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# THE SCHOOL MAGAZINE.

APRIL, 1880.

"THE SCHOOLS OF OTHER TIMES AND OF OTHER LANDS.

WHEN William Penn founded the State of Pennsylvania in 1681, his first counsel given to the colonists was to "educate the people." The last recommendation made by George Washington to the new Republic was "educate the people." The constant advice of Thomas Jefferson also to "educate the people." Counsel, advice and recommendation have been so earnestly followed that to-day the public school systems on this continent stand foremost amongst the world's educational schemes. As in the case of so many other excellent designs, errors have crept in, incompetency has been manifested and there is a suspicion abroad that the amount of money yearly set aside for our public schools is not expended to the best possible advantage. At this moment when education is engaging the attention of so large a portion of the community, it will be pertinent and interesting to spend a short time in hurriedly looking back and around at some of the various schools of the past and present throughout the world. It is mainly of schools as settled institutions akin to

or contemporary with ours of to-day that the attention of the reader is directed. Although the development of the physical forces occupied the principal place among the ancient Greeks and Romans, neither in Rome nor Athens, nor in any of the great cities of antiquity, was intellectual culture neglected. The education of children commenced when they were seven years of age in schools which, although generally private enterprises, were all under the state surveillance. In Athens the time to be devoted to lessons and the number of scholars which one master should teach were regulated by law; the school was not to open either before the rise or after the setting of the sun. In Rome the exercises often commenced before sunrise and by lamp-light, while the number of pupils under each master must have often been considerable, if one may judge from the recital of an old writer, who speaks very quietly of sixty children at school crushed under a gallery platform. It must not be supposed that either in the heyday of Greece or under the Roman Republic were the schools very splendid affairs. Dionysius, the tyrant of Syracuse, taught the

\*Condensed from Exchanges.

children of Corinth in the streets. It was in the market-place of Rome near the meat stalls that the school was held which Virginia was attending in the time of the decemvirs, and the most luxurious establishment was at the best a naked room open at all sides. The scholars sat around the master, very often on the ground, holding a tablet on their knees, upon which they first copied the characters of the alphabet, after which they passed on to syllables, then to words and finally to passages drawn from the poets. Arithmetical studies were mainly confined to learning to count by the aid of their fingers, or with little pebbles, or by making figures in the sand—the *abacus* (a counting machine very much like that which the Chinese use), being employed for complicated calculations. Such, with singing or the chanting recitation of, say, Homer's poems, constituted the whole system of elementary education. The children of rich parents occasionally followed this by engaging special teachers, who demanded a high price for their services, while there and then, as now and here, the schoolmaster was poorly paid and but little considered. He received his small salary, but there being four months of vacation, a day of rest in each week and a number of fete days, for all of which idle time he was not paid, the old Roman and Athenian pedagogue was not insensible to the presents which some parents occasionally made him at New Year's feast and birthday. Up to the days of the Empire corporal punishment in the most rigorous forms was practiced in the Roman schools; then some slight modifications were made in the modes of chastisement, but to mount an offending scholar on another's back, that his own might be in better position for the receipt of the schoolmaster's rattan, is a method of education which has come down from antiquity through the middle ages to our own day. After the wane of the

great Latin and Hellenic powers Europe paid but little attention to mental culture, until, as Guizot remarks. "the seventh century marks the lowest point to which the human spirit of modern Europe has descended." There were, however, a few country schools scattered sparsely throughout the land, in which the priests taught reading and writing, the latter being confined to that of manuscripts, and the first to characters traced upon the bark of trees or waxen tablets. The gloom continued until the close of the eighth century, when the priesthood, headed by one Theodulf, a Bishop of Orleans, made a strong effort to lighten the darkness by establishing a system of free schools. By it the gentlemen of the cassock were to hold schools in the burgs and fields, and to instruct all children who came in reading, writing and chanting, free of charge, receiving only the "voluntary contributions" of the parents in payment. The noble plan did not succeed; one by one the schools died out, and the people, provided they had bread enough to eat, cared for nothing else. There are arid wastes of time to pass over until the invention of printing in the fifteenth century. Thence, slowly but surely, the spread of schools advanced. Germany stood in the van, her schools became numerous and useful, the Government took the matter of public instruction in hand, and to-day the educational institutions of the Kaiserdom stand among the foremost in the world. In Great Britain, although much attention was paid to the scholastic improvement of the wealthy, the masses remained in ignorance, and it is only within the last twenty-five years that Parliament, struck by the wide-spread ignorance of the people, established the School Boards and rendered education compulsory. The work of the Irish hedge-schools was feeble and insignificant, and the Green Islander had need of all his mother wit to keep him to the front.

Spain and Italy are still backward, and nothing surprises the newly-arrived immigrant from these countries so much as to see every one in this country, however poor and low, reading his daily paper. Primary instruction is, however, making rapid progress in Italy. The State devotes large sums of money to the purpose of teaching; more, indeed, comparatively, than either France or Austria. The number of normal schools is constantly increasing, and the recruiting for instructors would be much less difficult if they were only paid a little better. At present there are over 25,000 schools in the rural communes of King Humbert's dominions. France, judging the country by the standard of its metropolis, has made a very sensible progress in educational matters during the present century. In 1380 Paris contained 40 small boys' schools and 20 for girls. Three hundred years later, the latter score had risen to the number of 166 schools for girls. The number of primary schools in 1871 was 341, attended by 89,012 scholars; in 1873 the budget contained the sum of 17,000,000 francs for primary education, and at present there are about 120,000 scholars, occupying about 430 schools. In the Parisian public schools the course of study is very simple, the expenditure of the money of the republic being scrupulously confined to the useful. The lessons taught are those in reading, writing, arithmetic, the French language, lineal drawing, singing, geography, and the history of France. There are many who may like to read the distribution of work, and for their benefit it is appended. This at least was the order of exercises a few years ago:—Morning at 8 o'clock, the class commences with a lesson of religious instruction, followed by the catechism and gospel; 9 o'clock, arithmetic, mental calculation or drawing, 9.30; from 9.40 to 11 o'clock, reading and writing. Afternoon:—At 1

o'clock, dictation in French; 2 o'clock, writing; 2.30, recess; 2.40, writing, varied twice a week with geography; from 3.30 to 4 p. m., questions on various topics and singing. During the recess gymnastics are taught. It is only since the emancipation of the serfs that the poorer subjects of the Czar have even dared to think about drawing themselves out of the slough of ignorance. Schools are now freely established throughout the empire, and the Muscovite youth is growing up wiser if not better than the past generation. Russia's old-time enemy that sits beside the southern Euxine has been striving not to lag far behind in the march of progress. A Mussulman used to consider himself sufficiently instructed if he knew how to read, write and count, his reading being confined to the Koran. This ancient routine is now considerably modified in Turkey. By the legislative action of 1847 and 1869 public instruction was arranged for, based on the German system. The primary schools are divided into two grades, *mektebi* and *rechdie*, and every city ward and village must contain at least one primary school. There the pupils are taught religion, morality, reading, writing, arithmetic, the history of the Ottoman Empire, elementary geography and a number of practical arts, particularly the use of the needle to girls. A most remarkable instance of the way in which narrow ideas and cast-iron prejudices are gradually giving way before the broadening influence of the world's general advancement is afforded by the Turkey of our day. Although the Mussulmans, since the coming of Mohammed, have followed the Koran, which says, "Let the child play seven years, instruct and correct him during the seven years following," the present regime renders it obligatory for parents to send their children to school at the age of six, and fixes the course of study at four years. Again, Mohammedan though Turkey may be,

the Government has prescribed that in the wards or villages, wherever the population is composed of believers in Christ and believers in the Prophet, two primary schools are to be established, one Mussulman and the other Christian. The writer is not aware of any very recent school census taken in Turkey, but a few years ago the Sultanate contained 10,897 Mussulman schools, having 11,266 teachers, and 2,249 Christian schools, having 2,250 teachers. If on our homeward-bound inspecting tour we rest a moment in the Tartar provinces of the Caucasus we shall have an opportunity of seeing a school which is a type of all such institutions in the Mussulman countries, and which existed in Turkey before the reformation. A murmur which fills the air like the buzz of a gigantic beehive indicates the whereabouts of the school, which is held in a single room on the level of the street. The interior walls are ornamented with verses from the Koran, copy-books are piled around the sides, while in a corner is seated the mollah, or schoolmaster, solemnly smoking his narghileh. Near him are ranged the children of well-to-do parents, the little fellows who have the misfortune to be poor squatting in disorder on the floor. Before each is spread his book, over which he bends, balancing himself from right to left, reading out his lessons in a high voice and stopping his ears with his hands. When any pupil thinks he knows his lesson he approaches the master, who, if the child slips in his recitation, canes him and sends him back making more noise than ever. As a visible warning to the scholars not to be overhasty, the mollah keeps a dozen switches of all sizes at his side, with which he plays an indiscriminate tattoo on the heads, hands and feet of those he has in charge. As if this was not enough, now and again he lays a pupil prone, two others place a kind of stocks around their schoolmate's feet, and two

others inflict the bastinado upon the heels of the poor child. And so with cries, lamentations and a continual drone, the school goes on. Let us make our next resting point in Hindostan, where, before the English conquest, education was of the most miserable description. The masters were ignorant, the school-houses mere hovels, and the text-books composed of songs and legends, poetic but corrupt. In 1814 the English missionaries began the establishment of better schools near Calcutta; two years later the Government came to their aid; in 1827 the East India Company began the foundation of elementary schools; in 1859 the number of these had risen to 3,335, containing 119,384 scholars, a number which, under the imperial fostering, has swelled considerably with each succeeding year. Reading and writing were at first only taught, but now the studies of arithmetic, grammar and geography have been added. The greatest difficulty which presented itself was that of teaching the girls. The Hindoos had with Eastern wisdom always considered it dangerous to let women know very much, but when the indelicate fables gave place to good books, and the teachers, besides instructing the girls, clothed and provided them with money, the success, which was first due to the appetite of gain, gradually gave way to honest emulation. It is to Miss Cooke, who was sent to Calcutta in 1821 by the Society of English and Foreign Schools, that this good work was begun. In five years thirty schools, attended by 600 girls, owed their existence to her zeal and enterprise. The English Government ably seconded her efforts, and at present it supports over a thousand schools devoted to the mental improvement of Hindoo girls. Still nearing home, as amateur inspectors, we next halt for a minute in China. Much as we boast, and with reason, of the universal education of children in this country, it is

a question whether primary instruction is not as wide-spread among the Chinese as with us. To be sure the methods employed there are bad, and the lessons of the most primitive description, still pupils learn something, and it is seldom one finds a Chinaman, however indigent, who cannot read, write and calculate. The idea which is held by many, that it takes a Chinaman his whole life long to learn to read, is not founded on fact. The truth is that he who knows two hundred signs is considered a literary man. As is the case in everything else in China, the system of education is systematically arranged by the Government, the different degrees of teaching being as follows: First, the principal characters, those which represent the most important objects in nature and the arts; secondly, the Santseu-kin, a metrical summary of what a child should know; thirdly, the four books of Con-Fu-Se, which form the principal portion of the Chinese scripture. To learn to write, the scholars reproduce the characters on transparent paper and then copy them upon tablets covered with a white varnish. Crossing the intervening sea, we set foot in that strange land Japan, whose progress is dream-like, whose simplicity and wisdom go hand in hand, and whose decorative art is at present accepted as the height of æsthetic taste. The methods

employed to teach the first principles of reading and writing are so nearly alike to those last seen that we need not stop to examine them. One of the chief factors, however, in the Japanese education is peculiar and unique. It is that known as the *Irova*, a sort of alphabet in which have been grouped in verses of four lines, not only the vowels and consonants, but also the fundamental sounds of the language. There are forty-eight of these verses, the first being as follows:

Irova nivoveto tsirinourou wo,  
Wagayo dazezo tsouno naramou.  
Ou wi no okouyama kefou koyete.  
Asaki youmemist evimo sozou oum.

Which, freely translated, would read:

Color and odor both pass away;  
In our world all is changing and shifting;  
The abysses of nothing will swallow to-day;  
Like dreamers, forever we're drifting.

This the little ones, standing around the master, chant aloud, parroting a philosophy that has been handed down for ages. Japan has been passing through an era of reforms, but still the generations which are gone before repeat to that which is springing up that there is nothing permanent here, and that the days of man are "as a dream when one awaketh." It is a school of sleepy influences, from which it is as healthy as a cold water douche to get back into the hard practicality of our own country.

## CHEMICAL DEFINITIONS.

By Thomas J. Godfrey, Student VI. Form.

