# Order Groups

Sets can have symbols in sequence {order group}, such as pattern or k-tuple.

**subsets**

The set can have subsets. Subsets are symbol sets in sequences and patterns.

**group**

All subsets form order groups. For example, pattern "acg" has subsets NULL, "a", "c", "g", "ac", "cg", and "acg". Order groups contain null set and pattern. If sets can be circular, the set can have subsets "ga", "cga", and "gac".

**equivalence**

Rules can be that patterns are equivalent over gaps and insertions, so "acg" = "ac gX". Gaps or insertion size or number can have restrictions.

**alignment**

Two patterns share largest subset. Two patterns share two largest equivalent subsets at optimum alignment.

**process**

To compare patterns, add or remove gaps and insertions from both patterns to find largest subset. If symbols are dimensions, spaces have maximum number of shared dimensions and minimum number of new dimensions.

**index**

Indexes are part of, and have position in, patterns. Pattern symbols have one or more indices. In pattern "acgta", symbol "a" is at position 1 and 5. Pattern subsets start at one or more indices. In pattern "acgta", subset "ac" starts at position 1.

**union**

Combining patterns results in new symbol sequences and patterns. Start with first pattern and add new symbols in sequence. Discard symbols that are the same in sequence, for example, "abc" and "ag" nets "abcg". It is like union of sets but with order in elements.

Combining is associative but not commutative. Null pattern combines with pattern to give same pattern. The same pattern combines with itself to give same pattern. Inverse pattern combines with pattern to give null pattern, but there can be no inverse pattern.

**intersection**

Finding largest aligned subset is like set intersection. Aligning "abc" and "ag" nets "a".

Aligning is associative and commutative. Null pattern aligns with pattern to give null pattern. The same pattern aligns with itself to give same pattern. Inverse pattern combines with pattern to give null pattern.

**conversion**

Natural or artificial objects, events, lines, surfaces, solids, n-dimensional figures, geometric points, figures, or images can be linear single-symbol series and so can be patterns. Patterns have order groups, and so all things can align. For example, letter "a" can stand for angle of 45 degrees and letter "L" can stand for angle of 90 degrees, so pattern "aLa" can stand for right triangle with two 45-degree angles.

Symbol sequences can transform into symbol group sequences. For example, pattern "acgta" has three-symbol subsets, "acg", "cgt", and "gta", rather than a five-symbol sequence. Subsets can align rather than single symbols.

Two objects or events can transform into linear RNA-base sequences. They can align by hybridization.

**length vs. symbol number**

Things can use patterns with few symbols and long sequences or shorter sequences with more symbols.

**brain**

Perhaps, brain can compare patterns using order groups.

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