HICON SERIES

CLASS 4 LESSON 3

MATHEMATICS
MULTIPLES AND FACTORS

CLICK HERE TO ACTIVATE

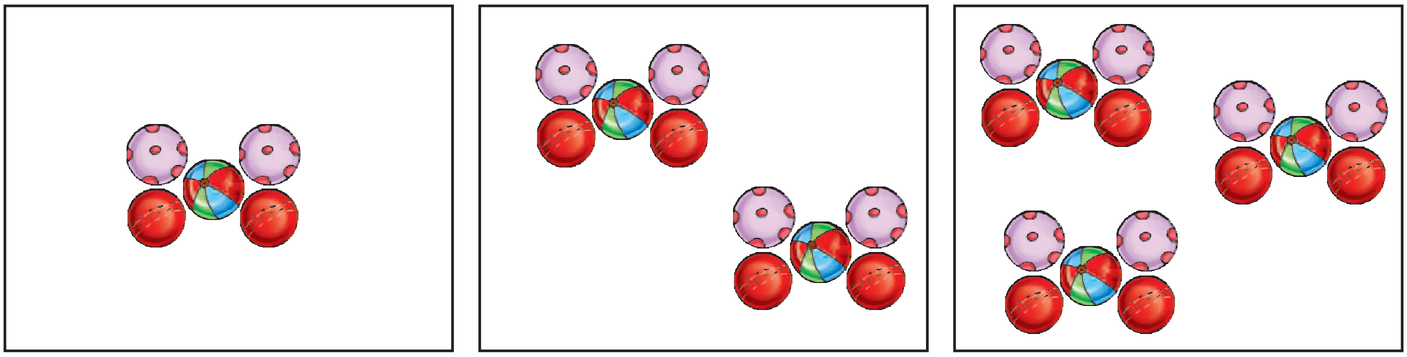
LESSON
PART 5

3

MULTIPLES AND FACTORS

READY ... STEADY

Multiply and find product.



$1 \times 5 =$ ________ $2 \times 5 =$ ________ $3 \times 5 =$ ________

The products obtained by you are the *multiples* of 5. The number 5 is the *factor* of all the products.

In this chapter, you will learn about multiples and factors.

MULTIPLES

Multiple is a number that is a product of two given numbers. To get the multiples of a given number, the number should be multiplied by 1, 2, 3, 4, ...

The multiples of 2 are :

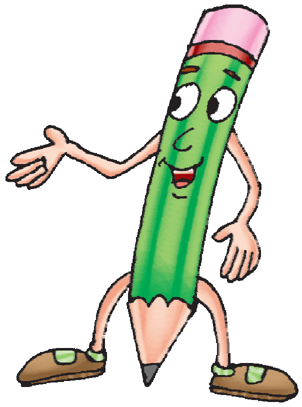
2, 4, 6, 8, 10, 12, 14, 16 .... and so on

The multiples of 3 are :

3, 6, 9, 12, 15, 18, 21, 24 .... and so on

The multiples of 4 are :

4, 8, 12, 16, 20, 24, 28 .... and so on



Properties of multiples

- A number is a multiple of itself.

  $3 \times 1 = 3$ $12 \times 1 = 12$ $35 \times 1 = 35$

  Here 3 is a multiple of 3 and 1.

  12 is a multiple of 12 and 1.

  35 is a multiple of 35 and 1.

- Every number is a multiple of 1.

  $3 \times 1 = 3$

  Here 3 is a multiple of 3 and 1.

- A multiple of a number is greater than or equal to the number.

  $1 \times 24 = 24$ $2 \times 12 = 24$ $3 \times 8 = 24$ $4 \times 6 = 24$

  This shows that 24 is a multiple of 1, 2, 3, 4, 6, 8, 12 and 24.

  It is greater than 1, 2, 3, 4, 6, 8 and 12. It is equal to 24.

- A number has an uncountable number of multiples. There is no largest multiple of a number.

  You can go on multiplying 3 by higher and higher numbers to get more and more multiples. This will never end!

