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THE SCHOOL MAGAZINE.

JUNE, 1881.

HEALTH DEPARTMENT.

VENTILATION.—(By F. Schuman, C. E.)

AIR SUPPLY.

Air Vitiated.—The following are some of the vitiating causes :

- 1st.—Respiration and transpiration of human beings.
- 2nd.—Respiration and transpiration of animals.
- 3rd.—Burning of lamps and gas-lights.
- 4th.—Operations generating smoke.
- 5th.—Operations generating dust and its disturbance.
- 6th.—Mechanical and chemical processes, generating steam and gases.

An adult man, under ordinary circumstances, requires for respiration and transpiration 215 cubic feet per hour, to be multiplied by a factor so that the per cent. of vitiation shall not exceed certain limits.

Every cub. ft. of gas consumed requires for complete combustion (the air remaining pure) 1800 cub. ft. per hour.

Every lb. of oil or candles consumed requires 18,000 cub. ft. per hour, or ten times as much as gas.

Air Supply.—The following formulæ will demonstrate the necessity of a greater supply of pure air than is

vitiated by an adult per hour, so that the percentage of vitiation will not exceed certain limits.

Let V = Volume of fresh air in cub. ft. to be supplied per hour.

v = Vol. of air vitiating per hour = 215 cub. ft. per adult.

p = Percentage of vitiation admissible.

C = Cubic contents of room to be ventilated.

V_1 = Volume of pure air in room after a time, t .

v_1 = Volume of vitiating air in room after a time, t .

After a time, t , V and v , approach certain values, V_2 and v_2 , that is :—

$$V_2 = C \frac{V}{V + v}$$

$$v_2 = C \frac{v}{V + v}$$

should, for instance, only so much air be supplied as is vitiating, that is, $V = v$,

$$\text{then } V_2 = \frac{C}{2}$$

$$\text{and } v_2 = \frac{C}{2}$$

in words, after a time, t , half the volume would be pure and half vitiated; this proves that it is not sufficient to supply just so much as is vitiated, because a room in good condition must not contain more than from 5 to 15 per cent. of vitiated air, therefore,

$$p = \frac{V_2}{C} = \frac{v}{V + v}$$

$$V_2 = Cp,$$

$$C = \frac{p}{1 - p}, \text{ and}$$

$$\frac{V}{v} = \frac{p}{1 - p}$$

$$V = v \frac{p}{1 - p}$$

$$v = \frac{p}{1 - p} V$$

$$v = \frac{p}{1 - p} V$$

$$v = \frac{p}{1 - p} V$$

$$v = \frac{p}{1 - p} V$$

$$p = \frac{v}{V + v}, \text{ hence when}$$

$p = .02, .03, .04, .05, .06, .07, .08$; V will be 49, 33, 24, 19, 16, 13, 12, times v respectively. Consequently, a room to contain not more than from 15 to 2 per cent of vitiated air must be supplied with from 5.6 to 49 times more fresh air than is vitiated, plus the quantity required for

illuminating purposes. The following are some of the values for p , when v = 215 cub. feet per hour :

Dwellings = .15 by day

" = .10 by night

Workshops = .10

Theatres and churches = .10

Schools = .15

Hospitals = .07 by day and night

" = .04 during epidemics.

Example.—A hall $40 \times 40 \times 20$, having 30 occupants, and illuminated by 30 gas-lights, each consuming 4 cub. ft. of gas per hour; how much pure air must be supplied per hour, so that the limit of vitiation shall not exceed .10 per cent.?

$$v = 215 \times 30 = 6450$$

$$V = v \frac{1 - p}{p} = 6450 \frac{1 - .10}{.10}$$

$$= 6450 \times 9 = 58050$$

cub. feet for the occupants, and for illuminating per hour $1800 \times 30 \times 4 = 216000$; therefore, total per hour = $58050 + 216000 = 274050$.

$$\text{The air in the hall changes } \frac{274050}{32000}$$

= 8.56 times per hour, and the inlet areas required for a velocity of 1.5 ft. per second

$$= \frac{274050}{1.5 \times 60 \times 60} = \frac{274050}{5400}$$

$$= 50.7 \text{ sq. ft.}$$

ENGLISH DEPARTMENT.

OXFORD LOCAL EXAMINATIONS.

Julius Caesar.

No. 1.—Quote passages showing the closeness with which Shakespeare follows his authority in this play.

All through this entire play we are astonished at the remarkable fidelity of Shakespeare to his authority. All

the incidents as related by Plutarch are transferred without change to the drama, and it only remains for Shakespeare to animate the whole to give life and action to the characters and reality to the events.

Striking examples of this conformity to the original are found in the following:—

Cassius' conversation with Messala, and his parting with Brutus before the battle.—Act V., Sc. I., ll. 71—125.

Appearance of the Ghost of Brutus.—Act IV., Sc. III.

Brutus' last farewell to Cassius.—Act V., Sc. III., ll. 100—107.

Antony's last speech over Brutus:—

“This was the noblest Roman of them all,” &c.

No. 2.—Quote any anachronisms or historical misstatements in the play:—

(a)

(1). *Brutus*.—Peace, count the clock.

Cassius.—The clock hath stricken three.

The Romans had no clocks, they used sun dials.

(2). “He plucked me ope his doublet.”

The doublet was part of the English dress. The Romans wore the toga.

(3). “My life is run his compass.”

(4). “Is not the leaf turned down.”

Books were then in the form of rolls of parchment.

(b) (1). Shakespeare's “Decius Brutus” was in reality Decimus Brutus, and he, not Marcus Brutus, was the special friend of Cæsar.

(1). Upon condition Publius shall not live,
Who is your sister's son Mark Antony.”

The person meant is Lucius Cæsar, and Mark Antony was his sister's son.

(3). “Cæsar's three and thirty wounds.”

Three and twenty.

No. 3.—Distinguish briefly the characters of the chief conspirators as drawn by Shakespeare.

Brutus, the leading conspirator, the character in the play who possesses our absorbing interest is a Stoic philosopher, his chief aim being to discard all passion, to harden himself so that he may not be influenced by any emotion however strong. He attempts to be a cold, calculating reasoner, at the same time possessing the warmest hu-

man sympathies. His great love for his wife exemplifies this, and his humanity is shown in his kindly treatment of his little servant Lucius. He is intellectual, a man of books, with little knowledge of the world, and he is therefore a fit subject to be easily influenced by the crafty Cassius, who feeds his pride of heraldry and lofty patriotism, and he consents to join the conspiracy, though his motives still are the purest and noblest. He believes that what he is about to do is for the good of the country so dear to him, and while he sincerely loves Cæsar, he does not hesitate to sacrifice him for the good of that country. His thorough honesty and high-mindedness make him dread even the suspicion of impure motives, and he explains first to Antony and then to the people “the reason of our Cæsar's death,” though he does not endeavor to conciliate the latter by considering their passions, a consequence of his want of oratorical powers. In the quarrel scene between Brutus and Cassius, his stoical self-command, his contempt for gold, high ideal of honor, and love of virtue, are finely depicted. His nobility is acknowledged by everyone, even by Antony, and we see it inspiring the warmest friendships in those with whom he comes in contact.

Cassius is the opposite of Brutus in many respects. He is a man of the world, with a wide knowledge of human nature, and this knowledge he makes use of in winning Brutus to his assistance in the plot. Cassius is nowise affected by the noble nature of Brutus; he is influenced by ambition and envy of Cæsar. He cannot bear to see Cæsar “bestride the narrow world like a Colossus.” His craft is shewn in the arguments he presents to Brutus to induce him to join in the conspiracy. The quarrel scene serves to bring out Cassius' character as well as that of Brutus. His chafing and fretting contrasts with Brutus' calmness. We

also get a peep at his avarice. Cassius was far more fitted to take command than Brutus. Brutus made two fatal errors—the first, in not acceding to Cassius' proposal to kill Antony; the second, in assuming the command of the army himself. In the first instance, Cassius' superior knowledge of human nature gave him a greater insight into the future, so that he could anticipate the consequences of leaving Antony out. In the second case, he was the older and more skilful soldier, and therefore should have led the Roman army. He was not a Stoic like Brutus; though he says he knows as much of the theory of Stoicism, his nature could not bear with calmness such a loss as Brutus sustained in Portia's death. He is hot and fiery and cares not to control himself. Still he possesses true friendship for Brutus. He admires him. He knows Brutus is superior to him both in intellect and in moral integrity. What he says of himself is true when he protests to Brutus that he is not a "common laugher" and does not profess friendship to men and after "scandal them."

Casca is a man of action rather than words. He is represented as being rough and blunt of speech as a cloak to his real nature. He is not a student like Brutus, but resembles Cassius in his knowledge of men. He possesses firmness of resolution, readiness of wit and hardihood of enterprise. A patrician, he entertains the greatest contempt for the tagrag people, as he calls them, and, as he relates what has occurred between them and Cæsar, we get a hint at his envy of Cæsar, which, however, he is prudent enough to keep secret till after the interview with the wily Cassius.

No. 4.—Compare the speeches of Brutus and Antony over Cæsar's body.

Brutus' speech is characteristic of the man. It is cold, calculating and formal, laconic, balanced and antithetical, in no way suited to conciliate an

infuriated mob. He had no idea of what oratory is, and when he goes into the Rostrum before Antony he thinks it an advantage, presents his "reasons," declares himself willing to be dealt with similarly if need be, and leaves his audience vacillating and dissatisfied, just in the mood to be worked upon by Antony's persuasive eloquence.

In the first thing he says Antony shews himself. Though he uses Brutus' very words, "Romans, countrymen and lovers (friends), he uses them to better advantage. He wants to win their regard, therefore he calls them first "friends," then their patriotism is thought of and he reminds them that they are "Romans," and then they are his "countrymen." Then he goes on to recount the benefits Cæsar has conferred on Rome, his goodness to the people, and successfully combats Brutus' assertion that Cæsar was ambitious, tells them they once loved Cæsar and pauses, ostensibly to give way to his own feelings, but in reality just in the place for the people to weep. This pause is in strong contrast to that of Brutus who pauses for a reply. He proceeds then to tell them of Cæsar's will, artfully pretending he does not wish to read it, at the same time instigating the people to insist on hearing it, and when he prepares to read the will, he gathers the people round the corpse and so enrages them against Cæsar's murderers that we think he has lost control over them. But Antony is master. He calls them back, pretending to soothe them:—

"Good friends, sweet friends, let me not stir
you up

To such a sudden flood of mutiny."

and succeeding very well in doing so, he tells them

"They that have done this deed are honorable," declares he is no orator as Brutus is, professes envy of Brutus' powers that he might "move the stones of Rome, to rise and mutiny," and off they rush again to slay Brutus. He recalls them

once more for the master-stroke. They have forgotten the will. He is now ready to read it, extolling Cæsar's generosity, and winding up with

"Here was a Cæsar; when comes such another."

his work is done.

No. 5.—Explain the references in the following :—

1. 'Twas one of these coronets.
2. He hears no music.
3. His coward lips did from their color fly.
4. Look, with a spot I damn him.
5. I, that denied thee gold, will give my heart.
6. Do what you will, dishonor shall be humor.
7. His life was gentle.
 1. Refers to the fact of Antony offering Cæsar the laurel crown.
 2. Refers to Cassius' distaste for revelry.
 3. Refers to Cæsar's illness in Spain. The metaphor is taken from a soldier flying from his colors.
 4. Refers to Antony's pronouncing the doom of Publius in their bill of attainder.
 5. Refers to the refusal or neglect of Cassius to send to Brutus the gold required by him.
 6. Refers to Cassius' testy humor, and also to the old idea that the temperament was made up of the four humors, and if any one predominated, the man was said to be humorous.
 7. Refers to the general esteem in which Brutus was held.

No. 6.—Give an account of the following words, and state where they

occur :—Neat's leather, Colossus, falling sickness, trash, genius, Ate, ort, cognizance.

Neat's leather—leather made from the hides of oxen. The expression occurs in Act I., Sc. I. :—

"As proper men as ever trod in neat's leather, Have gone upon my handiwork."

Colossus.—A gigantic statue of Apollo at the entrance to the harbor of Rhodes, accounted one of the seven wonders of the world.

"Why man he doth bestride the narrow world

Like a Colossus." Act I., Sc. II.

Falling sickness.—Epileptic fits to which Cæsar was subject. Brutus says :

"'Tis very like : he hath the falling sickness." Act I., Sc. II.

Trash.—Refuse, anything worthless. Used by Cassius in Act I., Sc. III.

"What trash is Rome !
What rubbish and what offal ; when it serves
For the base matter to illuminate
So vile a thing as Cæsar."

Genius.—The contriving and immortal mind ; the ruling intellectual power as opposed to the irascible nature. The word occurs in Brutus' soliloquy, Act II., Sc. I.

"The genius and the mortal instruments
Are there in council."

Ate,—Greek goddess of discord, the cause of the siege of Troy. It occurs in Antony's prophecy, Act III., Sc. I.

"And Cæsar's spirit suaging for revenge,
With Ate by his side, come hot from hell."

