

Show all work clearly and in order. No calculators, cell phones, or any other electronic devices, and no books or notes are allowed. You have 15 minutes to take this 20 point quiz. **You should leave all answers in un-simplified form.**

1. (7 points) In how many ways can 27 people be separated into 3 teams (Avalanche, Bruins, and Coyotes), each with 9 players?

NUMBER THE PEOPLE 1-27 AND LABEL EACH A, B, OR C

$$\Rightarrow \boxed{\frac{27!}{9!9!9!}}$$

$\left(\begin{matrix} 27 \\ 9 \end{matrix} \right)$ FOR A
 $\left(\begin{matrix} 18 \\ 9 \end{matrix} \right)$ FOR B
 $\left(\begin{matrix} 9 \\ 9 \end{matrix} \right)$ FOR C

$$\Rightarrow \frac{27!}{18!9!} \cdot \frac{18!}{9!9!} = \frac{27!}{9!9!9!}$$

2. (6 points) Suppose we have a bin full of blue, red, purple, and yellow balls, where balls of the same color are identical. How many different (unordered) selections of 12 balls can be made if at least 3 are blue?

SAME AS SELECTING 9 BALLS OF ANY COLOR
 (1 ≤ 3 CAN BE BLUE)

CHOOSE 9 FROM SET OF 4, ALLOWING REPETITIONS:

$$\binom{9+4-1}{4-1} = \binom{12}{3} = \boxed{\frac{12!}{3!9!}}$$

3. (7 points) Find the coefficient of the term $x^{11}y^{15}$ in the expansion of $(2x - y)^{26}$.

$$\binom{26}{15} (2x)^{11} (-y)^{15} = \frac{26!}{15!11!} (2)^{11} (-1)^{15} x^{11} y^{15}$$

$$\Rightarrow \boxed{\frac{-26!(2)^{11}}{15!11!}}$$