Exercise 3.1

A. Fill in the blanks.

1. 12 is a multiple of 3. It is also a multiple of 1, 2, ____, _____, and _____ .
2. 15 is a multiple of _____, _____, _____ and _____ .
3. The number _____ is a multiple of both 5 and 6.
   (*Hint* : Multiply 5 and 6 to get the multiple.)
4. The number _____ is a multiple of both 11 and 12.
5. The number _____ is a multiple of 2, 3 and 5.
6. The smallest multiple of 21 is _____ .
7. Divide the multiple of a number by the number. The remainder will always be _____ .

Finding multiples of a number

To find the multiples of a number, multiply the number by 1, 2, 3, 4, 5, ...

Example 1: The first 5 multiples of 9 are :

$9 \times 1 = 9 \quad 9 \times 2 = 18 \quad 9 \times 3 = 27 \quad 9 \times 4 = 36 \quad 9 \times 5 = 45$

Example 2: Check if 128 is a multiple of 12.

Solution :

Divide 128 by 12.

$128 \div 12 = 10$, remainder 8

Since there is a remainder, 128 is not a multiple of 12.

```
      1 0
12 ) 1 2 8
    -1 2 ↓
       0 8
      - 0
         8
```

Exercise 3.2

A. Find the first 5 multiples of the following.

1. 7 2. 9 3. 10 4. 12 5. 15 6. 20 7. 25

B. Check if the first number is a multiple of the second number.

1. 56, 7 2. 64, 8 3. 73, 9 4. 10, 10 5. 25, 1 6. 65, 5

C. Write the multiples of the following.

1. Multiples of 6 that are greater than 40 and smaller than 60.
2. Multiples of 15 that are smaller than 50.
3. Multiples of 20 that are between 75 and 125.
4. Multiples of 100 that are between 0 and 150.

D. Ring the numbers that are multiples of both 1 and 2.

1, 2, 4, 5, 8, 10, 15, 16, 18, 20

E. Ring the numbers that are multiples of both 3 and 5.

1, 2, 3, 4, 5, 9, 12, 15, 18, 20, 30, 36, 60, 75, 85

Common multiples

Consider the multiples of 5 and 10.

Multiples of 5 : 5, 10, 15, 20, 25, 30, 35, 40

Multiples of 10 : 10, 20, 30, 40, 50, 60, 70, 80

We can observe that 10, 20, 30, 40 are multiples of both 5 and 10.

Multiples which are common to two or more numbers are called *common multiples*.

Therefore 10, 20, 30, 40 are called common multiples of 5 and 10.

Example : Write the common multiples of 2 and 3.

Multiples of 2 : 2 4, 6, 8, 10, 12, 14, 16, 18, 20

Multiples of 3 : 3, 6, 9, 12, 15, 18, 21, 24, 27, 30

Common multiples of 2 and 3 are 6, 12 and 18.

Least Common Multiple (LCM)

The least common multiple (LCM) of two or more numbers is the smallest number which is divisible by each of the given numbers.

Consider two numbers 4 and 6.

The multiples of 4 : 4, 8, 12, 16, 20, 24, 28, 32, 36, 40

The multiples of 6 : 6, 12, 18, 24, 30, 36, 42

The common multiples of 4 and 6 are 12, 24, 36...

The least common multiple of 4 and 6 is 12.

12 is the smallest number which can be divided by both 4 and 6 without leaving a remainder.

Exercise 3.3

A. List the first 10 multiples of each number and find the common multiples.

1. 3 and 5
2. 4 and 5
3. 9 and 12
4. 6 and 8
5. 3 and 4
6. 2 and 6

B. Find the LCM by listing multiples.

1. 8, 20
2. 7, 14
3. 20, 32
4. 10, 20
5. 14, 21
6. 72, 90
7. 12, 16
8. 18, 36
9. 5, 15
10. 3, 6
11. 4, 8
12. 3, 9

FACTORS

A factor of a number divides the number without leaving a remainder.

