THE OFFICIAL GUIDE FOR
GMAT®
REVIEW 2016

The most comprehensive study guide, from the creators of the GMAT® exam

Includes 25% NEW content

Over 900 questions from past exams with answer explanations

Create your own **practice sets online** using past exam questions

Includes **diagnostic test**, study tips, and test-taking strategies

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Dear Future GMAT® Test-Taker and Business Leader,

This book, *The Official Guide for GMAT® Review 2016*, is designed to help you prepare for and do your best on the GMAT® exam. That's its purpose and our reason for bringing it to you. It's the only guide of its kind published by the Graduate Management Admission Council® (GMAC®), the makers of the exam.
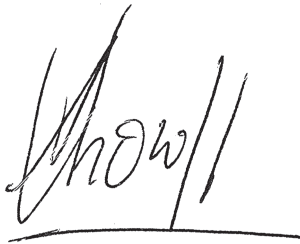
Taking the GMAT exam lets schools know that you're serious about your graduate business education, that you're motivated and will accept nothing less than the best from yourself. By using the *Official Guide* to prepare for the GMAT, you're taking a very important step toward gaining admission to a high-quality business or management school or program of your choice.

GMAC was founded by the world's leading schools in 1953 and, with them, developed the GMAT exam to help people who aspire to careers in management demonstrate their command of the skills needed for success in the classroom. Schools use and trust the GMAT as part of their admissions process because it's a very good predictor of that classroom success.

Today more than 6,000 graduate programs around the world use the GMAT exam to establish the MBA degree and other graduate-level management and specialized programs as hallmarks of excellence. That connection to schools has made the GMAT exam the gold standard of admissions assessments for business and management. A fact that makes us both proud and also drives us to keep improving the GMAT and the contribution it can make to you finding and gaining admission to the best school or program for you.

I applaud your commitment to your education, and I know that this book and the other official GMAT preparation materials you will find at mba.com will give you the confidence to achieve your personal best on the GMAT exam and launch a rewarding career in management.

I wish you the best success throughout your education and career.

Sangeet Chowfla
President and CEO
Graduate Management Admission Council®, makers of the GMAT® Exam

Visit gmat.wiley.com to access web-based supplemental features available in the print book as well. There you can take a diagnostic test to help you get the most out of your study time; access a question bank with 900 practice questions and answer explanations including 50 Integrated Reasoning questions; create personalized practice sets to gauge your skill level; and watch exclusive videos addressing concerns about taking the exam, balancing work and school, and preparing for the GMAT exam.

1.0　What Is the GMAT® Exam?

1.0 What Is the GMAT® Exam?

The Graduate Management Admission Test® (GMAT®) exam is a standardized exam used in admissions decisions by more than 5,200 graduate management programs worldwide. It helps you gauge, and demonstrate to schools, your academic potential for success in graduate level management studies.

The four-part exam measures your Analytical Writing, Verbal, Quantitative, and Integrated Reasoning skills—higher-order reasoning skills that management faculty worldwide have identified as important for incoming students to have. Unlike undergraduate grades and curricula, which vary in their meaning across regions and institutions, your GMAT scores provide a standardized, statistically reliable measure of how you are likely to perform academically in the core curriculum of a graduate management program. The GMAT exam's validity, appropriateness, and value in admissions have been well-established through numerous academic studies.

The GMAT exam is delivered entirely in English and solely on computer. It is not a test of business knowledge, subject matter mastery, English vocabulary, or advanced computational skills. The GMAT exam also does not measure other factors related to success in graduate management study, such as job experience, leadership ability, motivation, and interpersonal skills. Your GMAT score is intended to be used as one admissions criterion among other, more subjective, criteria, such as admissions essays and interviews.

1.1 Why Take the GMAT® Exam?

Launched in 1954 by a group of nine business schools to provide a uniform measure of the academic skills needed to succeed in their programs, the GMAT exam is now used by more than 5,200 graduate management programs at approximately 1,900 institutions worldwide.

Using GMAT scores helps institutions select the most qualified applicants and ensure that the applicants they admit are up to the academic rigors of their programs. When you consider which programs to apply to, you can look at a school's use of the GMAT exam as one indicator of quality. Schools that use the GMAT exam typically list score ranges or average scores in their class profiles, so you may also find these profiles helpful in gauging the academic competitiveness of a program you are considering and how well your performance on the exam compares with that of the students enrolled in the program.

> ### *Myth* -vs- **FACT**
>
> **M** – **If I don't score in the 90th percentile, I won't get into any school I choose.**
>
> **F** – **Very few people get very high scores.**
>
> Fewer than 50 of the more than 200,000 people taking the GMAT exam each year get a perfect score of 800. Thus, while you may be exceptionally capable, the odds are against your achieving a perfect score. Also, the GMAT exam is just one piece of your application packet. Admissions officers use GMAT scores in conjunction with undergraduate records, application essays, interviews, letters of recommendation, and other information when deciding whom to accept into their programs.

No matter how well you perform on the GMAT exam, you should contact the schools that interest you to learn more about them and to ask how they use GMAT scores and other criteria (such as your undergraduate grades, essays, and letters of recommendation) in their admissions processes. School admissions offices, web sites, and materials

published by schools are the primary sources of information when you are doing research about where you might want to go to business school.

For more information on the GMAT exam, test registration, appropriate uses of GMAT scores, sending your scores to schools, and applying to business school, please visit our web site at mba.com.

1.2 GMAT® Exam Format

The GMAT exam consists of four separately timed sections (see the table on the next page). The test starts with one Analytical Writing Assessment (AWA) essay prompt, and you will have 30 minutes to type your essay on a computer keyboard. The AWA is followed immediately by the 30-minute Integrated Reasoning section, which features 12 question prompts in four different question formats. The test ends with two 75-minute, multiple-choice sections: the Quantitative section, with 37 questions, and the Verbal section, with 41.

