

Math 414 Lecture 7 Exam 1 next week

Word problems

Translate into general linear programming problems.

- Golf carts are made in Detroit and Newark and shipped to dealers in Miami, Houston and LA.

Production:

- Detroit can make 100/month,
- Newark can make 95/month.

Needs:

- Miami needs 60/month,
- Houston needs 60/month,
- LA needs 70/month.

Shipping costs:

Shipping costs for a cart are as follows:

	to:	Miami	Houston	LA
from:	Detroit	\$50	\$30	\$70
Newark	\$40	\$60	\$90	

How many carts must be shipped from each plant (Detroit and Newark) to each dealer (Miami, Houston, LA) to minimize shipping costs?

Linear Programming Problem

Let dm = # shipped from Detroit to Miami,

dh = # Detroit to Houston,

dl = # Detroit to LA,

nm = # Newark to Miami,

nh = # Newark to Houston,

nl = # Newark to LA.

Let s = total shipping cost.

Minimize $s = 50dm + 30dh + 70dl + 40nm + 60nh + 90nl$

with

dp : $dm + dh + dl \leq 100$ Detroit production constraint.

np : $nm + nh + nl \leq 95$ Newark production constraint.

mn : $dm + nm \geq 60$ Miami needs.

hn : $dh + nh \geq 60$ Houston needs.

ln : $dl + nl \geq 70$ LA needs.

$dm, dh, dl, nm, nh, nl \geq 0$

Answers (turn this in for up to 3 extra credit points):

$dm =$ _____ slack in constraint dp : = _____

$dh =$ _____ slack in constraint np : = _____

$dl =$ _____ slack in constraint mn : = _____

$nm =$ _____ slack in constraint hn : = _____

$nh =$ _____ slack in constraint ln : = _____

- A potter makes lamps (the base part) and pots (for plants).

Clay:

- He has 100 lbs of clay.
- A lamp requires 4 lbs of clay; a pot requires 6 lbs.

Glaze:

- He has 100 oz of glaze.
- A lamp needs 10 oz. glaze; a pot needs 12 oz..

Labor:

- He can work 12 hours.
- A lamp needs 1 hour of labor; a pot needs .5 hours.

Total sales:

- A lamp sells for \$50; a pot sells for \$45.

To maximize his total sales, how many lamps and pots should he make?

Linear Programming Problem

Let l = # lamps, p = # pots, s = total sales.

Maximize $s = 50l + 45p$

with

cl : $4l + 6p \leq 100$ Clay constraint.

gl : $10l + 12p \leq 100$ Glaze constraint.

la : $1l + .5p \leq 12$ Labor constraint.

$l, p \geq 0$

Answers (1 extra credit point):

$l =$ _____ slack in constraint cl : = _____

$p =$ _____ slack in constraint gl : = _____

slack in constraint la : = _____

In applied problems, use reasonably descriptive names for variables and constraints as opposed to

1: $x + y \leq 1$

$s = 50dm + 30dh + 70dl + 40nm + 60nh + 90nl$