For example,

$21 \times 1 = 21$ $3 \times 7 = 21$

21 is exactly divisible by 1, 3, 7 and 21.

$\therefore$ 1, 3, 7, 21 are factors of 21.

MATHS LAB

Objective : Learning the concept of multiples and factors

Materials Required : A worksheet having a number and its factors as shown below, crayons, pencil (Factor cards are available in Math kit)

Steps :

1. Give each student a number card with all its factors and a few other numbers written on it.
2. Ask them to circle and colour all the numbers that are factors of the given number.
3. Give both prime and composite numbers on the card.

1	18	2
3	7	8
4	9	6
5		12
	18	

Example

Here the given number is 18. The numbers that can divide 18 without leaving a remainder are 18, 9, 3, 6, 2 and 1. So, only these numbers should be circled and coloured while other numbers like 5 and 7 should not be coloured.

Once all the students have completed the exercise, ask the following questions.

1. What is your number ?
2. How many numbers on your card can divide the given number ?
3. How did you find out ?
4. How many of you found only two factors for your number ?
   - Once all the students have given the answers, they could be told that.
   - The given number is the multiple of these factors.

   When we multiply two or more numbers we get a *product*.

   The product is a *multiple* of the numbers multiplied.

   Each number is a *factor* of the product.

Properties of factors

- 1 is a factor of every number.

  4 ÷ 1 = 4, 9 ÷ 1 = 9, 12 ÷ 1 = 12

  Here 1 is a factor of all the numbers.
- Every number is a factor of itself.

  Every number can be divided by itself without leaving a remainder.

  5 ÷ 1 = 5, 15 ÷ 1 = 15, 20 ÷ 1 = 20

  Here 5 is a factor of 5 and so on.
- A factor of a number is either smaller than or equal to the number.

  1, 2, 3, 4, 6, 8, 12 and 24 are factors of 24.

  1, 2, 3, 4, 6, 8 and 12 are smaller than 24. 24 is equal to 24.
- The smallest factor of a number is 1.

Finding factors

By multiplication

To find the factors of a number by multiplication, you should know the tables.

Example : Find the factors of 15.

Try 1 ⟶ 1 × 15

Try 2 ⟶ 2 × ? Not possible. So, 2 is not a factor of 15.

Try 3 ⟶ 3 × 5

Try 4 ⟶ 4 × ? Not possible. So, 4 is not a factor of 15.

Try 5 ⟶ STOP, we have already found 5 to be a factor of 15.

Answer : The factors of 15 are : 1, 3, 5 and 15

By division

To find the factors of a number, divide the number by 2, 3, 4,... and check if there is a remainder. Those numbers that do not leave remainder are factors.

Example : Find the factors of 24.

You do not need to divide by 1 or 24 – you know these are factors.

24 ÷ 2 = 12; 2 and 12 are factors

24 ÷ 3 = 8; 3 and 8 are factors

24 ÷ 4 = 6; 4 and 6 are factors

24 ÷ 5 = 4, remainder 4; 5 is not a factor

Stop here. Since 6 is already a factor

Answer : The factors of 24 are 1, 2, 3, 4, 6, 8, 12, and 24.

Exercise 3.4

A. Tick (✓) the correct answer.

1. Can a factor of the number be greater than the number ? *Yes/No*
2. To check if a number is a factor of the other, we *divide/multiply*.
3. The number of factors of a number is *unlimited/limited*.
4. 1 is a *factor/multiple* of every number.

B. Fill in the blanks.

1. 6 × 4 = 24, 6 and 4 are ________ of 24.
2. 8 × 5 = 40, ________ and ________ are factors of ________.
3. ________, 2, ________, ________, ________, ________, are factors of 20.
4. ________ is a factor of every number.

