

MUSC 208 Winter 2014
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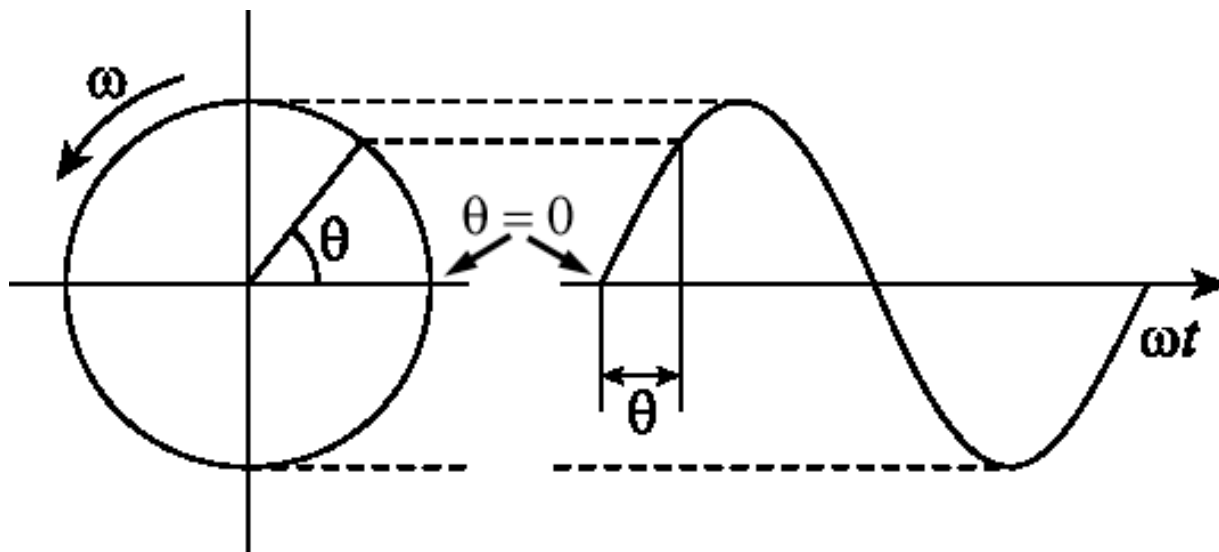
Phasor

Phasor

Definition: (physics) A rotating line used to represent a sinusoidally varying quantity; the length of the line represents the magnitude of the quantity, and its angle with the x-axis at any instant represents the phase.

<http://www.answers.com/topic/phasor-2#>

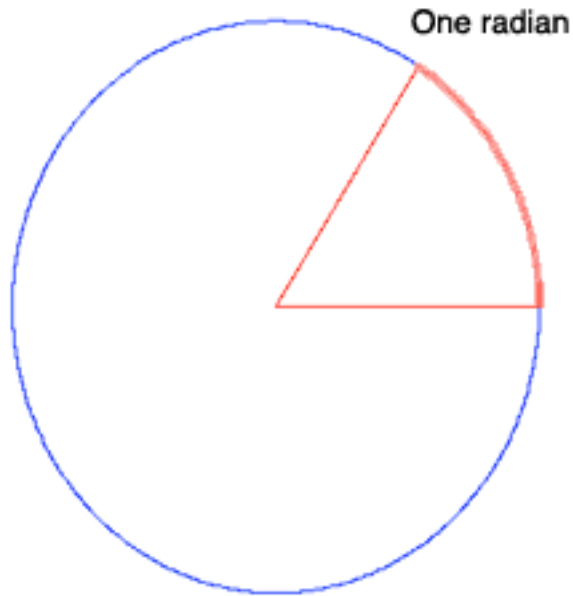
A phasor can be thought of a line rotating around the center of a circle. The tip of line traces the curve of a sine wave. The angle the spoke makes with the horizontal axis is called the phase angle. For every phase angle θ there is a corresponding distance θ along the horizontal axis of the sine wave.



