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PROBLEMS ABOUT WAR

For Classes in Arithmetic

For the Authors of Textbooks and for Use in Schools

BY

DAVID EUGENE SMITH, Ph.D., LL.D.

With an Introduction by

PAUL MONROE, Ph.D., LL.D.

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Suggestions for Makers of Textbooks and for Use in Schools

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INTRODUCTION

This pamphlet is issued with two purposes. The first is that of presenting to school children some of the facts regarding the price that is paid for the militant activities of nations. The second is that of enlisting their coöperation and that of teachers of mathematics in the preparation of similar problems through the study of facts. The larger pamphlet which is produced by these competitive efforts will in time be placed at the service of teachers of mathematics or of those who prepare texts in arithmetic. It is not desired to give the children of our schools any unfair bias, but simply to present to them some facts to the knowledge of which they are entitled. It is hoped that from a familiarity with such facts presented in connection with the various subjects of study, a broader patriotism and higher ideals may result. It should be noted by the teacher that the formulation of problems from phenomena of our present environment and the use of mathematical processes to solve actual problems of our social life, is in accordance with the soundest educational principles.

PAUL MONROE.

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PROBLEMS ABOUT WAR

FOR CLASSES IN ARITHMETIC

By DAVID EUGENE SMITH

General Object of these Problems.—The general object of these problems is apparent. Briefly stated, they are designed to lay before young people in the elementary schools, at the most impressionable age, the fact of the wastefulness of war. The questions are so framed as to emphasize this point at various stages in the study of arithmetic, and to do it in such a way as to give the pupil not only some valuable work in computation but some facts which will influence his later thoughts and actions on the question of war.

On the Nature of a Good Problem.—In order to be a good problem in arithmetic, a question must involve the kind of computation which the average citizen needs to know, which principle excludes such a topic as cube root; it must ask for a result which the average citizen might naturally wish to find, which principle excludes the finding of the time in which a given sum will yield a given interest at a given rate; it must be interesting, or easily capable of being made interesting to a pupil, which excludes problems about the population of a place like Mukden; and it must be stated in language which is fairly familiar to the class, which, in the early grades, excludes problems about proteids. For example, the following is a type of a bad problem: "The cost to France of the Franco-Prussian war of 1870, in francs, is the positive root of the quadratic equation $x^2 - 17,999,999,998x - 36,000,000,000 = 0$. Find the cost." Such a problem is ridiculous.' No one would ever find the cost in any such way, and the mere statement of the question would bring reproach upon the subject of algebra. Equally bad would be a problem framed on such a plan as this: "In 1913 the amount paid by England for war purposes plus the amount paid by France was so much, while five times the amount paid by England minus twice the amount paid by France was so much. Find the amount paid by each." Now it would be evident to any pupil that the one who framed a question as absurd as this must have known the answers in advance, and that the only purpose of the question would be to puzzle the learner, and so the problem would have substantially no value.

It is for such reasons as these that the problems relating to the wastefulness of war must, in the main, be those of simple arithmetic. We use algebra, trigonometry, the calculus, descriptive geometry, geodesy, and the like, in military and naval affairs, but we do not use them for the purpose which we have in mind in this series of problems, and any attempt to use them here would bring reproach upon the whole movement.

Necessity for Fairness.—No effort of this kind can be successful or should be successful if it is characterized by a spirit of unfairness. If pupils believe that the truth is not being told to them, the lesson sought to be inculcated will all be lost. Although the data of these problems are taken from the best authorities, and are supposed to be correct, it must be understood that they are presented for the avowed purpose of showing the wastefulness of war, not only in money but in life and in whatever admits of numerical measurement. This is done, however, with entire fairness, and it is believed that the conclusions which a pupil is led to draw from the problems are correct. On the other hand, it should be distinctly admitted that there is an argument on the other side of the question as to the financial loss through war. A nation economizes in war times. At the close of 1914 the Bank of England had nearly $900,000,000 on deposit, against an average of about $300,-000,000 before the war. If the European war costs $1,000,-000,000 a month, as estimated, and the population of the warring countries is 450,000,000, the cost is about $2.10 per month per person, and Europe can economize more than that and not seriously feel the financial sacrifice. Indeed, it may learn valuable lessons of economy by so doing. These arguments are mentioned in the spirit of fairness, and not because it is believed to be a good thing to put money into powder, or for Europe to be forced to economize $2.10 per month, per person. Similarly, there is some argument for military training on the score of health and discipline, of discontent with a life of indulgence, and so on, all of which must be recognized, although insignificant in comparison with the tremendous loss and waste which a study of military expenses shows. On the other hand, there are many losses caused by the present European war that we have no means of measuring and cannot include in sets of problems. A factory may have a hundred employees, all but twenty being above the age limit of military service; but these twenty may include all who are trained to do a special line of work in the factory, and their absence may result in closing the concern and throwing all the others out of employment. In one locality the flour mills may thus be shut down; in another, the mines; in another the machine shops, and so on, the damage arising from the absence of a few men being entirely out of proportion to the number of individuals who are called to arms from the particular locality.

