The 30 Patterns

A GRE Quant Cheat Sheet

What this is. Every recurring pattern the GRE Quant section uses, organized so you can spot what a question is really testing in seconds. *Tell* tells you how to recognize it. *Trap* warns what students get wrong. *Approach* gives the actual steps to solve it.

How to use it. Print it. Tape it next to your desk. After every practice set, ask: "what pattern was that, and did I solve it the way the cheat sheet says?" Once you can name the pattern instantly, you've cracked the section.

Where it comes from. Built from Xueersi's GRE curriculum, one of China's largest prep companies, 10,000+ real questions analyzed, translated to English for the first time. Synthesized down by Nader after scoring 170 on Quant himself.

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Tier 1 · The Big 9 (1 of 2)

Highest frequency. Master first.

TIER 1 · HIGHEST FREQUENCY

1. The Parity Detective

Odd or even? That's often the entire question.

TELL

Integers in the setup; answer choices vary by parity. Sometimes hidden inside exponents or signs.

TRAP

Solving for actual values of x, y. You don't need them, only their parities. Also: forgetting 2 is the only even prime.

APPROACH

1. Identify which parities the constraints force.
2. Apply the rules below to each answer.
3. If stuck, test one odd + one even concrete case.

```
odd+odd=even    odd×odd=odd
odd+even=odd    even×any=even
(-1)^even=1    (-1)^odd=-1
```

2. The Remainder Detective

Big number, small remainder. Find the cycle.

TELL

"Remainder when X is divided by Y", especially when X is a huge exponent or variable expression.

TRAP

Trying to compute the actual value. 3^64 is a 31-digit number. You never need it.

APPROACH

1. Test small cases (n=1,2,3,4,5). Write the remainders.
2. Look for the cycle. Most repeat every 2, 3, or 4.
3. Reduce the problem with mod arithmetic.
4. If QC and remainders vary, the answer is D.

```
÷3: digit sum mod 3
÷4: last two digits mod 4
÷9: digit sum mod 9
```

3. The Units Digit Whisperer

Skip the whole number. Just the last digit.

TELL

"Units digit of...", or any setup where only the final digit matters.

TRAP

Computing the full number. Wastes time, invites errors.

APPROACH

1. Track only the units digit of each number.
2. For powers, find cycle length, take exponent mod cycle.
3. Multiply only units digits, keep only the last.

```
Cycle 1: ends 0,1,5,6 (constant)
Cycle 2: 4→(4,6); 9→(9,1)
Cycle 4: 2→(2,4,8,6); 3→(3,9,7,1)
```

4. The Prime Hunter

Know your primes. Then hunt with them.

TELL

"Prime", "prime factor", constraints like p − q = 4 with both prime.

TRAP

Forgetting 2 is the only even prime. Forgetting 1 is NOT prime.

APPROACH

1. Translate constraints into a search over small primes.
2. Test each prime systematically.
3. Use parity filter: if p+q is odd, one must be 2.

```
Primes < 50:
2, 3, 5, 7, 11, 13, 17, 19, 23,
29, 31, 37, 41, 43, 47
```

5. The Factor Counter

Every number has a fingerprint: its prime factorization.

TELL

"Number of factors", "GCF", "LCM", "is X a factor of Y".

TRAP

Listing factors one by one. For "number of factors" you need (a+1)(b+1)..., not just a·b.

APPROACH

1. Prime factorize completely.
2. Factor count: multiply (exponent+1) per prime.
3. GCF: min power of each shared prime. LCM: max.

```
N = p^a × q^b × r^c
# factors = (a+1)(b+1)(c+1)
60 = 2²·3·5 → 12 factors
```

6. The Percent Translator

"Percent of," "more than," "less than": all different.

TELL

Anything with "percent", "% more than", "% less than", "increased by".

TRAP

Confusing "20% more than Y" (= 1.2Y) with "20% of Y" (= 0.2Y). Also: 20% up + 20% down ≠ 0%.

APPROACH

1. Translate each phrase with the formulas below.
2. Chain changes by multiplying factors, not adding %.

```
P% of Y = (P/100)·Y
P% more than Y = Y·(1+P/100)
% change = (New−Old)/Old × 100
```

Tier 1 (2 of 2) → Tier 2 begins

Wrap Tier 1, open Tier 2.

7. The 0-1-Negative Test

When variables are loose, test the weird values.

TELL

Quantitative Comparison + variables, where constraints don't pin down unique values.

TRAP

Testing only positives like 2 or 3 and concluding A or B. The GRE designs traps that fail for weird values.

APPROACH

1. Try a normal value (like 2). Note the relationship.
2. Try weird values: 0, 1, negative, fraction.
3. Two different relationships → D.

```
Suspect D when:
• No "positive" stated
• No "integer" stated
• Asymmetric quantities
```

8. The Identity Hunt

Don't solve the system. Find the clever combination.

TELL

System of equations asking for $x - y$, x^2, not for x and y individually.

TRAP

Solving for x and y separately. 4x longer, invites errors.

