GED Test Prep — MATHEMATICAL REASONING

Every mathematical concept covered on the exam with examples to boost your score

Overview

- There are 46 questions: 5 with a calculator not permitted, and 41 with a calculator allowed.
- The duration of the exam is 115 minutes.
- About 45% of the questions cover arithmetic and geometry, and 55% cover algebraic reasoning and data interpretation.

- Most questions use the multiple-choice format. Some questions are fill-in-the-blank, drop-box, drag and drop, and select an area.
- The test will provide several formulas in a reference section.
- There is no trigonometry or calculus on this test.
- Successful test takers can be

- certified as college ready and can earn up to 10 college hours.
- This measures your knowledge of:
  - Basic arithmetic, including the order of operations, fractions, decimals, and percents
  - Simple and multi-step equations
  - Creating equations based on word problem scenarios

- Ratios and proportions as tools to predict outcomes.
- Graphing linear and quadratic equations in the coordinate plane.
- Calculating the perimeter and area of plane figures, such as circles, squares, rectangles, trapezoids, and triangles.

- Finding the surface area and volume of three-dimensional figures.
- Interpreting data from charts and tables.
- Finding the mean, median, mode, and range of data sets.
- Modeling real-life situations using linear functions.

Arithmetic

Topics include the real number system, operations with real numbers, signed numbers, properties of exponents, the order of operations, absolute value, scientific notation, fractions, mixed numbers and improper fractions, decimals, converting fractions into decimals and decimals into fractions, understanding percents as fractions, and simple interest problems.

The Real Number System

The real number system consists of counting numbers, whole numbers, integers, and rational/irrational numbers.

- **Counting/Natural numbers:** Numbers beginning with 1 that do not include fractions or decimals.
  - EX: 1, 2, 3, 4, …

- **Whole numbers:** Numbers beginning with 0 that do not include fractions or decimals.
  - EX: 0, 1, 2, 3, …

- **Integers:** Any number, positive, negative or 0, that does not contain a fraction or decimal.
  - EX: −2, −1, 0, 1, 2 …

- **Rational numbers:** Numbers that can be expressed as a fraction or decimal. When containing a decimal component, the number must terminate or repeat a pattern.
  - EX: $5.2, 6\frac{1}{2}, \frac{3}{11}, 5.222…, -\frac{8}{1}$

- **Irrational numbers:** Numbers that do not terminate or repeat a pattern.
  - EX: $\pi(3.14159…), \sqrt{7}$ $(2.645751…)$

Operations with Real Numbers

Operations include addition, subtraction, multiplication, and division.

The results of mathematical operations have special names:

- **Addition:** Sum
- **Subtraction:** Difference
- **Multiplication:** Product
- **Division:** Quotient

Operations can be written vertically or horizontally.

- **Addition:**
$$9 + 8 = 17$$

- **Subtraction:**
$$100 - 54 = 46$$

- **Multiplication:**
$$19 \times 6 = 114$$

- **Division:**
$$729 \div 27 = 27$$

Arithmetic operations can be time-consuming. When permitted, perform arithmetic operations using the online calculator.

Absolute Value

The **absolute value** of a number is its distance from 0 on a number line. The symbol for absolute value is | |.

- EX: $|7| = 7$ and $|-7| = 7$

7 and −7 are both 7 units away from 0 on a number line.

Signed Numbers

Numbers can be positive or negative. Zero (0) is neither negative nor positive.

A positive number plus a positive number is positive.

- EX: $107 + 79 = 186$

A positive number plus a negative number can be positive or negative.

- EX: $132 - 26 = 106$
  $-132 + 26 = -106$

When multiplying an even number of negative numbers, the answer is positive. When multiplying an odd number of negative numbers, the answer is negative.

- EX: $-12 \times -13 = 156$
  $-5 \times -6 \times -11 = -330$

When dividing an even number of negative numbers, the answer is positive. When dividing an odd number of negative numbers, the answer is negative.

- EX: $-225 \div -9 = 25$
  $-200 \div -5 \div -4 = -10$

Properties of Exponents

An **exponent**, also known as a power, is a small raised number that indicates how often a number is multiplied by itself.

- EX: 7^3

7 is the base and 3 is the exponent.

$$7^3 = 7 \times 7 \times 7 = 343$$

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

- EX: $2^3 \times 2^2 = 2^{3+2} = 2^5 = 32$

When raising an exponent to another exponent, multiply the exponents.

- EX: $(2^2)^4 = 2^{2 \times 4} = 2^8 = 256$

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

- EX: $5^7 \div 5^5 = 5^{7-5} = 5^2 = 25$

The Order of Operations

The order of operations can be remembered as PEMDAS: Parentheses, Exponents, Multiplication, Division, Addition, Subtraction.

When a line of calculations contains only multiplication and division, or addition and subtraction, proceed from left to right.

- EX: $5(9 - 4)^2 + 12 \div 4 = 5 \times 125 \div 3 = 628$

Scientific Notation

Scientific notation expresses numbers as powers of 10. Move the decimal point to the left or right until you have a number greater than or equal to 1 and less than 10. If you move the decimal point to the left, add that many powers of 10. If you move the decimal point to the right, subtract that many powers of 10.

- EX: $453.7 = 4.537 \times 10^2$
  $.00598 = 5.98 \times 10^{-3}$

Fractions

The top number of a fraction is the **numerator** and the bottom number is the **denominator**. In the fraction $\frac{7}{9}$, 7 is the numerator and 9 is the denominator.

When adding or subtracting fractions with the same denominator, add or subtract the numerators and keep the same denominator.

- EX: $\frac{3}{11} + \frac{5}{11} = \frac{8}{11}$

$$\frac{13}{17} - \frac{7}{17} = \frac{6}{17}$$

When adding or subtracting fractions with different denominators, create fractions with the same denominator.

- EX: $\frac{2}{3} + \frac{1}{5}$

$$\frac{2}{3} = \frac{10}{15} \qquad \frac{1}{5} = \frac{3}{15}$$

$$\frac{10}{15} + \frac{3}{15} = \frac{13}{15}$$

When multiplying fractions, first multiply numerators and then the denominators. Simplify if needed.

- EX: $\frac{3}{10} \times \frac{5}{9} = \frac{15}{90}$

$$\frac{15}{90} = \frac{15 \div 15}{90 \div 15} = \frac{1}{6}$$

When dividing fractions, invert the second fraction and multiply.

- EX: $\frac{4}{3} \div \frac{8}{9} = \frac{4}{3} \times \frac{9}{8} = \frac{9}{24} = \frac{3}{8}$

The fractions $\frac{8}{9}$ and $\frac{9}{8}$ are called reciprocals.

Mixed Numbers & Improper Fractions

A **mixed number** is an integer with a fraction component.

- EX: $7\frac{2}{3}$

An **improper fraction** is one in which the numerator exceeds the denominator.

- EX: $\frac{13}{9}$

A mixed number can be converted to an improper fraction by multiplying the denominator by the whole number and adding the numerator. Remember to keep the original denominator.

- EX: $7\frac{2}{3} = \frac{3 \times 7 + 2}{3} = \frac{23}{3}$

An improper fraction can be converted to a mixed number by dividing the numerator by the denominator. Any remainder becomes a fraction with the original denominator.

- EX: $18 \div 11 = 1$ remainder 7

$$\frac{18}{11} = 1\frac{7}{11}$$

Many fraction questions can be solved quickly using the GED's online calculator. View the GED Testing Service video to learn how to use the online calculator at https://www.youtube.com/watch?v=...

Decimals

A **decimal** is a fraction with a denominator of some power of 10.

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