*Acids, Salts, Bases and Alkalies* must be discussed together, as they are correlative terms. Formerly, the distinction between them was very marked, but as chemical science advanced it was found that, in many cases, some of these distinctions disappeared under certain conditions. Hence arises the necessity for a new definition of these bodies,

and that necessity is still felt. It seems a hard matter to get a perfectly satisfactory definition, nearly every text book having a definition of its own, and often contradictory to the definition in another book. Most chemists, however, agree in saying an *acid* is a *salt* of Hydrogen, in other words, that all acids contain Hydrogen. Though this is

generally true, it is not always so.  $\text{Cu SO}_4$  is an acid and yet has no Hydrogen; Silica is an acid and has no Hydrogen, nor does it turn blue litmus red or taste sour. Again it is often said that all acids contain Oxygen, but Hydrochloric acid has no Oxygen. What, then, is an acid? To say that "an acid combines with a base to form a salt," and that a "salt is the union of an acid and a base," is reasoning in a circle—using the very word we want defined on both sides of our definition. We thus see the difficulty of correctly defining an acid. Acids and bases are correlative terms and seem to hold much the same relation to each other that *positive* and *negative* do in electricity—each is the very antithesis of the other. If we look at acid and base in this way, we may be able to arrive at a nearly satisfactory definition. Acid and base, when treated as *electro-positive* and *electro-negative*, may be defined: "Considering a Hydrate to be a compound formed on the type  $\text{H}-(\text{OH})$ , by substitution for either radical, if we arrange the hydrates in a series, beginning with that containing the most highly electro-positive radical, it will be found that those with strongly electro-positive radicals are bases, those with strongly electro-negative radicals are acids, while those in the middle of the series are acid towards those at one end of the series, but basic towards those at the other end." This definition seems to express exactly the relationship existing between acid and base. These two terms must, however, soon give place to better, as it is found they do not answer the purposes for which they are used. They may continue in use as popular terms, but as chemical terms they will ultimately be replaced by better. *Salt* appears to have a dependence on the previous two, since it is formed by their union, and it is called neutral because it exhibits neither the properties of an acid nor a base. If chemical language were perfectly consistent, all compounds of two dissimilar elements or groups of elements would be called salts, but in practice, the name is restricted to those bodies which closely resemble in properties or composition such a typical salt as Sodium Chloride.

An *Alkali* is about the same as a base—it counteracts the properties of an acid. Alkalies have usually a soapy feeling and taste, and restore the blue color to red litmus. An alkali is often defined as a "soluble base."

*Monobasic acids* are those which have one replaceable atom of Hydrogen, as Nitric acid  $\text{HNO}_3$ , where the H may be replaced by K, forming  $\text{KNO}_3$ .

*Dibasic acids* have two replaceable atoms of H, as Sulphuric acid  $\text{H}_2\text{SO}_4$ , where each H may be successively replaced, as  $\text{HKSO}_4$  and  $\text{K}_2\text{SO}_4$ .

*Radical* is any substance which can enter into a chemical compound, or is the basis or common ingredient of any series of compounds. Radicals are divided into *simple* and *compound*. A *simple radical* is an element, as Nitrogen in the Nitrogen series, or Carbon in Carbon compounds, all the elements are simple radicals. *Compound Radicals*, or more properly, *compounds radical*, are groups of two or more elements in chemical combination, which act in all respects as elementary bodies.  $\text{CO}_3$  is the comp. rad. found in all Carbonates; it is termed the "Carbonic radical," and is as characteristic of Carbonates as H is of the Hydrogen compounds. The following are the principal compounds radical:

$\text{CO}_3$ ,	-	found in all Carbonates.
HO, hydroxyl,	"	" Hydrates.
NC, or Cy,	"	" Cyanides.
$\text{NO}_3$ ,	-	" Nitrates.
$\text{ClO}_3$ ,	-	" Chlorates.
$\text{C}_2\text{H}_3\text{O}_2$ ,	"	" Acetates.
$\text{SO}_3$ ,	-	" Sulphites.
$\text{SO}_4$ ,	-	" Sulphates.
$\text{C}_2\text{O}$ ,	-	" Oxylates.
$\text{PO}_4$ ,	-	" Phosphates.
$\text{BO}_3$ ,	-	" Borates.
$\text{NH}_3$	-	" Ammoniates.

These comp. rad. are usually expressed by enclosing the radical in brackets thus:  $\text{K}(\text{NO}_3)$  &c. This is, however, only done when we wish to show how the composition of one compound is analogous to that of another.

*Electro-positive* and *electro-negative* are terms

derived from the electrolytic decomposition of bodies, as in the electrolysis of water. When compound bodies are thus decomposed, those elements that are liberated at the *negative* pole are called *electro-positive* elements, while those set free at the *positive* pole are called *electro-negative* elements. Such a classification is not, however, absolute; the same element may be obtained at either pole, according to the particular combination in which it occurs. This will explain why the same body is sometimes an acid and sometimes a base. (*See Acid ante.*) The principal elect. pos. bodies are Hydrogen and the metals, and the elect. neg. are O, N, S, Cl, Br, I, F, Cy, and some others.

*Formulae.* By *formula* is meant a combination of symbols, systematically arranged, so as to express briefly some chemical fact, either of the composition of a compound or the process by which compounds are formed, or the manner in which the several elements of the compound are united. In accordance with the different facts formulae illustrate they get their name.

*Molecular formulae.* A mol. being the smallest particle of a simple or compound body capable of existing in a free state--that is, generally a cluster of atoms--that combination of symbols which represents it, is called a *molecular formula*.  $H_2$  is the mol. form. of Hydrogen,  $O_2$  of Oxygen,  $N_2O$  of Nitrogen Monoxide, and  $H_2O$  of Water. Each of these formulae represents *one* mol. of the substance for which it stands. If we wish to express two or more molecules, we do so by prefixing a 2, 3, &c., to the mol.; thus,  $3H_2O$  means three mols. of water,  $5KClO_3$  is five mols. of Potassium Chlorate, and so for others. Elements whose mol. is not definitely known in the free state, are marked in works on chemistry by placing an asterisk over the symbol, thus,  $Cu^*$ ,  $Zn^*$ .

*Empirical formulae* represent the composition of bodies--the number of atoms, &c., as determined by experiment. Experimentally we determine the percentage of different

elements present in a compound, and from this we calculate the formula. Thus suppose Alcohol is analysed and is found to consist of 52.174 of Carbon, 13.043 of Hydrogen, and 34.783 of Oxygen; we then determine the formula by dividing the amount of each element present by its atomic weight, thus:

$$C = 52.174 : 12 = 4.348 \text{ or } 2 \text{ nearly.}$$

$$H = 13.043 : 1 = 13.043 \text{ or } 6 \text{ "}$$

$$O = 34.783 : 16 = 2.174 \text{ or } 1 \text{ "}$$

hence we conclude that the *empirical* formula for alcohol is  $C_2H_6O$ .

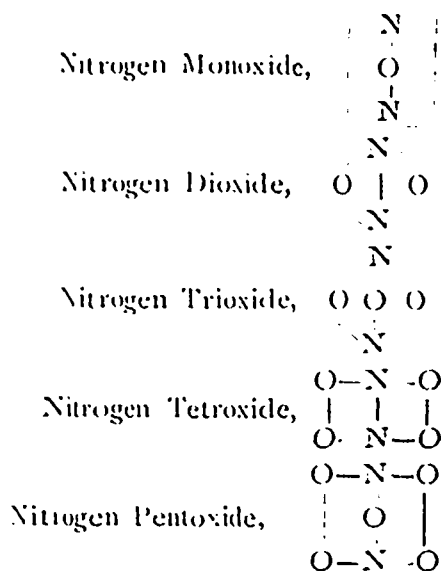
*Rational, Constitutional or Structural formulae* are used to indicate the structural form of a compound. By its use we can illustrate the substitution of one radical for another in any chemical reaction. It must be remembered that such formulae do not pretend to point out the actual position of the atoms in the molecule--they are used merely to illustrate and make simple what could not otherwise be easily understood. If we wish to show how Water is the type of a number of analogous compounds, we give Water the rational

formula,  $\left. \begin{array}{l} H \\ H \end{array} \right\} O$ , then the formula for Nitric acid is  $\left. \begin{array}{l} NO_2 \\ H \end{array} \right\} O$ , and for Sulphuric acid the formula is  $\left. \begin{array}{l} SO_2 \\ H_2 \end{array} \right\} O_2$ , where we show by

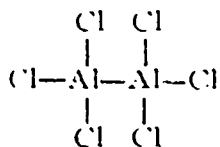
the *structure* of the formula the relative position of the elements, and also how the one may be substituted for the other. The same compound may have more than one rational formula.

*Graphic formulae* are nearly the same as rational formulae, but seem to differ in this: the latter represents only the relative position of an atom in a molecule, whereas the former points out the attraction, direction of the forces, or arms, so to say, by which the atoms are bound together. It is generally used when treating of the *valency* of bodies. If lines represent the forces by which atoms are bound together, the following *graphic* formulae will represent





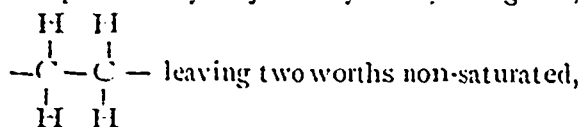
and Alumina Chloride will be



The same remark applies to this as to rational formulæ. It does not actually show the direction of the force or power, but it helps the student by simplifying some things. It is a purely speculative hypothesis in both cases. Such a representation of the combining powers of elements may help us to explain why compounds radical enter into combinations so powerfully. Carbon is a tetrad, (that is, has *four* combining worths), Oxygen is a dyad (i. e., has *two* combining worths), therefore the comp. rad. Carbon Monoxide written *graphically* is  $\begin{array}{c} \text{C} \\ | \\ \text{O} \end{array}$  which shows us



two worths are left free (non-saturated), and ready to enter into composition with some other body, hence it forms part of another compound body very readily. Olefiant gas is,



hence ready to take part in a new combination.

*Atomic formulæ* are used when we express the composition of a body by giving the elements of which it is composed and the number of atoms of these elements present. Thus, am-

monia is  $\text{NH}_3$ . This is an example of an *atomic combination*, which forms one molecule.

*Molecular formulæ* are used in expressing chemical actions; thus, when we express the formation of ammonia we use molecular formulæ,  $2(\text{NH}_3, \text{HCl}) + \text{CaO} = \text{CaCl}_2 + \text{H}_2\text{O} + 2\text{NH}_3$ , and this furnishes an example of *molecular combination*. It is this formulæ we use in chemical equations.

*Atomicity*, generally called *valency* or *quantivalence*--as these terms are now used they are synonymous. This is perhaps the most unsatisfactory part of Chemistry, as no satisfactory explanations have yet been given for the many irregularities that are noticed in connection with this law. *Atomicity* means the relative power or worth, compared with Hydrogen, which Radicals have of uniting to form compounds or of replacing each other in a compound. We may illustrate this graphically as follows:--1 mol. of Hydrogen is  $\text{H}-\text{H}$ , of Hydrochloric acid  $\text{H}-\text{Cl}$ , where an atom of Chlorine takes the place of an atom of Hydrogen in the mol. of Hydrogen--hence we say Cl is *monovalent*, or it is a

*monad*; 2 mols. of Hydrogen is  $\begin{array}{c} \text{H}-\text{H} \\ | \quad | \\ \text{H}-\text{H} \end{array}$  one

mol. of water is  $\begin{array}{c} \text{H} \\ \diagdown \\ \text{H} \end{array} \text{O}$ , where the atom of O has replaced two of H, hence O is *divalent*,

or it is a *dyad*; 3 mols. of H is  $\begin{array}{c} \text{H}-\text{H} \\ | \quad | \\ \text{H}-\text{H} \\ | \quad | \\ \text{H}-\text{H} \end{array}$  and

one mol. of ammonia is  $\begin{array}{c} \text{H} \diagdown \\ \text{H}-\text{N} \\ \text{H} \diagup \end{array}$ , where one atom of N has replaced 3H, hence N is *tri-*

*valent*, or a *triad*; 4 mols. of H is  $\begin{array}{c} \text{H}-\text{H} \\ | \quad | \\ \text{H}-\text{H} \\ | \quad | \\ \text{H}-\text{H} \\ | \quad | \\ \text{H}-\text{H} \end{array}$

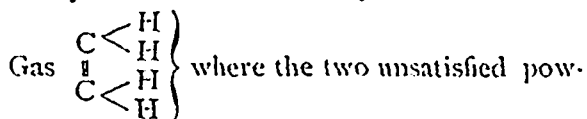
and one of marsh gas is  $\begin{array}{c} \text{H} \diagdown \\ \text{H} \diagup \\ \text{H} \end{array} \text{C}$ , where one

atom of C has replaced 4H, hence Carbon is *tetravalent*, or a *tetrad*. This atomicity refers to powers of the *atoms* only of simple radicals, and to the *molecule* of compound radicals. In the mol. of Hydrogen there are two atoms,

and the power of each is satisfied by that of the other; in water, the O has its two powers satisfied by two atoms of H; in ammonia it has three powers, and hence has three atoms of H to satisfy it; and in marsh gas, C has four H to satisfy it. The following are the principal

Monads.	Dyads.	Triads	Tetrads.
Cl	Ba	An	Mn
F	Ca	N	C
H	Cu	B	Si
I	Mg	St	Sn
K	Hg	Al	Pt
Ag	O	Sb	Ir
Na	S	As	Os
Br	Zn	P	Pd
Li	Pb	Fl	Rh

It must be distinctly remembered that this classification is not absolute—the same element often exhibits different atomicities, as with C and N noted below. Elements belonging to the same group can replace each other in compounds generally. It requires two monads to satisfy a dyad, three monads for a triad; one monad and a dyad will satisfy a triad, and a triad and diad will satisfy a pentad, and so on. So far all is very good, but now the irregularities begin. In the Nitrogen series  $N_2O$ ,  $N_2O_2$ ,  $N_2O_3$ ,  $N_2O_4$  and  $N_2C$ , N may be anything from a monad to a tetrad; in CO a tetrad is satisfied by a dyad; for anomalies like these no satisfactory explanation has been given. It has been suggested that, in some cases, the elements exhibiting the anomalies may satisfy each other mutually, as in Olefiant



stable than the others. Thus, of the two compounds of Chlorine and Tin, that which has least Chlorine Sn Cl has a great affinity for more, which it rapidly takes up, passing into the more stable compound Sn Cl<sub>4</sub>; so Cuprous Oxide readily passes into the more stable Cupric Oxide CO, hence it is usual to assign a radical to the class indicated by its atomicity in its most stable compound. Atomicity explains why elements enter into combination much more energetically in the *nascent state* than when free. When an atom is in the *nascent state* none of its combining powers are satisfied, hence it eagerly grasps at any other atom with which it can unite. The atomicity of an element is usually marked by small dashes as O<sup>II</sup>, N<sup>III</sup>, or thus, C<sup>iv</sup>, P<sup>v</sup>, Mn<sup>vi</sup>, by small Roman figures.

