Issues of Knowledge in the Policy of Self-Determination for Aboriginal Australian Communities

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Since 1972, the direction of policy concerning development of Aboriginal Australian communities has been towards adoption of the notion of self-determination. This paper presents a case study of how one particular Aboriginal community has combined local knowledge with non-Aboriginal knowledge to develop an alternative mathematics curriculum that will promote community development and authentic self-determination.

Since 1972 the direction of policy concerning development of Aboriginal Australian communities has been towards adoption of the notion of self-determination (Johnson, 1991). Such a policy implies serious consideration by both communities and government of issues relating to how Aboriginal communities might understand themselves as using "foreign knowledge" (i.e., non-Aboriginal knowledge) in their development. How "outside" knowledge might either clash with, or be used in tandem with local knowledge, concerns over control of resources, and how the developing local knowledge of communities fits within, or contests bureaucratic infrastructures, are questions integral to this policy. While some Aboriginal communities have taken on this challenge there is little evidence that the state and national bureaucracies have engaged the issues.

This paper presents a case study of the way one particular Aboriginal community has gone about solving some of these questions in the context

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of education. We discuss recent developments in combining knowledges in the Yirrkala community in Australia's Northern Territory. This work is both consistent with and promotes self-determination. For the most part, however, these developments have occurred despite the Australian policy of self-determination for Aboriginal communities, rather than because of it. Constituting policies, which promote development of authentic and sustainable community development in Aboriginal Australia, has generally eluded Australian authorities (Royal Commission into Aboriginal Deaths in Custody, National Report, 1991). For the most part this can be attributed to the failure of successive governments to provide resources necessary for Aborigines themselves to develop opportunities for shaping the nature, pace and style of their communities' development. Despite such rhetoric as:

> Past policies of earlier governments tended to break down Aboriginality and Aboriginal heritage. We have reversed the process. No longer will insensitive policies cause Aboriginals to become rootless second class Australians through denial of their own language, culture, beliefs and ideals (Cavenagh, 1974: 35),

there is little evidence to support claims that the vision contained in policies of self-determination has been realized. In particular, in the Yolngu Aboriginal communities in Arnhem Land in the northeast corner of the Northern Territory, which are the subject of the case study reported in this paper, the policy of self-determination has fallen far short of Yolngu aspirations (Coombs, Brandl, & Snowdon, 1993). In fact much of the planning for education for example, still contradicts the espoused framework of self-determination.

Early ideas about self-determination were disingenuous, and foundered on the use of "consultation" as the vehicle for realization of this policy objective. Discourse and power relationships are not challenged in the process of "consultation," and it implies little or no commitment to Aboriginal control over the decision-making structures, processes and the information flow that generate the bureaucratic agenda. Consultation without additional undertakings for involvement and participation in the other parts of the decision-making process still allows other interests to be served without adequate reference to, or respect for the Aboriginal aspirations and points of view. As Coombs et al. (1983) observed:

> . . . what is essentially being denied to Aborigines is the right of decision—of effective participation in the planning, management and delivery of services to meet their special needs (Coombs, Brandl, & Snowdon, 1983: 379).

With regard to education a 1988 report, prepared by a group of Aboriginal policymakers, saw the need to establish a framework so that Aboriginal communities would become fully involved in evolving policies and programs that would suit their particular needs; a framework that would support Aborigines in "effectively exercising their right to self-determina-

tion in education" (Hughes Report, 1988: 2). In the Hughes Report we see the debate over Aboriginal education as one over competing and conflicting forms of practice and theory—competing views of knowledge.

The framework was taken up by government as the Aboriginal Education Project, and as the policy passed from black hands to white, the ways that questions and concerns problematizing knowledge and the style and shape of education, changed. By now it is obvious that the issues raised by the report have been taken over by bureaucratic processes; again the interests of the Aboriginal people, as identified by them, are likely to be neglected.

In working up proposals from the Hughes Report the policy of self-determination has been diluted, neutralized and co-opted. There has been a tendency to reify self-determination as a long-term goal, instead of considering the possibilities for immediate and concrete change in a process of liberation from injustices of the colonial educational system. This has allowed the bureaucracy to treat self-determination in an instrumentalist fashion: it would result from specified steps being followed—steps that seem remarkably like the steps that have been advocated in earlier periods of government endeavor guided by the policy of assimilation. These changes, subtle and pervasive were effected in several ways.

