



8<sup>th</sup>  
EDITION

How to Prepare for  
**QUANTITATIVE  
APTITUDE**  
*for*

**CAT**

COMMON  
ADMISSION  
TEST

& Other Management  
Examinations

Mc  
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Hill  
Education

Arun Sharma

**8**

**Edition**

How to Prepare for  
**QUANTITATIVE  
APTITUDE**  
for **CAT**



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**Arun Sharma**

*Educational Consultant*



**McGraw Hill Education (India) Private Limited**

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*Dedicated to*

**My Father (Mr MK Sharma), Mother (Mrs Renu Sharma)  
and Brother (Mr Ravi Sharma)  
who have instilled in me the courage to have my convictions  
and to stand by them**



# Preface to the Eighth Edition

With the evolution of CAT in its online avatar, I felt the need to create a comprehensive and updated book that caters to CAT aspirants. Any book on CAT QA should take into account the latest changes in the test pattern and nature. Hence, I have kept in mind the following facts while designing the book you now hold in your hands:

**1. Questions from this book:** Over the past decade, it has been noticed that a minimum of 10–20% questions in CAT and other major management entrance examinations have been directly taken from the questions provided in this book. Furthermore, it has been seen that between 2003 (when the book was first released) and 2018, 80–90% of the questions in CAT and other top management entrance tests were covered in this book.

CAT, having gone online, saw no change in this trend. Many questions in each of the test papers that CAT has administered in its online avatar since 2009 are covered in this book.

In fact, 2009 onwards, the onset of CAT online pattern has created a significant shift in terms of the CAT preparation process. This is because, 2009 was the first year when there were multiple CAT papers to study, analyse and base our writing and preparation process on. In subsequent years, with the increase of CAT window, the number of papers every year had gone up to around 30–40 papers. CAT in 2015, however, went back to a two-slot test and hence, had a total of only two test papers. CAT 2017, was also a significant shift point in this journey—as for the first time in the history of the Online CAT, the actual test paper was released for the students who took the exam. Thus, all said, overall I am richer by the experience of 150 plus test papers, when it comes to understanding what I need to provide to my readers for their preparation. It is on the basis of this rather rich insight that I have based the changes in this edition (Note: Similar changes have been incorporated in my other books *How to Prepare for Verbal Ability and Reading Comprehension for CAT*, *How to Prepare for Data Interpretation for CAT*, and *How to Prepare for Logical Reasoning for CAT*) as also in the *Previous Years' Solved CAT Papers* book.

**2. CAT 2015, a watershed year for CAT:** Looking rationally into the patterns of the 150 plus CAT papers, we have had the good fortune of being able to track and analyse, that while things have remained the same in a lot of ways, they have also drastically changed during this period. In this context, we found that the changes in the exam introduced in CAT 2015 are significant, as they drastically alter the process of preparation for this exam. The trend introduced in CAT 2015 was just carried on and continued in CAT 2016 and CAT 2017. Hence, there is a lot to learn for us—from the analysis of these tests.

So am I contradicting myself here by saying that the exam has remained the same and at the same time has changed drastically? Not at all! When I say that the exam has remained the same in the online avatar, what I mean to say is that there are no changes in the patterns, the quality, the difficulty and the portion of coverage of questions asked in Quantitative Aptitude in CAT.

However, some of the noticeable changes seen in CAT 2015 to CAT 2017 that significantly alter the way you should study are:

- (a) **3-section mode of the examination:** Quantitative Aptitude, Verbal Ability and Reading Comprehension, Data Interpretation and Logical Reasoning being the three separate sections, you would need to display competence in each of the three areas of the exam in order to get a good percentile. This was a departure from the previous two section exam pattern (as of CAT 2013-2014), with Section 1: Quantitative Aptitude and Data Interpretation and Section 2: Verbal



Ability/Reading Comprehension and Logical Reasoning. So this is a significant change in terms of preparation strategies; for instance, the two-section exam pattern which allowed the aspirant to take a strategy of doing well in the Logical Reasoning questions in Section 2 and hence get through that section without being too good at Verbal Ability/Reading Comprehension. Likewise, aspirants could get through Section 1, by being really good at DI and moderately skilled in Quantitative Aptitude. The three-section exam does not provide the aspirant with that luxury any longer. An aspirant has to develop his skills in each of the areas of the exam and can no longer work on a selective skills development approach.

- (b) Introduction of questions having no options:** CAT 2015, CAT 2016 and CAT 2017 have on average had as many as 30+ questions out of 100 with no options. The presence of such a large number of questions without options clearly meant that students were tested for the clarity of their concepts in each area — especially in the QA section. Since this trend is supposed to continue, it is quite clear that you would need to know the exact answer for every question that you are trying to solve — gone are the days where an ‘educated’ guess would take you through a few questions in the exam.

However, you need to understand an important point in this context that the QA section is not a test of your mathematical knowledge. A closer look at the kind of questions (in which no options are given) reveals that these are pretty much solvable using simple numeric logic rather than using hard-core mathematical process and formula. There was not a single question in this category that forced you to follow the hard-core mathematical way, of solving such questions.

