Math 10 Spring 2010 Quiz 2

Name: Key

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3 (1) Simplify the following fraction until it has no factorials, ellipses (...), or obvious cancellations:

$$\frac{200!\ 20!}{4!\ 18!\ 197!}$$

$\frac{199 \cdot 198 \cdot 500 \cdot 19}{3}$ or $199 \cdot 66 \cdot 500 \cdot 19$

(2) 4 balls are to be drawn, with replacement, from a bin containing 2 red, 2 green, and 2 orange balls.

3 (a) Find the probability of drawing exactly one orange ball.

$$\underbrace{\binom{4}{1}}_{\text{choose one position}}\underbrace{\left(\frac{1}{3}\right)}_{\text{one orange ball probability}}\underbrace{\left(\frac{2}{3}\right)^3}_{\text{3 non-orange balls probability}} = 4 \cdot \frac{2^3}{3^4} = \frac{2^5}{3^4}$$

3 (b) Find the probability of drawing exactly 2 red balls.

$$\binom{4}{2}\left(\frac{1}{3}\right)^2\left(\frac{2}{3}\right)^2 = 6 \cdot \frac{4}{3^4} = \frac{8}{27}$$

6 (c) Find the probability of drawing exactly 1 orange ball *or* exactly 2 red balls. Remember our *or* is inclusive.

one orange <u>and</u> one red?

$$\underbrace{\binom{4}{1}}_{\text{orange slots}}\underbrace{\binom{3}{2}}_{\text{red slots}}\underbrace{\left(\frac{1}{3}\right)}_{\text{one orange}}\underbrace{\left(\frac{1}{3}\right)^2}_{\text{2 red}}\underbrace{\left(\frac{1}{3}\right)}_{\text{one green}} = 4 \cdot 3 \cdot \frac{1}{3^4} = \frac{4}{27}$$

Inclusion-exclusion

$$\frac{2^5}{3^4} + \frac{8}{27} - \frac{4}{27} = \text{prob of "or"} = \frac{44}{3^4}$$