

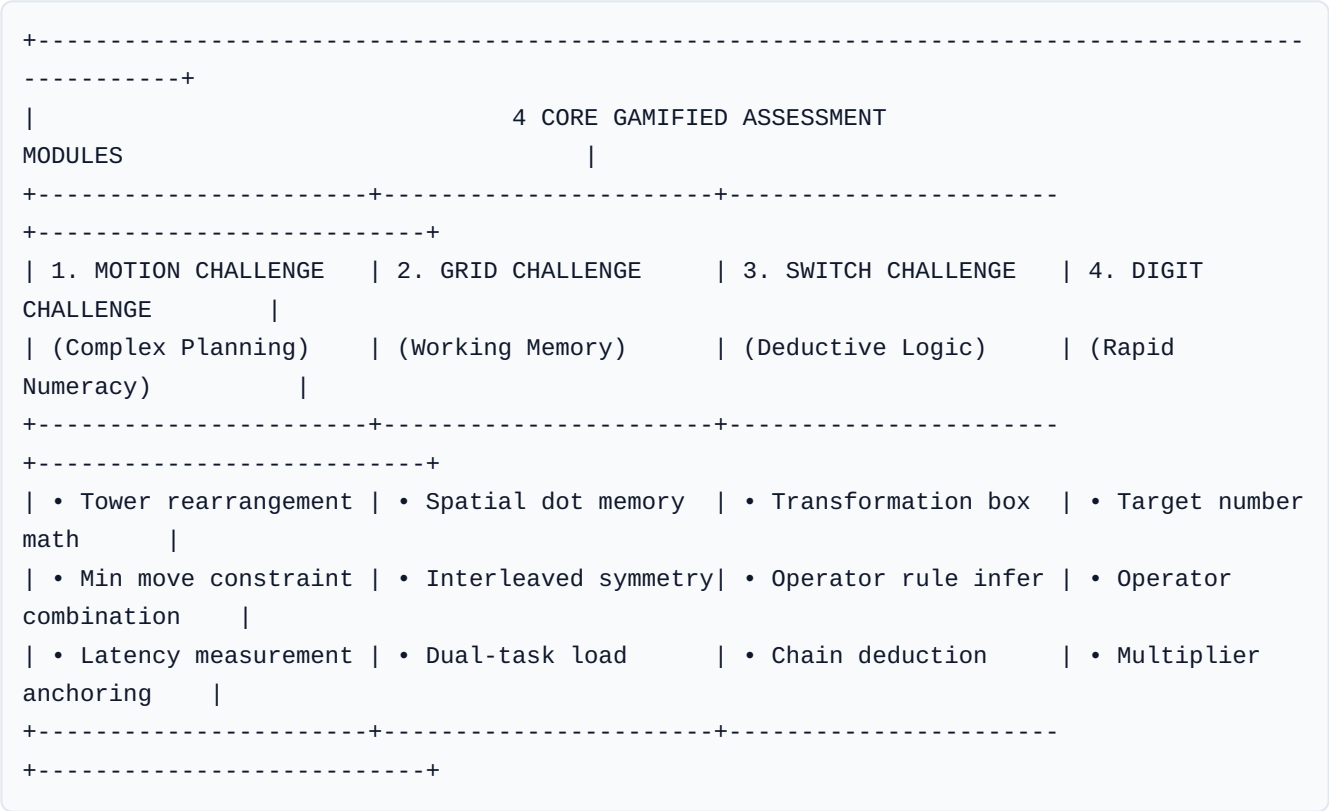
01. Gamified Assessment - Cognitive Games

Detailed Breakdown

Module Focus: Comprehensive Mechanics, Telemetry Architecture, Cognitive Competencies, and AI Scoring Rules for the 4 Core CoCubes / Interactive Gamified Assessment Challenges (~35 Minutes Total).

1. Overview of Gamified Assessment Architecture

CoCubes Gamified Assessment uses AI-driven interactive mini-games to measure candidates' subconscious behavioral traits, working memory capacity, spatial reasoning, deductive logic, and numerical agility in real time.



Key AI Measurement Dimensions Across All Modules

Unlike traditional multiple-choice tests, gamified assessments collect micro-telemetry (mouse movement, click timing, planning pauses, error recovery trajectories) to construct a multidimensional candidate profile:

- 1. **Planning Latency (Forward Thinking):** Time spent analyzing before executing the first click.
- 2. **Move / Execution Efficiency:** Ratio of optimal solution path length to actual clicks.
- 3. **Dual-Task Cognitive Resilience:** Ability to maintain memory accuracy while handling distracting tasks.
- 4. **Adaptive Error Recovery:** Stress control and re-planning latency after making an incorrect move.