The Verbal and Quantitative sections of the GMAT exam are computer adaptive, which means that the test draws from a large bank of questions to tailor itself to your ability level, and you won't get many questions that are much too hard or too easy for you. The first question will be of medium difficulty. As you answer each question, the computer scores your answer and uses it—as well as your responses to any preceding questions—to select the next question.

Computer-adaptive tests become more difficult the more questions you answer correctly, but if you get a question that seems easier than the last one, it does not necessarily mean you answered the last question incorrectly. The test has to cover a range of content, both in the type of question asked and the subject matter presented.

Because the computer uses your answers to select your next questions, you may not skip questions or go back and change your answer to a previous question. If you don't know the answer to a question, try to eliminate as many choices as possible, then select the answer you think is best. If you answer a question incorrectly by mistake—or correctly by lucky guess—your answers to subsequent questions will lead you back to questions that are at the appropriate skill level for you.

Though the individual questions are different, the content mixture is the same for every GMAT exam. Your score is determined by the difficulty and statistical characteristics of the questions you answer as well as the number of questions you answer correctly. By adapting to each test-taker, the GMAT exam is able to accurately and efficiently gauge skill levels over a full range of abilities, from very high to very low.

Myth -vs- **FACT**

𝓜 – **Getting an easier question means I answered the last one wrong.**

F – **Getting an easier question does not necessarily mean you got the previous question wrong.**

To ensure that everyone receives the same content, the test selects a specific number of questions of each type. The test may call for your next question to be a relatively difficult problem-solving item involving arithmetic operations. But, if there are no more relatively difficult problem-solving items involving arithmetic, you might be given an easier item.

Most people are not skilled at estimating item difficulty, so don't worry when taking the test or waste valuable time trying to determine the difficulty of the questions you are answering.

The test includes the types of questions found in this book and in the online Integrated Reasoning component, but the format and presentation of the questions are different on the computer. When you take the test:

- Only one question or question prompt at a time is presented on the computer screen.
- The answer choices for the multiple-choice questions will be preceded by circles, rather than by letters.
- Different question types appear in random order in the multiple-choice and Integrated Reasoning sections of the test.
- You must select your answer using the computer.
- You must choose an answer and confirm your choice before moving on to the next question.
- You may not go back to previous screens to change answers to previous questions.

Format of the GMAT® Exam		
	Questions	Timing
Analytical Writing Analysis of an Argument	1	30 min.

Integrated Reasoning
    Multi-Source Reasoning
    Table Analysis
    Graphics Interpretation
    Two-Part Analysis
	12	30 min.

Optional break		

Quantitative
    Problem Solving
    Data Sufficiency
	37	75 min.

Optional break		

Verbal
    Reading Comprehension
    Critical Reasoning
    Sentence Correction
	41	75 min.

	Total Time:	210 min.

1.3 What Is the Content of the Test Like?

The GMAT exam measures higher-order analytical skills encompassing several types of reasoning. The Analytical Writing Assessment asks you to analyze the reasoning behind an argument and respond in writing; the Integrated Reasoning section asks you to interpret and synthesize information from multiple sources and in different formats to make reasoned conclusions; the Quantitative section asks you to reason quantitatively using basic arithmetic, algebra, and geometry;

and the Verbal section asks you to read and comprehend written material and to reason and evaluate arguments.

Test questions may address a variety of subjects, but all of the information you need to answer the questions will be included on the exam, with no outside knowledge of the subject matter necessary. The GMAT exam is not a test of business knowledge, English vocabulary, or advanced computational skills. You will need to read and write in English and have basic math and English skills to perform well on the test, but its difficulty comes from the required analytical abilities, which are developed over time.

The questions in this book are organized by question type and from easiest to most difficult, but keep in mind that when you take the test, you may see different types of questions in any order within each section.

1.4 Integrated Reasoning Section

The Integrated Reasoning section measures your ability to understand and evaluate multiple sources and types of information—graphic, numeric, and verbal—as they relate to one another; use both quantitative and verbal reasoning to solve complex problems; and solve multiple problems in relation to one another.

Four types of questions are used in the Integrated Reasoning section:

- Multi-Source Reasoning
- Table Analysis
- Graphics Interpretation
- Two-Part Analysis

Integrated Reasoning questions may be quantitative, verbal, or a combination of both. You will have to interpret graphics and sort tables to extract meaning from data, but advanced statistical knowledge and spreadsheet manipulation skills are not necessary. You will have access to an online calculator with basic functions for the Integrated Reasoning section, but note that the calculator is **not** available on the Quantitative section.

To review the Integrated Reasoning question types and test-taking tips, see chapter 10. For practice questions of each format, with full answer explanations, please visit the Integrated Reasoning online component using your unique access code found in the back of this book.

1.5 Quantitative Section

The GMAT Quantitative section measures your ability to reason quantitatively, solve quantitative problems, and interpret graphic data.

Two types of multiple-choice questions are used in the Quantitative section:

- Problem Solving
- Data Sufficiency

Both are intermingled throughout the Quantitative section, and both require basic knowledge of arithmetic, elementary algebra, and commonly known concepts of geometry.

To review the basic mathematical concepts that you will need to answer Quantitative questions, see the math review in chapter 4. For test-taking tips specific to the question types in the Quantitative section, practice questions, and answer explanations, see chapters 5 and 6.

1.6 Verbal Section

The GMAT Verbal section measures your ability to read and comprehend written material and to reason and evaluate arguments. The Verbal section includes reading sections from several different content areas. Although you may be generally familiar with some of the material, neither the reading passages nor the questions assume detailed knowledge of the topics discussed.

