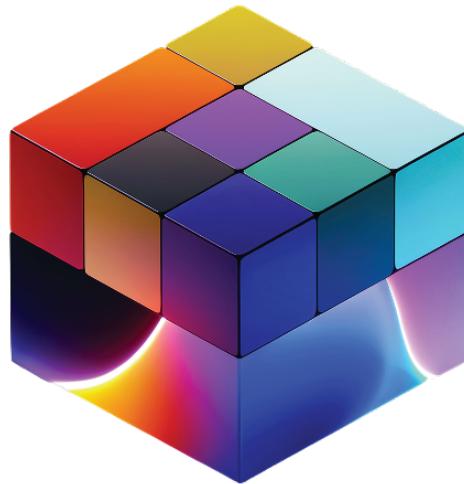


4

MATH GENIUS

Think Smart, Solve Fast

Ver. 2.0 >



Teacher's Resource Manual

Experience the Joy of Learning Mathematical Skills



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PREFACE

The Teacher's Resource Manual is specially developed for teachers using **Learning's Math Genius!** Coursebooks. The manual has been designed to provide the teacher with additional materials and support that they may require to effectively teach the coursebook. Each **Teacher's Resource Manual** is completely mapped with its coursebook. The method of teaching/learning suggested in the book is completely based on the Learning-by-doing method which supports guidelines and aids of classroom teaching as per the New Education Policy 2020. The classroom teaching/learning activity helps to allay the fear of Mathematics from the minds of the learners and develops an inherent link for the subject.

Each **Teacher's Resource Manual** has two segments—Chapter-wise detailed **Lesson Plans based on 6E model** and **Practice Materials** in the form of **Worksheets**.

Features of the Teacher's Resource Manual:

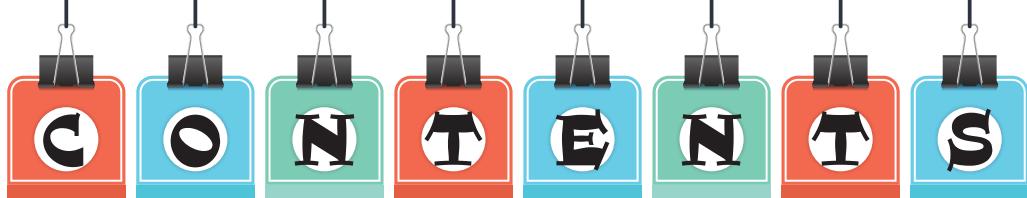
Detailed Lesson Plan: It contains Topics to be covered in the chapter, Suggested Allocation of Periods, Teaching Objectives, Learning Objectives and Suggested Teaching Aids.

- ❖ **Each lesson plan is based on 6E's:** The 6E lesson plan is based on an instructional model that consists of six phases or steps: Engage, Explore, Explain, Elaborate, Evaluate and Enhance.
- ❖ **ENGAGE:** It enhances students' curiosity, interest, and engagement and help them access prior knowledge. .
- ❖ **Explore:** It provides students with opportunities to construct learning experience through activities.
- ❖ **Explain:** students acquire opportunities to explain their learning experiences with the current learning and to conceptualise the topic's main ideas.
- ❖ **Elaborate:** Students apply their knowledge to real-world applications.
- ❖ **Evaluate:** it allows teachers and students to recognize the learning effect and review and assess what they have learned and how they have learned it.
- ❖ **Enhance:** Provides students time to think, plan, investigate, and organize collected information.

Worksheets: This segment has worksheets for each chapter which can be used for practice and evaluation of learners' understanding of the concepts taught. At the end, answers to each worksheet have been given.

A teacher has to use his/her experience and expertise in teaching the subject. This **Teacher's Resource Manual** provides some methodology in this regard but in no way does it limit the scope of the teaching. As per the interest, experience and proficiency of the teaching, you are advised to make suitable additions and modifications to the methodology being discussed.

Suggestions for the improvement of the book will be gratefully acknowledged by the teacher's community.



| | | |
|-----------|----------------------------|-------|
| 1 | Large Numbers | — 5 |
| 2 | Addition and Subtraction | — 17 |
| 3 | Multiplication | — 28 |
| 4 | Division | — 37 |
| 5 | Factors and Multiples | — 48 |
| 6 | Fractions | — 58 |
| 7 | Introduction to Decimals | — 68 |
| 8 | Geometry | — 76 |
| 9 | Symmetry and Patterns | — 86 |
| 10 | Measurement | — 93 |
| 11 | Perimeter and Area | — 103 |
| 12 | Time | — 109 |
| 13 | Money | — 119 |
| 14 | Data Handling | — 125 |
| ● | Answers of the Assignments | — 131 |
| ● | Detailed Solutions | — 133 |



Factors and Multiples

Learning Objectives

After studying this chapter, students will be able to...

- ◆ find factors and common factors of given numbers
- ◆ find multiples and common multiples of given numbers
- ◆ identify the numbers divisible by 2, 3, 4, 5, 6, 9, and 10 without dividing them
- ◆ identify prime and composite numbers
- ◆ do prime factorisation of a number

LESSON PLAN

Suggested number of periods: 10

Suggested Teaching Aids: Book: Math Genius! 4, notebook, chalk, blackboard or whiteboard, projector, smartboard, some real-life objects like eraser, pen, pencil, number/Flash Cards, number chart, multiplication table, A-4 size sheet, square grid paper.

Keywords: Factors, common factors, Multiples, Common multiples, Test of divisibility, Prime Numbers and composite numbers, Factorisation, Prime factorisation, Factor tree method, Division method

Pre-requisite knowledge: Students must be familiar with multiplication and division facts.

NEP feature: The way of teaching provides experiential learning opportunities to the students and allows them to work with the support of each other which helps in their holistic development.