**3. The need for greater variety in your preparation:** Prior to the CAT going online, preparing for QA used to be a battle for Blocks 1, 4, 5 and 6. Even out of these, if someone did Blocks I and V well, he stood a strong chance at the QA section, since over 60% of the questions asked in the papers were from these areas.

However, as explained below, the latest changes of this exam requires the aspirant to be much more balanced in the context of portion coverage.

As per the scheme followed in this book, the QA portion can be divided into six major parts (or blocks as I call them in this book).

The underlying constant that used to exist in the paper-and-pen version (through the entire decade prior to the first online CAT) was the prominence of Block I and Block V. (Block I comprising Number Systems and Progressions and Block V comprising the chapters on Functions, Inequalities, Quadratic and other Equations and Logarithms.)

In each of the years from 1999 to 2008, the QA section required you to get a net score of approximately 30 – 40% of the total marks in order to score a high 90 percentile in this section.

In the light of this fact, the importance of Block I and Block V can be gauged from the table below:

<i>Block</i>	<i>Weightage (as a % of total marks)</i>
Block I	30 – 50%
Block V	15 – 50%
Combined weightage of Blocks I & V	60 – 80%

Add to this, the chapter on Time, Speed and Distance with a minimum weightage of 5–10% and you pretty much had the QA section well covered. In a nutshell, QA for CAT preparation had become “do 10 chapters well”.

However, this scenario has changed in the context of the online version of the exam.

The balance of weightage of questions shifted and each of the six blocks have become important. The aspirant of CAT online version saw a weightage distribution of the kind illustrated below.

<i>Block</i>	<i>Total Out of 34 Questions</i>
Block I	6 – 8 questions
Blocks II & III	6 – 9 questions
Block IV	5 – 8 questions
Block V	5 – 9 questions
Block VI	2 – 5 questions

**4. Qualifying scores and attempts required at various accuracy levels:** In the current context of the CAT, you need to be able to solve around 23–25 (out of 34) questions at 100 percent accuracy to reach a 99.8+ percentile in the exam. Naturally, at 90–95% accuracy, this number would be around 30+ attempts. The following table would give you a clear idea about your targets based on the percentile you are targeting in the QA section.

<i>To score</i>	<i>Number of attempts required at 100% accuracy</i>	<i>Number of attempts required at 90–95% accuracy</i>
99.8+ percentile	23–25	30+
99 percentile	20–22	28–30
98 percentile	19–20	24–27
95 percentile	17+	22–24
90 percentile	14+	20–22
80 percentile	12+	16–20

**5. Accuracy is more important than speed:** This is a clear trend indication if you look at the scoring patterns at various percentiles. A student solving questions with 100% accuracy requires only 23–25 attempts to get a top 400 All India Rank in the test (99.8+ percentile). However, if your accuracy drops by just 5% to 95%, your attempts need to go up to 30+ to ensure the same score. What this means, is that if your accuracy is just 5% off the 100% accuracy level, you would almost completely lose the choice of skipping questions. A student solving between 23–25 questions at 100 percent accuracy, can skip 9–11 questions out of 34, while at 95% accuracy since the same percentile would require 30+ attempts, such a student would practically have no leeway to leave questions.

Hence, the key learning for you while preparing is to focus on improving your accuracy as well as the belief in your process of solving. This is especially true while preparing for the QA section. While solving a QA question, you should be able to know that if your process is correct then your answer would also be correct. The need to check the answer to a QA question is something that is only required for minds weak in Quantitative Aptitude. This is where an under-prepared aspirant loses out to the best—in the knowledge of whether what they are solving is correct or not.

Unfortunately, most students I see are more interested in seeing the answer to the question as soon as they solve the same.

This is a habit I would strongly discourage you from. The ideal preparation process for you should be:

- solve the question,
- review your process and tell yourself, “if your process is correct, so is your answer”, and
- only check your answer after you have reviewed your process.

This is important, because when you are solving a QA question inside CAT, you would not have the cushion to ‘look’ at the answer. The only thing you have is the question and the process you use in solving the same. Your mind should be able to tell you whether the answer you have got is correct or not. This is a key difference in solving questions in practise and solving them under exam pressure.

Hence, developing more confidence in your QA problem-solving processes becomes a key ingredient and objective of your preparation process for this section.

**6. Tougher level of CAT exam:** As already stated above, the quality of questions asked in the CAT over the past couple of years has become extremely good—requiring an upgradation of your grasp of concepts and understanding of each particular topic to a level not required before. This shift has necessitated that we do more through this book.

7. I have also come to know that many readers use this book for their preparation of other important management entrance exams (like XAT, IIFT, CMAT, MAT, SNAP, etc.). So now, I have also included/modified the contents so that aspirants of the above exams need not look for any other resource beyond this book for strengthening their hold on the quantitative aptitude section.