<http://commons.wikimedia.org/wiki/File:Phasor.svg>

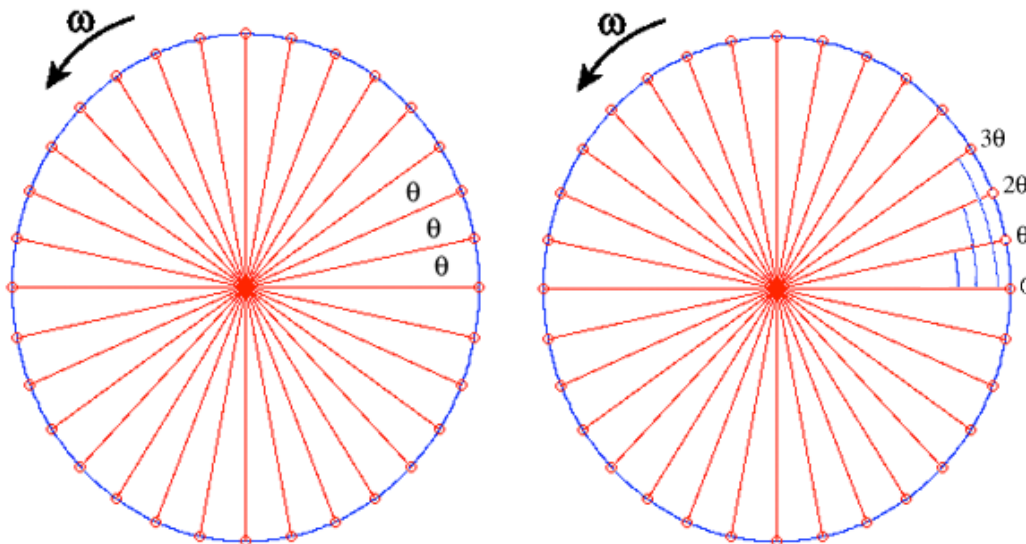
Radians

Phase angles are measured in radians. One radian is the angle whose arc length is equal to the radius. One complete revolution equals 2π radians, or 360 degrees. One radian is equal to $360/2\pi = 57.296$ degrees. Radians have no dimensions. Just like π they are pure numbers.

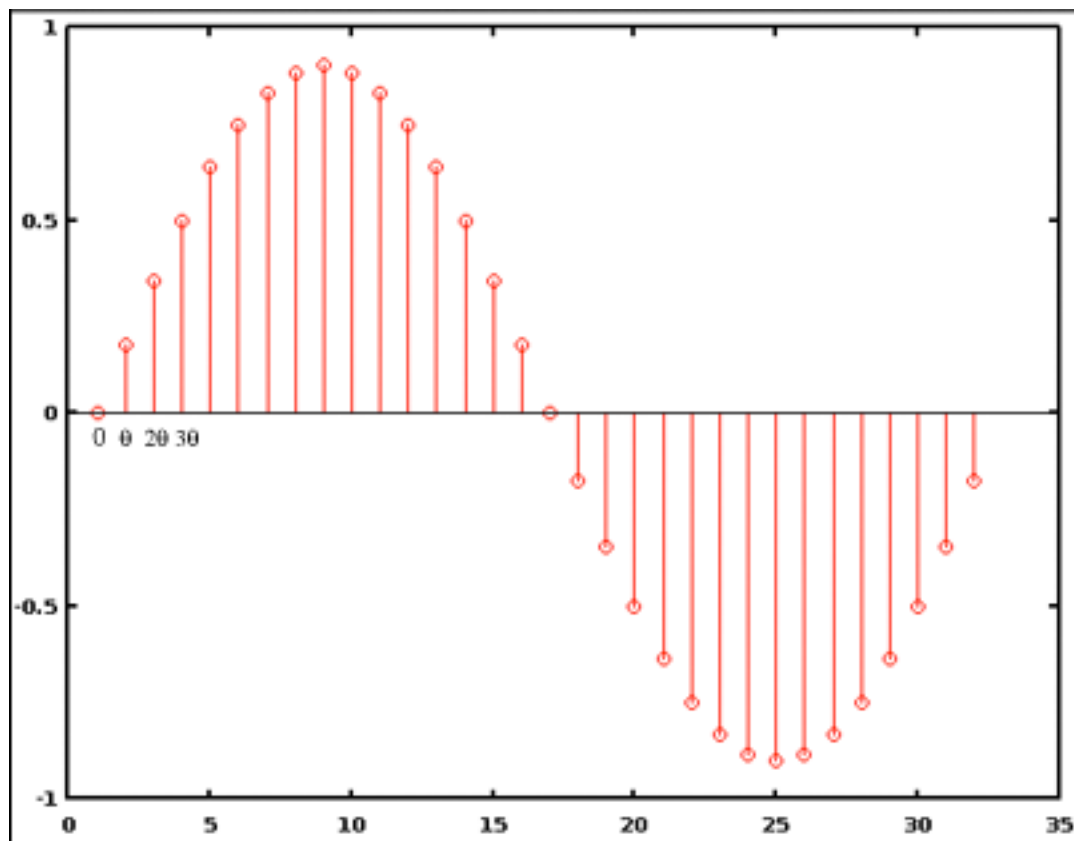


Phase Angle And Phase Increment

This unit circle is divided into 32 slices. Each slice has a phase angle theta, $\theta = 2\pi/32$ radians. As you move counterclockwise around the circle starting at point (1,0) the height of the point on the circumference above the horizontal axis corresponds to each sample of the sine wave. The angle θ is called the phase increment and each sample position is an integer multiple of θ .



