James Belmar da Costa @20513-5358

2a. 108 notes

A	B	C
53	35	20

choose 16 notes

ways of choosing A: $\binom{53}{4}$ · ways of choosing B: $\binom{35}{2}$ · ways of choosing C: $\binom{20}{10}$

$\binom{108}{16}$ ← ways of choosing 16 random notes

$$= \frac{53!}{4!\,49!} \cdot \frac{35!}{2!\,33!} \cdot \frac{20!}{10!\,10!}$$

$$108!/(16!)(92!)$$

$$= \frac{53! \cdot 35! \cdot 20! \cdot 16! \cdot 92!}{108!\,49!\,33!\,10!\,10!\,2!\,4!}$$

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b. If we define $S(x)$ as picking x with replacement,

then $P(S(A))^4 \cdot P(S(B))^2 \cdot P(S(C))^{10}$

$$= \left(\frac{53}{108}\right)^4 \cdot \left(\frac{35}{108}\right)^2 \cdot \left(\frac{20}{108}\right)^{10}$$

$$= \boxed{\frac{53^4 \cdot 35^2 \cdot 20^{10}}{108^{10}}}$$