



Problems for Solution: E661-E665,E637

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PROBLEMS AND SOLUTIONS

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ELEMENTARY PROBLEMS

Send all communications concerning Elementary Problems and Solutions to H. S. M. Coxeter, 24 Strathearn Boulevard, Toronto 10, Canada.

The department of Elementary Problems welcomes problems believed to be new, and demanding no tools beyond those ordinarily furnished in the first two years of college mathematics. To facilitate their consideration, solutions should be submitted on separate, signed sheets, within three months after publication of problems.

PROBLEMS FOR SOLUTION

E 661. *Proposed by Howard Eves, Syracuse University*

A plane p is projected from a point L onto a plane p' . Find those points on p for which all angles on p having such a point for vertex are invariant under the projection.

E 662. *Proposed by Victor Thébault, Tennesse, Sarthe, France*

A number is represented by a in the scale of α and by b in the scale of β ($\beta < \alpha$). Regarding both a and b as written in the scale of α , we write the difference $b - a = c$. Show how to determine the greatest possible value of a for given values of α, β, c ; e.g., when $\alpha = 10, \beta = 7$, and $c = 3501$.

E 663. *Proposed by Irving Kaplansky, Columbia University*

If $2^n + 1 = p^r$, where p is a prime, prove that r is a power of 2 (including the possibility $r = 2^0 = 1$).

E 664. *Proposed by D. H. Browne, Buffalo, N. Y.*

Prove that if $x < 1$,

$$\sum_{n=0}^{\infty} \frac{x^n}{n!} \int_1^{\infty} t^n e^{-t} dt = \frac{e^{x-1}}{1-x}.$$

E 665. *Proposed by L. A. Santaló, Rosario, Argentina*

Let C be a closed convex plane curve with continuous radius of curvature R . Let R_M be the greatest value of R . Given $\lambda \geq R_M$, show that the area F_λ covered by the centers of circles of radius λ which contain C in their interior is given by

$$F_\lambda = F - L\lambda + \pi\lambda^2,$$

where L and F are the length and area of C .

E 637 [1944, 472]. Hint: Use a plane parallel to one face.