Chapter -1 Addition and subtraction

Addition is the most basic operation and adding number 1 to the previous number generates all the numbers. The Sutra "By one more than the previous one describes the generation of numbers from unity.

0 + 1 = 1

1 + 1 = 2 2 + 1 = 3

3 + 1 = 4

4 + 1 = 5 5 + 1 = 6

6 + 1 = 7

7 + 1 = 8 8 + 1 = 9 9 + 1 = 10.....

Completing the whole method

8 close to 10

9 close to 10

17,18,19, are close to 20

27, 28, 29, are close to 30

37, 38, 39, are close to 40

47, 48, 49, are close to 50

57, 58, 59, are close to 60

67, 68, 69, are close to 70

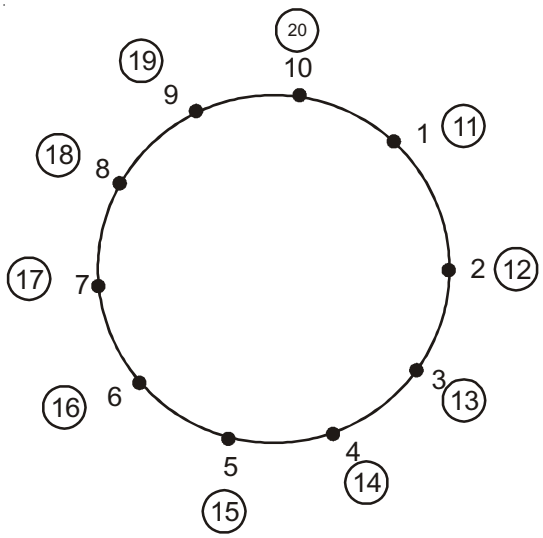
77, 78, 79, are close to 80

87, 88, 89, are close to 90

97, 98, 99, are close to 100 .....

and so on

The ten Point Circle



We can easily say that 9 is close to 10, 19 is close to 20 etc.

We can use this closeness to find addition and subtraction.

The ten Point Circle

Rule : By completion non-completion

Five number pairs

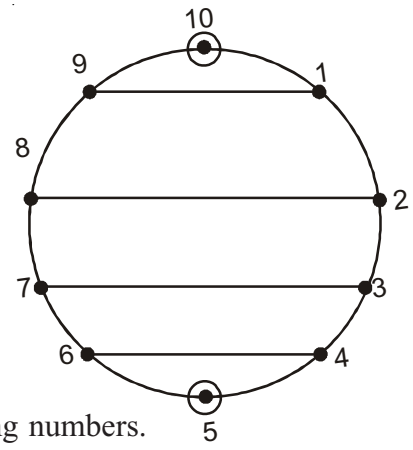
1+ 9

2 + 8

3 + 7

4 + 6

5 + 5



Use these number pairs to make groups of '10' when adding numbers.

Example : 24 + 26 = 20 + 4 + 20 + 6 = 20 + 20 + 10 = 50

Below a multiple of ten **Rule :** By the deficiency

49 is close to 50 and is 1 short.

38 is close to 40 and is 2 short.

Example : 59 + 4 = 59 + 1 + 3 = 60 + 3 = 63 {59 is close to 60 and 1 short 50, 59 + 4 is 60}

Example : 38 + 24 = 38 + 2 + 22 = 40 + 22 = 62

or

38 + 24 = 40 + 24 – 2 = 64 – 2 = 62 {38 is close and is 2 sheet so, 38 + 24 is 2 short from 40 + 24 hence 38 + 24 = 40 + 24 – 2 = 64 – 2 = 62

Example

Add 39 + 6 = ?

39 is close to 40 and is 1 less then it.

So we take 1 from the 6 to make up 40 and then we have 5 more to add on which gives 45

Add

29 + 18 + 3

29 + 18 + 1 + 2 [As 3 = 1 + 2 and 29 + 1 = 30, 18 + 2 = 20]

30 + 20 = 50 Note we break 3 into 1 + 2 because 29 need 1 to become 30 and 18 need 2 become 20]

Add

39 + 8 + 1 + 4

39 + 8 + 1 + 2 + 2

40 + 10 + 2 = 52

Sum of Ten

The ten point circle illustrates the pairs of numbers whose sum is 10.

