Chapter - 1 Numbers and Addition

1.1 Number system (0 to 999)

1.1.1 Let students write 1 to 10 neatly
- Spelling in English ONE, TWO, THREE etc., is optional but not very important. **Speaking and reading** out in English is important.
- Do not go to 11, 12 ….

1.1.2 Go to 10, 20, …….. 100

1.1.3 Then go to 100, 200 ….. 900

1.1.4 Write 11 to 19.
- No spelling
- Show that 10 + 1 = 11, 10 + 5 = 15 etc.
- 11, 12 are special (i.e. exceptions). Others are teens.
- Instantly test the grasp by asking the age of the student and the age of his/her elder/younger brother/sister.

1.1.5 The system of 2 digits in English is very easy
E.g.: Twenty + one = ……, 20+ 9 = …… (speak this out).

1.1.6 0 – 9 is the basic number system, all the others follow.

0 = 00
1 = 01
9 = 09
But 19 = 10 + 9

Similarly 101 = 100 + 1
123 = 100 + 20 + 3

1.2 Single digit addition (+)

1.2.1 Play a game of adding any number (between 1 to 10) and another one digit number.

1.2.2 Each student should write and fill up the following

1 + □ = 10
2 + □ = 10
3 + □ = 10
4 + □ = 10
5 + □ = 10
6 + □ = 10
7 + □ = 10
8 + □ = 10
9 + □ = 10
10 + □ = 10

1.2.3 Cut and make 'bricks' (i.e. thick squares or rectangles cardboard)
0 to 9: 3 sets
10 to 20: 2 sets.

- Play single digit addition game.

This could be [A] + [B] = [?]
or [A] + [?] = [C]
or [?] + [B] = [C]

A, B come from (0 – 9) bricks, C comes from A or B or [10 – 20] set

1.2.4 Simplified addition grid as a Frame is given in sec 1.2.7. Let the students fill it up at home.

1.2.5 Adding tips

- Do not allow the primary school method of 3 + 2 = (***) + (**) = …….5
- If some persons do it ask them to add 2 + 9.
- If they start making 9 dots or counting 9 fingers, stop it.
- Say 2 + 9 = 9 + 2 = 9 +1 + 1 = 10 + 1 = 11
  i.e. take the bigger and start counting from that stage.

1.2.6 Use the method of (1.2.5) for bigger numbers (All Oral Only):

9 + 3 =?
39 + 3 =?
89 + 3 =?
109 + 3 =?

- How to add 1234 + 4

1234 +  = 1235 +  = 1236 +  = 1237 +  = 1238

1.2.7 Simplified Addition Grid: Students should fill this.

+	1	2	3	4	5	6	7	8	9
1	2	3							10
2	3	4							
3									
4									
5									
6									
7									
8									
9	10								18

1.3 Addition – 2 digits

1.3.1 Before addition of two digits, start with:

20 + 4 = 24;
30 + 7 = 37 etc.
Make sure you know 37 has 30 + 7.

1.3.2 Let addition be done orally:

E.g.: 30 + 4 = 34
34 + 5 = 30 + 4 + 5
Now 4 + 5 = 9.
Therefore 30 + (4 + 5) = 39

E.g.: 44 + 6 = 40 + 4 + 6
Now 4 + 6 = 10.
Therefore 40 + (4 + 6) = 40 + 10 = 50

E.g.: 59 + 7 = 50 + (9 + 7)
= 50 + (16)
= 50 + (10) + (6) = 60 + 6 = 66

Even if it appears long, let it be.

Now write these sums:

```
3 4          4 4          5 9
+ 5        + 6          + 7
----         -----        -----
3 9          4 0          5 0
----       + 1 0        + 1 6
           ------       -----
           ------       -----
```

1.3.3 Do:

```
 5 0      5 1      5 4      5 6      5 9      5 0
+ 5      + 5      + 5      + 5      + 5     +1 5
-----    -----    -----    -----    -----    -----
-----    -----    -----    -----    -----    -----

 5 1      5 4      5 6      5 9
+2 5     +3 5     +3 5     +4 5
-----    -----    -----    -----
-----    -----    -----    -----
```

1.3.4 Do by the long way and by the usual short method:

E.g.: = 99 + 88
= 90 + 9 + 80 + 8
= 90 + 80 + 9 + 8
= 90 + 80 +(17)
= (170) + (17)
= (170) + (10) + 7
= (180) + 7 = 187

```
  1
  9 9
+ 8 8
 -----
 187
 -----
```

1.3.5 Go back to 1.3.4 example and do:

```
  1 5 5      1 5 5      1 5 5      1 5 5
+   5      + 1 5      + 3 5      + 6 5
------     -------    -------    -------
------     -------    -------    -------
```

If these are OK, then:

```
  1 5 5      1 5 5     1 5 5      1 5 5
+ 1 0 0    + 1 0 5   +1 1 5     + 9 5 5
------     -------   -------    -------
------     -------   -------      -------
```

Exercises - Chapter I

Ex I.1 Example:

- Write Down:

Nine	**Ans: 9**
Eightynine	**Ans: 89**
Four hundred and Forty four	**Ans: 444**
Ten thousand four hundred forty four	**Ans: 10444**

Now:

a. Seven
b. Seventy Seven
c. Seventy hundred and seventy seven
d. Seven hundred and seven
e. Seven thousand seven
f. Seven thousand seventy seven
g. Seven thousand seven hundred seventy seven
h. Seventy thousand seven
i. Seven lakhs seven thousand

j. Seven crores seven lakhs seven

Ex I.2 See the number and write down in words (and also speak out) (reading the number can be first in mother tongue and soon shift to English).