Cognizance.—Recognition. Decius uses the word in his attempt to persuade Cæsar to come to the Capitol, Act I., Sc. II.

"Great men shall press
For tinctures, stains, relics and cognizance."

EXAMINATION PAPERS IN ENGLISH GRAMMAR.

Set for V. Form of the Collegiate Institute.

I. Give as fully as you can the syntax of the subjunctive mood, and your reasons for discarding the potential mood.

II. Compare the verb, adjective and participle as to common and characteristic properties. What value do you attach to inflection as a mode of indicating number and person in English?

III. State and account for some of the anomalies of English orthography. What peculiarity of the mutes and liquids is shown in such words as cupboard, swept, number, sound?

IV. What parts of speech are from the Saxon.

V. Explain the derivation of strong and weak preterits, strong plurals, passive voice, the termination *ing*, and the construction of compound tenses.

VI. Trace the origin of the relative pronoun and give rules for the various uses of *who*, *which*, *that* and *what*.

VII. Write notes on *his*, *him*, *she*, *one*, *of mine*, *'em*, *the which*, *needs*, *I*, *thou*.

VIII. Correct the following, with reasons: *nime*, *sovrán*, *her's*, *hern*, *two book's*, *his self*, *naught*, *childern*.

IX. What has been the influence of foreign languages on English orthography and syntax.

(1.) The name subjunctive is not definite.

A verb may be in the subj. mood in a principal clause: "If 'twere done, when 'tis done, then 'twere well it were done quickly."

The indicative constantly occurs in subjoined clauses after *when*, *if*, and. "If he is at home I shall see him."

Suppositions are of two kinds:—

(2.) Those which relate to an actual event or state of things. In such suppositions the indicative mood is employed.

(3.) Those which treat an event or state of things as a mere conception of the mind.

In suppositions of this class the subjunctive mood is employed.

The subjunctive mood then is not simply a verb employed in the subjoined clause, but a particular kind of verbal form whose function is to indicate that the connection between the subject and predicate is not regarded as corresponding to any actual external event, independent of the thought of the speaker, but is dealt with simply as a conception of the mind. Using the term objective for what has an existence of its own, independent of the thought of the speaker, and subjective for what exists only in the thought of the speaker, we may call the indicative the mood of objective predication, and the subjunctive the mood of subjective predication.

The subjunctive is used in complex sentences.

a. To express a will or wish: "Thy Kingdom come."

b. To denote purpose: "See that all be in readiness."

c. To denote the purport of a wish or command: "The sentence is that the prisoner be hanged."

d. To denote concession: "Though He slay me, yet, &c."

e. To denote a supposition or wish contrary to the fact, or not regarded as brought to the test of actual fact:

"O! that it were possible."

Sequence of tenses.

1. If the pres. or fut. indicative in the principal clause requires the subjunctive, in the subordinate the pres. subjunctive must be used.

2. A past tense indicative or subjunctive in the principal requires a past tense in the dependent.

3. A future subjunctive in the principal clause must be followed in the dependent clause by a future subjunctive or a past subjunctive used as a future: "If he were (i.e. were to be or should be) rewarded others would be encouraged by his success."

POTENTIAL MOOD.

We discard the potential mood.

1. On the ground of inflection. If by mood is meant an alteration of form in any verb to express an altered relation in the assertion, we have no trace of a potential mood.

2. The combination of words may be referred either to the indicative or subjunctive.

If "I can run" is a potential mood, then "I may run" is a permissive mood, "I will run" &c., may set up similar pretensions.

3. Analogy is against it.

We might as well say *possum scribere* is the potential mood of *scribo*, *Ich kann schreiben* the potential mood of *schreiben* and *Je puis écrire* the potential mood of *écrire*.

II. In the two-fold division of Presentive and Symbolic words, verb, adjective, participle are presentive words, but as from their nature they pre-suppose the existence of a substantive they are secondary presentive words.

The essential qualities of the verb are assertion, time, attribute.

Of an adjective, attribute.

Of a participle, time and attribute.

When we call the adjective a dormant verb we mean that they differ only in the force and energy of their action.

In the sentence "Snow is white" the verb 'is' asserts the connection between the two notions. In the phrase "white snow" the connection between the two notions is assumed. The participle differs from the verb and resembles the adjective, in that it attributes a quality without formally asserting it. The participle differs from the adj. and resembles the verb in that it contains the idea of time, generally stands after its noun, when formed from a transitive verb can govern an objective case.

INFLECTION.

The growth of symbolic words in our language has in a great measure replaced the ancient inflection for number and person.

Verb. 1. Number. Except in *are* and *were* the plural is now indicated by the absence of endings.

2. Person. The only remnants left in English are "m" in, "am," "st," in 2nd sing., "s" and "th" in 3rd sing., and even these are omitted in the subjunctive.

Noun. Number. We cannot always tell by form the sing. from the plural, so that number is imperfectly expressed both in nouns and verbs.

-We have two forms of plural in "s."

1. A.S. modified to "s," or when required by euphony, to "es." A further modification occurs in A. S. words ending in lf, f, preceded by any long vowel sound except "oo," as: leaf, leaves. City is an example of another class or A. S. nouns, written in O. E. *citie*. At a very early period this "ie" became changed to "y" in the singular, in proper nouns we still usually retain the "y" in the plural.

Some remnants of the A. S. plural in "en" remain—oxen. Some A. S. neuter nouns without plural suffix, as deer, some col. nouns with strong plural have also a weak form, as: brother, plural brothers, brethren.

Many foreign words imperfectly incorporated retain their foreign inflec-

tion, others again, in addition to their technical plural (Lat. or Gr.) have assumed a popular plural (Eng.)

Pronoun. The pers. pronoun retains a distinct form for sing. and plu., and a distinct inflection for each person. "You" and "yours" are, however, the ordinary pronouns of address, whether we are speaking of one or more than one. "We" has idiomatic uses in the singular, and "it" for all nos. and persons. One defect in the person of our pronoun is the want of a pro. 3rd sing., com. gen. In this respect the Fr. "on" and the Ger. "man" supply a deficiency very much felt in English.

ADJECTIVE.

With the exception of "this" and "that," which have plural forms, adjectives are uninflected in modern English.

III. The imperfections of the Eng. alphabet belong in part to the peculiarity of the sounds it has to express in part to its history. The letters of the alphabet are too few to represent the variety of sounds in the language, and what they might do is not done because of the restraining influence of traditional association.

1. Double vowels are used to represent single sounds: coal. Double consonants to shorten preceding vowels, "hill," as an example. Double consonants represent sounds distinct from the sound of either of them: ch, ng, th.

2. Many single letters have two or more sounds, in certain combinations it is necessary to modify the spelling to preserve the sound, in "rog," "o" is long, first indicated by adding e = roge, this changes the sound of "g," and the effect is neutralized by the insertion of "u," = rogue.

3. City, for example, might be spelled sity (as far as sound is concerned,) but, being derived from the Latin and there spelt with a "c," we retain the "c" to recall its origin.

4. We have pairs of words, either

from the same root in which the dif. of spelling was at first accidental: draft and draught, or from different roots, as son and sun.

The meaning in each pair is now different, it is necessary to mark the difference by the spelling.

Cup-board.—1st "pb" form an unpronounceable combination of sharp and flat mutes; 2nd, an unaccented long syllable is apt to be slurred over in pronunciation. We say kub-bord.

Swept.—Verbs in a, p, r, s, never make their p. tenses in "d" simply, but, either if strong verbs, by changing the vowels, or if weak by adding ed or d, and pronouncing it, if not a separate syllable, as t, hence the tendency to write the past tense with t.

Number—from L. numerus, a number. Unstable combinations of liquids and consonants often borrow a strengthening sound from the class to which either liquid or consonant belongs: num-b-er.

Sound, from A. S. son, a sound. When short vowels stand alone there is a tendency to lengthen them, in this case by adding a second vowel = soun, then "d" was added as a strengthening letter to "n."

IV. Articles, pronouns, prepositions, conjunctions, auxiliary verbs, are generally of Saxon origin.

V. Strong preterite.—This appears to have been originally formed by reduplication. This formation was gradually weakened in speaking rapidly 1st, by omitting the final consonant from the first member of the doubled root; 2nd, by weakening the vowel sound of the initial syllable to one uniform letter; 3rd, by omitting the initial consonant of the second member of the doubled root, so that the vowel of reduplication and the vowel of the root came in contact with each other and were commonly blended into one sound.

Weak preterite.—This preterite tense was originally formed by annexing to

the root the preterite of the verb "do." This suffix became abbreviated in A.S. to *de* or *te* and was attached to the root by a connecting vowel, *o* or *e*. In Modern English the suffix has become *d* or *t* and the connecting vowel is always *e*.

Strong plurals.—These are of two classes, 1st, those nouns which form their plural by the A. S. suffix *en*: *ox*, *oxen*; 2nd by a radical change: "mon," "men;" "mouse," "mice." Terminations were added which modified the root, then the termination disappeared. When two vowels come together the tendency is to throw the last vowel back into the root. "Mon" (A. S. plural *ter*, *er*, *en*, *es*.)

Plu. manner in rapid speaking would be shortened to *menne*, then to *men*.

Passive Voice.—In all languages the passive voice has grown out of the reflexive form of the active voice. In Eng. we have no reflexive form of the verb (except two borrowed from the Scandinavian, *hisk* and *bask*,) thus we have no distinct form for the past voice, we are forced to periphrasis to supply the want. We use the substantive verb as auxiliary in association with the past participle, though this combination does not always convey a passive sense, and presents several anomalies.

The termination "ing."—

1. A. S. indefinite infinitive, ended in "an."

2. A. S. gerundial infinitive, a dative case of the inf. ended in "enne" or "anne" with "to" prefixed.

3. A. S. verbal noun ended in "ung," was formed from many verbs, especially those ending "ian."

4. The imperfect participle in "ende," "ande." The two forms of the infinitive were soon used loosely, the part changed gradually into "en" and "ing," until at length people lost sight of the distinction originally existing among the four classes.

The modern result of all these

confusions is this, our modern participle often represents a latent verbal noun and an omitted preposition: "I shall go (a) fishing."

Construction of compound tenses.—

Active Voice.—To supply the place of our lost inflectional endings we make use of the aux. verbs, "have," "shall," "will" using "have" followed by the per. part. to form the perfect tenses and "shall" and "will" followed by the infinitive to form the future tenses.

In O. E. verbs which had no object took "be" as aux. to form the per. tenses, hence we have verbs of motion—"come," arrive and often conjugated with "be."

We discriminate between such expressions as "he is come," and "he has come," by saying that in the former we refer to the actor as seen in the act, in the latter to the fact of the coming, *ie* to the action.

There are three distinct relations to be expressed by shall and will.

1, Simple futurity. 2, Futurity with reference to something external. 3, Futurity with reference to something internal and the two latter depending on ideas of what we have to do, like to do, must do, ought to do, etc.

The Germans have three verbs to express these three relations; *werden* = to become (simple futurity), *sollen* = shall (obligation,) *wollen* = will (volition.)

The idea lying at the foundation of all future tenses is obligation and when shall is not ambiguous it is the proper tense to use to denote simple futurity.

The following are our idioms in direct sentences:—

I shall.	We shall.
Thou wilt.	Ye will (you will.)
He will.	They will.
Shall I.	Shall we
Shalt thou.	Shall ye (you.)
Will he.	Will they.

Dep. clauses.

When the two subjects are the same

in the dep. clause we use shall, if different we use will.

VI. As who, which and what, were used as interrogatives, by natural transition they came to be used as indefinite pronouns, standing for some unknown or undetermined person or thing. Another step of great importance was made when the interrogative or indefinite pronouns who, what, which came to be used as indefinite relative pronouns. This was effected by attaching to them the adverb 'so,' as 'whoso.'

Lastly the indefinite relatives whoso, etc., dropped the 'so,' and who, what and which, became ordinary relative pronouns.

Uses of who, which, that and what.

Who is used to refer:—

1. To persons, and things personified.
2. When the antecedent is insufficiently limited and another fact is mentioned about it, we use who.
3. To collective nouns in the plural.

WHICH.

Which is used:—

1. In referring to inferior animals and things without life,
2. To refer to collective nouns in the singular.
3. To refer to an idea in a sentence.
4. In Bible with less of personal reference than who.
5. In reference to children.

THAT.

That is used:—

1. After superlative degrees of adjectives.
2. When the antecedent includes both persons and things.
3. When its clause restricts the antecedent.
4. In referring to personal pronouns.
5. In poetry instead of which.
6. To prevent the repetition of who, or which.

WHAT.

1. What is applied to things only,

and is used in both numbers, when the antecedent from its indefiniteness is necessarily omitted.

2. What, when used adverbially has the meaning of partly, when used elliptically, it is followed by 'if' or 'though.'

3. What sometimes stands for an indefinite idea.

4. What is also used as an adjective.

VII. *His* was formerly the genitive singular of both the masculine and neuter. Afterwards it was used for the neuter genitive or possessive.

Him is the old dative of he, now used both as accusative and dative.

