Chapter 1

How to Prepare for MATHS

(Using this book for Competitive Exams)

1. Importance of Maths paper (PO)

Quantitative Aptitude is a compulsory paper. You can't neglect. So make sure you are ready to improve your mathematical skills. Each question values 1.2 marks whereas each question of Reasoning values only 1.066 marks in PO exam. So, if you devote relatively more time on this paper you get more marks. Also, the answers of Maths questions are more confirmed than answers of Reasoning questions, which are often confusing. Most of you feel it is a more time-consuming paper, but if you follow our guidelines, you can save your valuable time in examination hall.

Other exams: There are very few competitive exams without Maths paper. SSC exams have different types of Maths paper. The mains exam of SSC contains Subjective Question paper. Keeping this in mind, I have also given the detail method of each short-cut or Quicker Method given in this book. Each theorem, which gives you a direct formula also contains proof of the theorem, which is nothing but a general form (denoting numerical values by letters say X, Y, Z etc) of detail method.

2. Preparation for this paper

(A) How to start your preparation

Maths is a very interesting subject. If you don't find it interest-ing, it simply means you havn't tried to understand it. Let me assure you it is very simple and 100% logical. There is nothing to be assumed and nothing to be confused about. So, nothing to worry if you come forward with firm determination to learn maths.

The most basic things in Maths are:

(a) Addition - Subtraction

(b) Multiplication - Division

All these four things are most useful. At least one of these four things is certainly used in any type of mathematical question. So, if we do our basic calculations faster we save our valuable time in each question. To calculate faster, I suggest the following tips:

(i) Remember the TABLE upto 20 (at least):

You should know that tables have been prepared to make calculations faster. You can see the use of table in the following example:

Evaluate: 16×18

If you don't remember the table of either 16 or 18 you will proceed like this:

$$\begin{array}{r} 16 \\ 18 \\ \hline 128 \\ 16 \\ \hline 288 \\ \hline \end{array}$$

But if you know the table of 16, your calculations would be:

$16 \times 18 = 16(10 + 8) = 16 \times 10 + 16 \times 8 = 160 + 128 = 288$

Or, if you know the table of 18; your calculation would be

$16 \times 18 = 18(10 + 8) = 18 \times 10 + 18 \times 6 = 180 + 108 = 288$

If you can, you remember the table upto 30 or 40. It will be precious for you.

Note: (1) You should try the above two methods on some more examples to realise the beauty of tables. Try to evaluate:
19×13; 17×24; $18 \times 32 (18 \times 30 + 18 \times 2 = 540 + 36 = 576)$; 19×47; 27×38; 33×37 etc.

(2) All the above calculations should be done mentally. Try it.

(ii) LEARN the one-line Addition or Subtraction method from this book

In the first chapter we have given some methods of faster addition and subtraction. Suppose you are given to calculate:

$789621 - 32169 + 4520 - 367910 = ...$

If you don't follow this book you will do like:

$$\begin{array}{r} 789621 \\ +4520 \\ \hline 794141 \end{array} \qquad \begin{array}{r} 32169 \\ +367910 \\ \hline 400079 \end{array}$$

$$\begin{array}{r} 794141 \\ -400079 \\ \hline 394062 \end{array}$$

The above method takes three steps, i.e. (i) add the two +ve values; (ii) add the two -ve values; (iii) subtract the second addition from the first addition.

But you can see the one-step method given in the chapter. Have mastery over this method. It takes less writing as well as calculating time.

(iii) Learn the one-line Multiplication or Division method from this book

Method of faster multiplication is given in the second chapter. I think it is the most important chapter of this book. Multiplication is used in almost all the questions, so if your multiplication is faster you can save at least 35% of your usual time. You should learn to use the faster one-line method It needs some practice to use this method frequently. The following example will show you how this method saves your valuable time.

Ex. Multiply: 549 × 36

If you don't follow the one-line method of multiplication, you will calculate like:

$$\begin{array}{r} 549 \\ 36 \\ \hline 3294 \\ 1647 \\ \hline 19764 \end{array}$$

If this method takes 30 seconds I assures: you that one-line method given in this book will take at the most 15 seconds. Try it.

One-line method of calculation for Division is also very much useful. You should learn and try it if you find it interesting. But, as division is less used, some of you may avoid this chapter.