Example: 122: **Noora ippatheradu – One hundred and twenty two.**

Now:

a. 47
b. 87
c. 107
d. 359
e. 8889
f. 6666689
g. 66689
h. 567891
i. 12345674
j. Your (or any) mobile number

Ex I.3 Example:

Find which is bigger (of the two) 7999, 9007.
Ans: 9007 >7999 (> is greater than)

Do Now:

a. 99, 101
b. 807, 799
c. 49999, 5001
d. 100001, 99899

Ex I.4 Example:

Find which is smaller 89, 98
And: 89 < 98 (< is smaller than)

Do Now:

a. 7444, 6989
b. 609, 906
c. 771, 769
d. 10203040, 9898989

Ex I.5 Example:

Write in ascending order: 98, 101, 9
And" 9, 98, 101 or 9< 98 < 101

Do Now:

a. 121, 112, 201
b. 1001, 9821, 999
c. 110012, 41099, 101012
d. 20202021, 191919191, 7667766

Ex I.6 Example:

Write in descending order: 97, 101, 24
Ans: 101, 97, 24 or 101> 97 > 24

Do: a to d Ex I.5

Ex I.7 Write both on ascending and descending orders:

a. 1, 8, 5, 3, 4
b. 11, 18 , 15, 13, 14
c. 10, 80, 50, 40, 30
d. 125, 85, 325, 65, 5
e. 101, 11, 1, 111, 1001, 100001
f. 989, 998, 889, 898, 900,190,1989
g. 1002, 1020, 1201, 1220, 1120, 1112

Ex I.8 Example:

Add: (12345) + 4
Ans: Orally [(12345), (12346), (12347), (12348), (12349)]
Start one two three four
Stop Answer is 12349

Do Additions Orally:

a. 28 + 4
b. 128 + 3
c. 99 + 5
d. 98 + 6
e. 98 + 7
f. 1238 + 2
h. 98 + 9
i. 12387 + 4

Ex I.9 Example:

Add 98 + 7
Orally (98 + 7) = 108 – 3 = 108, 107, 106, 105
Start one two three
Ans is 105

Do:

a. 98 + 9 c. 178 + 8 e. 12346 + 8
b. 89 + 8 d. 12345 + 9 f. 184 + 7

Ex I.10 Example:

(1234) + (25) Also 1234 = 1000 + 200 + 30 + 4
Ans: 1234 25 = 20 + 5
\+ 25 Total = 1259

Add in both ways:

a. 99 + 1 e. 43 + 36 i. (40065) + 4
b. 87 + 3 f. (10099) + 1 j. (50043) + 36
c. 76 + 3 g. (20087) + 3
d. 65 + 4 h. (30076) + 3

Ex I.11 Example:

(1234) + (17)
Ans: 1234 Also 1234 = 1000 + 200 + 30 + 4
\+ 17 17 = 10 + 7

--- Total = 1240 + 11 = 1251

Add in both ways:

a. 99 + 3 e. 843 + 38 i. 100465 + 7
b. 87 + 5 f. 10099 + 3 j. 100843 + 38
c. 176 + 6 g. 10087 + 5
d. 465 + 7 h. 100176 + 6

Ex I.12 Add (in the regular method):

a. (11) + (29) + (38) e. (10011) + (10029) + 10038)
b. (12) + (28) +(37) + (55) f. (10012) + (10028) + (10037) + 10055)
c. (14) + (27) + (35) + (55) g. (1014) + (1027) + 1035) + (0055)
d. (17) + (24) + (34) + (56) h. (917) + (924) + (934) + (956)

==========

Chapter - 2 Subtraction

2.1 Go to addition and make:

			Rewrite this as:		
1 + 4	=	□	5 – 4	=	1
2 + □	=	5	5 - □	=	2
3 + □	=	5	5 - □	=	3
4 + □	=	5	5 - □	=	4
5 + □	=	5	5 - □	=	5
			5 - □	=	0

Students should understand that subtraction is the same as **or** part of **or** reverse of addition. These are different ways of saying the same thing.

Note:

- Limit this approach to positive numbers.
- Therefore the first number should be bigger.
- Technical terms like minus numbers etc are not necessary at this stage.
- Let us have only 2 numbers.
- Let different student groups make sets of numbers adding up to 6, 7, 8, 9, 10:

E.g.:

1+5 = 6	6 – 1 = 5

2.2 Subtraction with fingers in two ways.

2.2.1 Start from the bigger (=first number). It is in your mouth. Take out one by one by fingers, until you reach the second number. Your fingers show the result.

E.g.: 10 – 7 =? [10] ⟶ [9] + 1 ⟶ [8] +1,1 ⟶ [7] + 1,1,1

You have reached [7] Therefore Answer = 1,1,1 = 3

2.2.2 Reverse the process. Put the second number in the mouth. Start counting up until you reach the second number.

E.g.: 10 – 7 = ? [7] ⟶ [8] - 1 ⟶ [9] - 1,1 ⟶ [10] - 1, 1,1

Therefore Answer = 1,1,1 = 3

2.2.3 Write down the above:

```
  8      8      8      8      8      8      8
- 1    - 2    -3     - 4    - 5    - 6    - 7
---    ----   ----   ----   ----   ----   ----
---    ----   ----   ----   ----   ----   ----
```

2.3 Subtraction without 'borrowing'.

2.3.1 Let the students select numbers from number 'bricks'.

Give one group the set of [5 to 9] and the other [0 to 4]

Let the first group make numbers; Let the second Subtract second from the first.

```
E.g.:    5        6        7        8        9
       - 0      - 1      -2       - 3      - 4
         ---      ----     ----     ----     ----
         ---      ----     ----     ----     ----
```

```
E.g.:    5 5      6 6      7 7      8 8      9 9
       - 1 0    - 2 0    -3 0     - 4 2    - 4 4
         ----     ----     ----     ----     ----
         ----     ----     ----     ----     ----
```

This way each digit gives the answer.

2.3.2 After doing the above see how it works:

E.g.: 99 – 44 = (90 – 40), (9 – 4) = 50, 5 = 55

2.3.3 Extend to 3 digits:

```
E.g.:    1 2 3      1 2 3      2 4 6
     -   1 2 2    - 1 1 2    -1 3 5
         -----      -----      ------
         -----      -----      ------
```

2.4 Subtraction with 'borrowing'.

2.4.1

```
  2      2      1 2    1 2
- 1    - 2    - 1    - 2
---    ----   ----   ----
---    ----   ----   ----
```

Now ask

```
  2
- 3
------
  ?
- -----
  1 2
- 3
-------
  ?
-------
```

Not possible - is OK as an answer.

