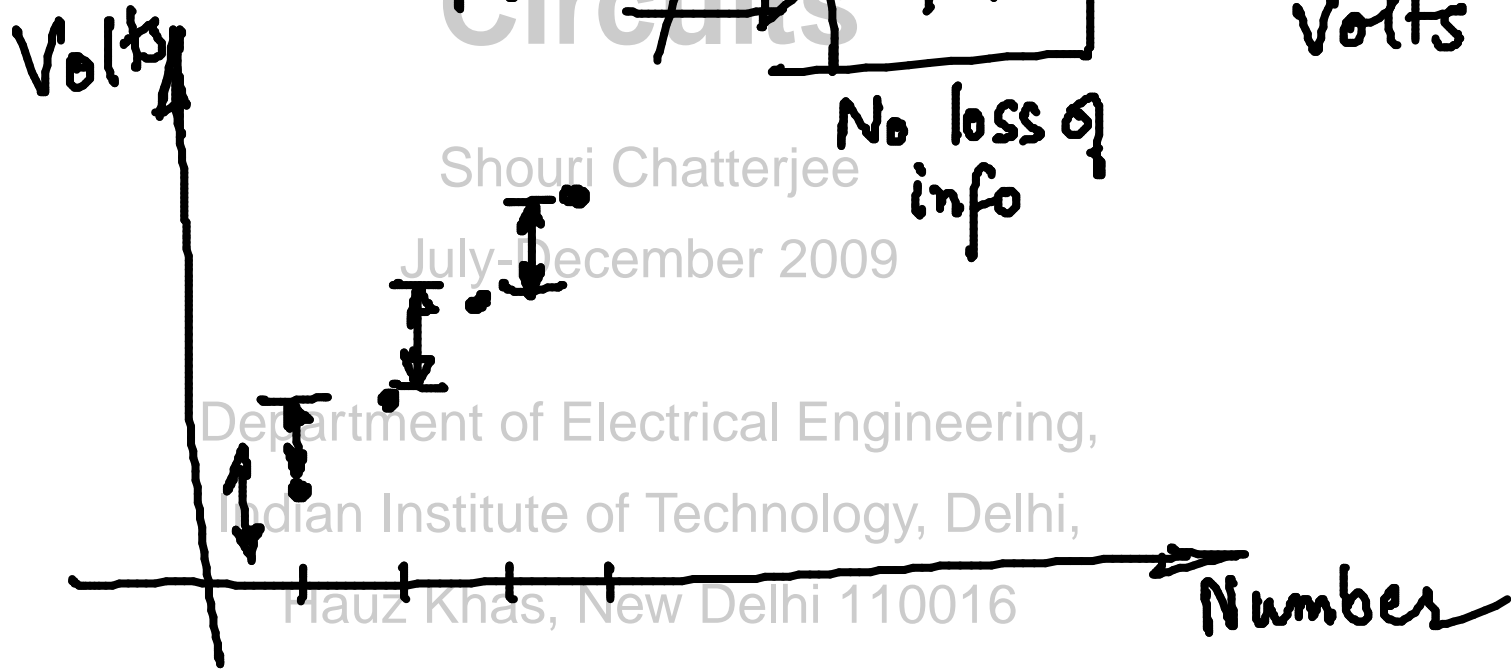
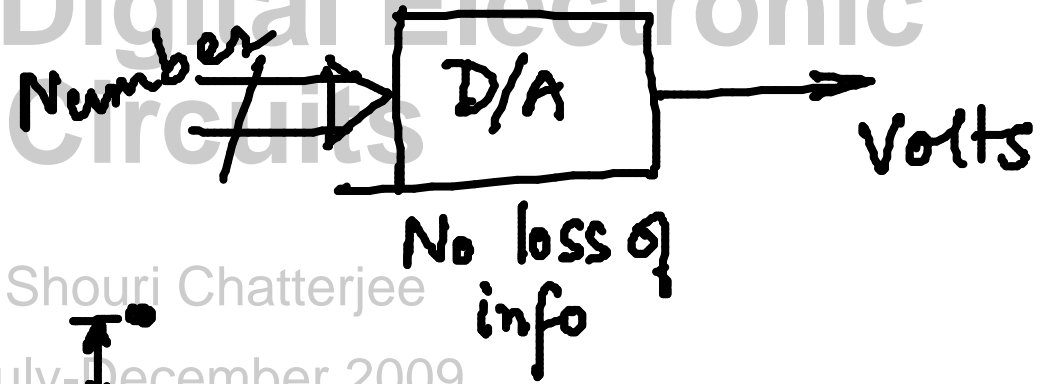
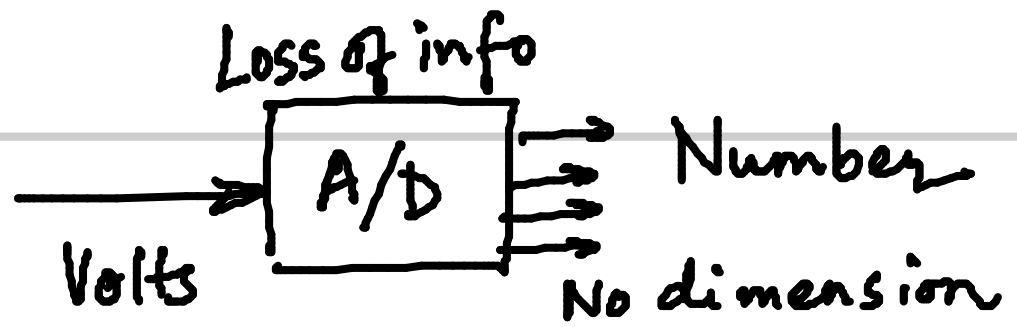