Periods: 1–2

Topics: Recap; Factors; Properties of Factors; Common Factors

Suggested extra teaching aids: Concrete items, multiplication table Math Genius 4 pages 86–91

ENGAGE

The teacher can start the topic in the classroom through active participation of students. For this, she can call a group of students and ask them to stand in rows and columns. Ask rest of the students to write a multiplication/division fact for the arrangement. Hence, introduce the number of rows and columns as the factors of the number representing total students. Next, invite same number of another students and tell them to stand in different way compared to the previous one. Again, the students will tell the factors of that number. **[Collaborative Learning]** Then teacher will revise the learners' previous knowledge of multiplication/division facts with the help of the "Get Ready" and "Let's Recall" sections given in the book.

EXPLORE

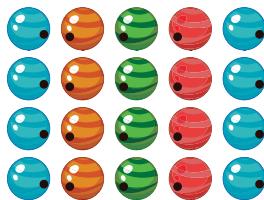
Divide the class into groups of 3 students each. Provide each group some beads, seeds, squared paper, etc. and ask them to make rectangles to show a particular number, say 20.



$$1 \times 20 = 20$$



$$2 \times 10 = 20$$



$$4 \times 5 = 20$$

Let them know that when we multiply two numbers to get a product, the numbers being multiplied are called factors.

Thus, 1, 2, 4, 5, 10 and 20 are the factors of 20.

Then, ask how many factors have they explored for that number. Also, discuss why 3, 6, 7, etc. are not factors of 20. For this, let them arrange the items in these numbers of rows and check whether each row has same number of items.

Monitor students' participation and engagement during the activities.

[Critical Thinking]

EXPLAIN

Start the discussion with an interaction based on any real life situations. For example,

Suppose you invite 36 guests on your next birthday. You want to arrange some items for them.

Let a packet contain 12 cookies, or carton holds 6 fruity packs, or tray has 9 cupcakes. How many sets of each item you take so that each person can get 1 item of each kind?

Accept the responses and explain the term factors. Then discuss how to find factors of a number using multiplication and division. Also, explain how to check whether a number is a factor of the given number.

Next, talk about properties of factors.

Refer textbook pages 87–90 for more explanation and examples.

[Conceptual Understanding]

ELABORATE

Bring a multiplication table in the class or display soft copy on projector.

| \times | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|----------|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 2 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 |
| 3 | 3 | 6 | 9 | 12 | 15 | 18 | 21 | 24 | 27 | 30 | 33 | 36 | 39 | 42 | 45 | 48 | 51 | 54 | 57 | 60 |
| 4 | 4 | 8 | 12 | 16 | 20 | 24 | 28 | 32 | 36 | 40 | 44 | 48 | 52 | 56 | 60 | 64 | 68 | 72 | 76 | 80 |
| 5 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 |
| 6 | 6 | 12 | 18 | 24 | 30 | 36 | 42 | 48 | 54 | 60 | 66 | 72 | 78 | 84 | 90 | 96 | 102 | 108 | 114 | 120 |
| 7 | 7 | 14 | 21 | 28 | 35 | 42 | 49 | 56 | 63 | 70 | 77 | 84 | 91 | 98 | 105 | 112 | 119 | 126 | 133 | 140 |
| 8 | 8 | 16 | 24 | 32 | 40 | 48 | 56 | 64 | 72 | 80 | 88 | 96 | 104 | 112 | 120 | 128 | 136 | 144 | 152 | 160 |
| 9 | 9 | 18 | 27 | 36 | 45 | 54 | 63 | 72 | 81 | 90 | 99 | 108 | 117 | 126 | 135 | 144 | 153 | 162 | 171 | 180 |
| 10 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | 200 |
| 11 | 11 | 22 | 33 | 44 | 55 | 66 | 77 | 88 | 99 | 110 | 111 | 132 | 143 | 154 | 165 | 176 | 187 | 198 | 209 | 220 |
| 12 | 12 | 24 | 36 | 48 | 60 | 72 | 84 | 96 | 108 | 120 | 132 | 144 | 156 | 168 | 180 | 192 | 204 | 216 | 228 | 240 |
| 13 | 13 | 26 | 39 | 52 | 65 | 78 | 91 | 104 | 117 | 130 | 143 | 156 | 169 | 182 | 195 | 208 | 221 | 234 | 247 | 260 |
| 14 | 14 | 28 | 42 | 56 | 70 | 84 | 98 | 112 | 126 | 140 | 154 | 168 | 182 | 196 | 210 | 224 | 238 | 252 | 266 | 280 |
| 15 | 15 | 30 | 45 | 60 | 75 | 90 | 105 | 120 | 135 | 150 | 165 | 180 | 195 | 210 | 225 | 240 | 255 | 270 | 285 | 300 |
| 16 | 16 | 32 | 48 | 64 | 80 | 96 | 112 | 128 | 144 | 160 | 176 | 192 | 208 | 224 | 240 | 256 | 272 | 288 | 304 | 320 |
| 17 | 17 | 34 | 51 | 68 | 85 | 102 | 119 | 136 | 153 | 170 | 187 | 204 | 221 | 238 | 255 | 272 | 289 | 306 | 323 | 340 |
| 18 | 18 | 36 | 54 | 72 | 90 | 108 | 126 | 144 | 162 | 180 | 198 | 216 | 234 | 252 | 270 | 288 | 306 | 324 | 342 | 360 |
| 19 | 19 | 38 | 57 | 76 | 95 | 114 | 133 | 152 | 171 | 190 | 209 | 228 | 247 | 266 | 285 | 304 | 323 | 342 | 361 | 380 |
| 20 | 20 | 40 | 60 | 80 | 100 | 120 | 140 | 160 | 180 | 200 | 220 | 240 | 260 | 280 | 300 | 320 | 340 | 360 | 380 | 400 |

With the help of this table, find out the factors of two or more numbers. First talk about factor properties and then demonstrate what factors are common to them. Discuss about common factors referring textbook page 91. Hence, write few numbers on the board and give the opportunity to find out their common factors.

[Conceptual Understanding]

EVALUATE

Classwork: Ask to practice Q.1 and 4 of Practice Time 5A; Think Tank given on pages 88 and 90.

Homework: Ask to practice remaining questions of Practice Time 5A.

ENHANCE

Students can play this game in pairs.