Apart from management entrance examinations, the book also has relevance for aspirants of UPSC and state civil services, Bank PO exams, GATE, engineering placement exams, etc. In short, the scope of this book has considerably widened to cover the entire subject of quantitative aptitude that finds a resonance for all career aspirants.

The book you now hold in your hand has always been written keeping in mind the avowed objective of developing your quantitative intelligence to a point where you can quickly scale the height of preparation in each chapter of the portion.

#### **Key features:**

- Comprehensive solutions** (wherever relevant) to questions in all LODs of all chapters.
- Based on an assessment of any logic I have missed in any chapter, I have introduced extra questions for readers in the form of **additional block-wise practice tests**. The questions in these tests have been carefully selected to ensure that I do not miss out on any probable question type.
- In some chapters, where I felt that there is some deficiency in the number and variety of questions (due to the increased difficulty level of the CAT) based on the concepts of the chapter, I have **introduced new questions into the LODs** of the chapter.

4. At some places, the need was felt to introduce an entire additional exercise on concepts of a chapter. This too has been accomplished in this revision.
5. **The training ground:** Perhaps the biggest differentiator in this book is the introduction of the ‘Training Ground’—which is an area through which I teach the readers real time higher-end problem solving. The training ground is a section where I tell you exactly how to think inside the examination hall when faced with questions of varying difficulty levels. Hence, a must read for all management aspirants.

#### **Logic of the Training Ground**

The quality of the questions in the Quantitative Aptitude section (especially in CAT and XAT) is of such a high quality level that even if you know the basics of each chapter within a particular block, it might not be enough to reach a point where you might be able to solve the questions from the chapter/block. In order to have a grip on any chapter/block and be able to handle application-based questions in the actual examination, you would need to raise your level of thinking and ideation in that chapter/block to the point where you are able to tackle any twists and turns that can be thrown up by it.

For this edition, the training ground has been introduced into four of the major blocks of chapters of this book — and you can expect a very extensive training ground section especially for Block V and Block VI. (Block V covers the chapters on Functions, Inequalities, Logs and Quadratic and Other Equations, while Block VI covers the chapters on Permutations and Combinations, Probability and Set Theory).

6. Introduction of a critical section within each block called ‘Taste of the Exams’ that covers the questions asked in the CAT, IIFT and XAT (the three major MBA entrance exams) for the last two decades. What’s more, these sections are completely solved, with illustrative thought processes as well as thought short cuts that you would not find in any other book of this type.
7. Introduction of questions without options in each of the relevant chapters of the book. This is in keeping with the latest trends introduced in the last CAT examination.
8. Completely revamped question banks at Level of Difficulty 1 and Level of Difficulty 2 for many chapters. We felt the need to update the chapter LODs in various critical chapters, based on the latest trends in the exam.

The book is now totally in sync with the new trend and pattern of the examination.

Ultimately the endeavour is to provide a one-stop solution for CAT and MBA exam aspirants to tackle the QA section of all major management entrance exams—an endeavour I feel I have managed to do pretty well.

Through this book, I am confident of giving you—the reader—an invaluable resource for enhancing your QA section score drastically. Contained in this book is the very best advisory for each and every question type. Your job is simple—to ensure that you follow the process contained in this advisory.

## **KEY POINTS FOR YOUR PREPARATION**

### **Outline and Strategy**

The first aspect I would like to deal with here is to focus on helping you with the formulation of your strategy with respect to the portion to be covered for the Quantitative Aptitude section of the various management entrance exams including CAT, XAT, CMAT, IIFT, MHCET and other examinations.

Let us start by trying to understand some of the key areas in Quantitative Aptitude (QA).

### **Tackling each portion**

My experience shows that very often students look at the vast number of chapters and concepts to be studied for QA and get disheartened. This is especially true for students who do not have a strong traditional background in Mathematics. Indeed if you were to look at it with a chapter-wise approach, you can easily define the course to be studied by dividing it into 20+ chapters—preparation for which is such a long-drawn effort that it ends up draining the student’s energy, enthusiasm and motivation.

It is in this context and for this precise reason that I have divided this book into six manageable blocks—the approach being rationalising the chapters and grouping them according to the amount of shared concepts these chapters have amongst each other.

The outline as defined in the contents to this book would divide your work into six major areas to prepare for. For your convenience and strategising I have put down the relative importance of each of these six blocks into perspective:

**Block I:** Number Systems and Progressions

*Importance:* **Very High** for CAT, XAT, IIFT, FMS and **High** for MAT, CMAT, SNAP, IRMA, etc.

**Block II:** Averages and Alligations

*Importance:* **Low** for QA in CAT, XAT, IIFT, but **High** for Data Interpretation as a lot of questions in DI are based on the concepts of averages and alligations. Also, **High** for MAT, CMAT, IRMA, NMIMS, etc.

