# Linear Programming Quiz

**5/5 points (100%)**

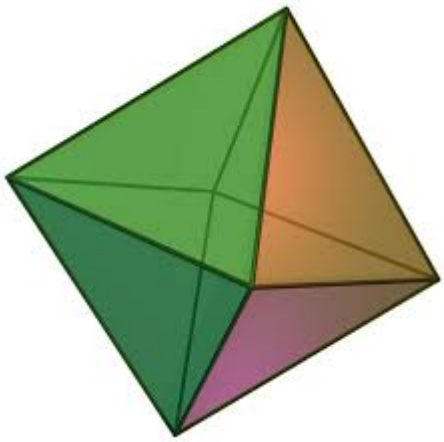
Quiz, 5 questions

## ✔ Congratulations! You passed!

Next Item

✔ 1 / 1 points

1.
What is the minimum number of linear inequalities needed to define the figure pictured below?



8

**Correct Response**
The figure is cut out by 8 flat surfaces. Thus 8 equations are needed.

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✔ 1 / 1 points

2.
Given a solution to a linear program, one could try to show that it is optimal by finding a matching solution to the dual program. Which of the following theorems will make it easier to do so?

Separation of convex sets from outside points by hyperplanes.

Complementary slackness.

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**Correct**
Correct! Complementary slackness tells you that your dual solution only uses equations that are tight in solutions to the primal.

Polytopes achieve optimum values at vertices.

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1 / 1 points

3.
Which of the following statements are true?

A system of linear equations has always 0, 1, or infinitely many solutions.

**Correct**
This statement is true. Unless there are no solutions, the solution set has some number of free variables. If there are no free variables, there is a unique solution. If there is at least one free variable, there are infinitely many solutions.

A system of n linear equations in n variables always has a unique solution.

**Un-selected is correct**

A system of linear equations has a solution unless they can be combined in some combination to give the equation 0=1.

**Correct**
This statement is true. There is a solution unless the corresponding row reduced matrix has a row corresponding to this equation, this will happen only if 0=1 can be obtained by combining the original equations.

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1 / 1

points

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4. Suppose that you are trying to solve the optimization problem:

Maximize $v \cdot x$ subject to $Ax \geq b$ for some $A \in \mathbb{R}^{m \times n}$ (i.e. trying to solve an optimization problem in $n$ variables with $m$ linear inequality constraints).

This problem can be reduced to running a solution finding algorithm on a different system of linear equations in $k$ variables. What is the smallest value of $k$ for which this can be done?

Preview

$m + n$

n+m

**Correct Response**

Correct! You need to look for matching solutions to the primal (n variables) and the dual (m variables). Thus, you need a solution to a larger system with n+m variables.
Your answer, n+m, is equivalent to the instructor's answer n+m.

1 / 1 points

5. What is the largest possible value of x+y achievable by pairs x,y of real numbers satisfying the constraints:

- x <= 7
- y <= 10
- 2x+y <= 21
- -x + 2y <= 12
- 5x-y <= 30

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**Correct Response**

Correct. The optimum is at x=6, y=9 as shown below.

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