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THE
SCHOOL MAGAZINE.

A GEOGRAPHY LESSON.

THAT is the way St. Paul preferred to pray and sing and teach. Hear St. Paul's declaration to the Corinthian Church. "I had rather speak five words with my understanding, that I might teach others also, than ten thousand words in an *unknown* tongue." No more important educational apothegm was ever uttered, than " 5 plain words are better than 10,000 pompous sounds." The understanding of the learner must keep step with the understanding of the author of the text-book, or of the personal teacher, as far as any real improvement is made.

Poets have sung the "Pleasures of Hope," and the "Pleasures of the Imagination;" but the *pleasures of the understanding* surpass them all in intensity and permanency.

It is often said that mathematical and scientific studies can be, to a limited extent, *understood*, but that descriptive geography, history, &c., depend on memory, and hence should be studied to recite *memoriter*. To a limited extent this is true, but the real pleasure and profit of such studies depend on the exercise of the learner's own powers of observation and reasoning.

Let us suggest a model, or at least a novel Geography Lesson. Let the pupils, young or older, have a map of the world before them ; Mercator's is best, but any will do. The teacher may ask *some* questions for them to answer, and probably *some* that he will have to answer himself. In what respects do the Eastern and Western Continents agree, and wherein do they differ? The intelligent pupil will notice that the Eastern, including Europe, Asia and Africa, is about double the area of the Western consisting of North and South America. That the Western is long and narrow, extending North and South, while the Eastern is very wide, extending East and West. The prevalence of large and long rivers and great lakes in the Western Continent will suggest a greater annual rainfall to supply them, and the vast riverless areas in the Eastern will be attributed to a deficiency of rain and snow. By suggestive hints the pupils may observe that the highest mountains of the Western Continent are south of the equator, and of the Eastern, north of it, and also, that the Western has

several active volcanoes, but that the Eastern has none except Vesuvius in Italy, and perhaps one in Kamtskatka. The inland Caspian, Aral and Dead Seas, also lakes Balkash and Tchad, receiving the drainage of vast basins, show a different configuration of land from the single inland basin of Utah with its salt lake. As every boy knows that water runs down hill, the directions and lengths of the principal rivers enable him to know the directions and extent of the great continental slopes, which so much influence the agricultural capacities of a country, and by running his pencil along between the sources of streams he can indicate the water shed or ridge of the continents.

That the loftiest mountains of the Eastern Continent are in its eastern part, but that the loftiest peaks of the Western Continent are near the western border, and the effect of such arrangement on the distribution of rainfall and consequent fertility and productions of the respective continents may be understood from the examination of a good map and a little meteorological information from the teacher. If the teacher will supplement these and other deductions from the map with the oral information his general reading and intelligence are supposed to enable him to do, illustrative of continental distinctiveness, he will find that one fact will aid in the retention of another.

A good way to present such facts is in parallel column on the blackboard, thus :

WESTERN CONTINENT.

11,000,000 square miles arable land.
Fertile plains.
Cactus abundant.
No heaths or spurges.
Black, grizzly and cinnamon bears.
Puma and lama.
Opossums.
Monkeys with prehensile tails, wide, flat nose, thumbs for grasping, and with thirty-six teeth.
Land of insects and reptiles.
Chief *vegetable* growth.
Native region of maize and tobacco.
Humming-birds and turkeys native.
According to Guyot, *men of action.*

EASTERN CONTINENT.

10,000,000 square miles arable land.
Deserts and plateaus.
No cactus.
Heaths and spurges.
Brown bears.
Lion and camel.
No opossums.
Monkeys with tails never prehensile, nostrils narrow, thumbs opposable, and thirty-two teeth.
Land of large and fierce animals.
Chief *animal* development.
Of wheat, cotton, coffee, tea.
Common fowls and pea-fowls, native.
Men of thought.

A lesson once a week like the above will be found to be as much an improvement on the daily memoriter recitation as the " variations " to some old worn out tunes.

Another method of stimulating observation and ready recollection of facts learned is found in Horace Mann's Geography Game. It is not a game of chance, but it affords scope for considerable skill, and none can invest in it without some geographical capital. Take, for instance, the capes on the atlas studied. Call on the boy first named on the roll to go to the blackboard and write the name and location of any cape he pleases, and immediately on the next to go and from memory write name and location of a cape beginning with the final letter of the last cape.

The skill consists in giving a name ending with a letter rare among initial letters of names.

As no cape is to be written twice, and every one must be pointed out by the writer if requested, and only one minute allowed for writing, it will be manifest that the game will require pretty close attention and rapid thinking, as all the capes of the world known to the writer may have to pass

rapidly through his mind to suggest the one with the right letter. Fortunately the deep interest soon excited in this game stimulates the application necessary to play it successfully, and the effect on those who engage in it, and those who witness it, is necessarily beneficial. A knowledge of capes, the salient points of lands, is especially important.

After capes have been exhausted rivers, mountains, lakes, bays and gulfs, &c., may be substituted, but the wide field is in towns. It is important that the name and location be written together. In a similar way the names of battles or historical persons or places may be made into an attractive and profitable game. What more pleasant for social games?

HEALTH DEPARTMENT.

Edited by Dr. Alexander Hamilton, M. A., Port Hope.

THE SCHOLAR'S EYE.

I.

What is Normal Vision?

What is Defective Vision?

How Vision is Measured.

(i). for Distance.

(ii). for Near Objects.

Every tutor has pupils whose vision is manifestly more or less defective. What may be the percentage of such, and what may be the nature of the principal defects producing it, we shall enquire farther on. For the present arises the question : What constitutes defective Vision? The trouble with the old metaphysics is that terms used are not defined with sufficient precision. We must have a clear knowledge of what constitutes defective vision. We must also have a standard by which we can measure the amount of vision, and hence infer how far it is defective. This must be as precise as the subject admits. Matters pertaining to the human frame are seldom as precise as mathematics—seldom as precise as even general physics. Yet very much is precise. The wide awake physician collects much accurate information from the human frame by means of precise instruments of diagnosis. He deserves greater public confidence than he gets. Of no one is this more true than of the competent oculist. We are going to take the look of a bystander into the work of such, in a part of his field which equally concerns him (the oculist), and the educator. We must conform to scientific precision in this or we shall not make much progress. Looseness in the foundation on which we reason must not be tolerated any more than laxity in the reasoning itself. Plato had written over his door : "Whoso knows not Geometry let him not enter here." Was, then, the ability to repeat by rote, as most pupils do, the propositions of Euclid a sufficient passport to the presence of the philosopher. Nonsense. The inscription meant : If your reasoning be not precise and clear, away with you. It must be like Euclid's, each part, like the link of a chain, fast to the prece-

ding, and the whole forming a convincing and indisputable proof, connecting what is granted (data) with what is sought to be proved (quæsita), and winding up by a triumphant Q. E. D.

Vision is defective when less than normal. We have normal vision when we see as well as the average of a large number of individuals believed to have perfect vision. The systems of measuring vision are chiefly those of Snellen, (Utrecht), and Jaeger (Vienna). As the result of the examination of many thousand eyes by each of these a set of test types has been arranged. Vision may be normal (i) for distance; (ii) for near work, as reading, writing, sewing, etc. We need a standard for each. Vision may be considered normal for distance when a large, broad-faced capital letter can be distinctly seen when so far removed as to subtend an angle at the eye of not more than five minutes. Thus, such a letter three-eighths inch in height subtends five minutes at twenty feet. True, quite a percentage of eyes see such at 22 or even 25 feet, but these are as much beyond the average and as exceptional as people over six feet high. Such vision is for the most part found in keen-eyed, healthy children and young adults. The measure of vision given is meant to apply to all ages, and in practice is sufficiently precise. Ordinary diffuse daylight of a well lighted room is presupposed. If an eye sees at only 10 feet what it should see at 20 feet, we infer that vision is ½, counting normal vision as unity. Such an eye requires the object to subtend an angle of ten *minutes*. In this way we can get a sufficiently precise measure of a given eye; for distance. I say eye, rather than eyes, for each eye should be tested separately. If

the eye see it at 15 feet off, vision is ¾, and so on. To test a scholar for distance then he should be asked to read letters of the kind indicated. These letters should not form a word, and should be such as are likely to require close observation. P is often mistaken for F, and *vice versa.* K, R, and E in like manner are somewhat liable to be mistaken ; so are S and 8, Hence the types should contain such letters, and a fairly accurate reading be required. Should vision for distance be ½ or less, the child labors under great disability, and should not be too much urged and abused in his classes. When vision is ⅔, ¾, or more approaching unity, he will not complain for distance except for the finer letters, which subtend angles of little more than five *minutes.* In the school room, vision for distance means use of blackboard and maps chiefly.

For reading closer at hand a graded series of test types is needed, running from that termed "Brilliant" by the printer, and which should be read easily at a foot, to "Pearl," "Minion," "Brevier," "Bourgeois," "Long Primer," and so on. We, in like manner, infer power of vision according to what size of type is seen.

In general, each teacher, in a case in which bad vision is suspected, should determine the case for himself, unless he can have an oculist do so. Where this is impracticable let the teacher determine vision for far and near, and if defective in any considerable degree, refer only such as are so to an oculist.

In the next paper the percentage of cases found will be shown, with the great evils resulting from overlooking them.

MATHEMATICS.

Solutions to Papers in June Number.

TRIGONOMETRY.

1. Log. $175 = $ log. $\dfrac{700}{4} = $ log. $700 - $ log. 4

$= $ log. $700 - 2$ log. $2 = 2.8451 - .60206$

$\qquad = 2.24304$

$\qquad$ Log. $6860 = 3.83632$.

2. Log. of the square root of $\dfrac{\sqrt{3}\sqrt[3]{577}}{49\sqrt{686}}$

$\qquad = \frac{1}{2}$ log. $\dfrac{\sqrt{3}\sqrt[3]{577}}{49\sqrt{686}}$

$= \frac{1}{2}$ log. $\sqrt{3} + \frac{1}{2}$ log. $\sqrt[3]{577} - \frac{1}{2}$ log. 49

$\qquad - \frac{1}{2}$ log. $\sqrt{686}$

$= \frac{1}{4}$ log. $3 + \frac{1}{6}$ log. $577 - $ log. $7 - \frac{1}{4}$ log. 686

$= \frac{1}{4}$ of $.47712 + \frac{1}{6}$ of $2.76118 - .8451 - \frac{1}{4}$ of
$2.83632 = \bar{1}.025296$

Log. $\dfrac{\sqrt{.002}}{\sqrt[3]{.07}} = \frac{1}{2}$ log. $.002 - \frac{1}{3}$ log. $.07$

$= \frac{1}{2}$ of $\bar{3}.30103 - \frac{1}{3}$ of $\bar{2}.8451$

$= \bar{2}.650515 - \bar{1}.61503$

$= \bar{1}.035485$.

