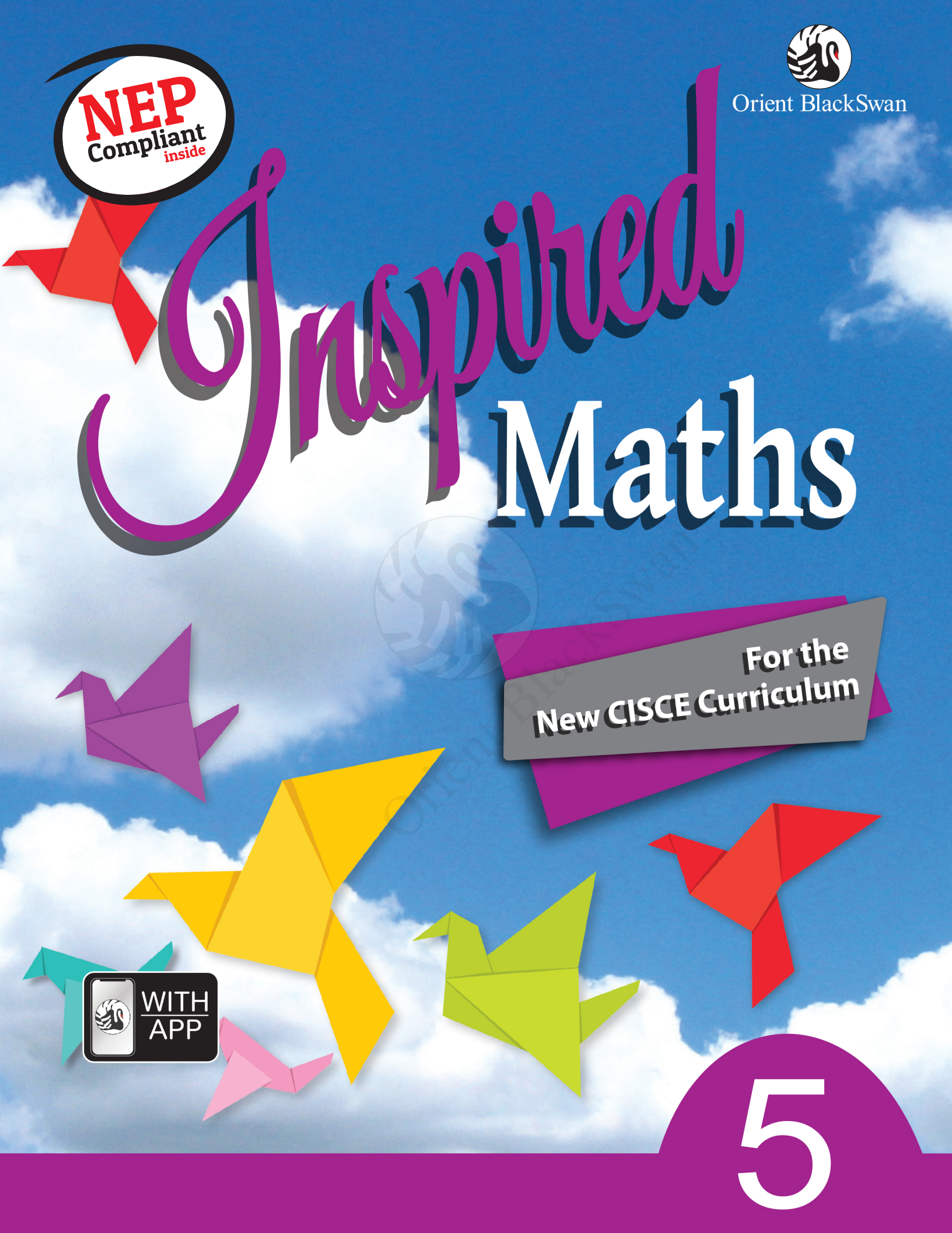
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Maths
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New CISCE Curriculum
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APP
5

Inspired Maths

has been developed in accordance with

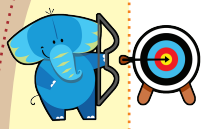
- the pioneering and exciting endeavours and initiatives for the effective teaching and learning of mathematics
- the need for students to develop the skills of problem solving and generating better algorithms, all directed towards developing the right attitude and approach to solving problems in a systematic manner
- sound pedagogical practices that enable students to learn effectively and apply their learning
- the needs of the teacher in the classroom

Students' Textbook

- complete syllabus coverage
- carefully graded text
- appropriate figures and images
- ample rigour to learn, understand and apply concepts and skills

Let's Learn

❖ Text and Exercises



Learning Outcomes

- encourage students to evaluate their progress and take responsibility for their learning

Warm Up

- **Activities** facilitate quick learning and easy understanding of new concepts
- **Recall exercises** help students recall concepts learnt and prepare for new learning

Guided Learning

- step-by-step approach consolidating each concept with solved and semi-solved exercises for guided learning

Activities

- extensively used to develop concepts, enhance skills and application

Variety of Exercises

- concept-based, calculation skill-based and application-based exercises

Common Mistakes

- students discover commonly committed mistakes on their own

Teachers' Resource Pack

- lesson plans for all lessons
- enrichment activities for teaching
- worksheets with answers for all lessons
- question bank with answers for all lessons
- assessment papers

Teachers' Smart Book

exciting and interactive with:

- embedded questions
- animations
- games
- presentations
- worksheets
- question paper generator

Students' App

- more practice for students of classes 3–8

Website

- a portal dedicated to the series with free access for teachers

www.inspiredmaths.com

Workouts

Let's Apply

WORKOUT 1 (Worksheet for concepts and calculation skills)

Concept-based and Calculation skill-based exercises

- to master concepts and calculation skills

Mental Maths

- to develop quick calculation skills

WORKOUT 2 (Worksheet for higher skills)

Multiple Choice Questions

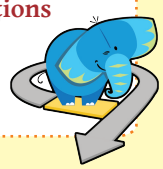
- provide feedback
- contribute to self-learning

Problem Solving

- improve students' analytical and problem-solving skills

Cross-curricular Questions

- help apply maths to various subjects



Life Skills

- help students gain self-management, communication, decision making and critical thinking skills

Projects and Fun activities

- help students apply what they have learnt to real life and also have some fun

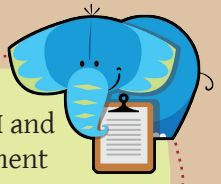
Our Heritage

- includes Vedic maths and yoga

Values

- students understand values like honesty, sharing, ethical behaviour and so on

Assessment



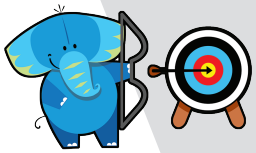
In addition to the **variety of exercises** in the lesson and in the **Workout I** and **Workout II** sections, there are four assessment papers for regular assessment

Contents

CHAPTER 5

Factors and Multiples

Learning Outcomes



At the end of this lesson, students will be able to:

- find the multiples and factors of a number.
- identify prime and composite numbers, twin primes and co-prime numbers.
- find the prime factors of a number.
- find the LCM and HCF of two or more numbers.
- test divisibility of a number by 2, 3, 4, 5, 9, 10 and 11.
- relate HCF and LCM and find one when the other is given.

❖ Recall—factors and multiples

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

A **multiple** of a number is exactly divisible by the number.

$3 \times 5 = 15$ means that $15 \div 3 = 5$ and $15 \div 5 = 3$

Therefore, 3 and 5 are _____ of 15, and 15 is a _____ of 3 and 5.

Activity 1

Materials required: 15 objects, for example counters.

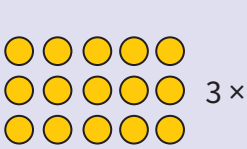
Learning outcome: Children understand that several pairs of numbers can be multiplied together to get the same number.

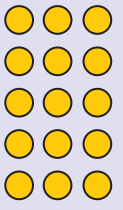
Method: Take 15 counters. Arrange them in rows and columns.

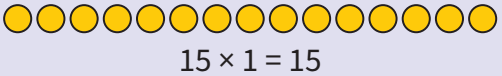
One way is to arrange them into 3 rows and 5 columns. This gives the multiplication fact: $3 \times 5 = 15$

How many more ways can you arrange these in? What multiplication facts do they show?

Try with 24 counters. How many multiplication facts can you get?







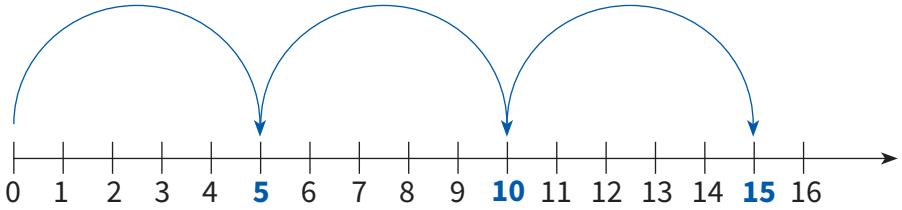
Finding multiples

Multiples of a number can be found by the following methods.

1. Multiply the number by 1, 2, 3, 4, … etc.

   Multiples of 5 are 1 × 5 = **5**; 2 × 5 = **10**; 3 × 5 = **15**; 4 × 5 = **20** … and so on

2. Skip count on a number line.



Finding factors

Factors of a number can be found by multiplication or division.

1. To find the factors of 12 by multiplication, find the numbers which when multiplied together give 12.

   1 × 12 = 12: _____ and _____ are factors of 12.

   2 × 6 = 12: _____ and _____ are factors of 12.

   3 × 4 = 12: _____ and _____ are factors of 12.

   So, the factors of 12 are ___, ___, ___, ___, ___, ___

2. To find the factors of 15 by division, find numbers that divide 15 without leaving a remainder.

   15 ÷ 1 = 15: ___ and ___ are factors of 15.

   15 ÷ 3 = 5: ___ and ___ are factors of 15.

   (no need to divide by 5 or 15 since we have already listed 5 and 15 as factors).

   So, the factors of 15 are ___, ___, ___, ___

Properties of multiples

1. Every number is a multiple of 1.
2. Every number is a multiple of itself.
3. A multiple of a number is greater than or equal to the number.
4. A number has an uncountable number of multiples. There is no largest multiple of a number.

Properties of factors

1. 1 is a factor of every number.
2. Every number is a factor of itself.
3. A factor of a number is smaller than or equal to the number.
4. The smallest factor of a number is 1.
5. The greatest factor of a number is the number itself.
6. A number has a limited number of factors. Every number (other than 1) has at least two factors—1 and the number itself.

❖ Prime and composite numbers

Numbers that have only two factors, 1 and the number itself, are called **prime numbers**.

Numbers that have more than two factors are called **composite numbers**.

2, 3, 5, 7, 11, 13, 17 and 19 are the prime numbers between 1 and 20.

4, 6, 8, 9, 10, 12, 14, 15, 16, 18 and 20 are the composite numbers between 1 and 20.

1 is neither prime nor composite.

The Sieve of Eratosthenes

Eratosthenes was a Greek mathematician who lived in the third century A.D. He found a simple method of finding prime numbers. His method consists of crossing out numbers on a grid, and is known as the **Sieve of Eratosthenes.**

On the grid, proceed as follows. Some are done for you.

1. Cross out 1
2. Ring the prime number 2. Cross out every second number from 2—that is cross out all multiples of 2.
3. Ring the next prime number 3. Cross out every third number from 3—that is cross out all multiples of 3.
4. Ring the next prime number 5. Cross out every fifth number from 5—that is cross out all multiples of 5.
5. Ring the next prime number 7. Cross out every seventh number from 7—that is cross out all multiples of 7.
6. Ring all the numbers that are not crossed out. These are the prime numbers from 1 to 100.

~~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

Twin primes

Twin primes are pairs of prime numbers which differ by 2. The first four twin primes are (3,5), (5,7), (11,13) and (17,19). There are 4 more between 1 and 100. Can you find them from the above table?

Exercise 5.1

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

1) 63, 7 2) 54, 9 3) 53, 10 4) 24, 6 5) 21, 4

B. List all the factors of the following numbers:

1) 32 2) 18 3) 67 4) 35 5) 49 6) 72 7) 23

C. List the next five multiples of 1) 6 2) 8

D. Fill in the blanks.

1) The number _____ is a factor of every number.
2) Each prime number has exactly _____ factors.
3) _____ is a number that is neither prime nor composite.
4) All even numbers are divisible by _____.
5) Two prime numbers which differ by 2 are called _____ primes.

E. State whether true or false.

1) Every number is a multiple of itself.
2) Every number is a multiple of 1.
3) A factor of a number can be greater than the number.
4) All even numbers are multiples of 2.

❖ Prime factors

Factors of a number which are prime are called its **prime factors**.

Factors of 36 are: 1, 2, 3, 4, 6, 9, 12, 18, 36

Prime factors of 36 are: 2, 3

A number can be written as a product of its prime factors, e.g. $36 = 2 \times 2 \times 3 \times 3$

A factorisation in which every factor is prime is called **prime factorisation** of the number. When a number is written as a product of its prime factors, it is said to be **completely factorised**.

Example 1: The prime factorisations of 48, 21 and 25 are:

$48 = 2 \times 2 \times 2 \times 2 \times 3$ $\quad$ $21 = 3 \times 7$ $\quad$ $25 = 5 \times 5$

Coprimes

Two numbers are **coprime** if they have only 1 as the common factor.

5 and 12 are coprime. So are 8 and 15.

12 and 15 are not coprime. Their common factors are 1 and 3.

Finding prime factors of a number

Prime factors of a number can be found by repeated division by prime numbers.

Example 2: Find the prime factors of a) 60 b) 84

Divide by the first prime number 2.

Go on dividing by 2 until the quotient is not divisible by 2.

Then divide by the next prime number 3, and so on.

Continue dividing until the quotient is a prime number.