2. Exhaustive Game-by-Game Breakdown

2.1 Motion Challenge (Complex Spatial Planning)

A. Core Task Description & Mechanics

- **Task Structure:** The screen displays a set of 3 pegs with colored balls/blocks stacked in an **Initial State** alongside a target **Goal State**.
- **Objective:** Transfer the balls/blocks from the initial state to match the goal state using the **minimum possible number of moves**.
- **Constraints:**
 - Only one ball/block can be moved at a time.
 - A peg can hold a maximum capacity (typically 3 blocks).
 - Size/placement rules (in Tower of London / Hanoi variants): A larger block cannot be placed on top of a smaller block.
- **Level Progression:** 10 to 12 rounds of increasing complexity (from 3-move solutions up to 7+ move complex rearrangements). Time limit per puzzle is typically 30–45 seconds.

B. Cognitive Competencies Measured

- **Executive Function & Spatial Planning:** Multi-step lookahead mental simulation.
- **Cognitive Flexibility:** Revising sub-goals when direct paths are blocked.
- **Spatial Working Memory:** Holding temporary intermediate state configurations in mind.

C. AI Telemetry & Behavioral Scoring Metrics

Metric Dimension	Target Behavior	Telemetry Trigger	Scoring Impact
First-Click Latency	Deliberate planning (5–10s pause)	Time from puzzle load to 1st peg click	High latency = High score; Impulse clicks (<1s) penalized
Path Efficiency	100% optimal move ratio	$\frac{\text{Optimal Moves}}{\text{Actual Executed Moves}}$	Direct score multiplier
Execution Velocity	Smooth, continuous clicks	Inter-click intervals after 1st click	Consistent speed = High motor confidence
Error Recovery	Methodical re-planning	Time taken after an invalid/suboptimal move	Panicked rapid clicking severely penalizes score

D. Common Pitfalls & Failure Modes

- **Impulsive First Move:** Clicking immediately without mapping out the full 4–6 move chain.
 - **Sub-Goal Illusion:** Moving the target top item first instead of clearing the peg base.
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2.2 Grid Challenge (Working Memory & Spatial Span)

A. Core Task Description & Mechanics

- **Task Structure:** A grid (3 × 3, 4 × 4, or 5 × 5) appears on screen. Red dots flash sequentially in individual grid cells.
- **Interleaved Distractor Task:** Between consecutive dot flashes, a visual distractor appears for 2–3 seconds (e.g., "Is this shape symmetrical horizontally?", "Is 7 + 5 = 11?"). The candidate must click YES/NO quickly.
- **Recall Phase:** After a sequence of 3 to 8 dot flashes, the candidate must click the empty grid cells to recall the exact dot locations in **original sequential order**.
- **Level Progression:** Sequence length increases from 3 dots (Level 1) up to 7–8 dots (Level 8+), with distractor complexity scaling up.

B. Cognitive Competencies Measured

- **Working Memory Capacity (Visual-Spatial Sketchpad):** Holding spatial coordinates in active memory.
- **Attentional Control & Interference Resistance:** Maintaining memory traces while switching context to the distractor task.
- **Dual-Task Multi-tasking:** Balancing speed on distractor tasks without degrading primary recall accuracy.

C. AI Telemetry & Behavioral Scoring Metrics

Metric Dimension	Target Behavior	Telemetry Trigger	Scoring Impact
Sequence Precision	Exact order spatial recall	Cell coordinate & sequence index match	Core score component (60%)
Distractor Accuracy	≥ 90% accuracy on symmetry	Distractor response accuracy	Pass threshold gate (25%)
Distractor Response Latency	Rapid, decisive answers (<1.5s)	Time taken on distractor prompt	Speed bonus (15%)
Recency / Primacy Bias	Uniform accuracy across sequence	Error distribution across sequence positions	Evaluates memory decay resilience

D. Common Pitfalls & Failure Modes

- **Distractor Over-focus:** Spending too much cognitive energy on the symmetry check and forgetting the spatial dot sequence.
 - **Rote Coordinate Memorization:** Trying to remember numbers (e.g. (1, 3), (2, 2)) instead of visualizing spatial shapes/trajectories.
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2.3 Switch Challenge (Deductive Reasoning & Rule Induction)

