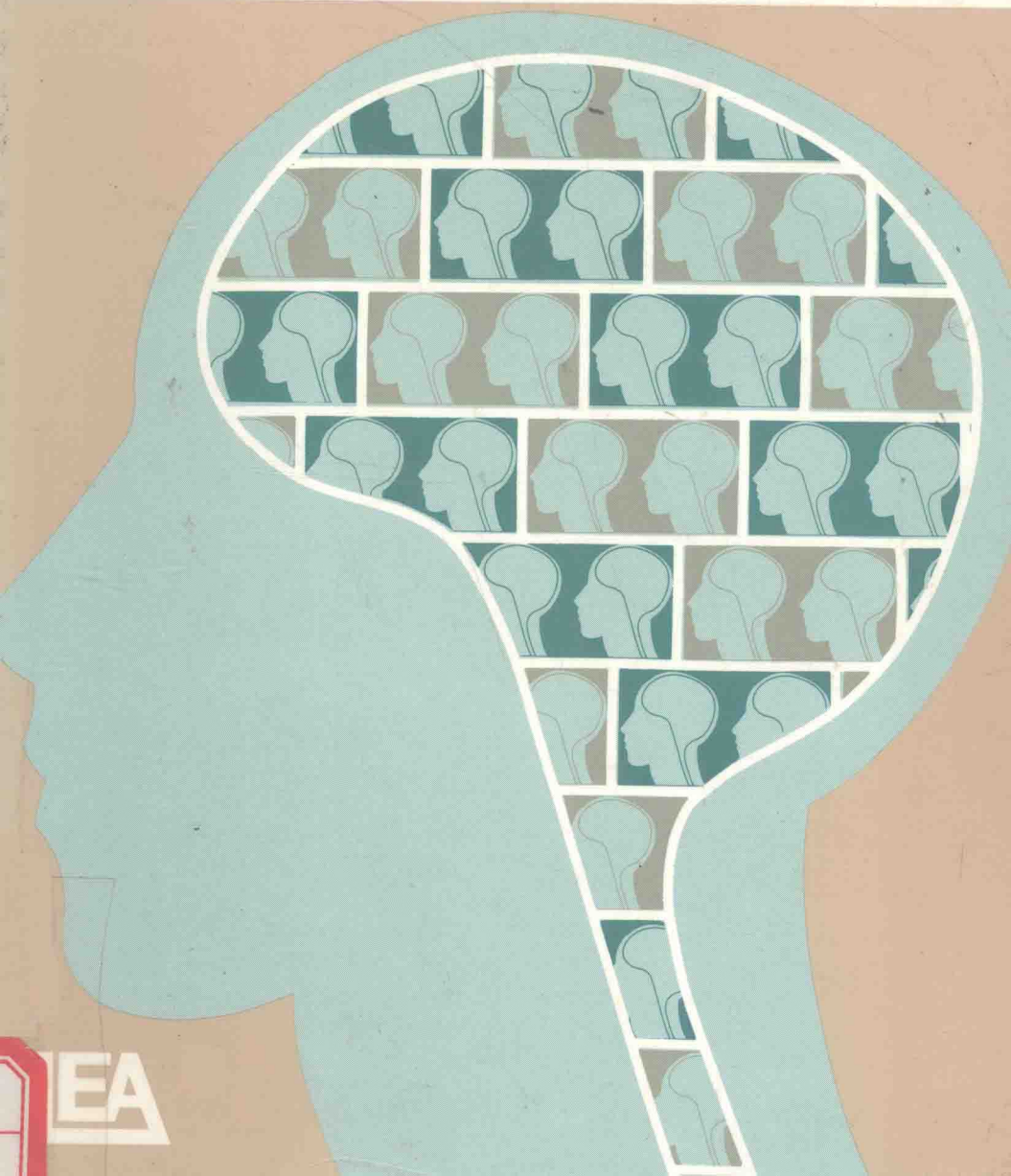# PROBLEM SOLVING & COMPREHENSION

FIFTH EDITION
ARTHUR WHIMBEY & JACK LOCHHEAD

LEA

Problem Solving and Comprehension

Fifth Edition

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PREFACE

Suppose you asked people the following questions: Would you like greater skill in solving math and logic problems? Would you like to sharpen your grasp of the ideas you read in scientific publications, medical reports, textbooks, and legal contracts?

