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Applying Mathematical Set Theory to Statutory Construction of Municipal Sign Laws

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Introduction

An ambiguity in the town code of Southampton, New York, recently created a controversy over whether thin strips of plain plastic would be signs if they were affixed to utility poles to demarcate a religious boundary.[1] The town's chief building inspector determined that the strips would be signs, even though they bore no writing or other distinguishing characteristics.[2]

The proponents of the project appealed to the Zoning Board of Appeals (ZBA). At the ZBA hearing, members of the public argued about whether these pieces of plastic would fall under the town's definition of "signs."[3] If the strips were "signs," attaching them to utility poles would be prohibited.[4]

Some residents favored the project and told the ZBA that the town's definition of "signs" clearly did not apply to the plastic strips. But other residents opposed the project and told the ZBA that the town's definition of "signs" clearly did apply to the plastic strips.[5]

This case illustrates why municipal lawyers might want to review their high school mathematics lessons about set theory before drafting statutes. The application of set theory—particularly in the form of Venn diagrams—can help to prevent ambiguity of language in statutory construction. It is this ambiguity that gives rise to differences in interpretation, and these differences frequently lead to litigation over the meaning of a statute.[6]

The Case[7]

The East End Eruv Association, Inc., a group of Orthodox Jews, sought to create an area known as an "eruv" in the western part of Southampton Town. An "eruv," under Jewish law, is an area outside the home in which Orthodox Jews are allowed to push or carry things on the Sabbath when such activity would otherwise be prohibited. The creation of an eruv allows worshippers to carry keys and push strollers or walkers to and from the synagogue. The eruv is conceptual. It has no walls or roof, but its outer borders are marked by thin plastic strips called "lechis" that

are attached to utility poles. At a hearing before the Southampton Town Zoning Board of Appeals on April 3, 2013, an attorney for the applicant stated that lechis serve as conceptual "doors" to an eruv and, therefore, do not convey a message. Thus, he explained, lechis are not signs under the language of the town code.[8]

The Regulation

Southampton Town's sign law defines a "sign" as follows (emphasis added):[9]

> SIGN
>
> Any material, device or structure displaying, or intending to display, one or more messages visually **and** used for the purpose of bringing such messages to the attention of the public, but excluding any lawful display of merchandise. The term "sign" shall also mean and include any display of one or more of the following:
>
> A. Any letter, numeral, figure, emblem, picture, outline, character, spectacle, delineation, announcement, trademark, or logo**; and**
>
> B. Colored bands, stripes, patterns, outlines or delineations displayed for the purpose of commercial identification.

The problem with the town's definition of a sign is that it is ambiguous. The highlighted words demonstrate some of the ambiguities that create confusion and give rise to multiple interpretations. Although the word "and" is conjunctive—properly used to combine two elements—writers sometimes mistakenly use "and" when they mean "or," which may be the case in the Southampton statute.[10]

If the word "and" is read in its proper use as a conjunctive, rather than as a disjunctive (or), the statute's meaning is as follows: A sign must include all parts of the definition. That is, for something to be a sign, it must either send a message or intend to send a message, and it must contain at least one element from part A or B.

But, because part B contains the word "and" before the words "commercial identification," the words "commercial identification" could be read to modify not only all the other words in part B but also those in

part A. This is because part A also ends with the word "and," which joins the two parts. Did the scrivener intend to fuse the two parts? This is unclear. And that is the problem.

Ambiguity in Statutes

Ambiguity in statutes comes from conflicts between the intended relationship of words and the reader's perceived relationship of those words. The "syntactic ambiguity" caused by the word "and" is common.[11]

This is an example of a sentence in which the word "and" might be conjunctive or disjunctive:[12]

"Persons who are law teachers and members of the A.B.A. will qualify."[13]

What does that mean? Did the scrivener mean to say that persons who are BOTH law teachers and members of the A.B.A. will qualify? Or did the scrivener mean to say that EITHER those persons who are law teachers OR those persons who are members of the A.B.A. will qualify? That is, was the word "and" meant to be conjunctive or disjunctive?

But this kind of "either-or" ambiguity is just the beginning of the havoc that the word "and" can create. The following is an example of a situation where the word "and" can create four possible interpretations of one sentence:

"All law professors and students at Yale should have little trouble understanding this."[14]

This seemingly simple sentence can be interpreted four different ways:

1. All law professors everywhere (not just those at Yale) plus all students at Yale (not just law students there) should have little trouble understanding this.

2. All law professors everywhere (not just those at Yale) plus all law students at Yale should have little trouble understanding this.

3. All law professors at Yale plus all students at Yale (not just law students there) should have little trouble understanding this.

