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Informational arithmetic in the junior high school or upper grades

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Thesis

INFORMATIONAL ARITHMETIC IN THE JUNIOR HIGH SCHOOL OR UPPER GRADES

Submitted by

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INFORMATIONAL ARITHMETIC IN THE JUNIOR HIGH SCHOOL OR UPPER GRADES

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(1) At Connorsville, Ind.

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(3) At Buffalo, N.Y.

(4) At New York City, N.Y.

(5) At Kansas City, Mo.

(6) At Stamford, Conn.

VI. Model Lessons of Informational Arithmetic :

(1) Teaching Taxes.

(2) A Municipal Water Problem .

(3) The Problem of Starting a Business.

(Studying and Making a Budget.

(5) The Problem of Buying a Suit.

While visiting a small high school in Rhode Island, the teacher of civics made the remark that when the class lesson was directed on a current topic, familiar to the pupils, intense interest was aroused. Conversely, when the lesson concerned some European question, far removed from their experience, the hour was far from being profitable. To bear out her contention, she pointed out a boy in her class who throughout the year had been manifestly disinterested in the Dawes Treaty or the World Court controversy. But, when the subject was the recent coal strike of the Pennsylvania mine workers, this same boy - with some eloquence, too - ventured the statement that "when a whole country is suffering from the want of fuel and the state of Pennsylvania has failed to bring about an agreement, the strike is no longer a matter for state settlement but rather a national question that demands the action of Washington ". The coal strike it seems was real, vital to the boy and struck a responsive chord. The other topics discussed in the class were unreal and uninteresting to him because they were so remote to his immediate experience.

The same principle is analogously carried over to the teaching of Arithmetic. When the lesson is motivated and the drill work identified with some problem of immediate interest to the class, it is highly successful. But, as the subject is taught today, much is lost because

the average teacher is addicted to excessive use of the text and the problems in these give the pupil no real sense of overcoming a difficulty worth the effort. They lack purposiveness and reality of background.

THE OLD AND POORER TYPE OF ARITHMETIC

David Eugene Smith, Professor of Mathematics, at Teachers' College, Columbia University, in his work, " The Progress of Arithmetic in the Last Quarter Century ", clearly indicates by typical examples, selected at random from popular Arithmetic texts, the roundabout methods of drill by forcing an operation under absurd conditions. Some of them were as follows :

(1) " 68.46 gals. of cream were ordered for a picnic and .06⅔ melted. How much is left ? "

(2) " Three men bought a grindstone, 20 inches in diameter. How much of the diameter must each grind off so as to share the stone equally, making no allowance for the eye ? "

(3.) " Find the weight of an ivory ball, 2 inches in diameter, the weight of ivory being 1825 oz. per cubic foot ? "

(4) " A boy's lung capacity increases from 1,000 cu.cm. at 6 years of age to 3,600 cu.cm. at 18 years of age. Express the difference in cubic inches. "

It is hardly necessary to point out at length why the above types should be discarded. Indeed, they

are not problems at all. They border more closely on the nature of a puzzle. Those children who, delight in solving puzzles for the sheer satisfaction of overcoming a perplexing riddle or difficulty will be interested in them. To the majority they will be meaningless, artificial, non-functional and, of course, boresome. Little good is to be obtained from the solution of such problems by a few while the bulk of the class cultivates only a deep distaste for anything mathematical, simply because they have been subjected to the "hare and hound " conundrum.

The Department of Education, Division of Reference and Research of the City of New York, also decries the non-functional, isolated problem. An excerpt of the 1924 report reads as follows :

" -- True there should be abundant drill; the mastery of simple combinations must be absolute. But, granting this is so, is it none the less true that one part of the teaching of Arithmetic must include the manipulation of numbers as a process of solving situations and interpreting conditions as a child may experience them ? It must be remembered that the presentation of impossible or unreal situations and conditions prevent that power of proper solution and interpretation which is one function of Arithmetic to develop."

The traditional isolated problem is inefficient in another sense. The New York report just quoted continues: " The isolated or conventional problems found in textbooks today minimized the exercise of real judgment because of the presence of certain cue words which the pu-

pil soon learns to refer to some particular operation. ---- they are apt to degenerate into set forms so that the fairly intelligent pupils are required not so much to think as to recall a cue which some particular sequence of words may suggest . Thus, it happens that in examples requiring the statement of a ratio between two quantities, a pupil knows that the number preceded by "of" should be the denominator, or that such an inquiry as ' What will be the cost of one ? ' suggests division".

E.R. Hamilton in his article, "Insight and Skill In Arithmetic", (Journal of Educational Research, Sept. 1925, pp. 136-144) confirms the above argument as follows:

" It is always possible, if the teacher is not careful, that the pupil will depend too much on habit in solving problems. That is, many so-called "mechanical" calculations may be really problems for the pupil, and many of his so-called "problems" may be really mechanical operations.

"---What is a "problem" ? A problem is a situation that can only be reacted to intelligently and with the employment of insight. If the pupil does not react intelligently, even though he "gets the right answer ", he has not solved the problem

" ---- The most important part of the process of solution consists in obtaining a clear "insightful" grasp of the situation --- I should say that ' the two most important tasks of the teacher of Arithmetic' are that of developing Arithmetical insight and that of getting their pupils to enjoy and value Arithmetical work ".

Hamilton arrays this criticism against the unreal, isolated problem which fails to encourage insight and mental analysis of facts.