Most people would answer "yes" to these questions. They'd be happy to gain increased capability to reason—because in today's world it's almost impossible to avoid doing some problem solving and technical reading.

The business world and the classroom have always put a premium on mental skills. Today, even in the home, checkbooks and budgets need balancing, wits are challenged by directions for assembling toys and stereo equipment, income tax forms must be deciphered, and so on.

This book shows you how to increase your power to analyze problems and comprehend what you read and hear. First it outlines and illustrates the methods that good problem solvers use in attacking complex ideas. Then it gives you practice in applying these methods to a variety of questions in comprehension and reasoning. As you work through the book you will witness a steady improvement in your analytical thinking skills. You will develop confidence in your own ability to solve problems, and this increased confidence will give you a vigorous, positive attitude when attacking problems. If you're willing to work and practice, you will be rewarded.

For example, at some time you may have to take a test to enter college, medical school or law school—or to be hired for a particular job. Here are some of the tests commonly used for college and job selection:

- Scholastic Aptitude Test (SAT)
- Graduate Record Examination (GRE)
- Law School Admission Test (LSAT)
- Wonderlic Personnel Test
- United States Employment Service General Aptitude Test Battery
- Civil Service Examinations

Tests such as these are made up of problems; the better you are at problem solving the higher your scores will be. If you put the techniques you learn in this book to work, you can expect to see real gains in your scores on selection tests.
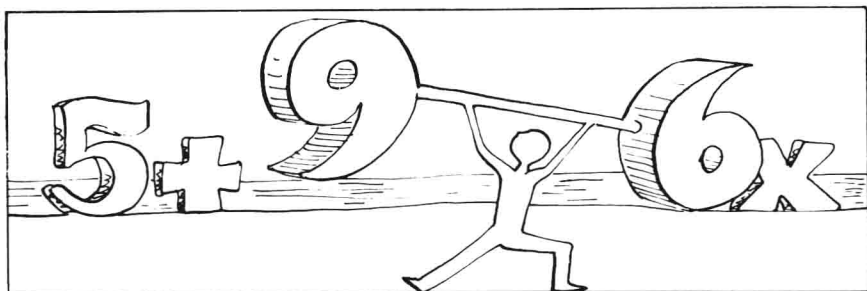
Your school grades can also be improved with the techniques you learn here because you will have a two-edged sword. First, you'll be better prepared to understand your textbooks and lectures so that your mastery of courses will be fuller and deeper. You'll be a better thinker and learner. In addition, when exam time rolls around, your sharpened reading and reasoning skills will give you a strong advantage in interpreting questions and answering them.

The thinking skills you learn in this book go beyond tests and school learning. You'll find them useful in all occupations that involve reading technical materials or tackling difficult problems. With the growth of technology, such occupations represent an expanding portion of the job market. X-ray technicians, TV repairmen, registered nurses, computer programmers, and accountants are all called upon to comprehend and coordinate advanced areas of knowledge. Automobile repair has become a field of specialists. Modern carburetors are so intricate that a that a person can't understand and repair them without the ability to read complex descriptions and directions. And skilled operators are needed for the new automotive diagnostic equipment which is used to get a profile of engine performance and difficulties. Even farming today has become a detailed science in which soils are chemically analyzed and then treated with spectrums of additives to produce maximum yields of high-paying crops. To be successful a farmer has to have considerable knowledge about both chemical products and crop-market trends.

In short, the techniques you learn in this book can help you on tests, in your academic courses, and in any occupations which involve analyzing, untangling, or comprehending knotty ideas.

CONTENTS

I. TEST YOUR MIND—SEE HOW IT WORKS

A good way to begin a thinking skills program is to take stock of your own thinking habits and compare them to those of other people. On page 3 you'll find a test called the Whimbey Analytical Skills Inventory (WASI). The WASI is the type of test you might take in applying for a job or college program. If you are using this book in a class your instructor will ask you take the WASI and make an extra copy of your answers. Then he will collect one copy.