For this, they will take a 1–100 number chart and two coloured pencils.

Procedure

Player A will choose any number on the grid and note it as his/her score. Player B will cross out all its proper factors, except the number itself and list them on his/her notebook and add. The sum of the proper factors will be the score of player B.

Now, player B will choose any number and add it his/her score. Player A will list the proper factors and get the sum as his/her score. Note that the selected number must have at least one proper factor on the board.

Repeat the procedure up to 10–15 rounds. The player with more points will be winner.

Periods: 3–4

Topic: Multiples; Properties of Multiples; Common Multiples

**Suggested extra teaching aids: Number Charts, Square grid paper
Math Genius 4 pages 92–95**

ENGAGE

Divide the class into pairs.

On the board make a 3×3 grid and write the numbers 21, 24, 40, 60, 288 and 378 as shown below.

Then, ask the students to write the numbers 1–9 in the squares such that numbers in each row when multiplied together they will give the product written next to that row.

Also, keep in mind that the numbers in each column multiplied together will give the product under that column.

Tell the students to recall the multiplication tables and try to fill in the numbers. After giving sufficient time, discuss about the answers by completing the grid as shown here.

| | | | |
|----|----|-----|-----|
| | | | 24 |
| | | | 40 |
| 60 | 21 | 288 | 378 |

| | | | |
|---|---|---|-----|
| 2 | 3 | 4 | 24 |
| 5 | 1 | 8 | 40 |
| 6 | 7 | 9 | 378 |

Hence, introduce the term multiple as the product of two or more numbers. For example, 24 is the product of 2, 3 and 4 so 24 is a multiple of each one, *i.e.*, 2, 3 and 4. Similarly, 40 is a multiple of 1, 5 and 8.

[Critical Thinking]

EXPLORE

Students will work in pairs. Each pair will take a 100-number chart and two coloured pencils.

| | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|-----|
| 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 |

Student A will choose any number less than 10 on the grid and ring all those numbers which come in the multiplication table of that number. Then he/she will list them in his/her notebook.

Similarly, Student B will choose any number less than 10 and ring all those numbers which come in the multiplication table of that number. Also, he/she will list them in his/her notebook.

Instruct them to find the numbers which are present in both the lists. Have them introduce these numbers as the common multiples of the numbers chosen.

Tell them to repeat the procedure and find the common multiples of other numbers. **[Experiential Learning]**

EXPLAIN

Start the discussion with an interaction based on any real life situations. Refer textbook pages 92–94 for explanation and examples. Explain the term multiples with examples. Then discuss how to find multiples of a number by multiplying it with counting numbers. Also, explain how to check whether a number is a multiple of the given number.

Next, talk about properties of multiples and common multiples. Solve few questions on the board and explain the concept. **[Conceptual Understanding]**

ELABORATE

After understanding the concept of multiples well, ask students to write the multiplication table of any number. Then ask few questions like:

- Which is the first multiple of that number?
- Is there any multiple smaller than that number?
- Up to which number can they write the multiples of that number?
- How many multiples can any number have?
- Is 1 a factor or multiple of every number?
- Is every number a factor or multiple of 1?

Accept the responses and discuss about the properties of multiples. Hence, encourage students to attempt questions given under Think Tank on page 94.

[Experiential Learning]

EVALUATE

Classwork: Ask to practice Q.3(a)-(d) and 4 (a) of Practice Time 5B.

Homework: Ask to practice remaining questions of Practice Time 5B.

ENHANCE

Divide the class into small groups and ask them to perform the Lab Activity as given in ‘Learning by Doing’ section on page 105.

[Discussion-based Learning, Collaborative Learning]

Period: 5

Topic: Test of Divisibility

**Suggested extra teaching aids: Concrete items, paper, pencil
Math Genius 4 pages 95–96**

ENGAGE

Divide the class into groups of different sizes, such as 2, 3, 4, 5 or 6 students. Give a certain number of things, say 24 chalks to each group and tell them to share among themselves equally. Let them explain their observation. Discuss about the number of chalks left over in distribution and introduce the term divisible. The group of 2, 3, 4 and 6 students can share the 24 chalks equally but the group of 5 students not, so, 24 is divisible by 2, 3, 4 and 6 but not by 5.

[Experiential Learning]

EXPLORE

Write some 2/3/4-digit numbers on the board and tell the students select numbers to complete the table and then answer the following questions. They can use the numbers at more than one places.

| | | | | | | | | | | |
|-----------------|-----|-----|------|------|------|------|-------|-------|-----|------|
| 35, | 40, | 88, | 105, | 350, | 432, | 117, | 2000, | 1256, | 60, | 2169 |
| Even numbers | | | | | | | | | | |
| Multiples of 3 | | | | | | | | | | |
| Multiples of 5 | | | | | | | | | | |
| Multiples of 4 | | | | | | | | | | |
| Multiples of 10 | | | | | | | | | | |

[Critical Thinking]

- Have any even numbers ones digit 1, 3, 5, 7, or 9?
- Is the sum of digits of a multiple of 3 lying in the multiplication table of 3?
- What are the digits at one place in the multiples of 5?
- Is every even number a multiple of 4?
- Which is the digit at one place in the multiples of 10?

After getting their responses, have them introduce rules of divisibility.

[Critical Thinking]

EXPLAIN

Refer textbook pages 95–96 and explain which number is divisible by a given number. Also, explain the divisibility rules for some numbers and have them understand its use. Solve few questions on the board and explain the concept.

[Conceptual Understanding]

ELABORATE

Interact with students and strengthen their concept through a game.

Divide the class into two teams.

Ask any member from first team to tell any two digits.

Then ask the other team members to make the greatest 3-digit number (divisible by any number say, 2, 3, 4, 5, 6, 9 or 10) using the two given digits and one digit of their own choice.

For each correct response, the team will score a point.

Suppose Team A gives the numbers 8 and 1. Teacher tell to make the greatest 3-digit number divisible by 3. And if Team B answers 981, then they be rewarded 1 point. For any other answers, they will not score any point.