Prime factors are a) 60: 2, 3, 5 b) 84: 2, 3, 7

a)

2	60
2	30
3	15
	5 ← prime number

$60 = 2 \times 2 \times 3 \times 5$

b)

2	84
2	42
3	21
	7 ← prime number

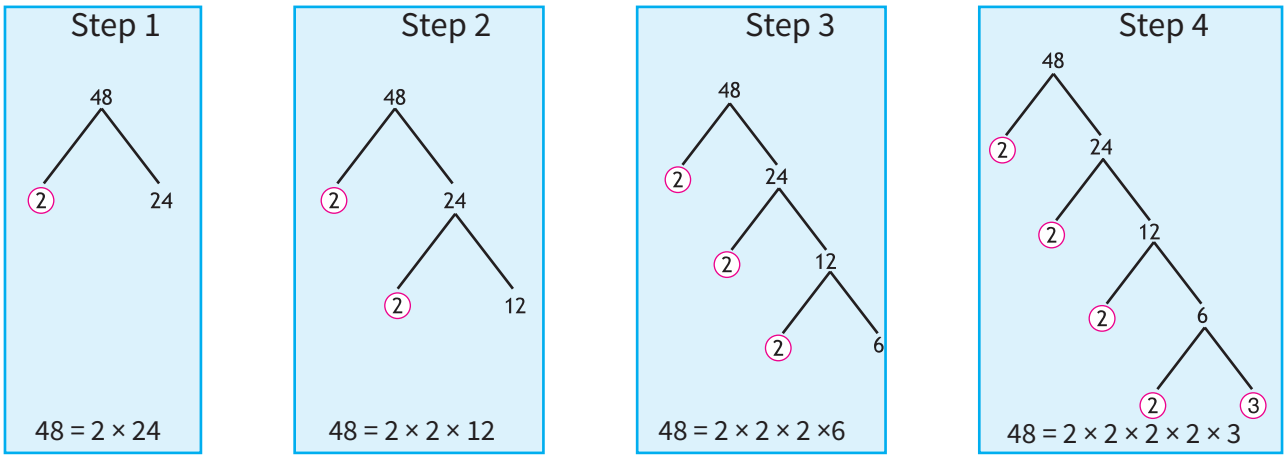
$84 = 2 \times 2 \times 3 \times 7$

❖ Factor tree

Prime factors of a number can also be found by factorising in a pictorial form, called a **factor tree**.

Example 1: Find the prime factors of 48.

Continue factorising until all factors are prime. In the factor trees below, the encircled factors are prime.



So, 48 = 2 × 2 × 2 × 2 × 3, and the prime factors of 48 are 2 and 3.

Can you form the factor tree in another way? (*Hint:* start from 4 × 12 = 48 or 3 × 16 = 48)

Exercise 5.2

A. 1) List all prime and composite numbers between 20 and 40.

2) Which of these are coprimes? i) 24, 32 ii) 18, 12 iii) 8, 21 iv) 9, 16

B. Find the prime factors.

1) 36 2) 64 3) 75 4) 91 5) 112 6) 120

C. Construct factor trees for: 1) 24 2) 72 3) 96 4) 120

❖ Highest common factor

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

The HCF of two numbers can be found by the listing method or the prime factorisation method.

Listing method

List the factors; find the common factors and the highest common factor.

Example 1: Find the HCF of 12 and 16.

The factors of 12 are: 1, 2, 3, 4, 6 and 12

The factors of 16 are: 1, 2, 4, 8 and 16

The common factors of 12 and 16 are: 1, 2 and 4.

The highest common factor is 4. **Answer:** HCF = 4

Prime factorisation method

Example 2: Find the HCF of 44, 60 and 36.

Step 1: Use the division method to find the prime factors.

2	44
2	22
	11

2	60
2	30
3	15
	5

2	36
2	18
3	9
	3

Step 2: Find the common prime factors.

The common prime factors are 2, 2

$44 = 2 \times 2 \times 11$

$60 = 2 \times 2 \times 3 \times 5$

$36 = 2 \times 2 \times 3 \times 3$

Step 3: Find the product of the common prime factors to get the HCF.

HCF of 44, 60 and 36 = $2 \times 2 = 4$ **Answer:** HCF = 4

Exercise 5.3

A. Find the HCF by finding all factors.

1) 24, 36
2) 20, 30
3) 25, 40
4) 14, 21, 28
5) 45, 65, 75
6) 22, 33, 44

B. Find the HCF by the prime factorisation method.

1) 49, 77
2) 20, 48
3) 40, 56
4) 72, 90
5) 14, 28, 56
6) 12, 48, 72
7) 42, 63, 84
8) 24, 72, 90

C. Find the HCF by the prime factorisation method.

1) 225, 315
2) 490, 540
3) 612, 522
4) 49, 70, 77
5) 108, 144, 60
6) 106, 192, 96

Common mistakes!

Teacher asked 2 students to find the HCF of 36 and 24. Check to see who got the answer correct. Can you point out the mistake in the wrong answer?

1) $36 = 2 \times 2 \times 3 \times 3$
   $24 = 2 \times 2 \times 2 \times 3$
   HCF $= 2 \times 3 = 6$

2) $36 = 2 \times 2 \times 3 \times 3$
   $24 = 2 \times 2 \times 2 \times 3$
   HCF $= 2 \times 2 \times 3 = 12$

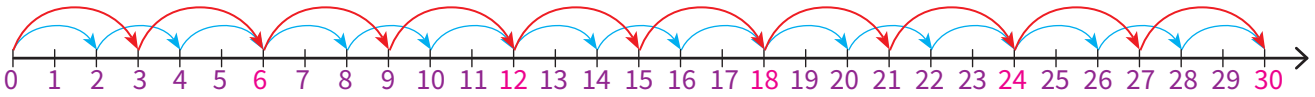
❖ Lowest common multiple

The **lowest common multiple** (**LCM**) of two or more numbers is the smallest number that can be divided by each of the numbers without leaving a remainder.

Using number line or tables

Example 1: Find the LCM of 2 and 3 using the number line or tables.

Look at the number line showing the common multiples of 2 and 3.



The jumps in blue show the multiples of 2: 2, 4, 6, 8, 10, 12, 14, 16, 18, …

The jumps in red show the multiples of 3: 3, 6, 9, 12, 18, 21, 24, …

The numbers where the jumps of 2 and 3 meet are the common multiples of 2 and 3.

The common multiples of 2 and 3 are: 6, 12, 16, 24, 30, … and so on.

The smallest of these multiples is 6. Therefore, the **LCM of 2 and 3 is 6.**

Instead of a number line, you can also use tables to list the multiples of 2 and 3; then list the common multiples and find the LCM.

Prime factorisation method

Example 1: Find the LCM of 8, 24 and 36.

Step 1: Find the prime factors of each number.

Prime factors of 8: $2 \times 2 \times 2$

Prime factors of 24: $2 \times 2 \times 2 \times 3$

Prime factors of 36: $2 \times 2 \times 3 \times 3$

LCM = $2 \times 2 \times 2 \times 3 \times 3 = 72$

Step 2: Ring all common factors. Taking **only one factor out of a set of common factors**, multiply all prime factors. This gives the LCM.

Answer: LCM = 72

Division method

Example 2: Find the LCM of 144, 96, 160.

Step 1: Write the numbers as shown. Divide all numbers by a prime number which divides at least two of the numbers.

Step 2: Write the quotient in each case below the number. If a number cannot be divided exactly, write the number as it is in the next row.

Step 3: Keep dividing by prime numbers until the last row has coprime numbers with no common factors.

2	144,	96,	160
2	72,	48,	80
2	36,	24,	40
2	18,	12,	20
2	9,	6,	10
3	9,	3,	5
	3,	1,	5

Step 4: Multiply all divisors and all numbers left in the last row.

The product gives the LCM of the given numbers.

LCM = 2 × 2 × 2 × 2 × 2 × 3 × 3 × 5 = 1440 **Answer:** LCM = 1440

❖ Relationship between HCF and LCM

There is an interesting property connecting the HCF and LCM of two numbers.
What do you notice in this table?

Numbers	Their product	HCF	LCM	Product of HCF and LCM
10 and 15	150	5	30	150
12 and 16	192	4	48	192
15 and 20	300	5	60	300

The product of two numbers is equal to the product of their HCF and LCM.

Exercise 5.4

A. Find the LCM by the prime factorisation method.

1) 12, 15 2) 21, 28 3) 30, 45 4) 16, 20

B. Find the LCM by the division method.

1) 42, 56 2) 24, 32 3) 24, 36 4) 21, 28
5) 108, 144 6) 72, 90 7) 39,195 8) 98, 147
9) 105, 70 10) 85, 51 11) 18, 24, 32 12) 14, 28, 30
13) 24, 72, 90 14) 75, 90, 125 15) 93, 62, 120 16) 48, 60, 84

C. Use the relation between HCF and LCM to fill in the table.

Numbers	Their product	HCF	LCM	Product of HCF and LCM
1) 14 and 21	294			
2) 24 and 20		4		
3) 15 and 20			60	
4) 33 and 22				726

Common mistakes!

Two students found the LCM of 6 and 18. Check their working and answers and say which is correct. Point out the mistake in the wrong answer.

1) 6 = 2 × 3
18 = 2 × 3 × 3
LCM = 2 × 3 × 3 = 18

2) 6 = 2 × 3
18 = 2 × 3 × 3
LCM = 2 × 3 × 2 × 3 × 3 = 108

❖ Real life applications

Example 1: Find the largest number that divides 12 and 20 without a remainder.

The largest number that divides 12 and 20 without a remainder is the HCF of 12 and 20.

$12 = 2 \times 2 \times 3$

$20 = 2 \times 2 \times 5$

HCF $= 2 \times 2 = 4$ **Answer:** 4

Example 2: Find the greatest number which divides 149 and 101, leaving a remainder of 5.

The number must divide 149 and leave 5 as remainder.
Therefore it must divide $149 - 5 = 144$ without a remainder.

The number must also divide 101 and leave 5 as remainder.
Therefore it must divide $101 - 5 = 96$ without a remainder.
Therefore we have to find the HCF of 144 and 96.

$144 = 2 \times 2 \times 2 \times 2 \times 3 \times 3$
$96 = 2 \times 2 \times 2 \times 2 \times 2 \times 3$
HCF $= 2 \times 2 \times 2 \times 2 \times 3 = 48$

Answer: 48

Example 3: Find the smallest number which when divided by 10 and 15 leaves no remainder.

The smallest number, which when divided by 10 and 15 leaves no remainder is their LCM.

$5 \mid 10, 15$
$2, 3$

LCM $= 5 \times 2 \times 3 = 30$ **Answer:** 30

Example 4: Find the smallest number which when divided by 44 and 55, leaves a remainder of 8.

The smallest number which when divided by 44 and 55 without a remainder is the LCM of 44 and 55.

$11 \mid 44, 55$
$4, 5$

LCM $= 11 \times 4 \times 5 = 220$

Therefore, the smallest number which when divided by 44 and 55 leaves a remainder of 8 is $220 + 8 = 228$

Answer: 228

Exercise 5.5

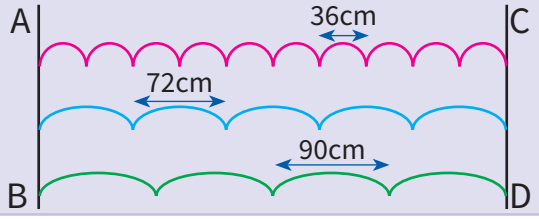
1. The HCF and LCM of two numbers are 48 and 288 respectively. One of the numbers is 144. Find the other number.
2. The product of two numbers is 600. Their LCM is 60. Find their HCF.
3. Find the largest number that divides 280 and 490 without leaving a remainder.
4. Find the largest number that divides 232 and 157 leaving a remainder of 7.
5. Find the smallest number which when divided by 72 and 90 leaves no remainder.
6. Find the smallest number which when divided by 39, 52 and 65, leaves a remainder of 5 in each case.

7. Three bells ring at intervals of 7, 10 and 14 minutes respectively. They begin by ringing together. After how long will they ring together again?

8. Three children are walking. Their steps measure 36 cm, 72 cm and 90 cm. If they step from a line AB, their steps will fall together again at line CD. What is the distance between AB and CD?

ACTIVITY 2

See the diagram that illustrates Q. 8.
Can you draw similar diagrams for Q. 7?



❖ Tests of divisibility

You have studied in class IV about simple tests of divisibility by 2, 3, 4, 5, 9, 10.

Let us revise these and learn about some other tests of divisibility.

A number is:

- **divisible by 2** if it has 0 or an even number in its ones place.
  380, 4812, 4344, 56, 388 are divisible by 2.
  381, 4813, 4345, 57, 389 are not divisible by 2.
- **divisible by 3** if the sum of its digits is divisible by 3.
  462 is divisible by 3 since 4 + 6 + 2 = 12 is divisible by 3.
  461 is not divisible by 3 since 4 + 6 + 1 = 11 is not divisible by 3.
- **divisible by 4** if the number formed by the tens and ones digits is divisible by 4.
  3652 is divisible by 4 since 52 is divisible by 4.
  3654 is not divisible by 4 since 54 is not divisible by 4.
- **divisible by 5** if it has 0 or 5 in its ones place.
  2340, 4845 are divisible by 5. 2342, 4846 are not divisible by 5.
- **divisible by 10** if it has 0 in its ones place.
  3840, 485030 are divisible by 10. 3845, 485032 are not divisible by 10.
- **divisible by 9** if the sum of its digits is divisible by 9.
  3843 is divisible by 9 since 3 + 8 + 4 + 3 = 18 is divisible by 9.
  3849 is not divisible by 9 since 3 + 8 + 4 + 9 = 24 is not divisible by 9.

- **divisible by 11** Start from the left. Find the sum of all odd numbered digits (1st digit + 3rd digit + 5th digit…).
  Find the sum of all even numbered digits (2nd digit + 4th digit + 6th digit …).
  If the difference between these sums is 0 or divisible by 11, then the number is divisible by 11.
  292215: 2 + 2 + 1 = 5; 9 + 2 + 5 = 16; 16 – 5 = 11, therefore 292215 is divisible by 11.
  760672: 7 + 0 + 7 = 14; 6 + 6 + 2 = 14; 14 – 14 = 0, therefore 760672 is divisible by 11.
  286749: 2 + 6 + 4 = 12; 8 + 7 + 9 = 24; 24 – 12 = 12, so 286749 is not divisible by 11

Make your own divisibility rules

Let us examine the rules of divisibility by 15.

A number is divisible by 15 if it is divisible by both 3 and 5.

14265 is divisible by both 3 and 5.
Therefore it is divisible by 15.
Notice that 3 and 5 are factors of 15 and they are coprime.

Rule 1: A number is divisible by another number if it is also divisible by the coprime factors of the divisor.

Using this rule you can make your own divisibility rules.

A number is divisible by 6 if it is divisible by both 2 and _____.

A number is divisible by 12 if it is divisible by both _____ and _____.

Rule 2: If a number is divisible by another number, it is also divisible by each factor of the divisor.

264 is divisible by 12. Therefore 264 is also divisible by the factors of 12, that is, by 2, 3, 4 and 6. You can check this yourself.

Exercise 5.6

A. Check divisibility by 2, 3, 4, 5, 6, 9, 10, 11, 12 and 15.

Number	2	3	4	5	6	9	10	11	12	15
1) 6225										
2) 4644										
3) 66660										
4) 726352										

B. Check if the first number is divisible by the second.

In each of these cases you have to form your own divisibility rules by using the coprime factors rule.