C. Match the numbers in the box to their factors.

7	33	15
8	50	11
3	84	12
10	120	5

D. Find the factors by multiplication.

1. 14 2. 15 3. 16 4. 48 5. 23 6. 35 7. 36 8. 55

E. Find the factors by division.

1. 18 2. 14 3. 25 4. 39 5. 93 6. 63 7. 56 8. 28

F. Check if the second number is a factor of the first number. Write Y for yes and N for no.

1. 121, 11 ☐	2. 99, 99 ☐	3. 20, 5 ☐	4. 33, 11 ☐
5. 64, 8 ☐	6. 154, 5 ☐	7. 81, 1 ☐	8. 144, 12 ☐
9. 45, 10 ☐	10. 54, 3 ☐	11. 22, 23 ☐	12. 50, 7 ☐

Common factors

Consider the factors of 4 and 8.

Factors of	4	8
	(1), (2), (4)	(1), (2), (4), 8

Common factors of 4 and 8 are 1, 2 and 4.

Factors common to two numbers are called common factors.

Therefore, 1, 2 and 4 are called common factors of 4 and 8.

Example : Find the common factors of 18 and 27.

Factors of 18 : (1), 2, (3), 6, (9), 18

Factors of 27 : (1), (3), (9), 27

Common factors of 18 and 27 are 1, 3, 9

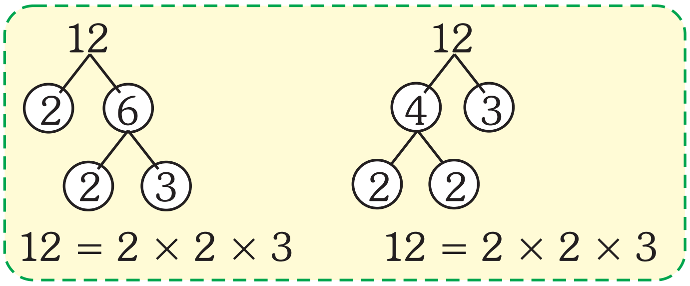
Factor tree

Numbers can have many factors. The factors can be multiplied in different ways to get the number.

For example :

$12 = 2 \times 6$ $\quad$ $12 = 4 \times 3$

$12 = 2 \times 2 \times 3$



We can make the two *factor trees* for 12 as shown.

Both factor trees end with $12 = 2 \times 2 \times 3$.

A *factor tree* shows the different ways in which a number can be obtained by multiplying its factors.

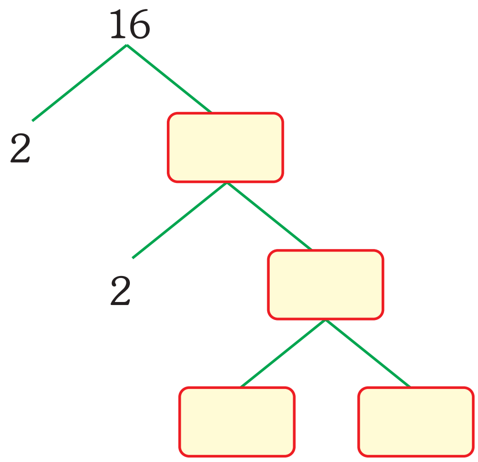
Exercise 3.5

A. Find the factors of the numbers. Then list the common factors.

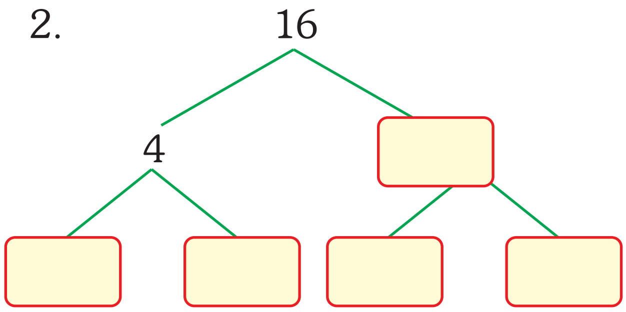
1. 6, 8   2. 4, 8   3. 4, 5   4. 2, 16

B. Complete the two factor trees for 16.

1.



2.