Three types of multiple-choice questions are intermingled throughout the Verbal section:

- Reading Comprehension
- Critical Reasoning
- Sentence Correction

All three require basic knowledge of the English language, but the Verbal section is not a test of advanced vocabulary.

For test-taking tips specific to each question type in the Verbal section, practice questions, and answer explanations, see chapters 7 through 9.

1.7 Analytical Writing Assessment

The Analytical Writing Assessment (AWA) consists of one 30-minute writing task: Analysis of an Argument. The AWA measures your ability to think critically, communicate your ideas, and formulate an appropriate and constructive critique. You will type your essay on a computer keyboard.

For test-taking tips, sample essay responses, answer explanations, and sample Analysis of an Argument topics, see chapter 11.

1.8 What Computer Skills Will I Need?

The GMAT exam requires only minimal computer skills. You will type your AWA essay on the computer keyboard using standard word-processing keystrokes. In the Integrated Reasoning and multiple-choice sections, you select your responses using either your computer mouse or the keyboard. The Integrated Reasoning section includes basic computer navigation and functions, such as clicking on tabs and using drop-down menus to sort tables and select answers.

To learn more about the specific skills required to take the GMAT exam, download GMATPrep® software, the free test-preparation software from mba.com/gmatprep.

1.9 What Are the Test Centers Like?

The GMAT exam is administered under standardized conditions at test centers worldwide. Each test center has a proctored testing room with individual computer workstations that allow you to sit for the exam under quiet conditions and with some privacy. You will be able to take two optional breaks—one after completing the Integrated Reasoning section and another between the Quantitative and Verbal sections. You may not take notes or scratch paper with you into the testing room, but an erasable notepad and marker will be provided for you to use during the test.

1.10 How Are Scores Calculated?

Verbal and Quantitative sections are scored on a scale of 0 to 60, with scores below 6 or above 51 extremely rare. The Total GMAT score ranges from 200 to 800 and is based on your performance in these two sections. Your score is determined by:

- The number of questions you answer
- The number of questions you answer correctly or incorrectly
- The level of difficulty and other statistical characteristics of each question

Your Verbal, Quantitative, and Total GMAT scores are determined by a complex mathematical procedure that takes into account the difficulty of the questions that were presented to you and how you answered them. When you answer the easier questions correctly, you get a chance to answer harder questions, making it possible to earn a higher score. After you have completed all the questions on the test, or when your time is expired, the computer will calculate your scores. Your scores on the Verbal and Quantitative sections are combined to produce your Total score.

The Analytical Writing Assessment consists of one writing task, Analysis of an Argument, and your essay will be scored two times independently. Essays are evaluated by college and university faculty members from a variety of disciplines, including management education, who rate the overall quality of your critical thinking and writing. (For details on how readers are qualified, visit mba.com.) In addition, your response may be scored by an automated scoring program designed to reflect the judgment of expert readers.

Your essay is scored on a scale of 0 to 6, with 6 being the highest score and 0 the lowest. A score of zero is given for responses that are off-topic, are in a foreign language, merely attempt to copy the topic, consist only of keystroke characters, or are blank. Your AWA score is typically the average of two independent ratings. If the independent scores vary by more than a point, a third reader adjudicates, but because of ongoing training and monitoring, discrepancies are rare.

Your Analytical Writing Assessment and Integrated Reasoning scores are computed and reported separately from the other sections of the test and have no effect on your Verbal, Quantitative, or Total scores. The schools that you have designated to receive your scores may receive a copy of your Analytical Writing Assessment essay with your score report. Your own copy of your score report will not include your essay.

Like your AWA score, your Integrated Reasoning score will not count toward your Total score.

Your GMAT score includes a percentile ranking that compares your skill level with other test takers from the past three years. The percentile rank of your score shows the percentage of tests taken with scores lower than your score. Every July, percentile ranking tables are updated. Visit http://www.mba.com/percentilerankings to view the most recent percentile rankings tables.

1.11 Test Development Process

The GMAT exam is developed by experts who use standardized procedures to ensure high-quality, widely appropriate test material. All questions are subjected to independent reviews and are revised or discarded as necessary. Multiple-choice questions are tested during GMAT exam administrations. Analytical Writing Assessment tasks are tested on mba.com registrants and then assessed for their fairness and reliability. For more information on test development, see mba.com.

2.0   How to Prepare

2.0 How to Prepare

2.1 How Should I Prepare to Take the Test?

The GMAT exam was designed specifically to measure academic skills needed for management education, and the test contains several question formats unique to the GMAT exam. At a minimum, you should be familiar with the test format and the question formats before you sit for the test. Because the GMAT exam is a timed exam, you should practice answering test questions not only to better understand the question formats and the skills they require, but also to help you learn to pace yourself so you can finish each section when you sit for the exam.

Because the exam measures reasoning rather than subject matter knowledge, you most likely will not find it helpful to memorize facts. You do not need to study advanced English vocabulary or mathematical concepts, but you should be sure your grasp of basic arithmetic, algebra, and geometry is sound enough that you can use these skills in quantitative problem-solving. Likewise, you do not need to study advanced vocabulary words, but you should have a firm understanding of basic English vocabulary and grammar for reading, writing, and reasoning.

This book and other study materials released by the Graduate Management Admission Council contain questions that have been retired from the GMAT exam. All questions that appear or have appeared on the GMAT exam are copyrighted and owned by the GMAC, which does not license them to be reprinted elsewhere. Accessing live Integrated Reasoning, Quantitative, or Verbal test questions in advance or sharing test content during or after you take the test is a serious violation, which could cause your scores to be canceled and schools to be notified. In cases of a serious violation, you may be banned from future testing, and other legal remedies may be pursued.

