It might reasonably be expected that all who aspire to become the instructors of the rising generation should be able, if not in six, yet certainly in twelve months, so to master the subjects in the programme as to secure for them at least 50 per cent. of the marks required at these examinations.

Such, however, it is shown by the records of the Board, is not the case. Of the forty-eight candidates at the late meeting, 24 had previously applied and failed, only two finally obtaining certificates. Of the remaining twenty-two, eight had twice before failed; two, three times; and one, on that occasion, suffered a fifth defeat.

The following instances will show that some of the candidates, though threatened with the mortification of successive defeats, are unable during 6, 12 or even 24 months, to make any solid advancement in those very subjects in which their deficiencies had before been demonstrated. One candidate who competed in four successive Examinations obtained the following marks in arithmetic, at those several Examinations respectively; the highest number possible being 200; viz.: 28, 75, 45 and 52.

The same; spelling, 50 being the maximum, 40, 10, 30 and 15 respectively.

Another in the three successive Examinations in Geography, 150 being the maximum; 65, 78 and 49 respectively.

Surely the public will suffer no loss by the elimination of this sort of material from the teaching class.

"From such apostles," exclaimed the indignant Cowper, after describing an unworthy class of clergymen:

"From such apostles, O ye mitred hands, preserve the flock, and lay not careless hands on empty skulls, which cannot teach and will not learn."—*Woodstock Times.*

Toronto, 15th September, 1873.

To the Editor of the Journal of Education:

SIR,—I send herewith for publication in the *Journal of Education* some notes which I think may be of interest to teachers.

Yours very truly,
GEORGE PAXTON YOUNG.

SOLUTIONS OF THE QUESTIONS IN ALGEBRA AND NATURAL PHILOSOPHY PROPOSED AT THE RECENT EXAMINATION OF TEACHERS FOR FIRST-CLASS CERTIFICATES.

2. ALGEBRA.

1. Book-work.

2. Book-work.

3. Assume $x + y + z = t\,(m + n + r)$..............(1)

$\therefore x + 2y + 3z = t\,(m + 2n + 3r)$.........(2)

& $x + 3y + 4z = t\,(m + 3n + 4r)$.........(3).

Subtract (1) from (2). Then $y + 2z = t\,(n + 2r)$.

Subtract (2) from (3). Then $y + z = t\,(n + r)$.

$$\therefore z = t\,r, \text{ and } \frac{z}{r} = t.$$

In like manner, $t = \frac{y}{n} = \frac{x}{m}$.

4. We have given the three equations,

$$x\,z = y^2,\ z = \frac{8\,y}{y+4},\ y + \tfrac{1}{4} = 2x.$$

The solution of these presents no difficulty.

5. Let r and s be the roots of the first of the given equations. Then

$$r + s = -(m+1)$$
$$rs = -3$$

$\therefore A = r^2 + s^2 = m^2 + 2m + 7.$

In like manner $B = m^2 + 4m + 7,$

and $C = m^2 + 6m + 11.$

$\therefore (m^2 + 2m + 7)(m^2 + 6m + 11) = (m^2 + 4m + 7)^2.$

or, $8m + 28 = 0 \quad \therefore m = -\frac{7}{2}.$

6. Because $(x + y\sqrt{-1})^5 = a + b\sqrt{-1}$, therefore also

$$(x - y\sqrt{-1})^5 = a - b\sqrt{-1}.$$

Multiply these together. Then $(x^2 + y^2)^5 = a^2 + b^2.$

But $x^2 + y^2 = 1 \quad \therefore \quad a^2 + b^2 = 1.$

7. Let r be the common ratio. Then the series is,

$$\frac{2}{r^2},\ \frac{2}{r},\ 2,\ 2r, \text{ \&c.}$$

$\therefore$ 7th term $= 2r^4 = \frac{1}{8}$.

The two real values of r are $\frac{1}{2}$ and $-\frac{1}{2}$; and the series are,

$$8,\quad 4,\quad 2,\quad 1,\quad \text{\&c.}$$
$$8,\ -4,\quad 2,\ -1,\quad \text{\&c.}$$

The remainder of the question is simple.