C. Make factor trees for the following.

1. 8   2. 20   3. 15   4. 21

Various Types of Numbers

Even Numbers : Whole numbers exactly divisible by 2 are called *even numbers*.

Example : 2, 4, 6, 8, 10, 12... are even numbers.

or

A number having digits 0, 2, 4, 6 or 8 at its ones place is called an *even number*.

Example : 248, 396, 5550, 8442 are even numbers.

Odd numbers : Whole numbers which are not exactly divisible by 2 are called *odd numbers*.

Example : 3, 5, 7, 9, 11, 13... are odd numbers.

or

A number having 1, 3, 5, 7 or 9 at its ones place is called an *odd number*.

Example : 315, 207, 2101, 359 are odd numbers.

Prime numbers : The numbers which have only two factors are called *prime numbers*. One factor is 1 and the second factor is the number itself.

Example : $2 \times 1 = 2$, $3 \times 1 = 3$, $5 \times 1 = 5$, $7 \times 1 = 7$, $11 \times 1 = 11$

2, 3, 5, 7, 11...... are prime numbers.

Composite numbers : The numbers which have more than two factors are called *composite numbers*.

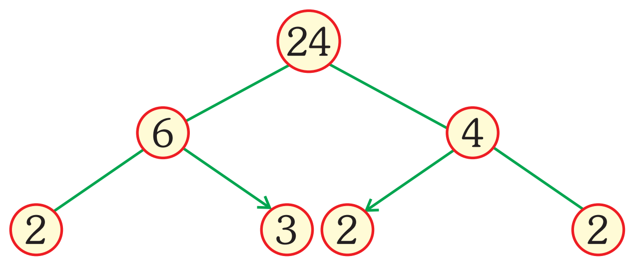
Example : 4 ⟶ $1 \times 4 = 4$; $2 \times 2 = 4$ — 1, 2, 4 are the factors → 4 is a composite number

6 ⟶ $2 \times 3 = 6$; $1 \times 6 = 6$ — 1, 2, 3, 6 are the factors → 6 is a composite number

Prime Factorisation

Prime factorisation is finding all the prime numbers which are multiplied to get the original number. A factor tree helps us to find any factors of the given number.

Factor Tree Method



Prime Factorization Method

2	24
2	12
2	6
	3

$\therefore 24 = 2 \times 2 \times 2 \times 3$

Coprime Numbers

Two numbers are said to be co-prime, if they do not have a common factor other than 1. Co-prime numbers need not be prime numbers.

Example : 7 and 10 are coprime numbers

Twin prime numbers

Two prime numbers whose difference is 2 are called twin prime numbers.

Example : 3 and 5, 5 and 7, 11 and 13, 17 and 19, 29 and 31, 41 and 43 are twin prime numbers.

Remember : 1 has only 1 factor 1 itself. It is neither prime nor composite.

Exercise 3.6

A. 1. Write all consecutive even numbers between 51 and 71.

2. Write all odd numbers between 30 and 50.

3. Write all prime numbers between 60 and 80.

B. Write 'P' for prime and 'C' for composite numbers.

1. 12 ______	2. 31 ______	3. 38 ______	4. 46 ______
5. 61 ______	6. 83 ______	7. 99 ______	8. 2 ______
9. 1 ______	10. 107 ______	11. 101 ______	12. 73 ______

SIEVE OF ERATOSTHENES

Eratosthenes, a Greek Mathematician gave a method for finding out prime numbers by removing numbers that are not prime. Let us write the numbers from 1 to 100. (Number Grid 1 to 100 is available in Math Kit.)

1. Cross out 1, since 1 is neither prime nor composite.
2. Cross out all the multiples of 2, except 2.
3. Cross out all the multiples of 3, except 3.
4. Cross out all the multiples of 5, except 5.
5. Cross out all the multiples of 7, except 7.