✓ Gain error  
✓ Offset error

DNL  
INL



Shouri Chatterjee

July-December 2009

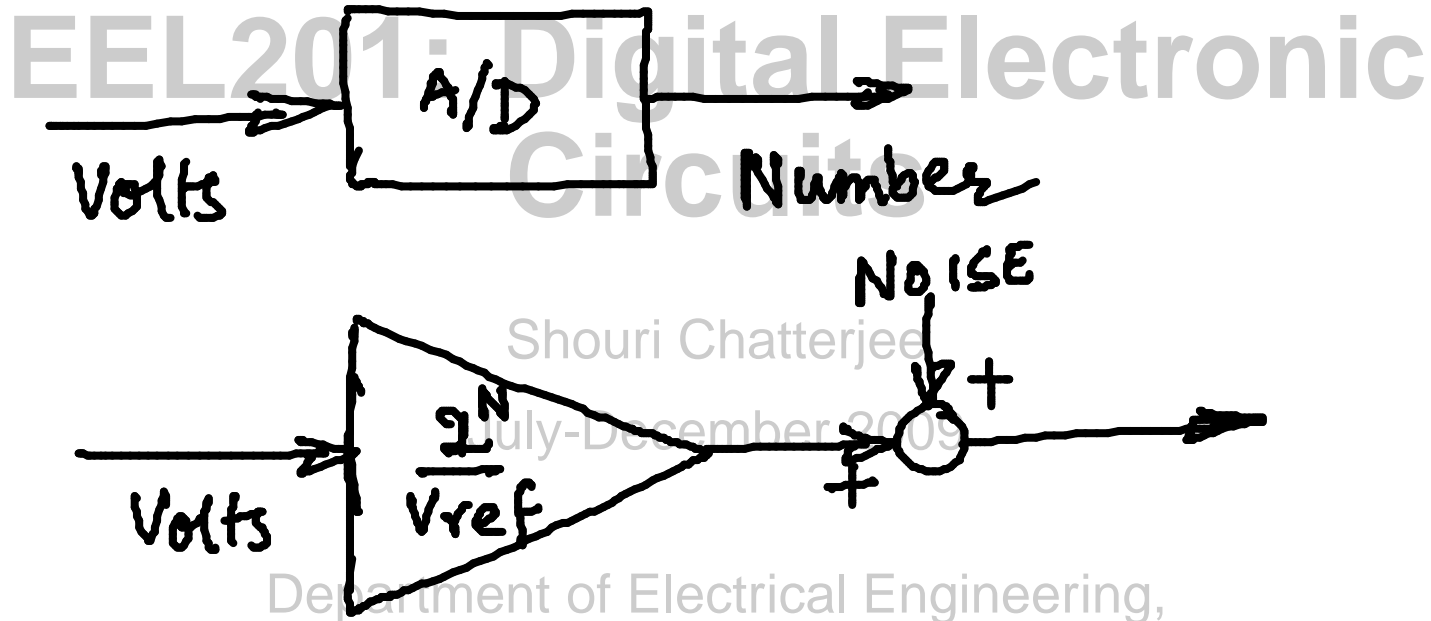
Department of Electrical Engineering,

Indian Institute of Technology, Delhi,

Hauz Khas, New Delhi 110016



# How much are we losing in an A/D ?

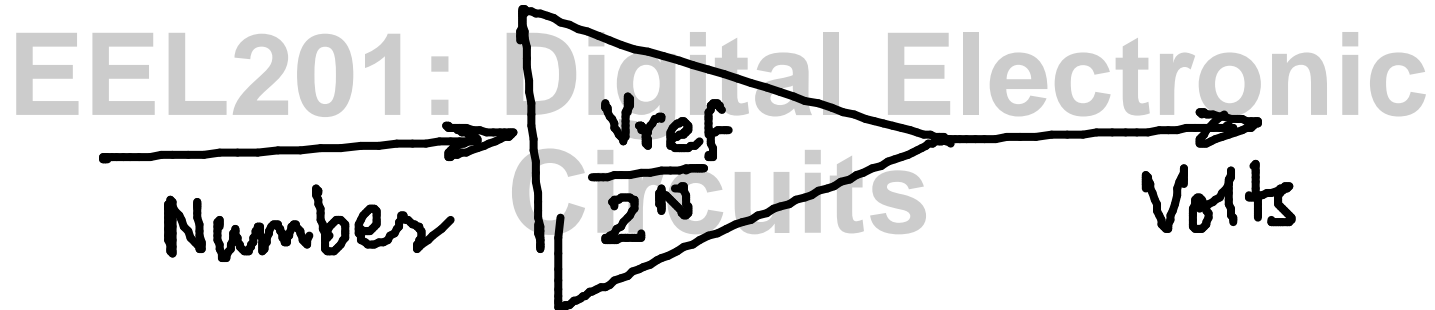


How much noise are we adding?



D/A

---



Shouri Chatterjee