1) 63405 by 18 (*Hint:* coprime factors of 18 are 2 and 9)

2) 5656800 by 24 (*Hint:* coprime factors of 24 are 3 and ____)

3) 486420 by 30 (Coprime factors of 30 are ____ and ____)

4) 1273490 by 40 (Coprime factors of 40 are ____ and ____)

C. Fill in the blanks.

1) A number is divisible by 24. It will also be divisible by ____ , ____ , ____ , ____ , ____ and ____.

2) A number which is divisible by 50 is also divisible by ____ , ____ , ____ and ____.

3) A number which is divisible by 25 is also divisible by the number ____.

D. Write true or false.

1) If a number is divisible by 6, it must be divisible by 12.

2) If a number is divisible by 6, it must be divisible by 3.

3) 11 and 6 are coprime numbers. If a number is divisible by both 11 and 6, it is also divisible by 66.

WORKOUT 1

understand and calculate

1. a) Find the prime factors of: i) 75 _____ ii) 88 _____

b) Which of these are coprime? i) 14, 28 ii) 9, 20

2. Find the HCF by finding all factors.

a) 20, 30 _____ b) 49, 77 _____

3. Find the HCF.

a) 28, 49 _____ b) 54, 72, 90 _____

4. Find the LCM by prime factorisation.

a) 12, 16 _____ b) 30, 45 _____

5. Find the LCM.

a) 60, 90 _____ b) 108, 120, 132 _____

6. a) Are all numbers divisible by 10 also divisible by 5? _____

b) Are all numbers divisible by 5 also divisible by 10? _____

c) If a number is divisible by 3 and 7, is it divisible by 21? _____ Which rule did you use to give your answer? _____

7. Find the greatest number that will divide 38 and 53, leaving a remainder of 8 in each case.

8. A bell rings every 15 minutes. Another bell rings every 25 minutes. They ring together at 12 noon. At what time will they ring together again?

9. The LCM of two numbers is 2310 and their HCF is 33. If one of the numbers is 330, find the other number.

Mental maths

10. a) What is the HCF and LCM of 5 and 15? _____

b) What is the smallest number you should **add** to 98 to make it a multiple of 5?

c) What is the smallest number you should **subtract** from 98 to make it a multiple of 5?

d) What is the smallest number you should add to 110 to make it divisible by 3?

WORKOUT 2

think and apply

MCQs

1. **The prime factorisation of 36 is _____ .**

a) 2 × 2 × 2 × 3 b) 2 × 3 × 3 × 3 c) 2 × 2 × 3 × 3 d) 2 × 2 × 2 × 2

2. **If a number is divisible by 32, it will also be divisible by**

a) 2 b) 4 c) 8 d) 2, 4 and 8

3. **A factory has 45,558 employees. An equal number of employees work in each department. How many departments does the factory have?**
(*Hint*: use divisibility rules)

a) 5 b) 10 c) 9 d) 4

4. **Two numbers 79 and 13 have no common factors. Their LCM is:**

a) 79 + 13 b) 79 × 13 c) 79 – 13 d) 79 ÷ 13

5. **The product of the HCF and LCM of two numbers is 135. If one of the numbers is 15, the other number is:**

a) 3 b) 6 c) 9 d) 13

Problem solving

6. **Find all two-digit numbers which satisfy the following conditions.**

a) It is divisible by 9 b) It is an even number

c) It is not divisible by 5 d) Two of its factors are co-prime

7. How many multiples of 6 are there between 0 and 100?
(*Hint*: Divide 100 by 6. What is the quotient?)

8. What is the LCM of 4 and 5? Can you find the highest common multiple of 4 and 5? Give reasons.

Fun activity

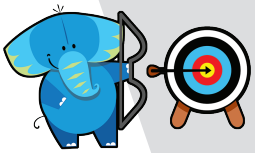
9. Complete the 3 × 3 magic square with the magic sum 15 (that is, the sum of numbers in each column, row and diagonal should be 15), using numbers from 1 to 9.

2		
	5	
		8

CHAPTER 6

Fractions

Learning Outcomes

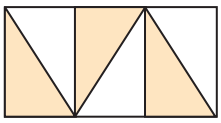


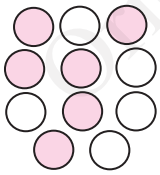
At the end of this lesson, students will be able to:

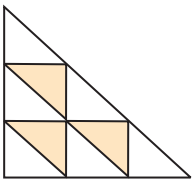
- state what equivalent fractions are.
- find equivalent fractions of a given fraction.
- convert improper fractions to mixed numbers and vice versa.
- compare fractions and arrange them in ascending/descending order.
- add and subtract unlike fractions and mixed numbers.
- multiply and divide fractions.
- solve everyday problems based on the four operations.

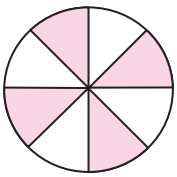
Recall exercise

A. Write what fraction the shaded part is of the whole.

1) 

2) 

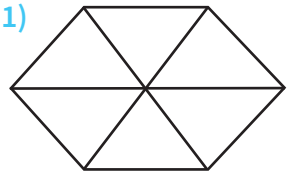
3) 

4) 

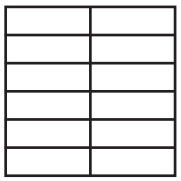
B. In the above figures write the fraction for the part not shaded.

1) ☐ 2) ☐ 3) ☐ 4) ☐

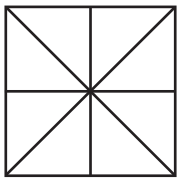
C. Shade the part of each whole as indicated.

1) 

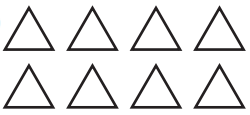
$\frac{5}{6}$

2) 

$\frac{5}{12}$

3) 

$\frac{3}{8}$

4) 

$\frac{7}{8}$

D. Write 'numerator' or 'denominator'.

1) In $\frac{5}{6}$, 6 is the _____

2) In $\frac{4}{9}$, 4 is the _____

3) In $\frac{11}{7}$, 7 is the _____

4) In $\frac{17}{19}$, 17 is the _____

E. Fill in the blanks.

1) $\frac{1}{2}$ of 6 = _____

2) $\frac{1}{3}$ of 18 = _____

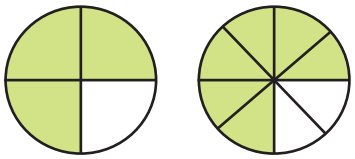
3) $\frac{1}{4}$ of ₹ 20 = _____

4) $\frac{1}{5}$ of ₹ 25 = _____

5) $\frac{1}{6}$ of 24 kg = _____

6) $\frac{1}{8}$ of 64 m = _____

F. Observe the coloured parts and write the equivalent fractions.

1) 

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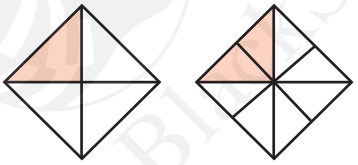
2) 

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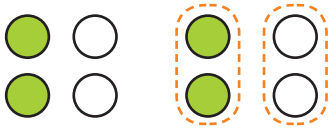
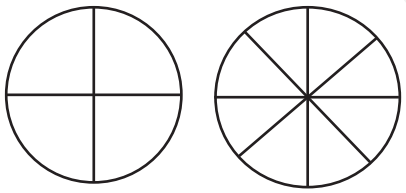
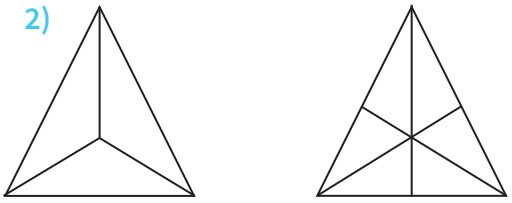
3) 

☐ = ☐

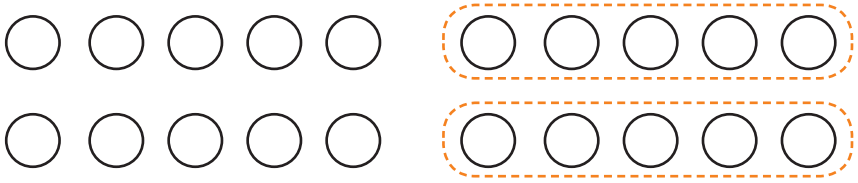
G. Colour to show the equivalent fractions.

1) 

$\frac{2}{4}$ = $\frac{4}{8}$

2) 

$\frac{1}{3}$ = $\frac{2}{6}$

3) 

$\frac{5}{10}$ = $\frac{1}{2}$

❖ Finding equivalent fractions

By multiplication

You know that $\frac{1}{2}$, $\frac{2}{4}$ and $\frac{4}{8}$ are equivalent fractions.

You can see that: $\frac{2}{4} = \frac{1 \times 2}{2 \times 2}$ and $\frac{4}{8} = \frac{1 \times 4}{2 \times 4}$

An equivalent fraction can be obtained by multiplying the numerator and denominator of a fraction by the same number.

Example 1: The next three equivalent fractions of $\frac{1}{5}$ are:

$\frac{1 \times 2}{5 \times 2} = \frac{2}{10}$, $\frac{1 \times 3}{5 \times 3} = \frac{3}{15}$, $\frac{1 \times 4}{5 \times 4} = \frac{4}{20}$

By division

Observe that: $\frac{2 \div 2}{4 \div 2} = \frac{1}{2}$; $\frac{2}{4}$ and $\frac{1}{2}$ are equivalent fractions.

$\frac{4 \div 2}{8 \div 2} = \frac{2}{4}$; $\frac{4}{8}$ and $\frac{2}{4}$ are equivalent fractions.

Therefore,

An equivalent fraction can also be obtained by dividing the numerator and denominator of a fraction by a common factor.

Example 2: The equivalent fractions of $\frac{6}{18}$ are:

$\frac{6 \div 2}{18 \div 2} = \frac{3}{9}$ $\frac{6 \div 3}{18 \div 3} = \frac{2}{6}$ $\frac{6 \div 6}{18 \div 6} = \frac{1}{3}$

Example 3: Find an equivalent fraction of $\frac{2}{7}$ with the numerator 8.

To get the numerator 8, multiply the numerator 2 by 4. The numerator and denominator have to be multiplied by the same number. So, to get the denominator, multiply the denominator 7 by 4.

Therefore, $\frac{2}{7} = \frac{2 \times 4}{7 \times 4} = \frac{8}{28}$

Example 4: What is the equivalent fraction of $\frac{8}{12}$ with denominator 3?

To get the denominator 3, 12 has to be divided by 4. So, the numerator 8 also has to be divided by 4.

Therefore, $\frac{8}{12} = \frac{8 \div 4}{12 \div 4} = \frac{2}{3}$

Exercise 6.1

A. Fill in the blanks to make the fractions equivalent.

1) $\frac{1}{3} = \frac{\square}{6}$ 2) $\frac{1}{3} = \frac{\square}{15}$ 3) $\frac{1}{4} = \frac{\square}{12}$ 4) $\frac{5}{25} = \frac{\square}{5}$

5) $\frac{1}{2} = \frac{\square}{20}$ 6) $\frac{1}{7} = \frac{\square}{21}$ 7) $\frac{2}{9} = \frac{\square}{18}$ 8) $\frac{3}{7} = \frac{\square}{35}$

9) $\frac{2}{3} = \frac{\square}{9}$ 10) $\frac{3}{4} = \frac{\square}{16}$ 11) $\frac{12}{21} = \frac{\square}{7}$ 12) $\frac{4}{9} = \frac{8}{\square}$

13) $\frac{2}{5} = \frac{10}{\square}$ 14) $\frac{3}{4} = \frac{30}{\square}$ 15) $\frac{4}{5} = \frac{16}{\square}$ 16) $\frac{3}{8} = \frac{\square}{40}$

B. Fill in the blanks to make the fractions equivalent.

1) $\frac{\square}{5} = \frac{12}{30}$ 2) $\frac{7}{15} = \frac{63}{\square}$ 3) $\frac{36}{56} = \frac{\square}{14}$ 4) $\frac{40}{72} = \frac{\square}{9}$

5) $\frac{8}{\square} = \frac{24}{39}$ 6) $\frac{11}{\square} = \frac{77}{105}$ 7) $\frac{\square}{13} = \frac{54}{117}$ 8) $\frac{3}{8} = \frac{18}{\square}$

C. Fill in the blanks.

1) $\frac{2}{3} = \frac{2 \times 5}{3 \times \square} = \frac{10}{\square}$ 2) $\frac{1}{3} = \frac{1 \times \square}{3 \times 5} = \frac{\square}{15}$

3) $\frac{12}{18} = \frac{12 \div \square}{18 \div 6} = \frac{\square}{3}$ 4) $\frac{18}{27} = \frac{18 \div \square}{27 \div \square} = \frac{\square}{9}$

D. Write the next four equivalent fractions.

1) $\frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \square = \square = \square = \square$

2) $\frac{2}{3} = \frac{4}{6} = \frac{6}{9} = \square = \square = \square = \square$

3) $\frac{1}{5} = \frac{2}{10} = \square = \square = \square = \square$

4) $\frac{1}{6} = \frac{2}{12} = \square = \square = \square = \square$

❖ Checking for equivalence

If two fractions are given to you, how will you check if they are equivalent or not?

Let us take a few examples and see.

1. Consider two equivalent fractions

$\frac{8}{12} = \frac{2}{3}$

Cross multiply as shown: $\frac{8}{12} \times \frac{2}{3}$

$8 \times 3 = 24$ and $12 \times 2 = 24$

We see that the two products are equal.

2. Now consider the equivalent fractions

$\frac{2}{7} = \frac{8}{28}$

Cross multiply as shown: $\frac{2}{7} \times \frac{8}{28}$

$2 \times 28 = 56$ and $7 \times 8 = 56$

The products are equal.

Thus, the fractions are equivalent if the cross products (that is, the product of the numerator of one fraction with the denominator of the other) are equal.

Exercise 6.2

A. Check for equivalence.

1) $\frac{21}{49}, \frac{3}{7}$ 2) $\frac{14}{63}, \frac{2}{9}$ 3) $\frac{5}{11}, \frac{25}{50}$ 4) $\frac{7}{13}, \frac{35}{63}$ 5) $\frac{3}{8}, \frac{18}{48}$

6) $\frac{5}{6}, \frac{25}{35}$ 7) $\frac{4}{7}, \frac{40}{70}$ 8) $\frac{6}{9}, \frac{54}{80}$ 9) $\frac{8}{11}, \frac{88}{121}$ 10) $\frac{9}{13}, \frac{36}{39}$

B. Fill in the missing numbers to make the fractions equivalent and check your answer by cross-multiplication.

1) $\frac{2}{5} = \frac{\square}{10}$ 2) $\frac{8}{24} = \frac{\square}{3}$ 3) $\frac{2}{7} = \frac{\square}{28}$ 4) $\frac{2}{3} = \frac{\square}{9}$ 5) $\frac{3}{5} = \frac{30}{\square}$

6) $\frac{10}{\square} = \frac{1}{10}$ 7) $\frac{3}{30} = \frac{\square}{10}$ 8) $\frac{3}{12} = \frac{\square}{4}$ 9) $\frac{9}{81} = \frac{1}{\square}$ 10) $\frac{6}{24} = \frac{1}{\square}$

❖ Fraction in lowest terms

A fraction is in the lowest terms, if the only common factor of the numerator and denominator is 1.

