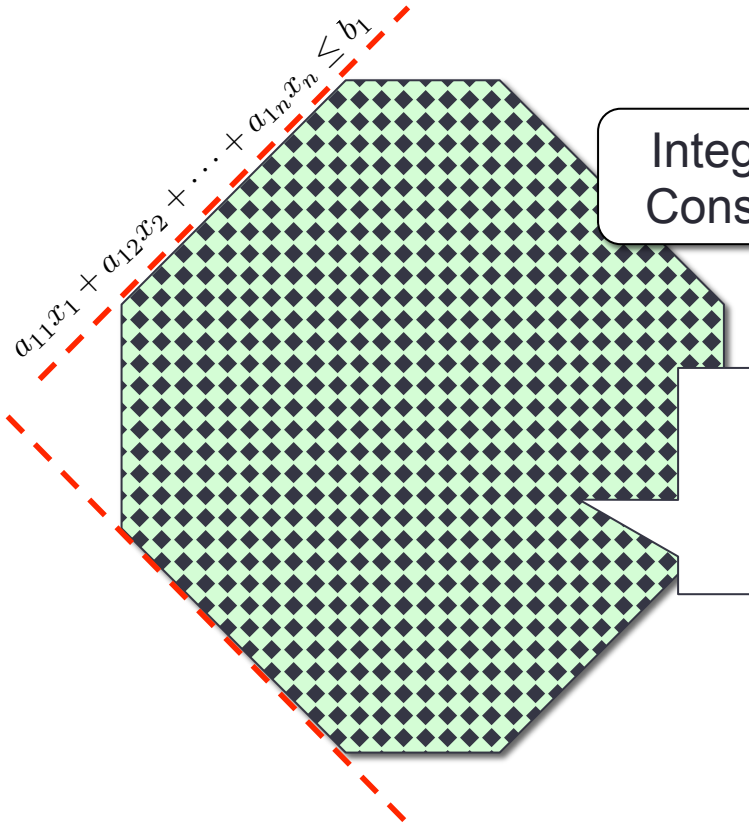
INTEGER LINEAR PROGRAMMING - INTRODUCTION

Integer Linear Programming



Integrality Constraint

$$
\begin{array}{lccccccc}
\max & c_1x_1 & +c_2x_2 & +\cdots+ & c_nx_n & & & \\
 & a_{11}x_1 & +a_{12}x_2 & +\cdots+ & a_{1n}x_n & \leq & b_1 \\
 & & & \ddots & & \vdots & \\
 & a_{m1}x_1 & +a_{m2}x_2 & +\cdots+ & a_{mn}x_n & \leq & b_m \\
 & x_1, \ldots, x_n & \in & \mathbb{Z} & & & &
\end{array}
$$

Feasible Region: Z-Polyhedron (n dimensional)

Integer Linear Programming

- Relaxation to a (real-valued) Linear Program
  - How does the LP relaxation answer relate to the ILP answer?
  - Integrality Gap
- Complexity of Integer Linear Programs
  - NP-Completeness
  - Some special cases of ILPs.
- Algorithms:
  - Branch-And-Bound
  - Gomory-Chvatal Cuts