

Wrath of Hapi

A 6×5 scatter-pays cascade slot set in a torch-lit tomb, built around a **persistent multiplier** that climbs a doubling ladder to 1,024× and carries across the whole free-spins round.



GAME RTP

96.5%

VOLATILITY

High

MAX WIN

5,000×

GRID

6×5

Designed, engineered and mathematically modelled by **Jack Drach** · jackdrach.com

All figures sourced from the game's real configuration and simulation harness (Python model and TypeScript engine, proven at parity). RTP and volatility validated to a 40,000,000-spin calibration and confirmed live in the shipped engine. Confidential design document.

1 Overview

Wrath of Hapi is an original 6×5 scatter-pays slot themed around Hapi, the baboon-headed guardian of Egyptian myth, rendered in a painterly, cinematic gold-and-lapis style. Wins form when 8 or more of a symbol land anywhere on the grid; winning symbols are removed and fresh ones **tumble** in, chaining until no new win forms. The design philosophy is a lean, suspenseful base game whose return is carried by a single escalating bonus: free spins in which the win multiplier never resets. The signature mechanic is the **Multiplier Strike**. On winning tumbles Hapi slams his staff and a global win multiplier steps up a doubling ladder — x2, x4, x8 — toward a **1,024× ceiling**. The strike is **probabilistic** (a 25% chance per tumble) rather than guaranteed, a deliberate choice that shapes the volatility and preserves the mid-ladder chase and the fat tail.

THE HOOK

One bonus, one rising force. Free spins trigger on 3 or more scatters, and inside the round the multiplier is **persistent** — it carries and keeps climbing across every spin instead of resetting. Hapi's blue-fire aura, an animated multiplier torch, and a board-wide energy field all intensify in lockstep as the multiplier rises, so the whole screen visibly powers up toward the 1,024× ceiling. The bonus is buyable at **82× bet** (~96.3% buy RTP).

ATTRIBUTE	VALUE
Title	Wrath of Hapi
Grid / mechanic	6×5 scatter-pays (8+ anywhere), tumbling reels, no wilds
Paying symbols	8 paying (4 high: Hapi, Qebehsenuf, ankh, scarab; 4 gem lows) + Eye of Horus scatter
Signature feature	Multiplier Strike — doubling ladder to 1,024×, 25% strike chance per tumble
Free spins	3+ scatters trigger; persistent multiplier carries and climbs across the round
Bonus buy	82× bet (~96.3% buy RTP), identical to a natural trigger
Bet range	\$0.20 – \$100.00 (default \$1.00)
Theme / style	Ancient-Egyptian tomb · painterly cinematic gold, lapis and turquoise
Base game RTP (base only)	~45.0%
Total game RTP	96.5%
Volatility class	High (CV ~22.8)
Max win potential	~5,000× bet

2 Math & RTP model

The game targets a **96.5% RTP** at **high volatility** (coefficient of variation ~22.8). It is deliberately bonus-forward: the base game returns only **~45.0%**, with the remaining **~51.5%** delivered inside the persistent-multiplier free-spins round (a base/bonus split of ~46.6 / 53.4). Free spins trigger roughly once every **152 spins**.

Dual-engine parity. The game runs on two independent engines — a Python simulation model and the live TypeScript game engine — proven to produce bit-identical results through a Monte-Carlo parity harness, so the deployed game provably matches the validated mathematics. The engine emits every spin as a replayable, typed record; the renderer is a pure consumer that never evaluates wins, enforcing a hard separation between math and presentation.

Deep calibration. RTP and the volatility profile were pinned with simulation runs up to **40,000,000 spins**, using explicit standard-error and confidence-interval reasoning to separate real signal from noise at high variance. The final model was confirmed live in the shipped engine: a 2,000,000-spin run reproduced 94.7% high-symbol presence, a 1-in-151.6 trigger rate, and a 96.5% reading inside the confidence interval.

DESIGN PROBLEM SOLVED

High-value symbols initially appeared in only ~30% of bonus rounds — the dense low-symbol population that drives the volatility left almost no room for them. Rather than thin the gems (which would gut the tail), a **decoupled pay/clear** rule was introduced: high symbols pay from 6 but only clear at 8, rewarding them more often without adding cascades. Paired with a precisely calibrated 15.24% reduction in gem pay values, this lifted high-symbol presence to **94.5% of bonus rounds** while holding RTP at 96.5%, preserving the volatility profile and improving the pay hierarchy.

3 Symbols & features



Hapi
Top high-pay



Qebehsenuef
High-pay



Eye of Horus
Scatter

The nine-symbol set runs from four gem lows (lapis, turquoise, carnelian, orange) through four highs, topped by Hapi himself. A separate Eye-of-Horus scatter is non-paying and tumble-immune, triggering the bonus and retriggering inside it. The full presentation layer — a custom staff-slam strike, a tier-scaled blue-fire aura, an animated multiplier torch, board and frame fire, an animated tomb background, a live win-breakdown feed and full bonus-celebration sequences — is authored as sprite-sheet packages driven off a single shared multiplier tier, so every effect escalates together.

Technology

PixiJS v8 · TypeScript · Vite. Replayable typed SpinRecord architecture with a pure-consumer renderer. In-engine live RTP monitor and isolated quick-sim tooling for continuous validation.

Genre features

Scatter-pays, tumbling reels, persistent-multiplier free spins, bonus buy. (Bonus buys are restricted in some regulated markets, e.g. the UK.)