$\frac{5}{10}$ is not in its lowest terms, since 5 is a common factor of 5 and 10.

$\frac{8}{12}$ is not in its lowest terms, since 2 and 4 are common factors of 8 and 12.

$\frac{3}{7}$ is in its lowest terms, since the only common factor of 3 and 7 is 1.

Simplification of fractions

To simplify a fraction means converting a fraction to its lowest term.

Example 1: Simplify the fraction $\frac{6}{12}$.

$$\frac{6}{12} = \frac{6 \div 2}{12 \div 2} = \frac{3}{6} = \frac{3 \div 3}{6 \div 3} = \frac{1}{2}$$

To simplify a fraction, divide the numerator and denominator by their common factors till only 1 is left as the common factor.

Example 2: Simplify the fraction $\frac{36}{54}$.

$$\frac{36}{54} = \frac{36 \div 2}{54 \div 2} = \frac{18}{27} = \frac{18 \div 9}{27 \div 9} = \frac{2}{3}$$

Exercise 6.3

Simplify the fractions which are not in lowest terms.

1) $\frac{15}{30}$ 2) $\frac{12}{36}$ 3) $\frac{12}{48}$ 4) $\frac{1}{28}$ 5) $\frac{15}{25}$ 6) $\frac{11}{13}$ 7) $\frac{10}{90}$ 8) $\frac{18}{45}$

9) $\frac{16}{48}$ 10) $\frac{9}{36}$ 11) $\frac{5}{25}$ 12) $\frac{20}{30}$ 13) $\frac{9}{63}$ 14) $\frac{7}{27}$ 15) $\frac{16}{64}$ 16) $\frac{49}{63}$

❖ Types of fractions

Like and unlike fractions

Like fractions are fractions with the same denominators, example $\frac{1}{9}$, $\frac{2}{9}$, $\frac{4}{9}$, $\frac{6}{9}$.

Unlike fractions are fractions with different denominators, example $\frac{2}{5}$, $\frac{3}{4}$, $\frac{1}{2}$, $\frac{8}{9}$.

Unit fractions are fractions in which the numerator is 1, example $\frac{1}{1}$, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$.

Proper and improper fractions

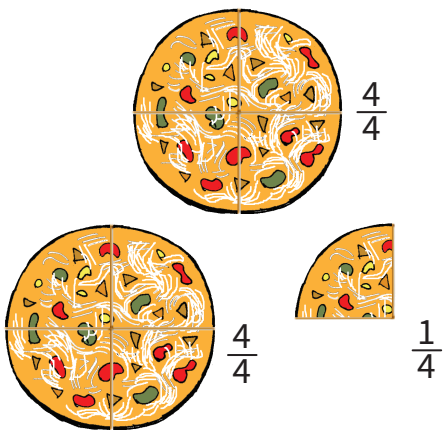
This picture shows a pizza divided into 4 equal parts.

$\frac{4}{4}$ or four-quarters is a whole, or 1.

What do we get if we add a quarter more to $\frac{4}{4}$?

$\frac{4}{4}$ and $\frac{1}{4} = \frac{5}{4}$

$\frac{5}{4}$ is a whole and a quarter or $1\frac{1}{4}$



Fractions such as $\frac{5}{4}$ in which the numerator is greater than the denominator are called **improper fractions**.

$\frac{6}{5}, \frac{4}{3}, \frac{7}{3}, \frac{16}{5}$ are improper fractions.

Fractions in which the numerator is less than the denominator are known as **proper fractions**.

$\frac{3}{4}, \frac{6}{12}, \frac{5}{10}, \frac{7}{9}$ are proper fractions.

Fractions such as $1\frac{1}{4}$ which are a combination of whole numbers and fractions are called **mixed fractions** or **mixed numbers**.

Exercise 6.4

A. Which set of fractions are like and which are unlike?

1) $\frac{1}{7}, \frac{2}{7}, \frac{3}{7}, \frac{4}{7}$
2) $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}$
3) $\frac{1}{3}, \frac{2}{6}, \frac{3}{9}, \frac{4}{12}$
4) $\frac{3}{9}, \frac{5}{9}, \frac{7}{9}, \frac{11}{9}$
5) $\frac{2}{3}, \frac{3}{2}, \frac{3}{4}, \frac{4}{3}$
6) $\frac{1}{11}, \frac{7}{11}, \frac{5}{11}, \frac{4}{11}$

B. Observe the pattern. Write the next five like fractions.

1) $\frac{1}{8}, \frac{2}{8}$, ———, ———, ———, ———, ———
2) $\frac{2}{9}, \frac{3}{9}$, ———, ———, ———, ———, ———
3) $\frac{1}{10}, \frac{2}{10}$, ———, ———, ———, ———, ———

C. Put a ✓ on the proper fractions.

1) $\frac{3}{7}$
2) $\frac{8}{6}$
3) $\frac{18}{27}$
4) $\frac{18}{20}$
5) $\frac{17}{19}$
6) $\frac{21}{20}$
7) $\frac{24}{20}$
8) $\frac{16}{17}$
9) $\frac{6}{7}$
10) $\frac{11}{12}$
11) $\frac{16}{20}$
12) $\frac{21}{17}$

D. Put a ✓ on the improper fractions.

1) $\frac{5}{6}$
2) $\frac{7}{9}$
3) $\frac{99}{100}$
4) $\frac{13}{11}$
5) $\frac{16}{17}$
6) $\frac{19}{18}$
7) $\frac{8}{5}$
8) $\frac{12}{11}$
9) $\frac{20}{21}$
10) $\frac{49}{50}$
11) $\frac{16}{34}$
12) $\frac{19}{3}$

❖ Conversion of improper fractions and mixed numbers

Example 1: Convert the improper fraction $\frac{5}{3}$ to a mixed number.

$\frac{5}{3}$ is five-thirds. We know that three-thirds make a whole.

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

Therefore, five-thirds make a whole and two-thirds.

$\frac{2}{3}$

That is $\frac{5}{3} = 1\frac{2}{3}$

Short method

Divide 5 by 3. You get quotient = 1 and remainder = 2.

The quotient 1 is the whole number of the mixed fraction.

The remainder 2 is the numerator of the mixed fraction.

The denominator remains as 3.

Therefore, $\frac{5}{3} = 1\frac{2}{3}$

Example 2: Convert $2\frac{1}{3}$ into an improper fraction.

$2\frac{1}{3}$ means 2 wholes and one-third.

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

1 whole is three-thirds.

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

Therefore, $2\frac{1}{3} = \frac{3}{3} + \frac{3}{3} + \frac{1}{3} = \frac{7}{3}$

$\frac{1}{3}$

Short method

Multiply 3 (demoninator) by 2 (whole number): $3 \times 2 = 6$

Add 1 (numerator) to this product: $6 + 1 = 7$

7 is the numerator of the improper fraction and 3 remains as the denominator.

So, numerator = denominator × whole number + numerator $= 3 \times 2 + 1 = 7$

Answer: $\frac{7}{3}$

Exercise 6.5

A. Fill in the blanks.

1) $\frac{5}{2} = 2\frac{\square}{\square}$

2) $\frac{6}{5} = 1\frac{\square}{\square}$

3) $\frac{100}{9} = \square\frac{\square}{9}$

4) $5\frac{3}{5} = \frac{\square}{5}$

5) $10\frac{1}{10} = \frac{\square}{10}$

6) $\frac{8}{3} = \square\frac{\square}{3}$

7) $100\frac{1}{2} = \frac{201}{\square}$

8) $1\frac{99}{100} = \frac{\square}{\square}$

B. Convert the following fractions into mixed numbers.

1) $\frac{17}{6}$ 2) $\frac{21}{6}$ 3) $\frac{19}{3}$ 4) $\frac{28}{5}$ 5) $\frac{16}{3}$ 6) $\frac{29}{5}$

7) $\frac{26}{4}$ 8) $\frac{19}{4}$ 9) $\frac{34}{3}$ 10) $\frac{39}{5}$ 11) $\frac{48}{7}$ 12) $\frac{69}{8}$

C. Convert the following mixed numbers into improper fractions.

1) $4\frac{2}{3}$ 2) $5\frac{1}{7}$ 3) $6\frac{2}{3}$ 4) $7\frac{1}{3}$ 5) $8\frac{1}{2}$ 6) $9\frac{1}{4}$

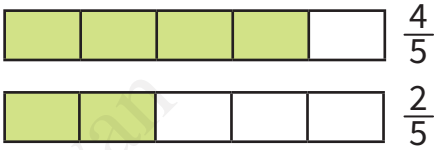
7) $1\frac{2}{9}$ 8) $5\frac{4}{7}$ 9) $6\frac{1}{7}$ 10) $7\frac{1}{11}$ 11) $8\frac{2}{5}$ 12) $3\frac{4}{13}$

❖ Comparison of fractions

Comparing like fractions

It is easy to compare like fractions. If two fractions have the same denominator, the fraction with the greater numerator is greater.

Therefore, $\frac{4}{5} > \frac{2}{5}$ since $4 > 2$



Comparing unlike fractions

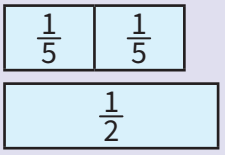
To compare unlike fractions, **first change them into like fractions and then compare**.

Example 1: Compare $\frac{2}{5}$ and $\frac{1}{2}$.

First let us compare the fractions physically through an activity.

ACTIVITY 1

Cut out two equal strips of length 20 cm each from a sheet of chart paper. Use a scale to divide the first strip into 2 equal parts and the second strip into 5 equal parts. Cut out the halves and fifths. Compare $\frac{2}{5}$ and $\frac{1}{2}$ by putting 2 fifths together and comparing with $\frac{1}{2}$. You can see that $\frac{1}{2} > \frac{2}{5}$



Now let us solve the example by finding like fractions in two different ways.

Method 1: Listing equivalent fractions to find like fractions.

Equivalent fractions of $\frac{2}{5}$: $\frac{4}{10}, \frac{6}{15}, \frac{8}{20}$

Equivalent fractions of $\frac{1}{2}$: $\frac{2}{4}, \frac{3}{6}, \frac{4}{8}, \frac{5}{10}$

$\frac{4}{10}$ and $\frac{5}{10}$ are like fractions

$\frac{4}{10} < \frac{5}{10}$, therefore $\mathbf{\frac{2}{5} < \frac{1}{2}}$

Method 2: Using LCM to find equivalent fractions.

Step 1: Find the LCM of the denominators: LCM of 2 and 5 = 10

Step 2: Convert the fractions into equivalent fractions with denominator = 10

$\frac{2}{5} = \frac{2 \times 2}{5 \times 2} = \frac{4}{10}$ $\frac{1}{2} = \frac{1 \times 5}{2 \times 5} = \frac{5}{10}$

Step 3: Compare the equivalent fractions: $\frac{5}{10} > \frac{4}{10}$, therefore $\mathbf{\frac{1}{2} > \frac{2}{5}}$

Example 2: Compare $\frac{2}{5}$ and $\frac{1}{3}$.

The LCM of 5 and 3 is 15.

15 ÷ 5 = 3, so the equivalent fraction of $\frac{2}{5}$ with denominator 15 is

$\frac{2}{5} = \frac{2 \times 3}{5 \times 3} = \frac{6}{15}$

Similarly, $\frac{1}{3} = \frac{1 \times 5}{3 \times 5} = \frac{5}{15}$

Since, $\frac{6}{15} > \frac{5}{15}$

Therefore, $\mathbf{\frac{2}{5} > \frac{1}{3}}$

Example 3: Compare $\frac{2}{3}$ and $\frac{3}{4}$.

The LCM of 3 and 4 is 12.

$\frac{2}{3} = \frac{2 \times 4}{3 \times 4} = \frac{8}{12}$

$\frac{3}{4} = \frac{3 \times 3}{4 \times 3} = \frac{9}{12}$

Since, $\frac{9}{12} > \frac{8}{12}$

Therefore, $\mathbf{\frac{3}{4} > \frac{2}{3}}$

Example 4: Arrange $\frac{2}{5}$, $\frac{1}{3}$ and $\frac{5}{6}$ in ascending order.

LCM of 5, 3 and 6 = 30.

$\frac{2}{5} = \frac{2 \times 6}{5 \times 6} = \frac{12}{30}$ $\frac{1}{3} = \frac{1 \times 10}{3 \times 10} = \frac{10}{30}$ $\frac{5}{6} = \frac{5 \times 5}{6 \times 5} = \frac{25}{30}$

Since, $\frac{10}{30} < \frac{12}{30} < \frac{25}{30}$

Therefore, $\mathbf{\frac{1}{3} < \frac{2}{5} < \frac{5}{6}}$

Comparing mixed numbers and improper fractions

Example 1: Compare $5\frac{1}{2}$ and $\frac{7}{2}$.

Convert the mixed number $5\frac{1}{2}$ into an improper fraction.

Thus, $5\frac{1}{2} = \frac{11}{2}$

Compare $\frac{11}{2}$ and $\frac{7}{2}$:

$\frac{11}{2} > \frac{7}{2}$

Therefore, $\mathbf{5\frac{1}{2} > \frac{7}{2}}$

Example 2 : Compare $2\frac{1}{3}$ and $\frac{9}{2}$.

$2\frac{1}{3} = \frac{7}{3}$. The LCM of 2 and 3 is 6.