4. All law professors at Yale plus all law students at Yale should have little trouble understanding this.

Now look at Southampton's definition of a "sign." The multiple uses of the word "and" between elements of the definition give rise to at least three interpretations of the definition:

1. A sign is a message that must also contain elements of both section A and elements of section B.

2. A sign is a message that must also contain elements of either Section A or elements of Section B.

3. A sign is a message that could, but doesn't have to, contain elements of either section A or section B.

This is where an application of the principles of mathematical set theory becomes helpful. They help to clarify which elements should be grouped with which other elements to become a set. For example, does $4 + 3 \times 2 = 10$ or 14?[15] It depends. If you group the first two numbers into a set, the answer is 14. But if, instead, you group the second two numbers into a set, the answer is 10. That is, $(4 + 3) \times 2 = 14$, but $4 + (3 \times 2) = 10$.[16]

Set theory becomes a lot more complicated when you are examining several sets, and each set contains numerous elements. This is where Venn diagrams are handy. For those of you who have long forgotten your pre-college mathematics lessons, set theory is a branch of mathematical logic that can be applied to collections of elements. Mathematicians often use non-numerical depictions known as Venn diagrams to show the logical connection between elements of various sets.[17] Similarly, at the pre-drafting stage, a scrivener of municipal statutes can use Venn diagrams to avoid unintentional conjunctions or disjunctions of sets. By creating a Venn diagram for each possible intersection of the sets of elements in a statute, a scrivener can see clearly the syntactic ambiguities and clarify them.

In the case of Southampton's definition of a "sign," the three interpretations would be represented in a Venn diagram as follows:

Figure 1:

In Figure 1, the triangular area at the intersection of the three circles shows one interpretation of the town's definition of a sign. That is, the small area in which all three circles overlap shows that a sign must contain all three of these elements: a message, a display and a purpose of commercial identification. In this scenario, the word "and" is always conjunctive.
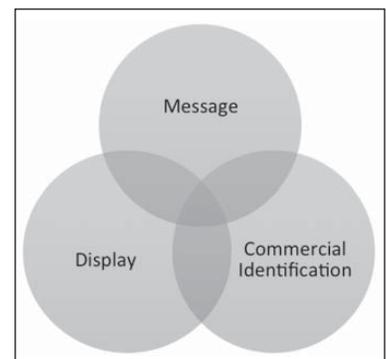
Figure 2:

In Figure 2, the two elliptical areas where the circles overlap show another interpretation of Southampton's definition of a sign. That is, the overlapping areas show that a sign must contain either of two combinations of elements: a display that sends a message or a commercial identification that sends a message. In this scenario, the word "and" is sometimes conjunctive. (That is, it is sometimes conjunctive and sometimes disjunctive.)
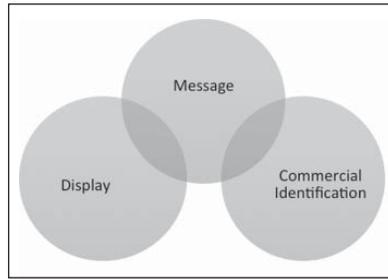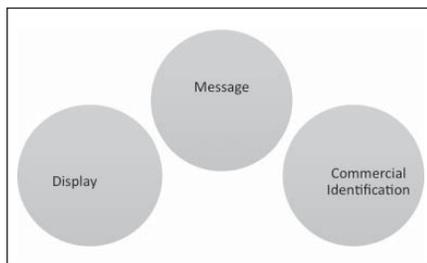
Figure 3:

In Figure 3, the three independent circles show yet another interpretation of Southampton's definition of a sign. That is, the separation between each circle shows that if a sign contains a message, the sign doesn't have to contain either a display or a commercial identification. In this scenario, the word "and" is never conjunctive. (That is, it is disjunctive.)

The Pink Flamingo Scenario

To understand the implications of what can happen if the word "and" is interpreted as being conjunctive versus disjunctive, consider the following hypothetical:

Question: In the Town of Southampton, is a pink flamingo whirligig a sign if a homeowner displays it on the front lawn of a residence? (Note, when reading the town's sign ordinance, that the town code defines the word "shall" as being mandatory.[18])

Task: Apply the elements of the three sets that make up the definition of a sign in Southampton: (a) a material, device or structure that sends or is intended to send a message to the public, (b) a display that contains a character or spectacle, and (c) a display for commercial identification.