It is also necessary to admit the reasonableness of adequate preparation for national defence, but it is believed that a study of problems like these will bring the next generation to weigh more carefully the question of the proper use of the money needed for such a purpose, and to consider whether the world is not by this time old enough to settle its disputes by a resort to arbitration instead of brute force.

Special Purpose of these Problems.—These problems are sent to thousands of teachers and textbook writers throughout the United States with a special purpose. It is hoped that teachers will use them in their classes, always with the due moderation that will maintain the pupil's interest and cause him to think out the real lesson of these statistics. It is also hoped that textbook writers will consider the advisability of using this or similar material, always within reason, perhaps to the extent of only a problem or two, and that school authorities will ask their teachers to frame occasional questions of this nature and to encourage their pupils to do likewise. It will be seen that the problems here given are not controversial in the slightest degree; they have nothing to do with the merits of the present war or of any past war; they do not enter into the questions of national defense, of pensions, or of adequate equipment of our army and navy; their sole purpose is the one above stated—to cause the pupils to think of their responsibility in assisting to create a world-sentiment in favor of a wiser use of money than in mere armaments.

THE PROBLEMS

The Cost of War

Problems Involving the Four Operations With Integers.

1. In the war of 1870 France lost in killed, wounded, and prisoners 723,500 officers and men in eight months, and Germany lost 129,647. Find the total loss of both countries, and the average loss per month and per day.

   In all such cases take 30 da. to the month.

2. In the great wars from 1790 to 1913 there were 5,498,-097 men killed. In the United States it is estimated that the average value of each life (man, woman, or child), based upon the value of the annual products of the country, is $2900. Taking the value of these men, all of them much above the average in health and strength, although living where human life was not economically so valuable, as $2900, what was the financial cost to the world in the loss of all these lives?

3. If in the great war of 1914-1915 there are 2,500,000 men killed, what is the financial loss of these human lives, on the basis of the average given in Ex. 2?

4. Valuing a human life economically at $5000, what would be the loss by the conditions of Ex. 3?

5. It is estimated that 21,200,000 were engaged in the great war of 1914-1915. Suppose each man could produce $2 a day, on the average, if he remained at home and worked, what is the loss per day in production by taking these men away from work?

6. In Ex. 5, what is the loss per month? What is the loss per year?

7. The mere cost of transporting the armies in the great war of 1914-1915 was $2,100,000 a day. How many poor people could be helped each day with such an amount, allowing 50c. a day to each person?

8. In this war it costs $1,000,000 a day to feed the horses used in the armies. How much does this amount to in a year? At $500 each, to how many boys and girls could be given a year in college for this amount paid for horse feed?

GUNS AND COLLEGES

Problems Involving Multiplication and Division.

1. Five superdreadnoughts of the Queen Elizabeth type are put in commission by Great Britain in 1915. The powder used in firing a single shot from one of the eight 15-inch guns costs $750. How much will it cost, for powder alone, to fire one round of the eight guns on a single ship? How much will it cost for the five ships?

2. The average annual tuition for a student in a certain college or university is $150. The mere powder required for a single round of shots from the five superdreadnoughts in Ex. 1 would pay the tuition of how many students for a year? Answer to the nearest unit in all such cases.

3. The cost of each of the 15-inch guns mentioned in Ex. 1 is $80,000. How much did the guns for the five superdreadnoughts cost?

4. A student's necessary living expenses in college averages $250 a year. The cost of the large guns for the five ships mentioned in Exs. 1 and 3 would pay the living expenses of how many college students for a year?

5. If all the five ships mentioned in Ex. 1 should fire 100 rounds during the year 1915, the mere powder consumed would cost how much?

6. The total annual income of a certain state university is $310,000. The powder mentioned in Ex. 5 would provide the annual income of this university for how many years?

7. A first-class battleship, fully equipped, will cost next year about $15,000,000. Such an amount would build and equip trade-schools, at $75,000 each, in how many cities?

8. The sum mentioned in Ex. 7, as the cost of a battleship, would send how many boys or girls through a business college, allowing $1,500 to each student?

9. It is proposed to build a series of forts and equip them with modern guns to defend one of our seaports. The expense is estimated at $2,500,000. Such a sum would pay the expenses of how many boys next year in a good school of technology, allowing $500 for each boy?

> Such a problem is not intended to show that adequate defence is not a wise precaution. It is simply intended to call attention to the amount of money that is being expended because the world will not agree to settle disputes in a rational manner.