Only [ONE] is borrowed from the next digit.

That [ONE] = [TEN] in the new place

Go to 2 2
- 3

2.4.2 As in 2.3.1 let two groups make numbers – first 2 digits – after making interchange the unit place – let them do subtraction.

Extend this game to 3 digits. Interchange either the unit place or ten place or both. Now all these require borrowing.

2.5 **Subtraction Grid:** Go back to the addition grid.

Students can convert it to subtraction grid. Skeleton in some places will be empty. (To the teacher: empty spaces can have negative numbers. Those ideas a little later.)

-	0	1	2	3	4	5	5	7	8	9
0	0	1	2							
1		0	1							
2										
3										
4										
5										
6										
7										
8										
9										

Exercises - Chapter 2

Ex II.1 Example:
27 – 4 =?
Ans: Orally [27] → [26] → [25] → [24] → [23]
Start one two three four **(STOP)**
Ans = 23

Do Orally:
a. 25 – 4
b. 16 – 3
c. 17 – 5
d. 29 – 2
e. 30 – 6
f. 10025 – 4
g. 20016 – 3
h. 30017 -5
i. 50029 - 2
j. 99930 - 6

Ex II.2 Example:
26 – 8 =?
Answer: You can do as given in Ex II.1. But better is 26-8 = (26-10)+2=16+ 2
Start, [16] → [17] [18]
0ne two **Ans = 18**

Do Orally (Shortcut Method):
a. 25 – 6
b. 16 – 7
c. 17 – 9
d. 29 – 8
e. 30 – 9
f. 10025 – 6
g. 20016 – 7
h. 30017 - 9
i. 50029 - 8
j. 99930 – 9

Ex II.3 Example:

123 – 12 =?

```
Ans:   123
     -  12
       -----
       111     Ans: 111
       -----
```

Do:

a. (987) – (76)
b. (976) – (43)
c. (654) – 42)
d. (109) – (107)
e. (20128) – (10117)
f. (17) – (6)
g. (26) – (3)
h. (34) – (12)
i. (9823109) – (9823107)
j. (138) – (107)

Ex II.4 Example:

(123) – (14) =?

```
         1
Ans:   123
     -  14
       -----
       109     Ans: 109
       -----
```

Do:

a. (987) – (88)
b. (931) – (43)
c. (654) – (65)
d. (107) – (88)
e. (20117) – (10128)
f. (27) – (18)
g. (56731) – (12343)
h. (123654) – (12365)
i. (987107) – (987088)
j. (7117) – (6128)

Ex II.5 Example:

Do the problems of EII.3 by "ULTA" Method (Opposite of "SEEDHA" method)

Ex: (123) – (14) =?

It is the same as

```
          14
      +  [  ]
         -------
          123     Ans: 109
         ------
```

Do (a) to (j) by this method.

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Chapter 3 Addition, Subtraction

3. Addition, Subtraction

3.1 After Chapters 1 & 2, it is time to do addition and subtraction in the regular method. The students start working from the unit place (i.e. right hand side of the number).

3.2

```
  5      1 8     1 5     2 1 5     2 1 5     2 1 5
+ 4    +  4    +1 4       + 4     + 1 4   + 1 1 4
---    ----    ----    -------    -----     -----
---    ----    ----    -------    -----     -----

3 2 1 5        3 2 1 5          1 2 3 4 5 0 0 6 7 8
+ 1 1 4      + 2 2 1 5          + 2 3 4 0 0 5 1 2 1
---------      --------         ----------------------
---------      --------         ----------------------
```

3.3 Now go to the next step:

```
  6        8 6        9 6      8 8 6      9 9 6
+ 4      +  4       + 4       + 4        + 4
 ---      ----       ----      -------    -----
 ---      ----       ----      -------    -----
9 8 8 6          9 8 8 6          9 8 8 6          9 8 8 6
+     4          +  1 4           + 1 0 4          + 1 1 4
---------        --------         ---------        --------
---------        --------         ---------        --------
```

3.4 Understand the term 'Carry Over". In these examples that carry over is only 1 ; it stands for '10'. Similarly 'borrow' is also only 1; but it is = 10.

3.5 See a calculator. Add 2 numbers; subtract the same – now use 3 or more numbers only for addition. See we can also do it by hand.

3.6 **Subtraction:**

3.6.1 Subtraction is the process of 'removal'. Subtract B from A means, 2 things:

a. A is bigger than B.
b. B is taken away from A.

- The answer can be written as A – B.
- Subtracting bigger number from a smaller number is not possible (in simple arithmetic). At higher level, the answer can be written using negative numbers.

Thus 9 – 8, 9 - 7, 9 – 6, 9 – 1 …… etc., are OK
9 – 9 also is OK
(9 – 10) will require knowledge of negative numbers etc.,

3.6.2

```
  9 9 9 9
- 7 7 7 7   This is without any "Borrowing"
 ----------
  2 2 2 2
 ---------
```

Students can do:

```
1 2 3 4 5          1 2 3 4 5          1 2 3 4 5
- 2 3 4 5          - 2 2 3 4        - 1 1 3 4 5
 ----------         ----------         -----------
 ----------         ----------         -----------
```

3.6.3

```
    1
  9 9 9 2
- 7 7 7 3   This required "Borrowing"
 ----------
  2 2 1 9
 ---------
```

'1' shown above is borrowed from 10th place. This is equal to 10unit places, making the unit place as 12. From this 3 removed gives 9.

Now in the 20th place, one less, i.e., (8 only) remains. From this 7 subtracted gives 1.

Students can do:

```
  8 7 6 5          1 2 3 4 5          1 2 3 4
- 7 9 6 7          - 3 4 5 6          - 2 3 5
----------         ----------         -----------
----------         ----------         -----------
```

3.7 The above subtraction can be done by an "ULTA" method. If what was shown above is called "SEEDHA" what will follow can be called "ULTA".

3.7.1 To Do:

```
  9 9 9 9
- 8 7 6 2
 ---------
---------
```

Ask what added to 2 will give me 9. This is 7.
Write this in the unit place.