> ## *Myth* -vs- **FACT**
>
> **M** – **You may need very advanced math skills to get a high GMAT score.**
>
> **F** – **The math skills tested on the GMAT exam are quite basic.**
>
> The GMAT exam only requires basic quantitative analytic skills. You should review the math skills (algebra, geometry, basic arithmetic) presented in this book, but the required skill level is low. The difficulty of GMAT Quantitative questions stems from the logic and analysis used to solve the problems and not the underlying math skills.

2.2 What About Practice Tests?

The Quantitative and Verbal sections of the GMAT exam are computer adaptive, and the Integrated Reasoning section includes questions that require you to use the computer to sort tables and navigate to different sources of information. GMATPrep® software will help you prepare for the test. The software is available for download at no charge for those who have created an account on mba.com. The software includes two full-length GMAT exams, including computer-adaptive Quantitative and Verbal sections; plus additional practice questions; information about the test; and tutorials to help you become familiar with how the GMAT exam will appear on the computer screen at the test center.

To maximize your free practice exams, you should download the software as you start to prepare for the test. Take one practice test to familiarize yourself with the exam and to get an idea of how you might score. As your test date approaches, after you have studied using this book and other study materials, take the second practice test to determine whether you need to shift your focus to other areas you need to strengthen. Note that the practice tests may include questions that are also published in this book.

2.3 How Should I Use the Diagnostic Test?

This book contains a Diagnostic Test to help you determine the types of Quantitative and Verbal questions that you need to practice most. You should take the Diagnostic Test around the same time that you take the first GMATPrep sample test. The Diagnostic Test will give you a rating—*below average*, *average*, *above average*, or *excellent*—of your skills in each type of GMAT test question. These ratings will help you identify areas to focus on as you prepare for the GMAT exam.

The Diagnostic Test does not include Integrated Reasoning or Analysis of an Argument questions.

Use the results of the Diagnostic Test to help you select the right chapter of this book to start with. Next, read the introductory material carefully, and answer the practice questions in that chapter. Remember, the questions in the chapters are organized by difficulty, from easiest to most difficult. Make sure you follow the directions for each type of question and try to work as quickly and as efficiently as possible. Then review the explanations for the correct answers, spending as much time as necessary to familiarize yourself with the range of questions or problems presented.

2.4 Where Can I Get Additional Practice?

If you would like additional practice, *The Official Guide for GMAT® Verbal Review* and *The Official Guide for GMAT® Quantitative Review* include even more practice questions that are not published in this book. For an on-the-go solution, you can purchase *The Official Guide for GMAT® Review* app, available in both Apple and Android platforms. Please note that the Official GMAT mobile app is a mobile version of *The Official Guide for GMAT® Review*. Although it has interactive features not available in the print edition, it uses the same questions published in the printed guide. The Official GMAT mobile app and other books and study materials are available at mba.com/store.

2.5 General Test-Taking Suggestions

Specific test-taking strategies for individual question types are presented later in this book. The following are general suggestions to help you perform your best on the test.

1. **Use your time wisely.**
   Although the GMAT exam stresses accuracy more than speed, it is important to use your time wisely. On average, you will have about 1¾ minutes for each Verbal question, about 2 minutes for each Quantitative question, and about 2½ minutes for each Integrated Reasoning question, some of which have multiple questions. Once you start the test, an onscreen clock will show the time you have left. You can hide this display if you want, but it is a good idea to check the clock periodically to monitor your progress. The clock will automatically alert you when 5 minutes remain for the section you are working on.

2. **Answer practice questions ahead of time.**
   After you become generally familiar with all question types, use the practice questions in this book and the online Integrated Reasoning component to prepare for the actual test. It may be useful to time yourself as you answer the practice questions to get an idea of how long you will have for each question when you sit for the actual test, as well as to determine whether you are answering quickly enough to finish the test in the allotted time.

3. **Read all test directions carefully.**
   The directions explain exactly what is required to answer each question type. If you read hastily, you may miss important instructions and lower your score. To review directions during the test, click on the Help icon. But be aware that the time you spend reviewing directions will count against your time allotment for that section of the test.

4. **Read each question carefully and thoroughly.**
   Before you answer a question, determine exactly what is being asked and then select the best choice. Never skim a question or the possible answers; skimming may cause you to miss important information or nuances.

5. **Do not spend too much time on any one question.**
   If you do not know the correct answer, or if the question is too time-consuming, try to eliminate choices you know are wrong, select the best of the remaining answer choices, and move on to the next question. Not completing sections and randomly guessing answers to questions at the end of each test section can significantly lower your score. As long as you have worked on each section, you will receive a score even if you do not finish one or more section in the allotted time. But you will not earn points for questions you never get to see.

6. **Confirm your answers ONLY when you are ready to move on.**
   On the Quantitative and Verbal sections, once you have selected your answer to a multiple-choice question, you will be asked to confirm it. Once you confirm your response, you cannot go back and change it. You may not skip questions. In the Integrated Reasoning section, there may be several questions based on information provided in the same question prompt. When there is more than one response on a single screen, you can change your response to any of the questions on the screen before moving on to the next screen. But you may not navigate back to a previous screen to change any responses.

7. **Plan your essay answer before you begin to write.**
   The best way to approach the Analysis of an Argument section is to read the directions carefully, take a few minutes to think about the question, and plan a response before you begin writing. Take care to organize your ideas and develop them fully, but leave time to reread your response and make any revisions that you think would improve it.

Myth -vs- **FACT**

M – **It is more important to respond correctly to the test questions than it is to finish the test.**

F – **There is a severe penalty for not completing the GMAT exam.**

If you are stumped by a question, give it your best guess and move on. If you guess incorrectly, the computer program will likely give you an easier question, which you are likely to answer correctly, and the computer will rapidly return to giving you questions matched to your ability. If you don't finish the test, your score will be reduced greatly. Failing to answer five verbal questions, for example, could reduce your score from the 91st percentile to the 77th percentile. Pacing is important.