10. To fire some of the guns in modern ships costs $1,200 for each shot, including all charges. If such a gun is fired once in three minutes for an hour a day on each of the seven days of a week, the expense is how much? This sum would pay your expenses in college, at $500 a year, for four years, and the expenses of how many of your friends at the same rate?

War Expenses and Our Pleasures

Problems Involving Long Division.

1. There are 300,000 Boy Scouts in America, and $30 on an average would give each of them a camping trip and a scout suit this year. We spent on our War Department $173,522,-804 last year. This amount would pay these expenses of the Boy Scouts for how many years?

> In all such cases answer to the nearest year or other unit.

2. Most boys would like to go to a ball game every week. If a boy went to a game every week for a season of twenty weeks, and took a 50c. seat, how much would it cost for the season? The amount which we spent on our navy last year, $139,682,186, would pay for tickets for how many boys?

3. A Camp-Fire Girl can, for $35, buy her suit and pay for a camping trip in the summer. The $173,522,804 which our Government spent last year on the War Department would pay these expenses for how many girls?

4. A good tennis racket can be bought for $1.50. The battleship Vermont cost $7,563,963. This amount would buy rackets for how many boys and girls?

5. A baseball suit can be bought for $4.50. The battleship Virginia cost $6,703,614. This amount would buy suits for how many boys?

6. A ticket to some good entertainment costs on the average 25c. The battleship South Carolina cost $5,097,355. This amount would buy tickets for how many boys and girls?

7. A good bicycle can be bought for $25. The battleship Oregon cost $6,575,032. This amount would buy bicycles for how many boys and girls?

8. Before the great war began, Europe owed $27,000,-000,000 for old war debts. If we can imagine such a sum divided equally among the 90,000,000 families of Europe, and devoted to pleasure, how much would be allowed to each family?

9. During the year preceding the great war, the five great European powers spent $898,921,000 on their armies. At 10c. per ticket, how many tickets to some good moving-picture plays would such an amount buy for each of the 450,000,000 people in these countries? Answer to the nearest unit.

10. In the year mentioned in Ex. 9, the same powers spent $619,511,000 on their navies. Such an amount would buy how many tickets per person as stated in Ex. 9?

> It is hoped that such examples, relating to the immediate interests of the pupils, may furnish means for giving them some idea of the vastness of expenditure for armaments. It is not intended to suggest that the money spent for war would otherwise be spent for pleasure, but to offer familiar standards of measure to allow our youth to appreciate the size of numbers represented by these "endless caravans of figures."

BATTLESHIPS AND SCHOOLS

Problems Involving Long Division.

1. The battleship Alabama cost $4,665,820. In 1913 the total receipts of Alabama for higher education amounted to $533,659. The cost of this single battleship would have kept Alabama in funds for her colleges, universities, and schools of technology for how many years? Answer to the nearest year.

2. The battleship Arizona is estimated to cost $7,425,500. In 1913 the total amount expended for common schools by the state of Arizona was $1,321,631. The cost of this single battleship would have paid for all the common schools of Arizona for how many years? Answer to the nearest year.

3. The battleship Arkansas cost $4,675,000. The total value of buildings for colleges, universities, and technological schools in Arkansas (1913) is $654,500. The cost of this single battleship would pay for how many times as many such buildings for this state?

4. The battleship Connecticut cost $7,911,175. It is estimated that the average cost of education of a pupil in the common schools of Connecticut is $39.92 per year. The cost of this single battleship would pay for the education of how many pupils for a year? It would pay for the education of how many pupils for ten years? Answer to the nearest unit.

5. The battleship Delaware cost $5,705,757. This is how many times the total value ($1,600,000) of all the public property used for common school purposes in Delaware? Answer to the nearest unit.

6. The battleship Florida cost $6,400,000. In 1912 Florida received for permanent endowments for her universities, colleges, and technological schools $1000. It would take the endowments for how many years, at this rate, to pay for this one battleship?

7. The battleship Wyoming cost $4,450,000. The total income of the University of Wyoming in a recent year was $243,639. The cost of this single battleship would pay this total income for how many years? Answer to the nearest unit.

8. The battleship Vermont cost $7,563,963. It is estimated that the average cost of education of a pupil in the common schools of Vermont is $34.80 per year. The cost of this single battleship would pay for the education of how many pupils for a year? It would pay for the education of how many pupils for the eight years of the elementary school? Answer to the nearest unit.

We have a number of battleships which we have named after our states. Such ships are necessarily expensive, and we feel that this expense is justified because of the protection we receive. If it were not for wars we might use this money to better purpose, and the object of these problems is to compare the expenditure for ships with the expenditure for schools.

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The Financial Cost of War

Problems Involving Decimal Fractions

1. The Franco-German war of 1870 lasted eight months and cost France, in expenses, indemnity paid to Germany and loss of territory, 18,000,000,000 fr. At 19.3c. to the franc, how many dollars does this represent? How many dollars for each month of the war? How many dollars a day?