~~1~~	2	3	~~4~~	5	~~6~~	7	~~8~~	~~9~~	~~10~~
11	~~12~~	13	~~14~~	~~15~~	~~16~~	17	~~18~~	19	~~20~~
~~21~~	~~22~~	23	~~24~~	~~25~~	~~26~~	~~27~~	~~28~~	29	~~30~~
31	~~32~~	~~33~~	~~34~~	~~35~~	~~36~~	37	~~38~~	~~39~~	~~40~~
41	~~42~~	43	~~44~~	~~45~~	~~46~~	47	~~48~~	~~49~~	~~50~~
~~51~~	~~52~~	53	~~54~~	~~55~~	~~56~~	~~57~~	~~58~~	59	~~60~~
61	~~62~~	~~63~~	~~64~~	~~65~~	~~66~~	67	~~68~~	~~69~~	~~70~~
71	~~72~~	73	~~74~~	~~75~~	~~76~~	~~77~~	~~78~~	79	~~80~~
~~81~~	~~82~~	83	~~84~~	~~85~~	~~86~~	~~87~~	~~88~~	89	~~90~~
~~91~~	~~92~~	~~93~~	~~94~~	~~95~~	~~96~~	97	~~98~~	~~99~~	~~100~~

After crossing all the numbers in the manner given above, we are left with some numbers that are not crossed. These are prime numbers between 1 and 100.

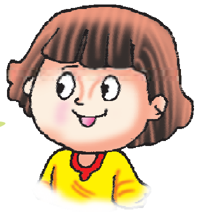
Prime numbers : 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97

And the crossed numbers are composite numbers except 1.

A number is said to be divisible by another number if on dividing no remainder is left. To test, if a number is divisible by a certain number without doing actual division, we can follow the following rules.

Divisibility by 2

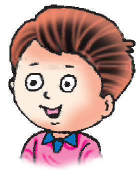
Any number that ends in 0, 2, 4, 6 or 8 is divisible by 2.



Example : 252, 374, 6790, 3286 and 668 are all divisible by 2.

Divisibility by 3

If the sum of the digits of a number is divisible by 3, the number is divisible by 3.



Example : 396 : 3 + 9 + 6 = 18 is divisible by 3, therefore 396 is divisible by 3.

488 : 4 + 8 + 8 = 20 is not divisible by 3, therefore 488 is not divisible by 3.

Divisibility by 4

A number is divisible by 4, if the number formed by its last two digits is divisible by 4.

Example : 2848 is divisible by 4 as 48 is divisible by 4.

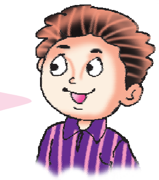
Divisibility by 5

Any number that ends in 0 or 5 is divisible by 5.

Example : 25, 2400, 6565, 3480 are all divisible by 5.

Divisibility by 9

If the sum of the digits of a number is divisible by 9, the number is divisible by 9.



Example : 396 : 3 + 9 + 6 = 18 is divisible by 9, therefore 396 is divisible by 9.

489 : 4 + 8 + 9 = 21 is not divisible by 9, therefore 489 is not divisible by 9.

Divisibility by 10

A number that ends in 0 is divisible by 10.

Example : 20, 230, 4560, 3480 are all divisible by 10.

Exercise 3.7

Put ✓ if divisible and × if not divisible.

		Divisible by				
	Number	2	3	5	9	10
1.	90	✓	✓	✓	✓	✓
2.	100					
3.	75					
4.	45					
5.	81					
6.	63					
7.	180					
8.	135					

HIGHEST COMMON FACTOR (BY FACTOR METHOD)

The highest common factor (HCF) is the greatest number, which divides two or more numbers without a remainder.

The highest common factor is also called the greatest common divisor (GCD).

Consider two numbers 6 and 8.

Factors of 6 : (1), (2), 3, 6 Factors of 8 : (1), (2), 4, 8

Common factors of 6 and 8 are *1* and *2*.

The highest common factor of 6 and 8 is *2*.

HCF by Prime Factorisation or Factor Tree Method

Factorising a number into a set of prime numbers is called prime factorisation.

For example, factorise 12.

