60. *Probability-theoretic Investigations on Inheritance. X₂. Non-Paternity Concerning Mother-Child-Child Combinations.*

By Yûsaku KOMATU.

Department of Mathematics, Tokyo Institute of Technology and
Department of Legal Medicine, Tokyo Medical and Dental University.

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3. Probability a posteriori of a father against a mother-child combination.

A new essential problem, being characteristic with respect to mother-child-child combination, will arise; i.e., given a mother-child-child combination, at how much rate a father of first child can assert his non-paternity against second child? In the problem discussed in § 1, the whole of men except a father of second child having been taken into account against a given mother-child-child combination, the relation to first child has not been directly necessary to be considered, and hence the use has been made of the quantities (1.1) consisting of the V's concerning general distribution-frequencies. In the present problem, however, the object in question being restricted to a father of first child, the possible types of him are limited according to mother-child-child combinations, and hence the V's in (1.1) must be replaced by probabilities a posteriori of a father for combinations of mother and her first child.

The probabilities a posteriori in question can be estimated by means of Bayes' theorem on probability of causes referred to at the end of § 1 in IV. In fact, we may take, as probability a priori, the frequency of general distribution. On the other hand, the probability of an event that a father produce a child of each type with a mother of given type has been listed in a table in § 3 of I, a remark stated immediately subsequent to (1.8) of IV being here also to be remembered.

Now, in general, given a pair $(A_{ij}; A_{hk})$ of a mother and her child, the probability a posteriori of a father to be of type A_{ab} be denoted by

$$Z(ab, ij; hk), \tag{3.1}$$

which will be explicitly determined in the following lines. Of course, only the cases are essential where at least a suffix among h, k coincides with a or b and with i or j; otherwise, the quantity (3.1) may by understood to be equal to zero.

We first consider a mother-child combination consisting of the