

Let  $x$  = rate per hour of first.  
 $y$  = rate per hour of second.

$$\frac{6}{x} - \frac{6}{y} = \frac{1}{2}, \quad \frac{6}{x + \frac{2}{3}} - \frac{6}{y + 1} = \frac{1}{2}.$$

Having found these two equations he works them out in the ordinary way.

Note 3.—The question 5 (c) was solved by only one gentleman, Mr. James C. Thompson. The simplest method of solving it is:—

Let  $x, \frac{2xy}{x+y}, y$ , be the quantities in H. P.

Then,  $4(x+y)^2 = 25xy$ .

And,  $4xy = (x+y)^2 - (x-y)^2$ ;

after which, the whole course is plain sailing.

Note 4.—A greater number of solutions than I expected were given of the questions 8 (a) and 8 (b). The following answer to 8 (a) is taken from the papers of Mr. John Cameron; and the answer to 8 (b) from the papers of Mr. P. Mactavish.

8 (a). Mr. John Cameron.

From equation,

$$x = -m + \sqrt{m^2 - n}.$$

$\sqrt{m^2 - n}$  is imaginary, when  $n > m^2$ ; and real, when  $n < m^2$ . Hence we see that  $N = m^2$ , as it comes under the same conditions. The roots are the same when  $n = N$ .

8 (b). Mr. P. Mactavish.

Let,  $x^2 + px + q = 0$ , have roots  $B, y$ .

Then,  $B + y = -p$ .

Mr. Mactavish gives the proof of this, which may be omitted. He also proves that—

$$By = q.$$

Take now equation,  $x^2 + rx + s = 0$ . Let its roots be  $B, n$ .

It can be proved, as in the other equation, that

$$B + n = -r,$$

$$\text{and } Bn = s.$$

$$\text{Now, } B + y = -p \quad (1)$$

$$B + n = -r \quad (2)$$

$$y - n = r - p, \quad (2) \text{ subtracted from } (1).$$

Hence the difference of their roots  $= r - p$ .

$$\text{Again, } \frac{By}{Bn} = \frac{q}{s}$$

$$\frac{y}{n} = \frac{q}{s}.$$

#### NATURAL PHILOSOPHY.

Note 5.—The question 3 (b) presented difficulty to some of the candidates, because there is no rule given in the text-book by which it can be directly solved. At the late Normal School examinations a similar problem was pronounced insoluble, for want of sufficient data, by a considerable number of the students examined. I intentionally set the question, in the August examination, in the form in which it appears, in order that candidates might be taught to emancipate themselves from the bondage of rules committed to memory, and might be thrown back on principles. The following solutions are taken from the papers of Mr. John Cameron and Mr. Andrew Hay respectively.

Mr. John Cameron's solution.

When sunk the tendency of the wood to rise is  $31.5 - 11.7 = 19.8$  oz., as it detracts that much from the weight of the copper. Hence weight of water it displaces  $= 70 + 19.8 = 89.8$ ; and  $70 \div 89.8 = .779 +$  is specific gravity.

Mr. Andrew Hay's solution.

Weight of equal volume of water  $= 70 + 31.5 - 11.7 = 89.8$   
 $\therefore s = \frac{70}{89.8} = .779.$

Note 6.—I have found that a large number of candidates for first class certificates have most indefinite conceptions as to how the velocity of a body, which is moving with a variable velocity, is, at any instant, to be estimated. I, therefore ask attention to the following answer to question 6 (a), by Mr. James C. Thompson, in which the only defect is, that the pronoun *it*, in the expression "if it were constant," is, perhaps, somewhat vague. Mr. Thompson means the velocity acquired.

"When a body moves with a variable velocity, the velocity at

each instant is estimated by the space through which, if it were constant, the body would pass in a second of time. A body falling by the force of gravity to the earth has acquired a velocity of 96 feet means—that, the force of gravity ceasing, the body would be carried through 96 feet in the second."

Note 7.—Question 8 was attempted by a number of candidates, but not successfully solved by any. It was assumed by those who tried the problem, that the additional pressure on the air in the tube is due to a column of mercury 4 inches high. But as the air in the tube has suffered compression, its lower surface is not 4 inches below the surface of the mercury in the vessel.

#### SPIRIT OF SOME TEACHERS IN REGARD TO THE RECENT EXAMINATIONS.

As an indication of the admirable spirit in which some of the teachers of the Province look upon the recent effort to elevate the character of their profession by the recent examinations, even although the result was adverse to themselves, we give an extract from a letter, among many, received by the Education Department on the subject. The writer says:—

"I may take this opportunity of expressing my thanks to Dr. Ryerson and his colleagues, for the many blessings conferred upon us (Teachers) as a class, by the new School Act; and although many of my fellow-teachers strongly condemn the stringent measures adopted by the new Boards of Examiners, I consider it the only effectual way of raising the standard of education, and also the position of the teachers, throughout the country. Previous to the new Examining Board, I received from the County Boards, at different times, five 1st Class Certificates, but in July last, I received only 3rd Class! Still, I am perfectly satisfied with my examination, and, therefore, I wish them all success."

Another Teacher says:—

"As my friends in my native county have requested me to accept the office of Public School Inspector for that county, and trusting that I might prove to be more useful in that capacity there, than as teacher here, it would have afforded me much pleasure to have acceded to their wishes, had I possessed the necessary legal qualifications, but in consequence of not having lately practised some of the branches required, I shall not be prepared to pass a critical examination at present.

"As a practical teacher, who has not lost a single day for 20 years, although excluded from this office myself, I beg most heartily to congratulate you upon the success of your unremitting exertions in elevating the position of the teacher, as well as the wisdom displayed in limiting this office as a reward for those only who are talented and worthy."

#### EXAMINATION PAPERS FOR SECOND PROVINCIAL AND THIRD CLASS CERTIFICATES OF QUALIFICATION AS PUBLIC SCHOOL TEACHERS, HELD UNDER THE REGULATIONS OF THE COUNCIL OF PUBLIC INSTRUCTION, COMMENCING 25TH JULY, 1871.

##### ENGLISH GRAMMAR—SECOND AND THIRD CLASS.

NOTE.—Candidates for third class certificates will answer the first twelve questions of this paper; and it is recommended to the local examiners that the per centage of marks, necessary in order that a candidate may pass, be taken on the value of these questions diminished by the number of marks assigned to questions 9 and 10. Candidates for a second class certificate will omit 2, 7, 8, and 10, and the analysis in 12, and will answer the remainder of the third class paper, together with their own special paper; and it is recommended that the per centage of marks necessary in order that a candidate may be ranked of a certain grade, be taken on the whole value of this work, diminished by the number of marks assigned to questions 13 and 14.

1. Define ABSTRACT NOUN; PERSON; RELATIVE PRONOUN; IMPERSONAL VERB.
2. (a) What are the various modes of distinguishing the Masculine and Feminine gender?  
 (b) Give the feminine of *marquis, stag, buck, executor*.
3. Write the plural of *cargo, canto, tyro, potato, echo, attorney, chimney, criterion, axis, genius, index, aide-de-camp*.
4. Explain the inflection 's in the Possessive Case.
5. Give examples of the Appositive to the Possessive.
6. How may a SIMPLE SUBJECT be changed into a COMPLEX?
7. In what light may any be regarded?
8. Give a list of Comparatives which want the Positive.
9. What rules are laid down to regulate the use of the relative "that"?
10. (a) Show that Intransitive Verbs are sometimes rendered Transitive.  
 (b) Give Transitive Verbs corresponding with the following Intransitive Forms,—Rise, Lie, Sit, Fall.