$\frac{7}{3} = \frac{7 \times 2}{3 \times 2} = \frac{14}{6}$

$\frac{9}{2} = \frac{9 \times 3}{2 \times 3} = \frac{27}{6}$

Since, $\frac{27}{6} > \frac{14}{6}$

Therefore, $\mathbf{\frac{9}{2} > 2\frac{1}{3}}$

Exercise 6.6

A. Which fraction is greater in each pair?

1) $\frac{1}{3}, \frac{5}{3}$ 2) $\frac{4}{5}, \frac{3}{5}$ 3) $\frac{1}{8}, \frac{1}{4}$ 4) $\frac{1}{6}, \frac{5}{12}$ 5) $\frac{5}{16}, \frac{3}{8}$

6) $\frac{2}{5}, \frac{3}{10}$ 7) $\frac{1}{7}, \frac{3}{14}$ 8) $\frac{3}{7}, \frac{2}{5}$ 9) $\frac{3}{5}, \frac{5}{10}$ 10) $\frac{2}{3}, \frac{1}{9}$

B. Which fraction is smaller in each pair?

1) $\frac{2}{15}, \frac{7}{15}$ 2) $\frac{4}{9}, \frac{1}{9}$ 3) $\frac{1}{10}, \frac{1}{15}$ 4) $\frac{5}{8}, \frac{7}{12}$ 5) $\frac{3}{4}, \frac{5}{12}$

6) $\frac{7}{12}, \frac{9}{16}$ 7) $\frac{5}{6}, \frac{11}{18}$ 8) $\frac{5}{21}, \frac{3}{7}$ 9) $1\frac{1}{4}, \frac{7}{8}$ 10) $2\frac{2}{3}, \frac{11}{6}$

C. Write in ascending order using the symbol <.

1) $\frac{1}{2}, \frac{1}{4}, \frac{3}{4}$ 2) $\frac{1}{3}, \frac{5}{6}, \frac{4}{9}$ 3) $\frac{3}{4}, \frac{3}{8}, \frac{5}{12}$ 4) $\frac{1}{3}, \frac{1}{4}, \frac{1}{5}$

5) $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}$ 6) $\frac{1}{2}, \frac{1}{4}, \frac{3}{8}$ 7) $\frac{3}{8}, \frac{5}{12}, \frac{5}{6}$ 8) $\frac{2}{5}, \frac{3}{10}, \frac{4}{15}$

9) $\frac{5}{6}, \frac{5}{8}, \frac{5}{12}$ 10) $\frac{11}{18}, \frac{5}{9}, \frac{2}{3}, \frac{1}{2}$ 11) $\frac{4}{5}, \frac{9}{10}, \frac{7}{15}, \frac{2}{3}$ 12) $\frac{2}{3}, \frac{1}{5}, \frac{5}{6}, \frac{1}{2}$

D. Arrange in descending order using the symbol >.

1) $\frac{5}{12}, \frac{1}{6}, \frac{3}{8}$ 2) $\frac{5}{7}, \frac{11}{21}, \frac{9}{14}$ 3) $\frac{7}{16}, \frac{9}{32}, \frac{5}{8}$ 4) $\frac{7}{10}, \frac{17}{20}, \frac{23}{30}$

5) $\frac{2}{5}, \frac{7}{15}, \frac{19}{30}$ 6) $\frac{5}{6}, \frac{7}{12}, \frac{13}{24}$ 7) $\frac{1}{9}, \frac{1}{18}, \frac{1}{12}$ 8) $\frac{10}{11}, \frac{19}{22}, \frac{19}{33}$

9) $\frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \frac{5}{6}$ 10) $\frac{7}{9}, \frac{7}{8}, \frac{5}{6}, \frac{11}{12}$ 11) $\frac{5}{7}, \frac{5}{9}, \frac{5}{6}, \frac{5}{11}$ 12) $\frac{5}{6}, \frac{7}{8}, \frac{2}{3}, \frac{3}{4}$

❖ Addition and subtraction of like fractions

Let us recall what we learnt in Class IV.

Example 1: $\frac{3}{8} + \frac{4}{8}$

The numerators are added.

The denominator remains the same.

Therefore, $\frac{3}{8} + \frac{4}{8} = \frac{7}{8}$

Example 2: Add $\frac{3}{11}$ and $\frac{5}{11}$.

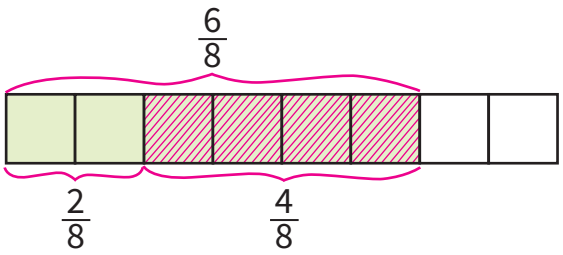
$$\frac{3}{11} + \frac{5}{11} = \frac{3+5}{11} = \frac{8}{11}$$

Example 3: $\frac{6}{8} - \frac{4}{8}$

The numerators are subtracted.

The denominator remains the same.

Therefore, $\frac{6}{8} - \frac{4}{8} = \mathbf{\frac{2}{8}}$



Example 4: $\frac{8}{13} - \frac{5}{13} = \frac{8-5}{13} = \mathbf{\frac{3}{13}}$

Exercise 6.7

A. Solve

1) $\frac{2}{7} + \frac{1}{7} =$
2) $\frac{1}{9} + \frac{5}{9} =$
3) $\frac{6}{11} + \frac{3}{11} =$
4) $\frac{1}{21} + \frac{1}{21} =$
5) $\frac{1}{5} + \frac{2}{5} + \frac{3}{5} =$
6) $\frac{3}{11} + \frac{4}{11} + \frac{1}{11} =$
7) $\frac{5}{18} + \frac{3}{18} + \frac{1}{18} =$
8) $\frac{6}{25} + \frac{2}{25} + \frac{6}{25} =$

B. Add

1) $\frac{3}{5}$ and $\frac{1}{5}$
2) $\frac{8}{21}$ and $\frac{9}{21}$
3) $\frac{9}{17}$ and $\frac{4}{17}$
4) $\frac{3}{11}$ and $\frac{7}{11}$
5) $\frac{2}{7}$, $\frac{3}{7}$ and $\frac{1}{7}$
6) $\frac{1}{13}$, $\frac{5}{13}$ and $\frac{6}{13}$
7) $\frac{4}{35}$, $\frac{6}{35}$ and $\frac{8}{35}$
8) $\frac{1}{11}$, $\frac{7}{11}$ and $\frac{2}{11}$

C. Solve

1) $\frac{3}{5} - \frac{2}{5} =$
2) $\frac{6}{7} - \frac{2}{7} =$
3) $\frac{10}{11} - \frac{1}{11} =$
4) $\frac{5}{9} - \frac{2}{9} =$
5) $\frac{6}{21} - \frac{3}{21} =$
6) $\frac{20}{25} - \frac{5}{25} =$
7) $\frac{9}{14} - \frac{7}{14} =$
8) $\frac{3}{8} - \frac{2}{8} =$

D. Subtract

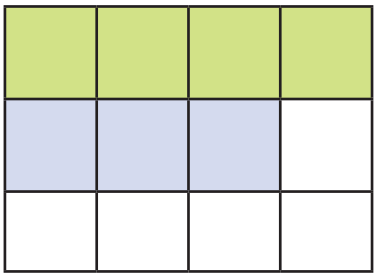
1) $\frac{3}{11}$ from $\frac{8}{11}$
2) $\frac{2}{9}$ from $\frac{5}{9}$
3) $\frac{9}{13}$ from $\frac{11}{13}$
4) $\frac{16}{33}$ from $\frac{28}{33}$
5) $\frac{31}{99}$ from $\frac{49}{99}$
6) $\frac{15}{26}$ from $\frac{21}{26}$
7) $\frac{7}{51}$ from $\frac{23}{51}$
8) $\frac{6}{13}$ from $\frac{12}{13}$

❖ Addition of unlike fractions

Example 1: Add $\frac{1}{3}$ and $\frac{1}{4}$.

This cannot be done straightaway since the denominators are different. We need to find a common denominator for the fractions. This can be the LCM of the denominators.

The LCM of 3 and 4 is 12. Consider a whole divided into 12 parts.



$\frac{1}{3}$ of 12 parts = 4 parts = $\frac{4}{12}$ of the whole

$\frac{1}{4}$ of 12 parts = 3 parts = $\frac{3}{12}$ of the whole

$\frac{1}{3} + \frac{1}{4} = \frac{4}{12} + \frac{3}{12} = \frac{7}{12}$ **Answer:** $\frac{7}{12}$

Example 2: Add $\frac{5}{6}$ and $\frac{3}{4}$

The LCM of 6 and 4 is 12.

Therefore, $\frac{5}{6} = \frac{10}{12}$ $(6 \times 2 = 12, 5 \times 2 = 10)$

$\frac{3}{4} = \frac{9}{12}$ $(4 \times 3 = 12, 3 \times 3 = 9)$

Adding $\frac{10}{12} + \frac{9}{12} = \frac{19}{12} = 1\frac{7}{12}$

Therefore, $\frac{5}{6} + \frac{3}{4} = 1\frac{7}{12}$

Answer: $1\frac{7}{12}$

Example 3: Add $\frac{3}{8}$, $\frac{5}{6}$, $\frac{11}{12}$

LCM of 8, 6, 12 = 24

$\frac{3}{8} = \frac{9}{24}$ $(8 \times 3 = 24, 3 \times 3 = 9)$

$\frac{5}{6} = \frac{20}{24}$ $(6 \times 4 = 24, 5 \times 4 = 20)$

$\frac{11}{12} = \frac{22}{24}$ $(12 \times 2 = 24, 11 \times 2 = 22)$

$\frac{9}{24} + \frac{20}{24} + \frac{22}{24} = \frac{51}{24} = \frac{17}{8} = 2\frac{1}{8}$

$\frac{3}{8} + \frac{5}{6} + \frac{11}{12} = 2\frac{1}{8}$

Answer: $2\frac{1}{8}$

Example 4: Add $3\frac{3}{4}$ and $1\frac{1}{8}$

There are two methods to add.

First method

Separate the whole numbers and the fractions of both the mixed numbers.

$3\frac{3}{4} + 1\frac{1}{8} = 3 + 1 + \frac{3}{4} + \frac{1}{8}$

Add the fractions $\frac{3}{4}$ and $\frac{1}{8}$.

The LCM of 4 and 8 is 8.

$\frac{3}{4} = \frac{6}{8}$ $(4 \times 2 = 8, 3 \times 2 = 6)$

Hence, $\frac{3}{4} + \frac{1}{8} = \frac{6}{8} + \frac{1}{8} = \frac{7}{8}$

Add the whole numbers separately.

$3 + 1 = 4$

Now $4 + \frac{7}{8} = 4\frac{7}{8}$

Therefore, $3\frac{3}{4} + 1\frac{1}{8} = \mathbf{4\frac{7}{8}}$

Second method

Convert $3\frac{3}{4} + 1\frac{1}{8}$ into improper fractions.

$3\frac{3}{4} = \frac{15}{4}$ and $1\frac{1}{8} = \frac{9}{8}$

Now consider $\frac{15}{4} + \frac{9}{8}$

The LCM of 4 and 8 is 8.

$\frac{15}{4} = \frac{30}{8}$ $(4 \times 2 = 8, 15 \times 2 = 30)$

Thus, $\frac{30}{8} + \frac{9}{8} = \frac{39}{8}$

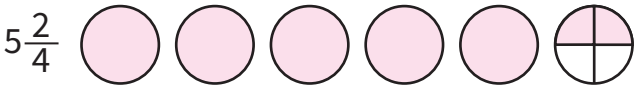
Convert $\frac{39}{8}$ back to a mixed number.

$\frac{39}{8} = \mathbf{4\frac{7}{8}}$

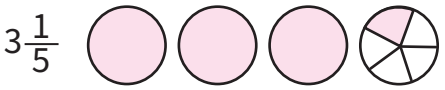
Answer: $4\frac{7}{8}$

Example 5: Add $5\frac{2}{4}$ and $3\frac{1}{5}$. Fill in the blanks.

$5\frac{2}{4} = \frac{\square}{4}$ and $3\frac{1}{5} = \frac{\square}{5}$



The LCM of 4 and 5 = _____



Therefore, $\frac{\square}{4} = \frac{\square}{20}$ and $\frac{\square}{5} = \frac{\square}{20}$

Thus $\frac{\square}{20} + \frac{\square}{20} = \frac{\square}{20}$

Converting $\frac{\square}{20}$ back to a mixed number. $\frac{\square}{20} = \square\,\frac{\square}{\square}$

Answer: $\square$

Exercise 6.8: Add

A.

1) $\frac{1}{3}, \frac{1}{6}$ 2) $\frac{1}{3}, \frac{1}{9}$ 3) $\frac{2}{5}, \frac{1}{10}$ 4) $\frac{7}{8}, \frac{3}{4}$

5) $\frac{1}{7}, \frac{3}{14}$ 6) $\frac{5}{16}, \frac{3}{8}$ 7) $\frac{5}{11}, \frac{3}{22}$ 8) $\frac{3}{16}, \frac{5}{8}$

9) $\frac{11}{20}, \frac{9}{10}$ 10) $\frac{6}{7}, \frac{5}{14}$ 11) $\frac{1}{2}, \frac{1}{4}, \frac{1}{3}$ 12) $\frac{1}{2}, \frac{1}{3}, \frac{1}{5}$

13) $\frac{3}{4}, \frac{1}{8}, \frac{3}{8}$ 14) $\frac{3}{4}, \frac{2}{5}, \frac{2}{3}$ 15) $\frac{5}{8}, \frac{3}{4}, \frac{1}{2}$

B.

1) $3\frac{1}{4}, 2\frac{2}{3}$ 2) $4\frac{1}{8}, 2\frac{1}{2}$ 3) $5\frac{1}{5}, 6\frac{1}{6}$ 4) $7\frac{1}{3}, 1\frac{1}{2}$

5) $5\frac{1}{4}, 1\frac{1}{8}$ 6) $2\frac{1}{12}, 1\frac{1}{4}$ 7) $2\frac{3}{4}, 1\frac{5}{16}$ 8) $2\frac{1}{4}, 1\frac{7}{8}$

9) $5\frac{1}{3}, 2\frac{1}{3}$ 10) $8\frac{3}{11}, 2\frac{5}{11}$

C.

1) $1\frac{2}{7}, 2\frac{1}{7}, 1\frac{3}{7}$ 2) $2\frac{7}{12}, 3\frac{1}{12}, 4\frac{1}{12}$ 3) $5\frac{2}{7}, 3\frac{1}{7}, 6\frac{3}{7}$

4) $1\frac{3}{4}, 2\frac{1}{2}, 1\frac{5}{12}$ 5) $1\frac{3}{8}, 3\frac{5}{12}, 2\frac{7}{16}$ 6) $5\frac{5}{6}, 6\frac{11}{24}, 1\frac{3}{16}$

Common mistakes!

Three students solved the addition $\frac{1}{4} + \frac{3}{5}$ as shown. Which is the correct answer? Can you point out the mistake in the wrong answers?

1) $\frac{1}{4} + \frac{3}{5} = \frac{5}{20} + \frac{12}{20} = \frac{17}{20}$ 2) $\frac{1}{4} + \frac{3}{5} = \frac{4}{9}$ 3) $\frac{1}{4} + \frac{3}{5} = \frac{5}{20} + \frac{12}{20} = \frac{17}{40}$

❖ Subtraction of unlike fractions

Example 1: Subtract $\frac{1}{4}$ from $\frac{1}{3}$

This cannot be done straightaway since the denominators are different.