Remember : There are eight unique groups of three number that sum to 10, for example 1 + 2 + 7 = 10

1 + 2 + 7 = 10

Can you find the other seven groups of three number summing to 10 as one example given for you?

2 + 3 + 5 = 10

Adding a list of numbers

Rule : By completion or non-completion

Look for number pairs that make a multiple of 10

7 + 6 + 3 + 4

The list can be sequentially added as follows :

7 + 6 = 13 then 13 + 3 = 16 then 16 + 4 = 20

Or

You could look for number pairs that make multiples of 10.

7 + 3 is 10 and 6 + 4 is 10

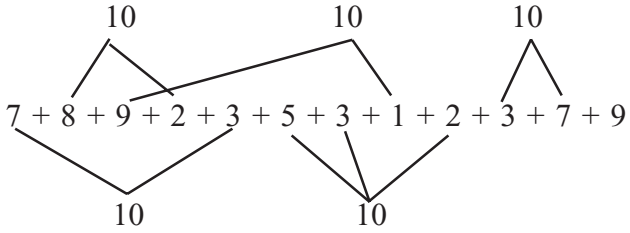
hence 10 + 10 is 20.

Similarily : 48 + 16 + 61 + 32

= (48 + 32) + (16 + 1 + 60)

= 80 + 77 = 157

or



= 10 + 10 + 10 + 10 + 10 + 9 = 59

PRACTICE PROBLEMS

Add by using completing the whole method

1. 39 + 8 + 1 + 5 =
2. 18 + 3 +2 + 17 =
3. 9 + 41 + 11 +2 =
4. 47 + 7 + 33 23 =
5. 23 + 26 + 27 + 34=
6. 22 + 36 + 44 + 18=
7. 33 + 35 + 27 + 25=
8. 18 + 13 + 14 + 23=
9. 3 + 9 + 8 + 5 + 7 + 1+ 2=
10. 37 + 25 + 33 =
11. 43 + 8 + 19 + 11=
12. 42 + 15 + 8 +4=
13. 24 + 7 + 8 + 6 +13=
14. 16 +43 + 14 +7 =
15. 13 + 38 +27=

ADDITION

Completing the whole method (class VI commutative & associative property)

1. 39 + 17 + 11 + 13 =
2. 16 + 23 + 24 + 7 =
3. 12 + 51 + 9 + 18 =
4. 35 + 12 +55 =

5. 123 + 118 + 27 =
6. 35 + 15 + 16 + 25=
7. 58 + 41 + 12 + 9=
8. 223 + 112 + 27 =
9. 24 + 106 + 508 + 12=
10. 506 + 222 + 278 =

Adding from left to right

The conventional methods of mathematics teachers use to do calculation from right and working towards the left.

In Vedic mathematics we can do addition from left to right which is more, useful, easier and sometimes quicker.

Add from left to right

1.
```
  23
+ 15
----
  38
```

2.
```
  2 3 4
+ 5 2 4
-------
  7 5 8
```

3.
```
  1 5
  3 8
  4 3
  Add 1
  = 53
```

4.
```
  2 3 5
  5 2 6
  7 5 1
  Add 1
  = 761
```

The method: This is easy enough to do mentally, we add the first column and increase this by 1 if there is carry coming over from the second column. Then we tag the last figure of the second column onto this