(iv) Learn the Rule of Fractions

In the chapter **Ratio and Proportion** on Page No. 269, I have discussed this rule. It is the faster form of unitary method. It is nothing but simplified form of Rule of Three and Rule of Proportional Division. No doubt, it works faster and is used in almost all the mathematical questions where unitary method (*Aikik Niyam*) is used. See the following example:

Ex. If 8 men can reap 80 hectares in 24 days, how many hectares can 36 men reap in 30 days?

Soln: I don't know how much time you will take to answer the question but if we follow the rule of fraction our calculation would be:

$$80 \times \frac{36}{8} \times \frac{30}{24} = 450 \text{ hectares.}$$

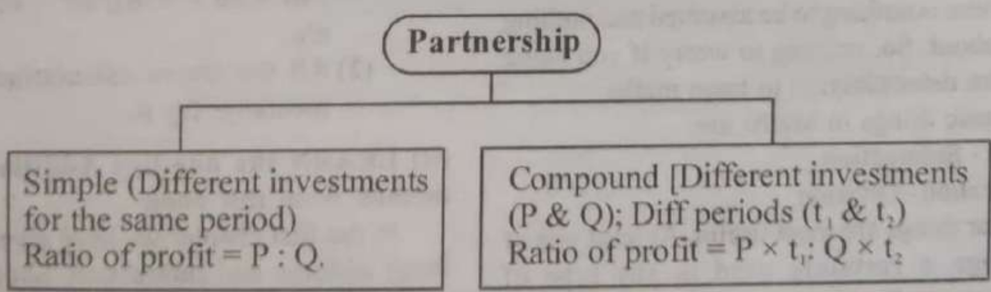
In this book this method is used very frequently. It is only when you go through the various chapters of this book that you will find how wonderful the method is.

It saves at least half of your usual time. I think this method should be adopted by all of you at any cost. First learn it and then use it wherever you can.

So, these four points are necessary for your strong and firm start. And only strong and firm start is the key to sure success.

(B) Clear the Fundamentals behind each chapter

There are 39 chapters in this book. Each chapter has some important basic fundas. Those fundas should be clear to you. Any doubt with the basics will hamper your further steps. Now the question arises - what are those basic fundas? Naturally, for each chapter, there are different fundas. I will discuss one chapter and its basic fundas. You can understand and find the same with different chapters. My chapter is **PARTNERSHIP (on page 309)**



It is natural that your fundas of **ratio** should be clear before going through this chapter. Now, you can understand what I actually mean by the fundas. In a similar way, you can collect all the fundas and basic formulae at one place.

(C) More and More Examples

You are suggested to go through as many examples as possible. Each question given in examples has some uniqueness. Mark it and keep it in mind. To collect more examples of different types you may consult different books available in the market.

(D) Use of Quicker Formulae

Before going for quicker formula I suggest you to know the detail method of the solution as well. So, see the proofs of all the formulae carefully. Once you get familiar with the detail solution, you find it easier to understand the quicker method. Direct Formulae or Quicker Methods save your valuable time but they have very high potential of creating confusion in their usage. So you should know where the particular formula should be used. A little change in the questions may lead you to wrong solution. So be careful before using them. In case of any confusion, you are suggested to solve the questions without using direct formula or quicker method.

Only frequent use of the quicker methods can make you perfect in Quicker Maths.

After covering all the chapters and knowing all the methods, you should be prepared for practice.

3. Practice of Maths Paper

(A) Pattern of paper

You should know the pattern and style of the question paper of the exam for which you are going to appear. Suppose you are preparing for Bank PO exam. You should know that maths paper consists of 35 questions in prelims exam, 35 questions main exam and 50 questions in various PGDBF courses. Out of which 15-20 questions are from Data Analysis, 5 Questions from Data Sufficiency, 5-10 are from Numericals (Calculation based), and 20-25 are from Mathematical Chapters (like Profit & Loss, Percentage, Partnership, Mensuration, Time & Work, Train, Speed etc.). In other exams it may be different. The pattern can be known from previous papers.

(B) Collection of Previous Papers as well as sample papers

If you can, you should arrange as many as possible numbers of previous and sample papers. There are many sources: Guides, Books, Magazines etc. The most standard and reliable sets are available in the magazine *Banking Services Chronicle*. Also, with our Correspondence Course we give at least 60 sets of Maths papers separately and 60 sets of Maths with full-length Practice Sets.