We need to find a common denominator for the fractions.

This can be the LCM of the denominators. The LCM of 3 and 4 is 12.

Let us do this as a activity.

ACTIVITY 2

Take a rectangular piece of chart paper.
Divide it into 12 equal parts as shown.

You have to first shade $\frac{1}{3}$ of the rectangle.

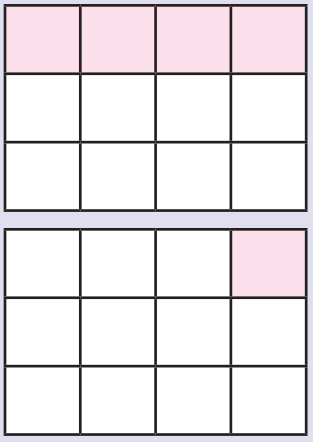
$\frac{1}{3}$ of 12 parts = 4 parts. Therefore shade 4 parts with pencil.

You have to take away $\frac{1}{4}$ of the rectangle.

$\frac{1}{4}$ of 12 parts = 3 parts. So rub out the shading in 3 of the 4 parts.

You have 1 part left. So $\frac{1}{3} - \frac{1}{4} = \frac{4}{12} - \frac{3}{12} = \frac{1}{12}$

Answer: $\frac{1}{12}$



Example 2: Subtract: $\frac{15}{16} - \frac{7}{24}$

The LCM of 16 and 24 is 48.

Therefore, $\frac{15}{16} = \frac{\mathbf{45}}{\mathbf{48}}$ $(16 \times 3 = 48,\ 15 \times 3 = 45)$ $\frac{7}{24} = \frac{\mathbf{14}}{\mathbf{48}}$ $(24 \times 2 = 48,\ 7 \times 2 = 14)$

Subtracting $\frac{45}{48} - \frac{14}{48} = \frac{31}{48}$

Therefore, $\frac{15}{16} - \frac{7}{24} = \frac{31}{48}$ **Answer:** $\frac{31}{48}$

Example 3: Subtract: $5\frac{1}{3} - 2\frac{1}{2}$. Fill in the blanks.

Convert both fractions into improper fractions: $5\frac{1}{3} = \frac{\square}{3}$ and $2\frac{1}{2} = \frac{\square}{2}$

The LCM of 3 and 2 is $\square$.

Therefore, $\frac{\square}{3} = \frac{\square}{\square}$ and $\frac{\square}{2} = \frac{\square}{\square}$

Subtracting $\frac{\square}{\square} - \frac{\square}{\square} = \frac{\square}{\square} = \square\frac{\square}{\square}$ **Answer:** $\square$

Example 4: Subtract: $3 - \frac{3}{4}$

Convert 3 into an improper fraction with denominator = 4; $3 = \frac{\square}{\square}$

Subtracting $\frac{\square}{\square} - \frac{3}{4} = \frac{\square}{\square} = \square\frac{\square}{\square}$ **Answer :** $\square$

Exercise 6.9: Subtract

A.

1) $\frac{2}{3} - \frac{1}{7}$ 2) $\frac{3}{8} - \frac{1}{12}$ 3) $\frac{7}{8} - \frac{5}{6}$ 4) $\frac{3}{7} - \frac{1}{6}$

5) $\frac{3}{4} - \frac{2}{15}$ 6) $\frac{9}{16} - \frac{5}{24}$ 7) $\frac{7}{8} - \frac{5}{12}$ 8) $\frac{5}{6} - \frac{2}{9}$

9) $\frac{5}{6} - \frac{2}{3}$ 10) $\frac{2}{5} - \frac{4}{15}$ 11) $\frac{1}{4} - \frac{1}{5}$ 12) $\frac{5}{6} - \frac{5}{16}$

13) $\frac{7}{12} - \frac{2}{9}$ 14) $\frac{5}{6} - \frac{1}{8}$ 15) $\frac{7}{15} - \frac{3}{20}$

B.

1) $2 - \frac{5}{6}$ 2) $1 - \frac{3}{7}$ 3) $3 - \frac{2}{3}$ 4) $4 - \frac{2}{5}$

5) $2\frac{3}{4} - 1\frac{1}{4}$ 6) $3\frac{1}{2} - 1\frac{1}{4}$ 7) $3\frac{1}{3} - 2\frac{1}{4}$ 8) $1\frac{7}{8} - 1\frac{1}{4}$

9) $6\frac{7}{8} - 2\frac{3}{4}$ 10) $3\frac{3}{4} - 2\frac{1}{4}$ 11) $4 - 2\frac{1}{3}$ 12) $3\frac{4}{5} - 1\frac{2}{3}$

13) $3\frac{7}{12} - 1\frac{1}{2}$ 14) $2\frac{5}{6} - 1\frac{11}{12}$ 15) $3\frac{1}{6} - 1\frac{2}{3}$

Common mistakes!

Three students solved the subtraction $\frac{4}{5} - \frac{1}{4}$ as shown. Which is the correct answer? Can you point out the mistakes in the wrong answers?

1) $\frac{4}{5} - \frac{1}{4} = \frac{16}{20} - \frac{5}{20} = \frac{11}{0}$ 2) $\frac{4}{5} - \frac{1}{4} = \frac{16}{20} - \frac{5}{20} = \frac{11}{20}$ 3) $\frac{4}{5} - \frac{1}{4} = \frac{3}{1}$

❖ Real life applications

Example 1: Raj bought a pen for ₹ $25\frac{1}{2}$ and a notebook for ₹ $20\frac{1}{4}$.

How much money did he spend?

Cost of pen $= ₹\ 25\frac{1}{2}$

Cost of notebook $= ₹\ 20\frac{1}{4}$

Total amount $= ₹\ 25\frac{1}{2} + ₹\ 20\frac{1}{4}$

$= ₹\ 25 + ₹\ 20 + ₹\frac{1}{2} + ₹\frac{1}{4}$

$= ₹\ 45 + ₹\ \frac{3}{4} = ₹\ 45\frac{3}{4}$

Answer: ₹ $45\frac{3}{4}$

Example 2: Mohan reaches school in a school bus in $\frac{3}{8}$ hours. He walks to school in $\frac{3}{4}$ hours. How much more time does it take him to walk to school than to go by bus?

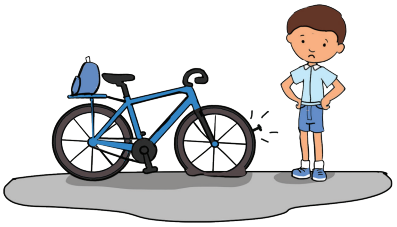
Time taken to walk to school $= \frac{3}{4}$ hours

Time taken by bus $= \frac{3}{8}$ hours

Difference $= \frac{3}{4} - \frac{3}{8} = \frac{6}{8} - \frac{3}{8} = \frac{6-3}{8} = \frac{3}{8}$

Answer: $\frac{3}{8}$ hours

Exercise 6.10: Solve

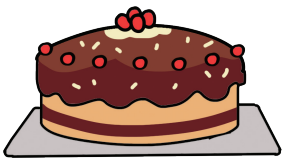


1. Ravi's school is $2\frac{1}{2}$ kilometres from his house. He cycles this distance daily. One day, his cycle tyre got punctured after he had gone $1\frac{1}{4}$ kilometres. What distance did he have to walk?

2. Arun wants to buy a marker. He has ₹ $3\frac{1}{2}$. His father gave him ₹ $5\frac{1}{4}$. How much money does he have now?

3. Ram's mother had 4 apples. She gave each one of Ram's three friends half an apple to eat. How much of the 4 apples remain?

4. It was Stella's birthday. Her father bought a cake. Stella gave each of her 7 friends one-tenth of the cake. What portion of the cake remained?



5. Suresh has ₹ 50 to buy a story book which costs ₹ $48\frac{1}{4}$. How much money will be left with him after buying the book?

6. Govind bought $1\frac{1}{4}$ metres of cloth from one shop and $2\frac{1}{4}$ metres of cloth from another. What length of cloth did he buy in all?

7. Martha and Rahul ran a 100m race. Martha completed the race in $17\frac{1}{5}$ seconds and Rahul in $15\frac{3}{4}$ seconds. Who won? How much longer did Martha take?

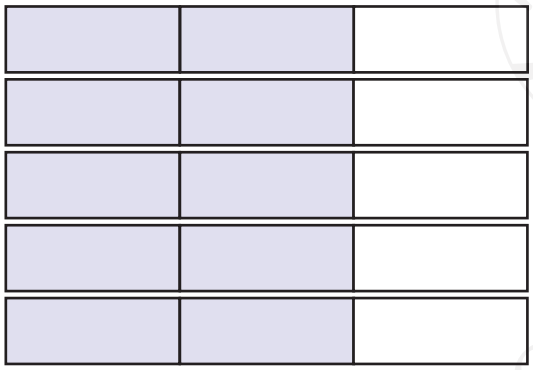
8. A vessel had $3\frac{1}{2}$ litres of milk. A cat drank $\frac{3}{4}$ litres. How much milk is left in the vessel?

9. What should be subtracted from $4\frac{4}{5}$ to make it $1\frac{3}{10}$?

10. What should be added to $2\frac{4}{9}$ to make it $5\frac{5}{12}$?

❖ Multiplication of a fractional number by a whole number

Multiply $\frac{2}{3}$ by 5.



Each rectangular strip represents one unit.

The shaded portion in each strip is $\frac{2}{3}$.

The shaded parts considered altogether

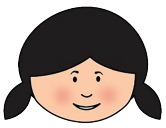
$= \frac{2}{3} + \frac{2}{3} + \frac{2}{3} + \frac{2}{3} + \frac{2}{3}$ or

$= \frac{2}{3} \times 5 \qquad = \frac{10}{3}$

This can be done by a short method.

$\frac{2}{3} \times 5 = \frac{2 \times 5}{3} = \frac{10}{3}$

To multiply a fractional number by a whole number, multiply the numerator of the fraction by the whole number. The denominator remains the same.



Exercise 6.11: Multiply

1) $\frac{4}{7} \times 6$
2) $\frac{2}{7} \times 9$
3) $\frac{7}{9} \times 10$
4) $\frac{5}{11} \times 9$
5) $\frac{2}{5} \times 10$
6) $\frac{3}{7} \times 5$
7) $\frac{4}{9} \times 4$
8) $\frac{3}{7} \times 3$

9) $\frac{7}{91} \times 6$ 10) $\frac{7}{9} \times 5$ 11) $\frac{2}{11} \times 8$ 12) $\frac{3}{14} \times 7$

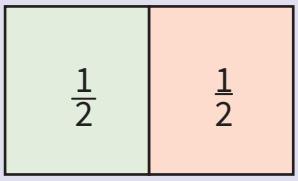
13) $\frac{5}{16} \times 9$ 14) $\frac{1}{10} \times 17$ 15) $\frac{3}{20} \times 0$ 16) $\frac{6}{11} \times 1$

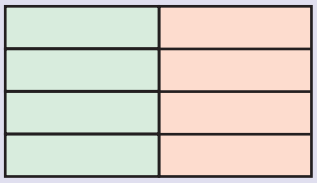
17) $\frac{2}{6} \times 24$ kg 18) $\frac{3}{4} \times 20$ km 19) $\frac{4}{7} \times ₹ 35$ 20) $\frac{3}{4} \times 8$ m

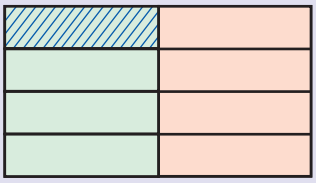
❖ Multiplication of a fractional number by a fractional number

ACTIVITY 3

Multiply $\frac{1}{4}$ and $\frac{1}{2}$: You have to find $\frac{1}{4}$ of $\frac{1}{2}$.







a) Fold a rectangle into halves as shown.

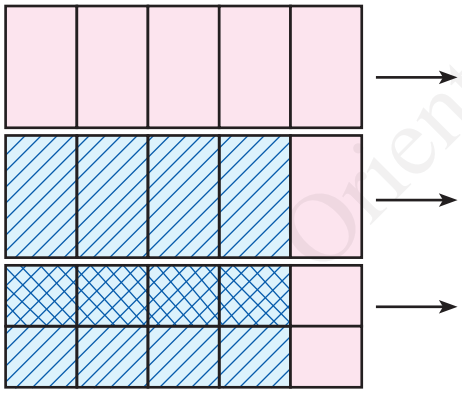
b) Fold it the other way into fourths.

c) Shade the area $\frac{1}{4}$ of $\frac{1}{2}$ $(\frac{1}{4} \times \frac{1}{2})$

The shaded area in **c** represents 1 out of 8 equal parts, that is $\frac{1}{8}$.

Therefore $\frac{1}{2} \times \frac{1}{4} = \frac{1}{8}$

Example 1: Multiply $\frac{1}{2}$ and $\frac{4}{5}$.



Look at the figures.

If this represents a whole then

this shaded part is $\frac{4}{5}$ of the whole and

this shaded part represents $\frac{1}{2}$ of $\frac{4}{5}$, or $\frac{4}{10}$ of the whole

Therefore, $\frac{1}{2} \times \frac{4}{5} = \frac{1 \times 4}{2 \times 5} = \frac{4}{10}$

On simplification, $\frac{4}{10} = \frac{4 \div 2}{10 \div 2} = \frac{2}{5}$

To multiply two fractions:

- multiply the numerators of the two fractions.
- multiply the denominators of the two fractions.
- simplify to the lowest terms.

Using a short cut to simplify

Sometime you can use a shorter method to get the answer in the lowest terms.
For this, cancel out the common factors before multiplying.

$\frac{3}{\cancel{4}_{1}} \times \frac{\cancel{16}^{4}}{1}$ (dividing by the common factor 4) $= \frac{12}{1} = 12$

Example 2: $\frac{5}{21} \times \frac{7}{10}$

$\frac{\cancel{5}^{1}}{21_{3}} \times \frac{\cancel{7}^{1}}{\cancel{10}_{2}}$ (dividing by the common factors 5 and 7)

$= \frac{1 \times 1}{3 \times 2} = \frac{1}{6}$ **Answer:** $\frac{1}{6}$

Example 3: Multiply $3\frac{1}{5}$ by $\frac{3}{8}$

$3\frac{1}{5} \times \frac{3}{8} = \frac{\cancel{16}^{2}}{5} \times \frac{3}{\cancel{8}_{1}}$ (dividing by the common factor 8)

$= \frac{2}{5} \times \frac{3}{1} = \frac{6}{5} = 1\frac{1}{5}$ **Answer:** $1\frac{1}{5}$

Exercise 6.12: Find the product. Cancel out common factors wherever possible.

