

men should hang upon the walls of the classroom in which instruction in mathematics is given, so that the twentieth-century student may get some appreciation of the appearance of these men and of their personalities, as well as of their scientific influence. In other words, it is quite as important for the college student to know about mathematics as it is for him to know something of mathematics itself. Precisely the same is true of chemistry, of physics, of zoology, of psychology, of economics, and of all the other fundamental subjects which are included in the usual college curriculum. To be overwhelmed with the details of knowledge in any one of these fields without first being given insight into what all those details of knowledge mean, is to build a barrier across the path of progress toward a liberal education which it is not easy to overcome.

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POLYNOMIALS AS DETERMINANTS

The observation that a general polynomial can be reduced to determinant form (*Scripta Mathematica*, Vol. 5, p. 203) is the basis for one of the most powerful methods for obtaining the roots of polynomials, the method of matrix iteration. The form, which turns out to be useful in that connection because of the fact that it contains the largest possible number of zero elements, is

$$\begin{vmatrix} x + a_1 & a_2 & a_3 & \dots & a_n \\ -1 & x & 0 & \dots & 0 \\ 0 & -1 & x & \dots & 0 \\ \dots & \dots & \dots & \dots & \dots \\ 0 & 0 & 0 & \dots & x \end{vmatrix}$$

This application, and many others, will be found in a recent book, *Elementary Matrices and Some Applications to Dynamics and Differential Equations*, by Frazer, Duncan and Collar (University Press, Cambridge).

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PARTITIONS IN MONETARY UNITS

A recent radio program* raised the question of the number of ways of changing a dollar, giving the correct answer, 292. This is a question of the partitions of 100 in units of 1, 5, 10, 25, 50, the monetary units less than a dollar, and the number in question is the coefficient of x^{100} in the expansion of the generating function:

$$\frac{1}{(1-x)(1-x^5)(1-x^{10})(1-x^{25})(1-x^{50})}$$

A moderately easy way of calculating this coefficient is as follows. Considering the first three terms of the product only, that is, the expansion

$$\frac{1}{(1-x)(1-x^5)(1-x^{10})} = \sum a_n x^n$$

* Vox Pop, Columbia network, on Thursday nights.

it is easy to show that if m is the integral part of $n/10$

$$\begin{aligned} a_n &= (m+1)^2 & n &= 0, 1, 2, 3, 4 \pmod{10} \\ &= (m+1)(m+2) & n &= 5, 6, 7, 8, 9 \pmod{10} \end{aligned}$$

These numbers are easy to compute. If the addition of the factor $(1 - x^{25})^{-1}$ to the G. F. produces coefficients b_n , then $b_n = a_n + b_{n-25}$; similarly the coefficients c_n produced by the further factor $(1 - x^{50})$ have the recurrence: $c_n = b_n + c_{n-50}$. In essentials, the calculation to $n = 100$ is as follows:

n	a_n	b_n	c_n
0	1	1	1
25	12	13	13
50	36	49	50
75	72	121	134
100	121	242	292

The number of ways, say N_n , of changing higher units, up to five dollars, is as follows:

n	200	300	400	500
N_n	2728	12611	41564	115022

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CHANGE IN NAME OF "THE AMERICAN PHYSICS TEACHER"

American Journal of Physics is the new title of the bimonthly publication known since its inception in 1933 as "The American Physics Teacher," according to an action taken recently by the American Association of Physics Teachers concerning its official journal. Remaining under the editorship of Professor Duane Roller of Hunter College, and under the publication management of the American Institute of Physics, the journal will continue to stress the educational, historical, socio-economic, and philosophic aspects of physics, and the instruction of students who take physics as part of a liberal education as well as those who specialize in the science.

MEETING OF THE NATIONAL COUNCIL OF TEACHERS OF MATHEMATICS

The National Council of Teachers of Mathematics will have its 20th annual meeting in St. Louis, February 22-23, 1940. The theme of the meetings will be "Mathematics for the Other-Than-College-Preparatory Student." All phases of this theme will be discussed in the four divisions of the meetings: I, General Meetings; II, Elementary Schools Program; III, Secondary Schools Program; and IV, Teacher Education Program.

Details of headquarters, banquet, speakers, topics, and places of meeting will appear in the January and February issues of *The Mathematics Teacher*. Questions and suggestions should be directed to 525 West 120th Street, New York City.