MasterLeap Tuition GMAT formula sheet

SECTION 1: GMAT QUANT OVERVIEW

Exam Format

Aspect	Details
Total Questions	21 questions
Time Allocation	45 minutes
Score Range	60-90
Question Types	Problem Solving only
Calculator	Not permitted

Topics Covered

- Arithmetic (Percentages, Ratios, Averages)
- Algebra (Linear equations, Quadratic equations)
- Number Properties (Divisibility, Prime numbers, Factors)
- Word Problems
- Note: Geometry has been removed from GMAT Focus Edition

SECTION 2: NUMBER PROPERTIES

Divisibility Rules

Divisible By	Rule
2	Last digit is even (0,2,4,6,8)
3	Sum of digits is divisible by 3
4	Last two digits are divisible by 4
5	Last digit is 0 or 5
6	Divisible by both 2 and 3
8	Last three digits are divisible by 8
9	Sum of digits is divisible by 9
10	Last digit is 0

Prime Numbers

- Definition: Positive integer >1 with exactly two factors (1 and itself)
- First few primes: 2, 3, 5, 7, 11, 13, 17, 19, 23, 29
- Note: 1 is NOT prime, 2 is the ONLY even prime

Factors and Multiples

- Factor: Divides evenly into an integer (e.g., factors of 8: 1,2,4,8)
- Multiple: Integer × any integer (e.g., multiples of 8: 8,16,24,32...)
- 0 is a multiple of every number

Greatest Common Factor (GCF) / Least Common Multiple (LCM)

- GCF: Largest divisor of two or more integers
- LCM: Smallest multiple of two or more integers
- Relationship: For any two positive integers a and b:
    - $a \times b = GCF(a,b) \times LCM(a,b)$

Prime Factorization

- Express a number as product of prime factors
- Example: $84 = 2^2 \times 3 \times 7$

Remainder Formula

- Dividend = Divisor × Quotient + Remainder
- Or: Dividend = Multiple of Divisor + Remainder

Even and Odd Rules

Operation	Result
Odd + Odd	Even
Even + Even	Even
Odd + Even	Odd
Odd × Odd	Odd
Even × Even	Even
Odd × Even	Even

Sum of Two Primes

- If sum is odd → one prime must be 2
- If 2 cannot be one of the primes → sum must be even

Absolute Value

- Distance from zero on number line
- $|5| = 5$, $|-5| = 5$
- $|x| = x$ if $x \geq 0$, $|x| = -x$ if $x < 0$

Positive/Negative Rules

- Even number of negatives → positive result
- Odd number of negatives → negative result

SECTION 3: ARITHMETIC

Percentage Formulas

Formula	Expression
Percentage	(Part/Whole) × 100
Percent Change	[(New - Old)/Old] × 100
Percent Increase	[(Increase)/Original] × 100
Percent Decrease	[(Decrease)/Original] × 100

Successive Percentage Change

- Two changes of a% and b%: Overall = a + b + (ab/100)

Ratios and Proportions

- Ratio: a : b = a/b
- Proportion: a/b = c/d
- Product of extremes = Product of means: ad = bc

Averages

Formula	Expression
Simple Average	Sum of values / Number of values
Weighted Average	$\sum$(Value × Weight) / $\sum$(Weight)

Numbers Added or Deleted

- Number added: New sum - Original sum
- Number deleted: Original sum - New sum

Fractions and Decimals

- 1/8 = 12.5%
- 1/6 = 16.67%
- 2/3 = 66.67%
- 5/6 = 83.33%
- 1/20 = 5%
- 1/25 = 4%

Powers and Roots

- $\sqrt{2} \approx 1.4$
- $\sqrt{3} \approx 1.7$
- $\sqrt{5} \approx 2.25$
- To multiply radicals: multiply outside numbers, then inside numbers
- $(6\sqrt{3})(2\sqrt{5}) = 12\sqrt{15}$

SECTION 4: ALGEBRA

Linear Equations

- Standard form: $ax + b = 0$
- Solution: $x = -b/a$

Quadratic Equations

- Standard form: $ax^2 + bx + c = 0$
- Quadratic formula: $x = [-b \pm \sqrt{(b^2 - 4ac)}] / 2a$

The Discriminant

- $D = b^2 - 4ac$
- $D > 0$: Two distinct real roots
- $D = 0$: One real root (double root)
- $D < 0$: No real roots