A. 1) $\frac{2}{5} \times \frac{1}{8}$ 2) $\frac{3}{4} \times \frac{1}{7}$ 3) $\frac{3}{5} \times \frac{2}{3}$ 4) $\frac{2}{11} \times \frac{3}{4}$

5) $\frac{1}{5} \times \frac{3}{4}$ 6) $\frac{7}{7} \times \frac{3}{4}$ 7) $\frac{7}{9} \times \frac{1}{21}$ 8) $\frac{4}{9} \times \frac{3}{8}$

9) $\frac{5}{8} \times \frac{8}{15}$ 10) $\frac{4}{5} \times \frac{10}{13}$ 11) $\frac{26}{33} \times \frac{22}{39}$ 12) $\frac{15}{49} \times \frac{14}{45}$

B. Multiply

1) $3\frac{1}{3}$ by $\frac{1}{5}$ 2) $3\frac{1}{5}$ by $\frac{1}{2}$ 3) $4\frac{1}{5}$ by $\frac{3}{7}$ 4) $5\frac{1}{10}$ by $\frac{3}{17}$

5) 15 by $1\frac{1}{5}$ 6) $2\frac{1}{7}$ by $\frac{4}{5}$ 7) $4\frac{2}{5}$ of $\frac{4}{11}$ 8) $3\frac{1}{5}$ by $\frac{3}{8}$

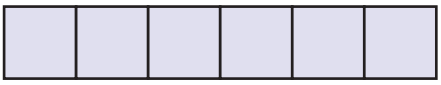
C. Find

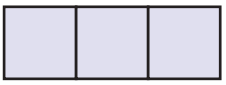
1) $3\frac{3}{4}$ of $6\frac{2}{5}$ 2) $3\frac{3}{7}$ of $2\frac{4}{5}$ 3) $3\frac{1}{5}$ of $2\frac{3}{4}$ 4) $2\frac{1}{15}$ of $2\frac{1}{5}$

❖ Multiplication of a whole number by a fractional number

Example 1: Multiply 6 by $\frac{1}{2}$

Look at the following rectangular strips.

If  represents 6, then

 represents $\frac{1}{2}$ of 6, or 3.

This can be written as: $6 \times \frac{1}{2} = \frac{6}{1} \times \frac{1}{2} = \frac{6}{2} = 3$ **Answer:** 3

Example 2: Find $\frac{3}{4}$ of 16.

$\frac{3}{4} \times 16 = \frac{3}{\cancel{4}_{1}} \times \frac{\cancel{16}^{4}}{1} = 12$

To multiply a whole number by a fractional number:

- write the whole number as a fractional number.
- multiply the numerators of the fractions.
- multiply the denominators of the fractions.
- simplify to the lowest terms.

Exercise 6.13

A. Find the product.

1) $12 \times \frac{1}{2}$
2) $14 \times \frac{1}{7}$
3) $16 \times \frac{3}{4}$
4) $15 \times \frac{2}{5}$
5) $10 \times \frac{3}{5}$
6) $12 \times \frac{2}{3}$
7) $18 \times \frac{2}{3}$
8) $21 \times \frac{3}{7}$

B. Solve.

1) $3\frac{1}{3}$ of 3
2) $5\frac{1}{5}$ of 10
3) $6\frac{2}{7}$ of 7
4) $6\frac{2}{3}$ of 1
5) $5\frac{2}{3}$ of ₹ 6
6) $1\frac{1}{5}$ of ₹ 15
7) $2\frac{2}{3}$ of 6 m
8) $5\frac{1}{2}$ of 4 kg

Common mistakes!

Check the product $\frac{5}{16} \times \frac{10}{7}$ worked out by three students. Who got it right? Can you point out the mistakes in the wrong answers?

1) $\frac{5}{16} \times \frac{10}{7} = \frac{50}{112}$

2) $\frac{5}{\cancel{16}_{8}} \times \frac{\cancel{10}^{5}}{7} = \frac{25}{56}$

3) $\frac{\cancel{5}^{1}}{16} \times \frac{\cancel{10}^{2}}{7} = \frac{2}{112}$

❖ Multiplication of more than two fractional numbers

Example 1: Multiply $\frac{1}{2}, \frac{2}{5}, \frac{3}{7}$

$$\frac{1}{2} \times \frac{2}{5} \times \frac{3}{7} = \frac{1 \times 2 \times 3}{2 \times 5 \times 7} = \frac{6}{70}$$

$$= \frac{6 \div 2}{70 \div 2} = \frac{3}{35}$$

To multiply more than two fractional numbers:

- multiply the numerators.
- multiply the denominators.
- simplify to the lowest terms.

To get the answer in the lowest terms, it is easier to cancel out the common factors before multiplying.

$$\frac{1}{\cancel{2}_{1}} \times \frac{\cancel{2}^{1}}{5} \times \frac{3}{7} = \frac{1 \times 1 \times 3}{1 \times 5 \times 7} = \frac{3}{35}$$

Example 2: $3\frac{3}{4} \times 2\frac{2}{5} \times 1\frac{1}{3}$

$$3\frac{3}{4} \times 2\frac{2}{5} \times 1\frac{1}{3} = \frac{\cancel{15}^{3}}{\cancel{4}_{1}} \times \frac{\cancel{12}^{4}}{\cancel{5}_{1}} \times \frac{\cancel{4}^{1}}{\cancel{3}_{1}}$$ (divide 15 and 5 by 5 ; 12 and 3 by 3; 4 and 4 by 4)

$$= \frac{3 \times 4 \times 1}{1 \times 1 \times 1} = 12$$

Exercise 6.14: Simplify

1) $\frac{2}{3} \times \frac{1}{7} \times \frac{4}{5}$
2) $\frac{2}{3} \times \frac{9}{2} \times \frac{3}{5}$
3) $\frac{3}{4} \times \frac{5}{7} \times \frac{7}{5}$
4) $\frac{6}{7} \times \frac{14}{25} \times \frac{5}{8}$
5) $\frac{3}{8} \times \frac{1}{3} \times \frac{2}{7}$
6) $\frac{1}{9} \times \frac{3}{5} \times \frac{3}{4}$
7) $11\frac{2}{3} \times 3\frac{1}{2} \times 7\frac{2}{7}$
8) $4\frac{1}{2} \times 3\frac{3}{5} \times 1\frac{1}{3}$
9) $\frac{4}{7} \times 5\frac{2}{3} \times \frac{7}{17}$
10) $3\frac{2}{7} \times 1\frac{1}{23} \times 2\frac{1}{12}$
11) $4\frac{1}{2} \times 5\frac{1}{4} \times \frac{8}{21}$
12) $3\frac{3}{4} \times 1\frac{2}{5} \times 1\frac{1}{7}$

❖ Real life applications

Example 1: 1 litre of milk costs ₹ $13\frac{1}{2}$. Find the cost of $\frac{1}{3}$ litre of milk.

1 litre of milk costs ₹ $13\frac{1}{2}$

$\frac{1}{3}$ litres of milk costs = $\frac{1}{3}$ of ₹ $13\frac{1}{2}$ = $\frac{1}{3}$ × ₹ $13\frac{1}{2}$ = ₹ $\frac{1}{\cancel{3}_{1}} \times \frac{\cancel{27}^{9}}{2}$

= ₹ $\frac{9}{2}$ = ₹ $4\frac{1}{2}$

Answer: ₹ $4\frac{1}{2}$

Example 2: Anuj has a rope $5\frac{1}{4}$ m long. He cuts off one-third of it. How long is the portion he cut off?

Anuj cuts off $\frac{1}{3}$ of $5\frac{1}{4}$ m

$\frac{1}{3}$ of $5\frac{1}{4} = \frac{1}{3} \times 5\frac{1}{4} = \frac{1}{\cancel{3}_{1}} \times \frac{\cancel{21}^{7}}{4}$ $= \frac{7}{4} = 1\frac{3}{4}$ **Answer:** $1\frac{3}{4}$ m

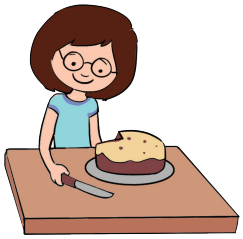
Exercise 6.15: Solve

1. a) Alka is getting dressed to attend her friend's birthday party. She wants to tie a ribbon around her hair. She has $\frac{3}{4}$ metre of ribbon. She cuts off $\frac{1}{3}$ of it. What part of the ribbon is cut off?

b) Her friend's house is 200 metres away. She walks $\frac{2}{5}$ of the distance and is then picked up by a friend. How far did she walk?

c) Alka is quite a fast walker. Her speed is $\frac{25}{16}$ km per hour. What distance in metres can she walk in $\frac{1}{5}$ of an hour?

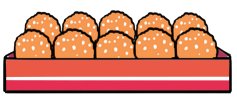
d) At the party, Alka found that only $\frac{5}{6}$ of the cake was left. She ate $\frac{1}{4}$ of it. What fraction of the full cake did she eat?



e) They all sat down to watch a television programme for $\frac{1}{2}$ hour. Advertisements took $\frac{1}{10}$ of the time. How many minutes was that?

2. 12 boys go to a circus. If each ticket costs ₹ $20\frac{3}{4}$, how much do they have to pay in all?

3. The cost of 1 kg sweets is ₹ $50\frac{1}{2}$. What is the cost of $2\frac{1}{2}$ kg sweets?

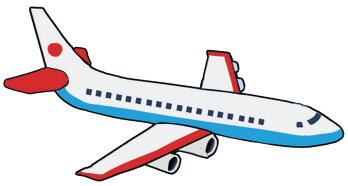


4. A man walks $3\frac{3}{4}$ km in 1 hour. How far does he go in $1\frac{1}{2}$ hours?

5. If 1 litre of petrol costs ₹ $70\frac{1}{2}$, what is the cost of 10 litres of petrol?

6. Mala can swim $1\frac{3}{5}$ m in 1 second. What distance can she swim in 1 minute?

7. An aeroplane flies 800 km in 1 hour. It completes the journey from Delhi to Hyderabad in $1\frac{3}{4}$ hours. What is the distance from Delhi to Hyderabad?



❖ Reciprocal (or multiplicative inverse)

Study the following examples.

1) $\frac{1}{3} \times \frac{3}{1} = \frac{1 \times 3}{3 \times 1} = \frac{3}{3} = 1$

2) $\frac{1}{7} \times 7 = \frac{1 \times 7}{7 \times 1} = \frac{7}{7} = 1$

3) $\frac{1}{12} \times 12 = \frac{12}{12} = 1$

In each case the product is 1.

Two numbers whose product is 1 are **reciprocals** (or **multiplicative inverses**) of each other.

To find the reciprocal of a fraction, simply interchange the numerator and denominator.

Example: Find the reciprocal of: a) $\frac{3}{5}$ b) 6 c) $2\frac{1}{4}$

a) Interchange the numerator and denominator → reciprocal is $\frac{5}{3}$

Check: $\frac{3}{5} \times \frac{5}{3} = \frac{15}{15} = 1$

b) Rewrite 6 as a fraction: $6 = \frac{6}{1}$

reciprocal of $\frac{6}{1}$ is $\frac{\square}{\square}$ Check: $6 \times \frac{\square}{\square} =$ _____

c) $2\frac{1}{4} = \frac{9}{4}$; reciprocal of $\frac{9}{4}$ is $\frac{\square}{\square}$ Check: $\frac{9}{4} \times \frac{\square}{\square} =$ _____

Note that:

- The reciprocal of 1 is 1, since $1 \times 1 = 1$.
- 0 does not have a reciprocal since no number multiplied by 0 gives 1.

Exercise 6.16: Find the reciprocals.

1) $\frac{3}{7}$ 2) $\frac{7}{9}$ 3) 8 4) $\frac{1}{9}$ 5) 1

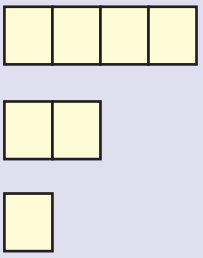
6) $2\frac{2}{5}$ 7) $3\frac{1}{3}$ 8) $4\frac{7}{9}$ 9) $3\frac{1}{4}$ 10) $2\frac{1}{2}$

❖ Division of a fractional number by a whole number

ACTIVITY 4

Let us learn division of a fractional number by a whole number using paper strips.

Take a strip of paper and divide it into 4 equal parts.
Let this represent 1.



How will you represent $\frac{1}{2}$? By cutting the strip into two equal parts

$1 \div 2 = \frac{1}{2}$

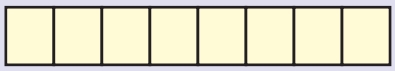
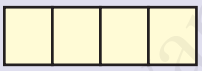
You can represent $\frac{1}{4}$ by cutting the strip further into two equal parts.

Therefore $\frac{1}{4}$ can be written as $\frac{1}{2} \div 2$ and can be obtained by taking $\frac{1}{2}$ of $\frac{1}{2}$

So $\frac{1}{2} \div 2 = \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

reciprocal of 2

Now divide another strip into 8 equal parts.

If  represents 1 then  represents $\frac{1}{2}$

and  represents $\frac{1}{8}$ of the whole.

This is also obtained by dividing $\frac{1}{2}$ into 4 equal parts,

i.e. $\frac{1}{2} \div 4$ or by taking $\frac{1}{4}$ of $\frac{1}{2}$.

So $\frac{1}{2} \div 4 = \frac{1}{2} \times \frac{1}{4} = \frac{1}{8}$

reciprocal of 4

To divide a fraction by a whole number (not 0) **multiply** the fraction by the **reciprocal** of the whole number.

Example: Divide $\frac{4}{5}$ by 2.

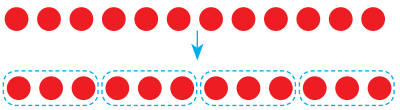
$$\frac{4}{5} \div 2 = \frac{4}{5} \times \frac{1}{2} = \frac{2}{5}$$

Exercise 6.17: Solve

1) $\frac{3}{7} \div 3$
2) $\frac{4}{9} \div 5$
3) $\frac{1}{3} \div 4$
4) $\frac{2}{5} \div 7$
5) $\frac{3}{4} \div 6$
6) $\frac{2}{3} \div 3$
7) $\frac{2}{9} \div 4$
8) $\frac{6}{7} \div 5$
9) $\frac{5}{6} \div 4$
10) $\frac{1}{3} \div 5$
11) $\frac{2}{7} \div 5$
12) $\frac{5}{9} \div 4$

❖ Division of a whole number by a fraction

To divide 12 by 3, you find how many threes there are in 12.

