

Numeracy is a complex cognitive skill that relies on a "distributed network"—a collection of brain regions working together.<sup>1</sup> Neuroscientists typically refer to the **Triple Code Model**, which suggests the brain processes numbers in three different ways (visual, verbal, and quantity), each involving a specific area.

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## 1. The Core Hub: The Parietal Lobe<sup>2</sup>

The parietal lobe (located at the top-back of your head) is the most critical area for math. It houses the **Intraparietal Sulcus (IPS)**, which is essentially the "engine room" of numeracy.<sup>3</sup>

- **Intraparietal Sulcus (IPS):** This area handles **number sense**.<sup>4</sup> It allows you to understand the "magnitude" of a number—knowing that "10" is larger than "2" or estimating how many marbles are in a jar.
- **Left Angular Gyrus:** This area is the "math dictionary." It is responsible for **arithmetic fact retrieval**.<sup>5</sup> When you know  $5 \times 5 = 25$  without having to calculate it, your angular gyrus is pulling that memorized fact from your verbal memory.
- **Superior Parietal Lobe:** This helps with **spatial attention**, such as lining up columns of numbers or keeping track of your place on a number line.

## 2. The Command Center: The Frontal Lobe

The frontal lobe handles the "logistics" and strategy of solving a problem.

- **Prefrontal Cortex (PFC):** This is your **working memory**.<sup>6</sup> It holds numbers in your "mental scratchpad" while you move through steps. If you are adding  $45 + 27$ , your PFC holds the "carry-over 1" while you add the tens column.
- **Executive Function:** It helps you decide *which* operation to use (e.g., "Should I add or multiply here?") and allows you to switch strategies if you get stuck.

## 3. The Visual & Verbal Translators

Before you can do math, your brain has to recognize the symbols.

- **Visual Number Form Area (VNFA):** Located in the **Occipito-Temporal** region (bottom-back of the brain), this area is specialized to recognize Arabic numerals (1, 2, 3) as distinct from letters or shapes.
- **Perisylvian Network:** This involves the language centers of the brain. It is used when you read math problems out loud or think "four plus four" in words.

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## Summary Table of Brain Regions

Brain Region	Specific Area	Function in Numeracy
Parietal Lobe	Intraparietal Sulcus (IPS)	Magnitude, "Number Sense," Comparison
Parietal Lobe	Left Angular Gyrus	Fact Retrieval (Times tables, simple addition)
Frontal Lobe	Prefrontal Cortex (PFC)	Working Memory, Step-by-step logic
Temporal Lobe	Visual Number Form Area	Recognizing the shape of digits (e.g., "7")
Occipital Lobe	Visual Cortex	General visual processing of symbols

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## Modern Insight: The "White Matter" Connectome

In 2026, research increasingly focuses on the **white matter tracts** (the "cables" connecting these regions). Even if the "hubs" (IPS or PFC) are healthy, damage to the connections between them can cause numeracy issues.<sup>7</sup> For example:

- Damage to the **Superior Longitudinal Fasciculus** (the bridge between the front and back of the brain) often leads to difficulty holding a number in mind while trying to calculate it.