GRE Math Skills

BASIC OPERATIONS | ESSENTIAL FORMULAS | FUNCTIONS | GEOMETRY

PEMDAS

Parentheses first, then **Exponents**, then **Multiplication** and **Division** (left to right), and lastly **Addition** and **Subtraction** (left to right).

Median and Mode

The median is the **value that falls in the middle of the set**.

The mode is the **value that appears most often**.

Counting the Possibilities

If there are ***m* ways** one event can happen and ***n* ways** a second event can happen, then there are ***m* × *n* ways** for the 2 events to happen.

ESSENTIAL FORMULAS

Average Rate Formula

$$\text{Average A per B} = \frac{\text{Total } A}{\text{Total } B}$$

$$\text{Average Speed} = \frac{\text{Total distance}}{\text{Total time}}$$

Percent Formula

Part = Percent × Whole

Average Formula

$$\text{Average} = \frac{\text{Sum of the terms}}{\text{Number of terms}}$$

Probability Formula

$$\text{Probability} = \frac{\text{Favorable Outcomes}}{\text{Total Possible Outcomes}}$$

Multiplying and Dividing Powers

To multiply powers with the same base, **add the exponents and keep the same base**.

To divide powers with the same base, **subtract the exponents and keep the same base**.

Raising Powers to Powers

To raise a power to a power, **multiply the exponents**.

Negative Exponent and Rational Exponent

$$x^{-n} = \frac{1}{x^n} \qquad x^{\frac{1}{n}} = \sqrt[n]{x}$$

FUNCTIONS

Direct and Inverse Variation

In direct variation, $y = kx$, where k is a nonzero constant.
In inverse variation, $xy = k$, where k is a constant.

Domain and Range of a Function

The domain of a function is the set of values for which the function is defined.

Determining Absolute Value

The absolute value of a number is the distance of the number from zero on the number line.

Multiplying Binomials—FOIL

To multiply binomials, use **FOIL**. First multiply the **F**irst terms. Next the **O**uter terms. Then the **I**nner terms. And finally the **L**ast terms. Then add and combine like terms.

Factoring the Difference of Squares

$$a^2 - b^2 = (a - b)(a + b)$$

Factoring the Square of a Binomial

$$a^2 + 2ab + b^2 = (a + b)^2 \qquad a^2 - 2ab + b^2 = (a - b)^2$$

Quadratic Equation

$$ax^2 + bx + c = 0$$

Finding the Distance Between Two Points

$$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$

Solving an Inequality

When you **multiply or divide both sides by a negative number**, you must **reverse the sign**.

Using Two Points to Find the Slope

$$\text{Slope} = \frac{\text{Change in } y}{\text{Change in } x} = \frac{\text{Rise}}{\text{Run}}$$

Using an Equation to Find the Slope (slope-intercept)

$$y = mx + b$$

Finding the Midpoint

If the endpoints are (x_1, y_1) and (x_2, y_2), the midpoint is:

$$\left(\frac{(x_1 + x_2)}{2}, \frac{(y_1 + y_2)}{2}\right)$$

Intersecting Lines

When two lines intersect, **adjacent angles are supplementary and vertical angles are equal**.

Kaplan's 5-step Method for Quantitative Comparisons

Step 1. Compare piece by piece.
Step 2. Make one column look like the other.
Step 3. Do the same thing to both columns.
Step 4. Pick numbers.
Step 5. Redraw the diagram.

GEOMETRY

Interior and Exterior Angles of a Triangle

The 3 angles of any triangle **add up to 180 degrees**.
The 3 exterior angles of a triangle add up to **360 degrees**.

Area of a Triangle

$$\text{Area of Triangle} = \frac{1}{2}(\text{base})(\text{height})$$

Pythagorean Theorem

For all right triangles: $(\text{leg}_1)^2 + (\text{leg}_2)^2 = (\text{hypotenuse})^2$

Special Right Triangles

The 3-4-5 Triangle
The 30-60-90 Triangle
The 5-12-13 Triangle
The 45-45-90 Triangle

Area of a Rectangle

Area of Rectangle = length × width

Area of a Parallelogram

Area of Parallelogram = base × height

Area of a Square

$$\text{Area of Square} = (\text{side})^2$$

Circumference of a Circle

Circumference = $2\pi r$

Length of an Arc

If n is the degree measure of the arc's central angle, then the formula is:

$$\text{Length of an Arc} = 1\left(\frac{n}{360}\right)(2\pi r)$$

Area of a Circle

$$\text{Area of a Circle} = \pi r^2$$

Area of a Sector

If n is the degree measure of the sector's central angle, then the formula is:

$$\text{Area of a Sector} = 1\left(\frac{n}{360}\right)(\pi r^2)$$

Interior Angles of a Polygon

The sum of the measures of the interior angles of a polygon = $(n - 2) \times 180$, where n is the number of sides.

Surface Area of a Rectangular Solid

$$\text{Surface Area} = 2lw + 2wh + 2lh$$

Volume of a Rectangular Solid

$$\text{Volume of a Rectangular Solid} = lwh$$
$$\text{Volume of a Cube} = \ell^3$$

Volume of a Cylinder

$$\text{Volume of a Cylinder} = \pi r^2 h$$

GRE Verbal Skills

KAPLAN'S PROVEN METHODS | ANALYTICAL WRITING TIPS | WORD ROOTS

4-step Method for Reading Comprehension

Step 1: Attack the first third of the question.

Step 2: Create a mental roadmap.

Step 3: Stop to sum up.

Step 4: Attack the questions.