(C) Now start your practice:

From the beginning to the end, the complete session of practice should be divided into five parts.

Part (i): Take your first test with previous paper without taking time into consideration. Try to solve all questions. Note down the total time and score in your **performance diary**. Also note down the questions which took more than one minute. Now you have to find out the reason of your low performance, if it is so. Naturally, you would find the following reasons:

- Some questions were difficult and time consuming.
- Some questions were unsolvable for you.
- You lost your concentration.
- You lost your patience.
- You did more writing job.
- You could not use Quicker Methods.

Try to find out the solutions to all the above problems. If any of the questions was difficult for you, it means your initial preparation was not good. But don't worry. Go through that chapter again and clear your basic concepts. Because the standard of a question is always within your reach. If you have passed your 10th exam with maths, you can solve all the questions. You should take at least 10-12 tests in this part.

Part (ii): This time the paper may be either previous or model (sample). Fix your alloted period (say 50 minutes for PO). And solve as many questions as possible within that period. Once you have completed your test, count the number of correct questions. Note down the number of questions solved by you and the no. of correct solutions in your **performance diary**. Now, you can find the reasons for your low scoring. If the reasons are the same as in Part (i), you try to resolve the problem again. Take at least 5-6 tests in this part. After analysing your performance and problems you should be ready for your third part of test.

Part (iii): This time you try to solve all the questions within a time period fixed by you in advance. This period should be less than that for the tests in part (ii). If you couldn't do it, try it again on another test paper. Part (iii) should not be considered completed unless you have achieved your goal.

Part (iv): After completion of part (iii), you need to increase your speed. This part is penultimate stage of your final achievement. You should try to solve the complete paper of maths within a minimum possible time (say, 30-35 minutes for PO paper). This part may take 3 to 4 months. Keep patience and go on practicing.

Part (v): This is the last part of your practice. After part (iv), you should take your test with complete full-length paper for PO.

Chapter 2

Addition

In the problem of addition we have two main factors (*speed* and *accuracy*) under consideration. We will discuss a method of addition which is faster than the method used by most people and also has a higher degree of accuracy. In the latter part of this chapter we will also discuss a method of checking and double-checking the results.

In using conventional method of addition, the average man cannot always add a fairly long column of figures without making a mistake. We shall learn how to check the work by individual columns, without repeating the addition. This has several advantages:

1) We save the labour of repeating all the work;
2) We locate the error, if any, in the column where it occurs; and
3) We are certain to find error, which is not necessary in the conventional method.

This last point is something that most people do not realise. Each one of us has his own weaknesses and own kind of proneness to commit error. One person may have the tendency to say that 9 times 6 is 56. If you ask him directly he will say "54", but in the middle of a long calculation it will slip out as "56". If it is his favourite error, he would be likely to repeat it when he checks by repetition.

Totalling in columns

As in the conventional method of addition, we write the figures to be added in a column, and under the bottom figure we draw a line, so that the total will be under the column. When writing them we remember that the mathematical rule for placing the numbers is to align the right-hand-side digits (when there are whole numbers) and the decimal points (when there are decimals). For example:

Right-hand-side-digits alignment	**Decimal alignment**
4 2 3 4	13.05
8 2 3 8	2.51
6 4 6	539.652
5 3 2 1	2431.0003
3 5 0	49.24
9 9 8 9	

The conventional method is to add the figures down the right-hand column, 4 plus 8 plus 6, and so on. You can do this if you wish in the new method, but it is not compulsory; you can begin working on any column. But for the sake of convenience, we will start on the right-hand column.

We add as we go down, but we "never count higher than 10". That is, when the running total becomes greater than 10, we reduce it by 10 and go ahead with the reduced figure. As we do so, we make a small tick or check-mark beside the number that made our total higher than 10.

For example:

4
8 4 plus 8,12: this is more than 10, so we subtract 10 from 12. Mark a tick and start adding again.
6 6 plus 2, 8
1 1 plus 8, 9
0 0 plus 9, 9
9 9 plus 9, 18: mark a tick and reduce 18 by 10, say 8.

The final figure, 8, will be written under the column as the "running total".

