$gain = \frac{NElectrons}{Counts} \Rightarrow C = \frac{N}{g} \Rightarrow N = Cg$
From Poisson uncertainty : $\sigma_N = \sqrt{N}$
$\sigma_C = \sqrt{(\frac{\delta c}{\delta N}\sigma_N)^2 + (\frac{\delta c}{\delta g}\sigma_g)^2}$
But since g is a constant
$\Rightarrow \sigma_C = \frac{\delta c}{\delta N}\sigma_N = \frac{\sqrt{N}}{g}$
We have :
$\sigma^2_{total} = \sigma^2_{Readnoise} + \sigma^2_C = \sigma^2_{Readnoise} + \frac{C}{g} \Rightarrow g = \frac{C}{\sigma^2_{total} - \sigma^2_{Readnoise}}$

aaaaa

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1 Introduction