ANOTHER WEAKNESS IN MOST ARITHMETIC TEXTS

Our Arithmetics also display a second big weakness. Certain definitions, terms, and word forms appear in texts such as " ad valorem ", "tariff", "mortgage", "brokerage", "property depreciation", "trade discount", etc. which the child does not fully comprehend.

That too much is taken for granted by both the text writer and the teacher as regards the child's ability to understand each new term that he sees in print is attested by the article of Flora Scott and G.C. Myers, " Children's Empty and Erroneous Concepts of the Commonplace " (Jour. Ed. Research, Nov.1923, pp.327-34). It reads in part :

"--- One of the authors ,while teaching history to a class of children of grades V-VIII found such examples of incorrect or vague historical concepts :

---1. Charter :- A rule of law, a person who holds a chart, a paper that laws are kept on, granted, a sheep skin parchment written by a king.

---2. Smuggling :- Stealing, to sneak, drinking whiskey, stealing furs and kidnapping everybody, a person who smuggles beer and alcohol, to tie up business, when anyone tries to get away from anyone.

---3.Granite :- Growing in New Hampshire, flour, wheat, marble, coke, coal, cement, fuel, lumber,lumbering places, made of dirt, many sorts of fruit, people,

"--- A simple test like this could be made up and applied by any teacher in practically any school subject. A teacher who will try such a test or one like the first test will get valuable information which will inevitably suggest to him that he has been taking too much for granted with the pupil. --- Is much of school learning only word manipulation ? If so what are we going to do about it ? ".

Certainly, if children have not clean cut ideas of such common place terms as appear above, how much more vague are their notions of abstract terms appearing in the Arithmetic texts ? Both the text book writers and the teacher have a mutual problem to eliminate this weakness by taking pains in defining clearly any obscure words.

THE MAIN DIVISIONS OF ARITHMETIC

Arithmetic may be logically divided according to the following outline. The back-bone of this analysis appears in the report on Arithmetic of the N.E.A.,1924, as submitted by the committee chairman, Prof. Guy M. Wilson:

I. General :-

(1) Computational:- To develop ability in ordinary manipulations.

(2) Informational :-

(a) Work to be checked, e.g. time to turn on auto headlights; time of ebb and flow of tides (for children living near the sea) .

(b) General reading without check, e.g. knowing the distance of a fixed star.

(c) judgment forming, e.g. Determining the cost of remodeling an old house; shall we buy a new auto or keep the old one, according to our present financial status ?

II. Vocational :-

(1) Computational:- Aims to develop skills in Arithmetic for particular vocations.

(2) Informational :- Aims to communicate information necessary for complete mastery of a certain vocational line , e.g. teaching useful facts from a trade journal.

The above outline may seem quite indefinite as it stands alone, but the next few paragraphs will amplify the ideas . Ordinarilly we are not justified in teaching vocational Arithmetic extensively in our schools. Franklin Bobbitt in an article, " The Technique of Curriculum Making in Arithmetic" (Elementary School Journal, Oct.1924, pp. 127-143) says on this point : " The new technique of curriculum making assumes that the individuals should be trained to perform the functions which they are going to perform and that we are not justified in giving any kind of training whatsoever except as we are reasonably certain that the training is going to function. This means that we cannot give anything in the curriculum which is designed for the performance of vocational labors until the individuals who are being trained, have chosen their vocation.

"---- Vocational applications of Arithmetic are ,therefore, shut out until the pupils have chosen their occupations. In the elementary schools and for the most part in the junior high schools we are training individuals who have not yet chosen their occupations. We cannot, therefore, give Arithmetic for vocational purposes".

However, in particular communities where a great percentage of the children enter certain industries, after leaving school, certain vocational Arithmetic which will make them more valuable in their chosen occupations, is justified on the grounds that the school stands for service This Bobbitt concedes.

It will be noted that mention is made to general in- "informational" Arithmetic. It is difficult to give an exact essential definition of this division of Arithmetic, but it is possible to give a descriptive definition that is fairly clear:

"Informational Arithmetic" aims to supplement the skills which the child has already attained sufficiently well by drill, with a thorough training which offers (1) a full, practical knowledge of the meaning of business terms and practices; and useful information and data on the affairs of commercial and industrial life in the childs community, the state, and lastly the nation.; (2) ample opportunities to "think through" and use good judgment in the solution of real life problems, according to the correct informational data and facts gleaned from the home, the com-munity and the country.

David Eugene Smith speaks of this type of work thusly, " There is also conceivable a type of problem which puts the child in a real situation where he must use his judgment in a matter of interest, as he would in practical life. For lack of a better term we may speak of

such examples as 'real situation' problems. That is, we may frame a half dozen or more problems which relate to some situation in which the pupil may find himself, making the problems one independent of the other, and finally say, ' Is it better, in view of all that we have found, to act in this way or that ?' It may be a matter of vocational guidance, it may be a question of this crop or that on the farm, it may relate to the rent of a house in the suburbs or an apartment in the city or have to do with the cost of farm buildings which the father of some pupil contemplates erecting ". --- (Div. of Research, Dept. of Ed.,New York City, 1914)

N.J. Lennes, Professor of Mathematics of the University of Montana, in his book, "The Teaching of Arithmetic" speaks of putting the teaching of Arithmetic on a life situation basis, in part :- " In a vital sense,however, it is important that the child should learn to see the human significance of the work he is doing. He should be made to feel that the Arithmetic which he is studying is an element of that rushing stream of adult life which he first views as one detach--ed but which is gradually to engulf him and make him a part of itself. He should be made to understand increasingly that Arithmetic is one means that the race of men is using to perform the tasks which their lives demand of them . --"

Thorndike, in his book,"The Psychology of Arithmetic", says :- " According to common sense, the task of the school should be to teach the ability to apply the knowledge and power in solving problems of everyday life. Problems should be solved in the school to the end that pupils may solve the problems that life offers. Much thought and ingenuity should in the future be expended in making problems that prepare directly for life's demands and still fit into the curriculum of an ordinary school.