Next we count the ticks that we have just made as we dropped 10's. As we have 2 ticks, we write 2 under the column as the "tick figure". The example now looks like this:

	4234
	8238′
	646
	5321
	350
	9989′
running total:	8
ticks:	2

If we repeat the same process for each of the columns we reach the result:

```
                 4234
                 8'238'
                  6'4'6
                 5321
                  350
                 9'9'8'9'
                 ------
running total:   6558
ticks:           2222
```

Now we arrive at the final result by adding together the running total and the ticks in the way shown in the following diagram,

```
running total:   0 6 5 5 8 0
                  \ \ \ \ \
ticks:           0 2 2 2 2 0
                 -----------
Total:             2 8 7 7 8
```

Save more time: We observe that the running total is added to the ticks below in the immediate right column. This addition of the ticks with immediate left column can be done in single step. That is, the number of ticks in the first column from right is added to the second column from right, the number of ticks in the 2nd column is added to the third column, and so on. The whole method can be understood in the following steps.

```
              4 2 3 4
              8'2 3 8'
                6 4 6
Step I.       5 3 2 1
                3 5 0
              9 9 8 9'
              -------
Total:              8
```

[4 plus 8 is 12, mark a tick and add 2 to 6, which is 8; 8 plus 1 is 9; 9 plus 0 is 9; 9 plus 9 is 18, mark a tick and write down 8 in the first column of total-row.]

```
              4 2 3 4
              8 2 3 8'
                6 4'6
Step II.      5 3 2 1
                3 5 0
              9 9 8'9'
              -------
Total:            7 8
```

[3 plus 2 (number of ticks in first column) is 5; 5 plus 3 is 8; 8 plus 4 is 12, mark a tick and carry 2; 2 plus 2 is 4; 4 plus 5 is 9; 9 plus 8 is 17, mark a tick and write down 7 in 2nd column of total-row.]

In a similar way we proceed for 3rd and 4th columns.

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

Note: We see that in the leftmost column we are left with 2 ticks. Write down the number of ticks in a column left to the leftmost column. Thus we get the answer a little earlier than the previous method.

One more illustration :

Q: 707.325 + 1923.82 + 58.009 + 564.943 + 65.6 = ?

Solution:

```
              707.325
             19'23'.8'2
                58'.009'
             5'6'4'.9'43
                6'5.6
             ---------
Total:       3319.697
```

You may raise a question:is it necessary to write the numbers in column-form? The answer is 'no'. You may get the answer without doing so. Question written in a row-form causes a problem of alignment. If you get command over it, there is nothing better than this. For initial stage, we suggest you a method which would bring you out of the alignment problem.

Step I. "Put zeros to the right of the last digit after decimal to make the no. of digits after decimal equal in each number."

For example, the above question may be written as 707.325 + 1923.820 + 58.009 + 564.943 + 65.600

Step II. Start adding the last digit from right. Strike off the digit which as been dealt with. If you don't cut, duplication may occur. During inning total, don't exceed 10. That is, when we exceed 10, we mark a tick anywhere near about our calculation. Now, go ahead with the number exceeding 10.

707.32~~5~~ + 1923.82~~0~~ + 58.00~~9~~ + 564.94~~3~~ + 65.60~~0~~ = ___.__7

5 plus 0 is 5; 5 plus 9 is 14, mark a tick in rough area and carry over 4; 4 plus 3 is 7; 7 plus 0 is 7, so write down 7. During this we strike off all the digits which are used. It saves us from confusion and duplica-tion.

Step III. Add the number of ticks (in rough) with the digits in 2nd places, and erase that tick from rough.

707.3~~25~~ + 1923.8~~20~~ + 58.0~~09~~ + 564.9~~43~~ + 65.6~~00~~ = ___._97

1 (number of tick) plus 2 is 3; 3 plus 2 is 5; 5 plus 0

is 5; 5 plus 4 is 9 and 9 plus 0 is 9; so write down 9 in its place.

Step IV.

707.~~323~~ + 1923.~~820~~ + 58.~~009~~ + 564.~~043~~ + 65.~~500~~ = _____.697

3 plus 8 is 11; mark a tick in rough and carry over 1; 1 plus 0 is 1; 1 plus 9 is 10, mark another tick in rough and carry over zero; 0 plus 6 is 6, so put down 6 in its place.