Analysis: A pink flamingo whirligig is made of wood (a "material"). Decorating your front lawn with it (a "display") demonstrates that you have a sense of humor or that you find pink flamingo whirligigs attractive (sends "a message to the public"). When the flamingo's little legs whirl around like the cartoon character Road Runner, the whirligig (a "character") draws attention to itself (a "spectacle").[19] But the determination of whether this whirligig is a sign hangs on one crucial word—"and"—at the end of section A of the definition of a sign. Recall that the definition of a sign includes the following:

> The term "sign" shall also mean and include any display of one or more of the following:
>
> A. Any letter, numeral, figure, emblem, picture, outline, character, spectacle, delineation, announcement, trademark, or logo; **and**
>
> B. Colored bands, stripes, patterns, outlines or delineations displayed for the purpose of commercial identification.[20]

If you believe that the word "and" was meant to be conjunctive between parts A and B of the definition, then the words "for commercial identification" at the end of part B modify each and every item in part A because the word "and" links them. This means that your character or spectacle would have to be displayed for the purpose of commercial identification to be deemed a sign. If your pink flamingo whirligig lawn ornament were not displayed for commercial identification, it would not be a sign.

Alternatively, if you believe that the word "and" was not meant to fuse parts A and B, then your whirling flamingo lawn ornament would be a sign. This is because the words "for commercial identification" in part B would apply only to part B and not to part A.

The Bottom Line

If you believe that the word "and" at the end of part A was meant to be conjunctive, then a lechi is not a sign because it is not displayed for purposes of "commercial identification." That is, if your pink flamingo whirligig is not a sign for this reason, then neither is a lechi.

Alternatively, if you believe that the word "and" was meant to be disjunctive (acting as "or"), then your whirling flamingo lawn ornament might be a sign. This is because the words "for commercial identification" would apply only to part B, but not to part A. If the word "and" was meant to be disjunctive, the determination of whether a whirligig or a lechi is a sign would be based on the application of other factors in the town's definition of a sign (for example, the word "message").

Municipal attorneys in other towns and villages should take a lesson from Southampton's lechi case and check their own sign ordinances for syntactic am-

biguities. They should also tell their children to pay attention in math class because a seemingly useless lesson can, years later, actually become useful.

Endnotes

1. Shaye Weaver, *ZBA Hears Case for Eruv*, Southampton Press, Apr. 11, 2013, at A1, a*vailable for subscriber at* http://www.27east.com.

2. *Id.*

3. *Id.*

4. Southampton, N.Y., Town Code § 330-203B(10), *available at* http://ecode360.com/8702596.

5. Weaver, *supra* note 1.

6. *See* Phillip M. Kannan, *Symbolic Logic in Judicial Interpretation*, 27 U. Mem. L. Rev. 85, 85 (1966) (courts are often asked to decipher ambiguous syntax in statutes); *see also* Layman E. Allen, *Symbolic Logic: A Razor-Edge Tool for Drafting and Interpreting Legal Documents*, 66 Yale L.J. 833, 833 (1957) (litigation over the meaning of statutes is often the result of the writer's unintentional failure to convey the intended meaning clearly).

7. Weaver, *supra* note 1. The public hearing concerning this case was televised throughout the Town of Southampton and was also available for viewing online on the town's web site during the week following the hearing. A transcript of the hearing was made part of the record as Exhibit A to the applicant's Supplemental Memorandum of Law.

8. In re East End Eruv Ass'n, Transcript of Public Hearing at 28 (Southampton Town Zoning Board of Appeals Apr. 4, 2013).

9. Southampton, NY, Town Code § 330-201, *available at* http://ecode360.com/8702596.

10. *See* http://www.thefreedictionary.com/and (defining "and" as conjunctive) (last visited July 15, 2013); http://www.thefreedictionary.com/or (defining "or" as disjunctive) (last visited July 15, 2013).

11. *See* Rudy Engholm, *Logic and Laws: Relief from Statutory Obfuscation*, 9 U. Mich. J.L. Reform 324 (1975-1976) (describing how to locate syntactic ambiguity in statutes through the use of mathematics and symbolic logic).

12. *See* http://www.thefreedictionary.com/conjunctive (stating that "conjunctive" means "serving to join") (last visited July 15, 2013); http://www.thefreedictionary.com/disjunctive (stating that "disjunctive" means "lacking connection") (last visited July 15, 2013).

13. Layman E. Allen, *Some Uses of Symbolic Logic in Law Practice*, 3 M.U.L.L. Mod. Uses Log. L. 119, 125-130; also published at 8 Prac. Law. 51 (1962).

14. Allen, *supra* note 6, at 860.

15. *Id.*

16. To further explain the difference between the two equations: The equation "(4 + 3) x 2" means that you first add 4 and 3, which equals 7. Then multiply 7 by 2, which produces 14. The equation "4 + (3 x 2)" means that you add 4 to the product of 3 x 2. The product of 3 x 2 is 6. Adding 4 to 6 produces 10.

17. For a basic refresher on set theory and Venn diagrams, see http://www.mathisfun.com/sets/venn-diagrams.html.

18. Southampton, NY, Town Code § 330-4C, *available at* http://ecode360.com/8702596.

19. Road Runner is a popular television cartoon character created for Warner Bros. in 1948.

20. Southampton, NY, Town Code § 330-201, *available at* http://ecode360.com/8702596.

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