" The old method was to state a general law or principle and require the children to learn it and then apply it in solving his problems. The more modern way is to provide experiences which will grow together in an orderly, rational system. Efficiency requires that problems should be firmly connected with the situations where they are need -ed. "

John C. Stone, in his book, " The Teaching of Arithmetic", corroborates in a similar paragraph the same stand that Thorndike takes, in the following passage :

" There are some who seem to consider that the development of ability to compute is the final end of a course in Arithmetic. But skill in computation is but the means to the end. Those who would try to meet the demands of the business world for a better product of the schools in the subject of Arithmetic by merely emphasizing drill in computation, are following a course about as inadequate for the purpose of developing a number sense or a mathematical type of thought as a training that confines itself to forming the letters of the alphabet would be as a final preparation for a career in journalism.

" The final aims in a course of Arithmetic are :

1. To develop power in the student to see and express the quantitative relations that exist among the magnitudes that come within his experience, and to interprete the numerical expressions of such relations.

2. To develop in the student the habit of seeing such relationships, especially those vital to his present or future welfare.

3. To give the student a social insight into current business and industrial practices. "

INFORMATIONAL ARITHMETIC IN PRACTICE IN GRADES 7,8,9

The ensuing paragraphs deal with Informational Arithmetic as put in practice in the various school systems of the United States and described in their respective courses of study.

CONNORSVILLE, IND., 1914 : This course of study worked out by Prof. Guy Mitchell Wilson of the School of Education, Boston University, while he was superintendent at Connorsville in 1914, is the best of all those reviewed. Because of its definite nature and suggestive aids in teaching Arithmetic on a life basis, it is most inspiring. To attempt to describe the course with justice to it, would mean to reproduce the syllabus at length. For economy of space, it may be said that this whole course of study was developed by a series of projects and in a motivated way. A fuller description of one of the lessons appears in the latter part of this thesis.

BALTIMORE : The following excerpt from this course is self explanatory : " To bring about an improvement in the work with problems in the grammar grades, the character of the problems and the traditional attitude towards this work must be changed. The pupil must recognize each problem as a life situation. The conditions of each must be like those of actual life, and the pupil must feel a real need for its solution.---- Teach problems having to do with personal health and health conditions in the community, problems on home economics, family and personal budgets; problems of thrift are of paramount importance as are the problems that involve the calculation of cost, dimensions, and maintainance of school and city playgrounds---- school activ--ities, including industrial arts and excursions in connection with history and geography afford abundant material for Arithmetic problems. Under these conditions, situations are real and vivid, and pupils are actively interested in discovering for themselves such data as amount and cost of materials needed for art work and periods of time, distances and extent covered in their excusions.

" A sample project in elementary Arithmetic :

I. Our School :

A. Size

B. Area Covered,
1. by building
2. by playground
3. Total area

C. Cost,
1. of building
2. of maintainance
3. of education per capita,

D. Annual School Appropriation,
1. Comparison of items
2. Comparison with entire city budget.

Other suggested problems : Our home, our city, our state, our nation, earning, spending, travel, industrial arts, saving ".

BUFFALO : "--- Sources for securing problems which will be real to the pupil lie all around one in the department store, factory, the home, expenditures, the personal savings of the pupils, manual training and other subjects. The text should serve as a guide or reference book and not as a sole means of instruction. "

NEW YORK : " In grade 8A and 8B, special effort should be made to get problems related to the industries of the community, the locality and of the state".

KANSAS CITY, MO. : " Each subject should be introduced with real and concrete problems from life. As far as possible, these problems should be based on the interest and ability of the pupils."

Designating a typical example of a concrete for use in the 7th grade, the report suggests : "-- Secure plans for a building and from the plans compute the cost of excavating, foundation, lumber materials, labor, papering, plastering etc. Teach pupils to count lumber as the lumber dealer and carpenter counts it.---- Many problems may be based on the school building itself. Pupils may take the meas-

urements of certain rooms at home and base problems on these".

STAMFORD, CONN : In the Stamford schools, the work in Arithmetic very largely disregards the use of isolated problems and puts the work on a motivated, judgment forming basis in the form of comprehensive problems, carefully developed. The course in Arithmetic (1917) for grade VIII, recommends :

" It is not only possible, but it is highly desirable to review Arithmetic through the solution of some large and comprehensive problem. This method not only adds interest to the work by making it vital to the pupils, but it also furnishes the teacher with ample opportunity for making practical application. The selection of a problem is not difficult. The following are a few of the many that might be suggested :

1. Building and furnishing a home.
2. Cost of making articles in the M.T. shop or sewing room.
3. Taking care of the business of the first selectman's office ".

