



MENTAL MATH FIELD MANUAL

THE MINDSET

Math is not magic. It is a battle plan. Break the enemy (the problem) into small, weak pieces. Crush them one by one. Then, reunite the victories.

1. THE SQUARE ROOT PROTOCOL (3-Digit Numbers)

Mission: Find the root of a perfect square. **Tactic:** Squeeze the number between easy tens, then hunt the last digit.

Target: $\sqrt{529}$

1. Establish the Perimeter (Range):

- $20 \times 20 = 400$ (Too small)
- $30 \times 30 = 900$ (Too big)
- *Intel:* The target is between 20 and 30.

2. Identify the Weak Point (Last Digit):

- The number ends in 9.
- What single digit times itself ends in 9?
- It is either 3 ($3 \times 3 = 9$) or 7 ($7 \times 7 = 49$).

3. Strike (Select the Candidate):

- Possibilities: 23 or 27.
- 529 is closer to 400 (20s) than 900 (30s).
- *Strike:* Guess 23.

4. Verify:

- $23 \times 23 = (20 + 3) \times (20 + 3)$.
- $400 + 120 + 9 = 529$.
- Victory.

2. THE SQUARING STRIKE (Power of 2)

Mission: Multiply a number by itself.

A. The "Ends in 5" Flank (Special Case)

Target: 65^2

1. The Setup: Take the first digit (6).
2. The Boost: Multiply it by the number above it.
 - $6 \times 7 = 42$
3. The Finisher: Attach "25" to the end.
 - Result: 4,225

B. The "Split & Double" Attack (General Case)

Target: 42^2

1. Split the Force: Break 42 into 40 and 2.
2. Square the Heavy: $40 \times 40 = \mathbf{1,600}$
3. Square the Light: $2 \times 2 = \mathbf{4}$
4. Double the Product (Crucial Step):
 - Multiply the parts: $40 \times 2 = 80$.
 - Double it: $80 + 80 = \mathbf{160}$.
5. Unite: $1,600 + 160 + 4 = \mathbf{1,764}$.

3. THE CUBE CHALLENGE (Power of 3)

Mission: Multiply a number by itself, then by itself again. **Warning:** This is heavy lifting. Do not engage without paper unless the number is small.

Tactic: Cube the Tens, Cube the Units, fill the middle. Target: 12^3

1. Split: 10 and 2.
2. The Front: Cube the Ten ($10 \times 10 \times 10 = \mathbf{1,000}$).
3. The Back: Cube the Unit ($2 \times 2 \times 2 = \mathbf{8}$).
4. The Middle Grind:
 - Zone 1: $3 \times (10 \times 10) \times 2 = 3 \times 100 \times 2 = \mathbf{600}$
 - Zone 2: $3 \times 10 \times (2 \times 2) = 3 \times 10 \times 4 = \mathbf{120}$
5. Unite: $1,000 + 600 + 120 + 8 = \mathbf{1,728}$.

Spartan Note: If this is too heavy, memorize cubes 1 through 10. Fight battles you can win.

4. MULTIPLICATION TACTIC (2 & 3 Digit Numbers)

Mission: Multiply two uneven numbers. **Tactic:** "Break the Line." Keep the big number whole. Break the small number apart.

Target: 123×12

1. Recon: 123 is the fortress. 12 is the attacker.
2. Break the Attacker: Split 12 into 10 and 2.
3. First Wave (The 10):
 - $123 \times 10 = \mathbf{1,230}$ (Easy. Just add a zero.)
4. Second Wave (The 2):
 - $123 \times 2 = \mathbf{246}$ (Double the number.)
5. Victory:
 - $1,230 + 246 = \mathbf{1,476}$.

Target: 32×21

1. Break: Split 21 into 20 and 1.

2. First Wave: 32×20 .

- Think: $32 \times 2 = 64$.
- Add zero: **640**.

3. Second Wave: $32 \times 1 = \mathbf{32}$.

4. Victory: $640 + 32 = \mathbf{672}$.

Final Orders: Do not rush. Precision first. Speed later. Start training.