166 x 100 = 16,600

ii. Applying commutative property

LHS		RHS
4 x 166 x 25		166 x 4 x 25
664 x 25		166 x 100
16,600		16,600
LHS	=	RHS

c. 8 x 291 x 125

i. Applying associative property

291 x (8 x 125) = 291 x 1,000 = 2,91,000

ii. Applying commutative property

LHS		RHS
291 x 8 x 125		8 x 291 x 125
291 x 1,000		2,328 x 125
2,91,000		2,91,000
LHS	=	RHS

d. 125 x 40 x 8 x 25

i. Applying associative property

(125 x 40) x (8 x 25) = 5,000 x 200 = 10,00,000

ii. Applying commutative property

LHS		RHS
125 x 40 x 8 x 25		125 x 25 x 8 x 40
5,000 x 200		3,125 x 320
10,00,000		10,00,000
LHS	=	RHS

PRACTISE SUMS

a. 625 x 279 x 16

b. 285 x 5 x 60

3. Find the value of the following-

a. 297 x 17 + 297 x 3

Applying distribute property

297 x (17 + 3)

297 x 20 = 5,940

b. 81265 x 169 – 81265 x 69

Applying distributive property

81265 x (169 – 69) = 81265 x 100 = 81,26,500

c. **3845 x 5 x 782 + 769 x 25 x 218**

   Applying distributive property

   3845 x 5 x 782 + 769 x 5 x 5 x 218

   3845 x 5 x 782 + 3845 x 5 x 218

   19,225 x 782 + 19,225 x 218

   19,225 x (782 + 218) = 19,225 x 1,000 = 1,92,25,000

   PRACTISE SUMS

   a. **54279 x 92 + 8 x 54279**
   b. **126 x 55 + 126 x 45**

4. **Find the product using suitable properties-**
   a. **738 x 103**

      Applying distributive property

      738 x (100 + 3) = 738 x 100 + 738 x 3 = 73800 + 2214= 76,014
   b. **1005 x 168**

      Applying distributive property

      (1000 + 5) x 168 = 1000 x 168 + 5 x 168

      = 1,68,000 + 840= 1,68,840

   PRACTISE SUMS

   a. **854 x 102**
   b. **258 x 1008**

Word Problems

5. **A taxi driver filled his car petrol tank with 40 litres of petrol on Monday. The next day , he filled the tank with 50 litres of petrol. If the petrol costs Rs 44 per litre, how much did he spend in all on petrol?**

   Solution

   Petrol filled in car tank on Monday 40 litres.

   Petrol filled in car tank on Tuesday 50 litres.

   Cost of 1 litre petrol is Rs 44.

   Total expenditure on petrol –

   44 x (40 + 50)= 44 x 90 = Rs 3,960
6. **A vendor supplies 32 litres of milk to a hotel in the morning and 68 litres of milk in the evening. If the milk costs Rs 15 per litre, how much money is due to the vendor per day?**

Solution

Quantity of milk supply in the morning 32 litres

Quantity of milk supply in the evening 68 litres

Cost of 1 litre of milk is Rs 15

Amt. paid by vendor per day –

15 x (32 + 68)= 15 x 100 = Rs. 1,500

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Exercise 2.3

1. If the product of two whole numbers is zero, can we say that one or both of them will be zero ?Justify through examples.

   Solution

The product of two numbers will be zero if either multiplicand or multiplier is zero.

Example- 2 x 0 =0

0 x 5 = 0

2. If the product of two whole numbers is 1, can we say that one or both of them will be 1? Justify through examples.

   Solution

   Any number when multiplied by one the product will be the number itself.

   Example- 2x1=2

   12 x 1 = 12

   But, 1 x 1 = 1 gives the result 1.

3. Find using distributive property:

   a. 728 x 101

      728 x (100 + 1)= 728 x100 + 728 x1

      = 72800 + 728=73,528

b. 4275 x 125
=4275 x (100 + 20 + 5)
=4275 x 100 + 4275 x 20 + 4275 x 5
=427500 + 85, 500 + 21,375
=5,34,375

c. 504 x 35
= 504 x (10 + 10 + 10 + 5)
= 504 x 10 + 504 x10 + 504 x 10 + 504 x 5
= 5040 + 5040 + 5040 + 2,520
= 17,640

CHAPTER- 3

PLAYING WITH NUMBERS

FACTOR- A factor of a number is an exact divisor of the number.

Example - 3 x 2 = 6 here 3 & 2 are factors of 6. When you divide 6 by any of its factors either 3 or 2 the remainder will be zero.

MULTIPLE – A multiple is the product of two numbers.

Referring to above example 3 x 2 = 6 if 3 & 2 are factors then 6 is the multiple.

PROPERTIES OF FACTORS-

1. 1 is a factor of every number.
2. Every number is a factor of itself.
3. Every factor of a number is an exact divisor of that number.
4. Every factor is less than or equal to the given number.
5. Number of factors of a given number are finite.