The remainder of this thesis is confined to a set of seven problems, for use in the junior high school or in the upper grades, as typical of the Arithmetic of the information -al or judgment forming type. They purpose to supplement drill in the abstract operations with concrete material or problem matter, taken from the community.

In two of the problems there, perhaps, is very little use or manipulation of number. In these the great value consists in the contribution of useful information rather than

in the development of mathematical insight or judgment. They aim to build up concepts of economic entities, terms, and relationships.

All lessons are such that they must be put on a socialized basis, the class discussing different phases of each problem, under the thought provoking stimulus of the teacher, who uses the "Socratic Method" frequently. It is expected that the pupils gather much of the data themselves, so that the problem will be as real and concrete as possible to them.

LESSON II --------A STUDY OF A REAL CIVIC PROBLEM

Background or motivating element : In a certain Connecticut city, the taxes levied to carry on a reasonably progressive policy was not at all equal to the annual expenditures. In fact, the city treasurer's books showed deficits for the preceding three years.

A series of city meetings were held to decide whether the prevailing rate (12 mills) should be raised to 14 mills to make up the deficit. One exponent was vehemently in favor of the 12 mills rate and talked loud and long to sustain his viewpoint.

To answer this speech, a prominent citizen (a banker by profession) arose to his feet and pointing his finger directly at the former speaker said : " Mr. X, for three years I have come to such meetings as this. Each time you have preached the doctrine of low taxation for your own

selfish advantage. In this city of 14,000 inhabitants, you have done more to drive the community to the poor-house than any man I know."

Of course this dramatic incident, was flashed in large size type from the local news journal and the subject was discussed generally in the home, office, and on the street. Here is an excellent opportunity to teach taxes on an informational and judgment forming basis, by use of a real situation.

Allow the class to study the annual city reports of the preceding three years. Let them find the amount realized by the taxation of real property, by poll taxes and then find the sum of these revenues. What kind of expenses were incurred by the city last year ? The year before ? What departments used the most money ? Why should this be so when the street and water departments curtailed their expenses etc.etc. ?

How should the annual expense list balance with the total city revenue ? If the grand list (total city assessment on real property) was $25,000,000, what would the amount be , that would be realized at .012 ? Ans. $300,000.

If the annual city expense were $326,000 last year, what was the deficit ? Ans. $26,000.

Ifthe city were fairly conservative in trying to curtail expense and still there appeared a deficit, what should be done ? Ans. Raise the rate of taxation .

Assuming that you raise the rate from 12 mills to 14 mills, what would the revenue be on $25,000,000 ? Ans. $350,000. This would cover the annual expense of $326,000 and would leave a balance of $24,000. This balance should be used as a part of a sinking fund, as a safe-guard against unforeseen municipal expense in the future, or to defray deficits of the past.

If a tax rate of 13 mills is sufficient to cover city expenses, should you reject a 14 mill rate ? Ans. No, If in the future the expenses should grow greater than a 13 mill taxation could carry, the people would be unwilling to submit to another increase. There is a certain psychology in this. They will be sure to protest against two increases, successively levied, more then they would one single increase at a greater rate.

If your father's property has a real value of $12,000 and its assessed value is three fourths of that, what tax would you have to pay at 12 mills ?

Ans.

$$\frac{3}{4} \times \$12{,}000 \times .012 = \$\ 108$$

What would the tax be at .014 ?

Ans.

$$\frac{3}{4} \times \$12{,}000 \times .014 = \$126$$

An informal discussion between the teacher and the class should supplement this lesson, showing different city improvements that may be made possible by the new tax rate . It may be possible to make other related problems grow out of this problem. For example, in the city in question, a very untidy parcel of property (on which three dilapidated structures stand) faces the city hall on main street. The owners, a local manufacturing concern, are indifferent to complaints, in spite of the fact that it is a civic eyesore.

Further problems for discussion and computation : How much is this property worth ? Its evaluaby the last assesment ? If bought by the city, should the land be divided into plots and immediately sold at a small gain, and with restrictions relating to appearance of property ? Should the city hold it for a municipal purpose-- a new green, a park, the location of the new community centre, or the new Junior High School ?

Since the city is building up in that section should we retain the land until its value was at its maximum, before selling etc. etc?

Each new question may reveal a problem of interest to the class. If the problem is worth while, the teacher should encourage it and follow it to its solution.

LESSON II ---- ANOTHER COMMUNITY PROBLEM

Background or motivating element : The same city mentioned in the problem above, receives its water supply

from a resevoir, three miles away and is pumped into the city mains by turbines or steam. Often in dry weather, in the summer, the water supply is so dangerously low that on account of the enormous amount of water a turbine uses, it is necessary to run the steam pumps instead of the turbines. Accordingly, a vast amount of coal is used and this adds materially to the city expenditure.

Recently, the city engineer asked to have the two wasteful turbines replaced by a single turbine of improved type, using a very small volume of water and which would pump just twice as much water as the steam pumps. There was an initial cost, however, of $25,000 and this petition became the subject of debate in the city common council.

Almost any school boy who ever went fishing in the deep pools below the pumping station dam in the summer months, would be acquainted with the water problem and the methods of pumping it into the city. This fact constitutes a situation that is real to him and therefore the above municipal problem can be made the unit of class work.

500 tons of bituminous coal at $5 a ton is the average cost of, running the boilers for the steam pumps. Add to this, $320 yearly (the wages of an extra man in the boiler room for eight weeks at $40 per) and the total cost is $2820 per annum .

