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ASSET MANAGEMENT

Constructing an Optimal Alternatives Portfolio Without Real Estate, Hedge Funds or Traditional Private Equity: An Efficient Frontier Approach

SEPTEMBER 2025

EXECUTIVE SUMMARY:

This paper analyzes the construction of an optimal portfolio of alternative investments using mean-variance optimization and the efficient frontier framework. The objective is to maximize the Sharpe ratio, defined as excess return over a 4% risk-free rate per unit of risk.

The analysis is based on seven core alternative asset classes: farmland, lower middle market private equity, timberland, private credit, traditional private equity, hedge funds, and private real estate. Using expected return and volatility inputs, along with an industry-consistent PSD-adjusted correlation matrix, we derive the covariance required to determine optimal portfolio.

The efficient frontier demonstrates the trade-offs between risk and return, showing how allocations evolve as target returns increase. At the conservative end, farmland dominates the allocation due to its combination of stable returns, low volatility, and low correlations. As target returns rise, timberland, private credit, and LMM private equity enter the mix, increasing expected returns while maintaining efficiency.

Traditional private equity, hedge funds, and private real estate do not appear in the tangency portfolio, as their incremental return is insufficient relative to their higher volatility and correlations. This is noteworthy given the often-dominant place these strategies play in most alternative portfolios.

The maximum Sharpe portfolio allocates nearly half its weight to farmland (46.7%), with meaningful allocations to private credit (19.2%), LMM private equity (17.3%), and timberland (16.8%). The resulting portfolio delivers an expected return of ~12.5% with volatility of ~3.8%, yielding a Sharpe ratio of ~2.25.

This outcome illustrates a key lesson: optimal portfolio design in alternatives is not about maximizing exposure to the highest-return assets, but about combining complementary return streams with diversifiers that improve overall efficiency. The framework provides both a clear picture of the most efficient current allocation and a roadmap for how portfolios should adjust as risk and return objectives change.

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INTRODUCTION:

The efficient frontier is the set of portfolios that achieve the best possible trade-off between return and risk. A portfolio is considered efficient if, for a given expected return, no other portfolio has lower volatility, or conversely, for a given volatility, no other portfolio has higher expected return. Portfolios lying below the frontier are inefficient because there exist better combinations of the same assets, while anything above the frontier is impossible.

The construction of the frontier begins with three inputs: the expected return of each asset, its volatility (standard deviation of returns), and the correlation structure that describes how assets move together. These combine to form the covariance matrix Σ, which is the core of the analysis. Mathematically, if σ is the vector of asset volatilities and C is the correlation matrix, then the covariance matrix is: $\Sigma = \mathrm{diag}(\sigma)\, C\, \mathrm{diag}(\sigma)$.

For any set of portfolio weights w, the expected return of the portfolio is: $\mu_p = w^\top \mu$,

where μ is the vector of expected returns. The risk of the portfolio, expressed as standard deviation, is: $\sigma_p = \sqrt{w^\top \Sigma w}$.

To trace the efficient frontier, we select a series of target returns μ^* ranging from the lowest to the highest available across the assets. For each target return, we solve the optimization problem: $\min_w \; w^\top \Sigma w$

subject to $\sum_i w_i = 1, \quad w^\top \mu = \mu^*, \quad w_i \geq 0.$

This yields the set of portfolio weights that achieve the target return with the smallest possible volatility. Repeating this across a grid of return levels produces a curve of (σ_p, μ_p) pairs: the efficient frontier. The curvature of this line reflects the extent of diversification benefits. If correlations between assets are low, combining them reduces risk substantially and the frontier bends sharply to the left; if correlations are high, the benefits are weaker and the frontier appears flatter and more outward-tilted. Among the portfolios on the frontier, the most important is the one with the maximum Sharpe ratio. The Sharpe ratio is defined as: $S = \frac{\mu_p - r_f}{\sigma_p}$,

where r_f is the risk-free rate. To find this tangency portfolio, we directly maximize S over all possible weight vectors subject to the budget constraint $\sum_i w_i = 1$

and non-negativity constraints $w_i \geq 0$.

The optimizer balances assets with high individual returns against those that provide strong diversification, concentrating the allocation into the most efficient mix.

RESULTS:

With our seven-asset alternative universe:

- Farmland
- Timberland
- Lower Mid-Market Private Equity
- Traditional Private Equity
- Private Credit
- Private Real Estate
- Hedge Funds

and the industry PSD correlation, the maximum Sharpe ratio portfolio allocates nearly half of its weight to farmland, with meaningful positions in private credit, LMM private equity, and timber.