PROPERTIES OF MULTIPLES-

1. Every multiple of a number is greater than or equal to that number.
2. The number of multiples of a given number is infinite.
3. Every number is a multiple of itself.

Definitions –

Perfect number- A number for which sum of all its factors is equal to twice the number is called a perfect number.

Example The factors of 6 are 1 ,2 ,3, and 6. Also , 1+2+3+6=12 and 12 = 3 x 6 therefore 12 is a perfect number.

Prime numbers- The numbers other than 1 whose only factors are 1 and the number itself are called Prime numbers.

Example - 2 ,3, 5, 7, 11 etc. are prime numbers. As they all have only two factors i. e. 1 and the number itself.

3= 3 x 1 in no other table you get 3.

Composite number- Numbers having more than two factors are called composite numbers.

Example- 15 = 1 x15

3 x 5 here 15 has more than two factors i.e. 1 and number itself also 3 and 5.

Note- 1 is neither prime nor composite number.

Even numbers and Odd numbers-

The numbers that are divisible by 2 are called even numbers. For example 2 , 4 , 6 , 8, ……and so on. The rest of the numbers 1, 3,5,7,9….are odd numbers.

Note- 2 is the smallest prime number.

Every prime number except 2 is odd.

Twin prime numbers- Two prime numbers whose difference is 2 are called twin primes.

Example- 3 and 5 are prime numbers and their difference is 2.

5 and 7 are prime numbers and their difference is 2.

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

<u>EXERCISE – 3.1</u>

1. Write all the factors of the following numbers:

a. 24

1 x 24

2 x 12

3 x 8

6 x 4

Factors are- 1 ,2, 3 ,4, 6,8, 12 and 24.

b. 15

1 x 15

3 x 5

Factors are - 1, 3 , 5 and 15.

c. 21

1 x 21

3 x 7

Factors are – 1,3,7 and 21.

d. 27

1 x 27

3 x 9

Factors are – 1 , 3 , 9 and 27.

Practise sums-

a. 12 b. 20 c. 18 d. 23 e. 36

2. Write first five multiples of :

a. 5

1^{st} multiple - 5 x 1 = 5

2^{nd} multiple- 5 x 2= 10

3^{rd} multiple- 5 x 3= 15

4^{th} multiple- 5 x 4= 20

5^{th} multiple- 5 x 5= 25

b. 8

1st multiple- 8 x 1 = 8

2nd multiple- 8 x 2= 16

3rd multiple- 8 x 3 = 24

4th multiple- 8 x 4 = 32

5th multiple- 8 x 5= 40

PRACTISE SUMS

a. 9 b. 12 c. 7

EXERCISE 3.2

1. What is the sum of any two

a. **Odd numbers**- 3 + 7= 10

9 + 11=20

Always an even number.

b. **Even numbers**- 4 + 6 = 10

8 + 10= 18

Always an even number.

2. State whether the following statements are True or False:

a. The sum of three odd numbers is even. False

3 + 5 + 7=15

b. The sum of two odd numbers and one even number is even.True 3 + 5 +6=14

c. The product of three odd numbers is odd. True

3 x 5 x7 = 105

d. If an even number is divided by 2, the quotient is always odd.False 122 ÷ 2 = 61 , 124 ÷ 2= 62

e. All prime numbers are odd. False

2 is not an odd number.

f. Prime numbers do not have any factors. False
   All prime numbers have atleast two factors.
g. Sum of two prime numbers is always even.False
   2 + 3 = 5 which is odd
h. 2 is the only even prime number. True
i. All even numbers are composite numbers.False
   2 is even but prime number.
j. The product of two even numbers is always even.True

3. The numbers 13 and 31 are prime numbers. Both these numbers have same digits 1 and 3. Find such pairs of prime numbers upto 100.

Pairs of prime numbers are-

17 and 71

37 and 73

79 and 97

4. Write down separately the prime and composite numbers less than 20.

Prime numbers- 2 , 3, 5,7,11,13,17 and 19.

Composite numbers- 4 , 6, 8, 9,10,12, 14,15,16 and 18.

5. What is the greatest prime number between 1 and 10.

The greatest prime number is 7.

6. Express the following as the sum of two odd primes-

a. 44 = 37 + 7
b. 36 = 31 + 5

PRACTISE SUMS

a. 24 b. 18

7. Give three pairs of prime numbers whose difference is 2.

3 and 5

5-3 = 2

5 and 7

7 - 5= 2

11 and 13

13 – 11 = 2

8. Write seven consecutive composite numbers less than 100 so that there is no prime number between them.

The seven consecutive composite numbers are-

90,91,92,93,94,95 and 96.

9. Express each of the following numbers as the sum of three odd primes:

a. 21

13 + 5 + 3

b. 53

41 + 7+ 5

PRACTISE SUMS

a. 31 b. 61

10. Write five pairs of prime numbers less than 20 whose sum is divisible by 5.

3 + 2=5

2 + 13=15

7 + 13= 20

17 + 3 = 20

11 + 19= 20

11. Fill in the blanks-

a. A number which has only two factors is called a prime number.

b. A number which has more than two factors is called a composite number.

c. 1 is neither prime nor composite number.

d. The smallest prime number is 2.

e. The smallest composite number is 4.

f. The smallest even number is 2.