8. Because $m + n\sqrt{-1}$ is a root of the equation $x^3 + qx + r = o$, $m - n\sqrt{-1}$ is also a root of that equation. Therefore, $x^3 + q\,x + r$ is divisible by $x^2 - 2mx + m^2 + n^2$ without remainder. Let the quotient be $x - s$. Then the expressions,

$$x^3 + qx + r,$$
$$(x^2 - 2mx + m^2 + n^2)\,(x - s),$$

are identical. Therefore,

$$2m + s = o,\ m^2 + n^2 + 2\,ms = q,\ -s\,(m^2 + n^2) = r.$$

Eliminate s and n; then

$$8m^3 + 2mq - r = o.$$

9. It is easily seen that $a_1\,ar - ab_1 = ar^2,$

$$a_2 b_1 r - a_1 b_2 = ar^3,$$

and so on. Therefore, &c.

10. [This question was not solved by any of the candidates at the recent examination. It requires reasoning of a more delicate kind than any of the other questions; and, none of the others presenting any special difficulty, I gave it as a test question, in view of the competition for the McCabe medal. I leave it as an exercise for students. I may add, that, taking into consideration the difficulty of this 10th question, I reckoned $9\frac{1}{2}$ questions a full paper at the recent examination.—G. P. Y.]

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3. NATURAL PHILOSOPHY.

1. *Mr. Cochrane's Solution.*—Suppose the cube to be 1 cub. ft.

Pressure on interior surface $=\frac{6}{2} \times 1000 = 3000$ oz.

$\therefore$ Pressure of air on one surface $= 1\frac{11}{25} \times 3000 = 4320$ oz.

$= \frac{15}{8}$ lb. on the sq. in.

But pressure of external air = 15 lbs. to sq. in.

$\therefore$ Elastic pressure of air inside receiver $= \frac{1}{8}$ of elastic pressure of external air. [A considerable number of the candidates offered no solution of this very simple question; and a considerable number of others gave a partially erroneous solution.—G. P. Y.]

2. *Mr Cochrane's solution.*—Let $F\,E\,H$, $K\,E\,G$ be drawn parallel to $A\,D$, $A\,B$, respectively. (The point K is in $A\,D$, H in $D\,C$, G in CB, and F in BA.—G. P. Y.) Then, because $E\,A$ represents the first force in magnitude, its components will be represented in magnitude and direction by $E\,K$, $E\,F$. Similarly the components of $2\ E\,B$ are represented in direction by $E\,F$ and $E\,G$, and in magnitude by $2\ E\,F$ and $2\ E\,G$. The components of $3\,E\,C$ are represented in magnitude by $3\ E\,G$ and $3\ E\,H$; the components of $4\ E\,D$ by $4\ E\,H$ and $4\ E\,K$. Hence the particle E is kept at rest by a force of

$3\ E\,F$ in the direction $E\,F$,
$5\ E\,G$ .... $E\,G$,
$7\ E\,H$ .... $E\,H$,
and $5\ E\,K$ .... $E\,K$.

But the forces $5\ E\,G$ and $5\ E\,K$ are opposite in direction; $\therefore$ they must equilibrate each other; $\therefore\ 5\,E\,G = 5\,E\,K\ \therefore\ E\,G = E\,K$; which proves first. And the forces $3\ F\,F$ and $7\ E\,H$ are opposite in direction $\therefore$ they must equilibrate each other.

$$\therefore 3\,E\,F = 7\,E\,H \text{ or } E\,F : E\,H = 7:3,$$

which proves second. [Mr. Cochrane's was the only perfectly satisfactory solution of this easy question in the Resolution of Forces.—G.P.Y.]

3. Let $B\,D$ be the perpendicular let fall from B on $A\,C$. The candidates, who solved this question, reasoned in the following manner: Let P, acting in direction $B\,A$, or W in $B\,C$, be counterbalanced by Q acting in direction $B\,D$. Then,

$$Q : P = B\,D : B\,A$$

and $W : Q = B\,C : B\,D$. Therefore, &c.