
Given $N$ coins, $k$ of which are defective, either lighter or heavier than the other $N-k$ coins which are assumed to be of equal weight, and a balance, determine the weighing procedures which minimize the number of weighings required to separate the defective coins from the ordinary coins. Consider the following two cases

a. The $k$ defective coins are all of the same weight, heavier or lighter than the regular coins.
b. The $k$ defective coins are all of different weight.

Also determine the weighing procedures which minimize the expected time required to determine the defectives.

This is a particular case of the general "sorting" problem where an individual element of a set may be characterized by a number of properties and we have a number of testing devices for determining these properties. (Received May 31, 1955.)


The derivative of the gamma function satisfies the recurrence relation

$$\Gamma'(x + 2) = (2x + 1)\Gamma'(x + 1) + x^2\Gamma'(x),$$

for $x > 0$. Can one derive from this equation a convergent continued fraction expansion for $\Gamma'(x)/\Gamma'(x+1)$, or a related expression, which can be used either

a. To obtain a rapid method for computing $\Gamma'(1)$, the negative of Euler’s constant, or
b. To obtain some results concerning the arithmetic character of Euler’s constant? (Received May 31, 1955.)

23. Richard Bellman: Number theory.

There are a number of numerical techniques available for determining the maximum over the $x_i$ of the linear form, $L(x) = \sum_{i=1}^n a_i x_i$, subject to the linear constraints $\sum_{j=1}^m b_j x_j \leq c_i$, $i = 1, 2, \ldots, M$, whenever it exists. Can one obtain a usable algorithm for the cases where we impose additional constraints of the form

a. $x_i = 0$ or 1, for $i = 1, 2, \ldots, N$, or
b. $x_i$ is zero or a positive integer? (Received May 31, 1955.)

24. Sherman Stein: Number theory.

Let $a$ be a positive rational fraction with odd denominator and $u_n = (2n+1)$, $n = 1, 2, \ldots$. Let $b_1$ be the smallest of the $u_i$ satisfying $a - (u_i)^{-1} \geq 0$. Having defined $b_1, b_2, \ldots, b_n$, define $b_{n+1}$ as the smallest $u_i, u_i > b_n$, with $a - (b_i)^{-1} - \cdots - (b_{n+1})^{-1} \geq 0$. Is the sequence $b_1, \ldots, b_n, \ldots$ finite for each $a$? (Received May 23, 1955.)


Let $J \subseteq \mathbb{R}^2$ be a rectifiable Jordan curve, with the property that for each rotation $R$, there is a translation $T$, depending on $R$, such that $(TRJ) \cap J$ has a nonzero length. Must $J$ contain the arc of a circle? (Received May 23, 1955.)