

# GRE Quantitative Reasoning

## OVERVIEW

- There are two sections with about 20 questions each.
- Each section should last about 35 minutes.
- An onscreen calculator is available. Even so, you should not become dependent upon it, as this is a reasoning test. The calculator is provided to help ensure accuracy, not for lengthy computations. Interpret the numbers and data using logic and critical thinking skills.
- There are three question types, so time should not be divided equally among them.

	Question Type per Section		
	Quantitative Comparison	Problem Solving	Data Interpretation
Number of Questions	7-8	9-10	~3
Minutes per Question	1.5	1.5-2	2

## TEST OF QUANTITATIVE REASONING SKILLS

- The test evaluates your ability to:
  - Understand elementary mathematical concepts and apply basic mathematical skills.
  - Read a math problem, understand what it's asking, and solve the problem.
  - Reason, using your own knowledge of the various topics.
  - Apply given information.
  - Think logically and draw conclusions.
  - Combine your knowledge of mathematical concepts with reasoning.
  - Compare quantities.
  - Solve word problems.
  - Interpret data in charts and graphs.
- The mathematical concepts on the GRE are similar to those on the SAT.
- Questions will relate to arithmetic, algebra, geometry, and data interpretation.
- There is no trigonometry, calculus, or other higher-level mathematics on the test.

## ARITHMETIC

Topics include integers, such as divisibility, factorization, prime numbers, remainders, and odd and even integers; arithmetic operations, exponents, and roots; and concepts such as estimation, percent, ratio, rate, absolute value, the number line, decimal representation, and sequences of numbers.

### Integers

#### Properties of Integers

- **Integer:** Number with no fraction or decimal.
- An integer can be positive, negative, or 0.

EX: -2, 0, 18

#### Identity Properties

- A number will not change when adding 0 to the number.

EX:  $8 + 0 = 8$     EX:  $y + 0 = y$

- A number will not change when multiplying it by 1.

EX:  $6 \times 1 = 6$     EX:  $y \times 1 = y$

#### Properties of Zero

- Any number multiplied by 0 is 0.
- If the product is 0, one or more of the factors must equal 0.

EX:  $a \times b \times c \times d = 0$      $a, b, c,$  or  $d$  must equal 0.

- If the product is not equal to 0, none of the factors equals 0.

EX:  $a \times b \times c \times d \neq 0$      $a, b, c,$  and  $d \neq 0$ .

#### Divisibility

- An integer is divisible by 2 if the last digit in the integer is divisible by 2.

EX: 8,542,634

4 is divisible by 2.

Therefore, 8,542,634 is divisible by 2.

- An integer is divisible by 3 if the sum of the digits in the integer is divisible by 3.

EX: 865,237

$8 + 6 + 5 + 2 + 3 + 7 = 31$ .

31 is divisible by 3.

Therefore, 865,237 is divisible by 3.

- An integer is divisible by 4 if the last digit in the integer is divisible by 4.

EX: 5,243,624

24 is divisible by 4.

Therefore, 5,243,624 is divisible by 4.

- An integer is divisible by 5 if the last digit in the integer is 0 or 5.

EX: 6,842,370

The last digit is 0.

Therefore, 6,842,370 is divisible by 5.

- An integer is divisible by 6 if the integer is divisible by both 2 and 3.

EX: 358,416

$3 + 5 + 8 + 4 + 1 + 6 = 27$

27 is divisible by 3.

6 is divisible by 2.

Therefore, 358,416 is divisible by 6.

- An integer is divisible by 9 if the sum of the digits in the integer is divisible by 9.

EX: 626,874

$6 + 2 + 6 + 8 + 7 + 4 = 27$

27 is divisible by 9.

Therefore, 626,874 is divisible by 9.

#### Odd & Even Integers

- A number is even if the last digit in the number is 0, 2, 4, 6, or 8.

EX: 6,584,298

The last digit of the number is 8.