A *symbol* stands for one *atom* of an elementary body; a *formula* represents, at least, one *molecule* of a body, simple or compound.

The definition of *monad*, *dyad*, *triad*, *tetrads*, *pentad* and *hexad* has been anticipated in the discussion on atomicity above; but briefly a *monad* is an element that can replace Hydrogen, or some monad element equivalent to Hydrogen, as Chlorine, atom for atom in a compound; a *dyad* can replace two of H, &c.

*Hydrates* or *Hydroxides* are bodies derived from water by replacing one atom of the H by an atom of some other radical, thus  $\left. \begin{array}{l} H \\ H \end{array} \right\} O$ , when one H is replaced it forms Caustic Potash or Potassic Hydrate,  $\left. \begin{array}{l} K \\ H \end{array} \right\} O$ . Compounds containing H<sub>2</sub>O are called *hydrous* bodies, and when these bodies form crystals the H<sub>2</sub>O they contain is called *water of crystallization*; when this water is driven off the body is not changed chemically, but has simply become *anhydrous*. Now *anhydrides* are compounds from which the elements of water have been removed, and their essential chemical (acid) properties are thus greatly altered. Thus Carbonic acid, H<sub>2</sub>CO<sub>3</sub>, when deprived of the elements of water becomes CO<sub>2</sub> (erroneously called Carbonic acid), a very different substance.

The *crith* is the weight of one litre of Hy-

drogen at 0°C and 760 min. pressure. It is used as a unit in composing bodies, as to weight. It was found that a centimetre was rather small, hence the introduction of this term; it is however seldom used. A type of the questions given under it would be: What is the weight in criths of four cubic metres of

Oxygen? This will illustrate its use sufficiently. This *crith* is not noticed by any of the leading works on Chemistry, and it is very doubtful if the term will come into general use; no great need is felt for such a term. I have found it in only one work, and it is scarcely noticed there.

## MATHEMATICS.

### Solutions to Problems in the March Number.

17. (a) Let  $m$  be the L.C.M. of  $a$  and  $b$ , and  $k$  any common multiple; then if there is any remainder after dividing  $m$  into  $k$ , this remainder being less than  $m$ , cannot contain  $a$  and  $b$ ; but since this remainder is the difference between  $k$  and some multiple of  $m$ , it must contain all factors common to  $m$  and  $k$ , and, therefore, must contain  $a$  and  $b$ ; hence there can be no remainder after dividing  $k$  by  $m$ , therefore. &c.

(b) In the process of finding the G.C.M. of  $a$  and  $b$  each pair of divisor and dividend contains precisely the same common factors as  $a$  and  $b$ ; hence the G.C.M., which is the last divisor, contains all the factors common to  $a$  and  $b$ .

(c) Since the G. C. M. contains all the factors common to  $a$  and  $b$ , it is a common multiple of all these factors, and being itself one of these factors it must therefore be their *least* common multiple.

(d) It has been shown in (a) that the L.C.M. is a common measure of all the common multiples, and being itself one of them, it must therefore be their *greatest* common measure.

18. Let  $p, q, r, s, \&c.$ , be the  $n$  simple factors of the G.C.M. of  $a$  and  $b$ : then  $pq, qr, \&c., pqr, prs, \&c., pqrs, \&c.$ , are factors of  $a$  and  $b$ : hence all the factors of  $a$  and  $b$  will be found by taking the combinations of the  $n$  letters  $p, q, r, \&c.$ , one, two, three, &c., at

a time, and the number of these combinations is  $2^n - 1$ .

$$19. \text{ Let } \frac{ax^2 + bx + c}{1 + x^2} = m$$

$$\text{then } (a - m)x^2 + bx + c - m = 0$$

$$\therefore x = \frac{-b \pm \sqrt{b^2 - 4(a - m)(c - m)}}{2(a - m)}$$

Now, if  $x$  is real, the expression  $b^2 - 4(a - m)(c - m)$  must be positive in order that its square root may be extracted. The factors of this expression are

$$[a + c + \sqrt{a^2 + b^2 + c^2 - 2ac}] - 2m$$

$$\text{and, } 2m - [a + c - \sqrt{a^2 + b^2 + c^2 - 2ac}]$$

These must be both positive or both negative. If these factors were both negative,  $2m$  would be greater than the first term of the first factor and at the same time less than the second term of the second, which is manifestly impossible. But both factors may be positive since this requires  $2m$  to be *less* than the first and *greater* than the second, hence if  $x$  is real  $2m$  must lie in value between

$$a + c + \sqrt{a^2 + b^2 + c^2 - 2ac}$$

$$\text{and } a + c - \sqrt{a^2 + b^2 + c^2 - 2ac}$$

20. Let  $xyz$  be in order of magnitude,  $x$  being the greatest, and let  $x = z + m$ , and  $y = z + n$ , so that  $m, n$  are positive quantities. Then, on substituting for  $x$  and  $y$  the expression becomes  $a^2 m^2 + b^2 n^2 + (c^2 - a^2 - b^2) mn$ .

$$\text{Now } c^2 - a^2 - b^2 = c^2 - a^2 - b^2 - 2ab + 2ab =$$

$2ab + (c-a+b)(c+a-b) = a$  positive quantity, since any two of  $a, b, c$  are together greater than the third, also  $a^2, m^2, mn$  are positive; therefore the whole expression is positive,

$$21. (1+x)^n = 1 + nx + \frac{n(n-1)}{1.2}x^2 + \&c. + \frac{n(n-1)}{1.2}x^{n-2} + nx^{n-1} + x^n$$

$$(1-x)^{-3} = 1 + 3x + \frac{3 \cdot 4}{1.2}x^2 + \&c.$$

The coefficient of  $x^n$  in the products of these expressions is

$$1 + 3n + \frac{3 \cdot 4}{1.2} \frac{n(n-1)}{1.2} + \frac{4 \cdot 5}{1.2} \frac{n(n-1)(n-2)}{1.2 \cdot 3} + \&c.$$

$$\text{Also, } (1+x)^n (1-x)^{-3} = (1-x)^{-3} (2-1-x)^n \\ = (1-x)^{-3} \{ 2^n - n2^{n-1}(1-x) + \&c. \} \\ = 2^n (1-x)^{-3} - n2^{n-1}(1-x)^{-2} + \frac{n(n-1)}{1.2} \cdot 2^{n-2} (1-x)^{-1}$$

+ terms involving powers of  $(1-x)$  from 0 up to  $n-3$ , none of which can therefore contain  $x^n$ . Expanding the first three terms we have

$$2^n (1 + 3x + \frac{3 \cdot 4}{1.2}x^2 + \&c. + \frac{(n+1)(n+2)}{1.2}x^{n-1}) \\ - n2^{n-1} (1 + 2x + 3x^2 + \&c. + (n+1)x^{n-1}) \\ + \frac{n(n-1)}{1.2} 2^{n-2} (1 + x + x^2 + \&c. + x^{n-1})$$

whence the coefficient of  $x^n$  is =

$$2^n \frac{(n+1)(n+2)}{1.2} - n2^{n-1}(n+1) + \frac{n(n-1) \cdot 2^{n-2}}{1.2} \\ = 2^{n-3} (n^2 + 7n + 8) \therefore \&c.$$

22. The first saves one-third, that is one-fourth and one-twelfth of his salary, and the second saves one-fourth, so that the two together save one-fourth of the whole \$4,400, and one-twelfth of the first person's salary; hence this one-twelfth is the difference between \$1,310 and \$1,100; therefore the first person's salary is \$2,520.

23. Two less in the shilling's worth or one less in sixpence worth raises the price a penny a dozen, that is, one less in sixpence worth raises the price of each egg one-twelfth of a penny. Taking this as the unit of price, the price of sixpence worth will be denoted by 72. This number is formed by two factors,

one indicating the number of eggs in sixpence worth, and the other the number of units of price in the price of each egg, and these factors are such that if the first be diminished by unity and the second increased by unity, their product is still 72. The factors are therefore 9 and 8; that is, there are 9 eggs in sixpence worth, therefore they are 8 pence a doz. The result may be obtained also from the second factor, for the 8 indicates that the price of each egg is 8 twelfths of a penny, so that the price of a doz. is 8 pence.

24. The greatest possible value of  $59.9643 +$  is  $59.96439$  or  $59.9644$ ; similarly the greatest value of  $3962.8 +$  is  $3962.9$ , therefore the required distance cannot exceed the product of these numbers or  $237632.92076$ . The least values of these numbers are  $59.9643$  and  $3962.8$ ; their product is  $237626.52804$ . The difference between these products is  $6.39272$ , adding half this to the lesser product we obtain  $237629.7244$ , a result which therefore differs from the true distance by less than  $3.2$  miles.

The following solution is somewhat shorter: Since  $59.9643$  is true to four places of decimals, therefore all the decimals omitted (being in the 5th, 6th, &c., places), are together less than 1 in the 4th place, that is, are less than .0001; therefore the error caused by taking only four places of decimals in  $59.9643$  is less than .0001, and therefore the error in the product of the two numbers is less than  $3962.8 \times .0001$ , that is less than .39628. Again the error caused by taking  $3962.8$  (omitting the digits in the 2nd, 3rd, &c., decimal places), is less than .1, and therefore the error in the product, due to this omission, is less than  $59.9643 \times .1$ , that is, less than 5.99643; adding to these two errors the product of .0001 and .1 we have the total error in the product less than 6.39272. Adding half of this number to the product of the given numbers gives the same approximate result as before.

25.  $\frac{P}{Q} = \frac{R}{R}$

Let R be the point when A overtakes B; then since A goes the distance PR while B goes QR, A's rate is to B's as PR : QR, and therefore in going equal distances B's time : A's time as PR : QR. Now A takes 4 hrs. in

going from Q to R, therefore B must have taken  $\frac{PR}{QR}$  times 4 hrs. to go from Q to R, and consequently to go from P to R which is  $\frac{PR}{QR}$  times as far, B would require  $\frac{PR}{QR} \times \frac{PR}{QR} \times 4$  hrs. But it takes 9 hrs. for B to go from P to R,

$$\therefore \frac{PR}{QR} \times \frac{PR}{QR} \times 4 = 9$$

$\therefore QR$  is  $\frac{2}{3} PR$ , and  $PR$  and  $QR$  are together equal to 30 miles,  $\therefore PQ$  is 6 miles.

## PROBLEMS.

26. "From a given point, in the circumference of a given circle, to draw a straight line which shall touch the circle, by the help only of the *parallel ruler*."

27. To construct an equilateral triangle equal in area to a given triangle.

28. Sum the series

$$\frac{1}{1 \cdot 2} + \frac{1}{2 \cdot 3} + \dots + \frac{1}{n(n+1)}$$

29. Find the equation of the fourth degree of which one root is  $\frac{1}{2}\sqrt{3} + \sqrt{-1}$ .

30. (a) In reducing  $\frac{1}{19}$  to a decimal, we have

$$\begin{array}{r} 19 \overline{) 100} \quad .05 \\ \underline{95} \\ 5 \end{array}$$

Show how to find the required result without dividing any further by 19.

(b) Infer from this result the decimal corresponding to any other proper fraction having 19 for denominator.