She is not the feminine of he, but of the article *Se*, *seo*, *thaet*, *Seo* was changed into she.

One is the numeral adjective used substantively. Some suppose that it is connected with the French 'ou,' meaning one, people, etc. In Anglo-Saxon man was used for one.

Of mine seems to be a double possessive, as *mine* is the genitive of 'Ic.' It may, however, be an old accusative; 'em' is probably a corrupt form of "heom or him," formerly the plurals of he,

The which. The article was formerly used before which, in the same way as the French 'le' before 'quel.'

Needs is the genitive of the noun, now used as an adverb.

I, the old form of I was "ie," the hard 'c' was left out.

Thou in Anglo-Saxon was *thu*. *Thou* has nearly become obsolete, you taking its place. Its inflections are *thee* and *thy* or *thine*.

VIII. *Rime*, rhyme, rime is the form etymologically, as it is derived from the Anglo-Saxon 'rim,' and not from Greek *rhythmos*. There is a growing tendency to correct the error.

Sovran.—This word has taken its present form sovereign from the belief that it was connected with reign, while in reality it is derived from the Italian

soveran, from the Latin super, and an, an affix.

Her's.—This is not spelt with an apostrophe, though there is just as much reason for using it here as for using it in the expression, 'a book of my sisters.'

However it is omitted as there was no other form with which it could be confused.

Hem, we do not now use this form, but employ instead of it 'them.'

Two books.—The apostrophe is not used in the plural now, though it would be correct, as there is an elision of the letter 'e.'

Hissself, This word is spelt thus after the analogy of myself, thyself. It is more correct than the form himself, which we employ.

Naught, nought.—Naught is the more correct form as it is derived from

the Anglo-Saxon ne-a-whit.

Childern.—This is an example of a double plural, in adding 'er,' and then 'n.' By metathesis we spell the word now Children.

IX. To the French language we owe the introduction of e mute at the end of words, the use of the letter z, and the recognition of 's' as the sign of the plural. To the same language we owe a considerable modification of the sounds of the language, the suppression of the sound of 'l' before other consonants, the partial suppression of the sounds of 'h' and 'gh,' the introduction of the sibilant sounds of j, g, ch, and c, and the consonantal sound of 'v.'

French has also freed us from the stiff and involved arrangement of sentences, which modern German still employs.

EXAMINATION QUESTIONS IN FRENCH ANSWERED.

1. What principles guide us in the division of French words into syllables?

a. When vowels are separated by a single consonant, the consonant is written with the second vowel, as, *so-li-tu-de.*

b. When more than one consonant occur between vowels the consonants are separated in the division, as, *as-sis-tan-ce.*

c. But combinations of mutes and liquids or of consonants representing but one sound are not divided; thus tr, bl, th, gn, ph, &c., are not divided, *i-gno-rant, al-pha-bet.*

2. Give three words in which s final is, and three in which f final is not sounded.

a. *lis,* lily; *vis,* screw; *ours,* bear.

b. *Clef,* key; *cerf,* stag; *œuf dur,* hard egg; pronounced klé, sèr, eu-ûr.

3. When are the final letters in *cinq,*

six, sept, huit, neuf, dix sounded and when not?

a. In counting or when the words come at the end of a phrase, the consonants are sounded, f and x being sharp like f and s.

b. Before a word beginning with a vowel sound, the final consonants are also sounded, f and x being like v and z.

c. Before a word beginning with a consonant sound the final consonants are silent.

4. Explain the spelling of *grand'chose,* *grand'mère,* *grand'rue,* &c.

Adjectives which in Latin have but one form for masculine and feminine had also in Old French but one form for both genders. In the 14th century this usage was abandoned, a regular feminine being formed for all words except *grand.* Grammarians of the 16th century thinking the e for the

feminine had been omitted placed an apostrophe after *grand* to mark the supposed omission. *Grand* is used with about a dozen words. Notice that we say *c'est grand'chose*, but *c'est une grande chose*, *j'ai grand'faim* but *j'ai une grande faim*, &c.

5. Give rules for the use of general and partitive collectives.

a. Every verb having as its subject a general collective noun preceded by the article, takes the number of that noun.

b. When a partitive collective noun occurs as the subject of a proposition, the verb agrees with that noun, if it occupies the first rank in the thought of the writer; but the verb agrees with the plural word following the collective if the collective acts only a secondary part, or is employed only to add an accessory idea of number. De F. p. 265.

6. Translate "I applied to him," and give rule for the use of the expression by which "to him" is translated.

Je me suis adressé à lui.

With reflexive verbs the pronoun, which is the indirect regimen, follows the verb and is governed by a preposition. De F. p. 242.

7. What is the rule for the agreement of the present participle?

Used with the true force of a participle it is always invariable. Used as a simple verbal adjective expressing quality and not action, it agrees with its substantive. e.g., *Ces hommes, prévoyant le danger s'enfuirent* (invar), *ces livres charmants*, these charming books (var).

8. Translate: (a) The rose which I have gathered. (b) That I (fem.) may have been happy. (c) They have always complained of their misfortunes. (d) My father was a bookseller. (e) He asked his father for the newspaper. (f) Is it I that you are speaking to? Yes, it is. (g) Honesty is one of the finest qualities that a man can possess.

(a) *La rose que j'ai cueillie.* De F.

p. 293. (b) *Que j'aie été heureuse.* (c) *Ils se sont toujours plaints de leurs malheurs*, 296. (d) *Mon père était libraire*, 206. (e) *Il demanda le journal à son père.* (f) *Est-ce à moi que vous parlez?* *Oui, c'est à vous.* (g) *La probité est une des plus belles qualités qu'un homme puisse posséder.* 287.

9. Represent the pronunciation of *hymen*, *lac*, *susdit*, *second*, *czar*, *yacht*, *nerfs*, *sang-ardent*, *jadis*.

Pronounce, *i-mèn*, *lak*, *sus-di*, *se-gon* (nasal), *gzar*, *iak*, *nèr*, *san-kar-den* (nasal), *ja-dis*.

10. Give the gender of *personne*, *quelque chose*, *ombre*, *pendule*, *vase*.

Personne, as a pronoun is masc.; as a noun meaning person, fem.

Quelque chose = something, is masc.; but meaning *whatever thing*, it is fem.

Ombre masc. a game; fem. shade.

Pendule masc. pendulum; fem. clock.

Vase masc. vase; fem. mire.

11. Trans.: (a) I saw them relieving their enemies. (b) I saw them relieved by their enemies. (c) How much good has she not done during the few days that she has reigned! (d) Have you eaten of the vegetables? I have eaten of them. (e) The little (le peu) affection which you have shown him has restored his courage. (f) The want (le peu) of affection which you have shewn him has discouraged him. (g) Have the goodness to excuse me.

(a) *Je les ai vus secourir leurs ennemis.* (b) *Je les ai vu secourir par leurs ennemis.* (c) *Que de bien n'a-t-elle pas fait pendant le peu de jours qu'elle a régné!* (d) *Avez-vous mangé des légumes?* *J'en ai mangé.* (e) *Le peu d'affection que vous lui avez montrée lui a rendu son courage.* (f) *Le peu d'affection que vous lui avez montré l'a découragé.* (g) *Veillez m'excuser.*

12. When a verb has both a direct and indirect regimen, these being pronouns, when does the direct precede the indirect?

When both are of the 3rd person, *je*

le lui donne. In the imperative affirmative, *Donnez-le-moi*, but *Menez-y-moi*.

13. Lagare Hoche p. 36, ll 16-27.

a. *Par*, why not *de*? *Par* governs the real agent, *de* the means employed by the agent, also *par* governs the agent if the verb expresses real action, *de* if the verb expresses sentiment.

b. *d'Italie*, why not *de l'Italie*?

The article is not used when the name of the country forms with the prep. a simple adjectival description of the preceding noun.

c. Explain the pronunciation of *cerf*, *chef*, *clef*, *nerf*, *neuf*; trans. nine oxen, new hats, and indicate the pronunciation.

Cerf, f mute, *chef*, f sounded, but

mute in *chef-d'oeuvre* (pron. shé-deu-vre), *clef*, f mute, *nerf*, f sounded but mute before a consonant and in the plural, *neuf*, nine, f sounded when alone or at the end of a phrase; f is sounded like v before a vowel, but in *neuf et demi*, *neuf en tout*, *neuf à manger* it retains the sound of f. *Neuf boeufs* (pron. neu-beu), *des chapeaux neufs* (dé-chapau neuf).

d. *Et*, when is the t in this word sounded?

The t of the French *et* is invariably mute; in the Latin *et cetera* t is sounded (pron. èt-sé-té-ra).

e. *Puis*, give a homonym of this word and translate the nom.

Puis, can, *puits*, well, pit.

MATHEMATICS.

Solutions to Algebra Paper in last number.

1. If $n > a + b$, $\therefore \frac{1}{n} < \frac{1}{a+b}$

and $\frac{1}{a+b} < \frac{1}{a} + \frac{1}{b}$

if $\frac{1}{a+b} < \frac{a+b}{ab}$

if $ab < a^2 + 2ab + b^2$

$\therefore \frac{1}{n} < \frac{1}{a} + \frac{1}{b}$;

but if $n < a + b$

$\therefore \frac{1}{n} > \frac{1}{a+b}$

but $\frac{1}{a} + \frac{1}{b}$ is also $> \frac{1}{a+b}$

\therefore it cannot be inferred that

$\frac{1}{n} > \frac{1}{a} + \frac{1}{b}$

2.

2	5	0	0	-3	+	0	+	1
		10	20	10		-46	-	122
-3			-15	-30		-15	+	69 + 189
	5	10	5	-23		-61	-	52

The remainder is $\therefore -61x + 70$, and the continuation of the quotient in descending powers of x is $-61x^{-1} - 52x^{-2}$ &c.

3. If we substitute $x - 1$ for x^2 in $(x^2 - 1)(x^2 - 2) + (x^2 - x + 1)^2 + (x^2 + x + 1)^2$ we have $(x - 2)(x - 3) + 0 + (2x)^2$

which reduces to $5x^2 - 5x + 6$

again substituting $x - 1$ for x^2

we have $5x - 5 - 5x + 6$ or 1 as the remainder after dividing by $x^2 - x + 1$.

If we put $x^2 = -x - 1$ we shall get the same result; \therefore we have the same remainder whether we divide by $x^2 - x + 1$ or $x^2 + x + 1$.

4. These expressions reduce to

$(x - y)(y - 3)(x + 2y + 3)$

$(x - y)(y + 1)(x + 3y + 2)$

$\therefore x - y$ is their G. C. M.

If $y = 1$, these become

$-2(x - 1)(x + 5)$

$2(x - 1)(x + 5)$

either of which may be taken as the G. C. M.

5. When $n = 0$, the expressions reduce to

$(y - x)(x + y - a - b)$

$(a - b)(x + y - a - b)$

when $n=1$, they become
 $(x-y)(ab+xy)$, $(a-b)(ab+xy)$
 and when $n=2$, we get
 $(x-y)(ab \frac{x+y}{a+b} - xy \frac{a+b}{a+b})$
 $(a-b)(xy \frac{a+b}{a+b} - ab \frac{x+y}{a+b})$

6. Let $\frac{a}{b} = \frac{c}{d} = x$

$\therefore a = bx, c = dx.$

then substitute these values for a, c , and the equality is established.

7. Let $\frac{a}{b} = x, \frac{c}{d} < x$

$\therefore a = bx$ (1)
 $c < dx$

$\therefore a + c < (b + d)x$

$\therefore \frac{a+c}{b+d} < x \therefore < \frac{a}{b}$

similarly $\frac{a+c}{b+d}$ can be proved to be greater

than $\frac{c}{d}$

again, from (1) $ac < bdx^2$

$\therefore \frac{ac}{bd} < x^2$

\therefore sq. rt. of $\frac{ac}{bd} < x \therefore < \frac{a}{b}$

and similarly it may be proved $> \frac{c}{d}$

$\frac{a+c}{b+d} > \frac{\sqrt{ac}}{\sqrt{bd}}$
 if $\frac{(a+c)^2}{ac} > \frac{(b+d)^2}{bd}$

if $\frac{a}{c} + \frac{c}{a} > \frac{b}{d} + \frac{d}{b}$

if $\frac{a}{c} - \frac{b}{d} > \frac{d}{b} - \frac{c}{d}$

if $\frac{a}{c} - \frac{b}{d} > \frac{\frac{a}{c} - \frac{b}{d}}{\frac{ab}{cd}}$ (1)

if $1 > \frac{cd}{ab}$ and $\frac{a}{c} > \frac{b}{d}$

if $\frac{a}{c} > \frac{d}{b}$ and $\frac{a}{c} > \frac{b}{d}$

or (1) holds if

$\frac{a}{c} < \frac{b}{d}$ and $1 < \frac{cd}{ab}$

if $\frac{a}{c} < \frac{b}{d}$ and $\frac{a}{c} < \frac{d}{b}$

i. e. if $\frac{a}{c}$ does not lie between

$\frac{b}{d}$ and $\frac{d}{b}$

8. Let the last of these ratios = r

then the next to the last = r^2

" " " this = r^3 , &c.

