Why[1]

Definition

We want to allocate a resource among n entities to maximize some measure of "return" or "profit."

Let $B \in \mathbf{R}$. Let $R_i : \mathbf{R} \to \mathbf{R}$ be a function which gives the return for allocating entity i the amount x_i of the resource. Let $\mathcal{X} = \{x \in \mathbf{R}^n \mid x \geq 0, \sum_i x_i = B\}$ Define $f : \mathbf{R}^n \to \mathbf{R}$ by $f(x) = \sum_{i=1}^{n} R_i(x_i)$. We call the optimization problem $(\mathcal{X}, f)$ a *single-resource allocation problem.* In this case we call $x \in \mathbf{R}^n$ an *allocation* and we call B the *budget.*

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[1]Future editions will include. For now this sheet serves as an example of a continuous optimization problem.

Resource Allocation Problems

Optimization Problems

N-Dimensional Space

Real Functions

Extended Real Numbers

Distance

Real Limits

Space Distance

Plane Distance

Absolute Value

Interval Length

Optimizers

Real Space

Intervals

Greatest Lower Bounds

Real Plane

Real Line

Real Order

Integral Line

Real Sequences

Geometry

Sequences

Rational Order

Real Numbers

Lists

Rational Numbers

Set Numbers

Direct Products

Integer Arithmetic

Comparisons

Finite Sets

Integer Order

Natural Multiplicative Identity

Natural Additive Identity

Orders

Equivalent Sets

Integer Products

Arithmetic

Identity Elements

Natural Order

Function Inverses

Integer Sums

Family Unions and Intersections

Natural Powers

Operations

Function Images

Function Composites

Families

Integer Numbers

Natural Products

Converse Relations

Functions

Equivalence Relations

Natural Sums

Relations

Recursion Theorem

Ordered Pair Projections

Peano Axioms

Set Products

Natural Induction

Set Powers

Natural Numbers

Generalized Set Dualities

Partitions

Unordered Triples

Successor Sets

Intersection of Empty Set

Set Dualities

Set Unions and Intersections

Set Symmetric Differences

Ordered Pairs

Set Intersections

Pair Unions

Set Complements

Set Unions

Set Differences

Pair Intersections

Unordered Pairs

Empty Set

Set Specification

Set Equality

Set Inclusion

Deductions

Quantified Statements

Logical Statements

Statements

Sets

Identities

Names

Letters

Objects