Step V.

Last Step: Following the same way get the result:

~~707.323~~ + ~~1923.820~~ + ~~58.009~~ + ~~564.043~~ + ~~65.500~~ = 3319.697

Addition of numbers (without decimals) written in a row form

Q. 53921 + 6308 + 86 + 7025 + 11132 = ?

Soln:

Step I: 53921 + 6308 + 86 + 7025 + 11132 = ____2

Step II: 53921 + 6308 + 86 + 7025 + 11132 = ___72

Step III: 53921 + 6308 + 86 + 7025 + 11132 = __472

Step IV: 53921 + 6308 + 86 + 7025 + 11132 = _8472

Step V: 53921 + 6308 + 86 + 7025 + 11132 = 78472

Note: One should get good command over this method because it is very much useful and fast-calculating. If you don't understand it, try again and again.

Addition and subtraction in a single row

Ex. 1: 412 – 83 + 70 = ?

Step I: For units digit of our answer add and subtract the digits at units places according to the sign attached with the respective numbers. For example, in the above case the unit place of our temporary result is

2 – 3 + 0 = – 1

So, write as:

412 – 83 + 70 = _ _ (–1)

Similarly, the temporary value at tens place is 1 – 8 + 7 = 0. So, write as:

412 – 83 + 70 = _ (0) (–1)

Similarly, the temporary value at hundreds place is 4. So, we write as:

412 – 83 + 70 = (4) (0) (–1)

Step II: Now, the above temporary figures have to be changed into real value. To replace (–1) by a +ve digit we borrow from digits at tens or hundreds.

As the digit at tens is zero, we will have to borrow from hundreds. We borrow 1 from 4 (at hundreds) which becomes 10 at tens leaving 3 at hundreds. Again we borrow 1 from tens which becomes 10 at units place, leaving 9 at tens. Thus, at units place 10 – 1 = 9. Thus our final result = 399.

The above explanation can be represented as

(–1)	(10) (–1)	(10)
(4)	(0)	(–1)
(3)	(9)	(9)

Note: The above explanation is easy to understand. And the method is more easy to perform. If you practise well, the two steps (I & II) can be performed simultaneously. The second step can be performed in another way like:

(4) (0) (–1) = 400 – 1 = 399

Ex. 2: 5124 – 829 + 731 – 435

Soln: According to step I, the temporary figure is:

(5) (– 4) (0) (– 9)

Step II: Borrow 1 from 5. Thousands place becomes 5 – 1 = 4. 1 borrowed from thousands becomes 10 at hundreds. Now, 10 – 4 = 6 at hundreds place, but 1 is borrowed for tens. So digit at hundreds becomes 6 – 1 = 5. 1 borrowed from hundreds becomes 10 at tens place.

Again we borrow 1 from tens for units place, after which the digit at tens place is 9. Now, 1 borrowed from tens becomes 10 at units place. Thus the result at units place is 10 – 9 = 1. Our required answer = 4591

Note: After step I we can perform like:

5 (– 4) (0) (– 9) = 5000 – 409 = 4591

But this method can't be combined with step I to perform simultaneously. So, we should try to understand steps I & II well so that in future we can perform them simultaneously.

Ex. 3: 73216 – 8396 + 3510 – 999 = ?

Soln: Step I gives the result as:

(7) (–2) (–5) (–16) (–9)

Step II: Units digit = 10 – 9 = 1 [1 borrowed from (–16) results –16 –1 = –17]

Tens digit = 20 – 17 = 3 [2 borrowed from (–5) results –5 – 2 = –7]

Hundreds digit = 10 – 7 = 3 [1 borrowed from –2 results –2 –1 = – 3]

Thousands digit = 10 – 3 = 7 [1 borrowed from 7 results 7–1=6]

So, the required value is 67331.

The above calculations can also be started from the leftmost digit as done in last two examples. We have started from rightmost digit in this case. The result is the same in both cases. But for the combined operation of two steps you will have to start from rightmost digit (i.e. units digit). See Ex. 4.

Note: Other method for step II: (–2) (–5) (–16) (–9) = (–2) (–6) (–6) (–9) = (–2669)

∴ Ans = 70000 – (2669) = 67331

Ex. 4: 89978 - 12345 - 36218 = ?