> [The] . . . parcel we offer to Aborigines has strings attached to the purse, and it is these that non-Aboriginal governments hold on to so absolutely and which provide one means whereby they exercise such disruptive influences and pressures upon Aboriginal initiatives (Coombs, Brandl, & Snowdon, 1983: 385).

A charitable explanation of the failure of the policy of self-determination is to suggest that a failure of the white bureaucratic imagination has led to the inability of government agencies at both state and federal level to accept and resource the basic premise that Aboriginal control is the foundation of any process of self-determination. The failures around policies associated with promoting self-determination for Aboriginal communities have primarily been sustained by the inability to develop a vision of parity that accepts Aboriginal knowledge, processes and tradition as a legitimate basis for authority. We suggest that this failure is partly a problem of the ways knowledge is understood. Thus, one of the first issues to be attended to is that of knowledge; possibilities of working knowledge systems together need to be explored.

A Case Study: An Alternative Mathematics Course for Yolngu Students in Northeast Arnhem Land in the Northern Territory of Australia

What follows is a presentation of the work of a group of Aboriginal and non-Aboriginal Australians who in 1986 set out to develop educational processes that would support self-determination for Yolngu Aboriginal Australians. The work has been made possible by a community systematically taking initiatives over reforming the administrative structures of education in their region. A school council properly based in the Yolngu

polity, and Yolngu in terms of both procedures and members, took extraordinary advantage of state policies of devolution of powers to school councils. It legally inserted itself between the Minister of Education and school staff so that all staff are finally responsible to the Aboriginal Council, which also makes all appointments to the schools. In addition, Action Groups comprising all Aboriginal staff in the schools in the region make decisions over the day-to-day running of the schools. Curriculum development, program evaluation, and all roles normally fulfilled by a school principal are now vested in the Action Groups. These political achievements have made possible responsible Aboriginal-controlled developments in education in the region, which would not otherwise have been possible.

The case study is presented in three sections. First, we consider the view of knowledge that has underpinned the work; next, we elaborate the Yolngu metaphors that enable the work and that are one evocation of this view of knowledge; finally, we consider some issues of curriculum content.

A View of Knowledge Consistent with the Practice of Self-Determination

We accept that knowledge systems inevitably give a partial account of the world, differing as they do in their logics, epistemologies, ontologies and notions of evidence. But in that they offer systematic accounts and ways of proceeding, which have their origins in practical work by people to make meaning in specific contexts, they are all alike. We are developing a framework that enables us to cope with the reality of a multiplicity of knowledge systems in ways that are useful. Since all knowledge systems give knowers a partial account of the world, in any cross-cultural work partialities will need to be negotiated.

The work does not romanticize and/or appropriate the vision of the less powerful Yolngu knowledge system. The contemporary Aboriginal Australian systems of knowledge are no more innocent than contemporary scientific knowledge, yet they are a useful counterweight because, as subjugated knowledges they are less likely to deny the critical and interpretive core of all knowledge.

> They are savvy to modes of denial through repression, forgetting and disappearing acts—ways of being nowhere while claiming to see comprehensively. The subjugated have a decent chance to be on to the god-trick and all its dazzling—and, therefore, blinding—illuminations (Harraway, 1991: 191).

Views of knowledge imply views of meaning making. Dissenting from conventional Western understandings of the relationship between language and meaning, we take meaning as radically unstable in that it is a function of the play of other meanings. The corollary of there being no single meaning is that there is no single reality. What there is, is the contingent and ever shifting outcome of meanings that can never be held still, any sentence or proposition has as many meanings as there are contexts. But, this should not be taken as an assertion that there are no meanings.

Similarly the notion of a multiplicity of knowledge systems manifesting quite different sets of accomplishments as truth necessitates a reconsideration of the notion of truth. In particular we must reconsider truth as conventionally understood by westerners: "objective" truth as corresponding to some prior reality. Some might understand this assertion as relativism—the view that truth is paradigm dependent, but the view that we adopt differs from that position too. Meaning is undecidable, so "objective" truth (whether it be a "relative" truth or a "universal" truth) must be considered as unattainable. This is to engage a notion of knowledge, which is not representational, but which asserts that all knowledge derives from particular practical contexts and is a collective accomplishment and an embodiment rather than a representation. We have abandoned the idea that there is a "natural world" for knowledge to be about, entirely distinct from the ways human beings as knowers and agents interact.

