$$\ell = \sum_u \sum_v \#Sample \cdot Sim_u(v) \cdot (log\sigma(\vec{s_u} \cdot \vec{t_v}) + \frac{k}{|V|} \sum_n log\sigma(-\vec{s_u} \cdot \vec{t_n}))$$

$$= \#Sample\{\sum_u \sum_v Sim_u(v) \cdot log\sigma(\vec{s_u} \cdot \vec{t_v}) + \sum_u \sum_n \sum_v Sim_u(v) \cdot \frac{k}{|V|} \cdot log\sigma(-\vec{s_u} \cdot \vec{t_n})\}$$

$$= \#Sample\{\sum_u \sum_v Sim_u(v) \cdot log\sigma(\vec{s_u} \cdot \vec{t_v}) + \sum_u \sum_n \frac{k}{|V|} \cdot log\sigma(-\vec{s_u} \cdot \vec{t_n})\}$$

$$= \#Sample\{\sum_u \sum_v (Sim_u(v) \cdot log\sigma(\vec{s_u} \cdot \vec{t_v}) + \frac{k}{|V|} \cdot log\sigma(-\vec{s_u} \cdot \vec{t_v}))\}$$