31. Show that the equation

$$(b^2 - c^2)x^2 + (c^2 - a^2)y^2 + (a^2 - b^2)z^2 + 2c(b-a)xy + 2a(c-b)yz + 2b(a-c)zx = 0$$

is satisfied by the simultaneous conditions

$$\begin{cases} ax + by + cz = 0 \\ a + b + c = 0 \end{cases}$$

32. There are  $n$  persons possessing certain sums of money. The first of them gives to each of the others a sum equal to what each already has; then the second does the same; then the third, and so on to the  $n$ th. Show that any one of them—say the  $r$ th—will have gained or lost according as the sum he originally had is greater or less than

$$\frac{2^{n-r}}{2^n - 1} s$$

when  $s$  is the total sum held by all.

33. Show that the equation

$$\frac{2}{\sqrt{(x-a)}} + \frac{1}{\sqrt{(x-b)}} = \frac{1}{\sqrt{(x-c)}}$$

is reduced to a quadratic if

$$\frac{2}{\sqrt{a}} + \frac{1}{\sqrt{b}} = \frac{1}{\sqrt{c}}$$

34. A wine-merchant mixes two kinds of wine and sells the mixture so as to gain 8 per cent. on what the wine cost him. Had he sold each kind of wine at the same price per gallon as he sells the mixture, he would have gained 10 per cent. and 6 per cent. respectively on their cost price. In what proportion were the two kinds of wine mixed together?

## TRIGONOMETRY.

Toronto University, First Year, 1876.

1. State and prove the rule for finding the characteristic of the logarithms of whole numbers.

Given  $\log .25 = -.60206$  find how many digits there will be in the integral part of  $(2 \cdot 5)^{20}$ .

2. Prove  $\log(a^x) = x \log a$ ,  $\log \frac{a}{b} = \log a - \log b$ ,

Evaluate the following by using logarithms:

$$\sqrt[4]{80} \times \sqrt[3]{27} \cdot \sqrt[5]{-5} \times 18^{-\frac{1}{5}}$$

Find the tabular logarithms of  $\sin 45^\circ$ ,  $\tan 60^\circ$ ,  $\cos 30^\circ$ .

3. Show that the logarithms of the trigonometrical ratios need not be entered for angles greater than  $45^\circ$ ; take  $\sin A$ ,  $\tan A$  as examples, where  $A$  has any value from  $0$  to  $180^\circ$ .

If  $\sec 120 = \frac{a}{40}$ , can  $a$  be found by logarithms? Adapt  $\sin A - \tan \frac{1}{2} A$  to logarithmic computation.

4. Prove the following relations :

$$\sin^2 A = 1 - \cos^2 A$$

$$\tan^2 A = \sec^2 A - 1$$

$$\operatorname{cosec} A - \sin A = \cos A \cot A$$

$$\sqrt{\frac{1 + \sin A}{1 - \sin A}} = \sec A + \tan A.$$

5. A person standing on one bank of a river observes that an object on the opposite bank has an angle of elevation of  $45^\circ$ , and going back 150 feet, the corresponding angle is  $30^\circ$ . Find the breadth of the river.

6. A vertical stick whose height is 10 feet throws on a horizontal plane a shadow 7.74 ft. long. Find the sun's altitude.

Indicate how the problem would be solved if the shadow fell on a plane through the foot of the stick inclined at an angle  $\theta$  to the horizon, the line of intersection of the plane and horizon being perpendicular to the plane through the sun and stick.

7. Prove  $\cos(A+B) = \cos A \cos B - \sin A \sin B$ ,  $2 \sin^2 \frac{1}{2} A = 1 - \cos A$

$$(\cos A - \sin A)^2 = \cos 2A \tan(45^\circ - A).$$

$$\frac{\cos \theta + \cos 3\theta}{\sin \theta + \sin 3\theta} = \frac{1 - \tan \theta}{2 \tan \theta}.$$

8. In any triangle establish the following :

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c},$$

$$\cos \frac{1}{2} C = \sqrt{\frac{s(s-c)}{ab}},$$

$$2 \times \text{area} = bc \sin A = \frac{c^2}{\cot A + \cot B}.$$

9. In a triangle

$$B = 123^\circ 40', b = 100, c = 60, \text{ find } A, C.$$

$$A = 112^\circ 40', b = 213.4, c = 213.4 \text{ solve the triangle.}$$

$$A = 200, b = 77.4, C = 41^\circ 50', \text{ find the area,}$$

10. If  $(\sin \theta + \cos \theta)^2 = 3 \sin \theta + \sin 2\theta$ , find  $\theta$  in degrees, &c.

If  $1 + \sin \theta = 2 \cos \frac{1}{2} \theta (\cos \frac{1}{2} \theta - \sin \frac{1}{2} \theta)$ , find  $\theta$  in degrees, &c.

11. In any triangle show that  $2(1 - \sin C) = (\cos A - \sin B)^2$ .

No.	Log.
20000	30103
30000	47712
41645	61956
77400	88874
21340	32919
17761	24946
51623	71284

ANGLE.	LOG.
$\tan 52^\circ 15'$	10.11110
$\tan 52^\circ 16'$	10.11136
$\sin 56^\circ 20'$	9.92027
$\sin 29^\circ 57' 30''$	9.69842
$\sin 41^\circ 50'$	9.82410
$\sin 19^\circ 28'$	9.52278
$\sin 19^\circ 29'$	9.52314
$\tan 26^\circ 33'$	9.69868
$\tan 26^\circ 34'$	9.69900

SOLUTIONS.

1. Cherriman, § 4

$$\log .25 = - .60206 = \bar{1}.39794$$

$$\text{then } \log 2.5 = .39794$$

$$\text{and } \log (2.5)^2 = 7.9588$$

$\therefore$  the number of digits will be  $7+1$  or  $8$ .

2. Cher. § 5

$$\log (4 \sqrt[5]{80} \times 3 \sqrt[3]{2.7}) = \log 2 + \frac{1}{5} \log 5 + \log 3 - \frac{1}{3} \log 10$$

$$= .30103 + .17474 + 47712 - .33333$$

$$= .61956 \text{ which is the log of } 4.1645.$$

$$(5 \sqrt{-5} \times 18^{\frac{1}{5}}) = (-1)^{\frac{1}{5}} \times (1^{\frac{5}{8}})^{\frac{1}{5}}$$

$$\log (1^{\frac{5}{8}})^{\frac{1}{5}} = \frac{1}{5} \log 5 - \frac{1}{5} \log 2 - \frac{2}{5} \log 3$$

$$= \bar{1}.88874 = \log \text{ of } .774$$

$$\therefore 5 \sqrt{-5} \times 18^{\frac{1}{5}} = (-1)^{\frac{1}{5}} \times .774 = -.774.$$

$$\therefore \sin 45^\circ = 10 + \log \sin 45^\circ.$$

$$= 10 + \log \sqrt{2} = 9.84949.$$

$$L. \tan 60^\circ = 10 + \log \tan 60^\circ$$

$$= 10 + \log \sqrt{3} = 10.23856.$$

$$L. \cos 30^\circ = 10 + \log \cos 30^\circ$$

$$= 10 + \log \frac{\sqrt{3}}{2} = 9.93753.$$

3. Cher. § 23

$$\sin 120^\circ = \sin 60^\circ = \cos 30^\circ$$

also  $\cos 120^\circ = -\cos 60^\circ = -\sin 30^\circ$

$$\therefore \tan 120^\circ = -\frac{\sin 60^\circ}{\cos 60^\circ} = -\frac{\cos 30^\circ}{\sin 30^\circ}$$

$$a = 40 \sec 120^\circ$$

$$\therefore a = -40 \sec 60^\circ$$

$\therefore \log(-a) = \log 40 + L \sec 60 = 10$   
Neglecting the sign of  $a$  we may find its numerical value and then prefix the sign afterwards,

$$\log \left\{ \sin A - \tan \frac{1}{2} A \right\} = \log \left\{ \sin A - \frac{\sin \frac{1}{2} A}{\cos \frac{1}{2} A} \right\}$$

$$= \log \left\{ \frac{2 \sin \frac{1}{2} A \cos \frac{1}{2} A - \sin \frac{1}{2} A}{\cos \frac{1}{2} A} \right\}$$

$$= \log \left\{ \frac{\sin \frac{1}{2} A}{\cos \frac{1}{2} A} (2 \cos \frac{1}{2} A - 1) \right\}$$

$$= \log (\tan \frac{1}{2} A \cos A) = L \tan \frac{1}{2} A + L \cos A - 20.$$

4. Let  $BAC$  be any angle. From pt.  $B$  in  $AB$  let fall a perpendicular  $BC$  on  $AC$ . Then

$$\sin A = \frac{BC}{AB} \text{ and } \cos A = \frac{AC}{AB}$$

$$\therefore \sin^2 A + \cos^2 A = \frac{BC^2}{AB^2} + \frac{AC^2}{AB^2} = 1. \text{ Euc. I.}$$

47.

$$\text{Also } \tan A = \frac{BC}{AC} = \frac{BC}{AB} : \frac{AC}{AB} = \frac{\sin A}{\cos A}$$

$$\text{and } \sec A = \frac{AB}{AC} = 1 : \frac{AC}{AB} = \frac{1}{\cos A}$$

$$\therefore \tan^2 A = \frac{\sin^2 A}{\cos^2 A} \text{ and}$$

$$\sec^2 A - 1 = \frac{1 - \cos^2 A}{\cos^2 A} = \frac{\sin^2 A}{\cos^2 A}$$

$$\therefore \tan^2 A = \sec^2 A - 1.$$

$$\text{Also } \operatorname{cosec} A = \frac{AB}{BC} = 1 : \frac{BC}{AB} = \frac{1}{\sin A},$$

$$\cot A = \frac{AC}{BC} = 1 : \frac{BC}{AC} = \frac{1}{\tan A} = \frac{\cos A}{\sin A}.$$

$$\therefore \operatorname{cosec} A - \sin A = \frac{1}{\sin A} - \sin A = \frac{\cos^2 A}{\sin A},$$

$$\text{and } \cos A \cot A = \frac{\cos^2 A}{\sin A}$$

$$\therefore \operatorname{cosec} A - \sin A = \cos A \cot A.$$

$$\frac{1 + \sin A}{\sqrt{1 - \sin A}} = \frac{1 + \sin A}{\sqrt{1 - \sin^2 A}} = \frac{1 + \sin A}{\cos A},$$

$$\text{and } \sec A + \tan A = \frac{1}{\cos A} + \frac{\sin A}{\cos A} = \frac{1 + \sin A}{\cos A}$$

$$\therefore \sqrt{\frac{1 + \sin A}{1 - \sin A}} = \sec A + \tan A.$$

5. Let  $x$  = width of river in ft.

$$\tan 30^\circ = \frac{x}{x + 150}$$

$$\therefore x = \frac{150}{\sqrt{3} - 1}$$

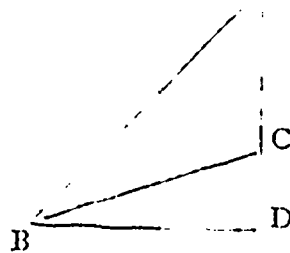
6. Let  $A$  = sun's attitude.

$$\tan A = \frac{10}{7.74}$$

$$\log \tan A = \log 10 - \log 7.74$$

$$= .11126$$

$$\therefore \text{angle is } 52^\circ 15' 37''$$



Produce  $AC$  to  $D$ .  $ADB$  is a rt. angle; side,  $BC$  and angle  $CBD$  are known;  $\therefore$  sides  $BD$  and  $CD$  may be found, and since the triangle is rt. angled and the sides  $AD$  and  $BD$  are known, the angle at  $B$  may be found.