\therefore the first ratio = last ratio raised to the power 2^{n-1} .

9. Let $a = m\sqrt{b}$, and $c^2 = n_2 b_3$.

$\therefore a^2 = m^2 b. \therefore a^2 c^2 = m^2 n^2 b^4$

$\therefore ac = mn b^2$

$\therefore ac$ varies as b^2 .

10. I, I.

11. $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

\therefore in order that these values of x may be positive integers, $b^2 - 4ac$ must be a complete square, z^2 suppose,

$\therefore x = \frac{b \pm z}{2a}$

\therefore also $b + z$ and $b - z$ must be multiples of $2a$ and b and a must have different signs.

13. $\frac{(H-a)(H-b)}{G^2}$
 $= \frac{H^2 - a + bH + ab}{G^2}$
 $= \frac{H^2}{G^2} - \frac{a + bH}{G^2} + \frac{ab}{G^2}$
 $= \frac{H}{A} - \frac{a + b}{A} + 1$, since $G^2 = AH$.

$$= \frac{H}{A} - \frac{2A}{A} + 1$$

$$= \frac{H}{A} - 1.$$

14. $s = (a + l) \frac{n}{2}$

$$= (200 - 100) \frac{49}{2} = 2450.$$

Middle term $= \frac{1}{2}(a + l) = 50.$

15. $s = (a + l) \frac{n}{2}$

$$2s = (a + l)n$$

$$= (2l - n - 1)d)n$$

$$\therefore dn^2 - (2l + d)n + 2s = 0$$

$$\therefore n = \frac{2l + d \pm \sqrt{(2l + d)^2 - 8ds}}{2d}$$

(1) In order that n may be positive we must have $2l + d > \sqrt{(2l + d)^2 - 8ds}$

$$\therefore (2l + d)^2 > (2l + d)^2 - 8ds$$

$\therefore ds$ must be positive, that is, d and s must have the same sign.

(2) Evidently $(2l + d)^2 - 8ds$ must be finite and a complete square (z^2 suppose.)

(3) $\therefore n = \frac{2l + d \pm z}{2d}$

$\therefore 2l + d + z$ and $2l + d - z$ must each be an even multiple of d , $\therefore 2l + z$ and $2l - z$ must be each an odd multiple of d .

Also since $a = l - n - 1d$

\therefore if p, q , be the two values of n , the sum of the two first terms will equal

$$l - (p - 1)d + l - (q - 1)d$$

$$= 2l + 2d - d(p + q)$$

$$= 2l + 2d - d \frac{2l + d}{d}$$

$$= d.$$

16. In the first series the common ratio is $-\frac{3}{2}$, \therefore sum to n terms

$$= \frac{4}{15} \left\{ 1 - \left(-\frac{3}{2}\right)^n \right\}$$

In second series com. ratio is $-\frac{2}{3}$ \therefore sum to

$$\text{infinity} = \frac{\frac{3}{2}}{1 + \frac{2}{3}} = \frac{9}{10}$$

17. $S = \frac{r^n - 1}{r - 1}$

$$\therefore s(r - 1) = r^n - 1$$

$$= (1 + r - 1)^n - 1$$

$$= 1 + n(r - 1) + \frac{n(n - 1)}{1 \cdot 2} (r - 1)^2 - 1$$

$$\therefore s = n + \frac{n(n - 1)}{1 \cdot 2} (r - 1) \quad (1)$$

gives an approximate value for s , and a still closer approximation is given by

$$s = n + \frac{n(n - 1)}{1 \cdot 2} (r - 1)$$

$$+ \frac{n(n - 1)(n - 2)}{1 \cdot 2 \cdot 3} (r - 1)^2$$

$$= s_1 + (s_2 - n) \frac{n - 2}{3} (r - 1)$$

18. (1). $x = 1$.

(2). $x = \pm 1$.

(3). $x = 21\frac{8}{11}, 10\frac{8}{11}$

(4): $\frac{x}{y} = \frac{y}{x} = b$

$$\therefore x^2 - y^2 = bxy$$

put $x = ky$

$$\therefore k^2 - 1 = bk$$

$$\therefore k = \frac{b + \sqrt{b^2 + 4}}{2}$$

again, $xy(x^2 + y^2) = a$

$$\therefore ky^2(k^2y^2 + y^2) = a$$

$$\therefore y^4 = \frac{a}{k^3 + k^2}$$

$$\therefore x^4 = \frac{ak^3}{k^2 + 1}$$

These give x and y since k has already been found.

19. $65\frac{5}{11}$ minutes.

20. $(x + a)(y - b) = xy$

$$(x + c)(y - d) = xy - e$$

$$\therefore x = b \frac{ad + e - cd}{ad - b}$$

$$y = a \frac{bc + e - cd}{ad - bc}$$

UNIVERSITY PASS ALGEBRA A, FIRST YEAR, 1862.

1. Explain the terms "abstract" and "concrete," and state the conditions in arithmetical algebra that one quantity may be capable of being added to, subtracted from, multiplied by, or divided by another.

If algebraic symbols denote concrete quantities which may be said to have *direction* as well as *magnitude* and to be measured from a fixed starting point, shew that "negative quantities" will receive an interpretation.

In all other cases how do we deal with such quantities?

Apply Horner's method of division to find (1) the greatest common measure of

$$2x^5 + 2x^4 - 5x^3 + 4x^2 - 9$$

$$3x^4 + 3x^3 - 10x^2 - x + 3.$$

(2) the expansion to 5 terms in ascending powers of x , of

$$\frac{4 - 11x}{1 - 5x + 6x^2}$$

(3) the remainder after dividing

$$x^n + ax^{n-1} + bx^{n-2} + \dots + p$$

by $x - a$

Also in (2) shew by the method of induction that the co-efficient of x^n is $3^n + 3 \cdot 2^n$.

3- Investigate the rule for finding the least common multiple of two or more algebraic quantities and find those of

$$(1) apx^2 + (aq + bp)x + bq$$

$$apx^2 - (ap - bq)x - bp$$

$$(2) x^2 - xy, x^m - y^m \text{ and } xy + y^2$$

and write down the greatest common measure and least common multiple of

$$a^r b^p c^{q+1}, a^{r+1} b^{p-1} c^q, \text{ as } b^p c^{2q}$$

where a, b, c are prime to one another and p, q, r are whole numbers.

4. If m and n denote abstract whole numbers, shew that $m \times n = n \times m$.

Assuming this law to hold generally, shew that

$$(1) \frac{a}{b} \times \frac{c}{d} = \frac{ac}{bd}$$

$$(2) \sqrt{x} \sqrt{y} = \sqrt{xy}$$

where the roots of x and y cannot be extracted. Give an extended definition of multiplication which shall apply to (1) and if possible to (2).

5. Define a surd and examine in what cases the square root of a binomial surd can be expressed in a similar form.

Find the value, to three places of decimals, of the fraction

$$\frac{\sqrt{7} - 2}{\sqrt{11} + \sqrt{112}}$$

6. Solve the equation $ax^2 + bx + c = 0$, and discuss the nature of the roots in the different cases.

Shew that if the left hand side of the equation cannot be made negative by substituting any number for x , the equation must have impossible roots.

7. Solve the equations:

$$(1) \frac{x - 2a}{3} = \frac{2x + 6a}{7} - \frac{x + 2a}{13}$$

$$(2) \frac{x - 1}{2} - \frac{x + 1}{3} = \frac{3}{x + 1} - \frac{2}{x - 1}$$

$$(3) \sqrt{x + 4} + \sqrt{2x + 6} = \sqrt{3x + 34}$$

$$(4) x^2(y - 1) + 3y(x^2 - 1) = \sqrt{x^2 + 3y}$$

$$x^2y = 5.$$

8. From a pyramid of metal on a square base a portion is cut off by a plane parallel to the base. The lower portion could be cast into (1) a complete pyramid on the same base, and height less by $\frac{63}{7}$ feet than that of the original pyramid; (2) into a rectangular solid on the same base and height $\frac{7}{12}$ of that of the truncated pyramid; (3) into a cube whose edge is 15 feet. Find the dimensions of the first pyramid and the portion of it cut off.

(The volume of a pyramid is one-third of the product of the height and the area of the base.)

9. How is the proportionality of four numbers expressed in Algebra? State and prove the propositions quoted by the words "Alterando," "Componendo," "Dividendo" and "Ex aequali."

There are four pairs of quantities, the ratio of the second pair is equal to that compounded of the ratios of the first and third pairs, and the ratio of the third pair to that compounded of the ratios of the second and fourth. Shew that the first pair are inversely as the last.

10. When is one quantity said to vary as another, directly or inversely?

If a varies as d^2 , b^3 as d^4 and c^3 inversely as d , shew that the product abc varies as if each of them varied directly as d .

11. Investigate the expression for the sum of n terms of an arithmetic progression whose first term is a and common difference d .

Shew that n consecutive odd numbers beginning with $2m + 1$ exceeds the sum of the first n odd numbers by $2mn$.

12. Find the arithmetic, geometric and harmonic means between two numbers a and b .

If the numbers are nearly equal, shew that the differences between the means are very small compared with the difference between the numbers themselves.

13. Find the sum of n terms of a descending geometric series, and the limit of the sum when it is continued *ad infinitum*.

If the number of terms be odd, shew that the middle term is the n th root of the product of all the terms.

14. Investigate the expressions for the number of permutations and the number of combinations of n things taken r together.

There are four sets of counters distinguished by different colors; each set contains six counters, marked with the numerals from one to six. One counter being taken from each set find the number of different collections which can be formed—the sum of the numbers in each collection being 9.

SOLUTION TO PROBLEMS FROM CORRESPONDENTS.

1. The diagonals AC, BD, of a parallelogram intersect in O, and P is a point within the triangle AOB. Prove that the difference between the triangles APB, CPD, is equal to the sum of the triangles APC, BPD.

Join PO.

$$\therefore DPC - DOC = DPO + CPO,$$

$$\text{and } AOB - APB = BPO + APO,$$

$$\therefore \text{by addition, since } AOB = DOC, \text{ we get}$$

$$DPC - APB = DPO + BPO + CPO + APO$$

$$= DPB + APC.$$

2. If from a point without a parallelogram there be drawn two straight lines to the extremities of the two opposite sides between which, when produced, the point does not lie, the difference of the triangles thus formed is equal to half the parallelogram.

Let ABCD be the parallelogram, and let O be the point, and let O lie on the side of AB remote from DC; through O draw FOE parallel to AB, produce DA, CB, to meet FE in F and E, and join OA, OB, OC, OD.

Then since the triangle ODC is half the parallelogram FDCE, and OAB is half of FA BE, therefore the difference between ODC and OAB is equal to half the difference between FDCE and FA BE, that is, to half the parallelogram ABCD.

3. Two cisterns of equal size are emptied by two taps in 4 and 5 hours respectively. If the taps are opened when both cisterns are full in what time will one cistern contain twice as much water as the other?

(1) Let x = required time in hours,

Then in x hours $\frac{x}{4}$ of the first will be emptied

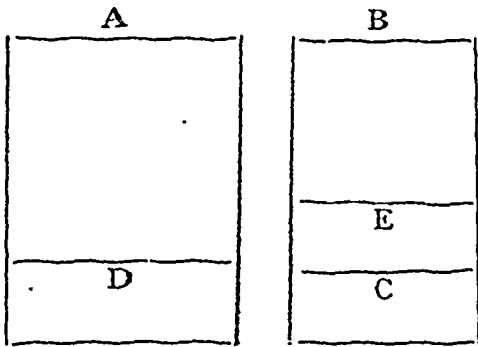
and $\frac{x}{5}$ of the second, \therefore the first will still

contain $\left(1 - \frac{x}{4}\right)$ of its full capacity, and

the second $\left(1 - \frac{x}{5}\right)$ and since $\left(1 - \frac{x}{4}\right)$

$$= 2 \left(1 - \frac{x}{4} \right) \therefore x = 3\frac{1}{2}$$

(2) Let A, B be the two cisterns, A being emptied in 4 hours and B in 5 hours. Let C be the quantity of water remaining in B when A is just emptied, C is therefore one-fifth of B. Also when B contains twice as much as A let D be the quantity in A, and C + E the quantity in B.



Now since D and E are emptied in the same time $\therefore D : E$ as $5 : 4$; also $D : C + E$ as $5 : 10$; $\therefore E : C$ as $4 : 6$, $\therefore E + C = \frac{5}{3}C$, and $C = \frac{1}{5}B$, $\therefore E + C = \frac{1}{5}B$, $\therefore B$ is $\frac{2}{3}$ empty at time required, consequently the required result is $\frac{2}{3}$ of 5 hours.

4. Find x and y from the equations:

$$x^2 + y = 7$$

$$x + y^2 = 11$$

It is evident that one solution gives $x = 2$, $y = 3$.

The other three pairs of values are obtained by cubic equations and are:

(1) $x = 3.131312$, $y = 3.584428$.

(2) $x = -1.848126$, $y = -2.805118$.

(3) $x = -3.283186$, $y = -3.779310$.

