#1 Let x = number of tickets sold to students
y = number of tickets sold to faculty
z = number of tickets sold to general public

$$3x + 5y + 8z = 252$$
$$x = 3y$$
$$z = 2x$$

**#2

$$\begin{matrix} R_2+2R_1 \\ R_3-R_1 \end{matrix}\begin{bmatrix} 1 & 0 & 9 & 12 \\ -2 & 2 & 1 & 3 \\ 1 & 2 & -3 & 8 \end{bmatrix} \quad R_3-R_2\begin{bmatrix} 1 & 0 & 9 & 12 \\ 0 & 2 & 19 & 27 \\ 0 & 2 & -12 & -4 \end{bmatrix}$$

$$-\tfrac{1}{31}*R_3\begin{bmatrix} 1 & 0 & 9 & 12 \\ 0 & 2 & 19 & 27 \\ 0 & 0 & -31 & -31 \end{bmatrix} \begin{matrix} R_1-9R_3 \\ R_2-19R_3 \end{matrix}\begin{bmatrix} 1 & 0 & 9 & 12 \\ 0 & 2 & 19 & 27 \\ 0 & 0 & 1 & 1 \end{bmatrix}$$

$$\tfrac{1}{2}*R_2\begin{bmatrix} 1 & 0 & 0 & 3 \\ 0 & 2 & 0 & 8 \\ 0 & 0 & 1 & 1 \end{bmatrix} \quad \begin{bmatrix} 1 & 0 & 0 & 3 \\ 0 & 1 & 0 & 4 \\ 0 & 0 & 1 & 1 \end{bmatrix}$$

#3a

$$x = 2$$
$$y = -1$$
$$z + w = 2$$

#3b infinitely many solutions

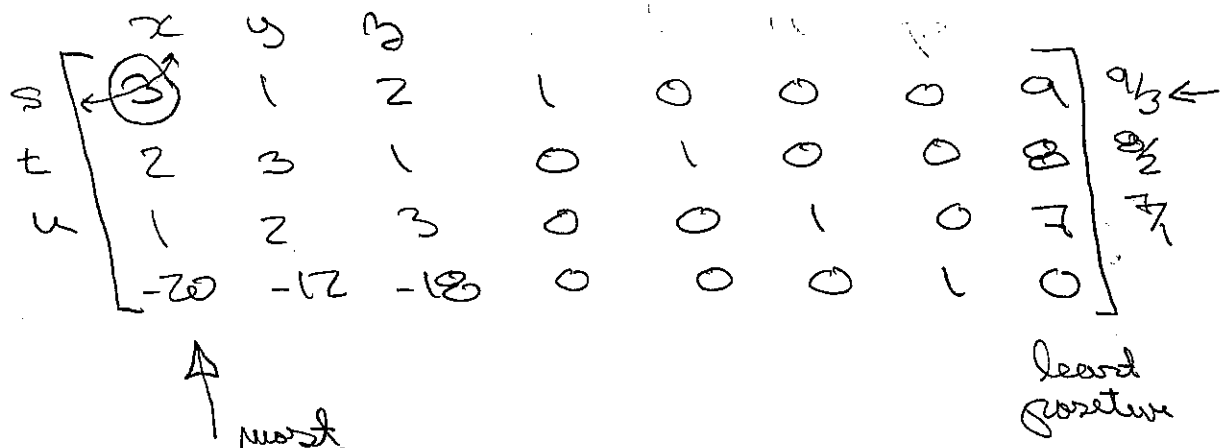
#4

$$2x + 10y + s = 80$$
$$6x + 2y + t = 72$$
$$3x + 2y - u = 6$$
$$-20x - 30y + p = 0$$

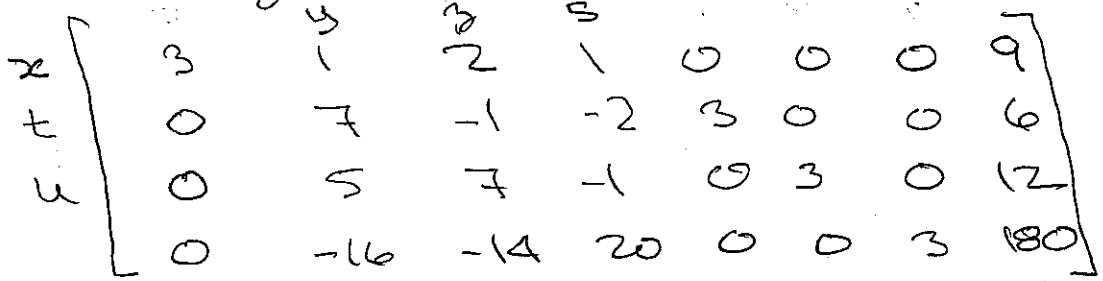
$$\begin{array}{c} \\ s \\ t \\ u \\ \end{array} \begin{array}{c} \begin{array}{ccccccc} x & y & z & & & & \end{array} \\ \begin{bmatrix} 2 & 10 & 1 & 0 & 0 & 0 & 80 \\ 6 & 2 & 0 & 1 & 0 & 0 & 72 \\ 3 & 2 & 0 & 0 & -1 & 0 & 6 \\ -20 & -30 & 0 & 0 & 0 & 1 & 0 \end{bmatrix} \end{array}$$

