Counting

1. (a) $1 + \binom{4}{3} + \binom{4}{2} = 11$

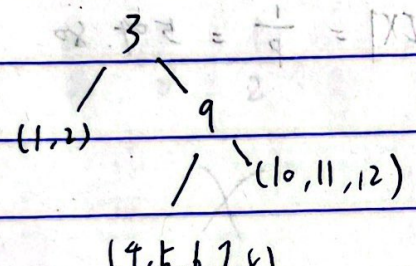
(b) $5! + \binom{4}{3}\frac{5!}{2!} + \binom{4}{2}\frac{5!}{3!} = 480$

2. $\binom{13}{2}\binom{4}{2}\binom{4}{2}\binom{11}{1}\binom{4}{1} = 123552$

3. $\binom{21}{5} + \binom{20}{5} = 35853$

4.

n (nodes)	ways
2	2
3	2+2+1 = 5
4	5×2 + 2×2 = 14
5	14×2 + 5×2 + 2×2 = 42



$42 \times 2 \times 5 = 420$

5. ~~$\binom{9}{3} + \binom{9}{2} = 120$~~

6 friends → 4 nurses

(0, 0, 0, 6)
(0, 0, 1, 5)
(0, 0, 2, 4)
(0, 0, 3, 3)
(0, 1, 1, 4)
(0, 1, 2, 3)
(0, 2, 2, 2)
(1, 1, 1, 3)
(1, 1, 2, 2)

7 friends → 3 nurses

(0, 0, 7) (0, 1, 6)
(0, 2, 5) (0, 3, 4)
(1, 1, 5) (1, 2, 4)
(1, 3, 3) (2, 2, 3)

$9 + 8 = 17$