Farmland	Private Credit	LMM PE	Timberland
46.7%	19.2%	17.3%	16.8%

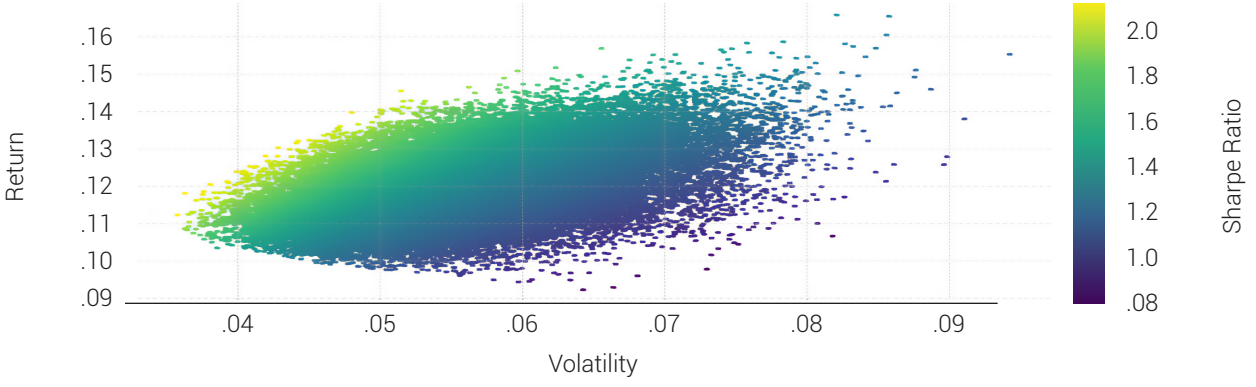
Traditional PE	Hedge Funds	Private RE
0%	0%	0%

Traditional private equity, hedge funds, and private real estate were excluded, as their higher correlations and weaker excess returns made them inefficient contributors once the 4% risk-free hurdle was applied.

The resulting portfolio delivered an expected return of ~12.5% with a volatility of ~3.8%, yielding a Sharpe ratio of ~2.25 — the most efficient balance of risk and return under these assumptions.

The shape of the efficient frontier illustrates how allocations shift as one moves from conservative, low-risk portfolios into higher-return territory. At the lower end, farmland remains dominant, while incremental increases in target return bring timber, private credit, and eventually LMM private equity into the mix. This smooth rebalancing, determined by the covariance structure, demonstrates the way diversification improves efficiency and why disciplined optimization is critical in constructing alternative asset portfolios.

Monte Carlo Simulation of Portfolio Allocations (7 alternative rf = 4%):



CONCLUSIONS:

Constructing a maximum Sharpe portfolio of alternatives requires balancing assets that generate attractive excess returns with those that provide true diversification. The efficient frontier analysis demonstrates that it is not sufficient to chase the highest-returning private equity strategies in isolation; the most efficient portfolio is achieved by combining complementary return drivers with assets whose risks are only weakly correlated.

Under these assumptions, farmland stands out as the anchor allocation. Its moderate return is amplified by very low volatility and low correlations to the other alternatives, making it the most efficient building block. Private credit complements this role by offering stable, income-like returns that sit well above the 4% risk-free hurdle, while still carrying modest risk. Timberland contributes further diversification, reinforcing portfolio stability while maintaining efficiency. Finally, lower middle market private equity earns a meaningful but not dominant allocation, adding higher return potential without overwhelming the risk budget.

Traditional private equity, hedge funds, and private real estate do not appear in the maximum Sharpe portfolio. Once the 4% risk-free rate is accounted for, their excess returns are not sufficient to offset their higher volatility and stronger correlations to other risk assets. This is noteworthy given the often-dominant place these strategies play in most alternative portfolios.

The key takeaway is that portfolio construction depends not only on standalone Sharpe ratios, but on the marginal contribution each asset makes to the overall portfolio Sharpe, given the covariance structure. The resulting tangency portfolio delivered an expected return of ~12.5% with a volatility of ~3.8%, producing a Sharpe ratio of ~ 2.25.