Myth -vs- **FACT**

M – **The first 10 questions are critical and you should invest the most time on those.**

F – **All questions count.**

It is true that the computer-adaptive testing algorithm uses the first 10 questions to obtain an initial estimate of your ability; however, that is only an *initial* estimate. As you continue to answer questions, the algorithm self-corrects by computing an updated estimate on the basis of all the questions you have answered, and then administers items that are closely matched to this new estimate of your ability. Your final score is based on all your responses and considers the difficulty of all the questions you answered. Taking additional time on the first 10 questions will not game the system and can hurt your ability to finish the test.

3.0   Diagnostic Test

3.0 Diagnostic Test

Like the practice sections later in the book, the Diagnostic Test uses questions from real GMAT® exams. The purpose of the Diagnostic Test is to help you determine how skilled you are in answering each of the five types of questions on the GMAT exam: problem solving, data sufficiency, reading comprehension, critical reasoning, and sentence correction.

Scores on the Diagnostic Test are designed to help you answer the question, "If all the questions on the GMAT exam were like the questions in this section, how well would I do?" Your scores are classified as being *excellent, above average, average,* or *below average,* relative to the scores of other test-takers. You can use this information to focus your test-preparation activities.

Instructions

1. Take your time answering these questions. The Diagnostic Test is not timed.

2. If you are stumped by a question, you should guess and move on, just like you should do on the real GMAT exam.

3. You can take one segment at a time, if you want. It is better to finish an entire section (Quantitative or Verbal) in one sitting, but this is not a requirement.

4. You can go back and change your answers in the Diagnostic Test.

5. After you take the test, check your answers using the answer key that follows the test. The number of correct answers is your raw score.

6. Convert your raw score, using the table provided.

Note: The Diagnostic Test is designed to give you guidance on how to prepare for the GMAT exam; however, a strong score on one type of question does not guarantee that you will perform as well on the real GMAT exam. The statistical reliability of scores on the Diagnostic Test ranges from 0.75 to 0.89, and the subscale classification is about 85%–90% accurate, meaning that your scores on the Diagnostic Test are a good, but not perfect, measure of how you are likely to perform on the real test. Use the tests on the free online software to obtain a good estimate of your expected GMAT Verbal, Quantitative, and Total scores.

You should not compare the number of questions you got right in each section. Instead, you should compare how your responses are rated in each section.

3.1 Quantitative Questions

Problem Solving

Solve the problem and indicate the best of the answer choices given.

Numbers: All numbers used are real numbers.

Figures: All figures accompanying problem solving questions are intended to provide information useful in solving the problems. Figures are drawn as accurately as possible. Exceptions will be clearly noted. Lines shown as straight are straight, and lines that appear jagged are also straight. The positions of points, angles, regions, etc., exist in the order shown, and angle measures are greater than zero. All figures lie in a plane unless otherwise indicated.

1. Last month a certain music club offered a discount to preferred customers. After the first compact disc purchased, preferred customers paid $3.99 for each additional compact disc purchased. If a preferred customer purchased a total of 6 compact discs and paid $15.95 for the first compact disc, then the dollar amount that the customer paid for the 6 compact discs is equivalent to which of the following?

   (A) $5(4.00) + 15.90$
   (B) $5(4.00) + 15.95$
   (C) $5(4.00) + 16.00$
   (D) $5(4.00 - 0.01) + 15.90$
   (E) $5(4.00 - 0.05) + 15.95$

2. The average (arithmetic mean) of the integers from 200 to 400, inclusive, is how much greater than the average of the integers from 50 to 100, inclusive?

   (A) 150
   (B) 175
   (C) 200
   (D) 225
   (E) 300

3. The sequence a_1, a_2, a_3,...,a_n,... is such that $a_n = \dfrac{a_{n-1} + a_{n-2}}{2}$ for all $n \geq 3$. If $a_3 = 4$ and $a_5 = 20$, what is the value of a_6 ?

   (A) 12
   (B) 16
   (C) 20
   (D) 24
   (E) 28

4. Among a group of 2,500 people, 35 percent invest in municipal bonds, 18 percent invest in oil stocks, and 7 percent invest in both municipal bonds and oil stocks. If 1 person is to be randomly selected from the 2,500 people, what is the probability that the person selected will be one who invests in municipal bonds but NOT in oil stocks?

   (A) $\dfrac{9}{50}$
   (B) $\dfrac{7}{25}$
   (C) $\dfrac{7}{20}$
   (D) $\dfrac{21}{50}$
   (E) $\dfrac{27}{50}$

5. A closed cylindrical tank contains 36π cubic feet of water and is filled to half its capacity. When the tank is placed upright on its circular base on level ground, the height of the water in the tank is 4 feet. When the tank is placed on its side on level ground, what is the height, in feet, of the surface of the water above the ground?

   (A) 2
   (B) 3
   (C) 4
   (D) 6
   (E) 9

6. A marketing firm determined that, of 200 households surveyed, 80 used neither Brand A nor Brand B soap, 60 used only Brand A soap, and for every household that used both brands of soap, 3 used only Brand B soap. How many of the 200 households surveyed used both brands of soap?

   (A) 15
   (B) 20
   (C) 30
   (D) 40
   (E) 45

7. A certain club has 10 members, including Harry. One of the 10 members is to be chosen at random to be the president, one of the remaining 9 members is to be chosen at random to be the secretary, and one of the remaining 8 members is to be chosen at random to be the treasurer. What is the probability that Harry will be either the member chosen to be the secretary or the member chosen to be the treasurer?