July-December 2009

Department of Electrical Engineering,  
Indian Institute of Technology, Delhi,  
Hauz Khas, New Delhi 110016



round



EEL201 Digital Electronic Circuits

noise  $\in [-0.5, 0.5)$

floor

Shouri Chatterjee  
July-December 2009  $\in (-1, 0]$

ceiling

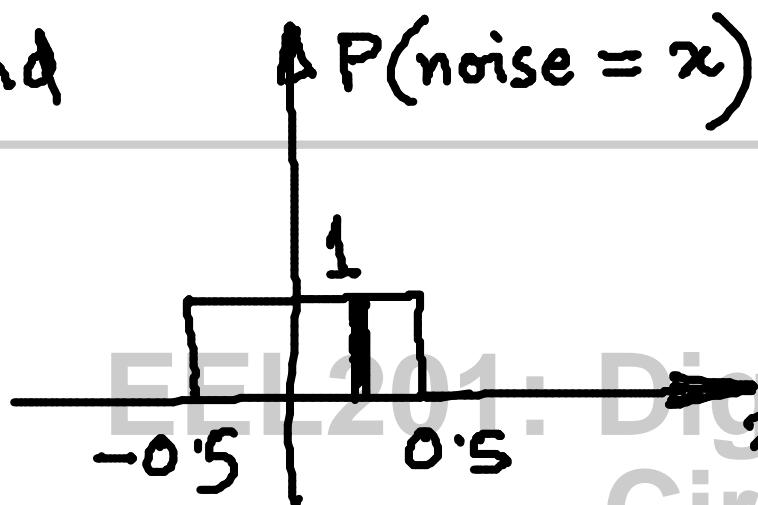
Department of Electrical Engineering  
Indian Institute of Technology, Delhi,