Here is how the WASI differs from other tests. Usually when you take such tests you don't get a chance to discuss your answers. Sometimes you don't even find out what your scores are. But with the WASI you will spend several days in class debriefing—going over the test item by item. For each question, your instructor will call on different students to explain how they handled it. In that way students can compare their problem-solving strategies. Furthermore, if students answered questions incorrectly when they took the test, the instructor may ask them to explain the method they employed that led to the wrong answer. Pay special attention to these explanations of errors, since they will show you how *not* to deal with such problems. Learning to recognize and void ineffective problem-solving methods is an important part of the training. Also notice the sequences of thoughts used by students who answered the question successfully. Compare the approaches leading to the correct answer with those leading to incorrect answers. Pinpoint how the approaches differ. Most importantly, for every question that you answer incorrectly, be sure you understand exactly why the error occurred, and how you can avoid such an error in the future.

If you are not using this book in a class, have a brother, sister, parent or some other friend take the WASI and then compare your answers and strategies.

Asking people to explain their answers to the test questions, and then to compare the explanations with those of others, accomplishes two things. First, it takes the mystery out of mental tests, making them less threatening should you be required to take such tests in the future. Secondly, research

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shows that this is an excellent way for people to improve their problem-solving skills. When they work through a test together, explaining and comparing their methods of solution, they learn from each other. They come to recognize ineffective methods, dead ends and pitfalls. They also come to understand how to attack problems effectively and reach correct answers.

Taking the WASI and then discussing it can be a highly valuable learning experience. When your instructor sets aside several class hours for this, use the time and opportunity to your greatest advantage.

WASI TEST
WHIMBEY ANALYTICAL SKILLS INVENTORY

Instructions

This inventory consists of 38 questions. Some of the questions are multiple choice, while others are more complex. For each of the multiple choice questions, circle the answer which you think is correct.

Here are two sample questions. Please try to answer them.

1. If you started with $25.00 and then spent $3.00 to go to a movie, how much would you have left?

    a. $23.00   b. $22.00   c. $21.00   d. $12.00

2. Circle the fifth word in this sentence.

For the first sample question you should have circled alternative *b.*, since $22.00 are left after spending $3.00 for the movie. With the second question you should have circled the word "in," because it is the fifth word in the sentence.

If you have any questions, please ask your instructor to answer them. Otherwise, wait until your instructor asks you to turn the page, then begin.

1. Which word is different from the other 3 words?

    a. yell　　　*b.* talk　　　*c.* pencil　　　*d.* whisper

2. Which letter is as far away from K in the alphabet as J is from G?

    a. K　　　*b.* M　　　*c.* N　　　*d.* G　　　*e.* I

3. If you are facing east and turn left, then make an about-face and turn left again, in which direction are you facing?

    a. east　　　*b.* north　　　*c.* west　　　*d.* south　　　*e.* southwest

4. Which pair of words fits best in the blanks?

    Arm is to wrist as _____ is to _____.

    a. leg: foot　　　*b.* thigh: ankle　　　*c.* leg: ankle　　　*d.* leg: knee

5. 20 is related to 30 as 10 is related to _____ ?

    a. 5　　　*b.* 25　　　*c.* 60　　　*d.* 15　　　*e.* 10

6. Which set of letters is different from the other 3 sets?

    a. EFGE　　　*b.* BCDB　　　*c.* KLML　　　*d.* OPQO

7. In a different language *liro cas* means "red tomato," *dum cas dan* means "big red barn" and *xer dan* means "big horse." What is the word for *barn* in this language?

    a. dum　　　*b.* liro　　　*c.* cas　　　*d.* dan　　　*e.* xer

8. Write the 2 letters which should appear next in the series.

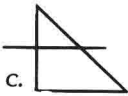   C B F E I H L K __M__ __N__

9. There are 3 separate, equal-size boxes, and inside each box there are 2 separate small boxes, and inside each of the small boxes there are 4 even smaller boxes. How many boxes are there altogether?