   (A) $\dfrac{1}{720}$

   (B) $\dfrac{1}{80}$

   (C) $\dfrac{1}{10}$

   (D) $\dfrac{1}{9}$

   (E) $\dfrac{1}{5}$

8. If a certain toy store's revenue in November was $\dfrac{2}{5}$ of its revenue in December and its revenue in January was $\dfrac{1}{4}$ of its revenue in November, then the store's revenue in December was how many times the average (arithmetic mean) of its revenues in November and January?

   (A) $\dfrac{1}{4}$

   (B) $\dfrac{1}{2}$

   (C) $\dfrac{2}{3}$

   (D) 2

   (E) 4

9. A researcher computed the mean, the median, and the standard deviation for a set of performance scores. If 5 were to be added to each score, which of these three statistics would change?

   (A) The mean only
   (B) The median only
   (C) The standard deviation only
   (D) The mean and the median
   (E) The mean and the standard deviation
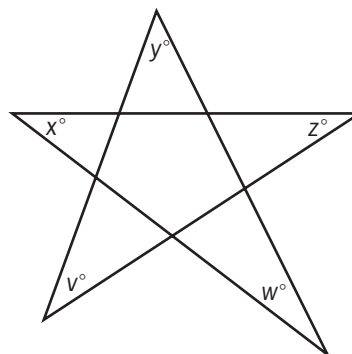
10. In the figure shown, what is the value of $v + x + y + z + w$?

   (A)   45
   (B)   90
   (C)   180
   (D)   270
   (E)   360

11. Of the three-digit integers greater than 700, how many have two digits that are equal to each other and the remaining digit different from the other two?

   (A) 90
   (B) 82
   (C) 80
   (D) 45
   (E) 36

12. Positive integer y is 50 percent of 50 percent of positive integer x, and y percent of x equals 100. What is the value of x ?

   (A)   50
   (B)   100
   (C)   200
   (D) 1,000
   (E) 2,000

13. If s and t are positive integers such that $\frac{s}{t} = 64.12$, which of the following could be the remainder when s is divided by t ?

   (A)   2
   (B)   4
   (C)   8
   (D) 20
   (E) 45

14. Of the 84 parents who attended a meeting at a school, 35 volunteered to supervise children during the school picnic and 11 volunteered both to supervise children during the picnic and to bring refreshments to the picnic. If the number of parents who volunteered to bring refreshments was 1.5 times the number of parents who neither volunteered to supervise children during the picnic nor volunteered to bring refreshments, how many of the parents volunteered to bring refreshments?

   (A) 25
   (B) 36
   (C) 38
   (D) 42
   (E) 45

15. The product of all the prime numbers less than 20 is closest to which of the following powers of 10 ?

   (A) 10^9
   (B) 10^8
   (C) 10^7
   (D) 10^6
   (E) 10^5

16. If $\sqrt{3-2x} = \sqrt{2x}+1$, then $4x^2 =$

   (A) 1
   (B) 4
   (C) $2-2x$
   (D) $4x-2$
   (E) $6x-1$

17. If $n = \sqrt{\dfrac{16}{81}}$, what is the value of $\sqrt{n}$?

   (A) $\dfrac{1}{9}$
   (B) $\dfrac{1}{4}$
   (C) $\dfrac{4}{9}$
   (D) $\dfrac{2}{3}$
   (E) $\dfrac{9}{2}$

18. If n is the product of the integers from 1 to 8, inclusive, how many different prime factors greater than 1 does n have?

   (A) Four
   (B) Five
   (C) Six
   (D) Seven
   (E) Eight

19. If k is an integer and $2 < k < 7$, for how many different values of k is there in a triangle with sides of lengths 2, 7, and k ?

   (A) One
   (B) Two
   (C) Three
   (D) Four
   (E) Five

20. A right circular cone is inscribed in a hemisphere so that the base of the cone coincides with the base of the hemisphere. What is the ratio of the height of the cone to the radius of the hemisphere?

    (A) $\sqrt{3}:1$
    (B) $1:1$
    (C) $\frac{1}{2}:1$
    (D) $\sqrt{2}:1$
    (E) $2:1$

21. John deposited $10,000 to open a new savings account that earned 4 percent annual interest, compounded quarterly. If there were no other transactions in the account, what was the amount of money in John's account 6 months after the account was opened?

    (A) $10,100
    (B) $10,101
    (C) $10,200
    (D) $10,201
    (E) $10,400

22. A container in the shape of a right circular cylinder is $\frac{1}{2}$ full of water. If the volume of water in the container is 36 cubic inches and the height of the container is 9 inches, what is the diameter of the base of the cylinder, in inches?

    (A) $\dfrac{16}{9\pi}$
    (B) $\dfrac{4}{\sqrt{\pi}}$
    (C) $\dfrac{12}{\sqrt{\pi}}$
    (D) $\sqrt{\dfrac{2}{\pi}}$
    (E) $4\sqrt{\dfrac{2}{\pi}}$

23. If the positive integer x is a multiple of 4 and the positive integer y is a multiple of 6, then xy must be a multiple of which of the following?

    I.   8
    II. 12
    III. 18

    (A) II only
    (B) I and II only
    (C) I and III only
    (D) II and III only
    (E) I, II, and III

24. Aaron will jog from home at x miles per hour and then walk back home by the same route at y miles per hour. How many miles from home can Aaron jog so that he spends a total of t hours jogging and walking?

    (A) $\dfrac{xt}{y}$
    (B) $\dfrac{x+t}{xy}$
    (C) $\dfrac{xyt}{x+y}$
   (D) $\dfrac{x+y+t}{xy}$
    (E) $\dfrac{y+t}{x} - \dfrac{t}{y}$

Data Sufficiency

Each data sufficiency problem consists of a question and two statements, labeled (1) and (2), which contain certain data. Using these data and your knowledge of mathematics and everyday facts (such as the number of days in July or the meaning of the word *counterclockwise*), decide whether the data given are sufficient for answering the question and then indicate one of the following answer choices:

A   Statement (1) ALONE is sufficient, but statement (2) alone is not sufficient.
B   Statement (2) ALONE is sufficient, but statement (1) alone is not sufficient.
C   BOTH statements TOGETHER are sufficient, but NEITHER statement ALONE is sufficient.
D   EACH statement ALONE is sufficient.
E   Statements (1) and (2) TOGETHER are not sufficient.