7. Cos $e = \cos^2 \dfrac{e}{2} - \sin^2 \dfrac{e}{2}$

$\qquad = \left\{ 1 - \tan^2 \dfrac{e}{2} \right\} \cos^2 \dfrac{e}{2}$

$\qquad = \dfrac{1 - \tan^2 \dfrac{e}{2}}{\sec^2 \dfrac{e}{2}}$

$\qquad = \dfrac{1 - \tan^2 \dfrac{e}{2}}{1 + \tan^2 \dfrac{e}{2}}$

$\overline{\sin 45 + a} \ \overline{\sin 45 - a}$

$= \sin^2 45 - \sin^2 a$

$= \frac{1}{2} - \sin^2 a$

$= \frac{1}{2}(1 - 2\sin^2 a)$

$= \frac{1}{2} \cos 2a$

$\sin^2 e - \sin^2 a$

$= \sin^2 e - \sin^2 e \sin^2 a$

$\qquad + \sin^2 e \sin^2 a - \sin^2 a$

$= \sin^2 e (1 - \sin^2 a)$

$\qquad + \sin^2 a (1 - \sin^2 e)$

$= \sin^2 e \cos^2 a - \sin^2 a \cos^2 e$

$= (\sin e \cos a + \cos e \sin a)$

$\qquad \times (\sin e \cos a - \cos e \sin a)$

$= \sin (e + a) \sin (e - a)$

$\dfrac{\sin a + \sin 3a}{\cos a + \cos 3a}$

$= \dfrac{\sin a + 3 \sin a - 4 \sin^3 a}{\cos a - 3 \cos a + 4 \cos^3 a}$

$= \dfrac{\sin a}{\cos a} \ \dfrac{2 - 2\sin^2 a}{2\cos^2 a - 1}$

$= \dfrac{\sin a}{\cos a} \ \dfrac{2 \cos^2 a}{\cos 2a}$

$= \dfrac{2 \sin a \cos a}{\cos 2a} = \tan 2a$

$\tan 67° 30 = \tan \dfrac{135}{2}$

$= \dfrac{\sin 135}{1 + \cos 135} = 1 + \sqrt{2}$

9. $\sin A = \dfrac{2a}{abc} \sqrt{s(s-a)(s-b)(s-c)}$

∴ $L \sin A = \log. 2 + \tfrac{1}{2}\log. S + \tfrac{1}{2}\log. (s-a)$
$+ \tfrac{1}{2}\log. (s-b) + \tfrac{1}{2}\log. (s-c) + \text{colog. } a$
$+ \text{colog. } b + \text{colog. } c - 20 + \log. a$
$= 6.80038 + \log. a$
$L \sin B = 6.80038 + \log. b$
$L \sin C = 6.80038 + \log. c$

thus :

s	2045	3 31069	log.
$s-a$	782	2.89321	"
$s-b$	686	2.83632	"
$s-c$	577	2.76118	"

$2\,)\,\overline{11.80140}$

5.90070

a	1263	6.89860	colog.
b	1359	6.86678	"
c	1468	6.83327	"

$\log. 2 = .30103$

$2,\ 6.80038$
$\log. a = 3.10140$

$\overline{9.90178}$
∴ $A = 52° 54$
again 6.80038
$\log b = 3.13322$

$\overline{9.93360}$
∴ $B = 59° 7'$
also 6.80038
$c = 3.16673$

$\overline{9.96711}$
∴ $C = 67° 59'$

(ii) $L \sin B = \log b + L \sin A + \text{colog } a - 10$
$= 9.95745$
$= L \sin 65° 3'$
∴ $B = 65° 3'$
$C = 180 - A - B = 46° 58'$
$\log c = \log a + L \sin C - L \sin A$
$= 3.31069 + 9.86389$
$+ .03289 - 10$
$= 3.20747 = \log' 16124$
∴ $c = 16124$

10. Area $= \sqrt{s(s-a)(s-b)(s-c)}$
∴ log. area $= \tfrac{1}{2}\left\{ \log. s + \&c. \right\}$
$= 5.90070$
∴ area $= 795610$

(ii) Area $= \tfrac{1}{2} ac \sin B$
log. area $= \log. a + \log c + L \sin B$
$+ \text{colog } 2 - 20$
$= 6\ 17458$
∴ area $= 1494800$

11. Let x = height of the tower,
then $\dfrac{x}{x + 60} = \tan 30° = \dfrac{1}{\sqrt{3}}$
∴ $x = 30(\sqrt{3} + 1) = 81 \cdot 96.$

ALGEBRA.

2. $1296 - (5x + 5y + 13z)^2$;
$3 + 3 = 1$

3. (1). $2c - a - 10b$
(2). $13a - 20b + 24c$

4. (3). $\dfrac{x^{3n}}{x^n-1} - \dfrac{1}{x^n-1} - \dfrac{x^{2n}}{x^n+1} + \dfrac{1}{x^n+1}$
$= \dfrac{x^{3n}-1}{x^n-1} - \dfrac{x^{2n}-1}{x^n+1}$
$= x^{2n}+x^n+1 - x^n+1$
$= x^{2n}+2$

5.
$\begin{array}{r|l} 1 & 4\ -7+25-15+\ 8+10 \\ 1 & \ \ 4\ -3+\ 2\ \ \ \ 2 \\ -5 & \underline{\ \ \ \ \ -20+15-10-10} \\ \end{array}$
$4-3+2+2$
∴ quot. $= 4x^3 - 3x^2 + 2x + 2$

$\begin{array}{r|l} 2 & 6-1+\ 2+13+4 \\ 3 & \ \ \ 9+12+\ 3 \\ -4 & \underline{\ \ \ \ \ \ -12-16-4} \\ \end{array}$
$3+4+1$
∴ quot. $= 3a^2 + 4ab + b^2$

7. (1). $(12 + x)^{\frac{1}{2}} = 2 + x^{\frac{1}{2}}$
square both sides, then
$12 + x = 4 + 4x^{\frac{1}{2}} + x$
∴ $x^{\frac{1}{2}} = 2,$ ∴ $x = 4$

(2). Multiply thro' by 2 and we have
$x - \dfrac{4x - 6 - 3x + 1}{x - 1} = 3\dfrac{x^2 + 2}{3x - 2}$

$x - \dfrac{x - 5}{x - 1} = x + \dfrac{2x + 6}{3x - 2}$
∴ $5x^2 - 13x + 4 = 0$
∴ $x = \dfrac{13 \pm \sqrt{89}}{10}$

(3). $\dfrac{66x + 1}{1.5x + 1} + \dfrac{4x + 5}{.5x - 1} = 52$

divide both sides by 2 ; then

$$\dfrac{66x + 1}{3x + 2} + \dfrac{4x + 5}{x - 2} = 26$$

$$22 - \dfrac{43}{3x + 2} + 4 + \dfrac{13}{x-2} = 26$$

$$\dfrac{43}{3x + 2} = \dfrac{13}{x-2}$$

$$x = 28$$

(4). $\dfrac{\sqrt{a} - \sqrt{a - \sqrt{a^2 - ax}}}{\sqrt{a} + \sqrt{a - \sqrt{a^2 - ax}}} = b\ (1)$

Subtract 1 from both sides, and

$$\dfrac{-2\sqrt{a - \sqrt{a^2 - ax}}}{\sqrt{a} + \sqrt{a - \sqrt{a^2 - ax}}} = -b\,(2)$$

Add 1 to each side of (1), and

$$\dfrac{2\sqrt{a}}{\sqrt{a} + \sqrt{a - \sqrt{a^2 - ax}}} = b + 1, \quad (3)$$

divide (2) by (3) and we get

$$-\dfrac{\sqrt{a - \sqrt{a^2 - ax}}}{\sqrt{a}} = \dfrac{b - 1}{b + 1}$$

squaring both sides gives

$$\dfrac{a - \sqrt{a^2 - ax}}{a} = \left(\dfrac{b-1}{b+1}\right)^2$$

$$1 - \dfrac{\sqrt{a^2 - ax}}{a} = \dfrac{(b-1)^2}{(b+1)^2}$$

$$\dfrac{\sqrt{a^2 - ax}}{a} = 1 - \dfrac{(b-1)^2}{(b+1)^2}$$

$$\dfrac{\sqrt{a - x}}{\sqrt{a}} = \dfrac{4b}{(b+1)^2}$$

$$\dfrac{a - x}{a} = \dfrac{16b^2}{(b+1)^2}$$

$$\therefore x = a \left\{ 1 - \dfrac{16b^2}{(b+1)^2} \right\}$$

8. (1). $\frac{4}{15}$. (2). The two together can do $\frac{1}{m}$ of the work in one day and $\therefore \frac{n}{m}$ in n days

so that when A is called off there remains $\dfrac{m-n}{m}$ of the work to be done. B does this in p days, and consequently does the whole work in $\dfrac{mp}{m-n}$ days. In one day $\therefore$ B can do $\dfrac{m-n}{mp}$ of the work, and the two together can do $\dfrac{1}{m}$ of it, $\therefore$ A can do $\dfrac{1}{m} - \dfrac{m-n}{mp}$ of the work in one day, and consequently does the whole work in $\dfrac{mp}{p-m+n}$ days.

9. (1) $(x + 22)^{\frac13} - (x + 3)^{\frac13} = 1$

cubing both sides, bearing in mind that $(a-b)^3 = a^3 - b^3 - 3ab(a-b)$, gives

$(x+22) - (x+3) - 3(x+22)^{\frac13}(x+3)^{\frac13} = 1$

$\therefore (x+22)^{\frac13}(x+3)^{\frac13} = 6$

$\therefore (x+22)(x+3) = 216$

$\therefore x = 5$ or -30.

2. $\dfrac{(a-x^4 - x - b^4)}{(a-x) - (x-b)} = \dfrac{(a-b)c}{(a-x)(-b)}(1)$

Also, $(a-x)+(x-b) = a-b$ (2)

dividing (1) by (2) gives

$\dfrac{(a-x)^4 - (x-b)^4}{(a-x)^2 - (x-b)^3} = \dfrac{c}{(a-x)(x-b)}$

$\therefore (a-x)^3 + (x-b)^2 = \dfrac{c}{(a+x)(x-b)}$

Denote $a-x$ by y and $x-b$ by z

$\therefore y^2 + z^2 = \dfrac{c}{yz}$ and $y + z = a - b$

$\because (y+z)^2 = \dfrac{c}{yz} + 2yz$ and $= (a-b)^2$

$\therefore yz = \dfrac{(a-b)^2 \pm \sqrt{(a-b)^4 - 8c}}{4}$

but $yz = (a-x)(x-b)$

$\therefore x = \frac12 \left\{ a+b + \sqrt[4]{(a-b)^4 - 8c} \right\}$

3. $x + y + xy = 11$

$\therefore x + y = 11 - xy$

also, $xy(x+y) = 30$

$\therefore xy(11 - xy) = 30, \therefore xy = 5$ or 6

$\therefore x + y = 6$ or $5, \therefore x = 5$ or 1

and $y = 1$ or $5.$

4. These equations are of the form
$$x^3 + y^3 = 126, \quad x + y = 6, \&c.$$

10. (*1*). 3, 5. (*2*). $6\frac{1}{2}\%$ and $3\frac{1}{13}$ yrs.

11. $a^2 + b^2 + c^2 > (a - b + c)^2$
$a^2 + b^2 + c^2 > a^2 + b^2 + c^2 - 2ab - 2bc + 2ac$

if $ab + bc > ac$
if $ab + bc > b^2$
if $a + c > b$
if $a + c > \sqrt{ac}$
$\therefore a^2 + b^2 + c^2 > (a - b + c)^2$.

PASS PAPER IN ENGLISH FOR MATRICULATION IN THE UNIVERSITY OF TORONTO, JUNE, 1880.

Examiners: FRED E. SEYMOUR, M.A., J H. LONG, B. A.

COMPOSITION.

1. Write a composition on one of the following subjects :
   (*a*) " The path of glory leads but to the grave."—*Gray.*
   (*b*) " How small, of all that human hearts endure
   That part which laws or kings can cause or cure."
   —*Goldsmith's Traveller.*
   (*c*) " Our birth is but a sleep and a forgetting :
   The soul that rises with us, our life's star,
   Hath had elsewhere its setting,
   And cometh from afar."
   —*Wordsworth.*
   (*d*) " 'Tis distance lends enchantment to the view."—*Campbell.*
   (*e*) " Fortes fortuna juvat."—*Pliny.*

GRAMMAR.

2. Give a full account of those grammatical forms by which the *gender* and *number* of nouns in English are distinguished, and the comparison of adjectives effected, noting exceptional formations, as fully as you can.

3. Give the past tense and perfect participle of *abide, burst, dig, flee, fly, flow, lead, lay, lie, ring, wring, set, sit, slink.*

4. Give rules for the use of *shall* and *will.*

5. Mention the chief sources from which the English language derives its vocabulary, and note the character of the contributions from the different sources.

6. Criticize the grammar of the following extracts, and where you consider it faulty suggest the proper emendations, stating your reasons for the changes you make :
   (*a*) " An author who is translated in this fashion suffers as much as when Archbishop Alexander Neville was translated from New York to St. Andrews by a Pope whom Scotland did not acknowledge."—*Saturday Review, 1875,* p. 437.
   (*b*) " The more recent of several attempts to realize Goethe's conception of an Iphigenia at Delphi is by C. Ernest, and may be pronounced at least as successful as any of his predecessors."—*Ib.,* p. 630.
   (*c*) " I went to Oaklands for the Egham races The party lasted more than a week ; there was a number of people and it was very agreeable." — GREVILLE, *Memoirs,* p. 5
   (*d*) " The life of Marlow was as riotous, his skepticism even more daring than the life and skepticism of Greene." GREEN, *Short History of the English People,* p. 420.

(*e*) " It is not wantonly that we call the attention of the public to these sort of publications."—REV. SIDNEY SMITH. *Works* p. 37.

(*f*) " The relations of these missionaries are of thrilling interest, and deserve the attention of all who desire to become a student of history."—CANNIFF, *Settlement of U. C.*, p. 250.