Phase II

#5a

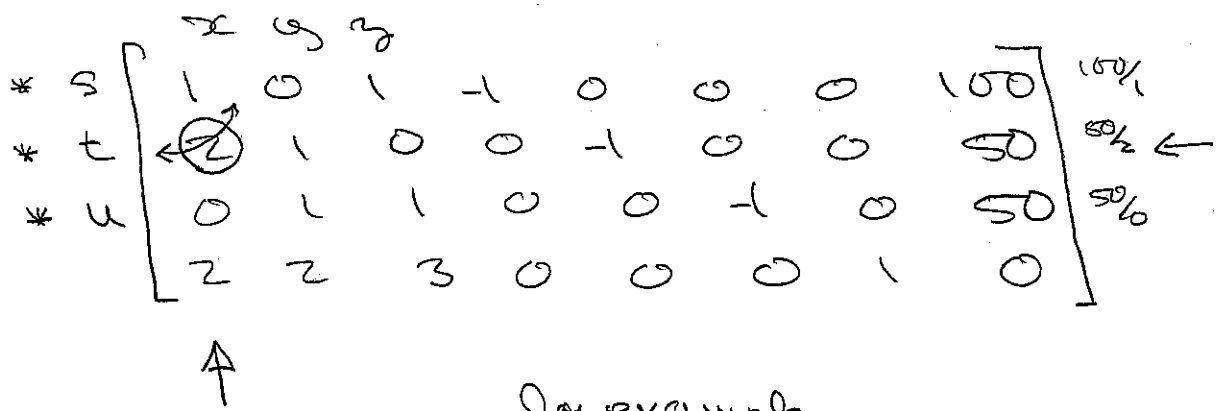


#5b



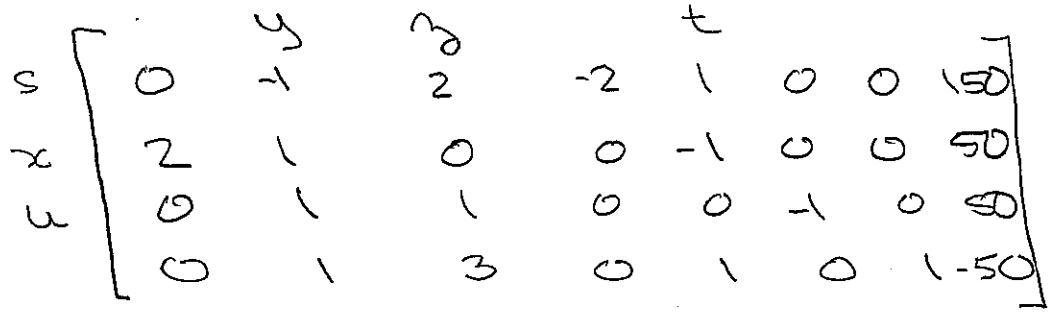
Phase I

#6a



for example ...

#6b



#7

$x = 30/6 = 5$

$y = 0$

$z = 90/2 = 45$

$P = 600/3 = 200$

* #8a

Maximize $P = 9x + 5y$

subject to $400x + 200y \leq 2000$

$12x + 8.5y \leq 65$

$x \geq 0$

$y \geq 0$

* #8b

$400x + 200y + s = 2000$

$12x + 8.5y + t = 65$

$-9x - 5y + P = 0$

	x	y					
s	(400)	200	1	0	0	2000	2000/400
t	12	8.5	0	1	0	65	65/12
	-9	-5	0	0	1	0	

↑

* 8c

#9

$$\begin{bmatrix} 3 & -2 & 4 \\ -2 & 1 & 0 \\ 6 & -5 & 8 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 6 \\ 4 \\ 4 \end{bmatrix}$$

#10

$$\left[\begin{array}{ccc|ccc} 2 & 1 & -1 & 1 & 0 & 0 \\ 1 & 1 & -1 & 0 & 1 & 0 \\ -1 & -2 & 3 & 0 & 0 & 1 \end{array}\right]$$

A I

$$\left[\begin{array}{ccc|ccc} 2 & 1 & -1 & 1 & 0 & 0 \\ 0 & 1 & -1 & -1 & 2 & 0 \\ 0 & -3 & 5 & 1 & 0 & 2 \end{array}\right]$$

$$\left[\begin{array}{ccc|ccc} 2 & 0 & 0 & 2 & -2 & 0 \\ 0 & 1 & -1 & -1 & 2 & 0 \\ 0 & 0 & 2 & -2 & 6 & 2 \end{array}\right]$$