Note: In data sufficiency problems that ask for the value of a quantity, the data given in the statements are sufficient only when it is possible to determine exactly one numerical value for the quantity.

Example:
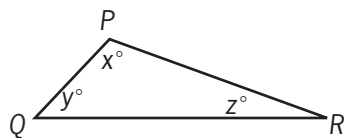
In $\triangle PQR$, what is the value of x ?

(1) $PQ = PR$
(2) $y = 40$

Explanation: According to statement (1) $PQ = PR$; therefore, $\triangle PQR$ is isosceles and $y = z$. Since $x + y + z = 180$, it follows that $x + 2y = 180$. Since statement (1) does not give a value for y, you cannot answer the question using statement (1) alone. According to statement (2), $y = 40$; therefore, $x + z = 140$. Since statement (2) does not give a value for z, you cannot answer the question using statement (2) alone. Using both statements together, since $x + 2y = 180$ and the value of y is given, you can find the value of x. Therefore, BOTH statements (1) and (2) TOGETHER are sufficient to answer the question, but NEITHER statement ALONE is sufficient.

Numbers: All numbers used are real numbers.

Figures:
- Figures conform to the information given in the question, but will not necessarily conform to the additional information given in statements (1) and (2).
- Lines shown as straight are straight, and lines that appear jagged are also straight.
- The positions of points, angles, regions, etc., exist in the order shown, and angle measures are greater than zero.
- All figures lie in a plane unless otherwise indicated.

25. If the units digit of integer n is greater than 2, what is the units digit of n ?

    (1) The units digit of n is the same as the units digit of n^2.
    (2) The units digit of n is the same as the units digit of n^3.

26. What is the value of the integer p ?

    (1) Each of the integers 2, 3, and 5 is a factor of p.
    (2) Each of the integers 2, 5, and 7 is a factor of p.

27. If the length of Wanda's telephone call was rounded up to the nearest whole minute by her telephone company, then Wanda was charged for how many minutes for her telephone call?

    (1) The total charge for Wanda's telephone call was $6.50.
    (2) Wanda was charged $0.50 more for the first minute of the telephone call than for each minute after the first.

28. What is the perimeter of isosceles triangle MNP ?

    (1) $MN = 16$
    (2) $NP = 20$

29. In a survey of retailers, what percent had purchased computers for business purposes?

    (1) 85 percent of the retailers surveyed who owned their own store had purchased computers for business purposes.
    (2) 40 percent of the retailers surveyed owned their own store.

30. The only gift certificates that a certain store sold yesterday were worth either $100 each or $10 each. If the store sold a total of 20 gift certificates yesterday, how many gift certificates worth $10 each did the store sell yesterday?

    (1) The gift certificates sold by the store yesterday were worth a total of between $1,650 and $1,800.
    (2) Yesterday the store sold more than 15 gift certificates worth $100 each.

31. Is the standard deviation of the set of measurements $x_1, x_2, x_3, x_4, \ldots, x_{20}$ less than 3 ?

    (1) The variance for the set of measurements is 4.
    (2) For each measurement, the difference between the mean and that measurement is 2.

32. Is the range of the integers 6, 3, y, 4, 5, and x greater than 9 ?

    (1) $y > 3x$
    (2) $y > x > 3$

33. Is $\dfrac{5^{x+2}}{25} < 1$?

    (1) $5^x < 1$
    (2) $x < 0$

34. Of the companies surveyed about the skills they required in prospective employees, 20 percent required both computer skills and writing skills. What percent of the companies surveyed required neither computer skills nor writing skills?

    (1) Of those companies surveyed that required computer skills, half required writing skills.
    (2) 45 percent of the companies surveyed required writing skills but not computer skills.

35. What is the value of $w + q$?

    (1) $3w = 3 - 3q$
    (2) $5w + 5q = 5$

36. If X and Y are points in a plane and X lies inside the circle C with center O and radius 2, does Y lie inside circle C ?

    (1) The length of line segment XY is 3.
    (2) The length of line segment OY is 1.5.

37. Is $x > y$?

    (1) $x = y + 2$
    (2) $\dfrac{x}{2} = y - 1$

38. If Paula drove the distance from her home to her college at an average speed that was greater than 70 kilometers per hour, did it take her less than 3 hours to drive this distance?

    (1) The distance that Paula drove from her home to her college was greater than 200 kilometers.
    (2) The distance that Paula drove from her home to her college was less than 205 kilometers.

39. In the xy-plane, if line k has negative slope and passes through the point $(-5,r)$, is the x-intercept of line k positive?

    (1) The slope of line k is -5.
    (2) $r > 0$

40. If $5,000 invested for one year at p percent simple annual interest yields $500, what amount must be invested at k percent simple annual interest for one year to yield the same number of dollars?

    (1) $k = 0.8p$
    (2) $k = 8$

41. If $\dfrac{x+y}{z} > 0$, is $x < 0$?

    (1) $x < y$
    (2) $z < 0$

42. Does the integer k have at least three different positive prime factors?

    (1) $\dfrac{k}{15}$ is an integer.
    (2) $\dfrac{k}{10}$ is an integer.

43. In City X last April, was the average (arithmetic mean) daily high temperature greater than the median daily high temperature?

    (1) In City X last April, the sum of the 30 daily high temperatures was 2,160°.
    (2) In City X last April, 60 percent of the daily high temperatures were less than the average daily high temperature.