<u>Test of Divisibility</u>

Divisibility by 2- A number is divisible by 2 if its digit at ones place is an even number.

Example – 412369<u>2</u> the underline digit stands at ones place and it is even. Therefore the above number is divisible by 2.

77745994 the digit at ones place is even. Therefore the given number is divisible by 2.

Divisibility by 3- If the sum of the digits of a number is multiple of 3 then the number is divisible by 3.

Example- 4123692 the sum of the digits 4+1+2+3+6+9+2=27

27 is multiple of three, therefore the given number is divisible by 3.

77745994 the sum of the digits 7+7+7+4+5+9+9+4=50

50 is not a multiple of 3, therefore the given number is not divisible by 3.

Divisibility by 4- If the last two digits(i.e. tens and ones place digits) of the given number is a multiple of 4 then the number will be divisible by 4.

Example - 312 last two digits (i.e. tens and ones) place makes 12. 12 is completely divisible by 4. Therefore the given number is divisible by 4.

94328 tens and ones place digits make number 28. 28 is completely divisible by 4. Therefore the given number is divisible by 4.

Divisibility by 5- If the last digit(i.e. ones place digit) of the given number is 5 or 0 then the given number will be divisible by 5.

Example- 4505 is divisible by 5 because digit at ones place is 5.

678990 is divisible by 5 because the digit at ones place is 0.

Divisibility by 6- If the given number will satisfy the divisibility rules of 2 and 3 both then the number will be considered to be divisible by 6.

Example 138- is divisible by 2 as the digit at ones place is even.

1+3+8 = 12 which is a multiple of 3.

Therefore 138 is divisible by 6.

3645 – is not div**isible** by 2 as the digit at ones place is not even.

3+6+4+5 = 18 which is a multiple of 3 . therefore

3645 is divisible by 3.

But 3645 is not divisible by 6 , as 3645 is not satisfying the divisibility by 2.

Divisibility by 7- First take the last digit of the number, and double it. Then subtract the new number from the rest of the original number. If the result is divisible by 7 then the original number will be divisible by 7.

Example 6881 ones place digit is 1. Double of ones place digit is 1 x2= 2 now 688 – 2 = 686 ÷ 7 = 98 therefore 6881 is divisible by 7.

Divisibility by 8- A number is divisible by 8, if the number formed by the last three digits is divisible by 8.

Example 39216 the last three digits make the number 216.

216 is divisible by 8. Therefore 39216 is divisible by 8.

Divisibility by 9- If the sum of all the digits of a number is divisible by 9, then the number itself is divisible by 9.

Example 5283 5+2+8+3 = 18 18 is divisible by 9 therefore 5283 is divisible by 9.

Divisibility by 10- If a number has 0 in the ones place then it is divisible by 10.

Divisibility by 11- **H T O**

3 0 8

Underlined digits are odd place digits.

Sum of odd place digits 3+8 = 11

Sum of even place digits in this case is 0

Difference between the sum of odd and even places digits –

11 – 0 = 11 is divisible by 11.

Therefore 308 is divisible by 11.

Th	H	T	O
1	**3**	**3**	**1**

Sum of odd place digits 3 + 1 = 4

Sum of even place digits 1 + 3= 4

Difference between the sum of odd and even places digits-

4 – 4 = 0 therefore 1331 is divisible by 11.

Find the difference between the sum of the digits at odd places (from the right) and the sum of the digits at even places (from the right) of the number. In the difference is either 0 or divisible by 11, then the number is divisible by 11.

Exercise 3.3

ASSIGNMENT

THIS EXERCISE IS BASED ON DIVISIBILITY TEST, RULES ARE ALREADY GIVEN TO YOU ALL WITH EXAMPLE. SO YOU ALL HAVE TO SOLVE THIS EXERCISE AS ASSIGNMENT WORK AND SUBMIT WHEN SCHOOL WILL REOPEN.

1. **Using divisibility tests, determine which of the following numbers are divisible by 4 ; by 8;**

   a. 572   b. 726352   c. 5500   d. 6000   e. 12159
   f. 14560   g. 21084   h. 31795072   i. 2150

2. **Using divisibility tests, determine which of following numbers are divisible by 6;**

   a. 297144   b. 1258   c. 4335   d. 61233   e. 901352

   f.438750   g. 1790184   h. 12583   i. 639210   j. 17852

3. Using divisibility tests, determine which of the following numbers are divisible by 11;

a. 5445   b. 10824   c. 7138965   d. 70169308   e. 10000001

f. 901153

4. Write the smallest digit and the greatest digit in the blank space of each of the following numbers so that the number formed is divisible by 3;

a. __6724   b. 4765___2

5. Write a digit in the blank space of each of the following numbers so that the number formed is divisible by 11;

a. 92__389   b. 8__9484

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