Thus 2 + [7] = 9 7 + [2] = 9

6 + [3] = 9 8 + [1] = 9

Ans: 1 2 3 7

3.7.2 Doing (-) by ULTA Method:

```
  9 9 9 9                    8 7 6 5
- 8 7 6 3                  - 7 9 8 7
---------   Ans: 1 2 2 9    ---------   Ans: 7 7 8
  1 2 2 9                    0 7 7 8
--------                   ----------
```

3.7.3 1 0 0 0 0 1 By 'SEEDHA' method

- 8 7 6 4 2 Ans: 1 2 3 5 9

---

1 2 3 5 9

The same by 'ULTA' method:

```
1 0 0 0 0 1
- 8 7 6 4 2
-------------
 1 2 3 5 9      Ans: 1 2 3 5 9
-------------
```

- In "ULTA" method subtraction problem is converted into ADDITION problem. Many people find this easier.

Exercises - Chapter 3

Ex III.1 Read aloud (in English or at least in mother tongue)

```
        1
       21
      331
     4331
    54331
   654321
  7654321
 87654321
987654321
```

- Rewrite these, inserting commas (,):

E.g.: **Indian system:** 87654321 ⟶ 8,76,54,321

American system: 87654321 ⟶ 87,654,321

- Now read aloud (in English) in these 2 methods.

Ex III.2 Write these numbers:

Nine
Eighty nine
Eight hundred eighty nine
Nine thousand eight hundred and eighty nine
Ninety thousand nine hundred and eleven
Nine hundred thousand and one
Nine lakh ninety thousand and one
Six million five hundred thousand and four
Seventy lakhs sixty thousand and five
4 billion and one
40 crore and one

Ex III.3

a. One hundred thousand = ……

b. 1 million = …….. lakhs
c. 1 crore = …….. lakhs
d. 1 crore = …….. millions
e. Population of India = …….. millions
f. Population of India = …….. crore
g. World population = …….. million
h. World population = …….. crores

Ex III.4 Example:

675 – 5 =? 675
- 5 (Written as 675 – 5 =? **Ans: 670**)

670

Do:

a. 605 – 5
b. 675 – 75
c. 675 – 575
d. 675 – 675
e. 675 – 1
f. 675 – 11
g. 675 – 111
h. 675 – 605
i. 675 – 615
j. 675 – 575
k. 675 – 585
l. 675 – 595
m. 675 - 85
n. 675 - 86
o. 675 - 98
p. 675 – 596

Ex III.5

a. 3 2 4 5 6 7 9 8
- 4 5 6 7 8 8

b. 3 2 4 5 6 7 9 8
- 4 5 6 7 9 8

c. 3 2 4 5 6 7 9 8
- 4 5 6 8 0 8

d. 3 2 4 5 6 7 9 8
- 4 5 6 8 1 8

e. 3 2 4 5 6 7 9 8
- 4 5 7 8 0 8

f. 3 2 4 5 6 7 9 8
- 4 6 7 8 0 8

g. 3 2 4 5 6 7 9 8
- 5 6 7 8 0 8

h. 3 2 4 5 6 7 9 8
- 3 2 4 5 6 7 8 0 8

i. 3 2 4 5 6 7 9 8
- 3 3 4 5 6 7 8 0 8

j. 3 2 4 5 6 7 9 8
-3 3 5 5 6 7 8 0 8

(First do it; write down the answers. Then check the results by using a calculator).

Ex III.6 Fill using [+] or [-] in boxes:

Example:

2 [ ] 6 [ ] 2 = 10 Ans: 2 + 6 + 2 =10

2 [ ] 1 [ ] 9 = 10 Ans: 2 - 1 + 9 =10

Ex III.7 Fill in using (+) or (-):

1		4		5	=	10
2		5		3	=	10
3		6		1	=	10
4		7		1	=	10
5		8		3	=	10
6		9		5	=	10
7		6		9	=	10
8		5		7	=	10
9		2		1	=	10
8		4		6	=	10
8		4		2	=	10
7		5		8	=	10
7		5		2	=	10
6		3		7	=	10
6		3		1	=	10
5		4		9	=	10
5		4		1	=	10
3		2		5	=	10
3		2		9	=	10

Ex III.8 Students make their own problems like the above using any numbers between 1 and 99.

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Chapter 4 Multiplication

4. Multiplication **(X)**

See that multiplication is only many additions of the SAME number.

4.1 The elementary idea of 10+10+10+10 = 4 x 10 = 40
/ how many times / (or by adding) = 40.

The simple idea can be a game by making students think of real life situations.

E.g.: How many tickets? One more
How many coffees? Two more
Wage/day = □, how many day's work?

4.2 Students are you comfortable with 'multiplication table' (= **Maggi**?) If not, it is OK.

4.3 When in doubt, add. i.e. when Maggi gets stopped, or doubt arises go to this method.

If 5 X 5 = 25; 6 x 5 =? 25 + 5 = 30

For 7 x 5 =? If (6 x 5) = 30, (7 x 5) is one more five (∴ 35)

2 methods:

a. (6 X 5) + 5 once = 30 + 5 = 35 or

b. (5 X 5) + (5 twice) = 25 + 10 = 35

4.4 Try method of 4.3 to great advantage in new and high number situations

a. If 29 x 10 = 290, what is 29 x 11
Answer: 290 + 29 = 290 + 30 (minus 1) = 320 – 1= 319

b. If 29 x 10 = 290, what is 29 x 9

Answer: 29 x 9 = 290 – 29
= 290 – 30 (plus 1) = 260 Plus 1 = 261

c. If (123456) x 10 = 1234560 Give the number
What is 123456 x 11

Ans.: 1 2 3 4 5 6 0
+ 1 2 3 4 5 6 Add & give this as answer 1238016

In the above, what is (123456) x 9?
Ans.: 1 2 3 4 5 6 0
- 1 2 3 4 5 6
---
1 1 1 1 1 0 4
---

d. **Game:** Play this game with a calculator (A group of 5, Leader has the calculator). He gives out the question as above. Asks the question. All the rest do by hand. He does using calculator. They compare.

E.g.: (56789) x (12345) = Give this number

What is (56789) x (12346)?