APPROACH

1. Look at what's asked: $x+y$? x^2-y^2? x^2+y^2?
2. Can you ADD or SUBTRACT equations to get it?
3. Check identities below first.

```
(a+b)² = a² + 2ab + b²
a² − b² = (a+b)(a−b)
a² + b² = (a+b)² − 2ab
```

9. The Diophantine Hunter

Integer solutions only. Hunt them down.

TELL

Equation like $3x + 5y = 120$, positive integers, "which could be...".

TRAP

Trying to solve algebraically. Faster to enumerate.

APPROACH

1. Isolate one variable: $y = (120 - 3x)/5$.
2. Find which integer x makes y an integer.
3. List all valid (x, y) pairs.

TIER 2 · SOLID FREQUENCY

10. Consecutive Integer Specialist

Three numbers in a row have hidden structure.

TELL

"Consecutive integers", "consecutive odd/even".

APPROACH

1. Represent as n, n+1, n+2 (or middle-anchored).
2. Sum of odd count = count × middle.
3. Product of k consecutive divisible by k!.

11. Absolute Value Unmasker

Every |...| hides two cases.

TELL

$|x|$, $|x - a|$, or nested like $||x - a| - b|$.

TRAP

Treating $|x|$ as just x (ignoring negative case).

APPROACH

1. Each |...| splits into 2 cases.
2. For nested, work inside out.
3. $|x - a|$ = distance from x to a.

12. The Fraction Master

Fractions hide easier numbers underneath.

TELL

"A of B", fractions of fractions, comparing fractions.

APPROACH

1. "a of b" → a × b.
2. For "fraction of unknown": set unknown = 1.
3. To compare: cross-multiply or decimal.

Tier 2 (continued)

Important patterns that show up regularly.

13. The Unit Wrangler

Convert everything to one unit FIRST.

TELL

Multiple units in the problem (ft/yd/mi, cups/pints).

TRAP

Cubic units. 1 yd = 3 ft, but 1 yd^3 = 27 ft^3.

APPROACH

1. Pick one target unit before any math.
2. Convert everything to it first.
3. For areas/volumes, square/cube the conversion factor.

14. The Combined Rate Solver

Things work together: add rates, not times.

TELL

Two pipes, machines, or workers on one task.

TRAP

Averaging the times. (4 + 6)/2 = 5 is wrong.

APPROACH

1. Convert times to rates.
2. Sum the rates.
3. Combined time = 1 / combined rate.

```
Combined = 1/(1/a + 1/b)
For 2 workers: ab/(a+b)
```

15. Distance-Speed-Time Triangle

d = rt. Three variables, find the missing one.

TELL

Cars, trains, runners, planes.

TRAP

Average speed ≠ average of speeds. Use total distance ÷ total time.

APPROACH

1. d = rt. Rearrange as needed.
2. Toward each other: rates add. Same direction: subtract.
3. Match units. mph with hours.

16. The Quadratic Solver

Factoring beats the formula. Try it first.

TELL

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

APPROACH

1. Factor first: two numbers multiplying to c, adding to b.
2. Vieta's: sum of roots = −b/a; product = c/a.
3. Quadratic formula only if factoring fails.

```
x = (−b ± √(b² − 4ac)) / 2a
```

17. The Exponent Law Master

Same base? Use laws. Different? Convert.

TELL

Expressions with exponents multiplied, divided, compared.

TRAP

a^m + a^n ≠ a^(m+n). Factor out smaller power instead.

APPROACH

1. Use laws below for same-base operations.
2. For different bases, find common base (8 = 2^3).
3. For sums, factor out smaller power.

```
a^m · a^n = a^(m+n)
(a^m)^n = a^(mn)
a^0 = 1, a^(−n) = 1/a^n
```

18. The Inequality Strategist

Flip when multiplying by negative.

TELL

<, >, ≤, ≥ in constraints.

TRAP

Forgetting to flip when multiplying by negative.

APPROACH

1. Manipulate like equations; flip sign for negative.
2. If variable sign unknown, split cases.
3. AM-GM (a,b > 0): (a+b)/2 ≥ √(ab).

19. The Triangle Master

Every triangle gives you 4 facts for free.

TELL

Any question with a triangle.

APPROACH

1. Angles sum to 180°.
2. Longest side opposite largest angle.
3. Any side < sum of other two.

```
45-45-90: 1 : 1 : √2
30-60-90: 1 : √3 : 2
Triples: 3-4-5, 5-12-13
```

20. The Circle Specialist

Radius, π, and one shortcut.

TELL

Circumference, area, arc, sector, inscribed shapes.

APPROACH

1. Don't confuse C = 2πr with A = πr^2.
2. Arc = (θ/360°) × 2πr.
3. Sector area = (θ/360°) × πr^2.
4. Inscribed angle = ½ central angle.

Tier 2 finale → Tier 3 begins

Closing Tier 2, opening niche patterns.

21. The Coordinate Detective

Distance, midpoint, slope: three workhorses.

TELL

(x, y) coordinates, slopes, distances.

APPROACH

1. Slope = $(y_2-y_1)/(x_2-x_1)$. Rise/run.
2. Parallel: equal slopes. Perpendicular: product = −1.

```
Dist: √((x₂-x₁)² + (y₂-y₁)²)
Mid: ((x₁+x₂)/2, (y₁+y₂)/2)
```

22. Mean & Median Specialist

Mean is balance. Median is middle.