44. If m and n are positive integers, is $\left(\sqrt{m}\right)^{n}$ an integer?

    (1) $\left(\sqrt{m}\right)$ is an integer.
    (2) $\left(\sqrt{n}\right)$ is an integer.

45. Of the 66 people in a certain auditorium, at most 6 people have their birthdays in any one given month. Does at least one person in the auditorium have a birthday in January?

    (1) More of the people in the auditorium have their birthday in February than in March.
    (2) Five of the people in the auditorium have their birthday in March.

46. Last year the average (arithmetic mean) salary of the 10 employees of Company X was $42,800. What is the average salary of the same 10 employees this year?

    (1) For 8 of the 10 employees, this year's salary is 15 percent greater than last year's salary.
    (2) For 2 of the 10 employees, this year's salary is the same as last year's salary.

47. In a certain classroom, there are 80 books, of which 24 are fiction and 23 are written in Spanish. How many of the fiction books are written in Spanish?

    (1) Of the fiction books, there are 6 more that are not written in Spanish than are written in Spanish.
    (2) Of the books written in Spanish, there are 5 more nonfiction books than fiction books.

48. If p is the perimeter of rectangle Q, what is the value of p ?

    (1) Each diagonal of rectangle Q has length 10.
    (2) The area of rectangle Q is 48.

3.2 Verbal Questions

Reading Comprehension

Each of the <u>reading comprehension</u> **questions is based on the content of a passage. After reading the passage, answer all questions pertaining to it on the basis of what is** <u>stated</u> **or** <u>implied</u> **in the passage. For each question, select the best answer of the choices given.**

Line   According to economic signaling theory, consumers may perceive the frequency with which an unfamiliar brand is advertised as a cue that the brand is of high quality. The notion that
(5)   highly advertised brands are associated with high-quality products does have some empirical support. Marquardt and McGann found that heavily advertised products did indeed rank high on certain measures of product quality. **Because**
(10)   **large advertising expenditures represent a significant investment on the part of a manufacturer, only companies that expect to recoup these costs in the long run, through consumers' repeat purchases of the product,**
(15)   **can afford to spend such amounts.**
       However, two studies by Kirmani have found that although consumers initially perceive expensive advertising as a signal of high brand quality, at some level of spending the manufacturer's
(20)   advertising effort may be perceived as unreasonably high, implying low manufacturer confidence in product quality. If consumers perceive excessive advertising effort as a sign of a manufacturer's desperation, the result may be less favorable
(25)   brand perceptions. In addition, a third study by Kirmani, of print advertisements, found that the use of color affected consumer perception of brand quality. Because consumers recognize that color advertisements are more expensive than
(30)   black and white, the point at which repetition of an advertisement is perceived as excessive comes sooner for a color advertisement than for a black-and-white advertisement.

1. Which of the following best describes the purpose of the sentence in lines 10–15 ?

    (A) To show that economic signaling theory fails to explain a finding

    (B) To introduce a distinction not accounted for by economic signaling theory

    (C) To account for an exception to a generalization suggested by Marquardt and McGann

    (D) To explain why Marquardt and McGann's research was conducted

    (E) To offer an explanation for an observation reported by Marquardt and McGann

2. The primary purpose of the passage is to

    (A) present findings that contradict one explanation for the effects of a particular advertising practice

    (B) argue that theoretical explanations about the effects of a particular advertising practice are of limited value without empirical evidence

    (C) discuss how and why particular advertising practices may affect consumers' perceptions

    (D) contrast the research methods used in two different studies of a particular advertising practice

    (E) explain why a finding about consumer responses to a particular advertising practice was unexpected

3. Kirmani's research, as described in the passage, suggests which of the following regarding consumers' expectations about the quality of advertised products?

    (A) Those expectations are likely to be highest if a manufacturer runs both black-and-white and color advertisements for the same product.

    (B) Those expectations can be shaped by the presence of color in an advertisement as well as by the frequency with which an advertisement appears.

    (C) Those expectations are usually high for frequently advertised new brands but not for frequently advertised familiar brands.

    (D) Those expectations are likely to be higher for products whose black-and-white advertisements are often repeated than for those whose color advertisements are less often repeated.

    (E) Those expectations are less definitively shaped by the manufacturer's advertisements than by information that consumers gather from other sources.

4. Kirmani's third study, as described in the passage, suggests which of the following conclusions about a black-and-white advertisement?

    (A) It can be repeated more frequently than a comparable color advertisement could before consumers begin to suspect low manufacturer confidence in the quality of the advertised product.

    (B) It will have the greatest impact on consumers' perceptions of the quality of the advertised product if it appears during periods when a color version of the same advertisement is also being used.

    (C) It will attract more attention from readers of the print publication in which it appears if it is used only a few times.

    (D) It may be perceived by some consumers as more expensive than a comparable color advertisement.

    (E) It is likely to be perceived by consumers as a sign of higher manufacturer confidence in the quality of the advertised product than a comparable color advertisement would be.

5. The passage suggests that Kirmani would be most likely to agree with which of the following statements about consumers' perceptions of the relationship between the frequency with which a product is advertised and the product's quality?

    (A) Consumers' perceptions about the frequency with which an advertisement appears are their primary consideration when evaluating an advertisement's claims about product quality.

    (B) Because most consumers do not notice the frequency of advertisement, it has little impact on most consumers' expectations regarding product quality.

    (C) Consumers perceive frequency of advertisement as a signal about product quality only when the advertisement is for a product that is newly on the market.

    (D) The frequency of advertisement is not always perceived by consumers to indicate that manufacturers are highly confident about their products' quality.

    (E) Consumers who try a new product that has been frequently advertised are likely to perceive the advertisement's frequency as having been an accurate indicator of the product's quality.