2. The war mentioned in Ex. 1 cost Germany 2,111,000,-000 marks. At 23.8c. to the mark, how many dollars does this represent? How many dollars a month? How many dollars a day?

3. The South African war of 1899-1902 cost Great Britain £211,156,000. At $4.866 to the pound, how many dollars does this represent?

4. To fire a single shot from each of the big 15-inch guns of England's superdreadnought the Queen Elizabeth costs £200, and each of the eight big guns can fire three shots a minute. Suppose all eight guns were fired for a single minute as rapidly as possible, and that we take the value of the pound as stated in Ex. 3, what would be the financial cost? At $600 a year, how many young men or women could be kept in college next year for the money spent in thus firing these guns for ten minutes?

5. If Great Britain had five superdreadnoughts of the type mentioned in Ex. 4 firing only their 15-inch guns for a single hour, the cost would pay one year's tuition at $150 of how many students in college?

> It must, be understood that these ships do not carry enough ammunition for such continuous firing. The figures are, however, approximately correct.

6. The Balkan war of 1912-1913 cost Greece 606,250,000 drachmas. A drachma is a Greek coin worth 19.3c. in our money. Find in our money the financial burden which this war placed upon Greece.

7. The war mentioned in Ex. 6 cost Serbia 1,212,500,000 dinars. A dinar is a Serbian coin worth 19.3c. in our money. Find in our money the amount which Serbia was compelled to pay for the war.

8. The war mentioned in Ex. 6 cost Turkey 8,800,000,000 piastres. A piastre is a Turkish coin worth 4.4c. in our money. Find in our money the amount which Turkey paid for her expenses in the war.

9. In the year preceding the great war Russia spent 617,000,000 rubles on her army. A ruble is a Russian coin worth 51.5c. in our money. Find in our money the amount which Russia spent on her army in that year.

War's Subsequent Financial Burdens

Problems Involving Percentage.

1. In 1866 we were paying $15,000,000 a year in pensions. In 1881 we were paying $56,000,000. What was the per cent of increase?

2. In 1890 we were paying $86,000,000. What was the per cent of increase over 1866? over 1881?

3. In 1913 we were paying $177,000,000. What was the per cent of increase over 1866? What was the per cent of increase over 1881? What was the per cent of increase over 1890?

4. In 1914 it cost our government $2,000,000 simply to pay its pensions and keep up the Pension Bureau. The amount paid in pensions in that year was $172,400,000. What per cent of the total amount of pensions and expenses, to the nearest tenth per cent was used for expenses?

5. Up to June 30, 1914, our government had paid as pensions the following amounts: war of the Revolution, $70,000,000; war of 1812, $46,000,000; Indian wars, $13,000,000; Mexican war, $49,000,000; Civil war, $4,458,000,000; Spanish war and Philippine insurrections, $46,000,000; other items, $49,000,000. Find the total amount paid for pensions, and find what per cent of this, to the nearest tenth, went for the civil war.

6. The annual expenditures of our government, exclusive of the post office, which is practically self-supporting, are about $750,000,000. Of this amount $174,000,000 goes for military pensions. Our pensions are what per cent of our total expenses?

7. Referring to Ex. 6, we pay $450,000,000 a year for our army, our navy, and our pensions,—all war expenses while we are at peace with all nations. What per cent of our total expenses go for these purposes?

8. In 1800 our country paid $64,131 for pensions. In 1914 we paid $173,092,065. The amount paid in 1800 was what per cent of the amount paid in 1914?

9. In 1914 we had 785,239 persons in the United States drawing war pensions. Taking our population as 98,646,491 in that year, what per cent of our population was on the pension roll? Answer to the nearest tenth per cent.

> After a war closes it is the laudable custom in most countries to pay pensions to those soldiers who were disabled while in service. Our nation is more liberal than others in this respect. The above problems are based upon our pension system and are intended to show one of the financial burdens of war, and not to touch in any way upon the merits of the system. Indeed, it is the duty of the schools to encourage the legitimate recognition of the services of those who have fought for the country.

Problems Involving Percentage.

1. At the outbreak of the Russo-Japanese war of 1904-5, the national debt of Japan was 600,000,000 yen. After the war was over, although Japan was victorious, the national debt was 2,260,000,000 yen. By what per cent did the war increase the national debt?

> It should be observed that it is not necessary to know the value of the yen in our money. If it is desired to translate the above figures into dollars, it may be stated that a yen is approximately equal to 50c. (actually 49.8c.) of our money.

2. At the beginning of the war mentioned in Ex. 1, the national debt of Russia was 6,630,000,000 rubles, and after the war expenses had been met it was 8,836,000,000 rubles. By what per cent did the war increase the national debt?

> Here again, the value of the ruble need not be known in order to solve the problem. It is approximately equal to 50c. (actually 51.5c.) of our money. By Exs. 1 and 2 we see that the victorious nation may suffer financially more than the unsuccessful one.