$\in [0, 1)$

Hauz Khas, New Delhi 110016



round

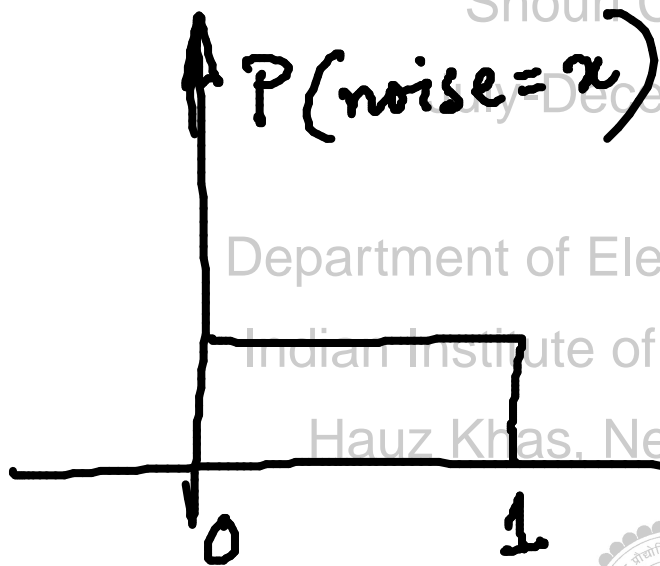


expectation of noise = ?

$$E(x) = \text{mean}$$

$$\sqrt{E(x^2)} = \sqrt{\frac{1}{12}}$$

ceiling



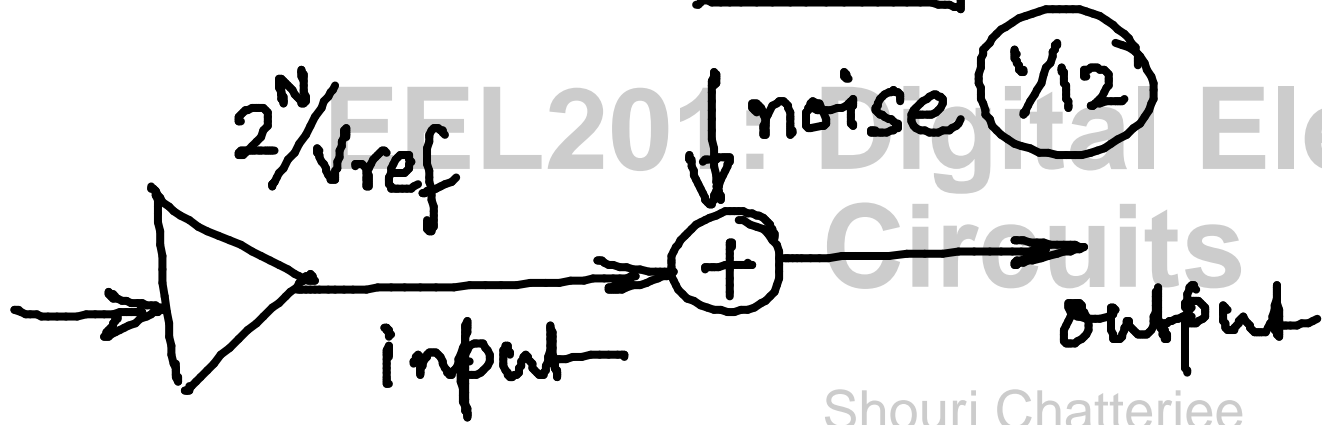
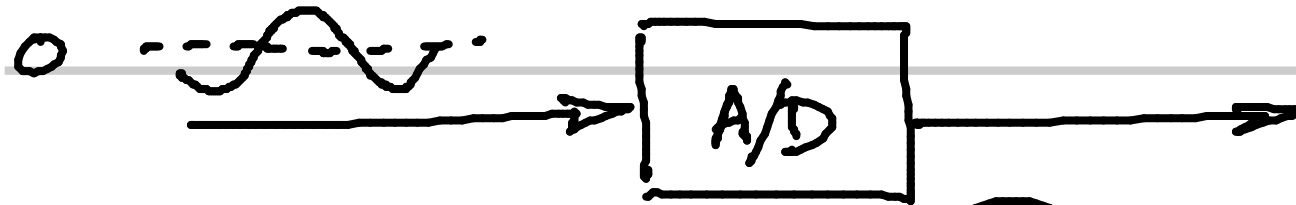
$$E(x^2) = \frac{1}{12}$$

