The first and second focal lengths are given by

$$f = \frac{f_1 f_2 f_3}{K}, \quad f' = \frac{f_1' f_2' f_3'}{K} = \frac{\mu_3}{\mu} f.$$

The first principal point and the first nodal point are at distances f and f' respectively behind the first principal focus. The second principal point and the second nodal point are at distances f' and f respectively in front of the second principal focus.

The formulæ have here been adapted so that each letter shall represent a positive quantity in the case of the normal human eye.

NOTE ON KIRKMAN'S PROBLEM.

By *A. C. Dixon, M.A.*

I do not know whether it has been remarked that the solutions of Kirkman's Problem may be divided into two classes as follows:

Suppose one of the school girls to receive an apple, another an orange, another a pear, and another a plum, and each of the others two, three or four of these fruits, no two receiving alike and none receiving two of a kind. Then it is possible for thirty-five triads to be formed, each of which will have an even number of each kind of fruit, and the triads may be broken up into seven sets of five each including all the girls.

Let us denote the girls by $a, b, c, d, e, f, g, h, i, j, k, l, m, n, o$ or $\alpha, \beta, \alpha\beta, \gamma, \delta, \gamma\delta, \alpha\gamma, \alpha\beta\gamma\delta, \beta\delta, \alpha\delta, \beta\gamma\delta, \alpha\beta\gamma, \alpha\gamma\delta, \alpha\beta\delta, \beta\gamma$. Then the following is such an arrangement—

abc . *adg* . *aej* . *afm* . *ahk* . *ain* . *alo*,

def . *bhm* . *bdo* . *bgl* . *bjn* . *bfk* . *bei*,

ghi . *cij* . *cfh* . *cen* . *cdl* . *cgo* . *ckm*,

jkl . *eko* . *gkn* . *dik* . *egm* . *djm* . *dhn*,

mno . *fln* . *ilm* . *hjo* . *fio* . *ehl* . *fgj*.

In each triad if the second notation is used there will be an even number (2 or 0) of each of the symbols $\alpha, \beta, \gamma, \delta$.

In this arrangement let us take any two triads containing the same letter, as *alo*, *fio*. Then if a, f, i, l are taken in pairs another way the third letter in the triad is the same for both, for we have *ain*, *fln* and *afm*, *ilm*. Further, the three letters *m*, *n*, *o* form a triad of the system.

We may now get another solution of the problem as follows: In each column after the first one of the three *m*, *n*, *o* is taken with two of the four *a*, *f*, *i*, *l*. Interchange the other two of the three. The new arrangement is—

abc . *adg* . *aej* . *afm* . *ahk* . *ain* . *alo*,

def . *bho* . *bdn* . *bgl* . *bjm* . *bfk* . *bei*,

ghi . *cij* . *cfh* . *ceo* . *cdl* . *cgm* . *ckn*,

jkl . *ekm* . *gko* . *dik* . *egn* . *djo* . *dhm*,

mno . *fln* . *ilm* . *hjn* . *fio* . *ehl* . *fgj*.

Here the former umbral notation will not apply.

The possibility or otherwise of using this umbral notation shews an essential difference between the solutions. It may be that this classification is of importance in considering Sylvester's further problem of making thirteen such arrangements including all possible triads. It is suggested by the system of half-periods of a quadruply-periodic function.

ON THE CURVE OF INTERSECTION OF TWO QUADRICS.

By *W. Burnside.*

It is well known that the coordinates of a point on the curve of intersection of two quadrics are expressible rationally in terms of elliptic functions of an arbitrary parameter. It is proposed here to answer the question:—When the quadrics are arbitrarily given, what is the elliptic differential involved; or in other words, what is the absolute invariant of the elliptic functions?

Suppose the equations to the two quadrics reduced to the standard form

$$x^2 + y^2 + z^2 + w^2 = 0,$$

$$\alpha x^2 + \beta y^2 + \gamma z^2 + \delta w^2 = 0,$$

so that α, β, γ, δ are the roots of the quartic (Salmon's *Solid Geometry*, Chap. IX.),

$$\lambda^4\Delta + \lambda^3\Theta + \lambda^2\Phi + \lambda\Theta' + \Delta' = 0 \text{............(i)}.$$