ABOUT PURE AND APPLIED MATHEMATICS

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The idea of usefulness in mathematics leads us to the distinction between *pure* an *applied* mathematics. This distinction was first drawn in the nineteenth century and, in the school and university sense, in England, *applied* mathematics was usually taken to mean theoretical physics, i.e. the system of concept, techniques and laws, put together by Newton in the *Principia* (1687) and which, throughout the eighteenth and nineteenth centuries, was extended to include elastic and fluid media, the theory of optics and electricity and magnetism.

Today the main concept of classical physics have been reformulated in terms of relativity theory. Even so, because the scope and influence of mathematics has been vastly enlarged in the present century, it is common to use the term *mathematical applications* to cover the whole area in which mathematicians is applied to sets of objects or elements in the external world. Through the manipulation of symbols in a fitted mathematical model, we are enabled to deduce some of properties of electrical circuits, radio waves, or even the combining of genes in reproductive processes.

In school and college mathematics courses a great many subjects such as algebra, geometry, calculus, analysis are grouped together under the general title, *pure* mathematics, and innumerable textbooks and examination syllabi bear this name.

Is this material really pure mathematics? Good teacher (those we can understand) often begin with a problem and, when we have solved it, go on to generalize our method and develop some abstract theory. The ideas we have abut the mathematics we learn are built up over many years of study and become associated in our minds with all the applications and illustrations we have encountered on the way.

It is always easier to explain what we can do with a piece of mathematics than to say what it is. Elementary school algebra of the traditional kind is certainly ab*out*

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number and consequently helps us in our counting operations. We can use school geometry to measure and to map the space around us. Shall we call arithmetic, algebra and geometry *pure* mathematics or mathematical application?

The word *geometry* denotes *earth measurement* and few would deny that, with the ancient Egyptians, this is exactly what was involved. In Greek mathematics, however and particularly in the *Element* of Euclid, the *coincs* Apollonius and the treatises of Archimedes, we find geometry utilized as a language through which the structure of mathematics could be organized and symbolized.

For over 2000 years Euclid's *elements* represented a model of a deductive system based on axioms, postulates and common notations (or rules of reasoning) and the only recognized valid form in which mathematical proofs could be presented.

Notwithsthstanding, and despite the axiomatic form in which Greek mathematics come down to us, the initial definitions, peculiar as they are, seemed to identify recognizable, through idealized, elements existing in the real world. In consequence, theorems deducible within the system appeared to represent true statements, confirmable within the limits of human error by measurement. It follows that, at least until the nineteenth century, Euclidean geometry was regarded as a valid account of the physical space in which we live and there are those who, to this days, can not regard it in any other light.

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