3 U's 2 U's 1 U

1.) $\binom{4}{2} + \binom{4}{3} + \binom{4}{4}$

$= 6 + 4 + 1$

$= 11$ unique subsets of 6 letters

a) $\frac{5!}{3!} \times 6 + \frac{5!}{2!} \times 4 + 5!$

$= 120 + 240 + 120$

$= 480$

2. pick 3 different number : $\binom{13}{3}$

pick 1 number to be the single : $\binom{3}{1}$

pick the symbol for first pair : $\binom{4}{2}$

" " 2nd pair : $\binom{4}{2}$

" " the single : $\binom{4}{1}$

$\times$

$\frac{13!}{10!3!} \times 3 \times 6 \times 6 \times 4$

$= \frac{13 \cdot 12 \cdot 11}{3 \cdot 2 \cdot 1} \times 6 \times 4 \times 3$

$= 1352$

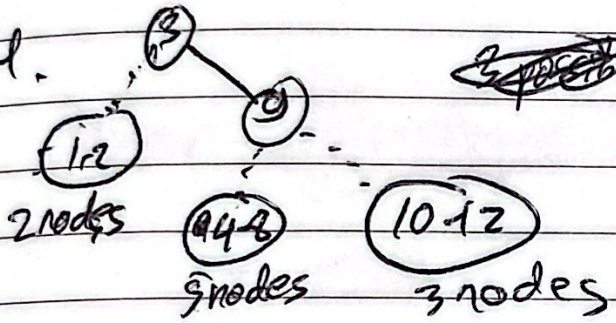
3. fighting couple 1 song : $\binom{21}{5}$

fighting couple 0 song : $\binom{22}{5}$ +

20349 + 26334

= 46683

4.



let $f(n)$ be the number of ways to create a BST with n nodes (for simplicity the nodes are named $1, \dots, n$)

$f(1) = 1$ -> ①

$f(2) = 2$ -> ① ② , ② ①

$f(3) = f(2) + f(1) \times f(1) + f(2)$

root=3 root=2 root=3

$= 5$

$f(4) = f(3) \times 2 + f(2) \times f(1) \times 2$

$= 10 + 4$

$= 14$

$f(5) = f(4) \times 2 + f(3) \times f(1) \times 2 + f(2) \times f(2)$

$= 28 + 10 + 4$

$= 42$

answer: $f(2) + f(3) + f(5) = 49$

~~5. Nurse on break.~~

5. Stars and bars:

Give 1 patient to the 3 nurses that is not on break.

stars: 7 patients
bars: 4 nurses - 1 = 3

answer: $\binom{10}{3}$

$= 120$