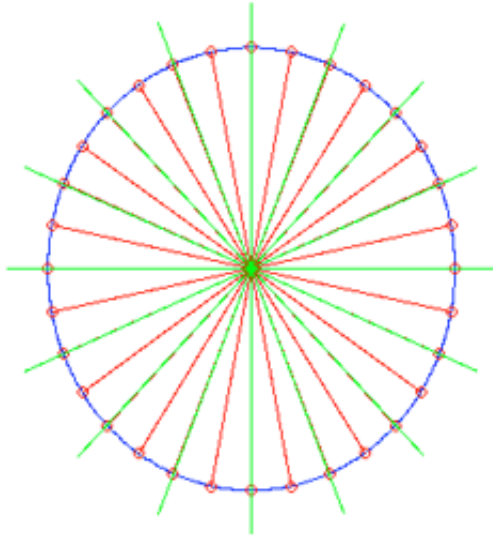
The sine wave shown below has 32 samples uniformly spaced $2\pi/32$ radians apart. The actual time interval between samples depends on the sample rate.



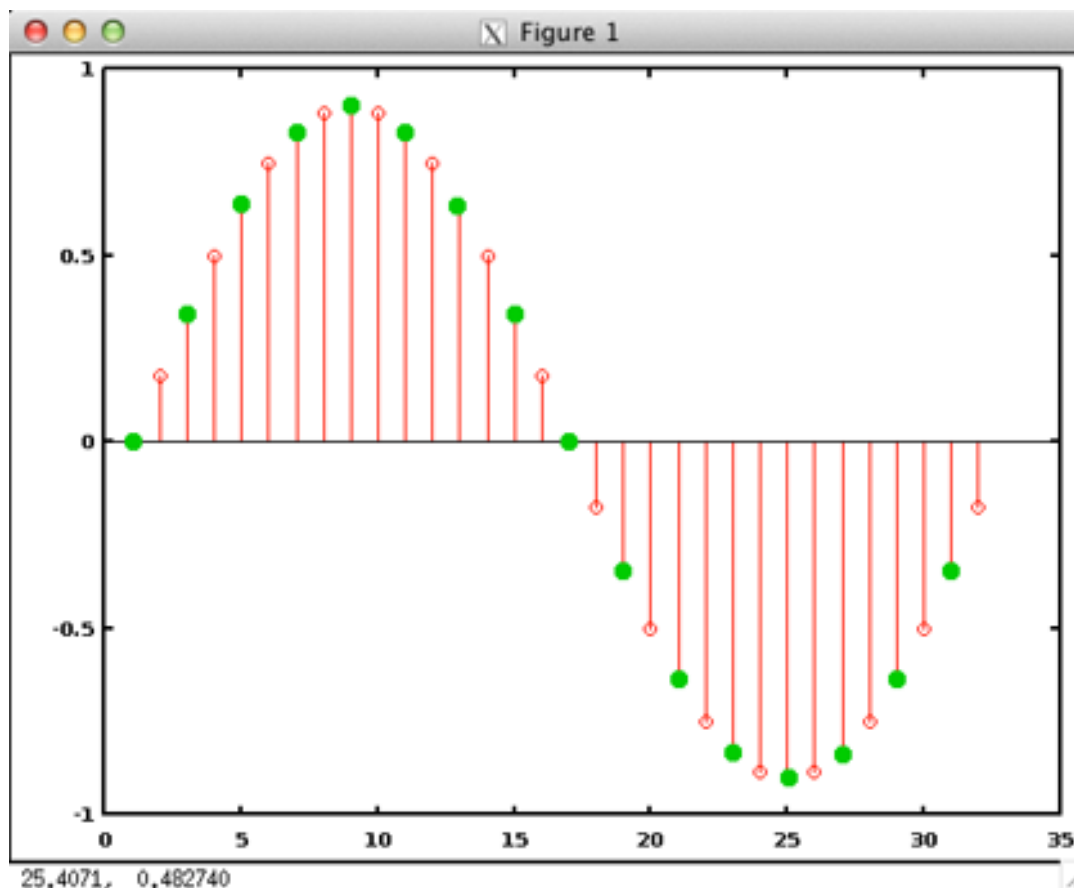
Mentally extend these to pictures to a circle and sine wave with 44100 samples and you have one second of a 1 Hz sine wave. The sample rate of 44100 samples per second can also be thought of as $2\pi/44100 = 0.0014248$ radians per second.

Phase Increment Of 2θ

The original 32 points are shown in red. The phase angle or phase increment is θ . The green lines are spaced using a phase increment of 2θ . The green lines intersect every other sample point.