We take our work to be transformational; using the present and our developing understandings of how our past has constructed the present, we seek to work against the relations of dominance. We undertake empirical enquiry, which is a "wilful contradiction" of accepted understandings unabashedly committed to using deconstructive methods, methods of displacement that "multiply the levels of knowing and doing upon which resistance can act" (Gayatri, in Harasym, 1988).

One characteristic of the work is a determination to keep the social relations of the research problematic. This requires the participants to publicly negotiate and set the directions of their endeavor. Places to start and directions in which to proceed must be negotiated and kept on the agenda for renegotiation.[2]

Having learned how to see these analogies and understand things in new ways we are answerable for what we do next. If we are to hope for transformations of systems of knowledge, for the construction of worlds less organized by axes of domination, we cannot present our claims to new knowledge as universal claims. Nor can we treat their mobilization in the dual knowledge production systems within which we work as unproblematic, using stabilized assemblages as though they were transparent technologies. In working through the dual sets of devices and strategies whereby claims are mobilized from Yirrkala, the site of our work, we must "focus up" the forms of association, the values and the politics embodied in the products and the processes of our work.

We are generating an exemplar. We regard the principles and the processes of our work as generalizable, but the "facts" we produce, with assumptions, values and ideology built in should be treated with suspicion. Along with the explanations and practices we are producing, which demand belief and prescribe, we are attempting to make evident and not transparent, the technologies we are using. The resistance inherent in our endeavor is shown and in turn invites informed resistance to our work.

We are engaged in the production of local knowledge but we are making its situatedness and its mobilization problematic so that the processes are recognizable. Others may consider and adopt our arrangements and under-

standings for their own purposes, but we are not attempting to enrol them as unwitting allies in our endeavor.

Yolngu metaphors for the work

The possibility of reframing Yolngu concepts within Western knowledge and vice versa, requires each side to assimilate something of the other. In this process Yolngu looks for and emphasizes metaphor. On the Yolngu side metaphors originating in the natural process of the Yolngu lands, and in Yolngu ceremonial life have been developed as the interpretive basis for the work practices.

To appreciate these metaphors one must understand that while in science "nature" and "society" are often taken as quite different from each other and from "knowledge" so that scientific knowledge sees itself and all other knowledge systems as a representation of reality, in Yolngu life this is not the case. Yolngu knowledge is strongly antirepresentational and does not see nature-society-knowledge as constituted of distinct and different sorts of things. We might characterize Yolngu knowledge as idealist, as distinct from empiricist science so that the forms of evidence considered relevant for Yolngu knowledge claims differ from those considered relevant in science. This goes along with recognition and reverence for the context of production of knowledge claims so that Yolngu knowledge celebrates itself as highly indexical (Watson, et al. 1989: 30).

The process of mutual interrogation and the negotiated making available of knowledge of one world in another is familiar practice for Yolngu. For their world exists in two mutually exclusive constituents: the *Dhuwa* and the *Yirritja*. These fundamental categories of Yolngu life are constituted by people and places, flora and fauna, words and songs, stories and metaphors, dances and graphic symbols. Everything, every person, every concept, every place that matters in the Yolngu world is either Yirritja or Dhuwa; the "moieties" contain entities that science would classify as natural, supernatural and social. There are accepted ways of presenting the Yirritja in the Dhuwa world and the Dhuwa in the Yirritja. Explicit acknowledgment of the process of mediation through use of metaphor is commonplace in the Yolngu world.

The metaphor through which the work proceeds on the Yirritja side of the Yolngu world, *Ganma*, is the dialectic of the meeting and continual mutual engulfing of two rivers. The rivers have different sources and as they flow into each other their separate linear forces become the force of a vortex. This vortical flow gives deeper penetration into understanding and knowledge. In terms of the research project, ganma is taken as the dialectic of a river flowing in from the sea (Western knowledge) and a river flowing from the land (Yolngu knowledge) continually engulfing and reengulfing each other on flowing into a common lagoon. In coming together the streams of water mix across the interface of the two currents and foam is created at the surface so that the process of *ganma* is indicated by lines of foam marking the interface of the two currents. In the terms of the metaphor this text is part

of the line of foam that marks the interface between the current of Yolngu life and the current of western life.