7. Cher. § 37.

In previous formula put  $\frac{1}{2} A$  for  $A$ , and  $\frac{1}{2} A$  for  $B$ , and we get

$$\cos A = \cos^2 \frac{1}{2} A - \sin^2 \frac{1}{2} A = 1 - 2 \sin^2 \frac{1}{2} A$$

$$\therefore 2 \sin^2 \frac{1}{2} A = 1 - \cos A.$$

$$\begin{aligned}
 (\cos A - \sin A)^2 &= (\cos^2 A - \sin^2 A) \frac{1 - \tan A}{1 + \tan A} \\
 &= (\cos^2 A - \sin^2 A) \frac{\cos A - \sin A}{\cos A + \sin A} \\
 &= (\cos A - \sin A)^2 \\
 \frac{\cos \theta + \cos 3\theta}{\sin \theta + \sin 3\theta} &= \frac{2 \cos 2\theta \cos 2\theta}{2 \sin 2\theta \cos 2\theta} = \frac{\cos 2\theta}{\sin 2\theta} \\
 &= \frac{\cos^2 \theta - \sin^2 \theta}{2 \sin \theta \cos \theta} = \frac{1 - \tan^2 \theta}{2 \tan \theta}
 \end{aligned}$$

8. Cher. § 34. § 41. § 48.

$$\begin{aligned}
 \frac{\sin B}{b} &= \frac{\sin(A+B)}{c}, \therefore b = \frac{c \sin B}{\sin(A+B)} \\
 \therefore b c \sin A &= \frac{c^2 \sin A \sin B}{\sin(A+B)} = \frac{c^2}{\cot A + \cot B}
 \end{aligned}$$

9.  $\frac{\sin C}{\sin B} = \frac{c}{b}$

$$\begin{aligned}
 \therefore L \sin C &= L \sin B + \log c - \log b \\
 &= 9.69842 \\
 \therefore C &= 29^\circ 57' 30'', \\
 A &= 180^\circ - B - C = 26^\circ 22' 30''.
 \end{aligned}$$

The triangle is isosceles. Let  $D$  be the foot of a perp'r let fall on the opposite side from  $A$ .

$$\begin{aligned}
 \text{Then } \log BD &= \log AB + L \sin A - 10 \\
 &= 2.24946 \\
 \therefore 2 BD &= 355.22 = a, \\
 \therefore B = \angle C &= \frac{1}{2} (180^\circ - 112^\circ 40') = 33^\circ 40' \\
 \text{area} &= \frac{1}{2} a b \sin C \\
 \therefore \log \text{area} &= \log 100 + \log 77.4 + L \sin 41^\circ \\
 &= 3.71284 \\
 \therefore \text{area} &= 5162.3
 \end{aligned}$$

10.  $(\sin \theta + \cos \theta)^2 = 3 \sin \theta + \sin 2\theta$

$$\begin{aligned}
 &= 3 \sin \theta + 2 \sin \theta \cos \theta \\
 &= 3 \sin \theta \\
 \sin \theta &= \frac{1}{3} \\
 L \sin \theta &= 10 - \log 3 = 9.52288 \\
 \therefore \theta &= 19^\circ 28' 17''
 \end{aligned}$$

$$\begin{aligned}
 1 + \sin \theta &= 2 \cos^2 \frac{1}{2} \theta - 2 \sin \frac{1}{2} \theta \cos \frac{1}{2} \theta \\
 1 + 2 \sin \theta &= 2 \cos^2 \frac{1}{2} \theta - 1 + \cos \theta
 \end{aligned}$$

$$\tan \theta = \frac{1}{2}$$

$$\begin{aligned}
 L \tan \theta &= 10 - \log 2 = 9.69897 \\
 \therefore \text{angle} &= 26^\circ 33' 54''
 \end{aligned}$$

11.  $2(1 - \sin C) = (\cos A - \sin B)^2$

$$\begin{aligned}
 2 \sin C + \cos^2 A - 2 \cos A \sin B + \sin^2 B &= 2 \\
 2 \sin(A+B) + \cos^2 A - 2 \cos A \sin B + \sin^2 B &= 2 \\
 2 \sin A \cos B + \cos^2 A + \sin^2 B - 2 &= 2 \\
 2 \sin A \cos B + 1 - \sin^2 A + 1 - \cos^2 B &= 2 \\
 (\sin A - \cos B)^2 &= 0.
 \end{aligned}$$

PROBLEMS SOLVED.

1. A person has a certain amount of bank stock which he sells at  $110\frac{1}{8}\%$ , and invests the proceeds in 5 per cents. at  $79\frac{3}{4}\%$ . When this has risen  $5\frac{1}{4}$  per cent. he purchases the same amount of the original stock as he held at first at  $109\frac{3}{4}\%$ , which now pays 8 per cent., and finds that while \$110 remain in cash his income has fallen \$8. Find the percentage originally paid by the bank stock, allowing  $\frac{1}{8}\%$  per cent. brokerage on each transaction?

On taking the brokerage into consideration it will be seen that he pays 80 for the 5 per cents and receives 85 for them, and therefore gains 5 on every 80 or one-sixteenth. He gains \$110 or one share of the original stock, therefore he must at first have held 16 shares of this stock; and since his income has fallen \$8, the dividend must be 50 cents a share less than before; hence  $8\frac{1}{2}\%$  was the percentage originally paid.

2. Every prime number when divided by 6 will leave a remainder of either 1 or 5.

If any number is divided by 6 there will be either no remainder or else one of the numbers 1, 2, 3, 4, 5. Therefore all numbers are included in the expressions  $6n, 6n+1, 6n+2, 6n+3, 6n+4, 6n+5$ . Of these the first, third and fifth are divisible by 2, and the fourth by 3, leaving  $6n+1$ , and  $6n+5$  as the only possible prime numbers, therefore, etc.



## THE ORIGIN OF LANGUAGE.

(Essay read by Mr. D. E. Sheppard, before Senior Literary Society, Hamilton Coll. Inst.)

IN regard to the origin of language, three different opinions prevail:—

First, that it is a natural gift;

Second, that it is an invention of man, the same as the arts and sciences; and

Third, that it is a direct gift from God.

Those philologists who are of the opinion that language is a natural gift, regard it as an innate and essential part of our nature, as is exemplified by the infant whose smile on the mother, at the first dawn of intelligence, seems a response to the tones of her maternal encouragements.

Those who think language a human institution believe with the ancient philosophers and poets that men were originally a dumb and low herd, that they were in all things rude and savage, totally ignorant of the arts, unable to communicate with each other except in the imperfect manner of beasts, and sensible of nothing save hunger, pain, and other similar emotions. Cicero, in alluding to the human race in primeval ages, says:—"There was a time when men wandered everywhere through the woods after the manner of beasts, and supplied life by eating the food of beasts." Pliny, Horace, Juvenal, and other ancient writers agree with Cicero in this opinion, and hold that it was only after a long and gradual improvement that men came to their present enlightened state. Other writers labor to prove that man is but a higher species of monkey, and think that originally the human race had only a few monosyllables, such as 'ha,' 'he,' 'high,' 'ho,' by which, like beasts, they expressed certain emotions.

Dr. Murray gives it as his opinion that all language originated in nine monosyllables, viz. :—'ag,' 'bag,' 'dwag,' 'gwag,' 'lag,' 'mag,' 'nag,' 'rag,' 'swag.' Each of these, he says, is a verb, and indicates a species of action. Power, motion, force, ideas associated in every untutored mind, are implied in them all. They were uttered at first in an insulated manner, and probably continued to be so used for several generations. The circumstances of the action were communicated by gestures, and the variable tones of the voice; but actions themselves were expressed by their suitable monosyllables.

Some modern philologists think that the sounds of nature first suggested language to man, and hold a theory of language, which they denominate the "Imitative System," and which may be compared to that theory of music by which music is derived from the cataract in the mountains, the wind in the trees, or the sound of the ocean on the shore. It appears, however, that there is nothing in inward or outward experience to justify such a theory. As there are sounds in nature that may give an occasional suggestion to the musician, but none that can be acknowledged either as his model to work by or as the original source of his art, so it is with speech. Music and language alike must come from within, from the greatest depths of our nature.

From a careful examination of the several theories advanced by writers on generative philology, we are led to the conclusion that the faculties of man, as far as their agency in regard to language is concerned, were simply used to *cultivate*, rather than *invent* language,

that these theories of the ancient philosophers are absurdities, and that beyond doubt language is a divine institution, invented by the Deity, and by Him made known to the human race. If language was devised by man, the invention could not have been at once matured, but must have been the result of the necessities and experience of successive generations. This, however, does not accord with the facts of history; for, however far we go back, we cannot arrive at any period at which even the most unenlightened portions of mankind did not possess a system of language. Scripture informs us that this means of communication was employed by the first man and woman, as well as their immediate descendants, and philologers are hence forced to the conclusion that language is the result of a direct revelation from on high.

And, while the elements were thus imparted by God, it is natural to suppose that much was left for man to perfect, and that, just as a mind is given to him which he is required to cultivate and fit for the performance of its duties by a long course of training, so the mere elements were imparted out of which he had to form, by successive improvements, a perfect means of communication.

Now, "three things," says a celebrated writer, "have contributed to enable man to perfect language; necessity, practice and a desire to please. Necessity produced a collection of words very imperfectly connected; practice, in multiplying them, gave them more expression; while it is to the desire of pleasing that we owe those agreeable turns, those happy collocations of words which impart to phrases both elegance and grace." We are confirmed in this supposition by the fact that the history of language shows a gradual progress from imperfect beginnings to a finished state, and that there is no cultivated tongue, which, if traced back to its earliest

stages, will not be found either defective in many of its parts, or wanting in those happy characteristics which are a source of beauty and strength. The language of any nation, traced through the successive eras of its existence, will be found to have undergone a series of improvements in all respects analagous to the advances which have been made in the institutions and social conditions of those by whom it is spoken. Again, the more rude and uncivilized a people is, the fewer the words of its vocabulary, and the more imperfect its dialect. Thus, nearly all the words of a dialect of some one of the Indian tribes of North America might be written out on a single sheet of paper. Since the arts and sciences and the fruits of these, and nearly all the varied and innumerable emotions of civilized beings are unknown to them, they have no necessity for words to express such ideas, and it follows, of course, that these terms are not found in their medium for the interchange of ideas.

From year to year, as civilization advances, words are added to language as they are needed, and the language of a nation advances hand in hand with that nation's social and scientific improvements; and such words as 'telegraph,' 'velocipede' and 'telephone,' show us how words are continually coined from original roots as necessity requires them, and added to our language as necessary embellishments. Holding, then, to the idea that language is not man's invention, but that its first principles were bestowed upon him by God, and that by divine assistance these first principles were improved upon by man, and that language was thus gradually perfected, let us consider man in his ruder state, and endeavor to ascertain how he was instigated, and by what means he was able to fabricate this perfected means of communication, the richest gift of God to the human race. Men, no doubt, in their barbarous

state, communicated many ideas by means of signs and gestures, and it is reasonable to suppose that the first words were mere exclamations; for it would be natural for men, however savage, or ignorant of the use of words, to employ exclamations for the purpose of expressing their sudden emotions. Probably words were next used to convey a complete idea or sentence. Individual objects would next engage attention. The savage, no doubt, in his rude and uncivilized state, lived in the midst of the primeval forest: inasmuch as he derived his means of subsistence partly from certain trees it contained, he was soon compelled in his intercourse with others to allude to those trees, and represent them by some name, or, as we say, noun. The frequent repetition of the nouns in time became disagreeable to the ear, and substitutes for them were employed. Hence we see the origin of pronouns. Many of the pronouns, particularly those of the third person, were first used as mere demonstratives. This consideration would lead us to the conclusion that pronouns originated when natural language afforded the chief means of communication.

Before all visible objects of creation were distinguished by general appellations in the manner we have indicated, it must have been necessary for men to allude to a specific object in contradistinction to the rest of the class. Consequently, the distinctive qualities or relations of that object to its class had to be represented as "the large tree," "the tree by the water," and so on. In this way, probably, were formed adjectives and prepositions to indicate the relations subsisting between nouns and other words.

By observing his fellows, animals, and the natural objects around him, man found it necessary to indicate their actions and the qualities inherent in them. Hence we see the origin of

verbs: adverbs were employed to indicate the time, place, or manner of the act, or the degree of the quality; and prolonged discourse necessitated the use of conjunctions to connect the different assertions. For the origin of our interjections, of course we must look back to natural language.

The similarity of original elements and inflections in the different languages show us that all of these sprang from the same fundamental roots which probably originated in the manner we have described, and which, it seems, constituted the primitive language when the population of the world was comparatively small, and confined within such narrow limits as afforded men an uninterrupted opportunity of communicating their ideas among one another. As from age to age this population increased, and men spread themselves over the world and became separated by physical and other barriers, as new ideas and emotions were generated in their minds for which they desired means of communication, new words were formed on the basis of the original stock, different methods of pronunciation and accentuation were adopted, each section of the community adding to its own store, and the thousand and one languages spoken at the present day were thus built up, all being stems and branches of the same common stalk.

We may appropriately close this theme in these vague and enquiring words of the poet:—

"Ye wandering utterances, has earth no  
scheme,  
No scale of moral music, to unite  
Powers that survive but in the faintest  
dream  
Of memory? O! that ye might stoop to  
bear  
Chains, such precious chains of sight  
As labored minstrelsies through ages  
wear!  
O! for a balance fit the truth to tell  
Of the unsubstantial, pondered well."

## TASTE.

*A Class Essay by J. N———t, VI. Form (Hamilton Coll. Inst.)*

**T**ASTE is that faculty of the human mind which assists us to perceive and enjoy whatever is beautiful in nature or art.

Whenever we perceive anything beautiful in objects, the perception is attended with a pleasure differing from all others. It is therefore appropriate in this investigation to assign a particular name to this emotion of the mind. Let us call it the emotion of Taste, and in consequence of the source of this pleasure being binary, we have emotions of sublimity and of beauty.

In the scientific investigation of causes, it is desirable that we have a thorough acquaintance with the effects produced; so in the discussion of Taste, it will be advisable to consider in the first place, the effect upon the mind when the emotions of sublimity or beauty are experienced. When we are brought in contact with one of Krupp's eighty ton guns with its ponderous missile lying at its side, we are first impressed with its immense size, and immediately after, a train of thought is awakened in our imaginations; so in the examination of a beautiful plant a similar operation of the mind is performed analagous to the character of the little object of nature; the raging sea, the placid lake, the huge conflagration, the tide of prosperity, create opposing trains of thought in the imagination.