Now, Team B will give the two digits and Team A have to form the number as per teacher's instruction.

Similar procedure will be continued till time permits. The team scoring more points will be winner!

[Logical Thinking]

EVALUATE

Classwork: Ask to practice Q.1 of Practice Time 5C.

Homework: Ask to practice Q. 2 of Practice Time 5C.

ENHANCE

Ask students to read the Maths Fun section given on page 97 and do as directed. Hence answer the questions as asked here.

[Art integration]

Periods: 6–8

Topic: Prime Numbers and composite numbers; Factorisation

**Suggested extra teaching aids:
Math Genius 4 pages 97–101**

ENGAGE

Tell the students to write their birth dates and roll numbers in their notebooks. Then each student will write all the factors of those numbers. For example, a student writes

Birth Date: 8 March and Roll Number: 12

Then he/she will list the factors as:

Factors of 8 are: 1, 2, 4 and 8

Factors of 12 are: 1, 2, 3, 4, 6 and 12

After listing the factors by all students, teacher will ask how many factors the numbers 1, 2, 3, 4, ..., 31 have and classify the numbers into prime (numbers having only two factors) and composite (numbers having more than two factors) numbers.

Teacher can ask the students to raise their left hands if their roll numbers or birth dates are prime, *i.e.*, 2, 3, 5, 7, 11, 13, etc. and to raise their right hands if their roll numbers or birth dates are composite, *i.e.*, 4, 6, 8, 9, 10, 12, etc.

[Experiential Learning]

Instruct the students to stand up whose roll number or birth dates are 1, *i.e.*, neither prime nor composite.

EXPLORE

Divide the class into small groups. Ask each group to write any three 2-digit numbers on a sheet. Hence try to express the numbers as the product of two or more numbers. Teacher can walk around during the activity to watch the participation of the students. After allowing the reliable time, ask them to check whether their factors are prime or not. Invite the group one by one in front of the class and encourage them to tell about their workings.

Hence, reiterate the factorisation as well as prime factorisation.

[Collaborative Learning]

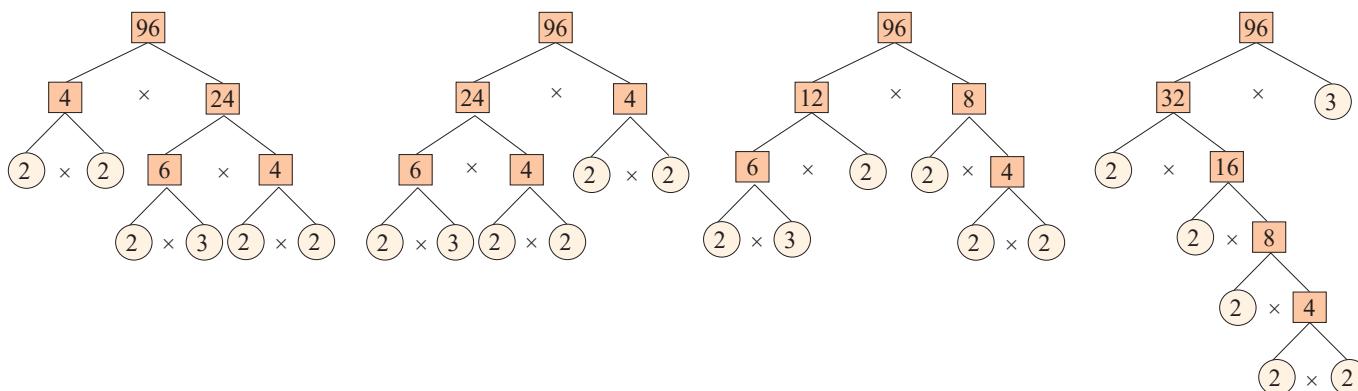
EXPLAIN

Refer textbook pages 97–99, and explain about prime and composite numbers. Demonstrate how to check whether a given number is prime or composite by dividing the numbers with known prime numbers starting from 2, 3, 5, 7 and so on. Encourage the students to attempt Think Tank given on page 99.

Next, write any composite number on the board and explain how to factorise it. Also, have them understand prime factorisation. For more explanation, refer textbook page 99. **[Conceptual Understanding]**

ELABORATE

After understanding the concept of prime factorisation, discuss the methods – factor tree method and division method which are often used to get the prime factorisation of a composite number. Reinforce that more than one factor tree be possible for the same number. For example, factor tree of 96.



Refer textbook page 99 to focus on the fundamental property of prime factorisation. Also, demonstrate the process of division method for the same number and let the students know that they will get the same result if they use any method.

Prime Factorisation of 96

$$96 = 2 \times 2 \times 2 \times 2 \times 2 \times 3$$
$$96 = 2^5 \times 3$$

| | |
|---|----|
| 2 | 96 |
| 2 | 48 |
| 2 | 24 |
| 2 | 12 |
| 2 | 6 |
| 3 | 3 |
| | 1 |

Hence, motivate the students to practice the given problems.

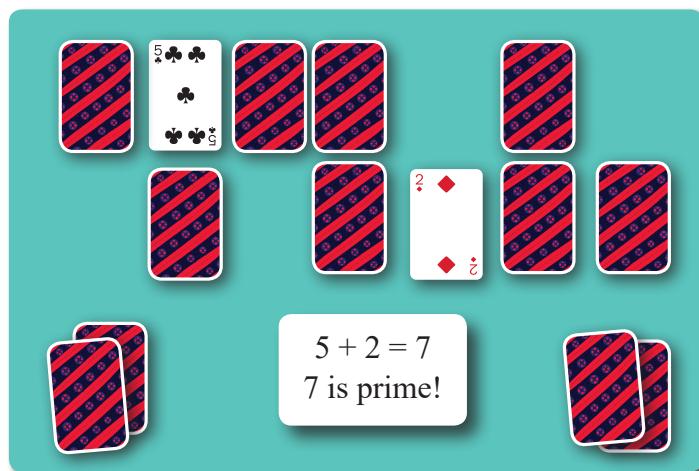
EVALUATE

Classwork: Ask to practice Q.1 and 6 of Practice Time 5D; Think Tank given on page 99.