5. A clock is half an hour slow at noon and

is gaining at the rate of a minute per hour, find the true time when the hands are together between six and seven, p. m.

At 12 o'clock the clock indicates 11.30, therefore at 7 o'clock the clock will indicate 6.37, and when the hands are together the clock indicates $6.32\frac{8}{11}$, which is $4\frac{3}{11}$ minutes (by the clock) before it indicates 6.37, \therefore the true time when the hands are together is $\frac{80}{81}$ of $4\frac{3}{11}$ minutes before 7 o'clock, or $6.55\frac{13}{77}\frac{5}{11}$ p. m.

6. A man undertakes to pile up the stones and pull out the stumps in a field at the rate of 10 cents a score for the stones and 25 cents a piece for the stumps. One stump occupies him as long as 40 stones. He works three days and earns \$8, then goes on at the same rate of working and finishes the job in $3\frac{3}{4}$ days more, and earns altogether \$20. How many stumps and stones were there in the field?

If he had worked at stumps and stones in the same proportion during the second period as during the first he would have earned only \$10, therefore he must have substituted stumps for stones to such an extent as to earn \$2 more without increasing the rate of working. Every time he pulls a stump instead of 40 stones he earns 5 cents more, therefore to earn \$2 more he must substitute 40 stumps for 1600 stones, and to render this possible he must have picked up at least 1600 stones the first 3 days; but as 1600 stones would bring him \$8 he could not have done more than 1600 stones the first 3 days, and if he could pick up 1600 stones in 3 days, he could, in $3\frac{3}{4}$ days, pick up 2000, but for 1600 of these he substitutes 40 stumps, \therefore there were 40 stumps and 2000 stones.

SCIENCE DEPARTMENT.

V. COMPOUNDS (*Continued from page 153.*)

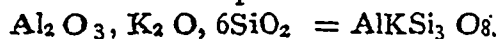
I. OXIDES.

AL.

The only Oxide of Aluminium is Alumina, Al_2O_3 , occurring native in crystals, as Corundrum, Ruby, etc. If Aluminium Hydroxide $\text{Al}_2(\text{OH})_6$ be heated, pure Alumina in the form of a white amorphous powder is obtained. Alumina acts as a weak base, acids attacking it with difficulty, forming salts. With strong bases it is electronegative or acts as an acid. Its use in dyeing and calico printing as a mordant depends upon its power of forming insoluble compounds ("lakes,") with vegetable colouring matter, so rendering the colours *fast*.

Clay is not Alumina but an Aluminium Silicate, resulting from the decomposition of felspar by the action of air and water.

The formula of felspar is



The Alkali being soluble in *water* is washed away leaving a mixture of Alumina and Silica behind.

Kaolin or porcelain clay, is the purest form of disintegrated felspar, containing no iron or other impurities.

CR.

Chromium forms a number of compounds with Oxygen:

- (1) Chromus Oxide, CrO .
- (2) Chromic " Cr_2O_3 .
- (3) Chromochromic Oxide, Cr_3O_4 .
- (4) Chromium Trioxide, CrO_3 .

The Monoxide CrO and the Sesquioxide Cr_2O_3 are basic, yielding with acids the corresponding chromous and chromic salts.

Chromochromic Oxide, CrO , Cr_2O_3 , is a neutral body. Chromic trioxide forms a dibasic acid with water, $\text{CrO}_3 + \text{H}_2\text{O} = \text{H}_2\text{CrO}_4$.

(1) Chromus Oxide is so oxidizable that it decomposes water, and is hence only known in the hydrated state $\text{Cr}(\text{OH})_2$.

(2) Chromic Oxide, Cr_2O_3 obtained by igniting the hydroxide, $\text{Cr}_2(\text{OH})_6$, is a dark green, infusible powder, which when strongly heated is nearly insoluble in all acids. It produces the green of the emerald, is also employed as a green colour for painting on porcelain. Chromic Oxide forms greenish black, very hard crystals which are isomorphous with alumina, Al_2O_3 , and Ferric Oxide, Fe_2O_3 .

II. HYDROXIDES.

Ammonia NH_4OH when added to any soluble salt of Aluminium (alum) throws down a white bulky precipitate, *Aluminium* hydroxide, $\text{Al}_2(\text{OH})_6$.

If after the addition of Ammonia in excess, heat is applied, the precipitation is complete.

Same. Chromic hydroxide, $\text{Cr}_2(\text{OH})_6$, is grayish green thrown down out of green solutions, and grayish blue out of violet solutions.

Same.

Potassium and Sodium hydroxides (KOH, NaOH) throw down the same precipitate which readily and completely redissolves in excess of the precipitant.

Ammonium Chloride, $\text{NH}_4 \text{Cl}$, upon the application of heat reprecipitates it completely from this solution.

Same. Solution has an emerald green tint.

Same.

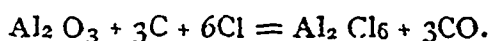
If Potassium Bichromate and Boron Trioxide be first heated together and then dissolved in water, a grass-green hydroxide $\text{Cr}_4 \text{H}_6 \text{O}_9$ remains behind. This hydroxide is termed Guinet's Green, and is a mixture of Chromic Oxide and Chromic Hydroxide, $\text{Cr}_2 \text{O}_3 + \text{Cr}_2 (\text{OH})_6$.

Chromous Hydroxide, $\text{Cr}(\text{OH})_2$, falls as a brown precipitate on the addition of Potassium Hydroxide to a solution of Chromous Chloride,



III.—CHLORIDES.

If Chlorine Gas be passed over a hot mixture of alumina and charcoal, Aluminium Chloride $\text{Al}_2 \text{Cl}_6$ is formed :



Aluminium Chloride is a volatile, white, solid body with crystalline structure, and is used in the manufacture of the metal.

Chromic Chloride $\text{Cr}_2 \text{Cl}_6$, prepared in the same way (using $\text{Cr}_2 \text{O}_3$ instead of $\text{Al}_2 \text{O}_3$), forms beautiful violet crystals which do not dissolve easily in water, but are readily soluble if a trace of chromium dichloride be present. A solution of *Chromic Chloride* may be prepared by boiling a solution of Chromic Acid or a Chromate ($\text{K}_2 \text{CrO}_4$) with Hydrochloric Acid and Alcohol—the red or yellow solution changing in a few minutes to a deep greenish blue.

If hydrogen be passed over heated chromic chloride, Chromous Chloride CrCl_2 is formed. It is a white crystalline body which upon dissolving in water forms a blue solution.

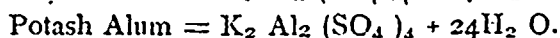
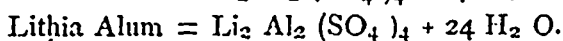
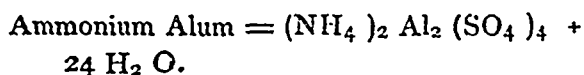
IV.—SULPHATES.

Aluminium Sulphate $\text{Al}_2 (\text{SO}_4)_3$ is prepared by the action of Sulphuric Acid upon clay, *free of iron*. It crystallizes in thin, pearly, soft needles and plates, which are readily soluble in water, (giving acid reaction), and contain 18 molecules water of crystallization.

Chromic Sulphate $\text{Cr}_2 (\text{SO}_4)_3$ is obtained in solution in the same way as Chromic Chloride by substituting Sulphuric Acid for Hydrochloric Acid.

V.—ALUMS.

Aluminium Sulphate forms with Potassium, Sodium, Lithium and Ammonium Sulphates, compounds which are isomorphous—(*i. e.*, compounds crystallizing in the same form but differing in their chemical and physical properties.)

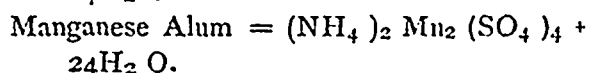
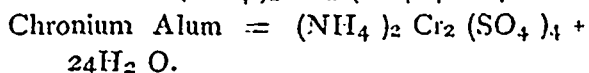
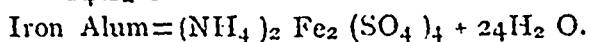
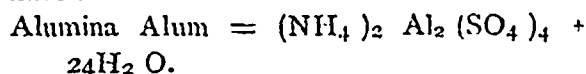


The Alums may be obtained by dissolving the two Sulphates together and allowing the compound salt to crystallize out.

Common Potash Alum is usually prepared from the decomposition of a shale or clay containing iron pyrites FeS_2 . By roasting the shale in the air the sulphur is oxidized to sulphuric acid, which, uniting with the alumina of the clay, forms aluminium sulphate. On the addition of a potassium compound Alum crystallizes out.

Ammonium Alum is at present manufactured on a large scale by adding to the burnt shale the Ammonia liquor of the gas works together with Sulphuric Acid.

If the sesquioxide of Aluminium ($\text{Al}_2 \text{O}_3$) be replaced by the isomorphous sesquioxides of Chromium ($\text{Cr}_2 \text{O}_3$), of Iron ($\text{Fe}_2 \text{O}_3$), of Manganese ($\text{Mn}_2 \text{O}_3$), another series of Alums is formed. Using Ammonia as the representative of the alkaline constituent we have :



The Alums formed by Chromium Sulphate with Potassium and Ammonium Sulphates, have a deep violet tint.

Some of the salts of Chromic Oxide ($\text{Cr}_2 \text{O}_3$) can be obtained in two differently coloured modifications—a green and a violet which show with reagents somewhat differing qualities.

(a). GLASSES.

The compound Silicates of the Alkali-metals (Alkali-Silicates are soluble in water and non-crystalline), and the Alkaline earth metals (these are soluble in acids and crystalline), form, when fused, a non-crystallizable substance, insoluble in water and acids, *termed a Glass*.

There are four varieties, viz. :

(1). *Crown or Window, and Plate-glass*, composed of Silicates of Sodium and Calcium.

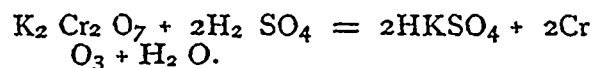
(2) *Bohemian Glass*, consisting of Silicates of Potassium and Calcium.

(3) *Flint Glass or Crystal*, containing Silicates of Potassium and Lead.

(4) *Common Green Bottle Glass*, composed of Silicates of Sodium, Calcium, Iron and Aluminium.

CHROMIC ACID AND CHROMATES.

(a). If an excess of strong sulphuric acid be added to a concentrated solution of potassium bichromate, Chromium Trioxide in the form of long, ruby-red, needle-shaped crystals is obtained :



These crystals may be freed from excess of sulphuric acid by washing them with concentrated nitric acid and drying them in a glass tube in a current of air. They are very soluble in water, forming Chromic Acid.

Organic matter reduces Chromium Trioxide to Chromic Oxide : $2 \text{CrO}_3 = \text{Cr}_2 \text{O}_3 + 3 \text{O}$. The evolution of oxygen can be so rapid that ignition occurs when alcohol is dropped on the dry crystals. If hydrochloric acid be heated with chromium trioxide, Chlorine is liberated, if sulphuric acid, Oxygen.

The first and third varieties are easily fusible, the second or potash glass is hard and difficultly fusible. The oxide of lead increases the specific gravity, lustre and fusibility of the glass. The materials must be mixed with a quarter or half their weight of "cullet" or broken glass. After the glass is blown or cast it is exposed to the process of "annealing" or slow cooling; otherwise it is brittle.

(b) COLOURED GLASSES.

Ferrous Oxide (Fe O) produces a *deep green*, Manganese Dioxide (Mn O₂) a purple tint to glass.

To obtain a colorless glass in materials not entirely free from iron, Manganese Dioxide is used, the violet being complimentary to the green. Arsenic Trioxide As₂ O₃ ensures the same end by oxidizing the ferrous to Ferric-Oxide.

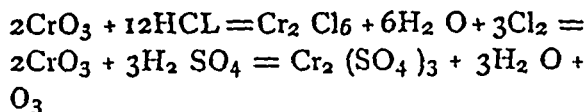
By the addition of certain oxides to the brilliant lead glass called "paste," the colours of precious stones are imitated. Cobalt Oxide Co O yields the blue of the Sapphire; Cuprous Oxide Cu₂ O a ruby-red; Ferric Oxide Fe₂ O₃ the yellow of the topaz.

(c). *Porcelain ana Earthenware* consist of Silicate of Aluminium, i. e. clay covered with a substance which fuses at a high temperature and forms a glaze, so binding the materials together.

The material for porcelain is the finest white or China clay = kaolin, whilst for the common earthenware a colored clay may be used.

The glaze for porcelain is generally finely powdered felspar, for earthenware the so called "salt glaze" is used. In the first place the porous ware is dipped in the vessel containing the felspar suspended in water and then strongly fired; in the second, common salt is thrown into the furnaces.

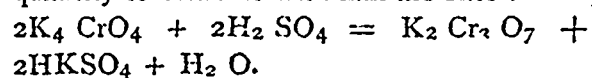
By the volatilization and decomposition of the salt upon the heated surface, the deposit of a fusible Silicate is made, thus rendering the ware imperious by moisture.



CHROMATES.