3. The Balkan wars of 1912-1913 cost $2,100,000,000. The population of Bulgaria is 4,755,000; of Roumania, 7,520,000; of Serbia, 4,600,000; of Albania, 825,000; of Montenegro, 520,000. Find the cost per capita for these Balkan states.

> Of course other states were involved, but the problem is intended to show the great financial cost in comparison with the population of the countries chiefly concerned.

4. In particular, the wars referred to in Ex. 3 cost Bulgaria $436,500,000. Find the per capita cost for that country.

5. Comparing Exs. 3 and 4, the per capita cost for Bulgaria was what per cent of the per capita cost for all the Balkan states?

6. One of the most expensive wars of the world was our own civil war of 1861-1865. The cost is estimated at $5,000,000,000, while the cost of our war with Spain is estimated at 23.3% as much. How much did these two wars cost?

7. The Transvaal War of 1900-1901 is estimated to have cost £200,020,000, and the war between Italy and Turkey, in 1911, to have cost 70% as much. At $4.866 to the pound, find the cost of each of these wars in our money.

8. Before the great war of 1914-1915, the national debt of the United Kingdom (Great Britain and Ireland), largely due to war, was $3,485,818,000, and the entire wealth of the country was estimated at $85,000,000,000. The debt was what per cent of the total wealth? Answer here and in Ex. 9 to the nearest tenth per cent.

9. As in Ex. 8, the national debt of France was $6,346,129,000, also largely due to war, and the entire wealth of the country was estimated at $50,000,000,000. The debt was what per cent of the total wealth?

The Human Sacrifice of War

Problems Involving Percentage.

1. In the war between France and England from 1793 to 1815, out of 3,000,000 men engaged 1,900,000 were killed. Find the per cent of deaths.

2. In the European wars of 1854-1856, 1,460,500 men were engaged and 41.7% were killed. Find, to the nearest thousand, the number killed.

3. In the Civil War of the United States, 404,400 men were killed. This was 17.8% of the total number engaged. Find, to the nearest thousand, the number of men engaged.

4. In the Franco-German war of 1870-1871 there were 1,713,000 men engaged, and 311,000 were killed. Find the per cent of deaths.

5. In the war between Russia and Turkey in 1876-1877, there were 1,500,000 men engaged, of whom 12% were killed. How many were killed?

6. In the Russo-Japanese war of 1904-1905 there were 555,900 men killed, which was 22.2% of the number engaged. Find, to the nearest thousand, the number of men engaged.

7. In the great wars from 1790 to 1913 there were 18,-552,200 men engaged, of whom 5,498,097 lost their lives. Find to the nearest tenth per cent the per cent of those who were killed.

8. Taking a general average, let us suppose that each man killed, as stated in Ex. 7, was the father of two children. How many children were left fatherless by these wars?

9. Instead of making the supposition of Ex. 8, let us suppose that only 66⅔% of the men were married. How many women were made widows by these wars?

10. In the Balkan wars of 1912-1913 there were 1,230,000 men engaged and 350,000 of these lost their lives, whereas in the Russo-Japanese war of 1904-1905 there were 2,500,000 men engaged, of whom 555,900 lost their lives. In which war was the per cent of loss the greater? State the per cent of loss in each case.

11. It is estimated that in the present great war there are 21,200,000 men engaged. If the per cent of loss of life should be the same as that in the Balkan wars (see Ex. 10) what number of men would be killed.

It should be stated that examples like Exs. 3 and 6 are not to be commended. We seldom have to find the number of men engaged, for this number is usually known. It is also open to question whether the attempt to draw a moral by such hypothetical cases as Exs. 8 and 9 is warranted. If the facts were really known the problems would be justified.

Cost of Saving and of Destroying Human Life

Problems Involving a Knowledge of Simple Interest.

1. Pittsburg recently spent $7,000,000 on purifying its water supply. It is estimated that 300 lives a year will be saved by having pure water, and that these lives are worth, on an average, $5000 to the city and country. How much is the financial saving of human life?

2. If Pittsburg borrowed the $7,000,000 at 4¼%, how much would the average charge be per year?

3. The expenditures for 2,000,000 shrapnel shells at $18 each which a certain European government placed in one order in 1915, was how many times the annual interest charge found in Ex. 2? It was how many times the entire charge of the purifying plant mentioned in Ex. 1? Answer to the nearest tenth in each case.

4. The death rate of infants in a certain English town was recently reduced one-third at the average expense of $20 per child saved. The mere cost of ten shrapnel shells at the rate mentioned in Ex. 3 would pay for the saving of how many children's lives at this rate?

5. At 5% the interest on the cost of a single battleship like the Pennsylvania ($13,000,000) would save how many children's lives at the figures given in Ex. 4?

