

## Week 2 Prelab

Calculate the ratio RMS/Vpp for the following signals. Show all your work!

Name:

1. Square Wave: **RMS / Vpp = ?**

UID:

$$y = a \quad \forall t < \frac{T}{2}$$

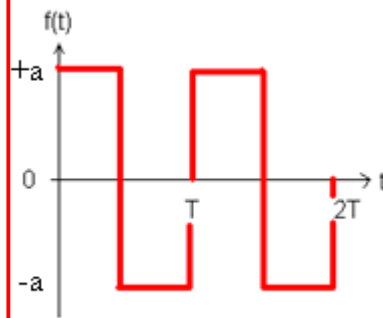
$$y = -a \quad \forall t > \frac{T}{2}$$

$$RMS = \sqrt{\frac{1}{T} \left( \int_0^{\frac{T}{2}} a^2 dt + \int_{\frac{T}{2}}^T a^2 dt \right)}$$

$$= \sqrt{\frac{1}{T} \left( a^2 \frac{T}{2} + a^2 \frac{T}{2} \right)}$$

$$= \sqrt{\frac{1}{T} (a^2 T)} = a$$

$$\frac{RMS}{V_{pp}} = \frac{1}{2a} = \frac{1}{2}$$



$$y = \frac{2a}{T}t \quad \forall t < \frac{T}{4}$$

$$y = \frac{-2a}{T}t + a \quad \forall \frac{T}{4} < t < \frac{3T}{4}$$

$$y = \frac{2a}{T}t - a \quad \forall t > \frac{3T}{4}$$

$$RMS = \sqrt{\frac{4}{T} \left( \int_0^{\frac{T}{4}} \left( \frac{4a}{T}t \right)^2 dt \right)}$$

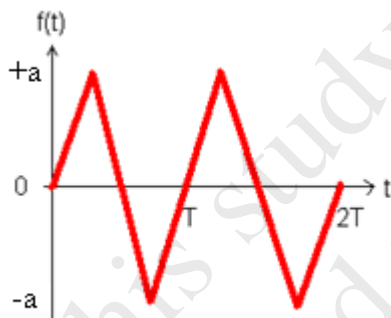
$$= \sqrt{\frac{4}{T} \left( \int_0^{\frac{T}{4}} \left( \frac{16a^2}{T^2}t^2 \right) dt \right)}$$

$$= \sqrt{\left( \frac{4}{T} \right) \left( \frac{16a^2}{T^2} \left( \frac{T^3}{3} \right) \right)}$$

$$= \sqrt{\frac{a^2}{3}} = \frac{a}{\sqrt{3}}$$

$$\frac{RMS}{V_{pp}} = \frac{\frac{a}{\sqrt{3}}}{2a} = \frac{1}{2\sqrt{3}}$$

2. Triangular Wave: **RMS / Vpp = ?**



3. If you see a difference by a factor of 10 between the oscilloscope reading and the function generator setting, where is the first place that you should look? Watch the Probe Setting video (<https://youtu.be/dtSuTHlviSo>) for the answer.

4. If you see a difference by a factor of 2 between the oscilloscope reading and the function generator setting, where is the first place that you should look? Watch the Function Generator Output Impedance video (<https://youtu.be/-8Dv1oOjD9w>) for the answer.

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5. Why would you ever want to use AC coupling on an oscilloscope? Watch the AC Coupling video (See CCLE) for the answer.

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***Week 2 Prelab End***

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