**Block III:** Percentages, Ratio, Proportion and Variation, Time and Work, Time, Speed and Distance. (Subsidiary but almost redundant chapters in this block — Interest and Profit & Loss)

*Importance:* **Moderate to High** for QA in CAT, XAT, IIFT, and **Very High** for Data Interpretation (DI) as DI is almost entirely based on the concept of Percentages and Ratio and Proportions. **Very High** for MAT, CMAT, IRMA, NMIMS, etc.

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**Note:** *The chapter on “Time, Speed and Distance” is extremely important for these exams (especially for the CAT as this chapter has been a constant presence in the CAT for the last two decades.)*

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**Block IV:** Geometry, Mensuration and Coordinate Geometry

*Importance:* **Very High** for CAT, XAT. **Average** for MAT, CMAT, SNAP, IRMA, IIFT, etc.

**Block V:** Functions, Inequalities, Logs and Quadratic Equations

*Importance:* **Very High** for CAT, XAT. **Low** for MAT, CMAT, IRMA, NMIMS, etc.

**Block VI:** Permutations and Combinations, Probability and Set Theory

*Importance:* **Very High** for CAT, XAT, IIFT, etc. **Average** for MAT, CMAT, IRMA, etc.

Based on the experience of the online CAT, the strategic preparation imperative for you should be to do at least four blocks and if possible up to six blocks really well.

What does it mean to prepare a block “really well”? This is something I feel needs emphasis here.

Well what I mean to say is that do not just focus on studying the theory in each of these areas but develop an intuitive knowledge of all problem scenarios which emerge out of each block.

Only then would you be able to reach a situation in the exam—that when the question presents itself to you in the exam—you would have had the logic for the same worked out before hand. This is something that can make a huge difference to your chances in CAT.

**Analysing Your Knowledge Level**

The first thing you need to focus on is an analysis of your knowledge level in each of these seven parts. In each of the above areas, first analyse your level of knowledge/ability. In order to do so the typical question you should ask yourself is: For the next 100 questions I face in each of these areas, how many would I be able to handle comfortably?

Think of a number as an answer to this question for each of the six blocks.

Based on your answer, the following analysis would provide you a thumb rule which would tell you how much of a knowledge issue you have:

1. 90+: You know pretty much every question type and variant in the area. You should focus your energies on other aspects rather than knowledge improvement in the area.
2. 80+: Maybe you need to increase your exposure to questions a little bit; around 200–300 more questions in that area would be sufficient.
3. 60–80+: You have a significant knowledge issue in the area. You might need to go back to the basics, but it is less likely to be a theory issue but more of an exposure to questions issue.
4. <60: You need to work on both theory and exposure to questions.

Needless to say, the target and objective for preparations has to be to reach the 90+ range as explained above in any block you intend to do “really well”.

**Looking beyond Ability (Quick Reflexes)**

A common frustrating experience for test-takers while taking the test is to not being able to solve a known question/logic and subsequently, not being able to score marks in questions which they knew.

In order to handle this problem, you would need to work on your reactions and reflexes when faced with QA questions. Once you have solved your knowledge/ability issue in a particular block, your next step is to improve your reactions and reflexes while solving a question. Needless to say you would need to do this block wise.

So obviously the main issue is how to improve reflexes and reactions.

- (a) For every block, once you have solved the LODs and the Pre-assessment/Review tests, the most crucial exercise in this context would be a comprehensive revision and review of each and every question you have solved in that block. Solve every question of every LOD and Pre-assessment/Review test again and review the logic/process of problem solving used. This need to be done to the point where you almost “recollect” the logic of the question and are able to recognise the same if it is used again in a different context/problem.
- (b) A thorough revision on the theory of the block.

**1. Improve your ability to select what you know and leave what you do not**

In the context of an examination where the required scores for 99 percentile would be 60–70% attempts with 100% accuracy, it is easy to see that perfect knowledge is perhaps not needed in order to crack CAT. Hence, even if you have around 60–70% knowledge of the questions in an average test, you are perhaps good enough to crack the exam. A good way to test whether you have sufficient knowledge would be to pick up 10–20 test papers and divide your QA section into blocks of five questions each. Then test your knowledge by looking at the average number of questions you know. If on an average for every five QA test questions that you pick up, if you know more than three, then the prognosis would be that you have adequate knowledge for cracking CAT. Thus, while you may want to move towards knowing 5 out of 5 in this context, there are other things that you should focus on—developing your ability to decide on whether you are going to be able to solve a question while reading it for the first time. This would help you stop *fishing* during the test. (*Fishing* can be described as the activity of trying to solve a question without knowing whether you would actually complete the question.)

Your mind should give you a clear indication of whether you would be able to do the last step in a question, before you start doing it. In that sense you should be able to clearly define three types of outcomes when you finish reading a question for the first time:

- (a) **I see a clear flowchart** and the steps are manageable—Obviously you need to go on and solve these questions.
- (b) **I see a clear flowchart** but the steps are too lengthy—In this case, you need to see where you stand in your test-time and attempt-wise.
- (c) **I do not see a clear flowchart but I can try as I see a starting point**—This is potentially the most dangerous situation for you in the duration of the test, as once you get sucked into a question, there is a strong tendency to lose track of the time you are using up while trying the question. My advice is that while taking the test, you should not even start doing such questions.
- (d) **I see no flowchart and no starting point to the question**—Obviously you should leave such questions and in fact if these are limited to around 20–30% of the paper there is no problem and you need not worry about them.

