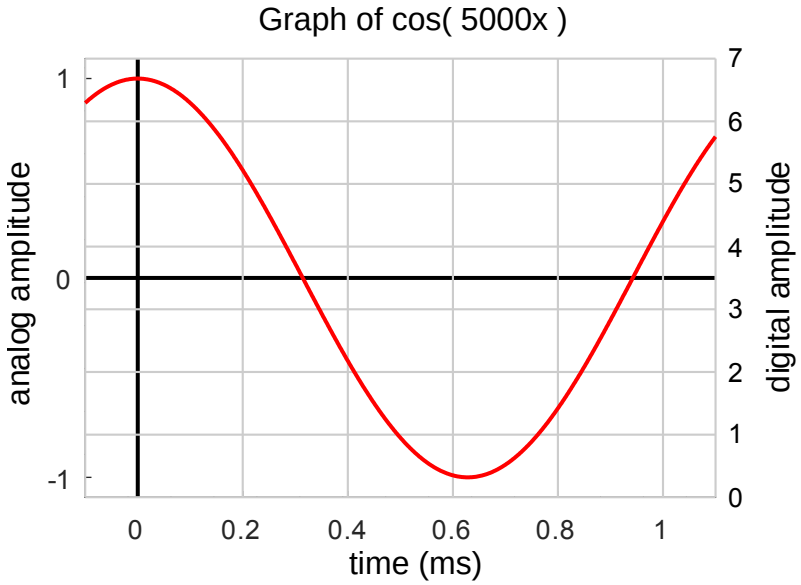
English name: _____

Worksheet: Sampling an Analog Signal

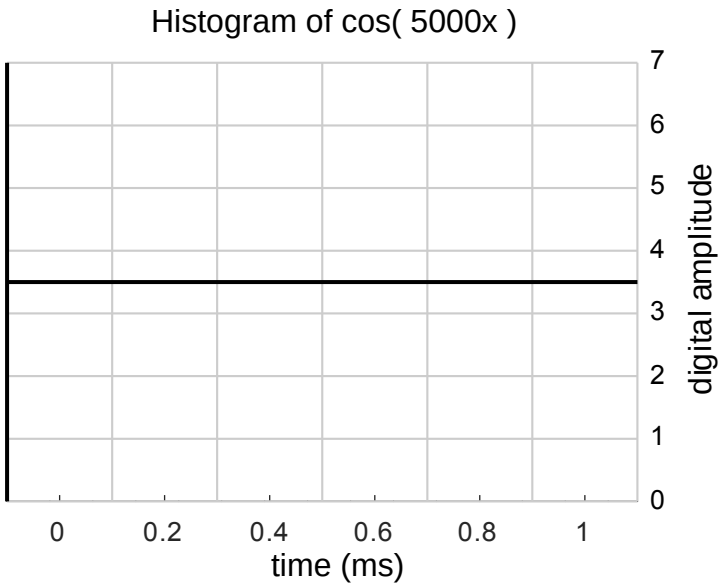
The mathematical formula $\cos(5000t)$, graphed below with a domain of 0 ms to 1 ms, represents a sound wave of about 796 Hz. Complete the table to the right of the graph by determining the digital samples, sampling the signal at a rate of 5000 Hz (once every 0.2 ms) and with a resolution of 8 levels (3 bits per sample).



Sampling Table		
Time (ms)	Digital Amplitude	
	Decimal	Binary
0.0		
0.2		
0.4		
0.6		
0.8		
1.0		

Write the sampled digital amplitudes as a bitstream in the box to the right.

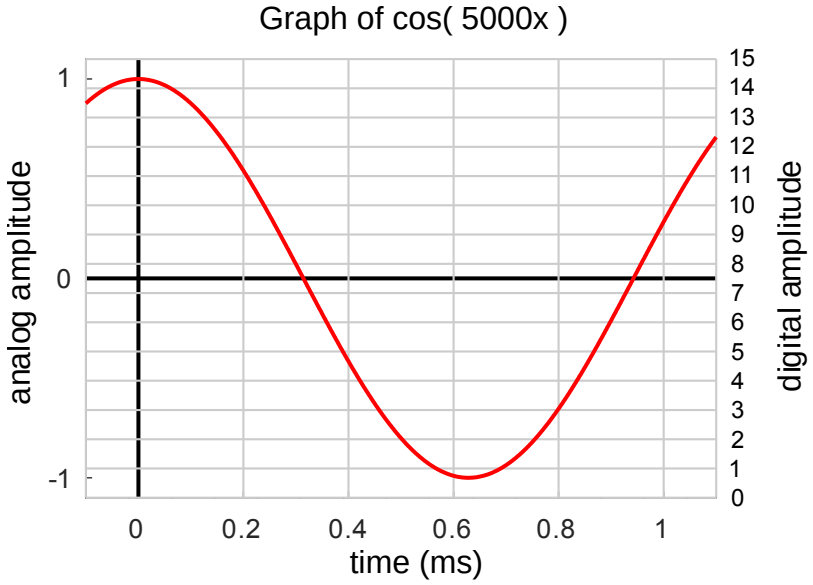
Use the digital values from the table above to create a digital histogram of the original signal.