Or What is (56790) x (12345)?

4.5 **Game:** split the class into 9 groups. Let each group make 1 to 10 Maggi by this addition method.

i.e. Group I will do for 1 & 10
Group II will do for 2 & 10 etc

2 x 1 =
2 x 2 =

2 x 10

4.6 Students should complete the Multiplication Grid given below:

X	1	2	3	4	5	5	7	8	9
1	1								9
2									
3									
4									
5									
6									
7									
8									
9	9								81

4.7 Make many copies of the completed multiplication grid. Play different games.

a:

X	1	2	3	4	5	5	7	8	9
1	1							8	
2									
3									
4									
5									
6									
7									
8	8							64	
9									

Cut off or blank out as given. Produce it by simple addition.

E.g.: 8 x 8 = 64; 8 x 9 = 64 + 8 = 72

Now 8 x 9 = 9 x 8 = 72

Therefore 9 x 9 = 72 + 9 = 81

b: Now cut off at 8

X	1	2	3	4	5	6	7	8	9
1	1						7		
2									
3									
4									
5									
6									
7	7						49		
8									
9									

Recreate the full grid. Go like 8, 16, 24 …

from left to right and top to bottom.

Then do as in 4.7 [a] above.

4.8 Make the student realize that Maggi up to 9 is good enough. 10 is simple & easy. Now show them how 10 x 10 is good enough for all the rest.

4.8a Use 10 x 10 grid for double digit to convert multiplication into single digit

8 x 14 = 8 x 10 + 8 x4
= 80 + 32 = (80 + 30) + 2 = 110 + 2 = 112

3 x 17 = 10 x 3 + 7 x 3 = 30 + 21 = 51

4.8b Double-digit number multiplication
14 x 14 =?
(14 x 10) + (14 x 4) = 140 + (14 x 4)
= 140 + 40 + 16 = 180+ 16 = 196

Seems to be long but with a little mental arithmetic, this is faster than going 14 x 1, 14 x 2 …. up to 10. Secondly you are sure your answer is right.

4.9 Students can play game of 4.8. Form 2 groups: One, which is sure of their Maggi up to 20 x 20. Another who wants to try the 10 x 10 grid. Have games for both – either oral or written or in quiz format.

For quiz format, go back to 3.6 and use the examples given by the students.

4.10a Not knowing Maggi (or aversion to Maggi) need not be the reason to fear mathematics. Maggi is only one of the tools. We can do without it if we have a calculator. But we cannot eliminate it, better is to be bold about it. 10 x 10 is good enough.

4.10b Now we will show that even 5 x 5 is OK

X	1	2	3	4	5
1					
2					
3					
4					
5					

This is 5 x 5 multiplication grid
All the students would be able
to complete this, written or oral.

4.11

4.12 Now use this 5 x 5 grid to make a 10 x 10 grid. This is easy as given in 4.7.

4.13 Use 5 x 5 only for all purposes.

4.12a Same as 4.8(a)

8 x 14 = (5 x 14) + (3 x14)
= 50 + (5 x 4) + 30 + (3 x4)
= 50 + 20 + 30 + 12
= 112

3 x 17 = (3 x 10) + (3 x 7)
= 30 + (3 x5) + (3 x 2)

= 30 + 15 + 6 = 51

4.12b Same as 4.8b

14 x 14 = (10 x 14) + (4 x 14)
= 140 + 4 x 14
= 140 + (4 x 10) + 4 x 4
= 140 + 40 + 16 = 196

4.14 In every example, we have assumed that multiplication by 10 is very easy and innate in every student. Test this before going any further.

Do 3 x 10 = 30
4 x 100 = 400
7 x 100000 = 700000

Exercises - Chapter 4

Ex IV.1 Worked example:

```
1 2 3 4          The same can be: 2 x (1234)
X     2          = 2 x (1000 + 200 + 30 + 4)
--------         = 2000 + 400 + 60 + 8
--------         = 2468
```

Do by both the methods:

a. (123) x 3
b. (812) x 3
c. (922) x 4
d. (202) x 5
e. (123123) x 3
f. (812312312) x 3
g. (92222121) x 4
h. (102102102) x 5

Ex IV.2 Example: (1234) x 5 =?

```
1 2 3 4          Also 5 x (1000 + 200 + 30 + 4)
X     5          = 5000
--------         + 1000
6 1 7 0          +  150
---------        +   20
                 ---------------
                   6170
                 ---------------
```

Do:

a. (12) x 8
b. (22) x 8
c. (35) x 9
d. (9876) x 5
e. (9876) x 2
f. (9143) x 2
g. (9143) x 3
h. (2345) x 4
i. (2228) x 6

Ex IV.3 Example: (1234) x (12)

```
1234                Also (1234) x (10 + 2)
x 12                = 12340
--------            +  2468
 2468               -----------
 12340                 14808
-----------         -----------
 14808
----------
```

Do both ways:

a. (34) x (12)
b. (23) x (33)
c. (2234) x (22)
d. (2123) x (33)
e. (1234) x (35)
f. (9876) x (35)
g. (1004) x (35)
h. (9006) x (35)
i. (102030) x (35)
j. (909090) x (35)

Ex IV.4 Do:

a. 56789 X 11
b. 56789 x 111
c. 56789 x 1112

d. 56789 x 12 e. 56789 x 123 f. 56789 x 1234

Ex IV.5 Example: (789) x (12345) =?

Method A:	Method B:
789	12345
x 12345	x 789
---	---
3945	111105
31560	987600
236700	8641500
1578000	---
7890000	9740205
---	---
9740205	

Method B is shorter than method A.
Therefore smaller number is taken at second place.

Do:

a. (12) x (6789) b. (123) x (6789)
c. (1230) x (67890) d. (12300) x (6789)

==========

Chapter 5 Division - 1

5.1 Students have understood that:

- Multiplication is many times addition.
- Multiplying (by a number bigger than 1) increases the value.
- This increase is always in equal steps.

