

Nice fact: $\underline{\underline{\text{Var}(aX+b) = a^2 \text{Var}(X)}}$

where a, b constants,
 X random variable

Why??

$$\begin{aligned}\text{Var}(aX+b) &= E(\underline{\underline{(aX+b)^2}}) - \underline{\underline{(E(aX+b))^2}} \\ &= E(a^2X^2 + 2abX + b^2) - (aE(X) + b)^2 \\ &= a^2E(X^2) + 2aE(X) + b^2 - (a^2(E(X))^2 + 2aE(X) + b^2) \\ &= a^2(E(X^2) - (E(X))^2) \\ &= a^2 \text{Var}(X).\end{aligned}$$