(*g*) " The class of commodities in the production of which the fa--cilities possessed by new communities, as compared with old. attain their greatest height, are those of which timber and meat may be taken as the type, and comprises such articles as wool, game, furs, hides, horns, pitch resin, &c."—CAIRNS, *Pol. Econ..* p. 250.

(*h*) " Now, in nature, suppose a family of animals removed by some accident to a different climate and feeding ground than those to which they are accustomed ; as for instance, a flock of sheep from Europe to South Amer .." —BRACE, *Ethnology*, p. 351.

(*k*) " Lorenzo Dow, in company with a male and female preacher, was in Camden, N. J., the last accounts."—W. L. MCKENZIE. *Sketches of Canada*, p. 35.

7
" *Yet still, even* here, content can spread a charm,
Redress the clime, and all its rage *disarm*.
Though poor the peasant's hut, his *feast* though small,
He sees his little *lot* the *lot* of all ;
Sees no contiguous place *rear* its head
To shame the meanness of his humble shed ;
No costly *lord* the sumptuous banquet *deal*,
To make him *loathe* his vegetable meal ;
But calm, and *bred* in ignorance and toil,
Each wish contracting fits him to the soil.
—GOLDSMITH, *Traveller*, ll. 175-184.

(*a*) Classify according to their origin, the words of this passage, which are not of Anglo-Saxon descent.

(*b*) To what country and people has this description reference.

(*c*) parse the words in italics, explaining fully their syntactical connection with other parts of the sentence.

GOLDSMITH'S TRAVELLER AND GRAY'S ELEGY.

8.
" Fired at the sound my genius spreads her wing,
And flies where Britain courts the western Spring ;
Where lawns extend that scorn Arcadian pride,
And brighter streams than famed Hydaspes glide.
There all around, the gentlest breezes stray ;
There gentle music spreads on every spray ;
Creation's mildest charms are there combined:
Extremes are only in the master's mind.
Stern o'er each bosom reason holds her state,
With daring aims irregularly great.
Pride in their port, defiance in their eye,
I see the lords of human kind pass by,
Intent on high designs, a thoughtful band,
By forms unfashioned, fresh from nature's hand,
Fierce in their native hardiness of soul,
True to imagined right, above control ;
While e'en the peasant boasts these rights to scan,
And learns to venerate himself as man."
—*Traveller*, ll. 317-334.

(*a*) *Genius spreads her wing.* Is this a correct figure ?

(*b*) What is meant by " courting the *western* spring ?"

(*c*) Write explanatory notes on ;"*Arcadian*" and " *Hydaspes.*"

(*d*) " *Extremes are only in the master's mind.*" Explain the meaning.

(*e*) *With daring aims irregularly great.* Explain the meaning.

(*f*) *peasant....learns to venerate, &c.* When, and under what circumstances did serfdom and slavery disappear from Great Britain ?

(*g*)
" How small of all that human hearts endure,
That part which laws or kings can cause or cure !
Still to ourselves in every place consigned,
Our own felicity we make or find."
By whom were these lines written ?

(*h*) Mention the principal writers of prose and poetry with whom Goldsmith associated, and give a brief account of their works.

(*k*) Give a list of Goldsmith's chief poetical and prose writings.

9.   xv.
" Some village-Hampden that with dauntless breast
The petty tyrant of his fields withstood ;
Some mute, inglorious Milton here may rest ;
Some Cromwell guiltless of his country's blood.
            xvi.
Th' applause of listening senates to command,
The threats of pain and ruin to despise,
To scatter plenty o'er a smiling land
And read their hist'ry in a nation's eyes—
            xvii.
Their lot forbade : nor circumscribed alone
Their growing virtues, but their crimes confin'd ;
Forbade to wade through slaughter to a throne,
And shut the gates of mercy on mankind ;
            xviii.
The struggling pangs of conscience Truth to hide,
To guard the blushes of ingenuous shame,
Or heap the shrine of Luxury and Pride
With incense kindled at the Muse's flame.
            xix.
Far from the madding crowd's ignoble strife
Their sober wishes never learned to stray :
Along the cool, sequestered vale of life
They kept the noiseless tenor of their way."
        —*Elegy in a Country Churchyard.*

(*a*) *Hampden—Milton—Cromwell.* What other names did the author replace by these in elaborating his poems, and why did he make the change ? What rhetorical figure is involved in the use of them ? Who was Hampden ? Give a brief account of the " tyranny" which he " withstood."

(*b*) *Tyrant.* What is the etymological meaning of the word?

(*c*) *Some—some—some.* Name the poetical figure.

(*d*) *may rest.* Give the subject of the verb.

(*e*) Give the subject of *command*, v. xvi.

(*f*) Parse *circumscrib'd* and *shut*, v. xvii.

(*g*) *Wade through slaughter to a*

throne. Refer to instances in English history.

(*h*) Point out the Rhetorical figures in v. xvii. Should it not be *Muses' flame* here ? Name the Muses. Which of them would an Elegiac poet evoke ? Parse *heap.*

(*k*) Rewrite the first and second lines of stanza xix., supplying whatever is necessary to express accurately and fully what you conceive to be their meaning.

(*l*) *Madding* Is it merely a poetical shortening of *maddening ?*

(*m*) What is an Elegy ? When was this one written ? Where was the " country churchyard ?"

MATRICULATION EXAMINATION, UNIVERSITY OF LONDON, JUNE, 1880.

ENGLISH LANGUAGE.

[Not more than *ten* questions are to be answered, including the Exercise in Dictation.]

1. Write out and punctuate the passage read by the Examiner.

2. Make a table showing the relationship of English to the other languages of the Indo-European family.

3. For how many sounds are there signs given by the English alphabet ? How many signs might be taken to represent all the elementary sounds used in forming English words ? Give a full list of these sounds classified.

4. Indicate some of the most important facts in the history of our alphabet, and account, as far as you can, for the order in which its letters follow one another.

5. Define each of the parts of speech, and give the reasons for and against including the article among them.

6. Classify the nouns, the pronouns, and the verbs.

7. Describe and account for the loss of inflexions in English nouns, with especial reference to inflexions that remain.

8. Discuss, with reference to their history, the words *ye* and *you, her, its, this, that, which.*

9. Describe and account for the regular and irregular forms of comparison in adjectives.

10. Distinguish between the forms of inflection in weak and strong verbs, and give what reason you can for the difference. Of each of the inflected forms of a weak verb tell what you know of its history and of its use in the expression of thought.

11. Discuss the verbs *shall, will, can,* and *may* with reference to their inflections and to their past and present use as parts of sentences.

12. Explain what is meant by tense and mood of verbs. Add a few notes upon past and present forms of the future tense and of the subjunctive mood in English verbs, and on the present use of the subjunctive.

13. Explain the following terms applied to the structure of words : *root, stem, primary derivative, secondary derivative, compound word.* Apply your explanation to the words *song, bait, batch, suds, thicket, spider, farthing, landscape, knowledge, wedlock, hemlock, eyrie, along, gossip, waylay, walking-stick.*

14. Analyse the following sentences: " We reckon more than five months yet to harvest ; there need not be five weeks ; had we but eyes to lift up, the fields are white already. Where there is much desire to learn, there of necessity will be much arguing, much writing, and many opinions ; for opinion in good men is but knowledge in the making."—*Milton.*

15. Correct or justify the syntax in the following sentences :

(*a*) They were both fond of one another.

(*b*) Thersites' body is as good as Ajax when neither are alive.

(*c*) How much more elder art thou than thy looks.

(*d*) The elder house.

(*e*) There were no less than five sons concerned.

(*f*) They are the six first lines in Paradise Lost.

(*g*) Neither he nor we are disengaged.

(*h*) One of the best books that has been written on the subject.

(*i*) I like it better than any.

(*k*) And since, I never dare to write as funny as I can.

(*l*) Laying the suspicion upon somebody, I know not who, in the country.

(*m*) Well is him that hath found prudence !

II.

A. European Division.

1. *Teutonic.*	Low German, Gothic, Frisian, Dutch, Flemish, *Saxon*, English, High German, Old, Middle and Modern High German, Scandinavian, Icelandic, Norwegian, Danish, Swedish.
2. *Celtic.*	Cambrian, Welsh, *Cornish*, Breton, Gadhelic, Irish, Gaelic, Manx.
3. *Italic.*	Old Italian Dialects— *Oscan, Umbrian, Sabine.* Romance (from Latin) —Italian, French, Spanish, Portuguese.
4. *Hellenic.*	Ancient Greek—*Attic, Doric, Ionic* and *Æolic* dialects. Modern Greek or Romaic.
5. *Sclavonic.*	Russian, Bulgarian, Polish, Servian, Bohemian, etc.
6. *Lettic.*	Old Prussian, Livonian and Lithuanian.

B. Asiatic Division.

7. *Indian.* { Sanskrit, Cingalese, Hindu, Gypsy.

8. *Iranian.* { Zend Cuneiform, Persian.

III.

We have twenty six signs in the alphabet, but as *c*, *j*, *x*, *w*, and *y* are redundant we have only signs for twenty-one sounds. There are forty-two elementary sounds in one language hence we should have forty-two signs.

These sounds, classified, are the following 12 simple vowel sounds :

4 of *a*—fall, father, fate, fat.
2 of *e*—led, feel.
1 of *i*—tin.
3 of *o*—not, note, cool.
5 of *u*—full, but.

2 semi-vowels—w (wet) and y (yet).

4 liquids—l, m, n, r.

16 mutes and semi-mutes—p, v ; f v ; t, d ; th (thin), th (thine ; k, g ; s, z ; sh, z (azure) ; ch. j.

4 others—r in work
ng in song
h in hot
wh in why.

4 Diphthongs—ou in house; eu in feud; i in pine, and oi in voice.

Total, 42.

IV.

Like most alphabets ours came originally from the old Phœnician, and that probably from a more remote system of hieroglyphics. But we get it through different channels which partly accounts for our eccentricity in spelling. These channels are Hebrew, Greek, Latin, Anglo-Saxon, French, all substantially one but differing in the signs for sounds peculiar to each. Thus *Greek* omitted *ts*, f, and ch, but add five new ones.

The *Latin* borrowed it from the Greek and omitted x, z, o and k, but afterwards added z and placed it last.

The *French* is Latin.

The Anglo-Saxon resembled the Greek in sound but the signs were taken from Latin with omissions and additions, j, q and z are left out, *c* was hard, *cc*=ch and g=y.

Old English as to its sounds is taken from the Anglo-Saxon, but as to its signs from Norman French, *i.e.*, Latin.

The *order* of the alphabet in all the languages is the same, hence they are sometimes called the *abcdonian* alphabets in contradistinction to the Runic alphabet which from its order is called the *Futhork*.

The following has been suggested as the reason for the order of our alphabet, viz : The alphabet consisted originally of sixteen letters, and of these a, e, o were the chief vowels each of which was followed by a labial, palatal and lingual, thus :

Vowel.	Labial.	Palatal.	Lingual.
A	B	C	D
E	F	G or H	D h
(I	L	M	N)
O	P	K	T.

V.

The definitions of the different parts of speech are given with sufficient accuracy by most of our text books on grammar. In giving a definition we should see that we indicate the chief function of the particular part of speech by a sufficient number of particulars to separate it from any other part.

The articles (for there are two of them) could not be made into one separate part of speech, for they perform essentially different duties, but as the functions of both come within the province of the adjective there is no need to consider them as anything else than adjectives, *an* as a quantitive adjective (it is really the word *one*), and *the* as a distinctive adjective, being demonstrative in meaning and origin.

VI.

This may be got from any book, but in making a classification we should endeavor to be logical and exhaustive.

VII.

In Anglo-Saxon nouns were com-

pletely inflected for gender, number and case. There were, however, three or four different deductions which in Chaucer's time were reduced to one, with some irregular forms.

(*a*) Of the case endings the ablative disappeared first ; in the Old English only the accusative was left which disappears in Middle English. The genitive singular, however, has remained yet and is extended to the plural, and is the only remnant of case inflection in the noun.

(*b*) The inflections for number were *an* and *as*, which were in Old English used indiscriminately, and finally *as* was changed to *es* or s, and owing to French influence superseded the other, of which, however, we have a few isolated remnants as irregular forms, as oxen, men, etc.

(*c*) Gender was marked by characteristic endings in all the cases and was grammatical gender. In Old English gender followed sex ; *ster* and *en*, the old feminine inflections, have been dropped, while we have borrowed *ess* from the French, but we most frequently use composition.

VIII.