4-step Method for Sentence Completions

Step 1: Read for clue words.

Step 2: Predict the answer.

Step 3: Select the best match.

Step 4: Read your selection in the sentence.

ANALOGY TIPS

4-step Method for Analogies

Step 1: Find a strong bridge between the stem words.

Step 2: Plug the answer choices into the bridge.

Step 3: Adjust the bridge as necessary.

Step 4: Eliminate all answer choices with weak bridges. If two choices have the same bridge, eliminate them both.

5 Classic Analogy Bridges

1. Definition
   Example: PLATITUDE : TRITE
2. Function/purpose
   Example: MONEY : VAULT
3. Lack
   Example: LUCID : OBSCURITY
4. Characteristic actions/items
   Example: PIROUETTE : DANCER
5. Degree (often to an extreme)
   Example: ATTENTIVE: RAPT

4-step Method for Antonyms

Step 1: Define the root word.

Step 2: Reverse it by thinking about the word's opposite.

Step 3: Find the choice that matches your preconceived notion of the choice.

Step 4: Eliminate any choices you can and guess among those remaining.

WORD ROOT LIST

If you don't have much time to spend on vocabulary, word roots can get you through the most commonly tested GRE words. Here are some samples:

A, AN—not, without
• amoral, anarchy

AC, ACR—sharp, sour
• acute, acrid

AMBI, AMPHI—both
• ambiguous, amphibious

AMBL, AMBUL—walk
• amble, ambulatory

AUD—hear
• audio

BENE, BEN—good
• benefactor, benign

BIO—life
• biology

CARN—flesh
• carnage

CEDE, CESS—yield, go
• cessation, secede

CO, COM, CON—with, together
• cogent, compliant, consensus

CURR, CURS—run
• current, precursor

DE—down, out, apart
• debilitate, deride

DEMO, DEM—people
• democrat, demagogue

DUC, DUCT—lead
• induce, conduct

EGO—self
• egoist

EN, EM—in, into
• enter, embroil

EU—well, good
• euphemism

FAL, FALS—deceive
• infallible, false

FORE—before
• forecast

FRAG, FRAC—break
• fragment, fracture

GRAPH, GRAM—writing
• biography, grammar

GRAT—pleasing
• gratitude

HELIO, HELI—sun
• heliocentric, perihelion

HOL—whole
• holocaust

INTRA, INTR—within
• intravenous, intrinsic

JECT, JET—throw
• trajectory, jettison

JUD—judge
• judicious

LAT—side
• lateral

LING, LANG—tongue
• lingo, language

MACRO—great
• macrocosm

MAL—bad
• maladroit

MEM, MIN—remember
• memento, reminisce

MIT, MISS—send
• transmit, missive

NAU, NAV—ship, sailor
• nautical, circumnavigate

NEO—new
• neoclassical

OB—against
• obsequious

OMNI—all
• omnipotent

PAC—peace
• pacifist

PHON—sound
• phonograph

POT—drink
• potable

QUAD, QUAR, QUAT—four
• quadrant, quarantine, quaternary

QUIE—quiet
• acquiesce

RETRO—backward
• retrospective

RID, RIS—laugh
• ridiculous, derision

SED, SID—sit
• sedentary, residence

SEN—old
• senior

SYN, SYM—together
• synthesis, symbiosis

TACIT, TIC—silent
• tacit, reticent

TERM—end
• terminal

TORT—twist
• distort

TOX—poison
• toxic

UNI, UN—one
• unify, unanimous

URB—city
• urban

VAC—empty
• evacuate

VOLV, VOLUT—turn, roll
• revolve, convoluted

VOR—eat
• voracious

ESSAY-WRITING (AWA) SKILLS

For an Issue Essay:

1. Take the issue apart.
   • Determine the conclusion and the (offered or implied) counterconclusion.
   • Consider the circumstances under which the conclusion would be true/untrue.
2. Select the points you will make.
   • Decide whether to agree or disagree, naming two to four reasons.
3. Organize.
   • In paragraph 1, restate the issue, agree/disagree, and state two to four reasons.
   • In the next two to four paragraphs, elaborate, using evidence, testimony, and anecdotes.
   • In the second-to-last paragraph, present and refute an alternative argument.
   • In the last paragraph, summarize your points.
4. Type your essay.
5. Proofread.

For an Argument Essay:

1. Take the argument apart.
   • Determine the conclusion, evidence, and assumptions.
   • Consider the circumstances under which the assumptions are valid/invalid.
   • Consider what would strengthen/weaken the argument.
2. Select the points you will make.
   • Decide which weaknesses/strengths of the argument are critical, and for which of those you can marshal evidence.
3. Organize.
   • In paragraph 1, demonstrate that you understand the argument, list weaknesses, and describe what could strengthen the argument.
   • In paragraph 2, detail assumptions on which the argument hinges, describe what would be required to validate the assumptions, and list gaps between existing evidence and what's necessary.
   • In paragraph 3, discuss poorly defined terms and their effect on the argument.
   • In the last paragraph, discuss what could strengthen the argument and summarize your points.
4. Type your essay.
5. Proofread.

5 Tips for Writing a Great AWA Essay

1. Use transitional phrases.
2. Try not to misspell words.
3. Vary the structure of your sentences.
4. Vary word choice.
5. When critiquing an argument: analyze the strength of the evidence presented, point out unwarranted assumptions, and present neglected alternatives. When constructing your own argument: make your points of evidence specific and defensible, avoid unwarranted assumptions, and anticipate your opposition by providing a refutation of the strongest point against your own argument.