At this rate how long would it take before the annual expenditure of running the steam pumps would pay

the $25,000, the cost of installing the new turbine ?

Ans. $\frac{\$\ 25,000}{\$2820} = 8$ years

If the city were to borrow $25,000 from a bank or private party to install the turbine, at 6% what would be the annual interest amount to ? Ans. $25,000 x .06 = $1500.

Clearly the city is paying out annually a sum greater than the interest on $25,000, if borrowed at the prevailing rate of interest and so, year in and year out, if the new turbine is not installed, it is practically wasting $1320, the difference between the average cost of running the steam pumps and the annual interest.

If the money is borrowed from a local bank, $1500 will pay off the interest each year and the balance, $1320 can be used to pay off the principal.
Then $25,000 ÷ $1320 = 18 years; or the number of years in which the city would be finally free of debt, if the difference, $1320, were constantly used to pay off the principal.

If the city refuses to put in the turbine it will have virtually lost $ 23,760 (i.e. $1320 x 18) in these 18 years--- which shows poor management .

The teacher at this point should explain to the class that initial cost is not the sole thing to be considered in expense; we must consider the ultimate cost or saving that the situation may involve.

THE PROBLEM OF STARTING A BUSINESS

Before going into any business, the individual should

consider whether the country is going through a period of inflation or contraction. If it is a time of inflated money (i.e. a super-abundance of currency at a depreciated value) he will have to pay out a great deal to engage in the business but will lose heavily if he should have to sell out when money is at par. Therefore, by no means, should he undertake an enterprise at these times.

It is always best to go into business during a period of contraction (when money is scarce and has the greatest value) because then a business may be bought out at the lowest possible figure. Assuming that you borrowed a sum of money to get started in business during a period of contraction, you will be favored by circumstances if you continue to pay off the interest until money becomes again inflated or at par. Then you will be able to pay off the principal in inflated money.

If you have a good opportunity to enter a paying business or one of good prospect, but lack the required capital, two avenues are open to you. (1) you may enlist the interest of some responsible minded friend or several friends and combine individual wealth to form a partnership or corporation. (2) If the required capital is not so great as to require a partnership, you may advance a reasonable amount of your wealth and borrow the balance from a banking house. It is always safe to borrow money on an enterprise, provided the borrower is sure beyond a reasonable doubt that the profit of the business is great enough to pay off the annual inter-

est plus the total expense of running it, and still leave a comfortable net for the investor.

Allow the class to study the local newspaper business. (1) It has no competition, (2) it does not require a great deal of capital to start, if a large partnership is formed; and (3) it yields a good profit. Since it embraces these three attributes of a good business field, it should afford an interesting lesson. Let the class assume that five of its members form a partnership in the publishing business at $25,000 capital stock.

SYLLABUS OF LESSON

What are the expenses for each month?

Payroll for one week

2 reporters at $30	$ 60
1 editor at $40	40
1 proof reader at $30	30
2 linotypists at $30	60
1 business mgr. at $40	40
1 bookeeper at $20	20
1 pressman, stereotypist	30
2 compositors at $30	60
1 apprentice at $10	10
Total	$340

Payroll for month = $340 x 4 = ---------- 1360.00

Rent for month at $100 ---------- 100.00

Fire ins. on $\frac{3}{4}$ val. of business at $12 per $1,000 for 1 yr. = $\frac{\$18750}{\$18,000}$ x 12 = $225

Fire ins. for one mo. = $\frac{\$225}{12}$ ---------- 18.75

Bank int. on $25,000 at 4½% for 1 yr. = $1125

Bank int. on $25,000 at 4½% for 1 mo.

= $\frac{\$1125}{12}$ = $93.75 ---------- ----------93.75

Depreciation for 1 year = $500

Depreciation for 1 mo. = $\frac{\$500}{12}$ = ---------- $ 41.66

Lease of Asso. Press wire for yr. = $5,000

Lease of Asso. Press wire for 1 mo.
$\frac{\$5,000}{12}$ = $416.66---------- 416.66

Cost of paper,power, etc. for yr. = $4,800

Cost of paper,power etc. for 1 mo. = $\frac{\$4800}{12}$ ----400.00

Total expense of running "News" for 1 mo. ----- $2430.82

FIGURING THE COST OF ADVERTISING SPACE

Now arises the question--- how shall the advertising space be figured to cover this expense and give profit of 40% ? In order to publish a paper on a paying basis,it is figured that 40% of the printed space should be advertise-ments.

Assuming that your paper is of standard size, 8 columns per page, each 21 inches deep, and that you are running 8 pages a day, you will have a possible printing space of 1344 coulumn inches, (i.e. 8 x 21 x 8). Since 40% of this should be for advertisements, you should reserve 537 column inches for "ads" alone, each day (i,e. 1344 x .40) . Next, deducting 4 Sundays, the paper should be published on an average of 26 days a month, barring holidays. That would mean that the advertising space for the whole month should be 13,962 column inches (i.e. 537 x 26).

By dividing the monthly cost of publishing the paper, $2430.82 by the number of advertising inches for the

month, you will find what each column inch of advertising should be to cover the cost of publication. Thus $2430.82 divided by 13962 = .174 .

Now, since the profit should be 40% of the cost, the profit on each column inch of advertising is found by multiplying the cost (.174) by the rate of profit (.40) which is .069 .