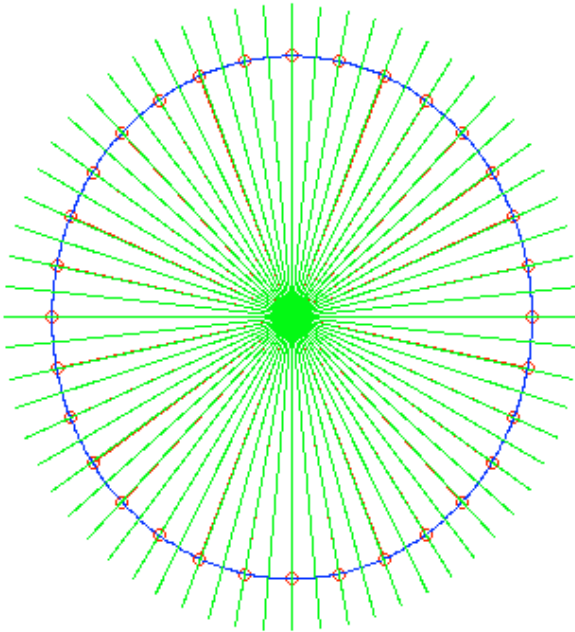


Using a phase increment of 2θ , the green samples will be selected for the output.

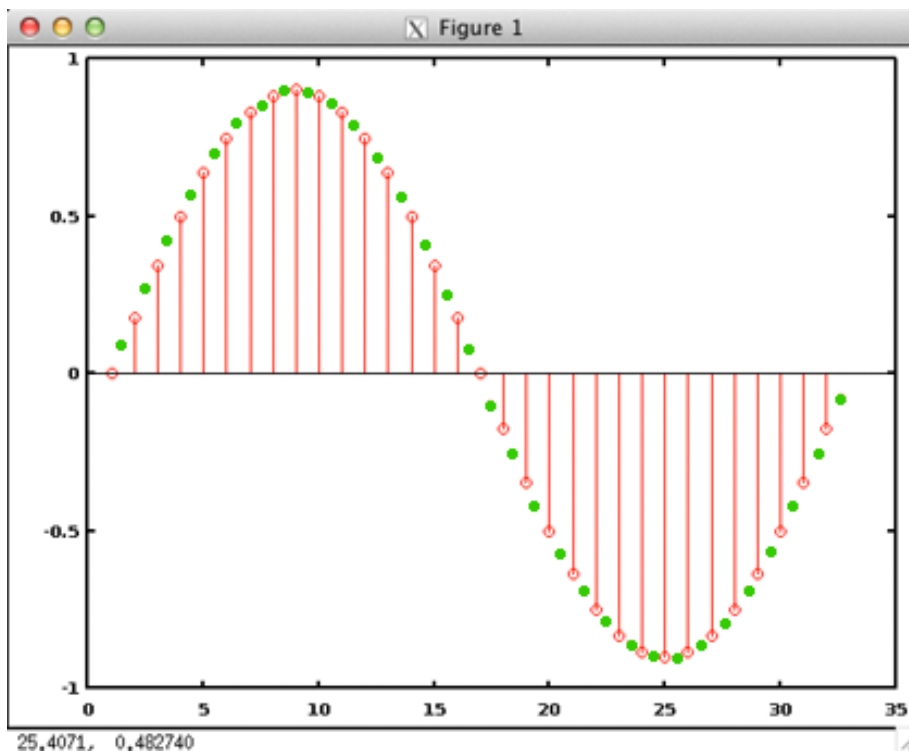


Phase Increment Of $1/2 \theta$

The original 32 points are shown in red. The phase angle or phase increment is $1/2 \theta$. The green lines are spaced using a phase increment of 0.5θ . The green lines bisect and intersect every sample point.

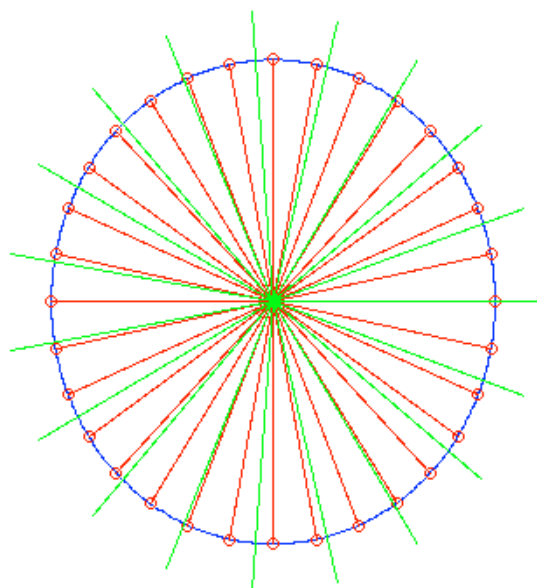


Using a phase increment of 0.5θ , there will be twice as many samples in the output. The green dots represent samples whose values need to be estimated.



Phase Increment Of 1.68θ

The original 32 points are shown in red. The phase increment in green is 1.68θ .



Using a phase increment of 1.68 , virtually all sample values will have to be estimated as indicated by the green dots.