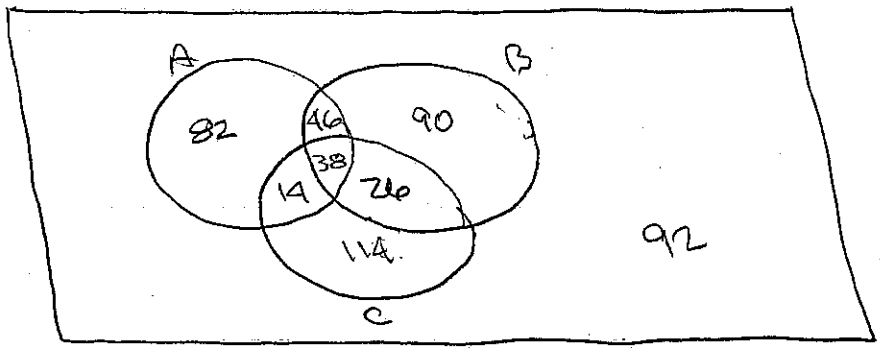
$$\left[\begin{array}{ccc|ccc} 2 & 0 & 0 & 2 & -2 & 0 \\ 0 & 1 & -1 & -1 & 2 & 0 \\ 0 & 0 & 1 & -1 & 3 & 1 \end{array}\right]$$

$$\left[\begin{array}{ccc|ccc} 2 & 0 & 0 & 2 & -2 & 0 \\ 0 & 1 & 0 & -2 & 5 & 1 \\ 0 & 0 & 1 & -1 & 3 & 1 \end{array}\right]$$

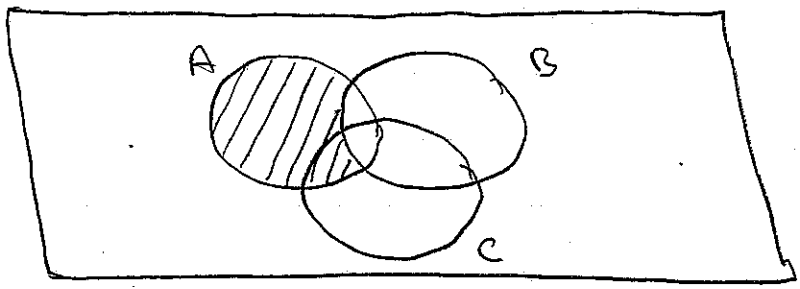
X A^{-1}

$$\left[\begin{array}{ccc|ccc} 1 & 0 & 0 & 1 & -1 & 0 \\ 0 & 1 & 0 & -2 & 5 & 1 \\ 0 & 0 & 1 & -1 & 3 & 1 \end{array}\right]$$

* #11



$A \cap B'$



$82 + 14 = 96$

* #12 $A \cap C \cap B'$

#13 $26 * 25 * 24 * 23 * 22 * 21 = P(26,6)$

$= 165765600$

#14 $C(100,3) = 161700$

#15 $C(10,2)\ C(10,3)$

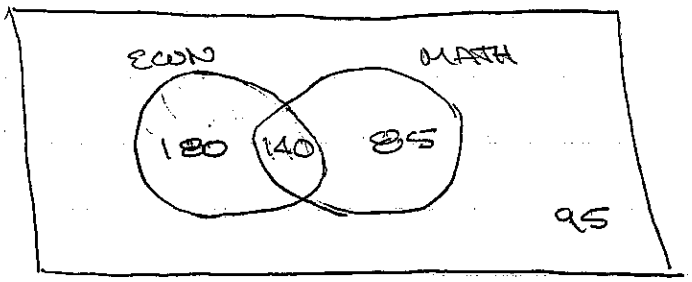
$= 45 * 120$

$= 5400$

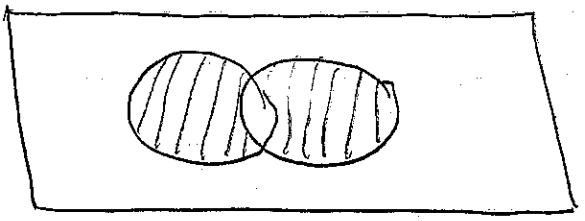
#16 $7 * 6 * 5 * 4 = P(7,4)$

$= 840$

#17



exactly one



$\frac{180+85}{500} = \frac{265}{500} = .53$

#18 one defective or two defective

$$\frac{C(20,1)\,C(4,1) + C(4,2)}{C(24,2)}$$

$$= \frac{20*4+6}{276} \approx .31159$$

#19

$P(\text{English}) = 49/200$

$P(\text{mathematics}) = 50/200$

$P(\text{Eng} \cap \text{math}) = 12/200$

$P(\text{English} \mid \text{mathematics})$

$$= \frac{P(\text{Eng} \cap \text{math})}{P(\text{mathematics})}$$

$$= \frac{12/200}{50/200} = 12/50 = .24$$

#20

$P(\text{defective} \mid A) = .02$

$P(A) = .5$

$P(\text{defective} \mid B) = .05$

$P(B) = .3$

$P(\text{defective} \mid C) = .06$

$P(C) = .2$

$$P(A \mid \text{defective}) = \frac{P(\text{defective} \mid A) P(A)}{P(d \mid A)P(A) + P(d \mid B)P(B) + P(d \mid C)P(C)}$$

$$= \frac{.02 * .5}{.02 * .5 + .05 * .3 + .06 * .2}$$