The effect of the different arts of Taste is similar. When we examine a beautiful painting, listen to a choice composition in music, or read some celebrated poem, we experience but a feeble emotion of pleasure if we con-

sider only the qualities which it presents to our senses; but if, on the other hand, we allow our imagination to perform its natural function, we are infinitely delighted by the variety of images which loom up before us.

These illustrations serve to show that the effects on the mind of these qualities of sublimity or beauty are two-fold in their nature, viz., a simple emotion of the mind, and a peculiar exercise of the imagination. The union of these give rise to what may be called the complex emotion of sublimity or beauty, and a little consideration will make it obvious, that there can be a simple emotion, without the exercise of the imagination, but we cannot experience the complex emotion without it.

Should the imagination be inactive from some cause or other, this complex emotion will not be experienced, as is evidenced by the great pleasure which some derive from a joke or witty saying, while their less imaginative companions can perceive no cause for merriment; by our own experience in reading, which, at times, we find a dull, heavy task, at others, our imaginations are so influenced by the suggestions of the author, that we are often induced to credit him with power it may be, that he never possessed. This inactivity in the imagination often presupposes a season of care, grief, business or other attraction which destroys the susceptibility to pleasure from the Fine Arts.

Thus we perceive that when the imagination is resisted, the emotion of Taste is diminished, and hence we are able to compare the pleasurable effects

produced by the critical reading of a poem, and the uninterrupted perusal of it. In the former our imagination is restricted when we pause to consider whether or not the poem conforms with certain principles established by usage and employed by critics, and the feeling of pleasure produced is in consequence feeble; in the latter we allow our imaginations to follow and keep pace with those of the author and find that the emotion of Taste or pleasure is proportionate to the degree of taste exercised by the poet. Now, as poetry stands at the head of the list of literary compositions in its power of producing pleasure, and as it is through the unarrested imagination that we derive pleasure from poetry, as a Fine Art, it will be in order, to consider what the poet must necessarily attend to, if he desire so to act upon the minds of his readers. Perhaps, the first difficulty which a poet is likely to encounter, is the choice of a proper subject. He has a vast field in which to operate, the whole history of nature is within his reach, the varying appearances which its different productions assume in the progress of their growth and decay, and the powerful effects which are produced by the contrast of these different aspects or expressions. All the sublimity and beauty of the moral and intellectual world are at his disposal. The present, past and future, furnish abundant materials. Having chosen his subject, and arranged the necessary materials, he must next consider how he can best arouse and lead the imagination throughout the whole construction. He must, in fact, have recourse to some or all of the following expedients: the personification of inanimate objects, by which he can produce at once an expression which every capacity may understand, and every heart may feel; the language of associated effects, compared with which no language can excite the imagination to a greater extent. As a remote example

of which we have the effect of national tunes upon different nations. It is not the execution of the music that produces this effect but the association, it may be, with fame, conquest or military glory; the language employed should be familiar; he must not dilate upon some scientific theory or repair to the regions of antiquity if he expects his poem to be enjoyed by the masses; unity of character must be preserved throughout the whole poem, that is, he must have for his aim the creation of some especial emotion, and then his language and sentiments, must all tend to converge to the single purpose of creating a train of imagery, that will be consistent in every particular with the single object he has in view; his pictures must have at least the semblance of truth, except, perhaps, in Fairy tales and Romances of chivalry; his punishments and rewards must be consistent with the characters employed; he must touch the springs of affection, awaken the admiration, court the sympathy, arouse the hatred, contemplate the mighty or ridicule the insignificant, according to the emotion which he seeks to arouse.

Should the poet judiciously employ those principles in his productions he will invariably succeed in arousing a feeling of pleasure in the minds of the majority of his readers; I say the majority, for all minds are not susceptible of pleasure in the same degree. The antiquarian, for instance, experiences little pleasure in literature, unless it tends to direct his imagination to the contemplation of the regions and relics of antiquity; the philosopher when brought in contact with beautiful scenery instantly sets to work to ascertain the cause of the beauty, hence it becomes a labor instead of a pleasure for him to contemplate the productions of fine art; likewise the business man experiences but little pleasure in the perusal of works of art, either because his imagination has

become inactive, or his mind from habit reverts to the consideration of their pecuniary worth. Similar anomalies distinguish other classes of people, and thus we stand face to face with the conclusion, and well-known fact, that we all have our heroes in literature, as well as in politics or war.

## ENGLISH GRAMMAR, SECOND CLASS, 15TH DECEMBER, 1873.

(Answered by Mary Summers, Intermediate Form.)

"*Strange as it may seem to find* a song-writer put forward *as* an active instrument of union among his fellow-Hellens, it is not *the* less true that those poets whom we have briefly passed in review, *by enriching* the common language and by circulating from town to town either in person or in their compositions, *contributed to fan* the flame of Pan-Hellenic patriotism at a time *when there were few circumstances to co-operate* with them, and when the causes tending to perpetuate isolation seemed in the ascendant."

1. Give the full syntactical parsing of the nineteen italicized words.

ANSWER.

"*Strange*," a predicate adjective qualifying subject *it*.

"*As*," a conjunctive adverb, modifying *may seem*, and connecting principal sentence, "it is not the less true," and subordinate sentence "strange as it may seem."

"*To find*," a verb, strong, active, transitive, infinitive, nominative, forming real subject of verb, *may seem*.

"*As*," a conjunctive adverb, modifying "*is put*" understood in elliptical sentence, and connecting sentences "it may seem strange to find," and "an active instrument (*is put forward*)."

"*Instrument*," a noun, common, neuter, third, singular, nominative subject of (*is put*).

"*The*," an adverb, modifying *less*.

"*By*," a preposition showing relation between *contributed* and *enriching*.

"*Enriching*," a verbal noun, active, third, singular, objective, governed by preposition *by*.

"*Language*," a noun, common, neuter, third, singular, object of *enriching*.

"*And*," a conjunction, co-ordinate, connecting clauses "by enriching the common language," and "by circulating from time to time."

"*Contributed*," a verb, weak, active, transitive, past, indicative, third, plural, agreeing with subject *poets*.

"*To fan*," a verb, weak, active, transitive infinitive, object of verb *contributed*.

"*When*," a conjunctive adverb, modifying *were* and connecting sentences, "those poets contributed to fan, etc.," and "there were few circumstances, etc."

"*There*," an expletive adverb, modifying *were*.

"*Were*," a verb of incomplete predication, weak intransitive, past indicative, third, plural, agreeing with subject *circumstances*.

"*Few*," an adjective, quantitative, qualifying *circumstances*.

"*Circumstances*," noun, common, neuter, third, plural, nominative, subject of verb *were*.

"*To co-operate*," a verb, weak, active, intransitive, infinitive, adjunct of *circumstances*.

2. Parse the italicized words in the following quotations :—

"In spite *of* such a man as Gibbon's opposition."

"They are not the same *that* they have been."

"They are very *much* in the style of Milton's sonnets."

"That is the way *that* boys begin."

ANSWER.

"*Of*," a preposition, showing relation between spite and opposition.

"*That*," a relative pronoun, the predicate nominative after *have been*.

"*Much*," an adverb, modifying the predicate "are in the style, etc."

"*That*," a relative pronoun, an adverbial objective, modifying *begin*. Though used colloquially, it is not good English. We should supply "*in*" after *begin*, or use "*in which*."

3. Correct, giving reasons or defend modes of expression employed in the following quotations :—

(a) "Give us the secrets of his pagan hell,

Where ghost with ghost in sad communion dwell."

(b) "Thou lovest but never knew loves sad satiety."

(c) "One sort of feels impressed with the vastness of the building, though disgusted with the childishness of the ceremonies."

(d) "A fool's wrath is heavier than them both."

(e) "Good order and not mean savings produce great profit."

(f) "The Chief Magistrate is styled a President."

ANSWER.

(a) When the subject is compounded with another word by means of the preposition *with*, the verb agrees with the word in the nominative only, hence "dwell" should be singular.

(b) The subject of the verb *knew* is the pronoun *thou*, which is the second person, singular form, therefore the

verb should be *knewest* to agree with subject.

(c) "One sort of feels impressed" cannot but be considered as grossly ungrammatical. The use of "sort of" a partitive, and hence an adjectival phrase, to qualify a verb is very inelegant. In correction, we might say: "One has a sort of feeling," or "feels in a measure."

(d) Omit them or use they: than cannot govern the objective.

(e) When a compounded subject consists of an affirmative and a negative, the verb agrees with the affirmative. The sentence corrected stands "Good order and not mean savings produces great profit."

(f) Should be, "The Chief Magistrate is styled President," as no article is required, the word is used generally.

4. Write plural of *two*, *hidalgo no*, *chimney*, *colloquy*, *Livy*, *vinculum*, *3*, *w*, *appendix*, *Lord Gordon*, *court-martial*.

ANSWER.

Twos, hidalgos, noes, chimneys, colloquies, Livys, vincula, 3's, w's, appendices or appendixes, Lord Gordons or Lords Gordon, courts-martial.

5. Give the abstract nouns of the same derivation as, *brief*, *true*, *common*, *needy*, *poor*.

ANSWER.

Brevity, truth, commonness or commonage, need, poverty.

6. Give examples of the different uses of—

(a) Words ending in *ing*.

(b) But.

ANSWER.

(a) The imperfect participle as: The *deserving* poor.

Abstract, nouns, expressing action as I like *reading*.

The gerund, as I like *reading* history. It is used to denote diminution, as, *farthing*.

It is used to denote being, as, *evening*, *morning*.

(b) *But* is used as a relative, as

“There was no one *but* saw him.”

*But* is used as a conjunction, as :

“He was poor *but* proud.”

*But* is used as a preposition, as :

“All fled *but* John.”

*But* is used as an adverb, as : “Give *but* one word.”

7. What are the Latin and Greek prefixes, meaning *from, beyond, without*.

ANSWER.

*From* (Latin) a, ab or abs, de, se, (Greek) apo, aph.

*Beyond* (Latin) extra, trans, tra, tres, tra, ultra.

(Greek) hyper.

*Without* (Latin) sine, (Greek) a or an.

8. Make lists of the prefixes and affixes occurring in the extract for parsing and classify them according to (a) meaning, (b) derivation.

*Prefixes.*

(S)trange=ex=out of.

(a) for=forward.

re= back or again.

en= to make.

con }  
com } =together.  
co }  
circum=around.  
per=thoroughly.  
a=ad = to.  
pan=all.

*Affixes.*

er denotes person who acts.

ive “ can do.

ment “ thing which is

ion } “ thing done.

age }

um “ practice or doctrine.

ance “ state or condition.

ate “ make.

ant “ person who acts.

ly “ likeness

(b) *Prefixes.*

*Saxon.*

for, en.

*Classic.*

con, com, co, cir-  
cum, ad.

*Affixes.*

*Saxon.*

er, ly.

*Classic.*

per, ive, ment, ion,  
age, ism, ate, ant.

## ENGLISH ROYAL HOUSES.

### HEREDITARY AND PARLIAMENTARY TITLES.

*By W. R. Bigg, Inspector of Schools.*

Should the Prince of Wales survive his mother, would he, on her decease, ascend the throne as the first English monarch of the House of Saxe-Cobourg-Gotha. or be ranked as of the House of Brunswick? Again, we might enquire in either event will he be called Albert I. or Edward VII.?

In the first case, if all the precedents in English History be followed, he will be classified as a Saxe-Cobourg, and, as regards the second case, while the general precedents are in favor of Albert. yet, if the exceptional precedent

of his mother's be followed, he will be called after his second name, Edward.

On the demise of Henry I. without male issue, the crown devolved on Matilda, and although she was of the House of Normandy and for a short time Queen regnant, yet her son, who eventually succeeded the usurper Stephen, ascended the throne as of the House of Plantagenet. So also with regard to Stephen himself; he was ranked as of the House of Blois, from his father's title, though his claim to the throne was through his mother



Adela, of the House of Normandy.

The next precedent is the ascension of Henry, Earl of Richmond, from whom we have the House of Tudor. He was the son of Margaret, of Beaufort, and Edmund Tudor, Earl of Richmond, yet he was called after his father's House, though his pretended claim to Regal honors was derived from his mother's Lancastrian descent.

Similarly James I. took his standing as a Stuart, his title to the English Crown being derived from his great grandmother Margaret, the eldest daughter of Henry VII. The House of Stuart originated with Robert, the son of Walter, the Steward of Scotland, and of Marjory, daughter of King Robert Bruce.

The last precedent is the accession of the House of Brunswick in the person of George I., who was called after his father's House, though his inheritance came to him through his mother Sophia, grand-daughter of James I.

There is not a single precedent to be found in English history where the son of the heiress to the Crown, or of the Queen regnant, was, upon his accession, called after his mother's House.