English name: _____

Worksheet: Sampling an Analog Signal

We will now see what happens if we increase the precision of the samples from 8 levels to 16 levels (from 3 bits per sample to 4 bits per sample). Complete the table to the right of the graph by determining the digital samples, sampling the signal at a rate of 5000 Hz (once every 0.2 ms).



Sampling Table		
Time (ms)	Digital Amplitude	
	Decimal	Binary
0.0		
0.2		
0.4		
0.6		
0.8		
1.0		

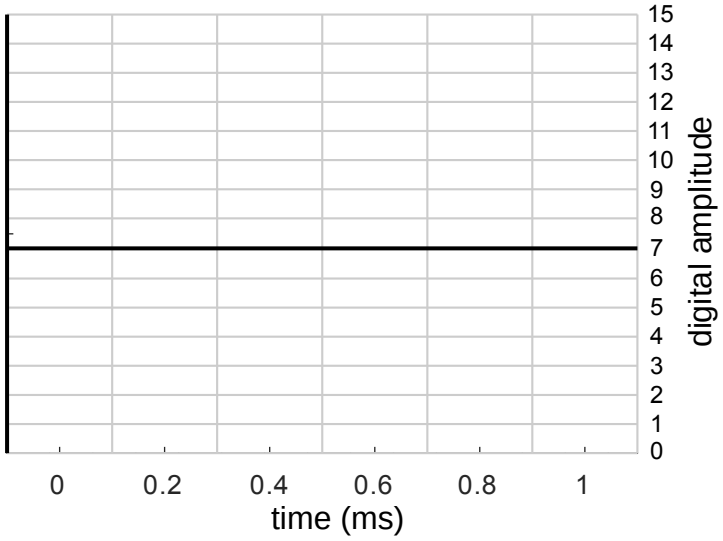
Write the sampled digital amplitudes as a bitstream in the box to the right.

Length of bitstream for 3 bits per sample

Length of bitstream for 4 bits per sample

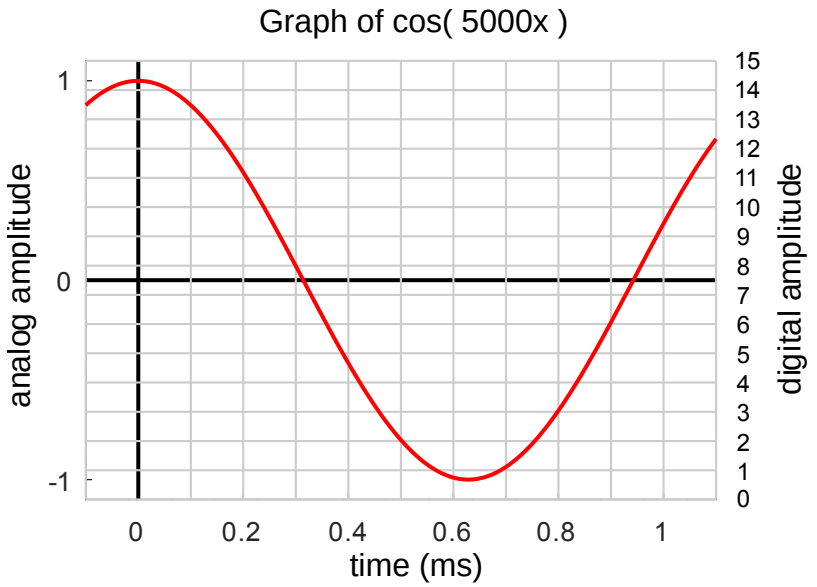
Percent increase

Use the digital values from the table above to create a digital histogram of the original signal.



Worksheet: Sampling an Analog Signal

This time we will double the sample rate from 5 kHz (5000 samples per second) to 10 kHz while holding the sampling precision at 16 levels (4 bits per sample). Complete the table to the right of the graph by determining the digital samples at the new sample rate of 10 kHz or one sample every 0.1 ms.



Sampling Table		
Time (ms)	Digital Amplitude	
	Decimal	Binary
0.0		
0.1		
0.2		
0.3		
0.4		
0.5		
0.6		
0.7		
0.8		
0.9		
1.0		
1.1		

Write the sampled digital amplitudes as a bitstream in the box below.

How does the length of the bitstream for the signal sampled with with 4-bit precision and at a sample rate of 10 kHz compare to the length of the bitstream for the signal sampled with 4-bit precision and at a sample rate of 5 kHz? Write in a complete sentence.

Use the digital values from the table above to create a digital histogram of the original signal.