Homework: Ask to practice remaining questions of Practice Time 5D.

ENHANCE

Card Game



Take a pack of playing cards and play a fun mystery game to help students get the hang of prime numbers and composite numbers.

Shuffle a deck of playing cards, and remove the jokers. You may also choose to remove aces, jacks, queens, and kings, or you can assign them number values. For example, tell your students aces are 1, jacks are 11, queens are 12, and kings are 13. To keep it simple, you could also say all face cards are 11. Then lay 10 to 20 cards face-down in rows on a table or desk.

Students will take turns flipping over two playing cards at a time. The student whose turn it is will add the numbers together. If the resulting number is a prime number, he or she gets to keep the cards. If not, he or she will flip the cards back over, and the next student will take a turn.

Play will continue for however many rounds you choose or until no other prime numbers can be formed from the card combinations. The player with the most cards at the end of the game wins.

Periods: 9–10

**Topic: (Revision)
Chapter assessment**

**Suggested extra teaching aids:
Math Genius 4 pages 102–105**

ENGAGE

Make students comfortable, so that they can ask any question on any previously taught topics. Clarify their doubts or queries before starting the revision.

EXPLAIN

Start the revision of the exercise by using Encapsulate, Challenge Question, Chapter Assessment, Life Skills and Mental Maths.

ELABORATE

Discuss questions 1 to 3 in the Chapter Assessment and accept students answer. If they have any confusion or do any error then explain and correct it. Motivate students to solve Mental Maths given on page 105.

EVALUATE

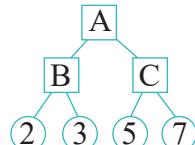
Classwork: Ask to practice Q. 1 to 3 of Chapter Assessment and Challenge Question given on page 102.

Homework: Ask to practice Q.4 to 8 of Chapter Assessment and Life Skills given on page 104.



Student's Name: _____ Section: _____

Roll Number: _____ Date: _____





Marks Obtained: _____

Student's Name: _____ Section: _____

Roll Number: _____ Date: _____

A. Fill in the blanks.

1. The 7th multiple of 8 is _____.
2. The smallest factor of a number is _____.
3. The first common multiple of the numbers 5 and 9 is _____.
4. _____ is the smallest composite number.
5. The number divisible by 10 always has ones digit _____.

B. Label True or False.

1. Every number is the multiple of itself
.....
2. 4 is a multiple of 28.
.....
3. The greatest 2-digit number is a prime number.
.....
4. The smallest 2-digit number is a composite number.
.....
5. 3248 is divisible 6.
.....

C. Match the following.

| Column I | Column II |
|---|-----------|
| 1. The first odd composite number | (a) 710 |
| 2. Neither prime nor composite number | (b) 3 |
| 3. Number divisible by 5 | (c) 2 |
| 4. The greatest common factor of 3 and 12 | (d) 1 |
| 5. The smallest prime number | (e) 9 |

D. Utilise Your Brain.

Select the numbers given below and write it in appropriate boxes.

2, 6, 9, 11, 17, 88

| | | | |
|-------------|--------------|---------------|-----------------|
| Even number | | | |
| Odd number | | | |
| | Prime number | Factors of 18 | Multiples of 11 |

ANSWERS OF THE ASSIGNMENTS

ASSIGNMENT-9

1. (b) 2. (a) 3. (a) 4. (c) 5. (d)
6. (b) 7. (a) 8. (b) 9. (d) 10. (c)
11. (b) 12. (a)

ASSIGNMENT-10

A. 1. 56 2. 1 3. 45 4. 4 5. 0

B. 1. True 2. True 3. False 4. True 5. False

C. 1. (e) 2. (d) 3. (a) 4. (b) 5. (c)

| | | | | |
|----|--------------|---------------|-----------------|----|
| D. | Even number | 2 | 6 | 88 |
| | Odd number | 17 | 9 | 11 |
| | Prime number | Factors of 18 | Multiples of 11 | |

DETAILED SOLUTIONS

CHAPTER 5 : FACTORS AND MULTIPLES

Let's Recall

2. $18 = 1 \times 18 = 2 \times 9 = 3 \times 6$
3. $20 = 1 \times 20 = 2 \times 10 = 4 \times 5$
4. $24 = 1 \times 24 = 2 \times 12 = 3 \times 8 = 4 \times 6$

Think Tank (Page 88)

Multiplication facts of 24
 $= 1 \times 24, 2 \times 12, 3 \times 8, 4 \times 6$
Factors of 24 = 1, 2, 3, 4, 6, 8, 12, 24

Think Tank (Page 90)

1. If there was just one boat, 90 people got into it.
2. If there were two boats, 45 people got into it.
3. If there were 30 people in a boat, there were 3 boats required.
4. If a small boat has a maximum capacity of 12 people, then, 8 such boats would be required keeping in mind that no one should be left behind.

Practice Time 5A

1. (a) True (b) False
(c) False (d) False
2. (a) $1 \times 12 = 12$; 1 and 12 are the factors of 12.
 $2 \times 6 = 12$; 2 and 6 are the factors of 12.
 $3 \times 4 = 12$; 3 and 4 are the factors of 12.
Since, there are no pairs of numbers left whose product is 12.
So, 1, 2, 3, 4, 6 and 12 are factors of 12.
- (b) $1 \times 28 = 28$; 1 and 28 are the factors of 28.
 $2 \times 14 = 28$; 2 and 14 are the factors of 28.
 $4 \times 7 = 28$; 4 and 7 are the factors of 28.
Since, there are no pairs of numbers left whose product is 28.
So, 1, 2, 4, 7, 14 and 28 are factors of 28.
- (c) $1 \times 45 = 45$; 1 and 45 are the factors of 45.
 $3 \times 15 = 45$; 3 and 15 are the factors of 45.
 $5 \times 9 = 45$; 5 and 9 are the factors of 45.

Since, there are no pairs of numbers left whose product is 45.

So, 1, 3, 5, 9, 15 and 45 are factors of 45.