**2. Focus on thorough knowledge of ‘problem scenarios’ rather than theoretical learning**

To illustrate this, I would like to start with a few examples.

Consider the following string of three questions. Before I come to my main point here, I would like you to start by solving these questions before looking at the explanations provided:

1. A boy starts adding consecutive natural numbers starting from 1. After some time, he reaches a total of 1000 when he realises that he has double counted a number. Find the number double counted.
2. A boy starts adding consecutive natural numbers starting from 1. He reaches a total of 575 when he realises that he has missed a number. What can be said about the number missed?
3. Find the 288th term of the series: ABBCCDDDDDEEEEEFFFFFG....

*We can now start to look at each of these questions:*

1. Consider the fact that when you add numbers as stated above ( $1 + 2 + 3 + 4 + \dots$ ) the result is known as a triangular number. Hence, numbers like 1,  $1 + 2 = 3$ ,  $1 + 2 + 3 = 6$  and so on are triangular numbers. This question asks us to consider the possibility of making the mistake of double counting a number. So instead of  $1 + 2 + 3 + 4$  if you were to do by error  $1 + 2 + 3 + 3 + 4$ , you would realise that the number you would get would be 13 which would be more than 10 (which should have been your correct addition) and less than 15 (the sum of 1 to 5) which is the next triangular number. The double counted value could be achieved by spotting 10 as the immediately lower value—and the difference between 10 and 13 would give you the required double counted number.

To carry forward this logic into the given question, we should realise that we are just bothered about finding the last triangular number below 1000, and in trying to work this out is where we really apply our intelligence.

Before one writes about that though, one fully realises that a lot of readers (especially aspirants with an engineering background) at this point are thinking about  $n \times (n + 1)/2$ . Knowing that process, one chooses to write about the alternate way to think about in this question.

$$1 + 2 + 3 + 4 \dots + 10 = 55$$

Hence, we can easily see that  $11 + 12 + 13 + 14 + 15 + \dots + 20$  would equal 155 and the sum of 21 to 30 would equal 255 and so on.

Thus, in trying to find the last triangular number below 1000 we can just do:  $55 + 155 + 255 + 355 = 820$  (which is the sum of the first 40 natural numbers) and since we have still not reached close to 1000, we start by adding more numbers as:  $820 + 41 + 42 + 43 + 44 = 990$  and the difference between 990 and 1000 is 10 which is the required answer.

2. For this question, we would just need to carry the learning from the previous question forward and realise that when we miss a number, we actually get a total which is lower than the correct total. Hence, if we want to find the number missed, all we need to do is to find the first triangular number greater than 575. This can be got simply by,  $55 + 155 + 255 + 31 + 32 + 33 + 34 = 595$ , so the number missed has to be 20.
3. In this question all you would need to notice is that in the series ABCCCCDDDDDEEEEEEF... A ends after the first term; B ends after the third (1+2) term; C ends after the sixth (1+2+3) term and so on. So we can infer that what we are looking at is how many numbers need to be added before we get to a number just below 288. So  $55 + 155 + 21 + 22 + 23$  gives us 276 which pretty much means that the 24th alphabet (i.e., x) would be running in this series when we reach the 288th term.

So looking at the three questions above and the solutions, one wants the reader to only answer one specific question:

How much does knowing the first question and developing your thought ability and your intelligence help you in solving the second and the third one? I hope you see the connection. For your information, the three questions presented above were asked in CAT 2001, CAT 2002 and CAT 2003!!! And such questions are pretty much standard in the years of the online CAT.

### **CONCLUDING NOTE**

You sit in front of your CAT question paper and the first question comes in front of you; if you have identified the logic of the question or seen the question itself earlier, your entire QA preparation is fructified. In fact, every question/logic (that you would face in your test) which you have seen earlier represents a triumph of your preparation process. It is for this very reaction that you prepare for an aptitude exam like CAT. Any other preparation is quite worthless.

Your battle for CAT would be won if you get a “YES I KNOW THIS PATTERN/LOGIC” reaction to 50–60% of the questions in your test.

Contained in this book is the finest collection of questions which you would hope to find anywhere. Remember, each question solved needs to be a learning experience—one that is to be kept in your mind for future problem solving. Adopt this approach with the problems contained in this book and I am quite confident that you would KNOW over 70% of your actual CAT test paper since you have already solved something like that before!!

**All The BEST !!!!!**

**Arun Sharma**



# Preface to the First Edition

Over the last few years, as a trainer of CAT and other aptitude tests, I have felt the need for a comprehensive book on the subject. Students appearing for the CAT and other aptitude tests usually struggle for appropriate study material to prepare for this vital section of the examination.