6. In Germany it costs on the average 2310 marks to rear a child from birth to the age of 20 years. At 23.8c. to the mark, how much is this in our money? At 6% the interest for 20 years on a battleship costing $9,500,000 would pay for the rearing of how many children in that period?

7. The United States government pays for the promotion of public health $4,425,188 in the year ending June 30, 1916. At 2½%, a fair rate of interest for the government, this is how much less than the mere interest on the $459,071,803 that we spend this year for war purposes?

8. The battleship South Carolina cost $5,097,355. Last year the state of South Carolina appropriated $42,220 for public health. One year's interest on the cost of the battleship, at 5%, would pay the amount appropriated for public health for how many years?

9. The mere hull and machinery of the battleship Oklahoma cost $5,926,000. Last year the state of Oklahoma appropriated $32,700 for public health. The interest on the cost of the battleship, at 5%, would allow this appropriation to be increased how much?

10. The battleship Kansas cost $7,565,620. Last year the state of Kansas appropriated $30,500 for public health. This represents, to the nearest tenth per cent, the interest on the cost of the battleship at what rate?   ❡

BATTLESHIPS AND TEACHERS

Problems Involving a Knowledge of Simple Interest.

1. The battleship Georgia cost $6,543,531. The average monthly salary of a teacher in Georgia is $45.54. The mere interest on the cost of this battleship at 6% would pay the salary of a teacher for how many years of 9 months each?

2. The battleship Illinois cost $4,621,408. The average monthly salary of a teacher in Illinois is $73.05. The interest on the cost of this battleship at 6% would pay the salaries of how many teachers for a month?

3. The battleship Indiana cost $5,983,371. The average monthly salary of a teacher in Indiana is $66.01. The interest on the cost of this battleship at 5% would pay the salaries of how many teachers for the year in which the interest is paid?

4. The battleship Iowa cost $5,871,206. How much would the simple interest on this sum amount to in the 15 yr. of the life of the ship? The average monthly salary of a teacher in Iowa is $51.67. This interest, plus the cost of the ship, which is then out of date, would pay the salaries of how many teachers 9 mo. in each year for the 15 yr.?

5. The battleship Kansas cost $7,565,620. In 1913 the state of Kansas received from the United States government. $80,000 for higher education. The interest on the cost of the battleship, at 6%, would have allowed this amount to be how many times as great?

6. The battleship Kentucky cost $4,998,119. In 1913 the state of Kentucky received from the United States government $72,750 for higher education. The interest for a single year on the cost of the battleship, at 5%, would have paid this sum for how many years?

7. The battleship Louisiana cost $7,425,613. The average monthly salary of a teacher in Louisiana is $55.51. The interest on the cost of this battleship for a single month, at 6% would pay the salaries of how many teachers?

8. The battleship Maine cost $5,381,903. The average annual salary of a teacher in the common schools of Maine is $450. The interest on the cost of this battleship, at 6%, would pay the salaries of how many teachers?

9. The battleship Massachusetts, built in 1891, cost $6,047,117, and is now obsolete. Suppose, instead of putting the money into this battleship, it had been placed at simple interest at 5%. The money would still be unspent, and it would have accumulated how much interest from the time the ship was built to the year 1915?

Cost of Saving Life and Cost of Destroying Life

Problems Involving Simple Interest.

1. The battleship New York cost, for hull and machinery alone, $6,400,000. This year New York State spends $257,940 on the department of health. How does the mere interest on this part of the total cost of the battleship, at 4¼%, compare with the amount devoted to public health?

> This is the regular appropriation of New York for 1914-1915, and similarly in the following examples.

2. The battleship Illinois cost $4,621,408. This year Illinois spends $112,115 on the department of health. If, instead of putting this amount into this battleship, which is now nearly obsolete, the same amount had been put at interest at 4½%, how long could this department of health have been maintained at its present expense? What annual income would result indefinitely at this rate of interest?

> It should be stated in fairness to the pupils that Illinois did not pay for this ship directly, and that if the money had not been put into building the ship it would not have been given to Illinois for purposes of public health. On the other hand, the $4,621,408 represents but a fraction of the total cost of the ship since it was built (1897), and the ship is nearly worthless at present. Similar considerations apply to many of these examples. All that these problems seek to show is that it is a pity that the world cannot find a better plan for ensuring peace than by spending these vast amounts.

3. The hull and machinery alone of the battleship Michigan cost $3,585,000. This year Michigan spends $39,000 on the department of health. At 4% the interest on this partial cost of the battleship would increase the appropriation for health by how much, besides continuing it indefinitely with no further expense?

4. The battleship Texas, with full equipment, cost about $12,500,000. This year Texas spends $48,200 on the department of health. The interest on the cost of the battleship would enable Texas to spend how many times this amount for public health forever?

