

How many DNA strings of length 4, i.e. strings in $\{C, T, G, A\}^4$ have exactly 2 C's, or exactly 2 T's?

Subtraction Rule:

Exactly 2 C's

$$\binom{4}{2} \cdot 3 \cdot 3$$

Choose 2 out of 4 positions to have C's

can put T, G, A in 1st non C position

2nd non C

Exactly 2 T's

$$\binom{4}{2} \cdot 3 \cdot 3 - \binom{4}{2}$$

2 T's
2 C's

$$= \binom{4}{2} \cdot 17 = \frac{4!}{2!2!} \cdot 17 = 3 \cdot 17$$

How many DNA strings of length 4, i.e. strings in $\{C, T, G, A\}^4$ have at least 2 C's, or at least 2 T's?

Exactly 2 C's or T's

Exactly 3 C's or 3 T's

Exactly 4 C's or 4 T's

$$3 \cdot 17 + 2 \cdot \binom{4}{3} \cdot 3 + 2$$