(d) and (e) — Do it yourself (same as above)

3. (a) We divide 24 by all possible counting numbers.
 $24 \div 1 = 24$; 1 and 24 are factors of 24.
 $24 \div 2 = 12$; 2 and 12 are factors of 24.
 $24 \div 3 = 8$; 3 and 8 are factors of 24.
 $24 \div 4 = 6$; 4 and 6 are factors of 24.
 $24 \div 6 = 4$; 6 and 4 are factors of 24.
 $24 \div 8 = 3$; 8 and 3 are factors of 24.
 $24 \div 12 = 2$; 12 and 2 are factors of 24.
 $24 \div 24 = 1$; 24 and 1 are factors of 24.
Thus, 1, 2, 3, 4, 6, 8, 12 and 24 are factors of 24.

$$\begin{array}{r} 36 \div 1 = 36 \\ 36 \div 2 = 18 \\ 36 \div 3 = 12 \\ 36 \div 4 = 9 \\ 36 \div 6 = 6 \end{array}$$

Thus, the factors of 36 are 1, 2, 3, 4, 6, 9, 12, 18 and 36.

$$\begin{array}{r} 54 \div 1 = 54 \\ 54 \div 2 = 27 \\ 54 \div 3 = 18 \\ 54 \div 6 = 9 \end{array}$$

Thus, the factors of 54 are 1, 2, 3, 6, 9, 18, 27 and 54.

(d) and (e) — Do it yourself (same as above)

4. (a) Divide 140 by 12.

$$\begin{array}{r} 12 \overline{)140} (11 \\ - 12 \\ \hline 020 \\ - 12 \\ \hline 08 \end{array}$$

Since, the division of 140 by 12 leaves remainder 8, so 12 is not a factor of 140

- (b) Divide 160 by 10.

$$\begin{array}{r} 10 \overline{)160} (16 \\ - 10 \\ \hline 060 \\ - 60 \\ \hline 0 \end{array}$$

Since, the division of 160 by 10 leaves no remainder, so 10 is a factor of 160.

(c) Divide 176 by 8.

$$\begin{array}{r} 176 \\ \hline 8 \end{array} \begin{array}{r} 22 \\ \hline 16 \\ \hline 16 \\ \hline 0 \end{array}$$

Since, the division of 176 by 8 leaves no remainder, so 8 is a factor of 176.

(d) Divide 220 by 15.

$$\begin{array}{r} 220 \\ \hline 15 \end{array} \begin{array}{r} 14 \\ \hline 15 \\ \hline 70 \\ \hline 60 \\ \hline 10 \end{array}$$

Since, the division of 220 by 15 leaves remainder 10, so 15 is not a factor of 220.

5. (a) The factors of 18 are $\textcircled{1}$, $\textcircled{2}$, $\textcircled{3}$, $\textcircled{6}$, 9 and 18.

The factors of 24 are $\textcircled{1}$, $\textcircled{2}$, $\textcircled{3}$, 4, $\textcircled{6}$, 8 12 and 24.

So, the common factors of 18 and 24 are 1, 2, 3 and 6.

(b) The factors of 10 are $\textcircled{1}$, 2, $\textcircled{5}$ and 10.

The factors of 25 are $\textcircled{1}$, $\textcircled{5}$, and 25.

So, the common factors of 10 and 25 are 1 and 5.

(c) The factors of 21 are $\textcircled{1}$, 3, $\textcircled{7}$ and 21.

The factors of 35 are $\textcircled{1}$, 5, $\textcircled{7}$ and 35.

So, the common factors of 21 and 35 are 1 and 7.

(d) The factors of 42 are $\textcircled{1}$, $\textcircled{2}$, $\textcircled{3}$, $\textcircled{6}$, 7, 14, 21 and 42.

The factors of 54 are $\textcircled{1}$, $\textcircled{2}$, $\textcircled{3}$, $\textcircled{6}$, 9, 18, 27 and 54.

So, the common factors of 42 and 54 are 1, 2, 3 and 6.

(e) The factors of 60 are $\textcircled{1}$, $\textcircled{2}$, $\textcircled{3}$, 4, $\textcircled{5}$, $\textcircled{6}$, $\textcircled{10}$, 12, $\textcircled{15}$, 20, $\textcircled{30}$ and 60.

The factors of 90 are $\textcircled{1}$, $\textcircled{2}$, $\textcircled{3}$, $\textcircled{5}$, $\textcircled{6}$, 9, $\textcircled{10}$, $\textcircled{15}$, 18, $\textcircled{30}$, 45 and 90.

So, the common factors of 60 and 90 are 1, 2, 3, 5, 6, 10, 15 and 30.

(f) The factors of 24 are $\textcircled{1}$, $\textcircled{2}$, 3, $\textcircled{4}$, 6, $\textcircled{8}$, 12 and 24.

The factors of 32 are $\textcircled{1}$, $\textcircled{2}$, $\textcircled{4}$, $\textcircled{8}$, 16 and 32.

So, the common factors of 24 and 32 are 1, 2, 4, and 8.

(g) The factors of 18 are $\textcircled{1}$, $\textcircled{2}$, 3, 6, 9 and 18.

The factors of 24 are $\textcircled{1}$, $\textcircled{2}$, 3, 4, 6, 8, 12 and 24.

The factors of 32 are $\textcircled{1}$, $\textcircled{2}$, 4, 8, 16, and 32.

So, the common factors of 18, 24 and 32 are 1 and 2.

Practice Time 5B

1. (a) $5 \times 1 = 5$, $5 \times 2 = 10$, $5 \times 3 = 15$, $5 \times 4 = 20$, $5 \times 5 = 25$ and $5 \times 6 = 30$.

Thus, the first six multiples of 5 are 5, 10, 15, 20, 25 and 30.

(b) $7 \times 1 = 7$, $7 \times 2 = 14$, $7 \times 3 = 21$, $7 \times 4 = 28$, $7 \times 5 = 35$ and $7 \times 6 = 42$.