No settled rule, however, seems to have prevailed whenever the direct male line was passed over. Thus William II. and Henry I were in rotation, both usurpers, the direct male heir, on the demise of their father, being his eldest son Robert. Yet each succeeded in order as of the House of Normandy, as they undoubtedly were.

The same precedent was followed on the usurpation of John, to the prejudice of Prince Arthur, the son of his elder brother Geoffrey. The House of Plantagenet was still continued.

But, on the usurpation of Henry IV, who was as purely Plantagenet as Richard II, a different ruling occurred, and we are introduced to the House of

Lancaster. Probably it was simply to prevent confusion that the descendants of the third and fourth sons of Edward III. were not called Plantagenets, which they really were, but were distinguished as Lancastrians and Yorkists, as, in the subsequent struggles of the Roses, it became equally necessary that though each might wear the same generic emblem, yet the White Rose should be typical of the House of York, and the Red that of Lancaster.

The Hereditary Title to the throne was governed by the laws of primogeniture, and accordingly was vested in the Monarch's eldest son and his heirs, and in default of issue to them, to the next elder son and his heirs, and in the event of failure of male issue, then to the eldest daughter and her heirs, males in all cases having the preferable claim, irrespective of age.

Although in early and troublous times this rule was occasionally violated, yet such exceptions were rare, and in two instances ended in the eventual resumption of their rights by the descendants of the legal heirs, notably in the instances of Henry II and Edward IV.

Hence the preferable claim of Richard, Duke of York, rested not on his descent from Edmund, Duke of York, the fourth son of Edward III, but on his descent from Lionel, Duke of Clarence, the second son, through his mother, Ann Mortimer, who intermarried with the Earl of Cambridge, second son of Edmund, Duke of York; her grandson, Edward IV, finally succeeding in placing the House of York on the throne and terminating the Lancastrian usurpation.

The claim of the House of Tudor was defective in every way. In the first place, whatever title Henry VII. had was derived from his mother, Margaret Beaufort, but as she was alive, his accession to the throne during her life was an act of usurpation. But his mother had no legal claim, she

being the lineal descendant of the illegitimate issue of John of Gaunt and Catherine Swynford. It is true that a parliament, at the request of Richard II., who was desirous of conciliating his uncle, had passed an act legitimating this issue, but such a statute was *ultra vires*, and opposed to common sense; in fact, a living lie. But, worse still, the line of John of Gaunt had no claim to the throne while any descendants survived of Lionel, Duke of Clarence, the elder brother of John of Gaunt, and there were such descendants, as, Elizabeth of York. The only escape from the dilemma is the unpalatable truth that the right of Henry VII, like William, Duke of Normandy's, was by conquest, subsequently strengthened by marrying the White Rose of York, and by a parliamentary confirmation. To his son Henry VIII.'s title there can be no objection, as in it was concentrated every claim that could be derived either from hereditary descent or from parliamentary confirmation. His only legitimate child was Mary, unless, indeed, we allow that parliaments can grant divorces without just cause, and declare lawful heirs illegitimate and bastards legitimate; and one of Henry's parliaments did this, while another one, equally as servile, enabled him to bequeath his throne to his immediate successors seriatim, and to further devise, that upon failure of issue to them, it should devolve on the House of

Suffolk, descended from his younger sister Mary, postponing, if not excluding, the House of Stuart, descended from his elder sister Margaret. Yet, the parliamentary title of the House of Suffolk proved subsequently of no avail, as the Stuart line succeeded the Tudor.

But a parliamentary title since the 18th century is a very different affair, as the law of the Commons must be regarded as the will of the people, the English form of government being now practically a Monarchical Republic.

After the glorious revolution, a really free parliament in 1700 decided by the "Act of Settlement" that on the demise of William III. and the Princess Ann, and failure of issue, the right should be in the Princess Sophia, grand-daughter of James I., and her heirs being protestants, all prior claims of inheritance being set aside and annulled. By virtue of this enactment, the House of Brunswick at present occupies the throne, having no claim by the Primogenitory laws, inasmuch as the descendants of Henrietta, daughter of Charles I., and several of the Palatine family stand before it. Queen Victoria, however, will probably be the last English Monarch of the House, as her eldest son or his heirs should, on her demise, succeed in establishing the House of Saxe-Cobourg-Gotha, unless all precedents be set at nought.

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## FIRST-CLASS WORK.

### QUESTIONS ON ADDISON.

1. Give an account of the life and writings of Addison and Steele.

2. State what you know about Addison's style (including vocabulary, sentences, simplicity, strength, etc.), his humour (stating its nature and

force), his satire (its nature and objects), his sentiments (their nature, depth and *truth*), and his aims.

3. Give an account of the originator of the *Spectator* and of some of the contemporary writers.

4. Account for and discuss the state of poetry of the time of Addison.

5. What relation does the *Spectator* bear to the novel.

6. Give a sketch of periodical literature.

7. Compare the social and political position of poets of Addison's time with that of the present day.

8. Compare Addison, Swift and Pope as satirists and poets.

9. Compare Addison and Johnson as poets, prose writers, novelists, politicians, scholars, as depictees of character, as periodical writers, and as to the patronage they received.

10. Give some account of the characters in the *Spectator* in which Addison

satirizes primogeniture in English families; (2) the man of the city; (3) the tory squire; (4) the belief in witchcraft.

11. Give the substance of Addison's remarks on party spirit, animal instinct (121), exercise (115.)

12. Give a synopsis of the story of Eudoxus and Leontine. In what connection did Addison give it?

13. "Simplicity is always a merit of Addison." Explain.

14. "He thinks justly, but he thinks faintly." — *Johnson*. Discuss this statement.

(Answers to these Questions will appear in the May Number.)

## PUBLIC SCHOOL DEPARTMENT.

### PROMOTION EXAMINATIONS.

In our January number we gave examination papers for promotion from the first three classes of the Public School Course; and, in the March number, the papers for promotion from the fourth to the fifth, namely, the papers for examination for entrance to Collegiate Institutes and High Schools. Below is given a second set of papers for promotion from the first three classes, that teachers may test the progress of their pupils in these classes.

#### READING.

*1st Class to Second.*—Read from page 40 First Book, part second, the 14 lines beginning—"Did you ever," &c.

*2nd Class to Third.*—Read from page 60 Second Reader, the 14 lines beginning—"Here's a pretty fellow," &c.

*3rd Class to Fourth.*—Read from page 168 Third Reader, the 14 lines beginning—"Is it a gilly-flower?"

Value 30 marks, namely, 5 for natural tone of voice, 5 for articulation and emphasis, 5 for ease and fluency; from the remaining 15 marks deduct 2 for each omitted, inserted or mis-called word.

#### WRITING.

*1st Class to Second.*—Write on slates, (1) all the capitals, (2) all the small letters, (3) the 10 digits.

*2nd Class to Third.*—Write on paper, (1) all the capitals, (2) five lines of the digits, (3) your name and the date in full.

*3rd Class to Fourth.*—Write on paper, (1) all the capitals and the 10 digits, (2) six lines of the copy: "Socrates was a distinguished Greek philosopher," (3) the address on the outside of a letter to go to your friend in Toronto.

Value 20 marks, 5 for each of the three parts and 5 for general neatness and display.

## DICTATION.

*1st Class to Second.*—Spell on slates to dictation the 4 lines on page 34 in the 1st Reader, part 2nd, beginning—“This fine ship,” &c.

*2nd Class to Third.*—Spell on paper to dictation the 6 lines on page 112 in the 2nd Reader, beginning—“Little Lucy was,” &c.

*3rd Class to Fourth.*—Spell on paper to dictation the 10 lines on page 145 in the 3rd Reader, beginning—“One of the men who had a gun,” &c.

Value 22 marks, 2 off for each misspelled word, capitals for proper names and beginning of extract.

## GEOGRAPHY.

*2nd Class to Third.*—(1) define continent, peninsula, cape, strait, channel, bay; (2) point out with promptness each of them on the map of N. A.; (3) point to the North, South, East and West, and tell how you know each; (4) draw a map of your county, putting in the names of the townships and the County town. Value 72 marks.

*3rd Class to Fourth.*—Draw a map of the Dominion, putting in all the provinces, the principal lakes, rivers, gulfs, bays and islands. Value 72 marks.

## COMPOSITION.

*3rd Class to Fourth.*—Write, (1) three simple interrogative sentences, using capitals and points correctly, (2) write three simple imperative sentences, (3) name and make the principal points used in writing, (4) define *composition*, (5) write your father's name and address in full, (6) give in about twelve or fifteen lines a description of your own home.

Value 72 marks, namely, 6 for each of the first 5 parts and 42 for the composition,—one mark off the value of the whole paper for each misspelled word.

## CANADIAN HISTORY.

*3rd Class to Fourth:*—

(1) Give a meaning to the following

dates:—1497, 1535, 1759, 1840, 1867.

- (2) Give the derivation of Canada, Quebec, Montreal, Ontario, Toronto.
- (3) What is “Representative Government?” and give an account of its first introduction into Canada.
- (4) Explain the meaning of Clergy Reserve, U. E. L., Family Compact, American Sympathizers, Fenian Raids.
- (5) Name the Provinces of the Dominion and the date when each joined the Confederation.

Value 72 marks—14 for each of the first 4, and 16 for the last; one mark off the whole paper for each misspelled word.

## GRAMMAR.

*3rd Class to Fourth:*—

- (1) Define *preposition* and *adverb*.—Value 8.
- (2) Write the singular and plural of *fox, church, woman, sheep, ladies, hero, oxen, life*. Value 16.
- (3) Write two dissyllables and two polysyllables marking the accent. Value 8.
- (4) Form two sentences, the 1st containing a *noun feminine*, the second a *noun neuter*. Value 9.
- (5) Separate into noun-part and verb-part: “My father's fields produce corn.”—“Some might have been saved.” “Before our house a prattling river runs.” Value 9.
- (6) On page 206, Third Reader, in the sentence beginning, “The clouds of smoke,” &c., point out all the parts of speech, giving the number, gender, and person of the nouns and the comparison of the adjectives. Value 50 marks, 2 for each word. Deduct one mark from the whole value of the paper (100 marks) for each misspelled word.

## LITERATURE.

*1st Class to Second.*—Open First

Book, part II., at page 34, and answer the following questions orally:—

(1) What is a *fine* ship? (2) and what is a *ship*? (3) give the meaning of *on its way*; (4) what do *Pearl* and *New York* mean here? (5) why did they want to keep from shore? (6) what does *furling* the sails mean? (7) what is a *gale*? a *bark*? (8) what does it mean by flying like a bird? (9) who is the mate? (10) what does *pass the word* mean? (11) what was the *word* that was passed? (12) what animal is a curb used on, and how could a storm be curbed? Value 72 marks.

*2nd Class to Third.*—Open Second Reader at page 125, and answer the following questions in writing:—

(1) what is a *hare*? spell another word of the same sound; (2) what is a *spring*? give two other meanings to this word; (3) give the meaning of *set out, together, fine, off, frisked*; (4) give the meaning of *road*, and spell two other words of the same sound; (5) how did the hare travel? how the tortoise? (6) give the meaning of *presently, good-bye, manage, pace*; (7) give the meaning of *tripped* here; (8) give another meaning for tripped; (9) give the meaning of *lie, down, nap, crawl, snooze*; (10) what is that mark after *laziness*, and before and after "*slow and sure!*" (11) how did the hare show speed and laziness? (12) what lesson does this fable teach? Value 72 marks.

*3rd Class to Fourth.*—Open Third Reader at page 209, and answer in writing:—

(1) Who was Selkirk? (2) why monarch? (3) from what centre? (4) what is the difference between a fowl and a brute? (5) why is Solitude spelled with a capital? and what is that mark after it? (6) what are *sages* and *whose* face is meant? (7) where is the midst of alarms, and why *horrible* place? (8) what is a *glance of the mind*, in 5th verse? (9) what are the swift wing'd arrows of light? (10) which was his own

native land? (11) what is the difference between *nest* and *lair*? (12) who was W. Cowper? Value 72 marks.

#### ARITHMETIC.

*First Class to Second.*—1. Write, in figures, nine hundred and eighty-seven; seven hundred and fifteen; eight hundred and seven; two hundred and nine; five hundred and sixteen.

2. Write, in Roman letters, 18, 17, 11, 19, 14.

3. Add 27896, 3258, 406, 72389, 621895 and 23073.

4. From 2396252 take 1827389.

5. Add 98736 to 5089, and take 67023 from the sum.

6. Find the sum of 29685, 89375, 723895, 69879, 323789 and 237896.

7. John has 16 marbles, Tom 18, James 29 and Edward 27. They put them into a bag. How many are in the bag?

8. Tell promptly (*orally*): 6 and 8 are how much? 9 and 7? 10 and 9? 9 and 8? 6 and 7? 8 and 11? 7 and 9? 8 and 5? 9 and 9? 6 and 9.