Ye and *you*. Formerly *ye* was the nominative and *you* an inflection of it used in the accusative or objective. Subsequently they were used indiscriminately, and at present *ye* has followed *thou* into desuetude. It is, however, used in solemn style and poetry for the veneration and quaintness associated with it as an old form of speech. It is mostly plural and in the nominative of address, but poets, especially Scotch poets, use it in the singular. *You* is now used for the nominative or objective, the singular or the plural. Its use is also one of our modes of supplying the want of an indefinite personal pronoun. *Her* is etymologically the genitive and dative of the old feminine pronoun *heo*, which has been 'supplanted by *seo*, *i. e.*, she, and as the

dative of the pronoun supplanted the objective *her* is now used as the objective. A remarkable circumstance about our English personal pronoun is that the genitive cases have all become adjectives, thus changing their part of speech and leaving the pronoun without an inflection for that case ; *her* has, of course, followed this transition and when used as a noun is a possessive adjective *Its.* The remarkable feature of this word is that, while a pronoun it has the inflection of a noun. The cause of this is that it is a modern inflection used to supply the place of the old neuter use of *his.* The difficulty of distinguishing this old *his* from the masculine *his* led to various expedients "thereof" being often used, then *it* without any inflection and finally *its* was used, coming into general use in the seventh century. In the old editions of the Bible *its* does not occur, and in the present edition it occurs only once, and that is a supposed printer's emendation. It occurs in Levit. xxv. 5.

This, historically, was the neuter of the old demonstrative *thes, theos, this*, which corresponded to the Latin *hic, haec, hoc.* *That* was the neuter of *se, seo, thaet*, which corresponded to Latin *is, ea, id.* They retain their old meaning yet, generally speaking, *that* being used more often in a general sense and to refer to something distant, while *this* is more definite and refers to something near the hand. *That* has the neutral inflection "t."

Which is a compound of the old relative pronoun *hwa* and *lic* (like). It is really an adjective and hence is often used as such yet. In the Bible it occurs preceded by the article *the*, an idiom derived from its objective use.

IX.

The regular form of comparison in adjectives is *er* for the comparative and *est* for the superlative. *Or* and *ost* were also formerly used but mostly are

now confined to adverbs. The superlative is usually formed by inflection from the comparative or by prefixing, the article as in French. When inflexion is used, as in English, it is usually thought to be a corruption of the article appended to the comparative; thus *est* consists of *es* with an added *t*, which may be a remnant of the article *the*, while *es* is etymologically the same as *er* of the comparative, the *es* being the old form which was changed into *er* in the comparative for euphony, r and s being interchangeable letters. Now this fact that the comparative formerly ended in *es* gives us the *irregular comparison* in *es*, occurring in only two words, " *less* " a contraction for *litess* the old comparative of an old word *lit*, of which little is a derivation, and " *worse* " the comparative of an old word *weor*.

(To be completed in next No.)

LONDON UNIVERSITY.—MATRICULATION EXAMINATION, JUNE, 1880.

ARITHMETIC AND ALGEBRA.

1. Multiply together 0.001234 and 0.07890; divide the product by 34.56 and extract the square root of the quotient, giving the result to three significant figures.

2. Assume that 6 men can do as much work in an hour as 7 women, and 8 women as much as 11 boys, and that 5 men can do a certain piece of work in 10 hours. How long will it take 1 man, 2 women, and 3 boys together to do the same piece of work? Express the result decimally.

3. A plot of land is sold at £1,200 per acre. What is the price in francs per square metre? [Assume £1=25 francs, a metre=$39\frac{2}{3}$ inches, an acre= 4,840 yards.

4. A reduction of 30 per cent. in the price of eggs would enable a purchaser to obtain 54 more for a guinea. What may the present price be?

5. Find the greatest Common Measure of $x^4+3x^3-7x^2+3x+28$ and $x^3+2x^2-11x+20$. Also find their Least Common Multiple.

6. Expose the fallacy in the following reasoning:— If $x=y$, $y^2=xy$, $x^2-y^2=x^2-xy$; but $x^2-y^2=(x-y)(x+y)$, and $x^2-xy=x(x-y)$; therefore $(x-y)(x+y)=x(x-y)$ and $x+y=x$; hence $2x=x$, therefore $2=1$.

7. Solve the simultaneous equations
$$\left.\begin{array}{l}x+5y+z=19\\3x+3y-3z=32\\4x+8y+17z=52\end{array}\right\}$$

8. What are the rates of wages for clerks, mechanics and laborers, if one clerk, five mechanics, and three laborers receive £12 10s. 0d. a week; five clerks and a single laborer £11 a week; whilst a staff of four clerks, ninety-five mechanics, and fifty-four laborers costs £204 10s. 0d. a week in wages? If you are not able to answer the question, explain why.

9. Find five numbers in arithmetical progression such that their sum is 30 times their common difference, and the square of the third exceeds the product of the first and last by 100.

10. A man manufactures pins. He pays in each year a certain sum for rent, insurance, &c., whatever be the number of pins made, " fixed expenses"; a certain sum per gross of pins in wages; and a certain sum per gross for materials. In a certain year he made and sold £10,000 worth of pins and had a clear profit of £2,000. He calculated that if the rate of wages had been 50 per cent. higher and the price of materials $16\frac{2}{3}$ per cent. higher, but he had sold twice as many pins at the same price, the profit would still have been £2,000; whereas, if he had sold half as many pins at 50 per cent. higher price (viz., £7,500) with the above named increased rate of wages and material, his profit would have been but £1,500. What did he pay for " fixed

" expenses," wages, and materials in that year ?

GEOMETRY.

[Candidates are at liberty to use all intelligible abbreviations in writing out their answers]

1. Two angles of a triangle being supposed equal in magnitude ; show, by any method, that the two sides opposite to them are equal in length.

2. Assuming the preceding property, or otherwise, show that every parallel to the base of an isosceles triangle cuts off equal lengths on the sides measured from the vertex of the triangle.

3. Two sides of a triangle being supposed given in magnitude; show, by any method, that the greater the angle between them the greater the third side.

4. Assuming the preceding property, or otherwise, show that, of the two diagonals of a parallelogram which is not a rectangle, the greater connects the two acute and the lesser the two obtuse angles of the figure.

5. Two chords of a circle being supposed to bisect each other, show by any method that they intersect at the centre of the circle.

6. Assuming the preceding property, or otherwise, show that, of every parallelogram inscribed to a circle, the two diagonals intersect at the centre of the circle.

7. Two chords of a circle being supposed to subtend equal angles at any point on the circumference of a circle; show, by any method, that they are equal in length.

8. Assuming the preceding property, or otherwise, show that, of a quadrilateral inscribed in a circle, when two of the opposite sides are parallel, the remaining two are equal.

9. Three points on the circumference of a circle being supposed to determine an isoceles triangle inscribed to the circle; show, by any method, that the three tangents at them determine an isosceles triangle circumscribed to the circle.

10. The two isosceles triangles in the preceding question being supposed to have equal vertical angles ; show, by any method, that they are both equilateral.

11. A rectilinear segment of any length being supposed divided equally and unequally; show, by any method, that the rectangle under the equal parts exceeds the rectangle under the unequal parts by the square of the interval between the points of section.

12. Assuming the preceding property, or otherwise, show how to divide a rectilinear segment of any length into two parts the rectangle under which shall be equal to three-fourths of the square of half the segment.

NATURAL PHILOSOPHY.

[Not more than *eight* questions are to be answered, of which at least *two* must be selected from section A.]

A

1. State your reason for regarding a pound as a unit of mass and not of force. What is the most convenient unit of force when a foot, a pound, and a second are units of length, mass and time respectively.

2. State the conditions necessary for the equilibrium of a body free to move in one plane. To what do these conditions reduce when one point in the body is fixed ?

3. A solid right circular cone of homogeneous iron is 64 inches in height, and its mass is 8,192 lbs. The cone is cut by a plane perpendicular to the axis so that the mass of the small cone removed is 686 lbs. Find the height of the centre of gravity of the truncated portion remaining above the base of the cone.

4. A heavy body starting from rest slides down a smooth plane inclined 30° to the horizon How many seconds will it occupy in sliding 240 feet down the plane, and what will be its velocity after traversing this distance ? $[g = 32.]$

5. What is the "kinetic energy" of a moving mechanical system? A shot of 1,000 lbs. moving at 1,600 feet per second strikes a fixed target. How far will the shot penetrate the target exerting upon it an average pressure equal to the weight of 12,000 tons?

B

6. What do you understand by the pressure of fluid *at a point?* A cylindrical bucket 10 inches in diameter and one foot high is half filled with water. A half-hundredweight of iron is suspended by a thin string, and held so as to be completely immersed in water, without touching the bottom of the bucket. Subsequently the string is removed and the iron allowed to rest on the bottom of the bucket By how much will the pressure on the bottom be increased in each case by the presence of the iron? [A cubic foot of iron contains 440 lbs. and a cubic foot of water $62\frac{1}{2}$ lbs.]

7. Two vertical cylindrical vessels. A and B, are connected at the bottom by a very narrow tube, and stand on a horizontal table. The diameter of A is 6 inches, that of B is 4 inches. A liquid of specific gravity 1.4 fills the cylinders to a height of 6 inches above the base, when an equal volume of water is poured carefully on the top of the liquid in A Where will the common surface of the liquids be when equilibrium has been restored?

8. The length of a barometer tube is 80 inches, its diameter is $\frac{1}{2}$ inch except for one inch of its length, where a cylindrical bulb is inserted so as to increase the diameter of the tube to 3 inches. The bottom of the bulb is 27 inches above the mercury in the tank. The lower portion of the bulb and of the tube below contains mercury, the upper part of the bulb and tube contains water. If the mercurial barometer rise .5 inch, through what distance will the upper surface of the water move, the specific gravity of mercury being 13.67?

9. A diving-bell is lowered into water at a uniform rate, and air is supplied by a force-pump so as to just keep the bell full without allowing any to escape. How must the quantity (*i. e.* mass) of air supplied per second be varied as the bell descends?

10. State the laws of refraction of light.

Explain clearly by aid of a diagram why the bottom of a lake appears nearer to the surface than it really is?

11. What is the focal length of a lens?

A circle an inch in diameter, a convex lens whose focal length is 6 inches, and a second lens whose focal length is 10 inches are placed so as to have a common axis. The distance from the circle to the first lens is 20 inches and from the first lens to the second 36 inches. What images of the circle will be formed, where will they be situated, and what will be their dimensions?

12 Explain the formation of images by means of a concave spherical mirror. How would you determine the focal length of such a mirror?

13. Define the latent heat of fusion of a substance.

The latent heat of fusion of ice is 79.5. Its specific gravity is ·917. Ten grammes of metal at 100° C. are immersed in a mixture of ice and water, and the volume of the mixture is found to be reduced by 125 cubic millimetres, without change of temperature. Find the specific heat of the metal.

14. What is the Dew-Point?

Explain why two volumes of air at different temperatures neither of which is saturated with aqueous vapour, may, when mixed, produce a cloud.

15. How would you compare the thermal conductivities of brass and copper?

Two equal cylinders, one of iron and the other of bismuth, are covered with wax and simultaneously placed on

end on a hot metal plate. At first the melting of the wax advances most rapidly on the bismuth bar, but when it has melted about an inch up the cylinder the iron overtakes the bismuth, and then the melting advances the more rapidly on the iron bar. Account for these phenomena.

16 Describe an experiment which shows that the absorbing power of a surface is proportional to its radiating power for the same rays.

How do you account for the apparent radiation of cold?

SECOND CLASS AND INTERMEDIATE.—ALGEBRA.

July, 1880.

1. Find the value of $x^5+x^4-166x^3-166x^2+81x+81$ when $x=-7$; and the value of $x^3-3px^2+(3p^2+q)x-py$ when $x=a+p$. (Arrange the latter result according to powers of a.) Value, 4+5.

2. What is the condition that $x+b$ shall be a factor of ax^2+bx+c? Value, 4.

Find the factors of

(a). $(a^2-ab)+2(b^2-ab)+3(a^2-b^2)+4(a-b)^2$ and (b). $(ax+b)(bx+c)(cx+a)-(ax+c)(bx+a)(cx+b)$. Value, 13.

3. What must be the relation among a, b, c, that ax^2+bx+c may be a perfect square? Value, 4.

(a). Extract the square root of $(a-b)^4-4(a^2+b^2)(a-b)^2+4(a^4+b^4)+8a^2b^2$. Value, 5.