5.1.1 As said above, take 3 x 4

- 3 x 4 = 12 This can be done as:

```
  3
 +3
 +3
 +3      4 times
 ------
= 12
 ------
```

- 3 increased to 12 because of multiplication.
- 3 became 6, the 9 and finally 12. It increased in equal steps

5.1.2 Exercise for students

Worked example: Do 6 x 3 by addition method

```
6 x 3 =   6      once
        + 6      twice
        + 6      thrice
        ------
         18
        ------
```

Answer: ∴ 6 x 3 = 18

- **Do by addition method:**

a. 2 x 5 d. 3 x 8 g. 123456 x 3
b. 5 x 2 e. 17 x 4 h. 98765 x 4
c. 8 x 3 f. 123 x3 i. 29 x 9 (here try 10 – 1 = 9)

5.2 If multiplication can be understood as, **'many times addition'**, division can be called as '**many times subtraction**'.

5.2.1 3 x 4 = 12. This is known

Now $\frac{12}{3} = 4$ or 12 ÷ 3 = 4

This can also be done as:

```
 12
- 3   once
----
  9
- 3   twice
----
  6
- 3  thrice
------
  3
 -3  four times
-----
  0
```

This means, if you take away 3 at a time and like this four times, nothing is left. i.e., $\frac{12}{3} = 4$

5.3 Students can now understand:

- Division is many times subtraction.
- Dividing a number by another number (bigger than 1 & smaller than the first number) decreases the first number.
- Division decreases the original number always in EQUAL STEPS.

5.4 See $\frac{12}{3} = 4$ $\frac{8}{2} = 4$ $\frac{6}{2} = 3$

Now try = $\frac{13}{3}$ **Ans.** = 4; but 1 remains

$\frac{9}{2}$ **Ans.** = 4; but 1 remains

$\frac{7}{2}$ **Ans.** = 3; but 1 remains

5.4.1 Let us learn some words.

$\frac{13}{3}$: Ans = 4. Left out = 1

Here 13 is an **integer**
3 is an **integer** (smaller than 13)
Answer 4 is an **integer**
Left out 1 is an **integer**

The Answer is called **QUOTIENT**.
What is left out is called **REMAINDER**. (Remainder = that which remains)
Like copier = that which copies; Joke: Should it not be 'remainer'?

13 is called **dividend** and 3 is called **divisor**. We can live without these two words. But we should know:
TOP NUMBER (here 13) is also called **NUMERATOR**
BOTTOM NUMBER (here 3) is also called **DENOMINATOR**

5.4.2 Exercises:

Example: Write A ÷ B in fraction form and write down the numerator & denominator.

A ÷ B = $\frac{A}{B}$ Numerator = A, Denominator = B

Now Do:

a. 15 ÷ 5 b. 9 ÷ 3 c. 21 ÷ 7 d. 16 ÷ 4

e. 36 ÷ 9 f. 24 ÷ 6 g. 12345 ÷ 25 h. 9676 ÷ 8

5.4.3 Exercises:

Worked examples:

Write down the quotient (= Answer) and the remainder (zero is no remainder).

8 ÷ 2 $\frac{8}{2} = 4$ **Ans** = 4, remainder = 0

9 ÷ 2 $\frac{9}{2} = 4 + 1$ remains; ∴ **Ans** = 4, Remainder = 1

Now Do:

a. 15 ÷ 5 b. 16 ÷ 5 c. 18 ÷ 5 d. 9 ÷ 3 e. 8 ÷ 3

f. $\frac{10}{3}$ g. 12345 ÷ 25 h. 12375 ÷ 25 i. 9676 ÷ 8 j. 9672 ÷ 8

5.5 Multiplication tables (= 'maggi') are useful for multiplying and dividing. That is why primary schools insist on every child learning it. Learning maggi and remembering is necessary. Every student should know multiplication tables from 2 to 9.

5.5.1 Let MT (= multiplication table).
MT of 1 is easy 1 x 1 =1, 1 x 2 = 2 etc.,

Mt of 10 is also easy 1 x 10, 2 x 10 = 20 ……. 9 x 10 = 90, 10 x 10 = 100
These need not be memorized.

5.5.2 MT of 2 should be known. But it is easy to memorize.
2 x 1 = 2, 2 x 2 = 4 …… 2x 6 = 12 etc.,

MT of 5 is also easy and does not trouble the students.
5 x 1 = 5, 5 x 2 = 10 …… 5 x 6 = 30 etc.,
Just see the answer has 0 or 5 as the last digit.

5.6 Let us learn how to use MT for dividing.
Start with 9 x1 = 9, 9 x 2 = 18 …… 9 x 7 = 63, 9 x 8 = 72, 9 x 10 = 90
Now take 9 x 10 = 90. This is multiplication

What is $\frac{90}{10} = ?$ Ans = 9

What is $\frac{90}{9} = ?$ Ans = 10

Similarly $\frac{72}{8} = ?$ MT of 8 helps to find the answer.

Similarly $\frac{72}{9} = ?$ MT of 9 is used.

Thus Division is reverse of multiplication.

5.7 (Number 1) (Number 2) = Product.

Now, $\frac{\text{Product}}{\text{number 1}}$ = (number 2)

Also $\frac{\text{Product}}{\text{number2}} = (\text{number } 1)$

Example: (1234) x (56789) = 70077626

What is $\frac{70077626}{1234} = ?$ **Ans**. = 56789

Given that (13) x (17) = 221; $\frac{221}{17} = ?$ **Ans**. = 13

5.8 Exercises

5.8.1 a. Write down MT of 13 up to 5, now seeing this, answer:

(a1) $\frac{65}{13} = ?$ (a2) $\frac{52}{4} = ?$ (a3) $\frac{26}{2} = ?$ (a4) $\frac{39}{13} = ?$

b. Write down any MT. Frame your own questions from this.

c. Given (137) x (17) = 2329, $\frac{2329}{17} = ?$

d. Given (13579) x (24) = 325896 (Given)

Find $\frac{325896}{13597} = ?$ $\frac{325896}{24} = ?$

5.8.2 a. Same method as above can be used; even when there is a remainder.