    a. 24   *b.* 13   *c.* 21   *d.* 33   *e.* some other number

10. Ten full crates of walnuts weigh 410 lb, while an empty crate weighs 10 lb. How much do the walnuts alone weigh?

    a. 400 lb   *b.* 390 lb   *c.* 310 lb   *d.* 320 lb   *e.* 420 lb

11. One number in the series below is incorrect. What should that number be?

    3 4 6 9 13 18 24 33

    a. 33   *b.* 7   *c.* 24   *d.* 31   *e.* 32

12. The first figure is related to the second figure in the same way that the third figure is related to one of the answer choices. Pick the answer.

    This [figure] is to this [figure] as this [figure] is to?

    a. [figure]   *b.* [figure]   *c.* [figure]   *d.* [figure]   *e.* [figure]

13. Which pair of words best fits the meaning of the sentence?

    _____ the dog was big, he was _____ heavy.

    a. Since—not   b. Although—very

    c. Although—not   d. Because—nevertheless

14. Write the 2 numbers which should appear next in the series.

    3 9 5 15 11 33 29 ___ ___

15. An orthopedist is a _____ specialist.

    a. brain   *b.* heart   *c.* ear and throat   *d.* lung   *e.* bone

16. An equivocal statement is _____.

    a. relevant   *b.* equivalent

    c. credible   *d.* somewhat loud

    e. ambiguous

17. Three empty cereal boxes weigh 9 ozs and each box holds 11 ozs of cereal. How much do 2 full boxes of cereal weigh together?

    a. 20 ozs   *b.* 40 ozs   *c.* 14 ozs   *d.* 28 ozs   *e.* 15 ozs

18. Cross out the letter after the letter in the word pardon which is in the same position in the word as it is in the alphabet.

19. A journey always involves a _____?

    a. person   *b.* destination

    c. distance   *d.* preparation

20. In how many days of the week does the third letter of the day's name immediately follow the first letter of the day's name in the alphabet?

    a. 1   *b.* 2   *c.* 3   *d.* 4   *e.* 5

21. Which pair of words is different from the other 3 pairs?
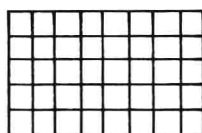
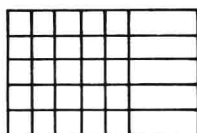   *a.* walk—slowly   *b.* speak—loud

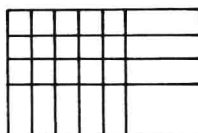   *c.* read—book   *d.* lift—quickly

22. The top 4 figures form a series which changes in a systematic manner according to some rule. Try to discover the rule and choose from among the alternatives the figure which should occur next in the series.
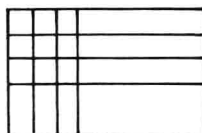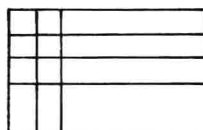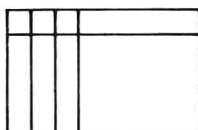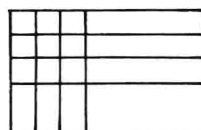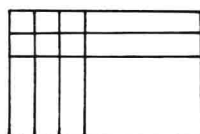

23. Which number is repeated first in the following series?

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

     a. 7   *b.* 8   *c.* 6   *d.* 4   *e.* 5

24. Which pair of words fits best in the blanks?

    Oven is to *bake* as _____ is to _____.

    a. automobile: carry   b. dishwasher: dishes
    c. food: ice   d. vacuum cleaner: rug

25. Write the 3 letters which should come next in this series.

    B A A C E E D I I E M M F ____ ____ ____

26. *One-third* is related to *9* as *2* is related to _____ .

    a. 6   b. 18   c. 36   d. 54   e. 99

27. *Elephant* is to *small* as _____ is to _____.