5. The United States Life-Saving Service cost our Government $2,309,317 last year, and cared for 29,000 shipwrecked persons. In the same year we spent $173,522,804 on our army, $139,682,186 on our navy, and $173,440,231 on pensions, all these being expenses due to war or fear of war. The amount devoted to our Life-Saving Service was how much less than the interest on the sum of these war expenses at 2%, which is about the rate that our Government has to pay?

> Teachers should encourage the pupils to find the amount spent locally, where they live, for the purposes of public health, and to make up problems similar to Ex. 5, based on this information.

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THE COST OF WAR

Problems Involving Stocks and Bonds.

1. Countries borrow money for public buildings and other permanent improvements, issuing bonds and usually paying a certain amount from year to year. Before the great war the per capita debt of Great Britain was $72; of Germany, $18; of France, $166; of Belgium, $97; of Austria-Hungary, $48; of Russia, $21; and of Serbia, $44. On January 1, 1915, this had increased so that the debt of Great Britain was $106 per capita; of Germany, $57; of France, $212; of Belgium, $114; of Austria-Hungary, $83; of Russia, $36; and of Serbia, $88. Find the per cent. of increase for each country for the first five months of the war (August to January).

> By *per capita* debt is meant the average which each man, woman, and child in a country would have to pay to cancel the whole debt.

2. To carry on the first five months of the great war, Great Britain had to borrow $1,560,000,000; France, $1,815,000,000; Germany, $2,600,000,000; Belgium, $130,-000,000; Austria-Hungary, $1,815,000,000; Russia , $2,600,-000,000; and Serbia, $130,000,000. How much was borrowed by these seven countries? How much did this average per month?

3. The daily cost of the great war is estimated at $50,-000,000. At this rate, how much will it amount to in the year from August 2, 1914 to August 2, 1915?

4. If the countries borrow the money mentioned in Ex. 3, and pay on an average 5% interest on their indebtedness, the interest alone will amount to how much per year?

5. Largely as a result of wars or appropriations for war, England had, before the war began, a debt of $3,305,000,000; Germany, $1,200,000,000; France, $6,575,000,000; Belgium. $740,000,000; Austria-Hungary, $2,450,000,000; Russia, $4,-450,000,000; and Serbia, $130,000,000. From these figures and those in Ex. 2, compute the debts of these countries after five months of war.

6. Before the war, Belgium's 3% bonds were quoted at 96, and Germany's 3% bonds at 82. What was the actual rate of interest which each of these countries, the former with no well-trained army, and the latter with a remarkable military organization, have to pay?

7. Before the war, Norway's 3½% bonds were quoted at 102, and Russia's at 81. What was the actual rate of interest which each of these countries, the former giving little attention to war, and the latter well equipped, had to pay?

> The object of Exs. 6 and 7 is to show that the credit of a country in the money markets of the world is not proportional to the attention paid to armaments.

Losses Occasioned by Rumors of War

Problems Involving a Knowledge of Stocks and Bonds.

1. Between July 22 and July 30, 1914, the prices of British 2½% bonds declined from 75½ to 70. What was the actual rate of interest on the money borrowed at each of these quotations? If Great Britain needed to borrow more money, which she and most European countries did, would she be actually paying more interest, or less interest?

> The great European War began in August, 1914. Rumors of war had been heard some days before war was actually declared. Between July 22 and July 30 all European and American stock exchanges felt the serious effects of these rumors. The examples on this page relate to this period, and to government bonds or their equivalent.

2. French 3% bonds declined from 81 to 76½. If France needed to borrow more money, what interest would she actually have to pay at each of these quotations?

3. German 3% bonds declined from 75 to 72. If Germany needed to borrow more money, what interest would she actually have to pay at each of these quotations?

4. Austrian 4% bonds declined from 84½ to 76½. What interest would Austria actually have to pay at each of these quotations?

5. Russian 5% bonds declined from 102½ to 93. What interest would Russia actually have to pay at each of these quotations?

6. Exs. 1-5 tell us something about the relative financial standings of the five great powers at the beginning and end of the week preceding the declaration of war. Which country could borrow money at the lowest rate of interest at the beginning of the eight days? Which could borrow money at the lowest rate at the end of the eight days?

7. The market value of the securities quoted on the London stock exchange fell, in the eight days mentioned, £600,000,000. That is, the stocks and bonds quoted on that exchange would sell for that much less. At $4.866 to the pound, what was the loss in value in these securities alone, caused by rumors of war?

8. Let us try to measure the enormous sum mentioned in Ex. 7. Not counting leap years, but taking 365 days to each year, how many days in the 1915 years from the beginning of the Christian era? If this sum of money were apportioned equally among these days, each day would represent how much money?

9. Let us try to measure the sums in Exs. 7 and 8 in another way. How much money would each of the 2,000 working men in one of our small cities, and his successors, have to earn a day for 1915 years to equal simply the losses on the London Stock Exchange in the eight days preceding the war?