E.g.: 7 x 1 = 7, 7 x 2 = 14 ……. 7 x 4 = 28, 7 x 5 = 35

$\frac{28}{7} = ?$ **Ans.** = 4

Let us ask $\frac{30}{7} = ?$ now nearest smaller number divisible by 7 is 28.

i.e., 7 x 4 = 28

$\therefore \frac{30}{7} = \frac{28}{7} + \text{remainder}$, **Ans.** =4 with remainder 2

b. Given (137) x (17) = 2329, $\frac{2335}{17} = ?$

Given number which we know is 2329, 2335 – 2329 = 6

$\therefore \frac{2335}{17} = 137 + \text{remainder } 6$

5.8.3 a. Write down the table of 13 up to 5. Now, using this table find answer (i.e., after dividing) and remainder.

(a1) $\frac{67}{13} = ?$ (a2) $\frac{50}{4} = ?$ (a3) $\frac{25}{2} = ?$ (a4) $\frac{42}{13} = ?$

b. Use another MT; Frame your own questions.

c. Given that (13) x (17) = 221, $\frac{228}{13} = ?$

d. Given that (13) x (17) = 221, $\frac{228}{17} = ?$

e. Given that (1234) (56789) = 70077626, (Known)

(e1) $\frac{70077626}{56789} = ?$ (Clue – no remainder)

(e2) $\frac{70077628}{56789} = ?$ (Clue – with remainder)

(e3) $\frac{70087626}{56789} = ?$ (Clue – with remainder)

5.9 Division by single digit numbers (i.e. 1 to 9):

5.9.1 Division by 2 is very easy.

Eg: 122 ÷ 2 $2\overline{)122}$ **Ans**. = 61

61

121 ÷ 2 $2\overline{)121}$ **Ans.** = 60, Remainder = 1

60 – 1

- It is good for the students to learn some words and concepts, related to 2.
- Numbers like 2, 4, 6, 8, 10 etc are all divisible by 2. These are called **EVEN numbers**.
- All the numbers 1, 3, 5, 7, 9 and any number ending in any of these numbers are called **ODD** numbers.
- EVEN numbers are divisible by 2.
- ODD numbers are not divisible by 2 (i.e., there will be a remainder, 1).

5.9.2 We have seen that if you know 'maggi' (=MT, Multiplication Table), division becomes easy. Assuming the student knows MT of 1 to 10, we can say division by single digit number is easy. This is the reason multiplication is done as shown in 5.9.1, in case divisor (= denominator) is a single digit number.

5.9.3 Exercises

Example 1: 92345678 ÷ 3 =?

Ans: $3\overline{)92345676}$ **Ans.** = 30781892

30781892

Example 2: 9236 ÷ 3 =?

Ans: $3\overline{)9236}$ **Ans**. = 3078 + (Remainder 2)

3078 – 2

Now do:

a. 92345676 ÷ 2
b. 92345676 ÷ 4
c. 92345676 ÷ 5
d. 92345676 ÷ 6
e. 92345676 ÷ 7
f. 92345676 ÷ 8
g. 92345676 ÷ 9
h. 92345676 ÷ 10
i. 124 ÷ 6
j. 125 ÷ 5
k. 126 ÷ 7
l. 121 ÷ 11

5.9.4 When you write down MT of 2 to 10, you see some pattern. These patterns have given the clue to find whether a given large number could be divided by another (single digit) number

without any remainder. These are given here as **divisibility rules**. [They are not rules; they are qualities of the behavior].

5.9.5a **1. Divisibility:**

- All numbers are divisible by 1 and by itself.
- Odd numbers, even numbers identification
- 2 – all even numbers.
- 3 – add all digits – result divisible by 3
- 4 – last 2 digits divisible by 4
- 5 – numbers ending in 0 or 5
- 6 – divisible both by 2 and 3
- 8 – divisible both by 2 and 4
- 8 - last 3 digits divisible by 8
- 9 – add all digits – divisible by 9
- 10 – last digit 0

2. Prime Numbers:

- Can be divided by 1 or itself
- Factorization not possible.
- Odd numbers.
- Some examples: 11, 13, 17, 19, 23 ……

3. **Special rule for 11:** (Sum of even digits)–(Sum of odd digits)= 0

5.9.5b **Examples:**

- 123 – sum = 6 div by 3 ∴ number 123 is divisible by 3
- 12345 – sum = 15 div by 3 ∴ number 12345 is divisible by 3
- 1218 & 1318 are not divisible by 4 because $\frac{18}{4} \neq$ integer
- But 1216 & 1308 are divisible by 4 because $\frac{16}{4}$ & $\frac{08}{4}$ = integers
- Any even number AND divisible by 3

  12346 - even number; div by 3, NO 16 = digits addition

  Try $\frac{12346}{6} = 2057\frac{4}{6}$

  123462 - even number; div by 3

  Try $\frac{123462}{6} = 20577$ OK
- 12345 - yes div by 3; By 9?

  Try $\frac{12345}{9} = 1371\frac{6}{9}$; Not div by 9

  Try 22446 Sum = 18, ∴ div by 9

  Check $\frac{22446}{9} = 2494$ OK

  Or Try 123453 Sum = 18, ∴ div by 9

  Check $\frac{123453}{9} = 13717$ OK
- 1221 – div by 11? 1+2 = 1+2; ∴ yes

  Check $\frac{1221}{11} = 111$

  12321 - div by 11? 1 + 3 + 1 =5, 2+ 2 = 4; ∴ No

  Check $\frac{12321}{11} = 1120\frac{1}{11}$

5.9.6 Divisibility Exercise:

A. Without actually dividing, state whether the following number is divisible by 92345676.

a. by 3 c. by 2 e. by 6 g. by 5
b. by 4 d. by 9 f. by 11

B. Students can make their own questions.

5.9.7 Factorization

Divisibility rules help us in factorizing a given number.