Essential Algebraic Identities

Identity	Formula

Difference of Squares	$a^2 - b^2 = (a - b)(a + b)$
Square of Sum	$(a + b)^2 = a^2 + 2ab + b^2$
Square of Difference	$(a - b)^2 = a^2 - 2ab + b^2$
Cube of Sum	$(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$
Cube of Difference	$(a - b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$
Sum of Cubes	$a^3 + b^3 = (a + b)(a^2 - ab + b^2)$
Difference of Cubes	$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$

Exponent Rules

Rule	Formula
Product	$a^m \times a^n = a^{m+n}$
Quotient	$a^m / a^n = a^{m-n}$
Power of Power	$(a^m)^n = a^{mn}$
Negative Exponent	$a^{-n} = 1/a^n$
Zero Exponent	$a^0 = 1 \ (a \neq 0)$
Fractional Exponent	$a^{(m/n)} = \sqrt[n]{(a^m)}$

Logarithms

- Definition: $\log_a b = c$ means $a^c = b$
- $\log_a(xy) = \log_a x + \log_a y$
- $\log_a(x/y) = \log_a x - \log_a y$
- $\log_a(x^n) = n \log_a x$
- $\log_a a = 1$
- $\log_a 1 = 0$
- Change of base: $\log_a b = \log b / \log a$

Inequalities

- Multiplying/dividing by negative number reverses inequality sign
- Adding/subtracting same number to both sides preserves inequality

Functions

Function Type	Form
Linear	$f(x) = mx + b$
Quadratic	$f(x) = ax^2 + bx + c$
Exponential	$f(x) = a \cdot b^x$
Logarithmic	$f(x) = \log_a x$

Function Transformations

Transformation	Effect

f(x) + c	Shift up by c
f(x) - c	Shift down by c
f(x + c)	Shift left by c
f(x - c)	Shift right by c
-f(x)	Reflect over x-axis
f(-x)	Reflect over y-axis

SECTION 5: SEQUENCES AND SERIES

Arithmetic Sequences

Formula	Expression
nth Term	$a_n = a_1 + (n - 1)d$
Sum of n Terms	$S_n = n/2(a_1 + a_n)$
Sum of n Terms	$S_n = n/2[2a_1 + (n - 1)d]$

Where:

- a_1 = first term
- d = common difference
- n = number of terms

Geometric Sequences

- nth Term: $a_n = a_1 \cdot r^{n-1}$
- Sum of n Terms: $S_n = a_1(1 - r^n)/(1 - r)$ for $r \neq 1$
- Sum to infinity ($|r| < 1$): $S\infty = a_1/(1 - r)$

Special Sums

- Sum of first n natural numbers: $n(n+1)/2$
- Sum of first n odd numbers: n^2
- Sum of first n even numbers: $n(n+1)$
- Sum of squares: $n(n+1)(2n+1)/6$
- Sum of cubes: $[n(n+1)/2]^2$

SECTION 6: RATE, WORK, AND DISTANCE

Distance Formula

- Distance = Rate × Time
- Rate = Distance / Time
- Time = Distance / Rate
- For fixed distance, speed and time are inversely related

Average Speed

- When distances are equal: Average Speed = $2xy/(x + y)$
- When times are equal: Average Speed = $(x + y)/2$

Work Formula

- Combined Work: 1/T = 1/A + 1/B
- Where T = time together, A = time for A alone, B = time for B alone
- Work = Rate × Time
- Rate = Work / Time

Relative Speed

- Same direction: Relative Speed = |x - y|
- Opposite direction: Relative Speed = x + y

SECTION 7: INTEREST AND PROFIT

Simple Interest

- $I = P \times r \times t$
- Amount = $P + I = P(1 + rt)$

Where:

- I = Interest
- P = Principal
- r = Rate (in decimal)
- t = Time

Compound Interest

- Amount = $P(1 + r/n)^{nt}$

Where:

- P = Principal
- r = Annual rate (decimal)

- n = Number of times compounded per year
- t = Number of years

Profit Formulas

Formula	Expression
Profit	Selling Price - Cost
Loss	Cost - Selling Price
Profit %	(Profit/Cost) × 100
Loss %	(Loss/Cost) × 100
Discount	Marked Price - Selling Price
Discount %	(Discount/Marked Price) × 100

SECTION 8: COUNTING AND PROBABILITY

Fundamental Counting Principle

- If one event can occur in m ways and another in n ways, the number of ways both can occur = m × n

Permutations (Order Matters)

- $P(n,r) = n!/(n - r)!$
- Permutations with identical items: $n!/(p! \times q! \times ...)$

- Circular permutations: (n - 1)!