Hence .179 plus .069 = .243 or .24, the price of advertising that each merchant has to pay.

FIGURING THE ANNUAL PROFIT

That starting in the newspaper business was more profitable for the five men , than by putting their money in stocks, may be shown to good advantage here :- Assuming that each contributes equally to the capital stock the sum of $5,000, at 6% interest on the same amount, elsewhere invested would yield only $300 per annum.

On the other hand, if we omit the 52 Sundays and the 5 legal holidays that occur in the year, the paper is published 308 times annually. If the advertising space has been up to quota. (40%) there would be 165,396 column inches of "ads" for the year, i.e. 537 in. (average daily space) x 308.

At a net profit of .069 or .07, $11,577 would be realized on the business (i.e. 165,396 x .07), in a year.

If the paper has a circulation of 500 daily and the company sells the papers to newsdealers at 2 cents profit, it realizes $10 daily. In the 308 days that the paper is published, $3,080 is taken in. This makes the total net profit, $14,667 . Since each of the five partners contribute in

equal parts, they each get one fifth of the dividends or $2933. Clearly by entering the publishing business, each man realized on his $5,000 just $2633 more than he could get at 6%, elsewhere on the same amount. This illustrates how money put to work in a good business, may sometimes be used to better advantage than if placed in a bank, or in some large stock company, as the New England Telephone Co.

40% profit, in this problem, is not too much because we figured the gain "on the cost" while in most cases, business houses figure it on the retail". Besides, in figuring the cost per column inch, we assumed that the paper was making its quota in advertising. This is not always possible because a slump in merchantile trade in the city, often affects the newspaper business in the same way, and so the rate of advertising has to be a little higher than we commonly think of as a fair rate, in order to even things up .

LESSON IV--THE FAMILY BUDGET

The average boy in the average American home today has little idea of the value of money or its wise use. Being unacquainted with the responsibilities that the paternal pay envelope must meet, he thinks that Dad is ruthlessly ungracious if he denies recurring drafts on the family exchequer. The best way to teach a boy or girl who, inadvertantly, is inclined to consider their parent as a Croesus, is to let them figure on a yearly budget, based on their own father's salary. Let them decide just what are the necessities essential to existence and what are the luxuries conducive to reasonable human confort. Permit them to find out

for themselves the cost of these aforesaid provisions of necessity and comforts and see for themselves how the cost of these items balance with father's annual income. In the majority of cases, where the salaries center around the $35 to $40 per week mark, the pupils will encounter a real problem and it should be patent that in the serious business of life, Dad's salary cannot be spent indiscriminently. Each child should formulate his or her budget, the teacher and the children picking out the good points in each and rejecting the weaker parts. A model expense list can then be agreed upon.

The following is a lesson, developed as a yearly budget, based on a salary of $40 per week, supporting a family of three. It is assumed that the home is satisfactorilly furnished so that this element does not enter into consideration.

THE BUDGET

HOUSE EXPENSE :

Food at $15 per week for 52 weeks ---	$780.00
Rent at $40 per mo. for 12 mos. -----	480.00
Coal at $15 (Range, bought in June) --	45.00
Coal at $15 (Furnace, bought in June)--	60.00
Gas(light and range), $2 per mo. ------	24.00
Elec. lights at $3 per mo. ----------	36.00
	$1425.00

FOR FATHER : CLOTHING

1 winter hat at $5 ----------	$ 5.00
2 suits at $30 ----------	60.00
4 shirts at $1.65 ----------	6.60
1 straw hat at $3 ----------	3.00
3 suits winter underwear ----------	6.00
3 suits summer underwear at $1 ------	3.00
2 pair shoes at $5 ----------	10.00
7 collars at .12½ ----------	11.08
12 pair of socks at .25 ----------	3.00
1 pair rubbers at $1 ----------	1.00
1 overcoat at $30 ----------	30.00
	$128.68

FOR MOTHER :

1 dress at $20	$ 20.00
2 light summer dresses at $12	24.00
3 house dresses at $1.95	5.85
2 pair corsets at $2	4.00
3 pair winter underwear at $1.25	3.75
3 suits summer underwear at $1	3.00
2 petticoats at $ 1.70	3.40
2 pair shoes at $ 5	10.00
2 hats at $5	10.00
1 coat at $30	30.00
4 pr. silk stockings at $1.65	6.60
6 pr. cotton stockings at .50	3.00
1 pr. rubbers at $1	1.00
	$ 124.60

FOR SON (AGE 12) :

2 suits at $15	$ 30.00
3 pr. shoes at $3.50	10.50
1 pair rubbers at $1	1.00
12 pr. stockings at .50	6.00
3 pr. winter underwear at $1.50	4.50
3 pr. summer underwear at $1	3.00
1 sweater at $3	3.00
1 overcoat at $15	15.00
2 caps at $1.50	3.00
	$ 76.00

MISCELLANEOUS:

Life insurance on father ($1,000) at $37 per annum	$ 37.00
Church support for three	20.00
Amusements for three	50.00
Car-fare for three for 1 yr.	80.00
Grand Total	$ 1941.28

Yearly salary	$ 2080.00
Total expense	1941.28
Balance	$ 138.72

It will be noted by some children that there is a balance of $138.72 after expenses are met. What should be done with this, the pupils will ask ? There are unforeseen emergencies in the life of man. An extended seige of illness in the family may require the services of a nurse or probably hospital care. It has happened to your neighbor--when will it happen to you ?