Eg: 6 = 2 x3 2 and 3 are FACTORS of the number 6.
Eg: 21 = 3 x 7 3 & 7 are factors of 21
Eg: 42 = 2 x 3 x 7 2, 3 & 7 are factors of 42

Exercises:

i. Say if 2 is a factor or not: a. 1235 b. 1235 c. 5000 d. 5005

ii. Say if 3 is a factor or not: a. 27 b.31 c. 121 d. 123 e. 1234 f. 1232

iii. Say if both 5 & 3 are factors a. 275 b. 285 c. 1230 d. 1235

iv. Write all the factors: a. 362880 b. 3628800 c. 399168 d. 420
(Clue: Try shortcut method of ALL single digits one by one)

5.9.7.1 (Extra) Factories: 16, 21, 28, 144, 153

- 16 = 2 x 8 = 2 x 2 x 4 = 2 x 2 x 2 x2
  Now, this can be written as: 16 = 2 x 2 x 2 x2
  = 2 x 8 = 4 x 4
- 21 = 3 x 7 (& no more)
- 28 = 2 x 14 = 2 x 2 x 7
  ∴ 28 = 2 x 14 = 4 x 7
- 144 = 2 X 72 = 2 x 2 x 36 = 2 x 2 x 2 x 18
  = 2 x 2 x2 x 2 9 = 2 x 2 x2 x 2 x 3 x 3
  ∴ 144= 2^4 x 3^2
  This can be written in many ways
- 153 = 3 x 51 (& try 51 now)
  = 3 x 3 x 17 (17 happens to be a prime number ∴ no more)
  ∴ 153 = 3 x 51 = 9 x 17

Exercise: Factorise

a. 6	b. 62	c. 98	d. 256	e. 22	f.198
g. 106	h. 162	i. 298	j. 10256	k.15	l. 47
m. 141	n. 255	o. 189	p. 115	q.147	r. 241
s. 55	t. 199				

5.9.8 Approximation:

Helps in many calculations. In division problems, a rough idea of the magnitude of the numbers helps.

E.g.: We have 26 mangoes. This is to be shared by 3 persons. How many per person?

We know 26 cannot be shared equally but how much. One can start by doing:

to A, B, C [1] [1] [1]
[1] [1] [1]

Then + + + to A, B, C etc.,

Or Give 2 2 2 to A, B, C

Then + + 2 + 2 to 2 C etc.,

Instead try this way: If I had 30 mangoes. I could have given 10 each. But I have four less. Therefore each will get approximately 7 or 8. Now try dividing you will get.

Thus approximation helps in division. This helps when we forget our "maggi" (= multiplication tables).
E.g.: Divide 299 by 13

Actual method:

```
        23
   ----------
13 | 299
     26
   ------
      39
      39
   ------
       0
   ------
```

Approximation method: 13 x 20 = 260. Remaining is ~ 40. This gives ~ 3
Ans: 20 + 3 = 23

Exercise: Do both ways - Actual Division & Approximation Method

a. 6860 ÷ 7 b. 788 ÷ 8 c. 12423 ÷ 123
d. 1678 ÷ 17 e. 1768 ÷ 17 f. 525252 ÷ 51
g. 122232 ÷ 1202 h. 1222301 ÷ 1201 i. 998 ÷ 19 J. 1028 ÷ 19

Exercises - Chapter 5

Ex V.I Learn how a question can be asked.

Eg: Divide 25 by 5 or 25 ÷ 5 or $\frac{25}{5}$ or If 25 items are equally distributed (or divided or shared or …..) (Among/by) 5 (Persons/portions/…), what will be each person's share?

All the above questions have the same answer= $\frac{25}{5} = 5$

Divide:

a. Divide 27 by 3 b. 27 ÷ 9 c. 12 ÷ 4 d. $\frac{36}{4}$ e. $\frac{15}{5}$ f. $\frac{40}{8}$

g. $18/9$ (new computer notation)

h. If 4 persons share a basket of mangoes and the basket contains 12 dozen mangoes. How many mangoes each one will get.

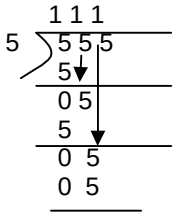
i. If the basket in (h) cost Rs. 600, how much each person should pay?

j. In (i) above, what will be approximate cost of each mango.

k. A hostel has 30 students, each, will eat 4 idles. How many idles will be needed? [Clue: This is a question on multiplication].

l. In (k), above only 92 idles are available. How many idles will each one get? [This is a question on division].

Ex V.2 Simple single digit division exercises.
Example: 555 ÷ 5



Start from left, one digit at a time. Write quotient above.
Bring one digit down see arrow.

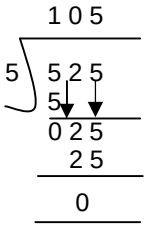
Ans: 111

[Do not write 5) 555 (111 This is not good]

Do the following by the correct way of writing, as shown above.

a. 242 ÷ 2 b. 369 ÷ 3 c. 848 ÷ 4 d. 1055 ÷ 5 e. 660 ÷ 6
f. 707 ÷ 7 g. 888 ÷ 8 h. 909 ÷ 9 i. 4848484 ÷ 4 j.2424242 ÷ 2
k. 369369369963 ÷ 3 l. 84884848848 ÷ 8

Ex V.3 Eg: 525 ÷ 5



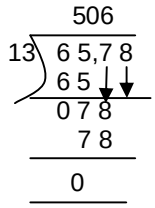
Bring down one digit at a time. If one is not enough, bring the next also. But put one 0 at the top.

Ans: 105

Do:

a. 327 ÷ 3 b. 927 ÷ 9 c. 812 ÷ 4 d. 436 ÷ 4 e. 1015 ÷ 5 f. 840 ÷ 8
g. 918 ÷ 9 h. 949 ÷ 9 i. 981 ÷ 9 j. 749 ÷ 7

Ex V.4 Dividing by 2 digit number [knowing maggi up to 16 is helpful]
Eg: 6578 ÷ 13



, introduced by us.

Ans: 506

Do:

a. 121 ÷ 11 b. 5566 ÷ 11 c. 8472 ÷ 12 d. 3952 ÷ 13
e. 5642 ÷ 14 f. 9870 ÷ 14 g. 4590 ÷ 15 h. 4695 ÷ 15
i. 8032 ÷ 16 j. 9696 ÷ 16 k. 345167 ÷ 17 . 3672 ÷ 18
m. 9557 ÷ 19 n. 9728 ÷ 19