9. Answer promptly: 6 from 9 leaves what? 8 from 11? 6 from 10? 7 from 15? 3 from 11? 5 from 10? 7 from 13? 0 from 8? 8 from 8? 9 from 12? Value 100 marks.

*Second Class to Third.*—1. Write in figures: Nine hundred and sixty-six thousand eight hundred and seventeen; eight hundred and three thousand and nineteen.

2. Write in Roman letters: 987, 206, 375, 729, 983.

3. Multiply 982796 by 798.

4. How often is 639 contained in 21376239?

5. The multiplicand is 807896 and the multiplier 876, find the product.

6. Divide 29367238 by 96 (factors.)

7. From the sum of  $989 \times 27$ ,  $823 \times 94$  and  $907 \times 26$  take 6939.

8. James has \$975, John \$723; and Thomas three times as much as John. How much money have the three men together?

9. The sum of two numbers is 21378, one of them is 10798, find the other?

10. James has 729 acres of land, John has four times as much, how many acres has John more than James? Value 100 marks.

*Third Class to Fourth*:—1. Divide 927 ac., 3 ro., 19 per., 17 yds., 3 ft., 29 in. by 97.

2. A distance of 30 mi., 6 fur., 37 po., 3 yds., 2 ft., 3 in. is walked at the rate of 3 mi., 3 fur., 17 po., 2 yds., 2 ft., 7 in., in one hour—how many hours will it take to walk the whole distance?

3. A plot of ground containing 69 ac., 2 ro., 17 po., 13 yds., 2 ft., 36 in. is divided into lots each containing 3 ac., 3 ro., 18 po., 22 yds., 5 ft., 36 in. and a man buys 12 of these lots; how much land has he?

4. Find the L. C. M. of 27, 32, 18, 36, 15, 16, 25, 24.

Divide the L. C. M. of 36, 48, 72 by their G. C. M.

6. A merchant having 12 tons, 13 cwt., 2 qrs., 15 lbs., 3 oz. of flour, sells 10 tons, 11 cwt., 3 qrs., 19 lbs., 15 oz. and the rest he sells in barrels, each containing 1 cwt., 2 qrs., 16 lbs., 13 oz., how many brls. are there?

7. Find the value of  $\frac{7}{8} + 3\frac{5}{8} - 1\frac{8}{4} + 51\frac{9}{6} - 2\frac{1}{2} + 9\frac{2}{3}$ .

8. How much can a person save each day out of a yearly income of \$2400 if he spends \$3 a day?

9. How many times is 19 ac., 3 ro., 27 po., 15 yds., 6 ft., 28 in. contained in 293 acres?

9. A wheel is 10 ft., 9 in., round, how many turns will it make in going 64 miles, 4 fur.

## OUR CANADIAN DOMINION.

We have made us a Dominion  
In this region of the west;  
And of young and growing countries  
'Tis the brightest and the best.  
For our homes are halls of plenty,  
We have peace on every hand,  
And our people are as noble  
As the lords of any land.

We have many little Edens  
Scattered up and down our dales,  
We've a hundred pretty hamlets  
Nestling in our peaceful vales,  
Where the sunlight loves to linger  
And the Summer winds to blow,—  
Where the rosy Spring in April  
Leapeth laughing from the snow.

We have oaks to build us navies,  
That have stood since Noah's flood;  
And we've men to build and steer them,  
Men of skill and dauntless blood.  
We have lakes as broad as oceans  
To transport our surplus grain,  
And we've mighty rolling rivers  
To convey it to the main.

We have springs of healing waters;  
We have over-during rills  
That encircle in their journey  
Half a thousand happy hills.  
Tell the oppressed of every nation,  
Him that plants and him that delves,  
If they'll cast their lots among us  
We will make them like ourselves.

For the West shall be a garden,  
And its glories be unfurled  
Till its beauty is a by-word  
With the people of the world;  
And the East shall build us shipping,  
That shall whiten ever sea;  
And the boast of the Dominion  
Shall be British Liberty.

And if foes too strong oppress us,  
On a little island shore  
Dwells a Lion that can shield us  
By the terror of his roar;  
For its flag, that rules the ocean,  
Is respected on the shore—  
It has braved a thousand battles,  
And can brave a thousand more.

In its folds, in silent sorrow,  
 We will wrap our fallen brave,  
 But we'll wave it high in triumph  
 Over every traitor's grave;  
 And in spite of Annexationists,  
 By the world it shall be seen  
 That we pride in our Dominion.  
 Love Old England and her Queen.

And our fathers up in Heaven,  
 In the leal-land far away,  
 Looking down with pride upon us,  
 Shall perhaps be heard to say:  
 These our children emulate us,  
 Tread the righteous paths we trod,  
 Live in peace and honest plenty,  
 Love their Country and their God.

G. W. J.

## THE OLD UNION JACK TO THE FORE.

Who dares to repeat to the face of a Briton  
 The falsehood that Russia to Germany said?  
 "The Mother of Nations is dying—her prestige  
 Has faded—her mandates's no longer  
 obeyed—

Her friends are deserting—her foes are united,  
 Her soldiers and sailors faint-hearts to a  
 man—

She daresn't say *no!*—if she did, well, what  
 matter?

We'll do what we like, let her do what she  
 can!"

But her soldiers sprang forward with rifles all  
 ready,

With face to the foe, held the braggarts  
 at bay;

Her sailors re-echoed while pointing their  
 cannon:

"You'll do as you choose, if you choose as  
 we say!"

The Bear of the North, with a growl of sub-  
 mission,

Slunk back like a cur that is whipped—with  
 a groan

The German bowed with a grim acquiescence,  
 And England said sharply, "Let Turkey  
 alone!"

Who dares to repeat to the face of a Briton:  
 "The Mother of Nations is dying?"—Her  
 hand

Still is potent to punish the proudest oppressor,  
 Or succor oppressed ones on sea or on land:

Wherever the cause of humanity calls her,  
 There duty impels and she asks nothing  
 more;

Wherever right beckons to might for assistance,  
 Her banner will ever be found at the fore!

In the days of Old Rome the proud boast,  
 "I'm a Roman,"

Held power more potent than princes pos-  
 sessed:

O'er a quarter of Europe, a portion of Asia,  
 The plea was a passport, the boaster was  
 blest.

But with a new watch-word a nation has  
 risen—

Wherever the banner of day is unfurled,

There flutters the flag of Old England trium-  
 phant—  
 "I'm a Briton" 's a passport all over the  
 world.

Then up, favored sons of this Mother of  
 Nations,

And fight for her fame while you share her  
 renown;

Lift her banner aloft with a hearty "God  
 bless it!"

And woe to the traitor that tramples it  
 down!"

St. Andrew's blue cross!—who shall dare to  
 deny it,

An emblem of peace wheresoever it stands?

St. George's red cross!—who shall dare to  
 defy it,

This union of flags and of hearts and of  
 hands?

Tune the Harp of Old Tara, ye sons of St.  
 Patrick,

And warble the lyrics of Erin once more;

March forth with your shamrock and *cead  
 mille fealties*,

Great Britain and Ireland's flag to the fore.

Ye sons of Old England, rejoice in your  
 birth-right,

An honor not purchased with silver and  
 gold:

Your mistletoe twine with your roses and holly,  
 And deck the Old Flag like a Druid  
 of old.

Ye brave, hardy sons of the mountain and  
 heather.

With strathspey and bag-pipe your pledges  
 renew;

Hurrah for the flag that floats proudly above  
 you,

And doff in its honor your bonnets of blue.

Ye loyal Canadians, by birth or adoption,

The Mother of Nations bow down and  
 adore;

Keep your Maple Leaf Land her most noble  
 possession,

Her Weal in your heart, her Flag to the  
 fore.

G. W. J.

## NOTES ON EDUCATIONAL TOPICS.

Towards the close of last session of the Ontario Legislature a motion introduced by the Minister of Education to expend \$30,000 on enlarging Upper Canada College was withdrawn after a spirited debate, in which members of both political parties joined in opposing the motion. It was stated by those opposed to the grant that the College is not doing anything more than High School work, that it is in fact merely a Collegiate Institute for Toronto, and that Toronto should contribute towards its support. It was also pointed out that the course of study prescribed for Collegiate Institutes and High Schools is now more extensive than that for Upper Canada College. The High School Course includes not only the work for Junior Matriculation, but also that for first year or Senior Matriculation.

The statement put forward by the defenders of this School that its aims and operations are distinctively provincial in their character, applies with greater force to some of the Collegiate Institutes and High Schools: the latter educate not only 2nd and 3rd class teachers, but also 1st class teachers—a work once monopolized by the Normal Schools, and is surely provincial. Nor can Upper Canada College claim support exclusively from the Provincial Treasury on the grounds that it trains a larger number of candidates for the learned professions than other schools: several of the Collegiate Institutes have sent annually as large a number of students to the preliminary professional examinations—Law, Medicine and Engineering—as Upper Canada College has sent. The large number of pupils in attendance from different parts of the Province has been advanced as an argument in favor of the continuance of the school on its pres-

ent footing; the number of boys from all parts of the Dominion attending its classes has been referred to as an indication that the country demanded such a school, and that it should be supported by the Province. It is perhaps not generally known, but it is nevertheless true, that there are at least five Collegiate Institutes in the Province, each of which has as large a non-resident attendance of pupils doing High School work as Upper Canada College has; and for several years past the former have taken the leading places at all University Examinations.

“There is one common practice of the public schools which ought to be abolished at once and everywhere without question or parley. That is the practice of imprisoning children in the school-houses beyond the school hours. Pretty nearly every school-house in the land is thus turned into a penitentiary in which children are immured every day, some of them for imperfect recitations, others for faults of deportment. This method of punishment, might if the teachers were all judicious, be resorted to occasionally with good effect: but teachers are not all judicious, and thousands of children are thus detained every day to whom the detention is a serious injury and a grave injustice. For some trifling breach of order, like turning in the seat or dropping a pencil—for some small failure in a recitation, and often for no fault at all—whole classes being kept on account of the indolence of some of their members, and the innocent thus suffering with the guilty—the children are shut up in the school-houses, sometimes during the intermissions, often after the close of school. Thousands of children of delicate health, to whom the regular school hours are too



long, are permanently injured by this system of confinement. If only the stupid and the wilful and those in sturdy health were thus punished there would be less reason for complaint; but any careful investigation will show that such discrimination is not generally made, and from the nature of the system cannot well be made and that the injury to the health of pupils resulting from the practice more than outweighs any good that may result from it. The health of the pupil is a subject to which the average teacher gives but little consideration; any practice therefore, which is liable to result in the impairment of the pupil's health ought to be forbidden."

We learn from the last number of *The White and Blue* that a memorial is in circulation praying the Chairman of Convocation of the University of Toronto to call a meeting of that body to discuss the following questions:—

(1.) Compulsory attendance on lectures; (2.) Shortening the arts course by relegating the first year work to the Collegiate Institutes; (3.) Publicity of the proceedings of the Senate; (4.) Throwing open local examinations to males as well as females. The memorial asks that the meeting may be called as soon as possible in view of the forthcoming elections of the Senate.

MANUAL OF DRILL AND CALISTHENICS  
by J. Laughlin Hughes, Inspector  
of Public Schools, Toronto; Graduate  
of Military School, H. M. 29th  
Regiment.

On a review of this book, we must confess to a slight feeling of disappointment at the character of the instructions met with in it. Taking into consideration, however, the size of the work, and the nature of the subjects, we may have expected too much from the author. No great scope for originality of treatment is afforded perhaps, by such purely technical subjects as Military Drill and Calisthenics. Yet

we think Mr. Hughes, from his connection with H. M. 29th Regiment, might have done a little more for the first subject than merely adapt the language of the Government Drill Book to the requirements of Public Schools. Even this adaptation has been very hastily performed as evidenced by one or two examples. He has substituted the word "boy" or "pupil" for the word "soldier" wherever it occurs in the Government Drill Book, yet we find on page 39 he has "nothing will sooner tend to enable the recruit to &c." The word "recruit" must be surely out of place in view of the other changes in the language of the Drill Book. With reference to correct position at drill, the authorized Drill Book says: "The toes turned out, so that the feet may form an angle of 45 degrees;" Mr. Hughes has seen fit to amend this to "Toes separated so that the feet may form an angle of 45°." The latter position, if practicable would certainly have one very marked advantage over the former; it would give the soldier a broader base to stand on. We do not intend to criticise the portion of the work treating of Calisthenics, owing to its brevity. In Mr. Hughes' work, the reader will find much that is suggestive, and we hope that it will have the effect of directing attention to proper modes of physical culture and of relaxation from the severe mental toil incidental to the student's life.

We have just received a copy of Complete School and Class Registers by H. N. Chute, M.S., late of the Canadian Literary Institute, Woodstock, published by Richmond, Backus & Co., Detroit. The arrangement of statistical tables in a form easily applicable to the requirements of any school is a leading feature in the Register: it provides for nearly 300 names and is compact, portable and convenient. Mr. Chute has also published a complete set of school reports.