On the Dhuwa side the research work proceeds through the *milngurr* metaphor. This sees the dynamic interaction of knowledge traditions as the interaction of fresh water from the land bubbling up in fresh water springs to make waterholes, and salt water moving to fill the holes under the influence of the tides. Salt water from the sea and fresh water from the land are eternally balancing and rebalancing each other. When the tide is high the salt water rises to its full. When the tide goes out fresh water begins to occupy the waterhole. *Milngurr* is dual and balanced ebb and flow. In this way the Dhuwa and Yirritja sides of Yolngu life work together. And in this way Balanda and Yolngu traditions can work together.

Over the past few years negotiations have been conducted amongst Yolngu people (and are still continuing) about the use of these metaphors to underpin the enterprise of knowledge production involving both Yolngu and Western forms. For Yolngu this move is a highly contentious issue, for all metaphors are owned by particular clans and encode the interests of particular groups. In turning the metaphors to use in reframing the western and Yolngu world in each other, we have elaborated the metaphors so that their life is not restricted to the Yolngu polity, yet particular Yolngu people still lay claim to them.

Developing an alternative course of mathematics study

Historically, learning mathematics has been presented as the neutral path through which learners can come to understand logic, seen as a timeless, universal theory. In contrast to this the theory of logic clotting at Yirrkala is both the identification of alternative logics and a translation between them. It is in part growing out of work to transform the mathematics curriculum as one site of work in the contestation over logic between the Yolngu communities and non-Aboriginal Australia. What is coming together from the practical endeavor of establishing a Yolngu school curriculum at Yirrkala is a vast set of meanings, both prescriptive and explanatory.

We are concerned with codified systems of logic in a practical focus relating to mathematics education. We are reconstructing the mathematics curriculum in Yolngu schools on the basis of radically new understandings of what mathematics is, how it relates to traditions of Yolngu knowledge, and how Yolngu learners might appropriate it. After some three years of work it became obvious that the place to start in was with the notion of organizing recursions; that is with the formalized "patterns which connect" and through which we reason.

We have identified that the number system of Western life and the *gurruṭu* system of Yolngu life (known in English as "the kinship system") are disparate codifications of a common logical phenomenon; they are both a set of formal relations that have the form of a recursion. They are formalized patterns that have the social function of connecting disparate sorts of things. At first the number system and the *gurruṭu* system seem to be very different

patterns. But with a little reflection we can identify a metapattern. The metapattern of reoccurring pattern, or recursivity. A formalized recursion such as the number system or the *gurruṭu* system is in fact a formalization of the idea of "and so on in the same pattern." The number system has one type of pattern base, the *gurruṭu* system has another type of pattern as its base. What they hold in common is that the base pattern reoccurs endlessly, and that each is used in a systematic way to organize social life. Normally, immersed and enmeshed in the working of the patterns, we just go on using them.

The Connecting Pattern of Yolngu Life

When Yolngu invite a stranger to their community—a stranger whom they anticipate will have some prolonged personal contact with the community, the person first needs to be located in the *gurruṭu* system, only then can she or he contribute in any way to Yolngu community. Once the relation between the stranger and one person has been settled, then the relations between this person and all other Yolngu is known.

Right from the beginning of their lives, babies are instructed on the relation that this or that person has to them. The *gurruṭu* system where everybody is exhaustively located with respect to every body else is what we might call a genealogic recursion. The recursion cycles with a three-generational interval known as the *mari-gutharra* (grandmother/father—granddaughter/son) cycle. The entire cycle can be considered as containing two subsets of eight elements in a cycle. The *gurruṭu* system is the recursive, linguistically mediated pattern by which everything is maintained in proper relation and located order in Yolngu life. Using the *gurruṭu* system, the relations between all the elements of the world can be known and used.

