Composition of Relations is Associative.

To show: (R ∘ S) ∘ T = R ∘ (S ∘ T)
Proof:

$$
\begin{aligned}
(R \circ S) \circ T &= \left\{ (a,b) \;\middle|\; \exists c, \quad (a,c) \in T \quad \wedge \quad \underbrace{(c,b) \in (R \circ S)} \right\} \\
&= \left\{ (a,b) \;\middle|\; \exists c\,, \exists d\,, \quad \underbrace{(a,c) \in T \quad \wedge \quad (c,d) \in S} \quad \wedge \quad (d,b) \in R \right\} \\
&= \left\{ (a,b) \;\middle|\; \exists d\,, \quad \underbrace{(a,d) \in (S \circ T) \quad \wedge \quad (d,b) \in R} \right\} \\
&= R \circ (S \circ T)
\end{aligned}
$$