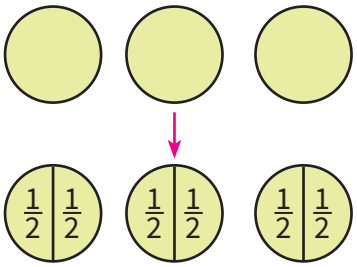


There are **4 threes** in 12, therefore 12 ÷ 3 = **4**.

A whole number is divided by a fraction in the same way.

Example 1: Divide 3 by $\frac{1}{2}$.

You have to find how many halves there are in 3.



You can see from the picture that there are **6 halves** in 3.

So, $3 \div \frac{1}{2} = \mathbf{6}$

Notice that $3 \times \frac{2}{1} = 6$; where $\frac{2}{1}$ is the reciprocal of $\frac{1}{2}$.

Therefore, to divide a whole number by a fraction **multiply** the whole number by the **reciprocal** of the fraction.

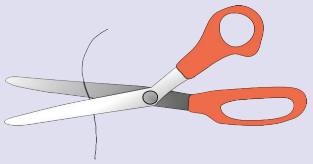
Example 2: Divide 9 by $\frac{3}{4}$.

$$9 \div \frac{3}{4} = 9 \times \frac{4}{3} = \frac{36}{3} = 12$$

($\frac{4}{3}$: reciprocal of $\frac{3}{4}$)

ACTIVITY 3

Take a 2m long piece of string. Cut it into $\frac{1}{4}$ m pieces.
How many pieces do you get?
Now work out $2 \div \frac{1}{4}$.
Does your answer tally with the number of pieces you got?

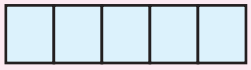


Exercise 6.18: Solve

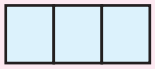
1) $7 \div \frac{5}{6}$
2) $14 \div \frac{1}{3}$
3) $15 \div \frac{1}{2}$
4) $5 \div \frac{1}{6}$
5) $4 \div \frac{2}{3}$
6) $8 \div \frac{1}{5}$
7) $9 \div \frac{2}{3}$
8) $8 \div \frac{3}{4}$
9) $10 \div \frac{5}{7}$
10) $10 \div \frac{1}{4}$
11) $17 \div \frac{1}{4}$
12) $6 \div \frac{2}{5}$

❖ Division of a fraction by a fraction

Example 1: $\frac{3}{5} \div \frac{1}{5}$

If  represents 1

then  represents $\frac{1}{5}$

and  represents $\frac{3}{5}$.

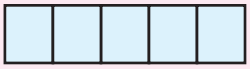
We find that there are 3 pieces of $\frac{1}{5}$ in $\frac{3}{5}$.

So $\frac{3}{5} \div \frac{1}{5} = 3$

Example 2: $2\frac{1}{2} \div \frac{1}{2}$

If  represents 1

then  represents $\frac{1}{2}$

and  represents $2\frac{1}{2}$.

We find that there are 5 pieces of $\frac{1}{2}$ in $2\frac{1}{2}$.

So $2\frac{1}{2} \div \frac{1}{2} = 5$

Now study the following.

$\frac{3}{5} \div \frac{1}{5} = 3$; also $\frac{3}{5} \times \frac{5}{1} = 3$; $\frac{5}{1}$ is the reciprocal of $\frac{1}{5}$.

$2\frac{1}{2} \div \frac{1}{2} = 5$; also $\frac{5}{2} \times \frac{2}{1} = 5$; $\frac{2}{1}$ is the reciprocal of $\frac{1}{2}$.

Therefore, to divide a fraction by another fraction **multiply** the fraction by the **reciprocal** of the divisor.

Example: $\frac{4}{5} \div \frac{1}{10}$

$$\frac{4}{5} \div \frac{1}{10} = \frac{4}{5} \times \frac{10}{1} = \frac{40}{5} = \mathbf{8}$$

($\frac{10}{1}$ is the reciprocal of $\frac{1}{10}$)

Exercise 6.19: Solve

1) $\frac{3}{8} \div \frac{3}{4}$
2) $\frac{15}{16} \div \frac{3}{4}$
3) $\frac{21}{28} \div \frac{3}{7}$
4) $\frac{10}{11} \div \frac{1}{11}$
5) $\frac{6}{7} \div \frac{3}{7}$
6) $\frac{12}{7} \div \frac{3}{7}$
7) $4\frac{1}{2} \div \frac{1}{4}$
8) $3\frac{1}{5} \div \frac{1}{5}$
9) $4\frac{1}{3} \div \frac{13}{5}$
10) $4\frac{1}{4} \div \frac{1}{8}$
11) $5\frac{1}{3} \div \frac{8}{9}$
12) $2\frac{4}{5} \div \frac{7}{2}$

Common mistakes!

Teacher gave the division sum $\frac{3}{5} \div \frac{1}{10}$. Check which student got it right. Can you point out the mistakes in the wrong answers?

1) $\frac{3}{5} \div \frac{1}{10} = \frac{5}{3} \times \frac{1}{10} = \frac{5}{30} = \frac{1}{6}$

2) $\frac{3}{5} \div \frac{1}{10} = \frac{5}{3} \times \frac{10}{1} = \frac{50}{3} = 16\frac{2}{3}$

3) $\frac{3}{5} \div \frac{1}{10} = \frac{3}{5} \times \frac{10}{1} = \frac{30}{5} = 6$

❖ Real life applications

Example 1: The cost of $3\frac{1}{2}$ kg sweets is ₹ $185\frac{1}{2}$. Find the cost of 1 kg sweets.

Cost of $3\frac{1}{2}$ kg sweets = ₹ $185\frac{1}{2}$

Therefore, cost of 1 kg sweets = ₹ $185\frac{1}{2} \div 3\frac{1}{2}$

$= \frac{371}{2} \div \frac{7}{2} =$ ₹ $\frac{\overset{53}{\cancel{371}}}{\underset{1}{\cancel{2}}} \times \frac{\overset{1}{\cancel{2}}}{\underset{1}{\cancel{7}}} =$ ₹ 53 **Answer:** ₹ 53

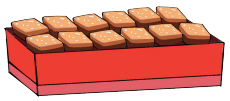
Example 2: In a class there are 32 girls. If the fraction of girls in the class is $\frac{8}{11}$, find the total number of students in the class.

$\frac{8}{11}$ of the students = 32, that is $\frac{8}{11}$ × number of students = 32

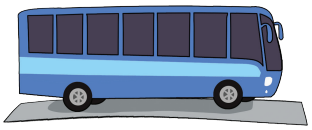
Therefore, number of students = $32 \div \frac{8}{11} = \overset{4}{\cancel{32}} \times \frac{11}{\underset{1}{\cancel{8}}} = 44$ **Answer:** 44

Exercise 6.20: Solve

1. The cost of $1\frac{1}{4}$ kg sweets is ₹ $127\frac{1}{2}$. What is the cost of 1 kg sweets?
2. A man walks $5\frac{5}{8}$ km in $1\frac{1}{2}$ hours. What distance does he cover in 1 hour?
3. 8 tins holds $42\frac{2}{3}$ ℓ of oil. How many litres can 1 such tin hold?
4. The product of two numbers is 4. One of the numbers is $5\frac{1}{3}$. Find the other.



5. If $5\frac{2}{3}$ kg sweets is equally distributed among 17 children, what quantity of sweets does each child get?



6. If a bus travels 104 km in $3\frac{1}{4}$ hours, how far does it go in 1 hour?

7. Banu cuts a 12 m cloth into $\frac{3}{4}$ m pieces each. How many pieces does she get?
8. Seema buys $2\frac{1}{2}$ kg sweets and out of that makes packets weighing $\frac{1}{4}$ kg each. How many packets does she make?
9. $2\frac{1}{2} \times \frac{4}{5} = 2$. Write the two division facts corresponding to this multiplication fact.
10. The product of two numbers is $3\frac{1}{2}$. One of them is 7. Find the other.

WORKOUT 1

understand and calculate

1. **Find two equivalent fractions for each. Use multiplication or division, whichever is easier.**

   a) $\frac{2}{9}$ b) $\frac{12}{36}$ c) $\frac{25}{40}$

2. **Compare the fractions. Put <, > or = in the ◯.**

   a) $\frac{2}{3}$ ◯ $\frac{5}{6}$ b) $6\frac{1}{2}$ ◯ $\frac{19}{3}$ c) $\frac{12}{5}$ ◯ $\frac{12}{7}$

3. a) Arrange in ascending order.

   $\frac{7}{11}, \frac{7}{9}, \frac{7}{17}$

   b) Arrange in descending order.

   $\frac{3}{4}, \frac{11}{12}, \frac{2}{3}, \frac{4}{15}$

4. **Add. Give the answer in the lowest terms as a proper or mixed fraction.**

   a) $\frac{3}{4} + \frac{11}{12} + \frac{2}{3}$ b) $2\frac{2}{5} + 1\frac{1}{10}$ c) $2\frac{2}{3} + 1\frac{4}{9}$

5. **Subtract. Give the answer in the lowest terms as a proper or mixed fraction.**

   a) $\frac{25}{30} - \frac{5}{12}$ b) $3\frac{2}{6} - 1\frac{2}{3}$ c) $3\frac{1}{2} - 2\frac{1}{4}$

6. **Multiply. Give the answer in the lowest terms.**

   a) $\frac{5}{21} \times 9$ b) $\frac{2}{9} \times 4\frac{1}{2}$ c) $1\frac{3}{7} \times 3\frac{3}{20} \times \frac{2}{9}$

7. **Divide. Give the answer in the lowest terms.**

   a) $44 \div \frac{11}{4}$ b) $\frac{4}{5} \div 1\frac{1}{15}$ c) $\frac{9}{11} \div 6$

8. Taslim sleeps 8 hours in a day. What fraction of a day does she sleep?

9. The normal route from my house to the market is $1\frac{4}{5}$ km long. There is a shortcut which is $1\frac{7}{10}$ km long.

   a) How much shorter is the shortcut than the normal route? ___

   b) If I go by the normal route and return by the shortcut, how much do I walk? ___

10. Harjeet studies $\frac{4}{5}$ hours every day for her exams. How many hours does she study in 10 days?

11. The cost of $3\frac{1}{3}$ kg onions is ₹ 25. What is the cost of 1 kg onions?

Mental maths

12. a) What is $\frac{3}{6}$ in its lowest terms? _____ b) What is $\frac{10}{10}$ in its lowest terms? _____

    c) How many quarters are there in 3?_____

    d) What is $\frac{3}{5} \times \frac{5}{6} \times 0$? _____ e) What is $\frac{9}{11} \times \frac{11}{9}$? _____

    f) If $\frac{1}{2}$ of a number is 10, what is the number? _____

WORKOUT 2
think and apply

MCQs

1. The fractions $\frac{3}{7}$ and $\frac{21}{49}$ are:

a) Equivalent and like
b) Equivalent and unlike
c) Equivalent and improper
d) Not equivalent but like

2. $\frac{30}{60}$ in the lowest form is:

a) It is already in its lowest form
b) $\frac{10}{20}$
c) $\frac{6}{12}$
d) $\frac{1}{2}$

3. Which pair of fractions are equivalent?

a) $\frac{2}{5}$ and $\frac{1}{5}$
b) $\frac{10}{9}$ and $\frac{3}{10}$
c) $\frac{3}{7}$ and $\frac{6}{14}$
d) $\frac{1}{2}$ and 2

4. $\frac{2}{2}$ is equal to:

a) half
b) quarter
c) 1 whole
d) 2 wholes

5. The multiplication inverse of 1 is

a) 0
b) 1
c) less than 1
d) cannot be found

Problem solving

6. Shabad has a chocolate. He wants to eat $\frac{1}{2}$ of it himself, give $\frac{1}{3}$ of it to his sister, and $\frac{1}{4}$ to his brother. Can he do this? Why?

7. a) Is the reciprocal of a proper fraction greater or smaller than the fraction? _____
b) Is the reciprocal of an improper fraction greater or smaller than the fraction? _____
c) A whole number is greater than 1. Is its reciprocal greater or smaller than the number? _____

8. Bobby can walk $4\frac{4}{5}$ km in one hour. What distance can he walk in 10 minutes?
(*Hint* : 10 minutes = $\frac{10}{60}$ = $\frac{1}{6}$ of an hour)

Cross-curricular

9. a) $\frac{7}{10}$ part of the earth's surface is covered with water. Express this as a fraction with 100 as denominator.
b) Express the part covered with land in the same way.

Fun activity

10. Find pairs of fractions that can be added or subtracted to give the answer $\frac{9}{12}$.

$\frac{10}{12}$ $\frac{5}{12}$ $\frac{1}{12}$ $\frac{4}{12}$ $\frac{6}{12}$ $\frac{3}{12}$ $\frac{7}{12}$ $\frac{8}{12}$ $\frac{11}{12}$ $\frac{12}{12}$ $\frac{2}{12}$

Inspired Maths

For the CISCE curriculum
CLASS 5

Orient BlackSwan

The National Education Policy (NEP) 2020 emphasises certain crucial parameters based on content and pedagogy. The Inspired Maths series provides a rich range of exercises and activities for each of the parameters. Here is a quick reference guide to some of the examples in this book.

The Inspired Maths series is mapped perfectly to the National Education Policy 2020.

21st Century Skills

A broad set of skills, knowledge, work habits and character traits that are important for success in the 21st century

The NEP parameters	Features	Page nos.
The 4Cs		
Critical Thinking	Workout 2-Problem Solving	17, 155, 166
Creativity	Make your own story sums	33
Creativity, Collaboration	Make your own story sums	42, 55–56
Collaboration, Communication	Workout 2-Project	233
Collaboration, Communication	Activity 1	237

Experiential/ Constructivist Approach

Learners construct their knowledge, based on what they already know, through experience or by doing and reflection

The NEP parameters	Features	Page nos.
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	Activity 1–3	117, 118, 125
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Integrated Approach

An approach to teaching and learning that works by connecting knowledge and skills across the curriculum, by bringing real life examples to the classroom

The NEP parameters	Features	Page nos.
Subject Integration	Workout 2-Cross-curricular (Science)	17
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	Workout 2-Life Skills	129

The NEP parameters	Features	Page nos.
Know more about India	Workout 2-Our Maths Heritage	17
	Workout 2-Our Heritage	155

India Knowledge

A strong focus on ancient knowledge from India, traditional values, modern developments and future aspirations

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The use of digital tools to enhance and support the teaching–learning process

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Teachers' Smart Book - Embedded Questions, Interactive Tasks, Animations, Games, Presentations, Worksheets, Teachers' Resources, Question Paper Generator

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Teachers' Resource Pack - Lesson Plans with Extension Activities, Worksheets with Answers, Question Bank with Answers, Assessment Papers

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