Mental math

Add from left to right

(1)
```
  6 6
+ 5 5
-----
```

(2)
```
  5 4 6
+ 6 7 1
-------
```

(3)
```
  5 3 4
+ 7 1 7
-------
```

(4)
```
  1 4 5 7
+ 2 8 5 7
---------
```

(5)
```
  4 5
+ 7 6
-----
```

(6)
```
  3 1 2 4 6 5
+ 7 6 1 2 4 6
-------------
```

(7)
```
  7 4 5
+ 2 7
-----
```

(8)
```
  1 4 3 2
+ 8 6 6 8
---------
```

(9)
```
  8 5
+ 2 3
-----
```

(10)
```
  5 3 7
+ 7 1 8
-------
```

(11)
```
  4 5 6
+ 1 2 7
-------
```

(12)
```
  2 6 4 8
+ 8 3 6 5
---------
```

(13)
```
  1 3 4 5
+ 5 8 3 6
---------
```

(14)
```
  5 4 6
+ 4 5 6 1
---------
```

(15)
```
  7 8 8 5
+ 1 5 4 3
---------
```

(16)
```
  3 7 8
+   4 8
-------
```

(17)
```
  3 5 6 7 1
+ 1 2 3 4 5
-----------
```

(18)
```
  2 4 6 8
+   1 2 3
---------
```

Shudh method for a list of number

Shudh means pure. The pure numbers are the single digit numbers i.e. 0, 1, 2, 3…9. In Shudh method of addition we drop the 1 at the tens place and carry only the single digit forward.

Example: Find 2 + 7 + 8 + 9 + 6 + 4

```
  2
• 7
• 8
  9
• 6
  4
 36
```

We start adding from bottom to top because that is how our eyes naturally move but it is not necessary we can start from top to bottom. As soon as we come across a two-digit number, we put a dot instead of one and carry only the single digit forward for further addition. We put down the single digit (6 in this case) that we get in the end. For the first digit, we add all the dots (3 in this case) and write it.

Adding two or three digit numbers list

```
. 23.4
 6.5.8
 .81.8
   46
 1756
```

We start from the bottom of the right most columns and get a single digit 6 at the unit place. There are two dots so we add two to the first number (4) of the second column and proceed as before. The one dot of this column is added to the next and in the end we just put 1 down (for one dot) as the first digit of the answer.

(Shudh method)

```
• 5
• 9
  4
• 6
  7
• 8
 _4
 43
```

```
  2 6
• 4•5
  3 4
• 8 1
  5 2
 23 8
```

Add the following by (Shudh method)

1.
```
  5
  7
  6
  8
  4
+ 9
```

2.
```
 37
 64
 89
 26
+ 71
```

3.
```
 345
 367
 289
+ 167
```

4. 3126
1245
4682
+ 5193

5. 468
937
386
654

6. 235
579
864
+ 179

7. 59
63
75
82
+ 91

8. 49
63
78
85
+ 97

9. 98
83
78
62
+ 44

10. 37
79
52
88
+ 91

11. 2461
4685
6203
1234
+ 5432

12. 9721
2135
5678
207
+ 1237

Number Spliting Method

Quick mental calculations can be performed more easily if the numbers are 'split into more manageable parts.

For example : Split into two more manageable sums

+ 3642	36 | 42	***Note :*** The split allows us to add 36 + 24
2439	+ 24 | 39	and 42 + 39 both of which can be done
	60 | 81	mentally

Remember : Think about where to place the split line. It's often best to avoid number 'carries' over the line.

For example :

342	3 | 42	34 | 2
+ 587	5 | 87	58 | 7
	2 | 29	92 | 9
	carry (1)	No carry is required

A carry of '1' over the line is required

SUBTRACTION

Sutra: All from 9 and the Last from 10

The Concept of Base

Numbers made up of only 1's and 0's are known as a Base.

Examples of a Base are

10, 100, 1000, 1, .01….etc

The base method is used for subtracting, multiplying or dividing numbers. Like 98, 898, 78999 etc that are close to base.

Applying the formula "All form 9 and Last form 10" to any number especially the big one's reduces it to its smaller Counterpart that can be easily used for calculations involving the big digits like 7, 8, and 9.