A. Core Task Description & Mechanics

- **Task Structure:** An **Input Sequence** of 4 geometric symbols (e.g., [Red Circle, Blue Square, Green Triangle, Yellow Star]) passes through a transformation box containing hidden/symbolic operators to produce an **Output Sequence**.
- **Objective:** Deduce which transformation operator or sequence of operators was applied to transform the input into the output.
- **Operator Types:**
 - **Position Swap:** e.g., Swap position 1 and 3 ($\text{Swap}(1,3)$), Swap position 2 and 4 ($\text{Swap}(2,4)$).
 - **Reverse Order:** Reverse all 4 positions ($1,2,3,4 \rightarrow 4,3,2,1$).
 - **Shift / Rotate:** Cyclic shift left or right.
 - **Color / Shape Mutators:** Change color or shape attributes based on position.
- **Level Progression:**
 - *Single Operator* (Levels 1–3): 1 transformation rule.
 - *Chained Double Operators* (Levels 4–7): 2 sequential transformation rules applied in series.
 - *Triple Operators* (Levels 8–10): 3 sequential rules with multiple choice operator options.

B. Cognitive Competencies Measured

- **Deductive Reasoning:** Inferring specific logical rules from input-output observations.
- **Rule Induction & Pattern Elimination:** Rapidly testing and eliminating candidate operators.
- **Cognitive Processing Speed:** Solving complex logical transformations under tight time limits (15–30 seconds per item).

C. AI Telemetry & Behavioral Scoring Metrics

Metric Dimension	Target Behavior	Telemetry Trigger	Scoring Impact
Rule Deduction Accuracy	Correct operator selection	Choice selection vs true operator	Core score driver (60%)
Verification Speed	Fast elimination (<8s per item)	Time to answer selection	Velocity multiplier (30%)
Chain Trajectory Tracking	Steady accuracy across levels	Accuracy retention on 2-layer and 3-layer operator chains	Evaluates complex logical capacity (10%)

D. Common Pitfalls & Failure Modes

- **Testing All Options sequentially:** Wasting time testing option A, B, C, D one by one instead of using elimination matrices.
 - **Ignoring Fixed Elements:** Overlooking elements that *did not change position*, which instantly rule out major swap categories.
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2.4 Digit Challenge (Numeracy & Speed Calculation)

A. Core Task Description & Mechanics

- **Task Structure:** Candidate is presented with a **Target Number** (e.g., 54) and a pool of **Available Digits** (e.g., 2, 5, 8, 3).
- **Objective:** Combine the available digits using basic arithmetic operators (\$+\$, \$-\$, \$\times\$, \$\div\$) to construct an equation equal to the target.
- **Rules:**
 - Each digit from the pool can typically be used at most once.
 - Standard precedence of operations applies (PEMDAS/BODMAS).
 - Solutions must be constructed within 12–20 seconds.
- **Level Progression:** Target numbers increase in magnitude (from 1-digit/2-digit targets to 3-digit targets like 144), requiring multi-operator combinations.

B. Cognitive Competencies Measured

- **Numerical Agility:** Rapid mental arithmetic calculations.
- **Heuristic Problem Solving:** Applying mathematical estimation and factorization heuristics.
- **Decision Speed Under Time Constraints:** Quickly committing to a working arithmetic path.

C. AI Telemetry & Behavioral Scoring Metrics

Metric Dimension	Target Behavior	Telemetry Trigger	Scoring Impact
Target Exact Match Rate	100% exact equation construction	Equation evaluation vs target	Primary score weight (\$65\%\$)
Solve Velocity	Rapid completion (<6s per equation)	Time elapsed from presentation to submit	Speed bonus (\$25\%\$)
Operator Efficiency	Minimal operator clutter	Number of operators used	Efficiency bonus (\$10\%\$)

D. Common Pitfalls & Failure Modes

- **Linear Addition Searching:** Trying additive paths (\$5 + 8 + 3...\$) instead of using multiplication anchors (\$5 \times 8 = 40\$).
- **Parity Mismatch:** Attempting to reach an odd target with combinations that only yield even numbers.

3. Summary Matrix of AI Telemetry & Behavioral Metrics

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METRIC / GAME	MOTION CHALLENGE	GRID CHALLENGE	SWITCH CHALLENGE	DIGIT CHALLENGE
CHALLENGE				

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Primary Trait	Forward Planning	Working Memory	Rule Deductive	Rapid
Numeracy				
Planning Latency	CRITICAL (5-10s)	Low Impact	Moderate (3-5s)	Low
Impact				
Execution Accuracy	Min Move Length	Order Recall	Operator Infer	Exact
Target Match				
Distractor Load	None	High (Symmetry)	None	Time
Pressure				
Optimal Pace	Pause then fast	Steady rhythm	Fast elimination	
Instant Anchor				
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