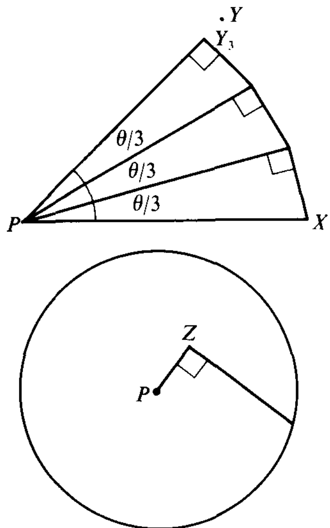
proof follows, although similar efforts were received from the setter, G. A. Garreau, N. J. S. Hughes, P. G. T. Lewis, Nick Lord, Ondřej Matouŝ and I. F. Smith.

K is compact so we can choose a point X of K such that PX is maximal. If X is P, then K is the single point P.

Let Y be any point on the circle centre P, radius PX, with $Y\hat{P}X = \theta$. Define a sequence of points Y_n on the line PY such that $PY_n = PX\left(\cos\frac{\theta}{n}\right)^n$. Then $Y_n \to Y$ as $n \to \infty$. As is evident from the diagram (for the case $n = 3$) each Y_n is in K. Since K is closed, Y itself must be in K. K therefore contains the circle centre P, radius PX and contains nothing outside the circle by the maximality of PX. Also K contains everything inside the circle since any point Z inside the circle is the nearest point to P of some line meeting the circle and thus K. K is thus a circular disc centre P.



The other successful solvers were G. J. McCaughan, H. B. Talbot, R. F. Tindall, B. C. Weyman and G. L. Wilson.

G.T.Q.H.

Correspondence

The future of A-level

DEAR EDITOR,

In the latest June 1987 issue of the *Gazette* you asked to hear from interested readers on the subject of the future of A-level. This is timely indeed. The Teaching Committee Subcommittee on Microcomputers in the Mathematics Curriculum is in the process of bringing out a Report (to be published in 1988) which will suggest that what is needed, even in terms of immediate adjustment, is considerably more than merely addressing the more obvious deficiencies of current A-level Mathematics courses. (Among such deficiencies are that they follow uneasily from GCSE, have no coursework component, are too prescriptive in respect of the core, tend to examine pure topics in isolation more than in a context of applications, contain moribund material and are overfull anyway.)

The purpose of this note is to promote further discussion by drawing the attention of readers to points which we and others have already made on the subject of mathematics A-level in a technological age. The recently published DES-sponsored critical review (1) affirms that:

> *It is important that the rapid changes in our society in technology, in methods of communication and in knowledge, are reflected in changes in mathematics education, both in what is taught and in the methods by which pupils learn. In the longer term the widespread use of the new technology implies substantial changes to the mathematics curriculum.*

and

> *We need to keep under review what mathematics is about, and what it will need to be about.*

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Considerable debate, research, curriculum development and teacher development are needed. As yet, this has hardly begun to happen. In July 1985 the Joint Mathematical Council organised a conference on the future of A-level mathematics "to consider the promotion of a new A-level mathematics course that would take full account of changes in the place of mathematics in the modern world and the widespread use of computers in schools." The Report of the Proceedings [2] emphasised the general agreement at the Conference about the need for change in a number of areas in order to take proper account of the microcomputer. Among the recommendations were the following:

(1) to help them learn mathematics students should write their own programs;
(2) algorithmic (or procedural) thinking and some "discrete mathematics" should come into the syllabus;
(3) more attention should be given to extended investigations and problem-solving; to encourage this coursework should be compulsory and should account for at least thirty per cent of the assessment;
(4) to make these changes possible, the existing A-level core syllabus should be pruned substantially.

At that Conference the Mathematical Association in presenting a draft Report [3] further suggested that:

(5) numerical approaches can allow topics to be introduced earlier in the secondary school and more effectively via applications;
(6) software and packages putting computer power in the hands of the pupil can foster a more experimental, scientific approach;
(7) calculus should retain its pride of place but be approached more numerically and graphically;
(8) the growing availability of symbolic systems (which can already perform, on hand-held machines, all the analytical and algebraic techniques required by current A-Levels) may mean that the amount of routine manipulation can be reduced;
(9) there now needs to be an extended but different focus on both geometry and statistics, and
(10) room needs to be made for some elementary modelling, simulation and, possibly, decision theory.

The above notes will be expanded upon and some issues related to content, to sequence of learning and to teaching and learning styles will be discussed in the major Report [4] of the association which is being prepared by us and which will be presented at ICME, Budapest in July 1988.

Yours sincerely,
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