Soln: Step I: (4) (1) (4) (2) (–5)

Step II: 4 1 4 1 5

Single step solution:

Now, you must learn to perform the two steps simultaneously. This is the simplest example to understand the combined method. **At units place:** 8 - 5 - 8 = (-5). To make it positive we have to borrow from tens. You should remember that we can't borrow from -ve value i.e., from 12345. **We will have to borrow from positive value i.e. from 89978.** So, we borrowed 1 from 7 (tens digit of 89978):

(-1)

8 9 9 7 8 - 12345 - 36218 = _ _ _ _ 5

Now digit at tens: (7 - 1 =) 6 - 4 - 1 = 1

Digit at hundreds: 9 - 3 - 2 = 4

Digit at thousands: 9 - 2 - 6 = 1

Digit at ten thousands: 8 - 1 - 3 = 4

∴ the required value = 41415

Ex. 5: 28369 + 38962 - 9873 = ?

Soln: Single step solution:

Units digit = 9 + 2 – 3 = 8

Tens digit = 6 + 6 – 7 = 5

Hundreds digit = 3 + 9 – 8 = 4

Thousands digit = 8 + 8 - 9 = 7

Ten thousands digit = 2 + 3 = 5

∴ required value = 57458

Ex. 6: Solve Ex. 2 by single-step method.

Soln: 5124 – 829 + 731– 435 =

Units digit: 4 – 9 + 1 – 5 = (–9). Borrow 1 from tens digit of the positive value. Suppose we borrowed from 3 of 731. Then

–1

5124 – 829 + 731 – 435 = _ _ _ 1

Tens digit: 2 – 2 + 2 – 3 = (–1). Borrow 1 from hundreds digit of +ve value. Suppose we borrowed from 7 of 731. Then

–1 –1

5124 – 829 + 731 – 435 = _ _ 9 1

Hundreds digit: 1 – 8 + 6 – 4 = (–5). Borrow 1 from thousands digit of +ve value. We have only one such digit, i.e. 5 of 5124.

Then

-1 -1 -1

5 1 2 4 – 829 + 731 - 435 = 4591

(Thousands digit remains as 5 - 1 = 4)

Now you can perform the whole calculation in a single step without writing anything extra.

Ex. 7: Solve Ex. 3 in a single step without writing anything other than the answer. Try it yourself. Don't move to next example until you can confidently solve such questions within seconds.

Ex. 8: 10789 + 3946 – 2310 – 1223 = ?

Soln: Whenever we get a value more than 10 after addition of all the units digits, we will put the units digit of the result and carry over the tens digit. **We add the tens digit to +ve value, not to the –ve value.** Similar method should be adopted for all digits.

+1 +1 +1

1 0 7 8 9 + 3946 – 2310 – 1223 = 11202

Note: 1. We put +1 over the digits of +ve value 10789. It can also be put over the digits of 3946. But it can't be put over 2310 and 1223.

2. In the exam when you are free to use your pen on question paper you can alter the digit with your pen instead of writing +1, +2, –1, –2 .... over the digits. Hence, instead of writing 8, you should write 9 over 8 with your pen.

Similarly, write 8 in place of $\overset{+1}{7}$.

Ex. 9: 765.819 – 89.003 + 12.038 – 86.89 = ?

Soln: First, equate the number of digits after decimals by putting zeros at the end.

So, ? = 765.819 – 89.003 + 12.038 – 86.890

Now, apply the same method as done in Ex. 4, 5, 6, 7 & 8.

-1 -1 -1 -1 +1

7 6 5. 8 1 9 - 89.003 + 12.038 – 86.890 = 601.964

Ex 10: 5430 - 4321 + 3216 - 6210 = ?

Soln: The above case is different. The final answer comes negative. But as we don't know this in the beginning, we perform the same steps as done earlier.

Step I: (-2) (1) (1) (5)

Step II: The leftmost digit is negative. It can't be made positive as there is no digit at the left which can lend. So, our answer is

$$\begin{array}{r} -2000 \\ +\ 115 \\ \hline -1885 \end{array}$$

Note: The second step should be done mentally keeping in mind that except the leftmost digit all the other digits are positive. So, the final answer will be -ve but not (–)2115. It should be -2000 +115= –1885.