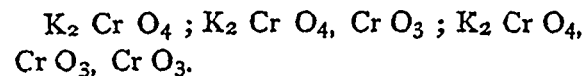
(b) If any Chromic compound be fused with Potassium Carbonate it becomes oxidized, and a soluble yellow Chromate, K₂ CrO₄ isomorphous with Pot. Sulphate (K₂ SO₄), and Pot. Manganate (K₂ MnO₄), is formed. Chromium compounds are prepared by this method from Chrome iron ore.

(c) Red crystals of the BICHROMATE, K₂ Cr₂ O₇, separate out when Sulphuric is added to a solution of the Chromate in sufficient quantity to combine with half the base:



(d). If to the solution of the bichromate a solution of chromium trioxide be added, Potassium Trichromate K₂ Cr₃ O₁₀ crystallizes out.

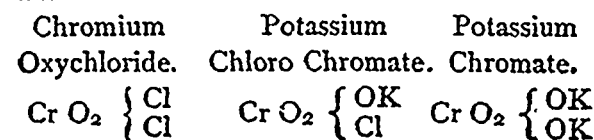
The bichromate is the chromate plus one molecule of chromium trioxide, the trichromate is the same plus two molecules of the oxide.



(e). The orange-red basic chromate of lead, Pb O, Pb Cr O₄, is obtained by heating lead chromate, Pb Cr O₄, with a solution of caustic potash (KOH).

(f). Chromium Oxychloride or Chromyl Chloride, Cr O₂ $\left\{ \begin{array}{l} \text{Cl} \\ \text{Cl} \end{array} \right.$ is a dark, red, strongly fuming liquid, boiling at 116.8° (Sp.G. 1.92). It is formed by distilling potassium bichromate, sulphuric acid and common salt.

(g). Upon cooling a solution of potassium bichromate in warm hydrochloric acid, large red crystals of Potassium Chloro Chromate, K Cl Cr O₃, separate out. The substance is intermediate between Chromium Oxychloride and Potassium Chromate.



TESTS AND SEPARATIONS.

Under heading "Hydroxides" in digest, the action of Potassium Hydroxide and Ammonia upon solutions of "Alumina—and Chromic—Oxide Salts" has been given.

The Solubility of Aluminium Hydroxide in solutions of Potassium and Sodium Hydroxides and its reprecipitation from Alkaline solutions by Ammonium Chloride, forms the most accurate test for Aluminium in the absence of Chromic Oxide Salts. The presence of the Chromic Oxide Salts is manifested either by the color of the solution, or by the faint yellowish green tint, which they give to a bead of Sodium Metaphosphate, Na PO_3 (obtained by heating the Microcosmic Salt, $\text{HNH}_4 \text{ Na PO}_4$) both in the oxidizing and reducing flame of the blow-pipe, changing to Emerald Green on cooling. It is necessary to remove the Chromium before the test of Aluminium is applied. This is effected by fusing the mixed oxides with Sodium Carbonate and Potassium Chlorate (two parts of each reagent are taken to one of the mixed Oxides) in a platinum crucible. If the yellow mass obtained be boiled in water, the whole of the Chromium is dissolved as potassium Chromate, part of the Aluminium as Potassium Aluminate, the rest of the Aluminium remaining undissolved. If the solution be acidified with Nitric Acid, and Ammonia then added to feebly Alkaline reaction, the dissolved portion of the Aluminium separates.

If any compound of Aluminium, after ignition upon Charcoal before blow-pipe, be moistened with a solution of Cobalt Nitrate and again strongly ignited, an unfused mass of a deep sky blue color is produced.

All the Salts of Chromium give to Borax bead before the blow-pipe in reducing flame an Emerald Green color.

The Chromous and Chromic Hydroxides are characteristic for the Chromous and Chromic Salts.

In solutions of Chromic Acid $\text{H}_2 \text{ CrO}_4$ and Chromates (the Alkali Chromates are soluble in water.)

(1.) *Barium Chloride* throws down a yellowish white precipitate of Barium Chromate, BaCrO_4 , Soluble in dilute Nitric and Hydrochloric Acids.

(2.) *Lead Acetate*, a yellow precipitate of Lead Chromate PbCrO_4 , soluble in Potassium Hydroxide, sparingly soluble in dilute Nitric Acid, insoluble in Acetic Acid.

(3.) *Silver Nitrate*, a dark purple red precipitate of Silver Chromate Ag_2CrO_4 ; soluble in Nitric Acid and Ammonia.

Chromic Acid and soluble Chromates give to a very dilute Acid solution of Hydrogen Dioxide, covered with a layer of ether, a fine blue color. This reaction is very characteristic, being distinctly produced in a solution of one part of Potassium Chromate in 40,000 parts of water.

PUBLIC SCHOOL DEPARTMENT.

Graded Course of Instruction.—Third Book.—Continued from May Number.

FIFTH GRADE.

(Time allowed—About 5 months.)

READING.

The first 80 pages of the Third Reader. To be copied on slates in preparation and read from slates by the pupils. It thus becomes a lesson

in composition, punctuation, capitals, spelling, writing and reading. Continue it through all the succeeding grades. Reading is largely an imitative art; read well yourself and encourage your pupils to imitate you. Good reading is something more than being able to *speak all the words*. Secure the *talkings*

tone of voice and look after the ends of the words, which are apt to be slurred over. Teach the meaning of the lesson rather than of the words.

SPELLING AND DICTATION.

Seldom or never oral,—then only for variety. Write on slates or paper to dictation, any eight consecutive lines of the reading limit. The whole extract should first be read to the pupils, then dictated in portions without repetitions, then read for the punctuation. If the system of copying the lessons on slates, and reading from the slates has been adhered to, the pupils will soon understand and apply all the rules for points and capitals.

ARITHMETIC.

- (1) Review simple rules, Notation and Numeration.
- (2) Roman numerals to 10,000.
- (3) Tables of weights and measures.
- (4) Reduction.
- (5) Problems involving simple rules and reduction.
- (6) Mental arithmetic (see remarks under fourth grade.) This exercise should be given daily.

GEOGRAPHY.

In this and the following grades, great attention should be given to map drawing, and to the pointing out of places on the map. The map should be used at every recitation, so that the position of places may become fixed upon the mind. Straits, channels and sounds must be described by telling what bodies of water they connect, or what bodies of land they separate. Islands must be described by telling what water they are in and their position from the nearest coast. Pupils should be taught to draw a part of the map, such as a particular coast as well as the whole. A good way to test pupils' knowledge of the position of places is for them to draw an outline of the map putting in no names, and for the teacher to dictate the names to them, giving time to print them in neatly. Great

attention should be given to the spelling of geographical names.

1. Review previous limit.
 2. The relative positions and the boundaries of all the continents.
 3. The following islands:—Cuba, Sicily, Madagascar, Japan, Australia, Ceylon, Cyprus, New Zealand, British Isles.
 4. Seas.—Behring, Mediterranean, Black, Arabian, Red, Japan, Adriatic, Caribbean, Caspian, Baltic.
 5. Gulfs and Bays.—Mexico, Biscay, Guinea, Suez, Bengal.
 6. Capes.—Horn, Good Hope, Conrorin, Ortegál, Finisterre.
 7. Mountains.—Rocky, Andes, Ural, Caucasian, Himalaya.
 8. Rivers.—St. Lawrence, Amazon, Danube, Mississippi.
 9. Great Lakes between Canada and United States.
 10. Counties of Ontario, with county-towns, thus:—
 - (1) Counties on the different bodies of water.
 - (2) Counties inland.
 11. Islands.—Manitoulin, Christian, Walpole, Wolfe, Amherst, Thousand Isles.
 12. Rivers.—Thames, Detroit, Grand, Ottawa, St. Clair, Trent.
- Draw an outline of Ontario, marking Georgian Bay, Lakes Huron, St. Clair, Erie, Ontario, river St. Lawrence.

GRAMMAR LIMIT.

1. Nature and object of grammar and its four divisions.
2. Definition of letter, syllable, word and sentence.
3. Distinction of vowels and consonants.
4. Definition of noun and verb.
5. Examples of nouns and verbs in simple sentences.

COMPOSITION LIMIT.

1. To know when capitals are chiefly used.
2. To form five easy sentences

beginning with a capital and ending with a proper point.

DRAWING.

Review straight lines in various positions and combinations, rectilinear figures, as, squares, triangles, &c.

WRITING.

Payson, Dunton & Scribner's copy book, No. 3. Pupils' progress depends not upon the amount written but upon the care bestowed on the work. Point out errors and correct on the blackboard.

SIXTH GRADE.

(Time allowed—about 5 months.)

READING.

The first 160 pages of the Third Reader, of which pages are review. See remarks under 5th grade.

SPELLING AND DICTATION.

On slates or paper, any 10 consecutive lines of reading limit. See remarks under 5th grade.

ARITHMETIC.

1. Review previous limit.
2. Compound addition, subtraction, Multiplication and Division.
3. Problems in simple rules, reduction and compound rules.
4. Mental arithmetic (daily.)

GEOGRAPHY.

1. Review previous limit.
2. *Rivers in Ontario*.—French, Muskoka, Saugeen, Petawawa, Bonnechere, Madawaska.
3. *Bays*.—Nottawasaga, Quinte.
4. *Lakes*.—Rosseau, Muskoka, Simcoe, Scugog, Rice, Pigeon, Nipissing.
5. *Towns*.—Dundas, Brampton, Newmarket, Ingersoll, Orillia, St. Mary's, Paris, Goderich, Kincardine, Collingwood, Oshawa, Brockville, Prescott.
6. The Countries, with capitals, situation of capitals, and relative position of the countries in South America.
7. *Rivers*.—Orinoco, Paraguay, Uruguay, Parana, Rio-de-la-Plata, Xingu, Pilcomayo, Yapura, Rio Negro, Ucayali, Purus, Madeira, Topajos.

8. *Lakes*.—Maracaybo, Titicaca.

9. *Gulfs and Bays*.—Venezuela, Paria, All Saints, San Matias, St. Georges, Penas, Guayaquil, Buenaventura, Darien, Panama.

9. *Capes*.—Pt. Gallinas, Orange, St. Roque, Frio, St. Antonio, Corrientes, Horn, Blanco, St. Francisco.

10. *Islands*.—Trinidad, Joannes, Staten, Hoste, Wellington, Hanover, Chonos, Chiloe, Juan Fernandez, St. Felix, Galapagos.

11. *Straits*.—Magellan, Le Maire.

12. *Cities or Towns*.—Panama, Cartagena, Valencia, Bahia, Pernambuco, Parana, Valparaiso, Potosi, Pasco, Riobamba,

13. *Mountains*.—Parimé, Cotopaxi, Antisana, Andes.

14. Draw South America, putting in countries and capitals, Andes Mts.; Amazon and Orinoco rivers; Lakes Maracaybo and Titicaca; Islands, Tierra-del-Fuego, Trinidad, Joannes; all the capes and all the gulfs and bays.

GRAMMAR.

1. Former limit.
2. Division of words into syllables.
3. Diphthongs and silent letters.
4. Number and gender of nouns.
5. Selection of nouns, adjectives, pronouns and verbs in simple sentences.

COMPOSITION.

1. To form simple sentences, with proper capitals and points.
2. To write simple sentences on any familiar subject, with proper capitals and points.
3. To date a letter correctly as to form, capitals and points.
4. To write and punctuate their own names.

DRAWING.

Review of previous grade, with curves, circle, ellipse, &c.

WRITING.

Copy book No. 4, Payson, Dunton & Scribner.

SEVENTH GRADE.

(Time allowed—about 5 months.)

READING.

All the Third Reader, of which the first 160 pages are review. See previous remarks on reading.

SPELLING AND DICTATION.

On paper, any 12 consecutive lines of limit. See preceding grades.

WRITING.

Copy-book No. 5. This and the foregoing numbers are intended to be the small series.

ARITHMETIC.

1. Review previous limit.
2. G. C. M. and L. C. M.
3. Reduction of abstract fractions.
4. Problems on simple rules, reduction and compound rules.
5. Mental arithmetic (daily.)

GEOGRAPHY.

1. Review previous limit.
2. The Provinces of the Dominion, with capitals and position of capitals; provinces to be learned so that they can be given in their order from W. to E. or from E. to W., or in order of size.

2. *Rivers.*—Mackenzie, Missouri, Frazer, Skeena, Peace, Athabasca, Saskatchewan, Assiniboine, Coppermine, Great Fish, Churchill, Nelson, East Main, Great Whale, St. Maurice, Saguenay, Richelieu, St. Francis, Chaudiere, Rimouski, St. John, Miramichi, Restigouche, Shubenacadie, Kamistiquia, Nipigon.

3. *Lakes.*—Great Slave, Athabasca, Wallaston, Deer, Winnipeg, Winnipegosis, Lake of the Woods, Rainy, Nipigon, Abittibe, Mistassini, St. John, Champlain, Memphramagog, Megantic, Temiscouata, Bras d'Or, Nicaragua.

