Homework Quiz 5, 21 April 2017 Name:

1. Find the number of two-pair poker hands in a 52-card deck (with no Joker).

$$\underbrace{\binom{13}{2}}_{\text{choose ranks}} \times \underbrace{\binom{4}{2}}_{\substack{\text{choose suits} \\ 1^{ST}\text{ pair}}} \times \underbrace{\binom{4}{2}}_{\substack{\text{choose suits} \\ 2^{ND}\text{ pair}}} \times \underbrace{44}_{\text{last card}} = 123,552$$

2. Find the number of full house poker hands in a 52-card deck (with no Joker) which DO NOT contain a Jack or a Queen.

$$\underbrace{11}_{\substack{\text{rank} \\ 3OAK}} \times \underbrace{\binom{4}{3}}_{\substack{\text{suits} \\ 3OAK}} \times \underbrace{10}_{\substack{\text{rank} \\ \text{pair}}} \times \underbrace{\binom{4}{2}}_{\substack{\text{suits} \\ \text{pair}}} = 2640$$

3. In how many different ways can the letters of the word "PARALLEL" be arranged such that the first letter is NOT an "E"?

PARALLEL: $\binom{8}{3\,2\,1\,1\,1} = \frac{8!}{3!2!} = 3360$

Subtract words beginning with E:

E PARALLL $\binom{7}{3\,2\,1\,1} = \frac{7!}{3!2!} = 420$

$3360 - 420 = 2940$

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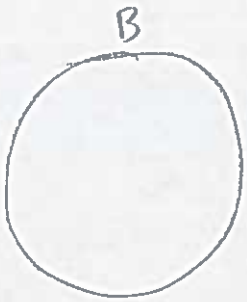
4. In how many different ways can 4 girls and 4 boys form a circle such that the boys and the girls alternate?



Choose a boy arbitrarily

Other locations for boys/girls forced

Boys: $3!$

Girls $4!$

$3! \times 4! = 144$

5. How many groups of five people can be formed from a collection of 8 men and 6 women if the group must contain 3 women and 2 men?

$$\underbrace{\binom{6}{3}}_{\text{choose women}} \times \underbrace{\binom{8}{2}}_{\text{choose men}} = 20 \times 28 = 560$$

6. How many 3 digit numbers can be formed from the digits 2, 3, 5, 6, 7 and 9 which are divisible by 2 if the digits MAY BE repeated?

$$\underbrace{6}_{\text{can be anything}} \times \underbrace{6}_{\text{can be anything}} \times \underbrace{2}_{\text{must be 2 or 6}} = 72$$

EXTRA CREDIT: You roll two 100-sided dice (each number has an equal likelihood of being rolled). What is the probability that the sum of the numbers on the dice is a multiple of 3?

1st die $\equiv 0 \bmod 3$ 1st die $\equiv 1 \bmod 3$ 1st die $\equiv 2 \bmod 3$

$33 \times 33 + 34 \times 33 + 33 \times 34$ ways

$= 3333$

Probability is $\frac{3333}{10,000}$