Applying the formula "All from 9 and the last from 10"

Example: Apply 'All from 9 Last from 10' to

Subtract 789 from 1000

7 8 9

↓ ↓ ↓ [Here all from 9 last from 10 means subtract 78 8 from 9 and 9 from 10, so weget 211]

2 1 1

We get 211, because we take 7 and 8 from 9 and 9 from 10.

from 10000	from 100	from 100	from 100000
2772	54	97	10804
↓↓↓↓	↓↓	↓↓	↓↓↓↓↓
7228	46	03	89196

If you look carefully at the pairs of numbers in the above numbers you may notice that in every case the total of two numbers is a base number 10, 100, 1000 etc.

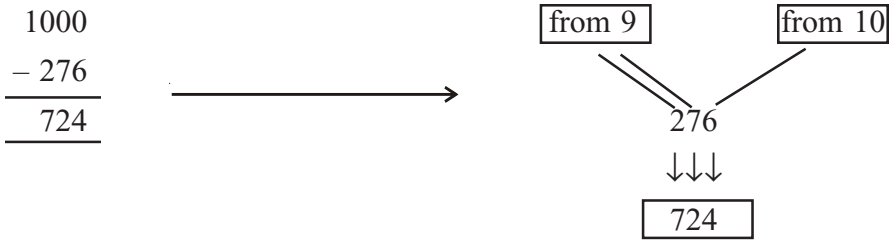
This gives us an easy way to subtract from base numbers like 10, 100, 1000…….

Subtracting from a Base

Example: - 1000 – 784 = 216

Just apply 'All from 9 and the Last from 10' to 784, difference of 7 from 9 is 2, 8 from 9 is 1, 4 from 10 is 6 so we get 216 after subtraction.

When subtracting a number from a power of 10 subtract all digits from 9 and last from 10.



Subtracting from a Multiple of a Base

Sutra: 'All from 9 and the last from 10'

and

'One less than the one before'

Example: 600 – 87

We have 600 instead of 100. The 6 is reduced by one to 5, and the All from 9 and last from 10 is applied to 87 to give 13. Infact, 87 will come from one of those six hundred, so that 500 will be left.

∴ 600 – 87 = 513 [***Note :*** First subtract form 100 then add 500, as 500 + 13 = 513]

Example: Find 5000 – 234

5, is reduced to one to get 4 and the formula converts 234 to 766

∴ 5000-234=4766

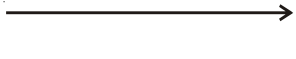
Example: 1000 – 408 = 592

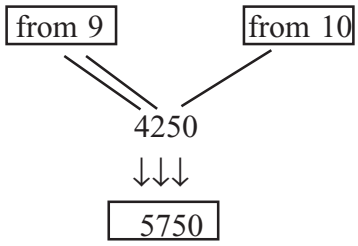
Example:100 – 89 = 11

Example:1000 – 470 = 530 [Remember apply the formula just to 47 here.]

If the number ends in zero, use the last non-zero number non-zero number as the last number for example.

$$\begin{array}{r} 10000 \\ -\ 4250 \\ \hline 5750 \end{array}$$





Hence 1000 – 4250 = 5750

Adding Zeroes

In all the above sums you may have noticed that the number of zeros in the first number is the same as the numbers of digits in the number being subtracted.

Example: 1000 – 53 here 1000 has 3 zeros and 53 has two digits.

We can solve this by writing

$$\begin{array}{r} 1000 \\ -\ 053 \\ \hline 947 \end{array}$$

We put on the extra zero in front of 53 and then apply the formula to 053.

Example: 10000 – 68, Here we need to add two zeros.