Combinations (Order Doesn't Matter)

- C(n,r) = n!/[r!(n - r)!]
- Properties: C(n,r) = C(n, n-r)
- C(n,0) = C(n,n) = 1

Probability Rules

Rule	Formula	
Single Event	P(E) = Favorable/Total	
Complement	P(not E) = 1 - P(E)	
OR (mutually exclusive)	P(A or B) = P(A) + P(B)	
OR (general)	P(A or B) = P(A) + P(B) - P(A and B)	
AND (independent)	P(A and B) = P(A) × P(B)	
Conditional	P(A	B) = P(A and B)/P(B)

Key Probability Facts

- P(A and B) < P(A or B)
- P(A or B) > Individual probabilities
- All probabilities range from 0 to 1

SECTION 9: STATISTICS

Measures of Central Tendency

Measure	Definition
Mean	Sum of all values / Number of values
Median	Middle value when data is ordered
Mode	Most frequently occurring value

Measures of Dispersion

- Range = Maximum - Minimum
- Standard Deviation = $\sqrt{[\sum(x_i - \mu)^2/N]}$
- Variance = (Standard Deviation)²

Properties

- If constant k added to each value: Mean increases by k, SD unchanged
- If each value multiplied by k: Mean multiplied by k, SD multiplied by k

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SECTION 10: SET THEORY

Basic Formulas

- $n(A \cup B) = n(A) + n(B) - n(A \cap B)$
- $n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(B \cap C) - n(C \cap A) + n(A \cap B \cap C)$

- n(A') = Total - n(A)

Venn Diagram Concepts

- Only A = n(A) - n(A∩B) - n(A∩C) + n(A∩B∩C)
- Exactly two = n(A∩B) + n(B∩C) + n(C∩A) - 3n(A∩B∩C)
- At least one = n(A ∪ B ∪ C)

Group Problems

- Group1 + Group2 + Neither - Both = Total

SECTION 11: IMPORTANT GMAT-SPECIFIC TIPS

What's NOT Tested in GMAT Focus Edition

- ❌ Geometry (completely removed)
- ❌ Pure memorization of complex formulas
- ❌ Data Sufficiency (moved to Data Insights section)

What IS Tested

- ✅ Arithmetic
- ✅ Algebra
- ✅ Word Problems
- ✅ Number Properties
- ✅ Rates, Ratios, Percentages
- ✅ Statistics
- ✅ Counting and Probability

Common Mistakes to Avoid

1. Doing too much math - GMAT tests logic, look for shortcuts
2. Misreading the question - Read carefully
3. Skipping steps - Always simplify before solving
4. Guessing randomly - Eliminate wrong choices first

Memorization Tips

1. Use mnemonics - Create memory aids
2. Create formula sheet - Organize by category
3. Practice regularly - Apply formulas to problems
4. Use flashcards - Active recall technique
5. Group study - Explain to others to reinforce

QUICK REFERENCE CARD

Top 10 Most Used Formulas

#	Formula	Topic
1	$(a + b)^2 = a^2 + 2ab + b^2$	Algebra
2	$a^2 - b^2 = (a - b)(a + b)$	Algebra
3	$x = [-b \pm \sqrt{(b^2 - 4ac)}]/2a$	Quadratics
4	Percent Change = (New - Old)/Old × 100	Percentages
5	Distance = Rate × Time	Rates
6	$1/T = 1/A + 1/B$	Work

7	$I = Prt$	Interest
8	$C(n,r) = n!/[r!(n-r)!]$	Combinations
9	$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$	Probability
10	$a_n = a_1 + (n-1)d$	Sequences

SUMMARY: GMAT MATH TOPICS

Category	Key Concepts
Arithmetic	Percentages, Ratios, Averages, Fractions, Decimals
Algebra	Linear equations, Quadratic equations, Exponents, Logarithms
Number Properties	Divisibility, Primes, Factors, Multiples, Odds/Evens
Word Problems	Rate, Work, Distance, Mixtures, Profit/Loss
Statistics	Mean, Median, Mode, Range, Standard Deviation
Counting	Permutations, Combinations, Probability
Sequences	Arithmetic, Geometric