This book comes as a humble attempt to fulfil this gap.

## Structure of the book

The book is divided into 19 chapters and five test papers. Each chapter is divided into three broad parts:

- (a) Theory
- (b) Solved examples
- (c) Chapter end exercises (LODs I, II & III), with answer key

The questions in the chapter end exercises have been categorised into three levels of difficulty, viz, Level of Difficulty I, Level of Difficulty II and Level of Difficulty III.

**Level of Difficulty I (LOD I):** These are the basic types of questions pertaining to the chapter. A majority of the MBA entrance tests would test the student with LOD I questions. Tests which ask LOD I questions include MAT, IMT, IRMA, IIFT, NIFT, CET Maharashtra, Bank PO examinations, BBA, BCA, Law, and so on. Besides, there are about 10 questions of LOD I type in the CAT nowadays.

**Level of Difficulty II (LOD II):** These are questions, which are more advanced than the LOD I questions. These questions test all basic as well as applied concepts in the chapter. *LOD II questions are closest to the difficulty levels of the CAT.* Hence, the objective of LOD II questions should be to:

- (a) Clearly understand the concept which underlies the question.
- (b) Create a judgment of time required for different mental processes.
- (c) Identify the time guzzlers.
- (d) Reinforce application of a method in mental processes through the question.
- (e) Learn to flowchart complex questions.

**Level of Difficulty III (LOD III):** LOD III questions build on the previous questions and are a step beyond the LOD II questions. Although they are also normally more difficult than the average CAT question, approximately 5–10 LOD III questions could be asked in the CAT every year. Hence, the learning objectives at LOD III are to:

- (a) Learn applications of the basic concepts at the highest level.
- (b) Sharpen the flowcharting skills learnt at LOD II.
- (c) Use each question as a learning opportunity.

One should not be disheartened if he/she is unable to solve LOD III questions. These questions are extremely tough and uncommon in the CAT and other aptitude tests. Questions in actual tests will appear very simple and elementary if one can solve LOD III questions.

## Approach Taken in Writing This Book

In my experience, the ‘math skill’ of students appearing for CAT can be classified into three levels:



Level 1: Students who are weak at Mathematics

Level 2: Students who are average at Mathematics

Level 3: Students who are strong at Mathematics

This book has been written keeping in mind all the three kinds of students.

From my experience I have given below my perspective of what one should aim for (based on the category that he/she belongs to). It is important to clearly understand the starting level and accordingly define strategy for the QA section.

**Level 1: Students who are weak at mathematics:** Typically, these are students who were weak at mathematics in school and/or have left mathematics after their 10th or 12th class. They face a mental block in mathematics and have problems in writing equations. They also have severe problems in understanding mathematical language and are unable to convert the mathematical language into mathematical equations. They make mistakes even in interpretation of the most basic statements in mathematics (leave alone the complex statements). Besides, these students also have problems in solving equations. They suffer from the insecurity of knowing that they are unable to solve most problems which they face.

**Level 2: Students who are average at mathematics:** These students lie between the Level 1 and Level 3 students.

**Level 3: Students who are strong at mathematics:** These are the students who have got strong, structured and logical thinking ability. They not only understand the basic repetitive statements in mathematics but also complex statements. They are able to create their own flowcharts to arrive at solutions of these complex mathematical situations. There are two alternative approaches that a student can take in solving this book.

**Approach 1:** “Start with basic concepts, solved examples then move on to LOD I, then LOD II in the chapter. Do not go into LOD III in the chapter in the first go. Complete all 19 chapters and then re-start with Chapter 1 — review the basic concepts, resolve LOD I and LOD II, then move on to LOD III. This approach is advocated for students who are weak to average in mathematics (i.e., students of Level 1 and Level 2).

After completing the theory and practice exercises of the book for a second time, go to the practice sets 1–5 provided at the end of book. Set a time limit of 40 minutes for each set and take the tests. The questions contained in the sets are questions which have appeared in the CAT over the last 5 years (based on memory).”

**Approach 2:** “Start with the basic concepts, solved examples and then go through the exercises of LOD I, LOD II and LOD III. This is recommended for students who have strong concepts in mathematics (Level 3 students).”

Then go to the 5 practice tests given at the end of the book and take them one by one (time limit of 40 minutes for each test).”

### **An Important Point**

Each of the questions contained in the LOD I, LOD II and LOD III exercises in the chapters have immense learning value. Hence, the approach that one takes while solving the questions should be one of learning. The reader should try to clearly understand the interpretation of each sentence used in the construction of the questions.

In other words the learning in every chapter should not be restricted to the solved examples or the theory contained in the chapter, but should continue through each of the questions contained in the exercises.

In conclusion, this is a book which is unique in approach and coverage. Any CAT aspirant who goes through the questions contained in this book in the manner advised in this book would get a distinct advantage when he/she faces the CAT.