    a. large: little   b. hippopotamus: mouse
    c. turtle: slow   d. lion: timid

28. Which word means the opposite of *demise*?

    a. hasty   b. birth   c. accept   d. embrace

29. Which set of letters is different from the other 3 sets?

    a. *HRTG*   b. *NOMP*   c. *XACW*   d. *LDFK*

30. *Hospital* is to *sickness* as _____ is to _____.

    a. patient: disease   b. jail: prisoner
    c. doctor: patient   d. school: ignorance
    e. nurse: illness

31. A train travels 50 mi while a car travels 40 mi. How many miles will the train travel while the car travels 60 mi?

    a. 60   *b.* 50   *c.* 70   *d.* 75   *e.* 80

32. *Heretic* is to *religious* as _____ is to _____.

    a. disbelief: faith   *b.* adversary: cooperative

    c. sinner: punishment   *d.* disrespectful: pious

33. How many sixths are in 12/2?

    a. 6   *b.* 1   *c.* 36   *d.* 4   *e.* 24

34. *2, 9, 3, 5, 1, 8, 4.* Take the difference between the second number and the next-to-last number, then add it to the fourth number. If this sum is less than 6, write the word "go" in this space _____; otherwise, write the word "stop" in this space _____.

35. Which word is different from the other 3 words?

    a. peregrination   *b.* pilgrimage

    c. outlandish   *d.* promenade

36. *3, 6, 4, 2, 5, 9, 1.* Add the second number to the sixth number, then divide by 3 and write the quotient, unless it is greater than 5; in this case add the first number to the next-to-last number and divide by 4. What is your final answer?

    a. 3   *b.* 5   *c.* 2   *d.* 4   *e.* some other number

37. Select the answer which is most nearly equivalent in meaning to the following statement.

> Show me the man you honor. I know by that symptom, better than any other, what you are yourself.
>
> —Carlyle

a. The works of great scholars should be read and studied.
b. A man can be judged by his works.
c. A man can be judged by those he emulates.
d. Each human being has his own unique worth.

38. *Optimist* is to *pessimist* as _____ is to _____.

a. solace: morose   b. sanguine: morose

c. benefactor: patron   d. eulogy: gloomy

END.   When you are finished, check back over your work.
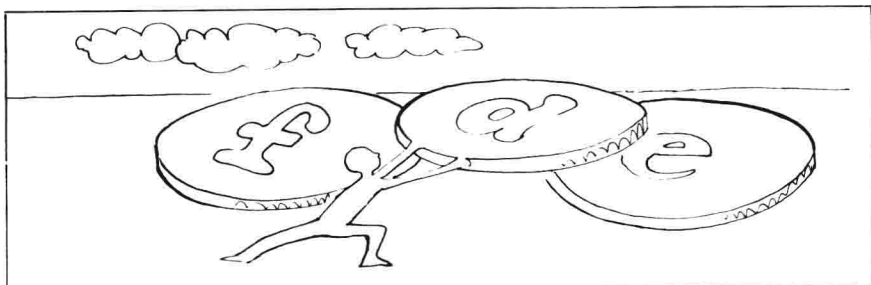
II. ERRORS IN REASONING

One say to improve your analytical skills is to see the types of errors that people frequently make in solving problems, and then guard against making those same errors yourself.

Various types of errors undoubtedly came to light in your discussion of the WASI. This chapter analyzes a sample of errors made by students in courses that we have taught. Read through these errors and see how they compare to the ones you made.

Occasionally errors are made on the WASI because people don't have enough information to answer a question. For example, on vocabulary questions (such as question #15) a person might not know the meaning of the words. But most errors are not of this type. Instead, people have sufficient facts yet miss questions because their analyses and reasoning processes break down. Here are four ways in which the breakdowns frequently occur:

1. Person fails to observe and use all the relevant facts of a problem.

2. Person fails to approach the problem in a systematic step-by-step manner, making leaps in logic and jumping to conclusions without checking them.

3. Person fails to spell out relationships fully.

4. Person is sloppy and inaccurate in collecting information and carrying out mental activities.

These sources of error tend to be interrelated; however, one may be more prominent than the others with some particular person or problem. You will see examples of all four sources of error below.

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