TELL

"Mean", "average", "median", "mode".

TRAP

Outliers move mean but not median.

APPROACH

1. Mean = sum / count.
2. Arithmetic seq: mean = median = (first+last)/2.
3. Add k: mean shifts by k, SD unchanged.

23. Standard Deviation Whisperer

SD measures spread, not size.

TELL

SD comparisons, transformations.

TRAP

Bigger numbers ≠ bigger SD.

APPROACH

1. SD measures spread around mean.
2. Add constant: SD unchanged.
3. Multiply by k: SD × |k|.

24. Probability Systematist

Careful counting over careful counting.

TELL

"What is the probability that..."

APPROACH

1. P = favorable / total.
2. "At least one": use 1 − P(none).
3. Independent A AND B: P(A)·P(B).
4. A OR B: P(A) + P(B) − P(A∩B).

TIER 3 · NICHE PATTERNS

25. The Constraint Eliminator

Which restrictions pin down the unique answer?

TELL

"Which statements provide sufficient information..."

APPROACH

1. Test each statement alone: does it uniquely determine?
2. For "together": test pairs systematically.
3. Try to find a counterexample.

26. The Boundary Hunter

Find max or min by pushing against constraints.

TELL

"Greatest/smallest possible value", fixed sum or product.

APPROACH

1. Identify the constraint.
2. To max one variable, push others to minimum.
3. To min, push others to maximum.

27. The Piecewise Navigator

Different rules for different ranges.

TELL

Tiered pricing, tax brackets, "X up to a point, then Y".

APPROACH

1. Identify boundary values.
2. Determine which zone applies.
3. Apply each rule to its portion. Sum.

28. The 3D Geometry Solver

Match the shape to the formula.

TELL

Box, cube, cylinder, cone, sphere, prism.

APPROACH

1. Memorize formulas below.
2. QC with underdetermined dims → likely D.

```
Box: V=lwh
Cyl: V=πr²h, SA=2πr²+2πrh
Sphere: V=(4/3)πr³
```

Tier 3 finale + Quick Reference

The last two patterns, then facts to know cold.

29. Normal Distribution Carver

Identify the band. Use the given %s.

TELL

Normal distribution with mean and SD given.

APPROACH

1. "How many SDs from mean?"
2. Identify the band(s). Add percentages.
3. Multiply by total population.

```
Within 1 SD: ~68%
1 to 2 SD each side: ~14%
Beyond 2 SD each tail: ~2%
```

30. The Combinatorial Counter

Small count: list. Big count: formulas.

TELL

"How many ways", "different orders".

TRAP

Confusing permutations (order matters) with combinations.

APPROACH

1. Order matters → perm. Doesn't → comb.
2. Small cases: list systematically.
3. "At least one": compute "none" and subtract.

```
nPr = n! / (n−r)!
nCr = n! / (r!(n−r)!)
```

Primes Under 100

2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97

25 primes total. Memorize the first 15 cold.

Divisibility Rules

2: last digit even **3:** digit sum ÷ 3
4: last 2 digits ÷ 4 **5:** ends in 0 or 5
6: ÷ both 2 and 3 **9:** digit sum ÷ 9
10: last digit 0 **20:** ends in 0, tens even

Common Identities

$(a + b)^2$	$a^2 + 2ab + b^2$
$(a - b)^2$	$a^2 - 2ab + b^2$
$a^2 - b^2$	$(a+b)(a-b)$
$a^3 - b^3$	$(a-b)(a^2+ab+b^2)$
$a^3 + b^3$	$(a+b)(a^2-ab+b^2)$

Units Digit Cycles

Base ends	Cycle
0, 1, 5, 6	Constant
4	4, 6, 4, 6, ...
9	9, 1, 9, 1, ...
2	2, 4, 8, 6, ...
3	3, 9, 7, 1, ...
7	7, 9, 3, 1, ...
8	8, 4, 2, 6, ...

Exponent Laws

a^m · a^n	a^(m+n)
a^m / a^n	a^(m−n)
(a^m)^n	a^(mn)
(ab)^n	a^n · b^n
a^0	1 (a ≠ 0)
a^(−n)	1/a^n
a^(1/n)	$\sqrt[n]{a}$

Special Triangles

Triangle	Side ratio
45-45-90	1 : 1 : √2
30-60-90	1 : √3 : 2
Equilateral, s	Area = $(\sqrt{3}/4)s^2$

Triples: 3-4-5, 5-12-13, 8-15-17, 7-24-25, 20-21-29

Normal Distribution Bands

Within 1 SD	~68%
Within 2 SD	~95%
Within 3 SD	~99.7%
Each side, 1 SD	~34%
1 to 2 SD each side	~14%
Beyond 2 SD each tail	~2%

Pattern recognition tip: Before you start solving, name the pattern out loud. "This is a Remainder Detective." "This is a 0-1-Negative Test trap." That single act forces the right approach. Students who score 170 don't memorize 5,000 solutions, they recognize 30 patterns instantly.