

Graph Pattern	Hop Type	Expressions in $\mu - RA$
(a)-[FriendOf]->(b), (b)-[Knows]->(c)	One Hop And Branch	$\tilde{\pi}_m \left(\rho_{fid}^m(F) \bowtie \rho_{pid}^m(K) \right)$
(a)-[FriendOf]->(b)-[FriendOf]->(c), (b)-[Knows]->(d)	Two Hops And Branch	$\tilde{\pi}_m \left(\rho_{fid}^m(F) \bowtie \rho_{pid}^m(F) \bowtie \rho_{pid}^m(K) \right)$
(a)-[FriendOf]->(b)-[FriendOf]->(c), (c)-[FriendOf]->(d), (c)-[Knows]->(d)	Three Hops And Branch	$\tilde{\pi}_m \left(\rho_{fid}^m \left(\tilde{\pi}_m(\rho_{fid}^m(F) \bowtie \rho_{pid}^m(F)) \bowtie \rho_{pid}^m(F) \bowtie \rho_{pid}^m(K) \right) \right)$
(a)-[FriendOf]->(b)-[FriendOf]->(c), (c)-[FriendOf]->(d), (b)-[Knows]->(d)	Three Hops And Branch	$\tilde{\pi}_{m,n} \left(\rho_{fid}^n \left(\rho_{fid}^m(F) \bowtie \rho_{pid}^m(F) \right) \bowtie \rho_{fid}^n(F) \bowtie \rho_{pid}^m(K) \right)$
(a)-[FriendOf]->(b)-[FriendOf]->(c), (c)-[FriendOf]->(d), (b)-[Knows]->(d)	Three Hops And Branch	$\tilde{\pi}_{m,n} \left(\rho_{fid}^m(F) \bowtie \rho_{pid,fid}^{m,n}(F) \bowtie \rho_{pid}^n(F) \bowtie \rho_{pid}^m(K) \right)$
(a)-[FriendOf]->(b)-[FriendOf]->(c), (c)-[FriendOf]->(d), (b)-[Knows]->(d)	Three Hops And Branch	$\tilde{\pi}_a(A) \rho_{fid}^m(F) \bowtie \rho_{pid,fid}^{m,n}(F) \bowtie \rho_{pid}^n(F) \bowtie \rho_{pid}^m(K)$