(b). If 5 be subtracted from the sum of the squares of any four consecutive numbers, the remainder will be a perfect square. (Prove this.) Value, 8.

4. If $\dfrac{a}{b}=\dfrac{c}{d}=\dfrac{e}{f}$ and $\dfrac{h}{k}=\dfrac{l}{m}=\dfrac{n}{p}$ prove that

$$\frac{(a+c+e)(h+l+m)}{(b+d+f)(k+m+p)}=\frac{ah+cl+em}{bk+dm+fp}$$

Value, 5.

(a). Reduce $\dfrac{ab(x^2-y^2)+xy(a^2-b^2)}{ab(x^2+y^2)+xy(a^2+b^2)}$ to its lowest terms. Value, 5.

(b). If $xy+yz+zx=1$ prove that

$$\frac{x}{1-x^2}+\frac{y}{1-y^2}+\frac{z}{1-z^2}=\frac{4xyz}{(1-x^2)(1-y^2)(1-z^2)}$$

Value, 8.

5. Prove that

(a). $\dfrac{2[x+2+\sqrt{(x^2-4)}]}{x+2-\sqrt{(x^2-4)}}=x+\sqrt{(x^2-4)}$.

Value, 5.

(b). $(b+c-a)a^{\frac{3}{2}}+(c+a-b)b^{\frac{3}{2}}+(a+b-c)c^{\frac{3}{2}}=(a+b+c)(a^{\frac{1}{2}}+b^{\frac{1}{2}}+c^{\frac{1}{2}})-2(a^{\frac{3}{2}}+b^{\frac{3}{2}}+c^{\frac{3}{2}})$

Value 5.

6. Solve the equations—

(a). $(b-c)(x-a)^3+(c-a)(x-b)^3+(a-b)(x-c)^3=0$. Value 5.

(b). $x+y=4xy$; $y+z=2yz$; $z+x=3zx$. Value 8.

(c). $x+y+z=0$.
$ax+by+cz=0$.
$bcx+cay+abz+(a-b)(b-c)(c-a)=0$. Value 8.

(d). $\dfrac{x-1}{x-3}+\dfrac{x-3}{x-1}+2=0$. Value 8.

SOLUTIONS TO ALGEBRA PAPER.

1. Divide the *ex.* by $x+7$ by Horner's method, the rem. viz: (-02997) is the Ans.

Divide the *ex.* by $x-(a+p)$ by Horner's method, the rem. viz: $-a^3+aq-p^3$, is the Ans.

1. Divide x^2+bx+c by $x+b$ by Horner's method, then the rem. ab^2-b^2+c must $=$ zero.

(a). $(a-b)(8a-3b)$

(b). $x(x-1)(a-b)(b-c)(c-a)$

3. $b^2 = 4ac$

(a). The ex is $= (a-b)^4 - 4(a^2+b^2)$ $(a-b)^2+4(a^2+b^2)^2$

∴ its sq. rt. is $(a-b)^2-2(a^2+b^2)$ *i. e.* $-(a+b)^2$

(b). Take $x-1, x, x+1, x+2$ as Nos., then the sum of their sqs is $4x^2+4x+6$ and subtracting 5 from this we have $4x^2+4x+1$ $=(2x+1)^2$

4. Let $\dfrac{a}{b} = \dfrac{c}{d} = \dfrac{e}{f} = x$ and $\dfrac{h}{k} = \dfrac{l}{m} =$ $\dfrac{n}{p} = y$

Then $\dfrac{(a+c+e)(h+l+n)}{(b+d+f)(k+m+p)} = xy$

And $\dfrac{ah+cl+en}{bk+dm+fp} = xy$ &c.

(a). $ex. = \dfrac{ax-by}{ax+by}$

(b). Clear of fractions, then $(x+y+z)-$
$\left\{ \begin{array}{c} x+(xy+xz+yz)+y(xy+xz+yz) \\ +z(xy+xz+yz) \end{array} \right\}$
$+3xyz+xyz(xy+yz+xz)=4xyz$

i. e. $4xyz = 4xyz$.

5. (a) Divide left hand side of $=n$ by $\sqrt{x+2}$ and rationalize the denominator of the resulting fraction.

(b). Adding and subtracting $a^{\frac{2}{3}} + b^{\frac{2}{3}} + c^{\frac{2}{3}}$ to the left hand side of the $=n$ it becomes

$a^{\frac{1}{2}}(b+c+a) + b^{\frac{1}{2}}(b+c+a) + c^{\frac{1}{2}}(a+b)+c) -$
$2(a^{\frac{3}{2}} + b^{\frac{3}{2}} + c^{\frac{3}{2}}) =$ &c., &c.

6. (a) Multiplying out, the coefs. of x^3 and x^2 vanish and $x = \frac{1}{3}(a+b+c)$

(b) Find the value of x from first of these $=ns$ in terms of y and from the last in terms of z. Equate these values and we find that $z = 3y$. Substitute this in second $= n$ and $y = 0$ or $\frac{2}{3}$ and $x = 0$ or $\frac{2}{3}$.

(c) Multiply the first $= n$ by a and subtract the second from the result. From this result $nd = n$ (1) we find the value of x and y in

terms of z. Substitute these values in 3rd $= n$ and we have $z = a - b$ from this $x=b-c$ and $y = c - a$

(d) Divide each of the fractions $\dfrac{x-1}{x+3}$ &c.

out and we have $\dfrac{1}{x+1} + \dfrac{1}{x+3} - 1 = 0$

from which $x = -1 + \sqrt{2}$

ARITHMETIC—VALUES—EACH TEN MARKS.

1. The G. C. M. of two numbers is 9187, and their L. C. M. is 634938944494; one of the numbers is 68590142, find the other.

2. (1) Divide 159.982 by .0009840018 to 7 places of decimals.

(2) Reduce $\dfrac{61}{4649}$ to a periodic decimal.

(3) Reduce .7002457 to a vulgar fraction.

3. There is a rectangular garden whose length is to its breadth as 6 to 5 ; running round it outside is a gravelled path 3 yards wide ; this path cost at 18¾ cents per square yard $127.25. Find the dimensions of the garden.

4. Simplify $\dfrac{2\sqrt{80}}{3\sqrt{108}} \times \dfrac{7\sqrt{192}}{5\sqrt{126}} \cdot \dfrac{4\sqrt{15}}{15\sqrt{21}}$

Find the mean proportional between 3402 and 15172 ; and extract the square root of .000097199881.

5. The oxygen of the air is 3 parts (by volume) in 14 of the whole ; 100 cubic inches of air weigh 31 grains, and the weight of oxygen is to that of air as 53:48. Find the number of grains of oxygen in a cubic foot of air.

6. A, B, and C do a piece of work; it would have taken A 2½ times as long as B and C together, and B 3½ times as long as A and C together. If they receive $240.40 for the work, how much should each man receive ?

7. Assuming that 90 cubic inches of lead, together with 81 cubic inches of cork, are equal in weight to 2308 cubic inches of pine, and that the weight of equal bulks of lead and pine are represented by the numbers 226.48, and 9 respectively; determine the proportionate weight of an equal bulk of cork.

8. A merchant in Toronto owes £560 stg. in London, and remits as follows: first to Paris at 5 francs 60 centimes per $1 ; thence to Hamburg at 2 francs per marc ; thence to Amsterdam at $17\frac{1}{2}$ stivers per marc; hence to London at 224 stivers per £1. If the expense of this circuitous exchange be 2 per cent. (*i.e.* of $102 paid by the merchant $2 is lost in commission), find what it costs to discharge the London debt.

9. I had two notes whose aggregate face value was $761.70, and each of which had 15 months to run; one of the notes was discounted at 10 per cent. bank discount, and the other at 10 per cent. *true* discount, and the total amount realized was $671.50. Find the face of the note on which *true* discount was allowed.

10. A cylindrical silver wire, .0015 millimetre in diameter, weighs 3.2875 grammes ; it is to be covered with a layer of gold .0002 millimetre in thickness. Required the weight of the gold, the specific gravity of silver being 10.47, and that of gold 19.26.

SOLUTIONS IN ARITHMETIC.

Since the prod. of the two Nos. divided by their G. C. M. is=their L. C. M., hence the product of the two Nos. is=their L. C. M. multiplied by their G. C. M. *i. e.* to

$634938944494 \times 9187 = 5833184083066378$

and since one of the Nos. is 68590142, the other is this product divided by 68590142 ∴ the other is=85044059.

2. (1) 162583.0359253

(2) .0131211

(3) $.7002457 = \dfrac{700245}{999999} = \dfrac{285}{407}$

3. The No. of square yards in path is $678\frac{2}{3}$. Let ABCP denote the garden and let the path be formed outside of it and let DGHM denote the large rectangle, let AP be pro. to meet DG and MH in E and L, and let BC meet these sides in F and K. Now the area of the path is=twice D L and twice PK, ∴ the length of twice D M + twice L K is $678\frac{2}{3} \div 3 = 229\frac{2}{3}$. But the length of twice D M is=to twice AP + four times D L =twice A D+12 yds, ∴ twice A D+twice

D C + 12 yds = $226\frac{2}{9}$ yds., ∴ A D + D C=$107\frac{1}{9}$ yds., ∴ A D=$58\frac{14}{33}$, D C=$48\frac{68}{99}$ yds.

4. (1) $4\frac{2}{3}$. (2) The mean proportional between the two Nos. is the sq. rt. of their product = 7184.3 + . (3) sq. rt. = .009859.

5. The No. of cub. ins. of O. in a cub. ft. of air is $\frac{3}{14}$ of $1728 = 370\frac{2}{7}$, and 100 cub. in. of O weigh $\frac{52}{48}$ of 31 grs., ∴ $370\frac{2}{7}$ grs. weigh $\frac{53}{48}$ of $\frac{31}{100} \times 370\frac{2}{7} = 126\frac{281}{350}$ grs.

6. A does whole work while B an C do $2\frac{1}{2}$ times work.

∴ A does whole work while A, B and C do $3\frac{1}{2}$ times work.

∴ A does $\frac{2}{7}$ of the work that A, B and C do, and ∴ gets $\frac{2}{7}$ of money.

B does whole work while A and C do $3\frac{1}{2}$ times work.

∴ B does whole work while A and B and C do $4\frac{1}{2}$ times work.

∴ B does $\frac{2}{9}$ of the work that A, B and C do, and ∴ gets $\frac{2}{9}$ of money.

7. The wt. of 90 cub. ins. of lead=wt. of $90 \times \frac{226.48}{9}$ cub. ins. of pine, ∴ 2264.8 cub. ins. of pine+81 cub. ins. of cork=wt. or 2308 cub. ins. of pine, ∴ 81 cub. ins. of cork=43.2 cub. ins. of pine. ∴ wt. of pine : wt. of an equal bulk of cork as 9 : $4\frac{4}{5}$, ∴ $4\frac{4}{5}$ is the wt. of an equal bulk of cork.

8. $\$1 = \frac{28}{5}\pounds \times \frac{25}{4} \times \frac{1}{24} = \pounds\frac{7}{32}$

∴ £500 = $2560, and since he pays 2 per cent. com. the whole sum = $2560 \times \frac{102}{100} = $2611.20.

9. The present worth of $1 at true discount for 15 mos. is $\$\frac{100}{112\frac{1}{2}} = \$\frac{8}{9}$ and the p. w. of $1 at bank discount is $\frac{87\frac{1}{2}}{100} = \$\frac{7}{8}$, ∴ $\frac{8}{9}$ of one note + $\frac{7}{8}$ of the other=$671.50. ∴ $\frac{1}{9}$ of one note + $\frac{1}{8}$ of other=$90.20, ∴ $\frac{8}{9}$ of one note+ other note=$721.60, ∴ $\frac{1}{9}$ of one note= $761.70−$721.60=$40.10, ∴ note on which true discount is charged=$360.90.

10. In this ex. we have to assume that 1000 cub. millis. of water weigh 1 gram.

∴ 3.2875 grams. of water occupy 3287.5 millis.

∴ 3.2875 grams of silver occupy $\frac{3.2875}{10.47}$ cub. millis.=313.9923 cub. millis.

The area of top of cylinder=$(.0015)^2 \times \frac{22}{7} \times \frac{1}{4}$

The area of top of " with gold outside=$(.0017)^2 \times \frac{22}{7} \times \frac{1}{4}$

∴ the area of cylinder with gold outside= $(\frac{.0017}{.0015})^2 \times 313.9923 = \frac{289}{225} \times 313.9923$, ∴ area of gold on outside=$\frac{64}{225} \times 313.9923$ millis. and its wt.=.01926 × 313.9923 × $\frac{64}{225}$ = 1.720175+grams.