Ex 11: 2695 - 4327 + 3214 - 7350 = ?
Soln: Step I: (-6) (2) (3) (2)

So, required answer =
$$\begin{array}{r} -6000 \\ +\ 232 \\ \hline -5768 \end{array}$$

Method of checking the calculation: Digit sum Method

This method is also called the **nines-remainder method.** The concept of digit-sum consists of this :

I. We get the digit-sum of a number by "adding across" the number. For instance, the digit-sum of 13022 is 1 plus 3 plus 0 plus 2 plus 2 is 8.

II. We always reduce the digit-sum to a single figure if it is not already a single figure. For instance, the digit-sum of 5264 is 5 plus 2 plus 6 plus 4 is 8 (17, or 1 plus 7 is 8).

III. In "adding across" a number, we may drop out 9's. Thus, if we happen to notice two digits that add up to 9, such as 2 and 7, we ignore both of them; so the digit-sum of 990919 is 1 at a glance. (If we add up 9's we get the same result.)

IV. Because "nines don't count" in this process, as we saw in III, a digit-sum of 9 is the same as a digit-sum of zero. The digit-sum of 441, for example, is zero.

Quick Addition of Digit-sum: When we are "adding across" a number, as soon as our running total reaches two digits we add these two together, and go ahead with a single digit as our new running total.

For example: To get the digit-sum of 886542932851 we do like: 8 plus 8 is 16, a two – figure number. We reduce this 16 to a single figure: 1 plus 6 is 7. We go ahead with this 7; 7 plus 6 is 4 (13, or 1+3=4), 4 plus 5 is 9, forget it. 4 plus 2 is 6. Forget 9 .... Proceeding this way we get the digit-sum equal to 7.

For decimals we work exactly the same way. But we don't pay any attention to the decimal point. The digit-sum of 6.256, for example, is 1.

Note: It is not necessary in a practical sense to understand why the method works, but you will see how interesting this is. The basic fact is that the reduced digit-sum is the same as the remainder when the number is divided by 9.

For example: Digit-sum of 523 is 1. And also when 523 is divided by 9, we get the remainder 1.

Checking of Calculation

Basic rule: Whatever we do to the numbers, we also do to their digit-sum; then the result that we get from the digit-sum of the numbers must be equal to the digit-sum of the answer.

For example:

The number:	23 +	49 +	15 +	30	=	117
The digit-sum:	5 +	4 +	6 +	3	=	0
Which reduces to :				0	=	0

This rule is also applicable to subtraction, multiplication and upto some extent to division also. These will be discussed in the coming chapters. We should take another example of addition.

	1.5 +	32.5 +	23.9	=	57.9
digit-sum:	6 +	1 +	5	=	3
or,			3	=	3

Thus, if we get LHS = RHS we may conclude that our calculation is correct.

Sample Question: Check for all the calculations done in this chapter.

Note: Suppose two students are given to solve the following question: 1.5 + 32.5 + 23.9 = ?

One of them gets the solution as 57.9. Another student gets the answer 48.9. If they check their calculation by this method, both of them get it to be correct. Thus this method is not always fruitful. If our luck is against us, we may approve our wrong answer also.

Addition of mixed numbers

Q. $3\frac{1}{2}+4\frac{4}{5}+9\frac{1}{3}=?$

Solution: A conventional method for solving this question is by converting each of the numbers into pure fractional numbers first and then taking the LCM of denominators. To save time, we should add the whole numbers and the fractional values separately. Like here,

$$3\frac{1}{2}+4\frac{4}{5}+9\frac{1}{3}=(3+4+9)+\left(\frac{1}{2}+\frac{4}{5}+\frac{1}{3}\right)$$

$$=16+\frac{15+24+10}{30}=16+1\frac{19}{30}$$

$$=(16+1)+\frac{19}{30}=17+\frac{19}{30}=17\frac{19}{30}$$

Q. $5\frac{2}{3}-4\frac{1}{6}+2\frac{3}{4}-1\frac{1}{4}$

Soln: $(5-4+2-1)+\left(\frac{2}{3}-\frac{1}{6}+\frac{3}{4}-\frac{1}{4}\right)$

$$=2+\left(\frac{8-2+9-3}{12}\right)=2+\frac{12}{12}=2+1=3$$