4. *Gulfs and Bays.*—Coronation, Boothia, Ungava, James, White, Notre Dame, Bonavista, Trinity, Placentia, Fortune, Fundy, Cobequid, Passamaquoddy, Chignecto, Verte, Miramichi, Chaleur, Hillsboro, Egmont, Campeachy, Honduras.

5. *Channels, Straits and Sounds.*—Melville, Lancaster, Barrow, Hudson, Davis, Belle Isle, Canso, Northumberland.

6. *Islands.*—Banks, Prince Albert, Prince of Wales, Southampton, Queen Charlotte, Newfoundland, Miquelon, Magdalena, Anticosti, Aux Coudres, Orleans.

7. *Capes.*—Chudleigh, Freels, Race, Ray, Sable, Canso, Eufume.

8. *Mountains.*—Laurentian, Alleghany, Watchish.

9. To know the divisions of North America, viz:—Alaska, Dominion of Canada, United States, Mexico, Central America, Newfoundland, Greenland, with capitals, position of countries and capitals.

10. *Towns and Cities.*—

(1) All the cities of Ontario and Quebec.

(2) *New Brunswick.*—St. John, Newcastle, Moncton, Shediac.

(3) *Novo Scotia.*—Lunenburg, Yarmouth, Truro, Pictou.

(4) *Prince Edward Island.*—Summerside.

(5) *Cape Breton.*—Sydney.

11. Draw North America, its different divisions, with capitals; provinces of the Dominion, with capitals, Rocky Mts., Alleghany Mts., River St. Law and Gulf.

12. *Draw Ontario*, and in addition to the 5th grade limit, block off the counties, and put in their names, and county-towns and all other names mentioned in 5th grade limit.

GRAMMAR.

1. Former limits.
2. Definition and use of adverbs and prepositions.
3. Gender, person, number and case of nouns.
4. Verbs, transitive and intransitive.
5. Parsing of nouns and classification of adjectives, pronouns, verbs, adverbs and prepositions in simple sentences.
6. Distinction of noun part and verb part in simple sentences.

COMPOSITION.

1. To write simple sentences of any specified kind, with proper capitals and points.
2. To distinguish between sentences of any specified kind.
3. To write a short letter, with proper form of date, address and subscription.
4. To write their own, their parents', and their teacher's names.

5. To give a short description of any familiar subject.

WRITING.

Copy-book No. 5, Payson, Dunton & Scribner.

DRAWING.

Review, and add scrolls, simple geometrical solids, and drawing simple copies.

(Concluded in next number.)

COUNTY OF PERTH PROMOTION EXAMINATIONS.

MARCH 25th, 1881.

Entrance to Senior Third Class.

Candidates are required to observe the Regulations strictly.

Time—2 hours.

ARITHMETIC.

1. A miller sold 7540 lbs. of flour at \$3.50 per 100 lbs; how much money did he receive?
2. What number must be taken 1416 times from 1377906, to leave 138 for remainder?
3. How many 4 oz. weights can be made out of 3 cwt., 3 qrs., 3 lbs. of brass?
4. What would it cost to ditch a road a quarter of a mile long on each side at the rate of 40 cts. per rod?
5. How many cubic feet in 9000 bricks, each 2 inches thick by 4 inches wide and 8 inches long?
6. If a man can make 20 buttons in a minute, how many days of 10 hours each will he be in making 2844000 buttons?
7. If I buy 80 turkeys at the rate of 5 for \$4 and sell them at the rate of 8 for \$9, how much do I gain?
8. Divide (75890134263—89649327) by the sum of 47, 36, 823, 64, 439, 88, 75, 751, 157, 98, 899, 75, 946, 437, 258, 346, 218, 516, 432, 814.
9. There are 67,440 acres in Elma and

45,880 in Blanchard, how many square miles in the two townships together.

10. Multiply 172,814,412 and 978,613,245 together by three lines of partial products, or any way you like?

Value 100. Any eight correct solutions will be considered a full paper.

Entrance to Fourth Class.

Time 2 hours.

1. A farmer bought 120 ac. 3 r. 20 sq. per. from one man, and 76 ac. 34 sq. per from another man, and then sold to a neighbor 56 ac. 3 r. 20 sq. yds. How many acres has he remaining?
2. How many yards of cloth worth 5 shillings per yard can be bought for £40 10s. 6d.?
3. A man built 2 mi. 1 fur. 15 rds. of fence for \$76 45. How much a rod did he get?
4. Find the sum of $7\frac{1}{2}$, $8\frac{2}{3}$, $14\frac{7}{8}$, $9\frac{1}{5}$, $\frac{3}{4}$, $1\frac{5}{8}$.
5. If \$402 be paid for 12 ac. 2 r. 10 per., how much will 1 ac. cost?
6. Bought $2\frac{1}{2}$ of $\frac{4}{5}$ of 20 bush. 1 pk. 1 qt. for \$51.92 and sold 12 bush. 2 pk. 1 gal. for \$20.20. How much was gained on each bush. sold?
7. Find the value of $3\frac{2}{3} + \frac{1}{2}$ of $2\frac{1}{2} + 8\frac{5}{16}$ + $1\frac{7}{8} - \frac{2}{3}$ of $1\frac{5}{8}$.
8. A man bought a horse for \$110 $\frac{3}{4}$ which was \$12 $\frac{5}{8}$ more than he gave for him. Al-

lowing \$5½ for his keep while he owned him, how much did he gain by the transaction?

9. If a man's income is £400 a year, how much can he spend on an average each day and still save £50 10s. 4d. in the year?

10. Find the G. C. M. of 460, 1035, 1150. Value 100. Any eight correct solutions will be considered a full paper.

Entrance to Fifth Class.

Time—2 hours.

1. How many lots containing 1 rood, 17 perches 3 yards can be surveyed out of 100 acres of land?

2. Divide $\frac{3\frac{1}{2}}{7\frac{1}{2}}$ of $\frac{12-3\frac{1}{7}}{3}$ by .036 giving the quotient as a decimal.

3. Express the time which elapsed between 5 p. m. on the 3rd of January last and 11 a. m. to day (March 25th) as a decimal of a year (365 days.)

4. If it require 4,900 yards of cloth 1½ yds. wide to clothe 2,900 soldiers, how many yards of cloth $\frac{3}{4}$ yard wide will suffice for 6,000 soldiers?

5. What is the value of 5 tons 3 cwt. 17 lbs. of barley and 3 tons 1 cwt. 13 lbs. of wheat, the barley being worth 75c. per bushel and the wheat 1¼ times as much per bushel as the barley?

6. The water in a cistern 4 feet deep, 5 feet long and 3 feet wide weighs 3,750 pounds; a gallon of water weighs 10 pounds; how many cubic inches in a gallon?

7. What is the value of 21 acres 3 roods 13 perches of land at \$67.75 per acre?

8. I gain \$2.50 by selling 5 bushels of clover seed at the rate of 61¼c. for 5 quarts; what did it cost me per bushel?

9. Express .75 of £16 12s. 8d. as a decimal of £14 17s. 6d.

10. A can do a piece of work in $\frac{1}{5}$ of a day; B in $\frac{1}{3}$ of a day, and B and C together in $\frac{1}{4}$ of a day; in what time would A and C together do it?

Value 100. Any eight correct solutions will be considered a full paper.

Entrance to Sixth Class.

Time 2 hours.

1. Bought Bank of Montreal stock at 186. If an annual dividend of 8% is declared, what rate of interest do I receive on my investment?

2. For how much must I draw a note for 8 months on which I can raise at a bank \$4,660.50; rate of discount being 7%?

3. What amount of stock in a company at 10¼% below par could be bought for \$1,342.50?

4. Dominion Government stock 5% is quoted at 107, and the City of Toronto 6% at 110. Which would be the better investment, and what would be the difference in the annual income from \$200 invested in each?

5. A rectangular field whose length is four times its breadth contains 10 acres; find its perimeter.

6. What will \$280 amount to in 3½ years at 7%, compound interest?

7. Find the value of $.0018\dot{5} \times .07 \div 3.0\dot{2}4$.

8. How many times larger is a spherical ball 4 inches in diameter than one 3 inches in diameter?

9. If it cost £15 15s. to make a cubical cistern, open at the top, with lead, at 1s. 9d. per sq. foot, inside measurement, how many gallons will the cistern hold?

(The Imperial gallon contains 277.274 cub. in.)

10. If A's income be 150% more than B's, how much per cent. is B's income less than A's?

Value 100. Any eight correct solutions will be considered a full paper.

Entrance to Senior Third Class.

GEOGRAPHY.

Time—1 hour.

1. Name all the rivers, bays, lakes, &c., through which the waters of Lake Simcoe pass on their way to the sea. Value 8.

2. Give the boundaries of the County of Huron. Value 4.

3. How do boats pass from Lake Ontario to Lake Erie? Value 4.

4. Define ocean, bay, continent, and peninsula. Value 4.

5. What and where are British Columbia,

Amherst, Galt, Rideau, Milverton, Sturgeon, Collingwood, Muskoka, Dufferin, Calumet? Value 20.

6. Draw a small map of the County of Perth, showing the townships, towns, rivers and railways. Value 10—Total value 50.

Entrance to Fourth Class.

Time— $1\frac{1}{4}$ hours.

GEOGRAPHY AND HISTORY.

1. Name in order the Continents and Oceans lying respectively to the north, east, south and west of the Atlantic. Value 6.

2. In what waters are the following islands: Manitoulin, St. Joseph, Walpole, Grand Island, Orleans and Amherst? Value 5.

3. Describe the course of the largest river in South America. Value 3.

4. Name the Capes along the coast of America, beginning at Cape Horn. [No mark will be given unless you name them in the order required.] Value 4.

5. What general direction would a ship take in sailing from California to Madagascar? Value 3.

6. What and where are Vancouver, Belle-Isle, Lima, Assiniboine, Chaleur, Wotchish, Trent, La Plata, Alleghany. Value 22.

7. Draw a small map of New Brunswick, showing its boundaries, rivers and towns. Value 5.

8. What parts of America were explored by Columbus, Cabot, Cartier and Champlain? Value 8.

9. What language is spoken in Ontario? What language would you hear spoken along the south bank of the St. Lawrence? Explain fully how this difference came about. Value 2 + 2 + 4.

10. Why do we celebrate Dominion Day? Value 4.

11. Where is Brock's monument, and why was it erected?

Give a full answer in order to deserve a full mark. Value 10—Total value 80.

Entrance to Fifth Class.

Time— $1\frac{1}{2}$ hours.

1. In a voyage from Hamburg to Venice what countries, large cities, capes and mouths of rivers would be passed? Name them in order. Value 12.

2. Name and explain the two motions of the earth, and give the results of each. Value 6.

3. Give the boundaries of the German Empire and of Russia. Value 8.

4. Name the chief towns of Switzerland and describe its climate and physical features. Value 7.

5. What are the chief exports of each of the following countries: Norway and Sweden, China, South Australia and Peru? Value 8.

6. Describe Oceania. Value 5.

7. Define river-basin, watershed, delta, hemisphere. Value 4.

8. Draw a small map of Scotland, locating thereon the bays, capes, four rivers, and the towns of Edinburgh, Glasgow, Aberdeen and Stirling. Value 20—Total value 70.

9. In whose reign did each of the following distinguished individuals live? Francis Bacon, Cardinal Wolsey, Sir Isaac Newton, Duke of Wellington, Daniel O'Connell. Value 15.

10. Show how Queen Victoria is descended from James I. Value 10.

11. How did the English get possession of Hindostan? Value 5.

12. Sketch the reign of Queen Elizabeth. Value 10—Total value 40.

Entrance to Sixth Class.

Time— $1\frac{1}{2}$ hours:

1. Give the boundaries of the Zones and their widths in miles. Value 5.

2. Define Meridian, Aphelion, Antæci, Satellite, Zodiac, Apogee, Orbit. Value 7.

3. Name three large islands crossed by the equator. Value 3.

4. Name all the States and Territories, with their capitals, west of the Mississippi, that have no sea coast. Value 15.

5. Describe a sea voyage from Hong-Kong to London, naming all the waters through which you would pass. Value 12.

6. What and where are Tahiti, Caithness, Auckland, Munich, Aleppo, Cotopaxi, Ashantee, Hawaii, Candahar, Morea, Odessa Fort William. Value 24.

7. Name and give the exact position of the largest city marked on the map of Oceania. Value 4—Total value 70.

HISTORY.

1. What were the causes of the alienation of the American colonies from the British Government?

2. Name two of the principal battles of the American Revolution and give a brief account of each.

3. Give an account of the battle of Marathon.

4. Name the principal personages and leading events of the second Punic War.

5. Give a short account of Charlemagne and his efforts.

6. Locate the following places and connect them with important events: Sobraon, Kars, Queenstown, Balaklava, Culloden.

Values 10 each.

Entrance to Senior Third Class.

DICTIONARY.

Time— $\frac{1}{2}$ hour.

N. B.—Writing will be judged from this paper. Slates not to be used.

1. The boy went | as he had promised | to the senator's house, | showed the cook the design | of the figure | which he meant to execute, | answered for the success of the attempt, | and cut the block of butter | with that purity of style | and perfect taste | which he afterwards displayed | in cutting blocks of marble.

