

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.
 - $6 \times 7 = \mathbf{42}$
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:** $40 \times 40 = 1,600$
3. **Square the Light:** $2 \times 2 = 4$
4. **Double the Product (Crucial Step):**
 - Multiply the parts: $40 \times 2 = 80$.
 - Double it: $80 + 80 = 160$.
5. **Unite:** $1,600 + 160 + 4 = 1,764$.

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

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):**
 - $123 \times 10 = 1,230$ (Easy. Just add a zero.)
4. **Second Wave (The 2):**
 - $123 \times 2 = 246$ (Double the number.)
5. **Victory:**
 - $1,230 + 246 = 1,476$.

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.