To impress the children with the necessity of making adequate provision for serious sickness, allow a committee from the class to visit a local hospital, and inquire what the total amount was for the year in bills; just for attendance, room and board. Divide this by the number of patients during the year and you will get an idea of what the average hospital bill amounts to.

Some children will observe that some families seemingly live far above their means and yet seem to get by. The reason is that they live largely on credit which they accept at local stores. They pay their bills today and tomorrow they start a new one. Never are they entirely free of debt.

LESSON V -- THE PROBLEM OF BUYING A SUIT

This lesson is an attempt to educate a boy of the 9th grade in the virtue of thrift; to teach him an economical, cautious way of buying a suit when a limited amount is at his disposal; to show him how to get the greatest value out of each dollar spent, and the reason why this is possible.

In this problem the pupil assumes that he is the head of a family of four, earning a yearly salary of $1200 and can only afford to buy one suit a year, and is allowed $ 40 for this item.

WAY OF ATTACKING THE PROBLEM

Take a trip with a small class group through the main men's store of Filene's, Jordan-Marsh's, and Gilchrist Co's., studying the prices of suits, and their quality and then go to the respective basement stores of these firms and examine prices and quality of merchandise in the men's departments. Compare the latter prices and qualities with values of the upstairs stores, keeping always in mind that you have $40 to spend.

Q.- When buying a suit, which should you keep uppermost in mind, price or quality ?

A.- Both are important. A suit bought at an extremely low price is a waste of money if quality is not there. A real bargain is good quality for a reasonably low price.

Q. How did some of the $30 suits in the basement stores compare with the $40 suits in the respective upstairs stores of Filene's, Jordan's, and Gilchrist's ?

A. They seemed to be of the same quality at a lower price. Some of the suits were identical.

Q.- Name five factors which can explain this fact .

A.- (1) When a wholesaler is changing his line of merchandise and has a few dozen suits (first quality) left, he will let the retail buyer have them (job lots) at a sacrifice to make a complete turnover and empty his stockrooms.

(2) Sometimes a retailer will cancel a big order on a manufacturer because of a sudden change of season etc., and the manufacturer will unload this surplus of stock (first quality) on some basement store which is attracted by a very low buy.

(3) Some retail stores going out of business either voluntarilly or through bankruptcy or as victims of fire or water damage, frequently sell out first quality lines at ridiculously low figures to large intown stores.

(4) The upstairs stores plan on fewer sales but at a greater profit, (mark-up usually between 65% to 70%) . The basement stores depend on a volume of sales, (which is simply terrific if the advertising in the preceding evening papers has been heavy), but with a smaller mark-up, usually about 35%, figured on the retail.

(5) The automatic plan on which many of these basement stores operate, demands that the selling price be extremely low, otherwise the form loses considerably on automatic reductions. The markdowns in certain departments are known to have amounted to several thousand dollars each month.

Q.- If you were buying a suit upstairs for $40 would you get the same value as you would if you bought one in the basement at the same price ?

A.- No. On account of the lower prices in the basement, a $40 suit bought there, would be equivalent to a $60 suit in the main store .

Q.- Can you give any reasons why the suits in the upstairs store should be higher than those bought in the basement.?

A.- Yes. A buyer from the main store buys selected stock, i.e. definite sizes, color mixtures, materials, and quantity and has to pay for this . The basement buyer can buy broken lots at a reduced figure and still get good quality or he may buy slightly damaged stock at a low figure.

Moreover, the expense incumbent on lavish display, fixtures, and department furnishings is large and the mark-up has to be greater to cover this overhead . The basement does not have the expense of maintaining an auditing office, because it does business on a cash basis. The upstairs store, on the other hand, is largely run on the credit system and is under additional expense because of this fact.

Q.- Assuming that you have decided to buy your suit in the basement, rather than in the main store, which should you buy - one $40 (first quality) suit or add $10 to the amount to be expended and buy two $25 suits (first quality also) ?

I would buy two suits at $25 because these would be good values (saleable at $35 in the main store); whereas $40 would be too much to pay for one suit in the basement and you would only have <u>one</u> very good value.

Q. Of what material, should your suit be made ?

A.- Of hard wearing fabric. Serge would be the best and tweed a good second choice . A suit made of cotton and wool (preferably 50/50) is the best because the cotton reinforces the wool and yet there is enough wool in it to give softness of texture and weight. An all wool suit is a waste of money because, first, it will not wear well and [illegible]

secondly, it is very expensive.

Q.- In buying a suit in a basement store, of what must the purchaser beware ?

A.- "Seconds" and inferior pieces of merchandise that very often find their way into the basements in broken job lots, along with first quality stock. Usually "seconds" are so marked by the retailer for the protection of the customer.

Doubtlessly many people consider that merchandise bought in a basement store is nothing more than "junk", to use the slang but expressive phrase. To be sure a great part of the merchandise is poor but this is not an universal,rule. On the contrary, some of the stock that has been placed on sale in Filene's have been more than bargains. In July 1925, that form ran a mamouth sale of 10,000 dresses (pure Irish linen and striped broad cloth) at $1.85 . These dresses could not be bought under $3.50 upstairs and the sale was made possible by a capable buyer who combed New York garment shops, large and small, until he had accumulated enough dresses to retail at a low figure and still make his profit.