2. The genius smiled | with a look of compassion | and affability | that familiarized him | to my imagination.

3. Approval, conscience, business, quietly, demeanor.

4. Bring sleeping draughts to the downy bed.

5. Slighting ancient footmarks, harangue, shriek.

6. He makes his living by dyeing cloth, daughter, ascending.

7. The disguised monarch, prodigious, perpetually.

8. Pursuit, perceptible, separately, paradise.

9. He saw signs of mischief, arrival, variety. Value 80. 5 marks off for each mistake.

READING.

Third Book, page 103—"Jacko's... rods." Value 50. Expression 15. Fluency 35. Two marks off for each error in pronunciation, and one mark off for every other error in fluency, such as hesitation, omission, substitution, mis-calling, &c., &c. Examiner will please fill in the reading marks on the list.

Value for writing 40.

Entrance to Fourth Class.

Time— $\frac{1}{2}$ hour.

N. B.—Writing will be judged from this paper. Slates not to be used.

1. I had no watch, | and was therefore compelled | to guess the hour, | by which means alone | I could determine my position | by the sun, | as it was impossible | to obtain a sight | of the sun's disc.

2. The language of this nation | seems very harsh | and unintelligible | to a foreigner.

3. Again the gallant boatswain | volunteered to make an effort | to save his comrades.

4. It spoke as articulately | as a parrot.

5. My scanty stock of biscuits | was exhausted.

6. As my life was now | in imminent jeopardy, | I secured a rope | round my waist | and gave a sign | of acquiescence.

7. Promptitude, schooner, lieutenant, screech, loosely, courage, specie, suicide, sortie, sovereign, siege, garrison, seize, blaspheme, oblique, discernible, secession.

Value 80. 5 marks off for each error.

READING.

Third Book, page 202—"As soon as... .. bones."

Value 50. Mark as in entrance to Senior Third.

Entrance to Fifth Class.

WRITING.

Value in all classes 50. Writing will be judged from dictation paper. Slates not to be used.

DICTATION.

Time 1/2 hour.

1. Having committed a serious crime.
 2. He disseminated a most exaggerated report.
 3. The descendants of the original settlers.
 4. The colonists had been completely annihilated.
 5. Some earnest adherents of loyalty.
 6. In imitation of Portuguese navigators.
 7. Whose attitudes and gestures expressed wonder and astonishment.
 8. Wearing an aspect of tempting prosperity.
 9. They generally lived together by twos.
 10. They started in pursuit of new booty.
 11. A prodigious subterranean noise.
 12. He placed his musketry in ambush.
 13. A traitor to his suzerian or feudal lord.
 14. Napoleon's Russian campaign.
 15. A breach of etiquette.
 16. Some marauding excursions.
 17. Consummate prudence and undaunted courage.
 18. Being too much occupied with civil dissensions.
 19. In the course of the thirty years' war.
 20. The interests of Spain were sacrificed by the cession of Gibraltar.
 21. Aborigines, auspices, requisite, jewels, inseparably, maritime, equitably, allegiance, desperation, indomitable, comparatively, acquisition, besiegers, catastrophe, manœuvre.
- Value 80. 5 marks off for each mistake.

READING.

Fourth Book, page 184.—But the other achievement.....from Cambria's tears.

Value 50. Mark as in entrance to senior third.

Entrance to Sixth Class.

WRITING.

Value in all classes 50. Writing will be judged from dictation paper. Slates not to be used.

DICTATION.

Time 1/2 hour.

1. Light is the emanation from luminous or illuminated bodies. Some philosophers suppose it to be a subtle and extremely attenuated fluid—so fine as to have no appreciable weight; others suppose it to be merely the undulation or vibration of an ethereal medium.
 2. Gorgeous, technically, phosphorescence, laboratory, imagination, benefitting, mattress, worshipper, vehemence, indispensable, ecclesiastical.
 3. Independently of his great attainments, Mr. Watt was an extraordinary and wonderful man. He had infinite quickness of comprehension, a prodigious memory, and a certain rectifying and methodizing power of understanding, which extracted something precious out of all that was presented to him. His stores of miscellaneous knowledge were immense. It could not, however, have been inferred from his usual occupations that he was curiously learned in many branches of antiquity, metaphysics, medicine and etymology, and perfectly at home in all the details of architecture, music and law. Nor was it at all extraordinary to hear the great mechanician and engineer detailing and expounding the metaphysical theories of the German logicians, or criticising German poetry.
 4. Parallel, mathematician, apparatus, oscillation.
- Value 80. 5 marks off for each mistake.

READING.

To be marked while algebra is going on. Fifth Book, page 141.—"Then it was that the great English.....England."

Entrance to Senior Third Class.

GRAMMAR AND COMPOSITION.

Time 1 hour.

1. What part of speech is each word in the following sentence?
One day his employer said to him, "Now, to-morrow, that cargo of cotton must be got out and weighed, and we must have a regular account of it." Value—10.
2. Write a description of "A Table."

Try to fill up fifteen lines of your paper with it.

Value—15.

3. Tell in writing what you can remember about Grace Darling. Do not try to remember the exact words of the book, but use your own words. No mark will be given for the words of the book. Value—10.

4. Construct a single sentence out of the following:—Value 5.

Joe drew near.

Joe saw signs of mischief.

Joe felt uneasy.

Entrance to Fourth Class.

GRAMMAR.

Time 1 hour.

1. Analyze, showing subject, attributive adjuncts of subject, and predicate, the following sentences:

At that moment, thoughts of my mother came into my mind.

With the fleetness of thought now commenced a race.

Not far from his father's house was a large pond.

Herbert's quick eye soon caught sight of him.

My right there is none to dispute. Value 15.

2. Parse: On such a night the sea engulfed my father's lifeless form. Value 19.

3. Change following nouns into the plural form:—Value 8.

A man's fault.

The child's dress.

The deer's horn.

The farmer's wife.

4. State the mood, tense, number and person of the verb "give" in each of the following examples:

He gives; we have given; thou gavest; you will give; they were giving; to give.

Value 12.

5. Write three complete sentences each containing an adjective in the superlative degree. Value 6.—Total values 60.

Entrance to Fifth Class.

GRAMMAR AND COMPOSITION.

Time 1½ hours.

1. Analyze: *During the same period, Eng-*

land had not been idle in the matter of taking possession of new countries and planting her sons therein. Value 17.

2. Parse the words in italics in the sentence given above for analysis. The neatness of your work will be considered in marking.

Value 40.

3. Vary the construction in each of the following sentences:

Many suppose that the bird still survives as a resident of those shores of East Greenland which are beyond the reach of man.

In two days from that time they were overtaken by the storm. Value 4.

4. Correct and improve the following:

(a.) A waggon has 4 wheels and they are made of wood and iron. You can get a ride in a waggon.

(b.) A threshing machine is a very useful article. The farmers could not hardly get along without them. Value 4.

5. Change into prose:

"All peacefully gliding, the waters dividing, The indolent bateau moved slowly along, The rowers, light-hearted, from sorrow long parted,

Beguiled the dull moments with laughter and song. Value 10.

6. Write a short letter to a friend in the United States describing the manner in which the Promotion Examination in this County is conducted, and stating what you may have heard people say about the impartiality of the examination. Do not sign your own name to the letter. Value 25—Total Values 100.

Entrance to Sixth Class.

GRAMMAR.

Time 1½ hours.

1. *That our sympathy can afford them no consolation, seems to be an addition to their calamity; and to think that all we can do is unavailing, and that what alleviates all other distresses, the regret, the love, and the lamentations of their friends, can yield no comfort to them, serves only to exasperate our sense of their misery.*

(a.) Analyze fully.—Value: 28.

- (b.) Parse the words in italics.—Value 32.
 (c.) Give the etymology of sympathy, calamity, alleviates, serves, comforts.—Value 5.
 2. Correct the following and give reasons:
 Man rebelling against his Maker, brought him to ruin.
 He said that truth was immutable.
 Its being me need make no difference.
 All enjoyed themselves very much, us excepted.—Value 8.
 3. Give adjectives of a classic origin, corresponding with the following nouns: friend, ship, day, hand, year, house.—Value 6.
 4. Parse the words in italics:
 Everything that is *worth having* is *worth working for*.—Value 4.
 5. Describe the principal changes of construction and give examples.—Value 12.
 6. State the different circumstances under which the nominative case is found. Give examples.—Value 5.

ALGEBRA AND GEOMETRY.

Time 1½ hours.

1. Resolve into elementary factors:

$$9x^2yz - 3xy - 6y^4; x^6 - 1$$

Value 10.

2. Divide 64 into two such parts that $\frac{1}{3}$ of the greater is equal to $\frac{3}{7}$ of the less.

Value 8.

3. $x^6 - 2x^3 + 1$ by $x^2 - 2x + 1$.
 Value 6.

4. Solve the equation:

$$\frac{x+4}{3x+5} + 1\frac{1}{2} = \frac{3x+8}{2x+3}$$

Value 16.

5. Give the definitions of plane angle, polygon, segment of a circle, hypotenuse, rectangle, trapezium.—Value 12.

6. Parallelograms on the same base and between the same parallels are equal.—
 Provc.— Value 12.

7. In any right angled triangle the square which is described on the side subtending the right angle is equal to the squares described on the sides which contain the right angle.—
 —Prove.—Value 15.

8. Construct an isosceles triangle having the vertical angle four times each of the angles at the base.—Value 6.

EDITORIAL NOTES.

The new scheme for the superannuation of teachers, proposed by the Minister of Education, does not seem to have been received by the Teachers' Associations which have so far taken it into consideration. A large majority have expressed themselves as decidedly averse to any scheme of superannuation whatever. It is easy to guess that this majority is made up largely of those teachers who do not intend to remain in the profession for any considerable time. Apart from this, however, the scheme is not wholly acceptable even to those who intend to make teaching their life work, the main objections urged being that contributions to the

fund should be voluntary, or that if compulsory it should include High School teachers, Inspectors and Separate School teachers as well as Public School male teachers. Salaries are surely small enough and represent very inadequately the benefits conferred upon the public by the work of a conscientious and efficient teacher; why then should not state aid to education go so far as to grant a retiring allowance after say 25 or 30 years service without any previous contribution to the superannuation fund?

From our perusal of Gage's *School Journal* in the past, we were prepared

for almost any exhibition of ill-temper, and almost any breach of that journalistic propriety that should characterize educational periodicals above all others; but we must confess to being disagreeably surprised by the introduction into its columns of such a display of vulgarity and bad taste as its personal attack on Mr. Adam, the editor of the *Canada Educational Monthly*. In the discharge of professional duty the *Canada Educational Monthly* directed attention to the discreditable tactics resorted to by the proprietors of Gage's *School Examiner* for the purpose of procuring a circulation for the latter magazine. The nature of these tactics is too fresh in the memory of our readers to call for particular reference or further description. Mr. Adam performed a duty felt to be due to the public and to the profession, when he undertook to expose the questionable proceedings of an unscrupulous publisher. The *Journal* unable to defend its proprietors from the strictures of the *Monthly*, resorts to the coarse *tu quoque* style of argument, in a manner as disreputable as it is revolting to all ideas of refinement and propriety. This attempt to conceal from the public the gravity of the offence with which they have been charged by making statements that are not only irrelevant to the case but absolutely false, must fail, and nothing has better served to disclose the animating spirit of these men, whose exponent the *School Journal* purports to be, than the contemptible and cowardly attack on the private character of Mr. Adam.

At the recent University Examinations the following places of honor were won by students from Hamilton :

FIRST YEAR : 1st in Classics, R. H. Little; 1st in Mathematics, J. C. Fields; 1st in General Proficiency, J. C. Fields; 2nd in General Proficiency, W. B. Roswell.

SECOND YEAR : 1st in Classics, H.

R. Fairclough; 1st in Mental and Moral Science, W. Fargaharson; 1st in Chemistry, R. C. Tibb; 2nd in Biology, R. C. Tibb; 2nd in Mathematics, G. Ross.

The July-August number of THE SCHOOL MAGAZINE will be issued about the 15th July.

We have to hold over for another month the promotion examinations for North Wellington.

REMARKABLE RESULTS.—The Ontario Mutual Life Assurance Company publish in this number some startling figures.—The practical results of the Purely Mutual Principle properly applied. These results show the folly of people joining Co-operative Associations because they are cheap.

The Ontario Mutual is a chartered Institution and gives ample security to its Members, and furnishes Insurance cheaper than any co-operative can possibly do. We recommend our readers to look carefully into the merits of this Association which is rapidly becoming the leading Assurance Company of Canada. It is keeping up with the advanced spirit of the age, by adding several new features to its already popular plans of Life Assurance. For particulars address any of the Agents or the Manager at Waterloo.

We would call attention to the announcement in our advertising pages of a Teacher's Class in Book-keeping, Penmanship and Phonography, to be held during the summer vacation at the Canada Business College, Hamilton. Mr. R. E. Gallager is the Principal, to whom applications should be made.

It is said that the Prussian school system amounts to no more than teaching each social grade to hate the grade above.