Thus, the first six multiples of 7 are 7, 14, 21, 28, 35 and 42.

(c) $11 \times 1 = 11$, $11 \times 2 = 22$, $11 \times 3 = 33$, $11 \times 4 = 44$, $11 \times 5 = 55$ and $11 \times 6 = 66$.

Thus, the first six multiples of 11 are 11, 22, 33, 44, 55 and 66.

(d) $13 \times 1 = 13$, $13 \times 2 = 26$, $13 \times 3 = 39$, $13 \times 4 = 52$, $13 \times 5 = 65$ and $13 \times 6 = 78$.

Thus, the first six multiples of 13 are 13, 26, 39, 52, 65 and 78.

2. (a) Since, 9 is an odd number and first five even numbers are 2, 4, 6, 8 and 10.

So, the first five even multiples of 9 are $9 \times 2 = 18$, $9 \times 4 = 36$, $9 \times 6 = 54$, $9 \times 8 = 72$ and $9 \times 10 = 90$.

Thus, the first five even multiples of 9 are 18, 36, 54, 72 and 90.

(b) Since, 13 is an odd number and first five even numbers are 2, 4, 6, 8 and 10.

So, the first five even multiples of 13 are $13 \times 2 = 26$, $13 \times 4 = 52$, $13 \times 6 = 78$, $13 \times 8 = 104$ and $13 \times 10 = 130$.

Thus, the first five even multiples of 13 are 26, 52, 78, 104 and 130.

(c) Since, 15, is an odd number and first five even numbers are 2, 4, 6, 8 and 10.

So, the first five even multiples of 15 are $15 \times 2 = 30$, $15 \times 4 = 60$, $15 \times 6 = 90$, $15 \times 8 = 120$ and $15 \times 10 = 150$.

Thus, the first five even multiples of 15 are 30, 60, 90, 120 and 150.

(d) Since, 25 is an odd number and first five even numbers are 2, 4, 6, 8 and 10.

So, the first five even multiples of 25 are $25 \times 2 = 50$, $25 \times 4 = 100$, $25 \times 6 = 150$, $25 \times 8 = 200$ and $25 \times 10 = 250$.

Thus, the first five even multiples of 25 are 50, 100, 150, 200 and 250.

3. (a) The 5th multiple of 8 = $5 \times 8 = 40$

(b) The 8th multiple of 9 = $8 \times 9 = 72$

(c) Multiples of 12 less than 144 are 12, 24, 36, 48, 60, 72, 84, 96, 108, 120 and 132.

(d) Multiples of 3 between 20 and 50 are 21, 24, 27, 30, 33, 36, 39, 42, 45 and 48.

(e) Multiples of 9 between 50 and 100 are 54, 63, 72, 81, 90 and 99.

(f) The first multiple of 9 exactly divisible by 8 is 72.

4. (a) Multiples of 4 = 4, 8, 12, 16, **20**, 24, 28, 32, 36, **40**, 44, 48, 52, 56, **60**, 64, 68, 72, 76, **80**, ...

Multiples of 5 = 5, 10, 15, **20**, 25, 30, 35, **40**, 45, 50, 55, **60**, 65, 70, 75, **80**, ...

Common multiples of 4 and 5 = **(20)**, 40, 60, 80

(b) Multiples of 3 = 3, 6, 9, 12, **15**, 18, 21, 24, 27, **30**, 33, 36, 39, 42, **45**, 48, 51, 54, 57, **60**, ...

Multiples of 5 = 5, 10, **15**, 20, 25, **30**, 35, 40, **45**, 50, 55, **60**, 65, 70, 75, ...

Common multiples of 3 and 5 = **(15)**, 30, 45, and 60

(c) Multiples of 2 = 2, 4, 6, 8, 10, 12, **14**, 16, 18, 20, 22, 24, 26, **28**, 30, 32, 34, 36, 38, 40, **42**, 44, 46, 48, 50, 52, 54, **56**, ...

Multiples of 7 = 7, **14**, 21, **28**, 35, **42**, 49, **56**, ...

Common multiples of 2 and 7 = **(14)**, 28, 42, and 56

(d) Multiples of 6 = 6, 12, 18, **24**, 30, 36, 42, **48**, 54, 60, 66, **72**, 78, 84, 90, **96**, ...

Multiples of 8 = 8, 16, **24**, 32, 40, **48**, 56, 64, **72**, 80, 88, **96** ...

Common multiples of 6 and 8 = **(24)**, 48, 72 and 96

(e) Multiples of 10 = 10, **20**, 30, **40**, 50, **60**, 70, **80**, ...

Multiples of 20 = **20**, **40**, **60**, **80**, 100, 120, ...

Common multiples of 10 and 20 = **(20)**, 40, 60 and 80

Practice Time 5C

1. (a) True;

Since, $2 + 4 + 3 = 9$ divisible by 3 and 9 both

(b) False;

For example, 45 is divisible by 5, but not by 10.

(c) True;

Since a number is divisible by 6, if it is divisible by 2 and 3 both.

(d) True;

Since a number is divisible by 9, then it must be divisible by 3.

2.

| Numbers | Divisible by | | | | | |
|----------|--------------|-----|-----|----|-----|----|
| | 2 | 3 | 4 | 5 | 9 | 10 |
| (a) 62 | yes | no | no | no | no | no |
| (b) 96 | yes | yes | yes | no | no | no |
| (c) 284 | yes | no | yes | no | no | no |
| (d) 251 | no | no | no | no | no | no |
| (e) 1024 | yes | no | yes | no | no | no |
| (f) 6318 | yes | yes | no | no | yes | no |

Think Tank (Page 99)

1. Prime numbers less than 25 = 2, 3, 5, 7, 11, 13, 17, 19 and 23.

2. Composite numbers less than 30 = 4, 6, 8, 9, 10, 12, 14, 15, 16, 18, 20, 21, 22, 24, 25, 26, 27 and 28.

Practice Time 5D

1. (a) 15; Composite number $(\because 15 = 3 \times 5)$

(b) 21; Composite number $(\because 21 = 3 \times 7)$

(c) 23; Prime number $(\because 23 = 1 \times 23)$

(d) 33; Composite number $(\because 33 = 3 \times 11)$

(e) 46; Composite number $(\because 46 = 2 \times 23)$

(f) 49; Composite number $(\because 49 = 7 \times 7)$

2. (a) Prime numbers between 10 and 30 = 11, 13, 17, 19, 23 and 29.