Therefore, 6,584,298 is even.

- A number is odd if the last digit in the number is 1, 3, 5, 7, or 9.

EX: 2,651,869

The last digit of the number is 9.

Therefore, 2,651,869 is odd.

- An even integer can be represented as  $2k$ , where  $k$  is an integer.

- An odd integer can be represented as  $2k + 1$  or  $2k - 1$ , where  $k$  is an integer.

#### Rules for Adding & Multiplying Odd & Even Numbers

1. Odd + Odd = Even
2. Even + Even = Even
3. Odd + Even = Odd
4. Odd × Odd = Odd
5. Even × Even = Even
6. Odd × Even = Even

#### Prime Numbers & Factors

- Factors of an integer are integers that can be divided evenly into the integer.

EX: The factors of 24 are 1, 2, 3, 4, 6, 8, 12, and 24.

- **Prime number:** Number that can only be divided evenly by itself and 1.

EX: 19 is a prime number.

- The prime numbers up to twenty are 2, 3, 5, 7, 11, 13, 17, and 19.

- 0 and 1 are never prime numbers.

- 2 is the only even prime number.

#### Least Common Multiple

- The least common multiple of two or more numbers is the smallest number that is a multiple of each of the original numbers.

EX: The least common multiple of 3 and 13 is 39.

The multiples of 3 are 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, etc.

The multiples of 13 are 13, 26, 39, etc.

39 is the smallest number that intersects these lists.

#### Exponents

- When multiplying two numbers with the same base, add the exponents.

EX:  $8^2 \times 8^2 = 8 \times 8 \times 8 \times 8 \times 8 \times 8 \times 8 \times 8$

- When dividing two numbers with the same base, subtract the exponents.

EX:  $2^7 \div 2^2 = (2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2) \div (2 \times 2) = 2^5$

- When multiplying two numbers with the same exponent, multiply the bases.

EX:  $4^2 \times 5^2 = 4 \times 4 \times 4 \times 5 \times 5 \times 5 = 20^2$

- When raising a number to a negative exponent, remove the negative sign and divide 1 by the number. This is also known as taking the reciprocal of the number.

EX:  $3^{-1} = 1 \div 3^1 = 1 \div 3 = \frac{1}{3}$

#### Properties of Exponents

- Raising a number greater than 1 to a positive integer exponent will produce a bigger number, while raising a number less than 1 to a positive integer exponent will produce a smaller number.

EX:  $4^2 = 4 \times 4 = 4 \times 4 = 16$

EX:  $25^2 = .25 \times .25 \times .25 \times .25 \times .25 = 0.0009765625$

- Any number not equal to 0 raised to an even power will be positive.

EX:  $3^2 = 3 \times 3 = 3 \times 3 = 9$

EX:  $(-3)^2 = -3 \times -3 = -3 \times -3 = 9$

- 0 raised to any exponent except for 0 equals 0.

EX:  $0^2 = 0 \times 0 = 0 \times 0 = 0$

- Any number except for 0 raised to the 0 equals 1.

EX:  $4^0 = 1$

#### Order of Operations

##### Parentheses, Exponents, Multiplication, Division, Addition, Subtraction

- Calculations inside parentheses should be performed first.

- All exponents should then be calculated.

- Next, do multiplication and division, moving from left to right.

- Then, do addition and subtraction, moving from left to right.

EX:  $5 + (6 \times 4 - 3) - 13$

Perform multiplication inside the parentheses:

$5 + (24 - 3) - 13$

Subtract inside the parentheses:  $5 + 21 - 13$

Add:  $26 - 13$

Subtract: 13

#### Scientific Notation

- To convert a number to scientific notation, break the number into two factors. The first factor is a number greater than or equal to 1 and less than 10. The second factor is 10 raised to an integer exponent.

EX: 65,000,000 in scientific notation is  $6.5 \times 10^7$

# Gre Study Guide

**M Carnoy**



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