

Hand to Hand Tactics

Kansas K.A.R. 111-23-22 · eInstant Cert Pack v1

Issued: 2026-05-15T21:45:35.533058Z · Authority: Multi.Bingo iLottery RGS
Signing key: Ed25519 · ID d651f1b9f793f40d

Math validation

Pool size	1,000,000
RTP @ unit denom	87.9992%
Top prize (max denom)	\$100,000
Bonus engine	none

1. Game specification (Kansas K.A.R. 111-23-22)

Hand to Hand Tactics is an instant lottery game governed by Kansas K.A.R. 111-23-22. Finite-pool model with 1,000,000 shares per pool. The bit-exact payable below has been imported from the K.A.R. (j) odds table.

Prize formula: $\text{prize_cents} = \text{multiplier} \times \text{denom_cents} \times \text{tickets_purchased}$

2. Paytable (40 tiers)

Multiplier	Count in pool	Odds (1 in)
×5000.0	1	1,000,000.00
×500.0	8	125,000.00
×400.0	19	52,631.58
×300.0	7	142,857.14
×200.0	7	142,857.14
×100.0	8	125,000.00
×95.0	8	125,000.00
×90.0	8	125,000.00
×85.0	8	125,000.00
×80.0	8	125,000.00
×75.0	8	125,000.00
×70.0	8	125,000.00
×65.0	16	62,500.00
×60.0	16	62,500.00
×55.0	16	62,500.00
×50.0	582	1,718.21
×45.0	371	2,695.42
×40.0	597	1,675.04
×35.0	565	1,769.91
×30.0	471	2,123.14
×25.0	611	1,636.66
×20.0	4,813	207.77
×19.0	155	6,451.61
×18.0	308	3,246.75
×17.0	155	6,451.61
... (15 more)		

3. Pool architecture

Each pool consists of 1,000,000 shares. Pool generation: RGS service `multibingo-rng:9443` provides the server seed (RNG_STRICT=true, no local fallback). Paytable counts written into array, shuffled with `mulberry32(SHA-256(server_seed))` Fisher-Yates. Pool audit_hash chained via Ed25519 signature. Tickets consumed sequentially; outcome = multiplier at position in shuffled array.

4. Audit chain (K.A.R. h)

Daily Merkle root signed with Ed25519 (key ID `d651f1b9f793f40d`). Leaves = ticket_hash + pool_hash. Persisted in WORM-locked PG row + audit blob to disk (S3 Object Lock in prod). Each day's row stores `prev_root_sha256` forming a hash chain.

5. Verifier endpoints

```
GET /api/ilottery/games/HAND_TO_HAND_TACTICS/paytable
GET /api/ilottery/games/HAND_TO_HAND_TACTICS/config?jur=GLI-SANDBOX
POST /api/ilottery/games/HAND_TO_HAND_TACTICS/open-pool
POST /api/ilottery/games/HAND_TO_HAND_TACTICS/play
POST /api/ilottery/vector/replay (game_code=HAND_TO_HAND_TACTICS)
GET /api/ilottery/verify/:ticket_id
GET /api/ilottery/merkle/proof/:ticket_id
GET /api/ilottery/audit/public-key
```

6. Test vectors v1

URL: https://kobowlotto.com/mathforge/ilottery/gdd/hand_to_hand_tactics/vectors_v1.json
600 vectors × 5 denoms = 3,000 prize data points (6 tiers × 100 each).

7. Operator Ed25519 public key

```
-----BEGIN PUBLIC KEY-----
MCowBQYDK2VwAyEAU2k0zXnm09QHDuKlSEQYUAFeACAeOTUceEuiRGLSiXs=
-----END PUBLIC KEY-----
```