

7. Write down the (standard, primal) simplex tableau corresponding to the problem:

Maximize $P = 2x + 3y$ subject to

$$\begin{cases} S: 4x + 8y \leq 396 \\ G: 6x + 4y \leq 482 \\ K: 2x + 6y \leq 246 \\ C: 8x + y \leq 593 \end{cases} \text{ and } x \geq 0, y \geq 0.$$

	X	Y	S	G	K	C	P	RHS
S	4	8	1	0	0	0	0	396
G	6	4	0	1	0	0	0	482
K	2	6	0	0	1	0	0	246
C	8	1	0	0	0	1	0	593
P	-2	-3	0	0	0	0	1	0

S = # of leftover seeds
 G = # of leftover grains
 K = # of leftover kernels
 C = # of leftover crumbs

$$\begin{aligned} 4x + 8y + S &= 396 \quad \text{not just } \leq \\ 6x + 4y + G &= 482 \\ 2x + 6y + K &= 246 \\ 8x + y + C &= 593 \\ -2x - 3y + P &= 0 \quad (\text{move vars left}) \end{aligned}$$

Solve #3

x	y	S	G	K	C	P	RHS
4	8	1	0	0	0	0	396
6	4	0	1	0	0	0	482
2	6	0	0	1	0	0	246
8	1	0	0	0	1	0	593
-2	-3	0	0	0	0	1	0

$396/8 = 49.5$
 $482/4 = 120.5$
 $246/6 = 41$
 $593/1 = 593$

It is better to use some Squawks than nothing, but the kernels are the limiting factor.

	X	Y	S	G	K	C	P	RHS
$R_1 - \frac{8}{6}R_3$	$4/3$	0	1	0	-4/3	0	0	68
$R_2 - \frac{4}{6}R_3$	$14/3$	0	0	1	-2/3	0	0	318
$R_4 - \frac{1}{6}R_3$	$1/3$	1	0	0	1/6	0	0	41
$R_5 + \frac{3}{6}R_3$	$23/3$	0	0	0	-1/6	1	0	552
$R_3 / 6$	-1	0	0	0	1/2	0	1	123

$x=0$
 $y=41$
 $P=123$ songs not bad, but should make some cheezy too!

$68/(4/3) = 51$ is smallest, so seeds are limiting factor

	X	Y	S	G	K	C	P	RHS
$R_2 - \frac{14}{4}R_1$	1	0	3/4	0	-1	0	0	51
$R_3 - \frac{1}{4}R_1$	0	0	-7/2	1	4	0	0	80
$R_4 - \frac{23}{4}R_1$	0	1	-1/4	0	1/2	0	0	24
$R_5 + \frac{3}{4}R_1$	0	0	-23/4	0	15/2	1	0	161
$R_1 / (4/3)$	0	0	3/4	0	-1/2	0	1	174

$x=51$
 $y=24$
 $P=174$, this is #3 guess, but we don't have to use all the kernels, they cost us 1/2 song each.

$80/4 = 20$ is smallest

	X	Y	S	G	K	C	P	RHS
$R_1 + \frac{1}{4}R_2$	x	1	0	-1/8	1/4	0	0	71
$R_3 - \frac{1}{8}R_2$	K	0	0	-7/8	1/4	1	0	20
$R_4 - \frac{1}{8}R_2$	Y	0	1	3/16	-1/8	0	0	14
$R_5 + \frac{1}{8}R_2$	C	0	0	1/16	-15/8	0	1	11
$R_2 / (4)$	P	0	0	5/16	1/8	0	0	184

$x=71$
 $y=14$
 $P=184$ songs optimal!