The three "horizontal" levels of the *gurruṭu* system might be considered as generations, while the two "vertical" levels of the *gurruṭu* system are named as moieties the *Dhuwa* subworld and the *Yirritja* subworld. Every person who has dealings in the Yolngu world is either *Yirritja* or *Dhuwa* and every named thing is likewise either *Yirritja* or *Dhuwa* (or sometimes both). One is the same moiety as one's father and a different moiety to one's mother and one's spouse. *Gurruṭu* is a recursive locative system with a finite number of elements; it locates the proper partners for the total range of social interactions of Yolngu life (potential marriage is merely one of these relations) and maintains an ordered society across time and space. The most important function of the *gurruṭu* system is the orderliness it imposes on the relations of individuals and groups to the land.

The Connecting Pattern of European-Derived Australian Life

Can we look at Western society and say "Here is a recursion by which Western life is ordered"? Yes; the number system. English-speaking mothers and fathers teach their babies the number names, the babies learn a chant and a set of activities that go along with saying the chant—counting pegs or

people or pieces of toast. They learn the number names in songs "One, two, three, four, five, Once I caught a fish alive, . . . " Learning to use the number names properly and to quantify is considered to be one of the most important things that children learn at primary school. The number system mediates all but the most intimate of human relations in the Western world.

The base ten number system, which dominates contemporary Western life is an infinite recursion based around the pattern of our fingers in tallying; it is a reoccurring pattern with ten elements. The number system constitutes a tallying recursion. The value of something, its total size or quantity is revealed when a number name is used in talk of that thing. We can put numbers on just about anything, and so give what ever it is we are talking about a specific value. Using its value we can fit it into the scheme of things. Any number series is a linguistic pattern and it encodes the social practice of adding up (tallying) the individuated things, encoding the practice of tallying on fingers. At its base the system of number names is a way of using a small number of names over and over again so that you can keep adding for ever and ever.

Numerals constitute an infinite series by having a base about which repetition occurs, and a rule by which any element may be derived from the element that precedes it. Contemporary number systems associated with Indo-European languages have ten as their base unit. In a decimal system, ten is the point in the series that marks the end of the basic set of numerals. As each ten is reached, the basic series is started again, another level is begun, each time there must be a record in the numeral of how many tens have been passed.

One can easily imagine the involvement of fingers and toes in tally keeping in a nonlinguistic way. One separated finger codes for one separated item. But if we then extend the coding operation and say a word that codes for the finger or toe, we have done something much more complex, and ended up with a code that is much more useful than material fingers and toes. In saying a word as a finger is held up to code for an item we understand that the word we say does not name either the item, or the finger. It names a position in a progression. Numerals are words that code for a position in a series. Base ten numerals are a linguistic code with which one may record how far through the series of fingers we have progressed, and how many times we have done it.[3]

The Pattern of the Patterns

We have identified two recursions—but they are very different in their content. Should that worry us? Should we wonder at the disparity in content of the ordering recursions, which act as connecting patterns? These two great recursions—the tallying recursion codified in counting and the genealogic recursion codified in *gurruṯu* are of a kind, albeit different in form. They differ in structure: each number has one direct antecedent and one direct successor, and each *gurruṯu* position has two direct antecedent positions and one successor position. However the two systems are characterized by recursive definition, a form of mathematical induction.

A recursive definition formalizes the idea of "and so on." It is a mathematical definition in the weaker sense, in being indirect. However it can be given a more direct form as was elegantly demonstrated a little over a hundred years ago by Frege. We can define *gurruṭu* positions as the members shared by all classes that contain a *gurruṭu* position, and the successors of all their own members. Similarly we can define the natural numbers as the members shared by all classes that contain one and the successors of all their own members.

By noting the emphasis on the genealogical system in Yolngu society we are not saying that the tallying recursion (collecting and distributing material things in patterned ways) is entirely absent from Yolngu life—it is not. Nor, in noting the predominance of tallying in European derived Australia, are we saying that the genealogic recursion (arranging matters on the basis of close and distant kinship) is entirely absent from Western life. What we are saying is that in Yolngu life the tallying recursion does not carry the organizing burden that the genealogic recursion carries. Conversely, in Western society the genealogic recursion carries very little by way of organizing the knowledge system or the productive processes.

