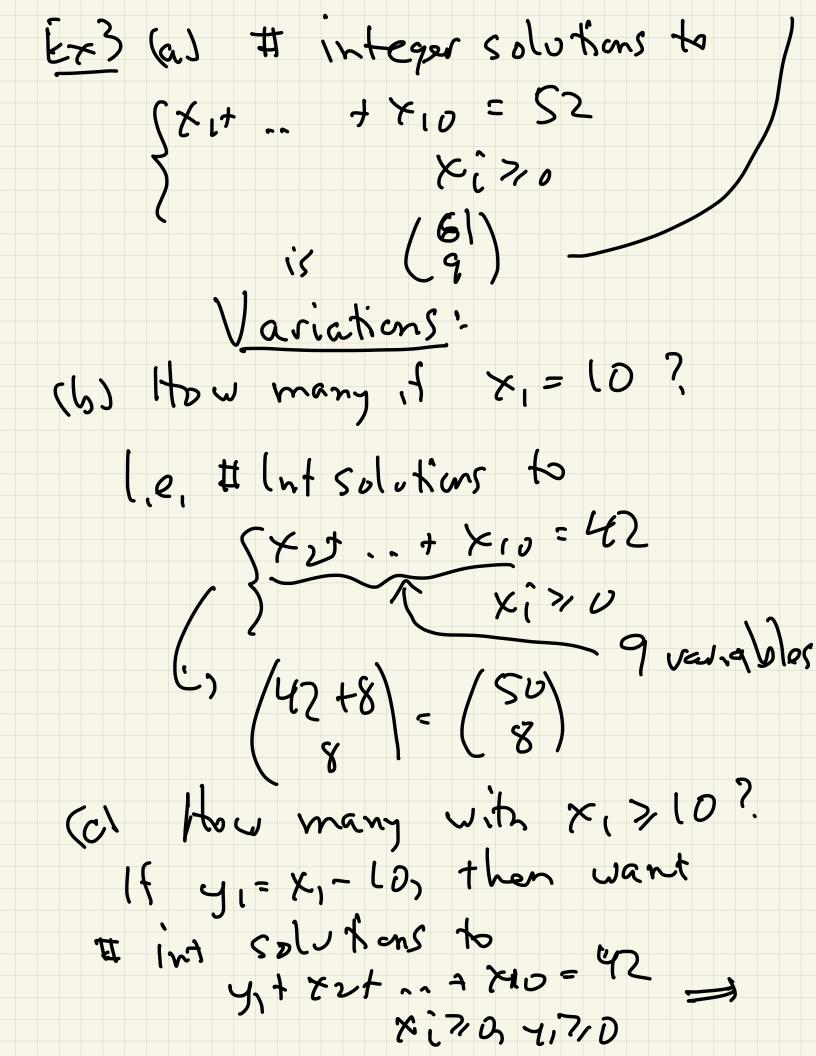
2/10/Disc2 Quiz3 26 2. $P(26,9) = \frac{26!}{17!}$ 3. $P(21,9) = \frac{21!}{12!}$ 4. $\binom{9}{4} 25^5$ 7 Ns place rest $S.(\frac{9}{4})P(2S,5)$ $\int N_{0} \sqrt{rest are}$ $\int N_{0} \sqrt{rest are}$ $\int \sqrt{9} \left(\frac{6}{2}\right) 24^{4}$ 6. NP me rest. Lasttime Ex1 Select 3 cookies from 5 types ABCDE

 $\begin{pmatrix} 5 \\ 3 \end{pmatrix} = lo$ $\begin{pmatrix} 5 \\ (3) \end{pmatrix} = 20$ 3 different: 2 different (25) = 5 all sume With larger numbers, this method is harville! BETTER WAY: encode possibilities: 2B1D - ABCDE -> 1001101 place dividers and cookies This gives bijection between length? bit strings w 4 Is Cookie Selections (

