

1.a)

$$\binom{6+30-1}{30} = \binom{35}{30} = 324632$$

$$\binom{n+r-1}{r} n = \text{unique type} | r = \text{total}$$

b.)

$$\binom{6+30-6-1}{30-6} = \binom{29}{24} = 118755$$

Must spend at least 6 balls for each type first

c.)

$$\binom{6+30-11}{30-10} = \binom{25}{20} = 53130$$

d.)

$$\binom{5+17-1}{17} + \binom{6+3-1}{3} = \binom{21}{17} + \binom{8}{3} = 6041$$

e.)

$$\binom{20-2}{17-2} + \binom{8}{3} + \binom{5+2-1}{2} = \binom{18}{15} + \binom{8}{3} + \binom{6}{2} = 887$$

2a.) Callitrichidae

$$\frac{14!}{2!*2!*2!*3!*1!*1!*1!} = \frac{8718291200}{48} = 1816214400$$

b.) Start or end with vowels

$$\frac{14!}{2!*2!*2!*3!} - \frac{56*12!}{2!*2!*2!*3!} = 1816214400 - 558835200 = 1257379200$$

c.) Contain Substring LITERAL

$$\frac{8!}{2!*2!} = 10080$$

3.) Antidisestablishmentarianism

$$\frac{28!}{4!*3!*3!*5!*4!*2!*2!*2!} = \frac{3.0488834*10^{29}}{19906560} = 1.53159734 * 10^{22}$$

4.)

5.)

6.)