Nor are we suggesting that the "great recursions" operate quite independently of one another. They seem to be mutually constitutive and supportive. In the Western world the tallying recursion predominates—we talk of "natural number." It is the recursion by which most social relations are effectively ordered. This is not to deny the influence that the genealogical recursion retains. Yet genealogic classifications are not exhaustive and applicable as apparently "natural" classification throughout the community as we see them in Yolngu life. In Western life kinship classifications are discontinuous and discrete. They are variously regarded as important or not. Westerners can reject their genealogy and invent ancestors with impunity. They can lie about their genealogic relations. The genealogical recursion is taken as significant (that is, objective, inevitable and deterministic) only in the biological sense. In the social sense people can choose to invoke or not to invoke the recursion.

In contrast to the dominant place of the tallying recursion in Western life, it is involved in the reproductive processes of Yolngu life in only a secondary way. Distributive arrangements for turtle eggs invoke such a recursion; here a recursive material arrangement—base five is engaged, and linguistically encoded. In contemporary Yolngu society the use of the tallying recursion, as expressed in money, is subordinate to the working of the *gurruṭu* system. Little hangs on the functioning of the tallying system in Yolngu life. It does not carry the deterministic weight, the aura of objectivity and inevitability, it carries in non-Aboriginal Australia. People can choose or not to invoke the tallying recursion. In all Aboriginal-Australian communities the genealogic recursion carries the productive processes of the social order.

The Curriculum Growing out of these Insights

Recursion has a central role in our alternative mathematics curriculum, now known as a *Garma* Course of Study. This is currently undergoing

authorization as an approved Australian course of study in mathematics. Starting with *gurruṯu* Yolngu children can begin to appreciate Western mathematics through recursive pattern, the shared characteristic of *gurruṯu* and number.

A concern with recursive pattern dominates the first years of the curriculum; working with the two recursive patterns as expressed in language and material patterning. On the language side this is driven by a concern that children should first learn the names of both recursive systems, and the rules by which successive names are generated. Learning the names is accompanied by material displays of the patterning. Emphasis here is not on the so-called "concept," which the names conjures up (for example the notion of "the teness" of "ten" or "the *gutharra*- ness" of *gutharra*[4] but on the pattern within which the name has a place.

What we might understand as the "global concepts" embedded in the two contrasting ways of ordering the world, "value" through number, and "relatedness" through *gurruṯu,* come later, after children have learned to work the patterns through their naming and displaying. Introduction of work with the concept of "numerical value" necessarily occurs much later in the *Garma* course of study compared to a mathematics course of study for native English speakers, where it is often the very first element of mathematics education.[5] Learning concepts like this implies that children have attained a high degree of facility with English on the one hand and Yolngu language on the other. Since English is a second language, sufficient facility with it will be achieved quite some time after facility with Yolngu language.

Solving problems of mathematics education in an Aboriginal-Australian community is a small element in that community attaining self-determination. However the issues involved here are a microcosm of the much larger picture. The content and the processes of the educational program and the values that inform the curriculum can only develop in such a way as to serve Aboriginal interests *after* other matters have been settled. These other matters—epistemology and ontology—knowledge, in turn can only be seriously attended to after issues to do with power and authority have been arranged in such a way that the community itself determines procedures in a very practical way. Aboriginal control is the foundation of any process of self-determination.

Notes

1. We have both been adopted into particular families at Yirrkala. Teachers involved in this work include: Raymattja Marika-Muninggiritj, Banbapuy Maymuru, Merrkiawuy Ganambarr, Yalmay Yunupingu, Mandawuy Yunupingu, Ngalawurr Mununggurr, Wali Wunungmurra, Michael Christie, Kathy McMahon, Bev Taumololo, Claire van Rohy, Sandra Bach and Sally Baker. Elders stand behind the work of the teachers having been actively involved from the very beginning.
2. See Ch. 1, Helen Watson with the Yolngu Community at Yirrkala and D.W. Chambers *Singing the land signing the land,* Deakin University Press, 1990, for a discussion of the conceptual basis of these negotiations.

3. A more detailed elaboration of the practical origin of numbers can be found in Helen Watson "Investigating the Social Foundations of Mathematics: Natural Number in Culturally Diverse Forms of Life" *Social Studies of Science* Vol. 20, No. 2, 1990.
4. *Gutharra* is one of the base names of the *gurruţu* system. A woman calls her daughter's children *gutharra* and a man calls his sister's daughter's children *gutharra*.
5. This is the so-called conservation of number. It is highly likely that this is not a useful way to introduce most native English speakers to a study of mathematics.

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