Optimal portfolio uses farmland (47%), timberland (17%), private credit (19%) and LM M PE (17%) with resulting:

- Expected return = ~12.5%
- Volatility = ~3.8%
- Sharpe ratio = ~ 2.25

In practice, this allocation shows how an investor could build a “core alternatives portfolio”: overweighting farmland, private credit, and timber as the stabilizing base, with a measured allocation to LMM private equity to enhance returns. Ultimately, the efficient frontier highlights the value of disciplined optimization. By grounding allocations in both expected returns and realistic correlations, investors can identify the mix of alternatives that maximizes efficiency. The framework offers not just a single optimal portfolio, but a roadmap for how allocations should adjust as one targets more or less risk while still maintaining efficiency.

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Table 1: Return & Volatility

Asset	Return	Volatility
Farmland	0.11	0.04
LMM PE	0.20	0.10
Timber	0.108	0.05
Private Credit	0.108	0.055
Traditional PE	0.145	0.12
Hedge Funds	0.09	0.09
Private RE	0.084	0.087

Table 2: Correlation Matrix (Industry PSD)

	Farmland	LMM PE	Timber	Private Credit	Traditional PE	Hedge Funds	Private RE
Farmland	1.00	0.25	0.50	0.20	0.30	0.25	0.30
LMM PE	0.25	1.00	0.20	0.30	0.75	0.55	0.55
Timber	0.50	0.20	1.00	0.15	0.25	0.20	0.25
Private Credit	0.20	0.30	0.15	1.00	0.35	0.30	0.35
Traditional PE	0.30	0.75	0.25	0.35	1.00	0.60	0.55
Hedge Funds	0.25	0.55	0.20	0.30	0.60	1.00	0.45
Private RE	0.30	0.55	0.25	0.35	0.55	0.45	1.00

Table 3: Covariance Matrix

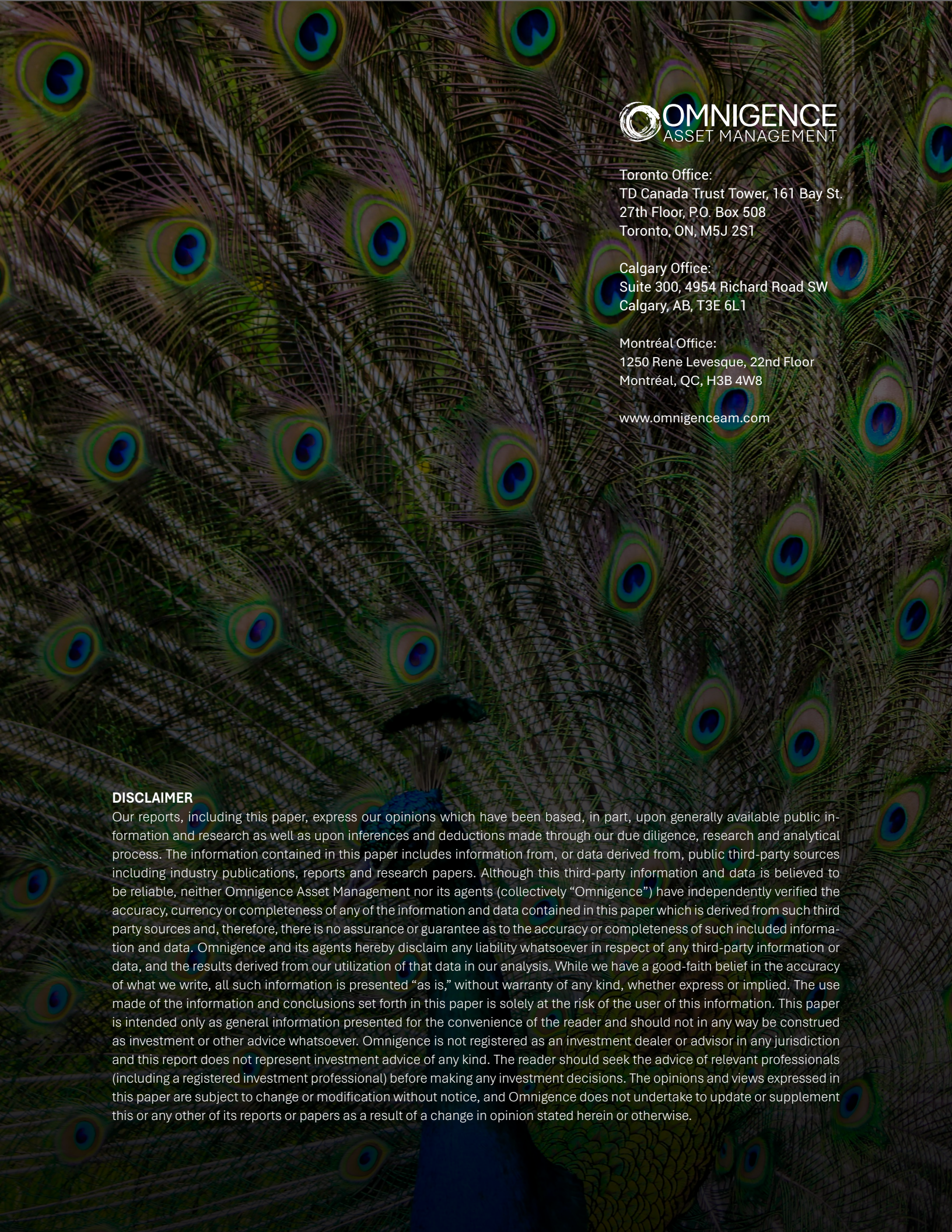
	Farmland	LMM PE	Timber	Private Credit	Traditional PE	Hedge Funds	Private RE
Farmland	0.0016	0.0010	0.0010	0.0004	0.0014	0.0009	0.0010
LMM PE	0.0010	0.0100	0.0010	0.0017	0.0090	0.0050	0.0048
Timber	0.0010	0.0010	0.0025	0.0004	0.0015	0.0009	0.0011
Private Credit	0.0004	0.0017	0.0004	0.0030	0.0023	0.0015	0.0017
Traditional PE	0.0014	0.0090	0.0015	0.0023	0.0144	0.0065	0.0057
Hedge Funds	0.0009	0.0050	0.0009	0.0015	0.0065	0.0081	0.0035
Private RE	0.0010	0.0048	0.0011	0.0017	0.0057	0.0035	0.0076