**Arun Sharma**

# Acknowledgements

The text and questions contained in this book are the manifestation of a learning process that began for me over 23 years ago. During the intervening period, I have come across some wonderful people in the form of relatives, friends or acquaintances from whom I have learnt immensely. While it is not possible to name them individually, I would like to express a deep sense of gratitude towards them.

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My mind also gets reminded of the multitude of people who have worked on the previous editions of this book – and I would like to mention a special word of thanks and appreciation to each of them.

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**Arun Sharma**



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# Developing Your Calculations

**FIRST  
THINGS  
FIRST**

*Developing your ability to calculate well should be one of your major thrust areas for your preparation strategy for Quantitative Aptitude. In fact, most of the times (in most coaching programs and books) this area is totally bypassed leaving the student broadly to develop his/her own methods to calculate faster. Needless to say, your work in trying to develop your ability to calculate would always be greatly superior if you are guided properly with approaches that have been tested and have stood the test of time. The following advisory contained in this special section of the book not just aims to give you the best advice for each and every type of calculation, but also gives you a comprehensive plan to develop your calculation speed—for every conceivable type of calculation.*

*My focus throughout this special note on calculations is to help you to develop the relevant calculations only, viz., calculations that you are likely to encounter inside the CAT based on the experiences of the past CAT examinations. For this purpose this section has been divided into the following chapters:*

**Chapter 1: ADDITIONS and SUBTRACTIONS** Ideas for developing your ability to add & subtract well;

**Chapter 2: MULTIPLICATIONS** Ideas for developing your ability to multiply well;

**Chapter 3: DIVISIONS, PERCENTAGE CALCULATIONS and RATIO COMPARISONS** Ideas for developing your ability to divide well as well as to compare ratios more efficiently;

**Chapter 4: SQUARES and CUBES of NUMBERS**

**Chapter 1 – Additions and Subtractions  
(As an Extension of  
Additions)**

**Chapter 2 – Multiplications**

**Chapter 3 – Divisions, Percentage  
Calculations and Ratio  
Comparisons**

**Chapter 4 – Squares and Cubes of  
Numbers**

This special section contains the best available approaches for all kind of calculations that you are likely to face in the CAT or any other aptitude examination...



# Additions and Subtractions (As an Extension of Additions)

## IDEAS FOR ADDING AND SUBTRACTING WELL

Addition is perhaps the most critical skill when it comes to developing your calculations. As you would see through the discussions in the remaining chapters of this section of the book, if you have the ability to add well you would be able to handle all the other kinds of calculations with consummate ease.

**Skill 1 for addition:** The ability to react with the addition of two numbers when you see them.

The first and foremost skill in the development of your addition abilities is the ability to react to 2 two digit numbers when you come across them. You simply have to develop the ability to react with their totals whenever you come across 2 two digit numbers.

For instance, suppose I were to give you two numbers at random—5, 7 and ask you to **STOP!! STOP YOUR MIND BEFORE IT GIVES YOU THE SUM OF THESE TWO NUMBERS!!** What happened? Were you able to stop your mind from saying 12? No! of course not you would say.

TRY AGAIN:  $12 + 7$  STOP YOUR MIND!! You could not do it again!!

TRY AGAIN:  $15+12$  STOP!! Could not?

TRY AGAIN:  $88+ 73 = ??$  STOP!! If you belong to the normal category of what I call “addition disabled aspirants” you did not even start, did you?

TRY AGAIN:  $57 + 95 =??$

TRY AGAIN:  $78+88 =??$

What went wrong? You are not used to such big numbers, you would say. Well, if you are serious about your ability to crack aptitude exams, you better make this start to happen in your mind. You would know what I mean if you just try to look at a 5 year old child who has just learnt to add, struggle with a calculation like  $12 + 7$  on his fingers or his abacus.

His struggle with something like  $12 + 7$  or even  $15 + 12$  would be akin to the average aspirant’s ability to react

to  $88+ 78$ . However, just as you know  $15 + 12$  is not a special skill so also  $88+78$  is not a special skill. It is just a function of how much you practice your calculations especially in the domain of 2 digit additions.

So what am I trying to tell you here?

All I am trying to communicate to you is to tell you to work on developing your ability to react to 2 two digit numbers with their addition as soon as these numbers hit your mind. What I am trying to tell you that the moment you make your mind adept at saying something like  $74 + 87 = 161$  just the way you would do  $9 + 6 = 15$  you would have made a significant movement in your mind’s ability to crack aptitude exams.

Why do I say that—you might be justified in asking me at this point of time? In order to answer your question I would like to present the following argument to you:

In numerical questions, a normal student/aspirant would be roughly calculating for approximately 50% of the time that he/she takes to solve a question. This means that half the total time that you would spend in solving questions of Quantitative Aptitude or data interpretation would essentially go into calculations.

Thus, in the current pattern of the CAT, where you solve QA for 60 minutes and DI for 30 minutes approximately, out of the total 90 minutes solving numerical questions, you would use close to 40-45 minutes calculating—if your calculating ability is similar to most average CAT aspirants.