HISTORY—VALUES—TEN MARKS EACH.

1. Tell what you know about the settlement of the Danes in England, and state what traces of that settlement still exist.

2. What were the causes, and what the results of the Peasant Insurrection of 1381 ?

3. What was the nature of the claim of Henry V. to the crown of France, and what was the issue of the claim ?

4. Give some account of " monopolies," the " Habeas Corpus Act," the trial of Charles I., the Accession of William III.

5. Write a concise sketch of the reign of George III., with reference to (1) domestic politics, (2) foreign wars, (3) literature.

6. Write an explanatory note on this passage from the text book : "From the twelfth century to the reign of Edward III., we may reckon three written languages in use in England."

7. When did the confederation of the Canadian Provinces take place, and what led to it?

8. What is the difference between a federal and a legislative union? When, and to what extent did the latter exist in Canada ?

9. State the causes and the results of the third Punic war?

10. Account for the great powers possessed by the Roman Emperor Augustus.

ENGLISH GRAMMAR.

⁎ The value follows each question, M., is for the matter of the answer; the value under F., is for its literary form.

1.

" In vain,
Opinions, those or these,
Unaltered to retain
The obstinate mind decrees ;
Experience, like a sea, soaks, all-effacing in.

—Who lists
May what is false hold dear.
And for himself make mists
Through which to see less clear ;
The world is what it is, for all our dust and din."
—*Mathew Arnold—Empedocles on Ætna.*

(i.) Parse the words in the second and fifth lines.—M. 7, F. 1.

(ii) Analyze fully the second stanza.—M. 6, F. 1.

(iii.) State the meaning in other words.— M. 5, F. 5.

2. Correct anything which is wrong in the following sentences, giving your reason in each case:—

" She wrote, among other poems, a spirited defence of her sex, in answer to Pope's Character of Women, which Duncomb praises in his Feminead."

" It is surprising how great part of life is made up of trifles."

" Religion is surely to be taught, but what of it is to be taught, and how?"

" The way and manner of doing it is certainly, as it seems to me, very evident and plain and easy to be understood and comprehended."

" The English hate frogs; but the French love frogs, and hate the English, and cut off their hind legs, and consider them a great delicacy."

" Hear what the senior professor of the Dublin Normal says of it."

" This being comparatively slow and opposite of flashy, has not obtained the reward given to the charlatan." M. 14. F. 7.

3. Point out the ambiguity in each of the following sentences:

" They have no more control over him than others."

" Rich or poor, you have always been to me a true friend."

" His presence was against him."

" A man who has lost his eye-sight has in one sense less consciousness than he had before."

" The connexion between words and ideas

is arbitrary and conventional, owing to the agreement of men among themselves."—M. 10, F. 5.

4. Punctuate the following sentence in two ways :

" Richard Green Parks says James Russell Lowell is a great genius."—M. 2.

5. Accentuate *vehemently, vagary, laboratory.*—M. 3.

6. Parse the italicized words in the following sentences :

They were all rescued *to* a man.

I *had rather be a doorkeeper* in the house of the Lord *than dwell* in the tents of wickedness.

These documents prove my title *good.*

He falls, like Lucifer, never *to hope* again.

Music hath charms *to soothe* the savage breast.

Once upon a time there lived a prince.—M. 12, F. 1.

7. Explain what you mean by inflection. Give examples of all the inflections of the language.—M. 10, F. 5.

8. State which of the following expressions are correct, giving your reasons :

The (passing or passage) of the bill.

I differ (from or with) you.

The honor (bestowed or conferred) on me.

Such expressions sound (harsh or harshly.)

(Whom or who) do you say that I am.

It is a long time since I (have been or was) devoted to your interests.

As two (is or are) to four, so (is or are) four to eight.

It is better to fall among vultures than flatterers, for (those or these) devour only the dead, (those or these) the living.

Less than a million tons (are or is) produced in a year.

The temper, as well as the knowledge of a modern historian (require or requires) a more sober and accurate style.

In reality more than one principle (has or have) been contended for.

The following is the mode of (proceeding or procedure) in such a case.—M. 24, F. 12.

9. What is the difference in meaning between

A king of France and a French king,

A serial story " a serious story,

Politic " political,

Practical " practicable,

An age of faith " an age of credit,

The silent man " the taciturn man,

Ingenious " ingenuous,

Conciliate " reconcile? M.16.F.8.

10. Criticize the following definition :

A verb is a word which may be used as the predicate in a sentence without a copula. M. 8, F, 5.

11. Give the roots of altitude, city, recluse, deign, hypothesis, autocrat, phrase, school, boon, call, chain, chief.—M. 12, F. 1.

ENGLISH LITERATURE.

1. What are the distinguishing features of the school of Pope ? What characteristics have Gray and Goldsmith in common with it ? and in what does each differ from it ? Value, 14.

2. "Hence every state to one loved blessing prone,
Conforms and models life to that alone,
Each to the favorite happiness attends,
And spurns the plan that aims at other ends?
Till carried to excess in each domain,
This favorite good begets peculiar pain."
—*The Traveller, ll.* 93-98

(i.) State, quoting the words of Goldsmith, if you can, ' the favorite good ' and the 'peculiar pain ' of each of the nations to whose cases he refers in support of his argument. Value, 14.

(ii.) Show to what extent the subsequent history of each of these nations bears out his views. Value, 8.

(iii.) Explain the meaning of ' domain.' Value, 1.

3. " But all the gentler morals, such as play
Through life's more cultured walks, and charm the way."
—*The Traveller, ll.* 235 and 236.

Explain fully what is meant by ' the gentler morals.' Value, 2.

4. What were Goldsmith's views as to the dangers to which freedom and good government where exposed in England when the *Traveller* was written ? Explain these views by referring to the history of the time. Value,

14.

5. "For just experience tells, in every soil,
That those who think must govern those that toil;
And all that freedom's highest aims can reach
Is but to lay proportioned loads on each,
Hence, should one order disproportioned grow
Its double weight must ruin all below."
—*The Traveller, ll.* 371-376.

(i.) Write out the lines following this extract that indicate the ' order ' which, in Goldsmith's opinion, was growing too powerful. Value, 3.

(ii.) *Those who think must govern those that toil.* On this Mr. Sankey remarks : " So far from ' just experience' teaching this, no nation has ever been governed by its thinkers." Mr. Stevens says : ·· Those who toil at manual labor have, as a rule, neither the time nor the learning requisite for the study of political or social economy."

Criticize these comments and state clearly what you consider to be Goldsmith's meaning. Value, 2.

6. Write out in full the stanzas of Gray's Elegy in which the following words occur :

' Cromwell.'

· The genial current of the soul.'

· E'en in our ashes live their wonted fires.'

· The long drawn aisle and fretted vault.'
Value, 4.

7. For whom to dumb Forgetfulness a prey,
This pleasing anxious being e'er resigned,
Left the warm precincts of the cheerful day,
Nor cast one longing lingering look behind?"

(i.) In what different ways may you construe ' prey ' ? Explain the meaning given by each construction   Value, 2.

(ii.) Explain fully the meaning of ' pleasing anxious being, ' precincts,' and ' day.' Value, 3.

GEOGRAPHY.

1. Define Estuary, River-basin, Tropic, Neap-tide, Republic. Value, 5.

2. Explain the cause of Ocean Currents, and give the name and course of three of the most important. Value, 6.

3. Trace the Mississippi River from its source to its mouth, naming the chief tributaries from East and West, the States and chief towns bordering upon its banks, and the principal commercial products for which it affords an outlet. Value, 12.

4. Sketch that part of Europe from the Straits of Dover to the Gulf of Genoa, indicating the rivers, bays, capes, and cities of importance along the coast. Value, 12.

5. Over what railroads, across what intersecting lines of railway, and through what cities and large towns would you pass on a trip from Berlin to Amherstburg? Value, 11.

6. What and where are Ste Maurice, Scugog, Rimouski, Chignecto, Pelee, Shediac, Burrard, Roanoke, Galveston, and the Cyclades. Value, 10.

7. Locate Cape St. Lucas, Havana, Staten Island, Yapura River, Jutland, Valparaso, the Cambrian Hills, Cape Agulhas, Scilly Islands, Table Bay, Warsaw, Baikal, Tonquin, Ormuz, Loo Choo, and Zambizi. Value, 16.

CONTRIBUTORS' DEPARTMENT.

DICTATION IN COMMON SCHOOLS.

To the Editor of the School Magazine:

Sir,—Although the subject of " Dictation in Common Schools " is hardly what might have been expected to have been seen in a periodical published by a Collegiate Institute ; yet, the fact that so large a number of teachers of country and other schools read your valuable magazine, has induced me to offer a few suggestions on this very important subject.

I believe that Dictation is too little used in our schools. The variety of subjects taught to advance

classes renders this difficult in the larger schools; but in the ordinary school of from ·30 to 40, I think it should be made the means of teaching, to no small extent, our very interesting but intricate language.

In considering this, allow me to divide my subject under the following heads:

1. *Dictation is useful as a means of teaching spelling.* In the preface to teachers of Parts 1 and 2 of the First Reader, and also in the Second Book, the Education Department advocates strongly, teaching the younger pupils to spell correctly by making them write *the words to be spelt on their slates.* This system is admirable, and for the following reasons, viz: It teaches them to spell by the *eye*, and not by the *ear*; and it also has this advantage, that each pupil spells the word independently of the others. This causes the pupil to think and not to guess, as would be the case if a word were spelt wrongly by one and passed to another. Dictation eminently carries out this idea.

II. *As a means of teaching the synthesis of sentences.* Though the class may not be far advanced in grammar; though, in fact, they may know nothing about it, yet constantly seeing sentences correctly written and synthetically arranged, cannot but have a beneficial effect apparent to all. It seems to me, that not only would dictation tend to this end, but it *does* almost everything. In teaching grammar this very mode is adopted, and success here as well as in other subjects consists in presenting the subject to the mind of the pupil in as many different ways as possible.

III. *Punctuation.* Correct punctuation is a difficult thing to teach. The mind of the beginner does not easily distinguish the nice differences between the comma, semi-colon, colon, &c. And it is only after long practice that a thorough knowledge of this important part can be obtained. There can surely be no need for proof of this. It is only too apparent in the everyday work of the pupil. Dictation supplies this need (i. e. of practice) fully.

IV. *Writing.* It is a lesson in writing, having a beneficial effect which copy writing has not. The object in teaching writing is to obtain celerity and neatness combined; and while the copy-book is used to teach the proper foundation of letters and the adoption of a particular style, dictation teaches the application of what has been learned from the copy-book.

Other and minor advantages will at once appear to the intelligent teacher. These appear to be the chief ones and I hope they are not unworthy of consideration.

There are more ways than one of giving dictation. For instance, some teachers allow preparation of the passage beforehand. I believe the better way is to dictate a short paragraph of some lesson in the Reader previously studied by the class. If this be done it will serve as a sort of review of the lesson, and the passage dictated is impressed on the mind of the pupil merely by writing.

I think where in any way it can be managed, dictation ought to be given every day. Half an hour is sufficient, and I am convinced that if this plan be adopted, much greater good than has yet been obtained will be accomplished in our schools, teaching the pupil to be careful, quick, neat and exact.

Yours, &c.,

J. O. MILLER.

BOOK NOTICES.

THE LADY OF THE LAKE.

An Annotated Edition for the use of Students and Teachers, by T. C. L. Armstrong, M.A.

When a standard work of English Literature is prescribed for study by our senior pupils it is not intended to serve merely as a text or foundation for lessons on the origin of words, grammatical structure, or other facts or circumstances. These are useful and important in their place, so is the meaning of the author as shown in each word, sentence or work, indeed this is essential to the study of any literary work, but in a mere literary study we are satisfied with understanding, we do not stop to criticise too minutely or to refute. In a school exercise all these objects may be kept in view, and none pursued too far.

It is perhaps true that the literary investigation is least attended to in our English Classes, or at least has been so until recently, and it is for this reason that the present edition of the Lady of the Lake has incorporated a large amount of literary criticism and hints, while containing copious notes and explanations in each of the other departments of an English lesson.

The fact that this book is prescribed for the various teachers' examinations and the university and law matriculations, has afforded the editor an opportunity of thus treating the subject. An English classic poem should be studied as a model of the art on which it is founded, and we apprehend the object of its employment is to create and fasten a taste for literary excellence and to promote refined and noble sentiments. No better book could be selected than the Lady of the Lake.