Table 4: Efficient Frontier Allocations (7 assets)

Return	Volatility	Sharpe	Farmland	LMM PE	Timber	Private Credit	Traditional PE	Hedge Funds	Private RE
8.88%	6.85%	0.712	0.000	0.000	0.130	0.000	0.000	0.285	0.585
9.37%	5.66%	0.949	0.099	0.000	0.204	0.036	0.000	0.225	0.437
9.85%	4.60%	1.272	0.228	0.000	0.206	0.111	0.000	0.161	0.294
10.33%	3.79%	1.670	0.357	0.000	0.208	0.187	0.000	0.096	0.152
10.82%	3.40%	2.006	0.486	0.000	0.210	0.263	0.000	0.032	0.009
11.30%	3.42%	2.135	0.501	0.043	0.199	0.256	0.000	0.000	0.000
11.78%	3.52%	2.210	0.488	0.096	0.187	0.230	0.000	0.000	0.000
12.27%	3.68%	2.247	0.474	0.149	0.174	0.203	0.000	0.000	0.000
12.75%	3.90%	2.244	0.460	0.202	0.161	0.177	0.000	0.000	0.000
13.23%	4.16%	2.219	0.446	0.255	0.148	0.151	0.000	0.000	0.000
13.72%	4.46%	2.179	0.432	0.308	0.136	0.125	0.000	0.000	0.000
14.20%	4.80%	2.125	0.418	0.361	0.123	0.098	0.000	0.000	0.000
14.68%	5.16%	2.070	0.404	0.413	0.110	0.072	0.000	0.000	0.000
15.17%	5.54%	2.016	0.391	0.466	0.098	0.046	0.000	0.000	0.000
15.65%	5.94%	1.961	0.377	0.519	0.085	0.019	0.000	0.000	0.000
16.13%	6.35%	1.910	0.358	0.572	0.070	0.000	0.000	0.000	0.000
16.62%	6.77%	1.864	0.325	0.625	0.050	0.000	0.000	0.000	0.000
17.10%	7.21%	1.817	0.293	0.678	0.029	0.000	0.000	0.000	0.000
17.58%	7.65%	1.775	0.260	0.732	0.009	0.000	0.000	0.000	0.000
18.07%	8.11%	1.735	0.215	0.785	0.000	0.000	0.000	0.000	0.000
18.55%	8.57%	1.698	0.161	0.839	0.000	0.000	0.000	0.000	0.000
19.03%	9.04%	1.663	0.107	0.893	0.000	0.000	0.000	0.000	0.000
19.52%	9.52%	1.630	0.054	0.946	0.000	0.000	0.000	0.000	0.000

Table 5: Optimal Weightings

Asset	Weight (%)
Farmland	46.7%
Private Credit	19.2%
LMM PE	17.3%
Timberland	16.8%
Traditional PE	0.0%
Hedge Funds	0.0%
Private RE	0.0%



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