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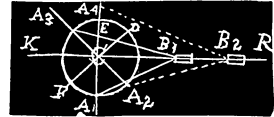
182. Proposed by A. H. HOLMES, Brunswick, Maine.

Evaluate  $\int_0^{\frac{1}{2}\pi} d\theta \sqrt{[1 + \sin^2 \theta (1 - 4\cos \theta)]}$ .

MECHANICS.

170. Proposed by ELISHA S. LOOMIS, Berea, Ohio.

Two angles of iron,  $A_1CD$  and  $A_1CA_3$ , move freely on a pivot at  $C$ . Rods  $B_1A_1$  and  $B_1A_3$  are attached respectively at  $A_1$  and at some point  $A_3$  so that when  $B_1$  moves along the rod  $CR$ , which is perpendicular to  $A_1A_4$ ,  $CD$  and  $CA_3$  shall coincide in position with  $CE$  which is perpendicular to rod  $KR$ . When angle  $A_1CD$  is  $135^\circ$  find  $CA_3$  in terms of  $CA_1$ .



Also find the following:

1. That value of  $CB_1$  which will require least effort exerted at  $B_1$  to cause  $CA_3$  to take the position  $CA_4$ .
2. That value of  $CB_1$  which will cause  $B_2A_2$ , if produced, to pass through the point  $A_1$ .
3. As  $CB_1$  varies in value, what is the locus of the intersection of  $A_1B_1$  and  $A_2B_2$ ? Of  $B_1A_3$  and  $B_2A_4$ ?
4. Suppose angle  $A_1CD$  to be any other angle than  $135^\circ$ , then find  $CA_3$  in terms of  $CA_1$ .

GROUP THEORY.

5. Proposed by L. E. DICKSON, Ph. D., The University of Chicago.

In lieu of the incorrect developments of Burnside, *Theory of Groups*, pp. 56-58, show that an Abelian group of type  $(m_1, m_2, \dots, m_r)$ ,  $m_1 \bar{s} m_2 \bar{s} \dots \bar{s} m_r$ , has a subgroup of type  $(n_1, n_2, \dots, n_s)$ ,  $n_1 \bar{s} n_2 \bar{s} \dots \bar{s} n_s$ , if and only if  $s \bar{s} r$ ,  $n_i \bar{s} m_i$  ( $i=1, \dots, s$ ).

MISCELLANEOUS.

145. Proposed by H. F. MacNEISH, Chicago. III.

Two complete 5-plane configurations in space having the same vertices are identical; in general two complete  $(n+2)$ -faces in  $n$ -space having the same vertices are identical.

NOTES.

Dr. H. L. Rietz has been promoted to an assistant professorship at the University of Illinois.