10000 – 0068 = 9932

Practice Problems

Subtract from left to right

(1) 86 – 27 =
(2) 71 – 34 =
(3) 93 – 36 =
(4) 55 – 37 =
(5) 874 – 567 =
(6) 804 – 438 =
(7) 793 – 627 =
(8) 5495 – 3887 =
9) 9275 – 1627 =
(10) 874– 579 =
(11) 926 – 624 =
(12) 854– 57 =
(13) 8476 – 6278 =
(14) 9436 – 3438 =

Subtract the following mentally

(1) 55 – 29 =
(2) 82 – 558 =
(3) 1000 – 909 =
(4) 10000 – 9987 =
(5) 10000 – 72 =
(6) 50000 – 5445 =
(7) 70000 – 9023 =
(8) 30000 – 387 =
(9) 46678 – 22939 =
(10) 555 – 294 =
(11) 8118 – 1771 =
12) 61016 – 27896 =

Example: Find 9000 – 5432

Sutra: 'One more than the previous one' and 'all from 9 and the Last from the 10'

Considering the thousands 9 will be reduced by 6 (one more than 5) because we are taking more than 5 thousand away

'All from 9 and the last from 10' is than applied to 432 to give 568

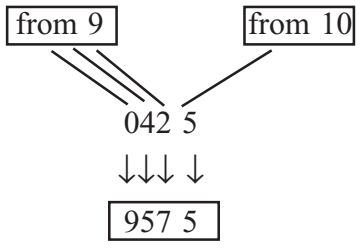
9000 – 5432 = 3568

Similary—7000 – 3884

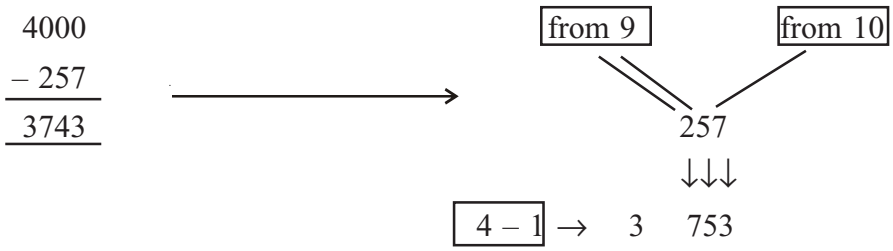
= 3116 {3 = 7 – 4, 4 is one more than 3 and 116 = 4000 – 3884} by all from a and the last from 10}

If the number is less digits, then append zero the start :

$$\begin{array}{r} 1000 \\ -\ 425 \\ \hline 9575 \end{array}$$

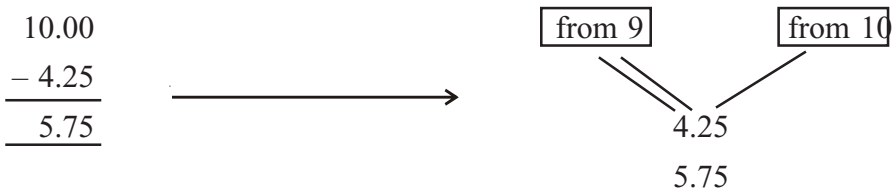


When subtracting form a multiple ofa power of 10, just decrement the first digit by 1, then subtract remaining digits :



Look at one more example :

Money: A great application of "all from 9 and last from 10" is money. Change can be calculated by applying this sutra mentally for example :



This is helpful because most our rupee notes are multiple of 10's.

PRACTICE PROBLEMS

Subtract (base method)

(1) 1000 – 666
(2) 10000 – 3632
(3) 100 – 54
(4) 100000 – 16134
(5) 1000000 – 123456
(6) 1000 – 840
(7) 1000 – 88
(8) 10000 – 568
(9) 1000 – 61
(10) 100000 – 5542
(11) 10000 – 561
(12) 10000 – 670

Subtract (multiple of base)

(1) 600 – 72 =
(2) 90000 – 8479 =
(3) 9000 – 758 =
(4) 4000 – 2543 =
(5) 7000 – 89 =
(6) 300000 – 239 =
(7) 1 – 0.6081 =
(8) 5 – 0.99 =

Subtracting Near a base

Rule : By completion or non completion.

when subtracting a number close to a multiple of 10. Just subtract from the multiple of 10 and correct the answer accordingly.