The author's devotion, honor, chivalry, and high spirit are most likely to inspire a youth with a desire to imitate those noble sentiments, while the book has the interesting plot of a name, the variety of interest, of character and of dialogue that characterize a drama. It moreover abounds in literary beauties which the author has called from the whole domain of literature. It is the object of the present edition, then, to point out these characteristics, to investigate their nature and estimate their merit by a comparison with the canons of literary criticism as laid down by the science of rhetoric. In this object the annotator follows the poem throughout, thus giving an elaborate literary analysis or critique of the poem, pointing out its beauties and blemishes. We imagine this to be the kind of information most needed by the student and most interesting to acquire; a poem studied with the aid of these notes cannot fail to be productive of a lasting improvement on the mind of the student, and after all, the chief object in studying English literature is the development of a healthy imagination and correct literary taste. The book contains many useful notes and suggestions and can be safely recommended to all interested in teaching our language or literature.

It will be seen from an advertisement in another page that Messrs. Warwick & Son have recently published a new hand-book,—The Essentials of Chemistry and Chemical Physics, by the Science Master of the Brantford Coll. Institute. This little work is essentially a student's hand-

book, compressing much valuable information on the subjects treated of into small space.

·Besides more than usually ample technical information on the special chemistry of the intermediate examinations, it will be found to contain a large number of definitions of terms, commonly used in connection with chemistry and chemical physics, but which are not explained in the handbooks in general use ; an introduction to qualitative analysis, including test tables for the principal metals, acids and gases, all the intermediate papers in chemistry, with references to the paragraphs where the questions are answered, or special answers when necessary ; and a selection of questions from the papers of first class candidates, with references or special answers.

The object of the work and the method of treating the subject can be best understood through the knowledge that it is compiled by a successful teacher, especially for class work preparatory to the intermediate and similar examinations.

It will be found a very great aid to candidates who have to prepare for examination in chemistry on short notice.

PUBLIC SCHOOL DEPARTMENT.

PROMOTION EXAMINATIONS.

Still the good work of equalizing the promotions in the Public Schools goes on, and several of the western counties have adopted a uniform system of examination and promotion from class to class. We are indebted to J. S. Carson, Esq., inspector of West Middlesex, for the set of papers used in the schools under his supervision at the mid-summer examination. In his instructions to the teachers of his inspectorate, Mr. Carson says :—

"Make all necessary arrangements for the promotion examination which will commence on Tuesday, June 29th, at 9 a. m. Endeavor to gather in the pupils out of school doing spring work for a preparatory drill. Place on your desk paper, pens, ink, slates, pencils, &c., for the candidates, also, a list of names and the class they propose entering. Give the package of questions unopened to some responsible person, who will hand it to the presiding examiner on the morning of the 29th instant. On your register mark the same attendance for Tuesday and Wednesday you had on Monday.

" *Change schools with a teacher of your own choice ;* have a trustee, if possible, to preside with him. Be kind and considerate with the children ; allow no copying ; give no explanation leading to the answer of a question. Read the answers of the school where you are presiding examiner. Send one copy of results to the Inspector, and another to the teacher whose pupils you examine. Retain answers, so that in case of appeal they may be forwarded to the Inspector. For promotion 30 per cent. on each subject and 50 per cent. of the aggregate, or 65 per cent. of the total marks obtainable. Promptly record promotions on the general register. If requested by the teachers, a handsome certificate, signed by the Inspector and presiding examiner, will be prepared for those who pass.

" I rely with confidence on the honor of

my teachers to faithfully carry out the provisions of this examination in a manner reflecting credit on themselves and the Inspectoral Division.

"The concurrent testimony of the teachers admits the necessity of systematic promotions, hence unkind or ungenerous remarks from other sources cannot be regarded sufficient to weaken, much more overthrow, evidence of the practical nature referred to. Duty to your school demands an impartial test, though it may cost an effort, you will be strengthened for the future and have less fear, knowing that the weak or unskilful parts of your teaching, when detected, are easily made strong.

"Experience has shown that pupils may be stimulated to increased action by our method of promotion, while parents hostile to classification can easily be induced to see the merits of honorable and impartial examinations. The following time-table has been prepared with the expectation of avoiding confusion or injustice; it will be adhered to rigidly."

J. S. CARSON.

SPELLING.

From 2nd to 3rd Class.

1. Ned Baffle's uncle.
2. She dreamt she heard them bleating.
3. For fear she'd lay astray. (line of poetry)
4. His wife didn't do a day's work.
5. servant's hall.
6. I'm sure that I love you.
7. I'll, she'll, you'll, they'll he'll, we'll.
8. He will lose what he has.
9. deceive, believe, afraid, made.
10. hymn, him, penny, many.
11. "Here they are, Annie," said Alfred.
12. circle, autumn, quiet, quite.
13. clothes, close, highest, driest.
14. wondrous, ponderous, my, pie.
15. Which I must ne'er enjoy. (line of poetry)
16. cousins, dozens, ascent, consent.
17. O'er the summer's scented clover.
18. Currant, current, blossoms, bottoms.
19. prettily, daintily, combed, roamed.
20. cushion, rushing, Christmas, faults.
21. feather, neither, haven't, again.
22. It grieved the doctors too much.
23. Aaron, grievous, written, bitten.
24. queer stocking, dear stocking.
25. guard chain, cell, coral isle.
26. pony, money, stony, chimney.
27. tyrant, spectacles, stubborn, famous.
28. peeped, reaped, taught, fought.
29. Israel, whom thou hast defied.
30. scissors, ribbon, Miss Lucy, dolly's apron.
31. epitaph, answered, Bertha, paling.
32. ocean, motion, despise, disguise.
33. Exactly the size that one's comfort requires. (line of poetry.)
34. What's the matter, my little man?
35. A knot of people would not do it.
36. boy, buoy, ringing, wringing, to, too, two.
37. anchor, ranker, Saviour, behavior.
38. Then turn to Him 'mid sorrow's wild. (line of poetry)
39. thievish eyes, commotion, colts' manes.
40. demurred, obstacles, axe, acts.
41. succeeded, acceded, fly, die.
42. tongue, rung, wrung, Monday, Sunday.
43. switch, rich, neighbor, labor.
44. The footstool of humility. (line of poetry)
45. thwarting, guidance, befallen, citizens.
46. dying, well-behaved, special.
47. fragrant spices, Sir Richard.
48. The Lord Mayor loyally replied.
49. All his woes were soon forgotten.
50. He saw a monkey grinning.

Pupils number as here. Two marks for each number correctly spelled. One mark, off for any mistake—for instance, 7 counts two, but there may be six mistakes. These destroy three numbers correctly spelled. Dictate slowly and construct easy sentences to show meaning of words. Don't fail to give all necessary explanations.

READING.

Re-write the following and for italicised words use their meanings. Answer any questions asked.

1. He *upset* four or five of them into the *gutter.*
2. She had heard *Aunt* Mary say. Who are your aunts?
3. The dog had to go home without *breakfast* or *dinner.*
4. A *rude* boy came to take the *kid.*

5. I'd *scorn* to intrude on her and her *brood.* Who owned the brood?

6. Don't be *meddlesome* in *future.* Tell the story of meddlesome Matty.

7. They carried up the bricks and mortar. Of what are bricks and mortar made?

8. Two men were *engaged* in painting the *ceiling* of a grand *church.*

9. In a chink near the *cupboard,* with dainties *provided.* Mention some dainties.

10. *Advancing* at once toward the *shore.*

11. His coat and vest were *hastily resumed.* Name the other articles of clothing.

12. *Remembering* like the *fearless* child. What did the child remember?

13. *Jesus* grew up in health and strength. Tell the story of Jesus.

14. Not liking the too great *complaisance* of his master.

15. *Drifting* snows my *tomb prepare.* Why did the children feel glad?

16. Robert, the *coward,* determined to tell his *mother* a *lie.*

17. We still have one true *anchor* left. Why is God an anchor?

18. Willie was soon *cantering* home on his back. How else can a horse go?

19. The *Commandments* were written on tables of stone. Write any two of the Commandments.

20. Let your *motto* be, 'Try again.' Give two or three mottos.

21. That King *borrowed* money of the citizens.

22. Give the meaning of scented, perseverance, epitaph, lamenting.

23. Write two verses from the story of the beggarman.

24. Next morning he was *hungry.* Name four other feelings we all have.

25. What words are opposite in meaning to love, handsome, cold, afraid?

Four for each number.

ARITHMETIC.

1. Multiply 9810759 by 800709 and from the product take the difference between eight hundred thousand and 17, and forty-nine thousand and nine. Value 3+4.

2. How often does 406070736 contain 8056? Do this question, using any two or more factors for divisors. Value 5+5.

3. Divide the product of the largest two of the following by what the sum of the smallest two is less than one hundred thousand : 794869, 43987, 598, 704. Value 16.

4. The product of two numbers is 7855563028131, one of them is 800709; find the other. Value 10.

5. Tell carefully your methods of proving questions in Subtraction, Multiplication, and Long Division. Write the sign of each, and tell what it means. Value 6.

6. A farmer had 79685 bushels of potatoes; in each bushel there were 89 potatoes; how many bags, each holding 389 potatoes, will they fill? Value 5+6.

7. What number added to the sum of all the numbers that exactly contain 9 between 1 and 100 will make one million? Value 4+3.

8. By using factors work the following questions :—

$71930148674301 \div 1728.$ Value 4.
$9876839 \times 72 \div 132.$ " 7.
$867413218613874 \div 51.$ " 6.
$3198637486197 \times 16 \div 96.$ " 6.

9. Divide the product of 49, 96, 132, 169, 42; 1728 by the product of 144, 2, 11, 13, 7, 12. Value 10.

Nothing unless the solutions are both accurate and neat.

SPELLING.

From 3rd to 4th Class.

1. Alfred enjoyed tranquillity.
2. accessible, asylum, cathedral.
3. sceptre, pageantry, benignly.
4. Over the enemy's taffrail they go.
5. England's naval supremacy is indisputable.
6. cottage-wall, Bingen, Rhine, Algiers.
7. It is unintelligible to a foreigner.
8. pernicious, ambitious, Hottentots.
9. ingredients, pungent, unpalatable.
10. solemn, Jerusalem, orphan.
11. Aghast the chieftain stood. (line of poetry.)
12. dormitory, missiles, rebels.
13. The ruler gave a sign of acquiescence.

14. mutinous, sojourn, vigilance.

15. The Ottawas had forgotten to tell him.

16. expedition, militia, enthusiasm.

17. Niagara, adjacent, sovereign.

18. Penobscot, ammunition, garrison.

19. cedar-swamp, sleigh, waistcoat.

20. The schooner collided near Chicago.

21. thermometer, zero, horizon.

22. O Solitude ! where are the charms ?

23. I'm near the gigantic ferns.

24. O'er the aqueduct and bog.   (line of poetry.)

25. His attendants went on imaginary errands.

26. Minnesota, St. Marie, baggage.

27. auction, stretched, specimen.

28. Hon. Arthur Hamilton Gordon.

29. victuals, vigorous, exertion.

30. scorpion, walking-cane, serpent.

31. mandibles, brilliant, Lucien.

32. paroxysm, moose, miniature.

33. bowlful, jelly, 'kerchief.

34. Grimalkin's astonished.

35. This effectually terrifies the wolves.

36. melancholy, rolling, horrified.

17. untamable, discernible, separated.

38. the shrieking murderous roar.

39. He would inevitably seize his proboscis.

40. Lake Ngami, elephants, rhinoceroses.

41. momentarily, succeeded, acceded.

42. Beauty's epitome. (line of poetry.)

43. wainscot, gnaw, jerks.

44. parochial, rummage, kernel.

45. procedure, 'Tis false, braided.

46. Colonel, veterinary, professor.

47. mutilated, pennon, wreathing.

48. vengeance, hazardous, besieged.

49. The dyer lives by dyeing.

50. Bill may pay the bill.

Pupils number as here. Two marks for each number correctly spelled. One mark off for any mistake—for instance, 7 counts two, but there may be six mistakes, These destroy three numbers correctly spelled. Dictate slowly and construct easy sentences to show meaning of words. Don't fail to give all necessary explanations.

READING.

Re-write the following. For italicized words use their meanings.   Answer the questions.