$$E(x) = \text{mean} = \frac{1}{2}$$

$$E(x^2) = \frac{1}{3}$$

floor





$$\text{Power} = \frac{V^2}{R} = 1\Omega$$

Shouri Chatterjee

July-December 2006

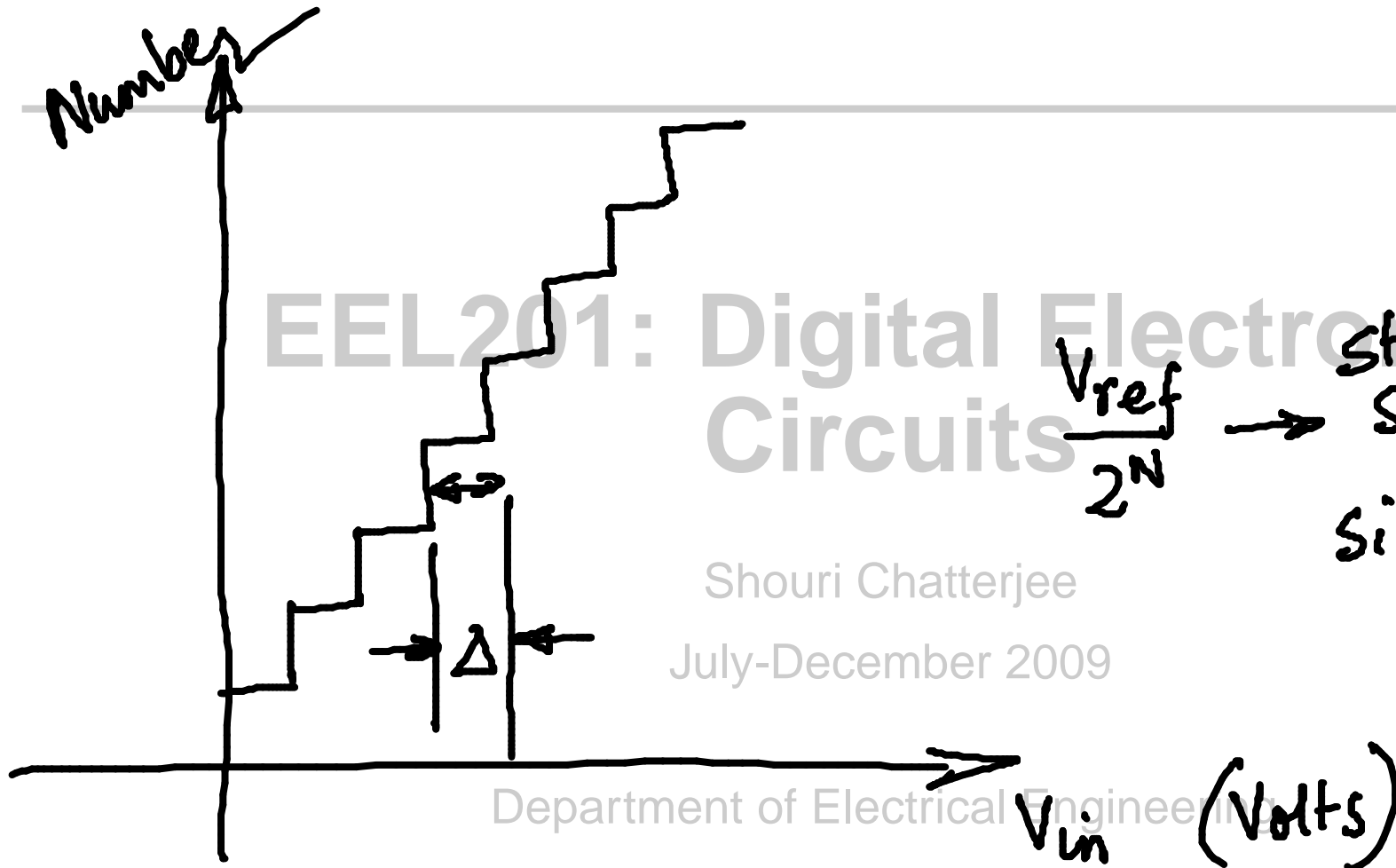
"Quantization"

$$\frac{(V_{ref})^2}{2^N \cdot 12}$$

Hauz Khas, New Delhi 110016



Number



# EEL201: Digital Electronic Circuits

Shouri Chatterjee  
July-December 2009

step size  
size of 1 LSB  
=  $\Delta$

Department of Electrical Engineering

Indian Institute of Technology, Delhi,  
Hauz Khas, New Delhi 110016

round :  $\overline{q_n^2} = \frac{\Delta^2}{12}$

floor/ceiling :  $\overline{q_n^2} = \frac{\Delta^2}{3}$



---

# EEL201: Digital Electronic Circuits

Shouri Chatterjee

July-December 2009

Department of Electrical Engineering,  
Indian Institute of Technology, Delhi,  
Hauz Khas, New Delhi 110016