In Jan.1926, Filene's bought out a New York specialty house for fashionable attire, dress and sport wear, and a goodly representation of Beacon Hill, Boston, was in shopping in the basement.

It might be well to give the class a true concept of thrift and making a dollar go the limit by discussing the above problem. Certainly there is but little value in it from the standpoint of computational Arithmetic, but it has informational matter in it worth acquiring.

LESSON VII --- BUYING A LOT AND BUILDING

The following is only one example of the zealous work of Prof. Guy M. Wilson, outlined in the course of study for the teachers of Connorsville, Ind., while superintendent of schools in that city in 1911 :-

" That the children enjoy work that involves a real prob--lem, has been abundantly proven by their interest in this line of work under the direction of Mr. Pierson. The work must conform to actual conditions throughout, and a careful record made in a correctly ruled memorandum book, kept especially for the purpose. The plan of development will vary, of course, but involves substantially the following :-

First : Divide the class into groups according to the number of rows of seats in the room and start each group with certain conditions as,

	AGE	RENT PER MO.	SALARY PER MO.	CASH ON HAND
Group I ---	24	$15.00	$50.00	$ 1000
" II	20	10.00	40.00	600
" III	30	12.00	55.00	900
" IV	35	22.00	100.00	1600
" V	27	16.00	90.00	1200
" VI	40	26.00	85.00	1500

These conditions are to observed throughout, and the pupils are expected to exercise good judgment under the prescribed conditions.

Second : Each pupil in the group will select a suitable building lot. This must be paid for in cash, so that the cost will not be greater than the cash on hand. Each pupil must get a legal description of his lot and consider title, making and recording deed, and any delinquent taxes,

or assesments. Deeds should be shown to the class.

Third : Each pupil will decide upon and draw a suitable plan for his house. Several questions will arise and will be figured out as class work. What plan of lighting and cost of same -- Stoves, warm air, furnace,hot water, steam ? What about bath and modern conveniences -- can I afford them ? What will the water permit and water rent cost? Shall a cistern be made or a well driven ?

Fourth :- As no pupil will have sufficient money to pay for his house, it will be necessary for him to borrow some money . The pupils will inquire from different sources the terms on which money may be borrowed. Groups I and II may inquire of banks, Groups III and IV of building associations, and Groups V and VI of private parties. The facts will be presented in class, after which each pupil may determine where he will borrow the money he needs to complete payment on the house. Notes will be given, secured by mortgage. Mortgage papers should be shown to the class if possible.

Fifth : Fire and tornado insurance will be taken out on the house. This involves a study of property insurance. Decide the amount wanted, the rate and compute the premium.

Sixth : Since the pupil has gone into debt, he should really protect his family by taking out life insurance. This should at least equal the amount of his indebtedness, so that in case of his death his family will have the property free of debt. Each group may be assigned to a well established company and report to the class,

e.g. Group I, New York Life; Group II, Mutual Life of New York etc. It will be found that the rates and conditions are practically the same in all, and that there are many reliable companies. Only three forms of policies should be considered-- ordinary life, 20-payment life, and twenty year endowment. This will be a little difficult. Make it simple and leave out intricate details.

Seventh : Complete the house and move in . Thus you will stop paying rent and you can enjoy a home that is really your own ".

LESSON VII -- MARKETING OF FARM PRODUCTS

The following problem is taken from N.J. Lennes, Professor of Mathematics, of the University of Montana, in his book, "The Teaching of Arithmetic " :

" Problem : One farmer,A, sells his corn as soon as it is husked in October, receiving 73 cents per bushel, while another farmer, B, stores his corn on the farm and sells it the following May at 93 cents a bushel. Did B lose or gain by keeping his corn ?

Solution : To solve this problem, we must know how much this corn shrinks in storage, how much more it costs to handle it twice and store it than to haul it directly to the market and how much interest should be charged against the corn while it is lying idle in the crib. Suppose, further, that it costs two cents a bushel extra to handle the corn twice and store it and that the rate of interest is 7%. For simplicity suppose each farmer had 1000 bushels in October. Then A sells his corn for 1000 x $.73 = $730 . In May, B sells 83.5% of 1000 bushels or 835 bush-

els for 835 x $.93 = $776.55 . From this must be deducted 2 cents a bushel extra cost on 1000 bushels or $20, and 7% interest on $730 for 7 months, or $29.81, leaving $726.74 . Hence B lost $ 3.26 by keeping his corn ".

There is very little motivation in the above example nor is it of a comprehensive nature . However, even allowing for this, it is not strictly a mechanical isolated problem, because the pupil has to "think thru" the problem and solve it by considering the various factors which conspire to raise or lower a profit. In this there is an element of the informational. The problem may be made real by abandoning the use of the abstract symbols of " Farmer A" and " Farmer B" and using the names of real agriculturists of the locality who are well known to the pupils.

Business men contend that Arithmetic should be <u>life itself</u> but as the subject is taught by coined problems of the isolated type, it fails miserably in attaining this ideal. It is only by abandoning the non-functional, formal example for the comprehensive problem of the informational and judgment-forming type that the real function of Arithmetic is fulfilled.

It is somewhat discouraging for one interested in curriculum reconstruction to see some leaders in the field of Arithmetic, still thinking along the same old line.However, it may be only a matter of time when informational and judgment forming Arithmetic will enter fully into the curriculum, scientifically developed, just as we have passed from inferior techniques of teaching to others of greater worth.

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