(b) Prime numbers between 50 and 60 = 53 and 59.

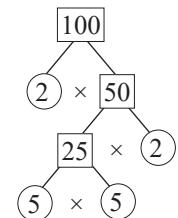
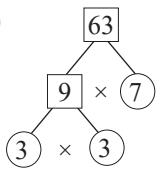
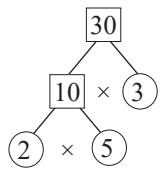
(c) Prime numbers between 80 and 90 = 83 and 89.

3. (a) Composite numbers between 1 and 10 = 4, 6, 8, 9 (4 numbers).

(b) Composite numbers between 20 and 30 = 21, 22, 24, 25, 26, 27, 28 (7 numbers).

(c) Composite numbers between 70 and 80 = 72, 74, 75, 76, 77, 78 (6 numbers).

4. (a)



5. (a)

| | |
|---|----|
| 3 | 75 |
| 5 | 25 |
| 5 | |

| | |
|---|-----|
| 2 | 108 |
| 2 | 54 |
| 3 | 27 |
| 3 | 9 |
| | 3 |

| | |
|---|-----|
| 5 | 625 |
| 5 | 125 |
| 5 | 25 |
| | 5 |

6. (a) $18 = 2 \times 3 \times 3$

$$\begin{array}{r|l} 2 & 18 \\ \hline 3 & 9 \\ \hline 3 & 3 \\ \hline & 1 \end{array}$$

(b) $20 = 2 \times 2 \times 5$

$$\begin{array}{r|l} 2 & 20 \\ \hline 2 & 10 \\ \hline 5 & 5 \\ \hline & 1 \end{array}$$

(c) $32 = 2 \times 2 \times 2 \times 2 \times 2$ (d) $42 = 2 \times 3 \times 7$

$$\begin{array}{r|l} 2 & 32 \\ \hline 2 & 16 \\ \hline 2 & 8 \\ \hline 2 & 4 \\ \hline 2 & 2 \\ \hline & 1 \end{array}$$

$$\begin{array}{r|l} 2 & 42 \\ \hline 3 & 21 \\ \hline 7 & 7 \\ \hline & 1 \end{array}$$

(e) $60 = 2 \times 2 \times 3 \times 5$

$$\begin{array}{r|l} 2 & 60 \\ \hline 2 & 30 \\ \hline 3 & 15 \\ \hline 5 & 5 \\ \hline & 1 \end{array}$$

(f) $81 = 3 \times 3 \times 3 \times 3$

$$\begin{array}{r|l} 3 & 81 \\ \hline 3 & 27 \\ \hline 3 & 9 \\ \hline 3 & 3 \\ \hline & 1 \end{array}$$

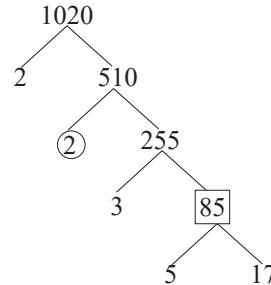
Chapter Assessment

1. (a) (iii) Both Riya and Siya are correct.

($\because 90 = 15 \times 6$)

(b) (ii) 8, 16, 24, 32, 40, are all multiples of 8.

(c) (iii) $a = 2, b = 85$



(d) (i) 3630 is not divisible by 9.

2. (a) False;

Since, $1 \times 5 = 5$ is a prime number.

(b) False;

For example, 15 is an odd number, but not a prime number.

(c) False;

Multiples of a number cannot be counted whereas factors of a number can be counted.

(d) True;

For example, 10 or 15 both have 5 as their factor and the numbers are also multiple of 5.

(e) False;

Every counting number (except 1) are either prime or composite.

(f) True;

2 is the only even prime number.

3. (a) The smallest multiple of 2 greater than 28 is 30.

(b) A multiple of 2 but not of 3, lesser than 12 but greater than 8, is 10.

(c) A multiple of 5, 6 and 10, greater than 40 but less than 80, is 60.

(d) A multiple of 5 and 2 which is 2 more than the third multiple of 6, is 20.

(e) A multiple of 3 but not of 6 and 9, greater than 22 but less than 37, is 33.

4. (a) Thirteenth multiple of 2 = $2 \times 13 = 26$.

(b) The greatest 2-digit multiple of 3 = 99.

(c) Greatest factor of the greatest 5-digit number = 99999

(d) Smallest multiple of the greatest 5-digit number = 99999

5. 1, 2, 4, 5, 8, 10, 25, 40, 125

6. First 3 multiples of 9 are: 9, 18, 27 and sum = $9 + 18 + 27 = 54$. And $54 = 6 \times 9$
Thus, 6th multiple of 9 is equal to the sum of its first 3 multiples.

7. 4 pairs (13 and 31, 17 and 71, 37 and 73, 79 and 97)

8. 312, 402, 444, 612.
House number 312, 402, 444, and 612 are divisible by 6, so by 3 also.

Life Skills (Page 104)

1. Room numbers that are multiple of 3 and 5,

i.e., 15 are: 15, 30, 45, 60, 75, 90, 105, 120, 135, 150, 165, 180, 195.

2. 6, 12, 18, 24, 30; Since, Vishal work daily, Simran work alternate day, i.e., every 2nd day and Shelly work on every 3rd day, so we have to find the date, which are common multiple of 1, 2 and 3, i.e., 6.

Mental Maths (Page 105)

1. (a) Every number is a multiple of 1.

2. (c) Every number other than 1 has at least 2 factors.

3. (c) Smallest 2-digit number = 10
 $10 - 2 = 8$ is a multiple of 2.

4. (a) Odd factors of 30 are 1, 3, 5 and 15 (4 factors).