Example : 53 – 29

29 is just close to 30, just 1 short, so subtaract 30 from 53 making 23, then add 1 to make 24.

$$\begin{aligned} 53 - 29 &= 53 - 30 + 1 \\ &= 23 + 1 \\ &= 24 \end{aligned}$$

Similarily

$$\begin{aligned} 45 - 18 & \\ &= 45 - 20 + 2 \\ &= 25 + 2 \\ &= 27 \qquad \{18 \text{ is near to } 20, \text{ just } 2 \text{ short}\} \end{aligned}$$

Use the base method of calculating

To find balance

Q. Suppose you buy a vegetable for Rs. 8.53 and you buy with a Rs. 10 note. How much change would you expect to get?

Ans. You just apply "All from 9 and the last from 10" to 853 to get 1.47.

Q. What change would expect from Rs. 20 when paying Rs. 2.56?

Ans. The change you expect to get is Rs. 17.44 because Rs. 2.56 from Rs.10 is Rs. 7.44 and there is Rs. 10 to add to this.

Practice Problem

Q1. Rs. 10 – Rs. 3.45

Q2. Rs. 10 – Rs. 7.61

Q3. Rs. 1000 – Rs. 436.82

Q4. Rs. 100 – Rs. 39.08

Subtracting number just below the base

Example: find 55 – 29

Subtraction of numbers using "complete the whole"

Step 1: 20 is the sub base close to 19

19 is 1 below 20

Step 2: take 20 from 55 (to get 35)

Step 3: Add 1 back on 55 – 19 = 36

Example

61 – 38

38 is near to 40 = 40 – 38 = 2

61 – 40 = 21

61 – 38 = 21 + 2 = 23

Example

44 – 19

19 + 1 = 20

44 – 20 = 24

44 – 19 = 24 – 1 = 23

Example 88 – 49

49+1=50

88 – 50 = 38

88 – 49 = 38 + 1 = 39

Example

55 – 17

17 + 3 = 20

55 – 20 = 35

55 – 17 = 35 + 3 = 38

Number spliting Method

As you have use this method in addtion the same can be done for subtraction also :

$$\begin{array}{r} +\ 3642 \\ \underline{\ \ 2439} \end{array} \longrightarrow \begin{array}{r|l} 36 & 42 \\ +\ 24 & 39 \\ \hline 12 & 03 \end{array}$$

Note : The split allows on to add '36 – 24' and 42 – 39 both of which can be done mentally

General Method of subtraction

Subtraction from left to right

In this section we show a very easy method of subtracting numbers from left to right that we have probably not seen before. We start from the left, subtract, and write it down if the subtraction in the next column can be done. If it cannot be done you put down one less and carry 1, and then subtract in the second column.

Subtraction from left to right.

Example:

Find

83 – 37

$$\begin{array}{r} 8\ 3 \\ \underline{-\ 3\ 7} \\ 4\ 6 \end{array}$$

Find

78 – 56

$$\begin{array}{r} 7\ 8 \\ \underline{-\ 5\ 6} \\ 2\ 2 \end{array}$$

Left to right

(3)

	5	$^{1}1$
$-$	4	9
	0	2

(4)

	3	$^{1}2$	$^{1}1$
$-$	2	8	9
	0	3	2

(5)

	3	0	$^{1}1$
$-$	2	0	4
	1	9	7

(6)

	3	0	1
$-$	2	0	1
	1	0	0

(7)

	3	5	$^{1}5$	6	$^{1}7$
$-$	1	1	8	2	8
	2	3	7	3	9

Starting from the left we subtract in each column 3-1=2 but before we put 2 down we check that in next column the top number is larger. In this case 5 is larger than 1 so we put 2 down

In the next column we have 5-1=4, but looking in the third column we see the top number is not larger than the bottom(5 is less than 8) so instead putting 4 down we put 3 and the other 1 is placed as the flag, as shown so that 5 becomes 15, so now we have 15-8=7. Checking in the next column we can put this down because 6 is greater than 2. In the fourth column we have 6-2=4, but looking at the next column (7 is smaller than 8) we put down only 3 and put the other flag with 7 as shown finally in the last column 17-8=9.