So, the contention is this: If you can improve your calculation speed to 5 times your current calculation speed, the calculations you would be doing in 40 to 45 minutes currently, would get done in 8 to 9 minutes—giving you a whopping 32 to 36 minutes extra inside the exam. In an exam like the CAT (or for that matter any other parallel aptitude exam you might be preparing for), an extra 30 minutes converts straight to extra questions solved—and hence extra marks. On a conservative estimate, if you are in the category of students who are attempting 15-20 questions in one hour in the QA section, you are solving one question in 3-4 minutes. In this context, an extra 30 minutes available in the exam, would straight away convert to an extra

**FTF.4** How to Prepare for Quantitative Aptitude for CAT

8-10 attempts—the difference between an 85 and a 95 percentile in the exam!

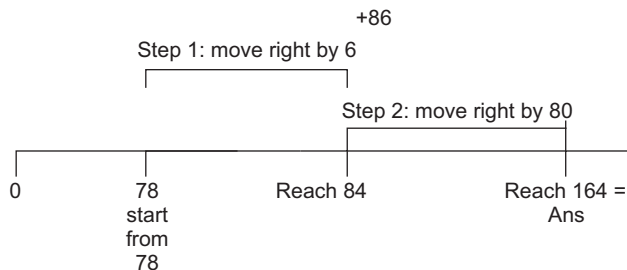
Addition being the mother of all calculations has the potential of giving you the extra edge you require to dominate this all important examination.

Over the next few chapters in this section of the book, all I am going to show you is how knowing additions well would have an impact on each and every calculation type that you might encounter in this exam and indeed for all aptitude tests. However, before we go that far you need to develop your ability to add well.

Let us look at the simple calculation of  $78 + 88$ . For eternity you have been constrained to doing this as follows using the carry over method:

$$\begin{array}{r} 1 \\ 78 \\ + 86 \\ \hline 164 \end{array}$$

The problem with this thought is that no matter how many times you practice this process you would still be required to write it down. The other option of doing this same addition is to think on the number line as this:



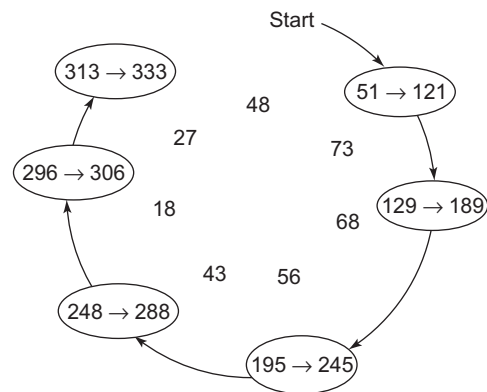
78 + 86 – how to think of this addition problem

As you can see, the above thinking in an addition situation requires no carry over and after some practice would require no writing at all. It is just an extension of how you are able to naturally react to  $5+11$  so also you can train your mind to react to  $58+63$  and react with a two step thought (as  $61 \rightarrow 121$ —with practice this can be done inside a fraction of a second. It is just a matter of how much you are willing to push your mind for this). Once you can do that your next target is to be able to add multiple 2 digit numbers written randomly on a single page:

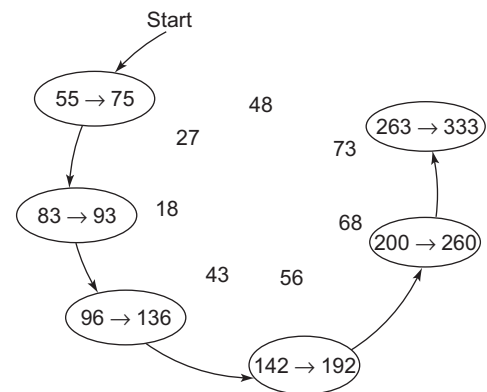
**Try this: Add the following**

$$\begin{array}{r} 48 \\ 27 \quad 73 \\ 18 \quad 68 \\ 43 \quad 56 \end{array}$$

In order to do this addition your thinking should go like this:



Alternately you may also do this the other way. The result would be quite the same:



While you are trying to work on this addition you would realize the following about your abilities to add (if you belong to the normal category of aspirants')

1. Something like  $121 + 68$  would be easier than  $189 + 56$  because the latter requires you to shift hundreds—something that the former does not require you to do.
2. Something like  $48 + 27$  would be easier for you to do initially than  $136 + 56$ ; and  $136 + 56$  would be easier than  $543 + 48$  because your mind would be more comfortable with smaller numbers than you would be with larger numbers.

However as you start practicing your additions, these additions would become automatic for your mind—as they would then fall into the range where your mind can react with the answers. That is the point to which we would want you to target your skill levels for additions.

To put it in other terms, you would need to work on your additions in such a way that 10 numbers written around a circle (as shown above) should be done in around 10-12 seconds in your mind.

Till the time your addition skill levels reach that point, I would want you to work aggressively on your addition ability.

The following  $10 \times 10$  table done at least once daily might be a good way to work on your additions: