The remark is frequently made of us, that we fail in school government; again I say it is our own fault if we do. Firmness, kindness, and work fully prepared, are the essentials of success in any teacher. Make yourself complete mistress of the school from the very first: let the children see that you understand your work and are prepared to do it. Nor need you be hard-hearted—no true woman is ever *hard*; but she can be strong, if she seek her strength in true service. In order to have command of your school, have the mastery of self, and do not allow yourself to exhibit passion, even with provocation. Do not be continually scolding—it is only worrying to yourselves, and not at all beneficial to your pupils. Make few rules,—no more than necessary for the good government of your school-room, and see that those you make are carried out. Insist on instant obedience. Children will see very quickly whether it is possible to take any liberties or evade any commands; therefore, if you tell a child to do anything, see that he does it, or you will forfeit his respect by your leniency. Study your pupils' inclinations, find out their tastes, and take advantage of them. You will also find that children can be managed easier if you get an insight into their dispositions. Let your pupils always find in you a friend who is willing to assist them in all that is for their best interests. Do not act as if you thought any of your pupils were really bad; trust them, and even if they have bad habits they will be the better for your confidence. Curb evil inclinations in speech or action, and strive to make your pupils love the truth and abhor falsehood and deception. Do not give all your attention to the bright pupils and strive to crowd a certain number through the examinations. I have heard teachers say they judged of a school's progress by the number of pupils it sent up to High School Entrance, and other examinations. My idea of a successful school is that of one in which every pupil is improving, and I think that the other opinion is not a right one, as we have not the same material to work with. It does not require much talent to instruct a child keen for knowledge, but to arouse an interest in a dull pupil requires more than an effort on the teacher's part. Besides, with many of us, particularly those of us in the rural schools, what a small proportion of our pupils will ever have the opportunity of attending any but a public school. Consider what is best for your pupils; some of them at most have only a few years at school: let their time be given to such subjects as will fit them for the active work of life in which they will have to engage—such subjects as will make them good common-sense men and women, who can speak and write good English and appreciate it. In after years, if not now, they will be able to thank you. Keep a strict oversight of school-house and surroundings,—nothing speaks worse of a teacher than to allow things to go to ruin generally. Trustees also find their labors far easier with a teacher who keeps things in order, and they make a point of it in engaging a teacher. Make your school-room look as cheerful as possible; children are quick admirers of the beautiful, and the adornment of our school-rooms has a refining influence. Take a good educational paper; having once had one, you will find that you cannot keep pace with the educational tendencies of the age without its help. Get as many books as you can on your different school subjects, and in preparing your work you will be able to introduce much of variety as well as true interest in every branch. Arrange your programme in such a manner that your pupils shall have constant profitable occupation. Childhood is all activity, and if you engage the active tendencies of your pupils constantly, you will not find them getting into mischief.

Lastly, let us strive to throw as much sunshine into our work as possible, and to make our pupils feel that school is not a place where the "rod reigns," but that it is a place where they may be sure of an approving smile and an encouraging word for all their honest endeavors. And when it is ours to quit our present occupation, whether we go to fill earthly homes, or pass to our long, last home, it will be with the pleasing satisfaction of having done our best in that sphere of life in which it has pleased God to place us.

Mathematical Department.

SOLUTIONS TO EXAMINATION PAPERS, JULY, 1881.

FIRST CLASS, GRADE C.

ALGEBRA.

1. (1) Given $x^2+y^2+z^2+2xyz=1$, transposing and adding x^2y^2

$$(z+xy)^2=1-x^2-y^2+x^2y^2$$
$$=(1-x^2)(1-y^2), \text{ and by analogy}$$
$$(y+xz)^2=(1-x^2)(1-z^2)$$
$$(x+yz)^2=(1-y^2)(1-z^2)$$

From which we have

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

Adding up and substituting 1 for $x^2+y^2+z^2+2xyz$ we have the required relation.

(2) $x^2+y^2+z^2+2xyz=1$

or, $(x+y)^2=(1-z)(1+z+2xy)$

i.e., $\dfrac{x+y}{1-z}=\left(\dfrac{1+z+2xy}{1-z}\right)^{\frac{1}{2}}$ and by analogy.

$$\frac{y+z}{1-x}=\left(\frac{1+x+2yz}{1-x}\right)^{\frac{1}{2}}$$
$$\frac{z+x}{1-y}=\left(\frac{1+y+2zx}{1-y}\right)^{\frac{1}{2}}$$

Adding up we have the required relation.

2. (1) Subtracting we have $x=0$ and $2x=y$

Substitute these values and $y=\pm\sqrt{13}$ or ± 2, $x=\pm 1$.

(2) Put $(1+x)^{\frac{1}{n}}=K$, $(1-x)^{\frac{1}{n}}=m$, and hence $(1-x^2)^{\frac{1}{n}}=Km$ and we see that the given equation is a quadratic:

$$K^2-Km-m^2=0, \text{ whence } K=m\left(\frac{1\pm\sqrt{5}}{2}\right)$$

i.e., $\dfrac{K}{m}=\left(\dfrac{1+x}{1-x}\right)^{\frac{1}{n}}=\dfrac{1\pm\sqrt{5}}{2}$

$$\therefore\ x=\frac{(1\pm\sqrt{5})^n-2^n}{(1\pm\sqrt{5})^n+2^n}.$$

3. If a is a root of $f(x)=0$, then by definition of root $f(a)=0$

And when $f(x)\div(x-a)$ the remainder is $f(a)$.

See Colenso's Algebra, Part II., page 163. Gross, page 11, Appendix to Part I.

Let x, α and β be the roots

$$\therefore\ x^3-13x^2+\tfrac{49}{4}x-3=(x-\alpha)^2(x-\beta$$
$$=x^3-x^2(2\alpha+\beta)+x(\alpha^2+2\alpha\beta)-\alpha^2\beta$$

$\therefore\ 13=2\alpha+\beta$, $\tfrac{49}{4}=\alpha^2+2\alpha\beta$, and $3=\alpha^2\beta$

And $\alpha^2+2\alpha(13-2\alpha)=\tfrac{49}{4}$ $\therefore\ \alpha=\tfrac{1}{2}$ or $\tfrac{49}{11}$

$\beta=12$ or $-\tfrac{1}{9}$

But the second pair will be found inapplicable to this equation. Similarly

$$x^4-10x^3+32x^2-38x+15=(x-\alpha-1)(x-\alpha+1)(x-\beta-2)(x-\beta+2)$$
$$=\{(x-\alpha)^2-1\}\{(x-\beta)^2-4\}$$
$$=\text{etc.}$$

Whence, equating coefficients $\alpha=2$, $\beta=3$ and the roots are 1, 3, 1, 5, and other roots which do not apply.

It is generally easy to factor such equations when they have any rational roots. Thus in the latter the factors of 15 are 1, 3, 5, and 15 must = product of all the roots, hence we may try $x\pm1$, $x\pm3$, $x\pm5$ as divisors, and the equation splits up into $(x-1)^2(x-3)(x-5)=0$. Hence the roots.

See McLellan's Algebra, page 92, *et seq.*