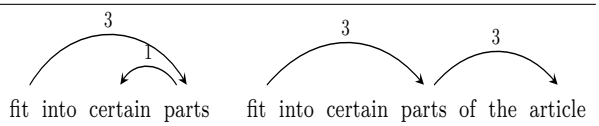
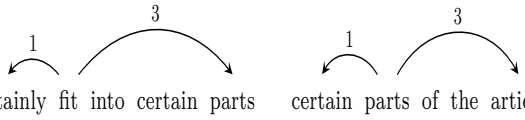
hierarchical catena	
parallel catena