FASHIONS IN FIGURES.

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"E'en the moon hath her phases."

Problem-solving is the mathematics of the people. No matter how great the value of examples, formulas, or the deduction of abstruse principles as a means of mental culture or of furthering mathematical progress, the public still asks the graduates of its schools to "do its sums."

Since the days when ancient Greek philosophers held "sum-doing bees" in the forum of Athens, where these worthies, keeping the methods secret, gave satisfactory answers to knotty mathematical problems asked by a fascinated and mystified populace, who flocked to discover, if they might, the magical art of these wizards—down through the days when the cute old gentleman assailed the collegian with "the herring and a half that cost a cent and a half"—the plain people have shown an unfailing interest in the subject and have held in high admiration the person who could satisfactorily answer its catchy queries.

Not only in questions of that character is interest shown, but the public in general demands, and justly too, that the young people of its schools shall be able to solve the practical problems that puzzle the brain and stay the hand of this same overworked, busy public.

It follows, therefore, that since a changing public finds continual interest in these problems, the problems themselves must change—varying, as do the milliner's creations, but accurately recording every phase of the political and commercial world. Indeed, it may not be too much to say that if other records and histories were lost, the mathematical problems of a time would reveal its civilization.

Note the following from a new arithmetic. "The battle of Manila began 41 minutes after 5 o'clock Sunday morning, May 1st. Manila is in long. 121 20' E, Washington is in long. 77 W. What was the time at Washington when the battle began by sun time? by standard time?" Such is the text, but between the lines are the words annexation, Spanish oppression, Dewey, McKinley, Morse, Field, International Date Line, Royal Observa-

tory, and indeed much that science, discovery, exploration, patriotism, or philanthropy has done for the race is suggested by this simple question.

Ancient and modern modes of travel are easily discovered, also. The problem beginning, "If a man can walk eighteen miles a day," has been replaced by "A train goes from London to Birmingham in 3 hours;" "The smaller wheel of a bicycle makes 135 more revolutions than the larger one." And a really up-to-date book will no doubt include the automobile and the airship.

Questions of hygiene are now found in the texts. One begins, "How much pure air must be allowed to enter a school room 20x18x10 to supply 30 pupils," etc. Preserve us! In the old days the amount of oxygen consumed by each pupil mattered little, since it came to him freely through the cracks of the log school house. All he had to do to solve the question of ventilation was to lengthen or shorten his distance from the open fireplace, and he immediately and effectively lowered his temperature and so solved and verified the problem at one and the same time.

The arithmetic of fifty years ago contained this problem: "If a man and his wife can drink a keg of beer in twelve days," etc; and this—"If a bushel of corn is worth 35 cents and makes $2\frac{1}{2}$ gallons of whiskey which sells at \$1.14 a gallon, what is the profit?" etc. This is suggestive. Whether the bibulous man who shared the drinks with his wife is extinct or not, he is not now considered sufficiently suggestive of right living to make an example of him; and although many of our youth may be led into the liquor business, public sentiment forbids the predestination of its youngsters to that lucrative employment by the large per cent profit offered by Ray's Higher. In contrast we copy this from a new algebra: "A druggist accepts an offer of \$5 for as many glasses of soda water as can be flavored with any two of his 20 syrups," etc. The change in public sentiment on the liquor question is as marked as is the change from whiskey of the earlier to the soda water of the later problem.

Note this from Ray's "Intellectual"—"If a man earn $37\frac{1}{2}$ cents a day, how much will he earn in 204 days?" Not enough to stimulate the modern boy to join the ranks of laborers, surely, nor enough to suit these days of frequent strikes and shorter hours—for witness this from the New Model—"A clerk's salary is \$4,500," etc.

And so one might multiply illustrations. The settlement of the great West has given us many "land problems." Recent years introduced the new units of electricity. Importation and scientific teaching require the metric units—and all these demands must be met, and in meeting them the old ways are gone, indeed.

Where is the old-fashioned man whose boy semi-annually took this message to the school ma'am?—"Pop says here's a example fer ye to work"—"If 3 cats catch 3 rats in 3 minutes, how many cats will it take to catch 100 rats in 100 minutes?" Shades of scared school ma'ams of long ago, your occupation is gone. What with Rough on Rats, and modern traps, the cat industry has ceased to interest the book makers; but it is doubtful if the rats have been exterminated at less expense than when a cat in full practice and enjoying a reasonable degree of health, and possessing a rat-catching ancestry, was expected to demolish rats with such celerity and dispatch as to terrorize the pedagogues.

The problems that kept our grandfather up nights baking his brain before a roaring fire, "figgerin'"—on the hearthstone—with a charred stick—were of cats and rats, of fox and geese; those of a later generation "ciphered" out with slate and pencil flanked by a shining coat sleeve—fierce salivic sum-destroyer of fifty years ago—were of men walking, plowing and mowing and earning. As a brain stretcher they "figgered" on the famous fish whose tail weighed as much as its head and its body as much as both together. The modern youth sits erect—clamped into a patent desk—armed with patent tablet, pencil and eraser—near a patent air-destroying register—and writes of ohms and ergs, volts and amperes, stocks and bonds, and solves problems like unto this—"How many committees, each consisting of 2 Republicans and 3 Democrats, can be formed from 14 Republicans and 21 Democrats?"

Gone are the good old days of the good old men with their catch questions. Gone the times when men walked 18 miles, mowed $1\frac{1}{4}$ acres, chopped 2 cords of wood, and earned $37\frac{1}{2}$ cents per day—and enter the "youngest son of the newest race," who travels by train at 60 miles per hour and calculates the transmission of millions per cable, or the journey of automobile or bicycle. Verily we move, and mathematics checks off the mile posts of our progress. Is it advance or retreat? *Quien sabe.*

The newer days require new problems—but we must see to it

that in offering them to the youth they are questions fitted to stimulate the keenest thought, the closest application, the most strenuous mental effort. Let not the going of the catch question lose us its keen, shrewd quality of mental exercise. See to it that the new books are not lacking in these things and that the boy in his effort and application measures up to the book.

WHAT MATHEMATICS CAN DO FOR PHYSICS.*

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The question brought before us for consideration in the paper† just read is one of great importance to teachers of mathematics for several reasons.

In the first place the persistence with which it crops out at meetings of science and mathematics teachers wherever and whenever held is a sufficient reason for our considering it carefully.

In England, France and Germany, as well as in the United States, there is a growing demand for reform in the methods of teaching mathematics so as to make the knowledge thereby gained by the student a better tool for use in his work in physics and other sciences.

From the standpoint of the teacher of mathematics therefore, I am convinced that it is high time we were investigating the demands of these reformers for the purpose of complying with them when they are reasonable and just and of putting a stop to them when they are not. Aside from the general agitation of this subject in educational circles we find that our own teachers of physics are after us with a big stick and we who teach mathematics must either comply with their demands or show them why we do not.

Before discussing in detail the things which have been asked of us to-day I shall define my own view-point and that which I believe is the view-point of most teachers of mathematics. Shall we consider this question from the apparent view-point of the teachers of physics that mathematics is, or should be, merely a

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*Read before the Science and Mathematics Teachers of St. Louis.

†"What Physics Can Do for Mathematics."