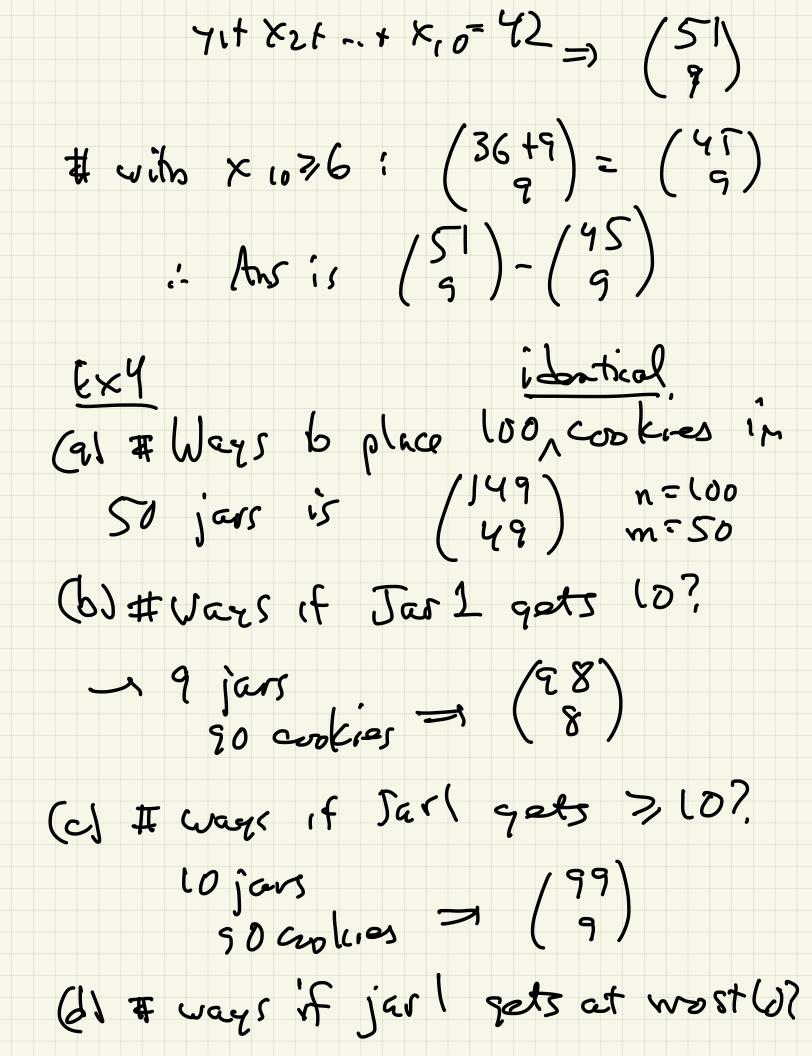
3A (n ooolli so # selections = # lemits bit string with 4 1s $(\frac{7}{4}) = 35$ In general; # ways to choose n tems from m types # length nt (m-i) bir strings with m-) 1s $\left(\begin{array}{c} h + (m - i) \\ m - 1 \end{array} \right).$ Ex2 (a) How many ways to place 52 cards in 10 boxes?

1052 10 1010 (b) # ways to place 52 identical Provoles into 10 horces? Think of boyces as lO types Another viewpoint: Ex2(b) equivalent to finding all integer solutions to $\begin{cases} \chi_{1} + \chi_{1} + \chi_{10} = 52 \\ \chi_{1} = 70 \end{cases}$ (Xi = # marbles in box î)



 $\begin{pmatrix} 42 + 9 \\ 9 \end{pmatrix} = \begin{pmatrix} 51 \\ 9 \end{pmatrix}$ (d) How many with $x_1 = x_2 = 10$, $x_3 = x_2 = 5$, then let 23= x3-5, ter 43+X4+ ... 7 ×10 = 27 8 yars $\begin{pmatrix} 27+7 \\ 7 \end{pmatrix} = \begin{pmatrix} 37 \\ 7 \end{pmatrix}$ (e) How many with $X_1+X_2+-+X_{10} \leq S2$ I dea: let XH= SZ-ZXî Solve SX1+ -- r X10+X11 = SZ X1+ -- r X10+X11 = SZ 4 is (52+10) = (62)(1) = (10)

(f) How many if at most 5 go into box LD? Lea: complement : It with <u>at least 6</u> in box 10 is $\frac{1}{41}$ solutions to $\begin{cases} X_1 + \dots + X_{10} = 46 \\ X_{10} \end{cases}$ $1S \begin{pmatrix} 5S \\ 9 \end{pmatrix} \\ 1S \\ 61 \\ - \begin{pmatrix} 5S \\ 5S \\ 61 \\ - \begin{pmatrix} 5S \\ 9 \end{pmatrix} \end{pmatrix}$ (g) How many, f at least 10 in hox 1 at most Sin box lo Combine parts (c)*(f): y, = x,-10



Complement : jarl at last ll, su n = 89 - (138)m = 50 - (49) s_{v} Ans $\binom{149}{49} - \binom{138}{49}$ (e) How many if (loop some cookies?. Lot, X51 = # ((coop, Toon $\begin{pmatrix} n=51\\m=100 \end{pmatrix} \begin{pmatrix} 150\\50 \end{pmatrix}$ (57 st jar far me) (fl # ways with equal number in each jar? Eractly 2 coskies 90 11 Exactly c 1. in each jar ! No choices ! Summary:

n marbles in mboxes = At most 1/ same It in per hox, same It in mor, each box, m(n # ways to place No $\binom{m}{m}$ madeley (ntm-1 same (m-1 same \mathcal{h}_{i} P(min) madiles (m/m) })m Lifeert