The Financial Cost of War

Problems Involving a Knowledge of Stocks and Bonds.

1. To pay her great loss to Germany in the war of 1870, France first issued $150,000,000 worth of 3% bonds and sold them at 60.6% of their par value. What rate of interest did she have to pay on the money actually received? How much interest did she pay per year on this loan?

2. France also issued $50,000,000 worth of 6% bonds and sold them at 85% of their par value, and $400,000,000 worth of 5% bonds and sold them at 82.5% of their par value. On which of these loans did she pay the higher rate of interest on the money actually received? How much interest did she pay per year on each of these two loans? on the two together?

3. To finance the South African war of 1899-1902, Great Britain was forced to borrow a large amount of money through the sale of bonds. She sold £30,000,000 worth of 2¾% bonds at 98½, £60,000,000 worth at 94½, and £32,000,000 worth at 93½. How much actual cash did she receive from these sales, how much interest did she have to pay a year, and what was the actual rate of interest on the cash received?

> The teacher should call attention to the fact that Great Britain sold her bonds first at 98½, then at 94½, and finally at 93½, her credit decreasing as the war continued. As a matter of fact her bonds (Consols) were selling at 102¾ when the war was declared, whereas they are now (1915), largely as a result of war and armament charges, selling at about 70, a tremendous shrinkage in values.

4. The loss occasioned by the war mentioned in Ex. 3, also affected railway stocks in Great Britain. Partly as a result these stocks declined £300,000,000 in value. Compute this shrinkage in dollars, at 4.866 to the pound.

5. In the Russo-Japanese war of 1904-5 Japan had to borrow large sums by issuing government bonds. Her credit declined as the war proceeded, although she was successful in her battles. At first (March 1904) she sold her 5% bonds for 95; then (May and October, 1914) her second and third issues of 5% bonds for 92; then (February and May, 1905) she had to issue 6% bonds at 90. Find the rate of interest which she had to pay on the money she actually received for her bonds in each of these three cases.

> These did not represent all the loans, but they represent the money borrowed at home, and they show how even a successful war impairs the financial standing of a country.

6. The world's annual armament bill in times of peace, that is, in the year preceding the great war of 1914, was $2,324,-067,000. Let us try to realize how vast a sum this is. What is the population of the place in which you live? If one fourth of these persons are wage earners, and average $2 a day, how much can they earn in a day? How many days would it take them to earn this amount? How many years?

The Financial Cost of War

Problems Involving Ratio and Proportion.

1. The South African war began Oct. 11, 1899, and on Oct. 20, 1899, the British ministry estimated that it would cost £10,000,000. It turned out that the ratio of estimated cost to actual cost was substantially 25 : 53. At this ratio, how much did the war really cost?

2. The Russo-Japanese war of 1904-5 cost Japan 2,030,943,000 yen, a yen being equal to 50c. of our money. The amount charged to the national debt (that is, the amount borrowed) was to the amount paid for out of the current revenues (that is, the amount paid for as the war went on) as 98 : 27. Find the number of dollars added to Japan's national debt by this war in which she was successful. Find also the number of dollars she had to pay at once.

3. For the year ending June 30, 1916, it is estimated that our country will spend for army, navy, pensions, and other matters relating to war, the sum of $459,071,803. Our total expenditures for the year are estimated as $1,090,775,134. Find to the nearest hundredth the ratio of our war expenses to our total expenditure.

4. For the year mentioned in Ex. 3 our war estimates are, as stated, $459,071,803, and our estimated expenses for such peaceful purposes as agriculture, labor, education, foreign affairs and care of the Indians are $196,306,267. Find to the nearest hundredth the ratio of our peace expenses to our war expenses.

5. The battleship Pennsylvania, launched in 1915, cost $13,000,000. It cost our country $211,840 to pay our President and Vice-President, and to meet the expenses of the executive offices of the government. The cost of this single battleship would pay these expenses for how many years?

6. In the year 1914 the United States, at peace with all the world, with a very small army and a navy that ranked only third or fourth in the navies of the world, spent $173,894,143 for her army, $139,893,614 for her navy, and $173,092,065 on pensions. What was the ratio, to the nearest tenth, of our total war expenses to the war expenses of Germany in 1913, with the best-equipped army in the world, these expenses being $312,967,000?

7. In Ex. 6, find the ratio of our war expenses to the war expenses of England in 1913, with the best-equipped navy in the world, these expenses being $351,044,000.

8. In Ex. 6, find the ratio of our war expenses to the war expenses of France in 1913, with a large army and good-sized navy, these expenses being $259,349,000.

> Exs. 6-8 show that we spend a very large amount in proportion to the results. Part of this is undoubtedly legitimate, for we pay our workmen, our soldiers, and our sailors better than most other countries.