1. The road *gradually* became more *solitary*. What difference between solitary and lonely ?

2. I am *obliged* by your *confidence*. Mention methods of gaining confidence.

3. It cost them a great trial *to solicit charity*. Give a few points in this story.

4. With the *tenacity* of a *drowning* man. Why are drowning men tenacious ?

5. I have heard thee in thy *soliloquies*. Describe the bridge in the " Vision of Mirza."

6 *Wearied* and *faint* she laid herself down. Tell why it was wrong to scold the match girl.

7. They do not *appreciate* their *privileges*. What privileges had John Adams ?

8. When *yielding* to the *difficulties* before him. How was Grace Darling rewarded?

9. The maid *superciliously* tossed up her head. Illustrate " Counting chickens before they are hatched."

10. It was then *determined* to *discover* the cause of this *singular procedure*.

11. *Dumb* creatures never appeared more *grateful*. Name five dumb creatures.

12. *Amiability* is not a *trait* of the rat. By what means would you know an amiable person?

13. He has *finished* his *peregrinations*. How was Robert Bruce encouraged to try again?

14. Pleasure is ever *bought* with pain. Give examples from your own experience.

15. Too highly *civilized* for a *nomadic* life. Draw a beaver's tail.

16. *Hospitality* is esteemed a *principal* virtue. Cite two hospitable acts.

17. *Intelligence received* with *amazement* and *horror*.

18. My *scanty* stock of biscuit was *exhausted*. Name other forms in which we use flour.

19. What words mean the opposite of hatred, idle, rough, opaque.

20. Write any verse of poetry and give the same ideas in prose.

21. Compose sentences showing the use of these words: reiterated, poised, migrate, lenient.

22. Words often sound the same but are diff-

erently spelled. Give four pairs of such.

23. Give the names of three feelings and four actions.

24. 'Tis bound by a thousand bands to my heart. What does this mean?

25. Write eight words, two of one syllable, two with two, two with three, two with four.

Four marks for each number. Writing neat with no crowding of words. Each answer carefully numbered.

ARITHMETIC.

1. A bar of iron one perch long, $\frac{1}{2}$ yard wide and 16 inches deep is melted and made into blocks, each $\frac{1}{27}$ of a cubic yard; how many were there? Value 10.

2. How many square fields of the largest possible size can be made out of a tract of land 527 perches long and 403 perches wide? Find the number of inches in one of them. Value 7+3.

3. Thirty-five hundred pounds of sugar are bought at 8 cents per lb. Avoirdupois, at what rate per lb. Troy must it be sold so as to neither gain nor lose? Value 10.

4. Two men a 150 miles apart are walking in opposite directions at the rate of $4\frac{1}{2}$ and $3\frac{1}{2}$ miles per hour respectively; suppose they walk 12 hours per day, in what time will they be 300 miles apart? Value 10.

5. Find the smallest number that will exactly contain 3007, 3977 and 5917. What is meant by common multiple, by least common multiple? Value 7+2+1.

6. If 5 be added to both terms of the fraction $\frac{4}{9}$, find how much larger or smaller this fraction has become. What two operations can be performed on any fraction without altering its value? Value 8 + 1 + 1

7. Sold $\frac{5}{12}$ of my farm at one time, $\frac{2}{3}$ at another, and the remainder for $360 at $40 per acre; how many acres were then in the farm? Define a fraction. Value 8+2.

8. Bought cherries at 10 cents per quart, and sold them at $3.35 per bushel gained $7½; how many bushels did I buy. Write the table of dry measure. Value 9+1

9. Simplify $19\frac{1}{2}+21\frac{1}{2} - \frac{1}{8}$ of $2\frac{2}{3}+4\frac{1}{7} - \frac{3}{8}$ of $\frac{12}{7}$. When is a fraction in its lowest terms; Value 7+3.

10. Make out the following bill carefully:
4500 lbs. of coal at $3 per ton.
197 " wheat at $1.19 per bushel.
3 oz. of gold at $1.07 per dwt. Value 2+3+4.

GEOGRAPHY.

1. On what continents are Negroes, Indians and Whites found in greatest numbers? Name the remaining continents and the oceans bordering on them. Value 3 + 8.

2. Give a country in which tobacco grows abundantly, tea, oranges, sugar cane, pepper, rice, wheat, cotton, grapes, cocoanuts. Value 10.

3. A boat sails close to Ontario from Point Edward to Montreal, state the counties passed, giving one railroad in each. Value 12 + 12.

4. Name the cities of Ontario. Starting from London visit each, telling the railroads passed over. Value 5+9.

5. "Canada is rich in minerals." In what provinces are the following found: Gold, Copper, Lead, Iron, Silver, Coal, Petroleum, Salt. Value 8.

6. Why is Ontario the most important Province in the Dominion? Name the Provinces and give the number of square miles and capital of each. Value 2+ 14+ 1.

7. State the exact position of the following:
Capes—Chidley, Sable, Flattery, Hurd, Gaspe, Horn, Race, Breton.
Islands—Walpole, Anticosti, Bahama, Jamaica, Bermuda, Iceland, Christian, Navy.
Towns—Kincardine. Windsor, Ingersoll, Dundas, Brighton, Bradford, Madoc, Oshawa.
Bays—Fundy, Fortune, Georgian, Quinte, Long Point, Rond Eau, Pigeon, Burlington. Value 4+4+4+4.

N.B.— The pupils will tabulate as much as possible. One off for each mis-spelt word.

GRAMMAR.

1. Give the past tense, present participle and perfect participle of the following verbs :

swing, mow, grew, rend, rise, eat, dye, die, know, fly. Value, 10.

2. Name the moods, and compose a sentence to illustrate each. Value, 4+4.

3. Write the objective plural of I, he, thou, she, we. Give sentences showing the different ways the nominative may be employed, Value, 5+6.

4. Correct the following sentences:
Him and me seen the bird that flied.
who done it. our town baker.
I saw the men that was there.
Value, 4+6+3.

5. Parse italicized words—
Here are the *children who* played truant.
Mary and Jane's chickens are *all black*.
The man *whom* you *see* shot a *lion*.
John, you are the *boy* who said so.
Value, 6+9+9+6.

6. Compose a notice offering one dollar reward for the recovery of a book you lost. Illustrate by sentences the use of the following points: comma, period, note of interrogation, point of exclamation. Tell after each of the four sentences which you are illustrating
Value 8+8.

7. Divide into subject and predicate.
Where are the pigeons?
In the morning he came to school.
Over the fence he threw the ball.
Value, 4÷4+4.

CANADIAN HISTORY.

1. In what countries are Versailles, Plains of Abraham, Louisbourg, Utrecht, Detroit, Ryswick, St. Malo, Bristol, Florida, Quebec? Value 10.

2. Attach events to the following dates: 1492, 1497, 1506, 1541, 1615, 1629, 1635, 1731, 1763, 1774. Value 10.

3. Sketch carefully the researches made under Frontenac. Dates, if you can. Value 15.

4. Describe fully any two of the Colonial Wars. Be particular about names. Value 15.

5. Give a concise history of the American Revolution. Value 20.

6. Account for the name United Empire Loyalists. Tell all you know about them. Value 20.

7. Write a summary of some of the Indian Wars. Value 10.

One off for each mis-spelt word.

PRACTICAL COMPOSITION.

By JOHN SWETT: *Principal Girls' High School, San Francisco.*

SPECIAL DIRECTIONS FOR PUPILS.

1. Avoid "fine writing."

2. Never use two words where one will fully express your meaning.

3. Avoid long and complicated sentences.

4. Divide into paragraphs and punctuate *as you write.*

5. In correcting your first rough draft, observe the following order:

a. Cross out any *adjectives*, or other words that can be spared.

b. Interline any omitted words, or transpose any words, phrases or clauses to a better position in the sentence.

c. Substitute more exact words whenever by so doing you can make the sentence clearer.

d. Go over your composition very carefully, with reference to 1. Spelling; 2. Capitals; 3. Punctuation; 4. Grammatical correctness; 5. Dot your *i*'s and cross your *t*'s.

6. Copy in a legible hand-writing.

GENERAL PRINCIPLES OF SENTENCE-MAKING.

1. Every sentence must be complete. It must contain at least one principal

subject, and one principal predicate, each of which must either be expressed or clearly implied.

2. Explanatory words, phrases or clauses, must be connected as closely as possible to the words which they explain or modify.

3. In simple sentences, be careful about the position of words and phrases; in complex sentences, about the position of clauses and the use of connectives; and in compound sentences, about the use of conjunctions of the *and* type.

4. When there are several adverbial phrases or clauses in a sentence, they should be distributed over the sentence instead of being crowded together near the close.

5. Avoid writing long complex or compound sentences. It is better for beginners to write short sentences.

6. Use only words whose meaning you fully comprehend.

7. Express simple ideas in plain words.

8. Avoid the use of high-sounding adjectives, and high-flown language.

9. Use only words enough clearly to express your meaning,

THE PARAGRAPH.

A paragraph is a closely connected series of sentences relating to the same subject, or some particular part of a subject. Sentences are built up of words, phrases and clauses; paragraphs are made up of simple, complex or compound sentences ; composition consists of a succession of connected paragraphs.

The art of dividing a piece of composition into paragraphs is best learned by noticing carefully the paragraphing in your readers, histories or other books ; but the following directions may be of use to beginners :

1. In general make a new paragraph whenever you make a new turn of thought.

2. Denote a new paragraph by beginning the sentence a short space to the right of the left hand margin.

3. The sentences included in one paragraph should all relate to the same division of the subject

4. The line of thought should be continued between paragraphs, if necessary, by some such connectives as, *and, but, moreover, however, thus, at the same time,* etc.

THE SCHOOL MAGAZINE.

Each month we send out a number of sample copies to persons who are not subscribers. We wish those receiving them to consider it as an invitation to subscribe. We cannot of course personally ask each individual teacher in the Dominion for his subscription, but we think the "School Magazine" is possessed of sufficient merit to entitle it to the active support of a large majority of the teaching profession. Many of our friends have done nobly for us. To such we tender our hearty thanks. We shall be glad to have their continued influence on our behalf and invite with them the co-operation of all who desire the improvement of the profession.

NOTICE.

Subscribers, if you do not receive the Magazine regularly, let the Business Manager know and he will gladly correct all irregularities of this nature.

CHUTE'S ARITHMETICAL CABINET, WITH KEY, (*Richmond, Backus & Co., Detroit,*) is a carefully selected collection of over 2000 questions printed in 1400 separate cards, illustrating all the rules usually found in the best prac-

tical arithmetics. The questions are printed on strong card-board, and arranged in compartments according to subjects, in a substantial box, corresponding numbers being placed on the cards and the divisions of the box so that the cards can be returned without trouble or loss of time to their proper places after being used. These questions are designed for the use of teachers in giving drill in arithmetic and for saving time in writing questions on the blackboard. The answers to the questions are to be found in a neatly printed key accompanying the Cabinets.

The advantages to be derived from the use of such a cabinet as this are obvious; it saves the time of the teacher or inspector in dictating or writing the questions; it affords a better way of testing the work of a class because each pupil has work that differs from his neighbors, and it enables a class to accomplish much more work during recitation hour. The Cabinet and key were designed by H. N. CHUTE, M.S., a practical teacher, and formerly connected with the faculty of the Canadian Literary Institute, Woodstock.

The next number of THE SCHOOL MAGAZINE will contain the first of a series of articles on practical Chemistry adapted to the wants of students pursuing the study of Chemistry without the aid of a teacher. There are many students and teachers who possess a fair knowledge of Chemistry and who, through inability to utilize fully the apparatus which they possess, or to construct chemical appliances from materials at hand, cannot verify chemical and physical phenomena, or make qualitative analysis of any simple substance submitted to them. It will be the aim of the editor of this department to show how apparatus for qualitative analysis can be constructed from articles easily procurable by the students, and also to take the students through a course of practical Chemistry.

———

The cheapest microscope, and one really useful for some purposes, can be made by perforating a card or piece of paper with a small pin or needle. Hold the hole close to the eye, and look at a near object. The shortened focus, or point of distinct vision, indicates the power. Try it. No glass is necessary.

———

A lady teacher took her class in geography and began with the town in which the pupils lived, locating their houses and the principal public buildings. Then each pupil was assigned some special topic, upon which to obtain all possible information. One took the foundry, and learned the number of men employed there, the kind of iron manufactured, etc. Another took a particular kind of business, like banking, and so on. When the town had been thoroughly studied, then the county was taken up, and finally the State. For information the pupils resorted to books and to conversations with their parents and friends.

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