12

$12 = 2 \times 6$

12 is factorised into one prime and one composite factor

$12 = 3 \times 4$

12 is factorised into one prime and one composite factor

$12 = 2 \times 2 \times 3$

12 is factorised into prime factors only

Example : Find the HCF of 24 and 40.

Solution : Prime factors of 24

2	24
2	12
2	6
	3

Prime factors of 40

2	40
2	20
2	10
	5

Prime factors of 24 are : $\boxed{2} \times \boxed{2} \times \boxed{2} \times 3$

Prime factors of 40 are : $\boxed{2} \times \boxed{2} \times \boxed{2} \times 5$

HCF of 24 and 40 is $2 \times 2 \times 2 = 8$

HCF by Division Method

To find the HCF by division method, divide both the numbers together by their common prime factors. Stop dividing when there is no common prime factor left.

Find the product of the common prime factors to get the HCF.

Example : Find the HCF of 12 and 18.

Solution :

2	12, 18
3	6, 9
	2, 3

Cannot be divided further as they do not have a common factor.

Product of common factors $= 2 \times 3 = 6$

So, HCF of 12 and 18 $= 6$

You might have noticed that 2 and 3 which we got at the end are co-primes.

Exercise 3.8

A. Determine the HCF of following pairs by finding factors.

1. 5 and 10
2. 25 and 30
3. 16 and 48
4. 14 and 28
5. 4 and 6
6. 18 and 36

B. Determine the HCF of the following by prime factorisation method.

1. 45 and 60
2. 40, 48 and 72
3. 64 and 80
4. 25, 40 and 60
5. 30 and 105
6. 128, 136 and 512
7. 480 and 720
8. 64, 96 and 216
9. 12, 36 and 48

C. Find the HCF of the following by division method.

1. 30 and 50
2. 9 and 24
3. 28 and 35
4. 84 and 105
5. 88 and 110
6. 64 and 80

D. Find the prime factors of the following numbers by factor tree method.

1. 30
2. 63
3. 90
4. 56
5. 88

WORD PROBLEMS

Example : Find the greatest number that will divide 24 and 36 without leaving a remainder.

Solution : The greatest number that will divide 24 and 36 is the HCF of 24 and 36.

2	24, 36
2	12, 18
3	6, 9
	2, 3

Cannot be divided further as they do not have a common factor.

So, HCF $= 2 \times 2 \times 3 = 12$

Hence, 12 is the greatest number that will divide 24 and 36 without leaving any remainder.

Exercise 3.9

Solve the following.

1. Manish and Parul are running around a large dining table for practising. Manish takes 3 minutes for each round while Parul takes 2 minutes for each round. If they start at the same time, when do they meet together in half an hour ?
2. Ganesh is an athlete. Starting from 1st January, he practised high jump every third day, and long jump every fifth day. On which dates in January did he practise both long jump and high jump ?
3. Can I make 7 packets of equal number of sweets from 149 sweets ?
4. Class 4A has 32 students. Teacher wants to divide the class into groups of 3 each. Can she make groups with the same number of students in each group ?
5. If I have 8 bunches of bananas, with 12 bananas in each bunch, how many bananas do I have ?
6. Find the greatest number that divides 33, 44 and 55 without leaving any remainder.
7. Find the HCF of 35, 40 and 55.

WORKSHEET

A. Find the first 10 multiples of each of the following pairs of numbers. Then list the common multiples.

1. 4, 5
2. 2, 6
3. 5, 10
4. 11, 22
5. 6, 12
6. 12, 18

B. Find the HCF of the following numbers.

1. 40, 48
2. 18, 21
3. 21, 24
4. 32, 20
5. 36, 24
6. 28, 35
7. 18, 6
8. 64, 16
9. 45, 30
10. 24, 36

C. Put ✓ if divisible and × if not divisible.

		Divisible by				
	Number	2	3	5	9	10
1.	95					
2.	396					
3.	645					
4.	945					
5.	810					
6.	630					
7.	594					
8.	1350					

D. Make two factor trees for each of the following.

1. 32
2. 24
3. 42
4. 48