Doubling the amplitude

```
def double( sound ) :
  for sample in getSamples(sound):
    value = getSample(sample)
    setSample(sample, value * 2)
```

Normalizing

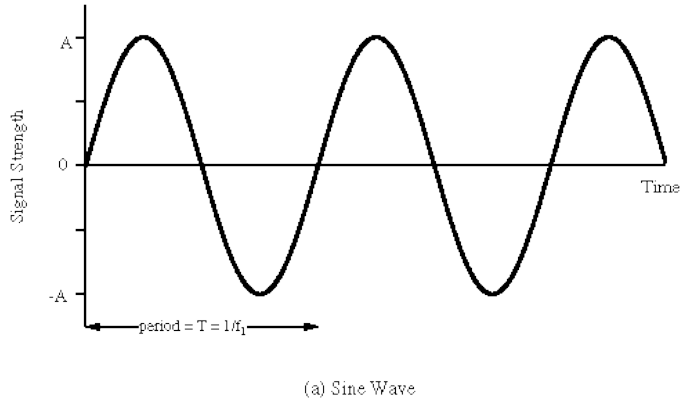
- A few ways to think about "normalizing":
  - **use the whole enchilada (don't waste any bits...)**
  - **make everything use the same scale (0 to 100%)**
  - **need 2 loops -- one to find largest and one to reset**

```
def normalize( sound ) :
  largest = 0
  for sample in getSamples(sound):
     largest = max( largest, getSample(sample) )
  multiplier = 32767.0 / largest
  print "Largest", largest, "multiplier is", multiplier
  for sample in getSamples(sound):
    setSample(sample, getSample(sample) * multiplier)
```

Normalizing (modified)

```
def normalize( sound ) :
  largest = 0
  for sample in getSamples(sound):
    largest = max( largest, abs( getSample(sample) ) )
  if largest > 32766 :
      return sound
  multiplier = 32768.0 / largest
  print "Largest", largest, "multiplier is", multiplier
  for sample in getSamples(sound):
    setSample(sample, getSample(sample) * multiplier)
  return sound
```

Sine wave



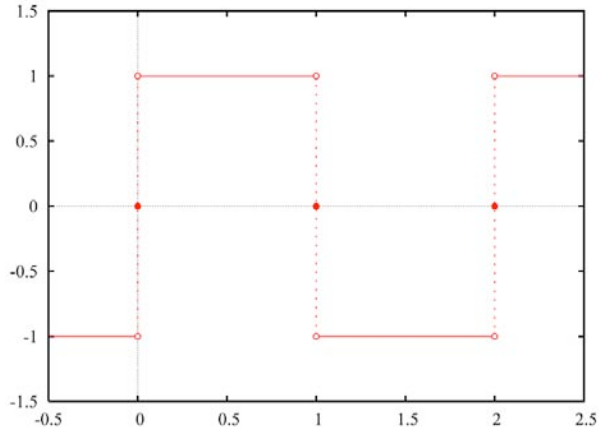
(a) Sine Wave

- recipe 70

```
def sineWave( freq, amplitude ) :
  mySound = getMediaPath("sec1silence.wav")
  buildSin = makeSound(mySound)
  sr = getSamplingRate(buildSin)  # sampling rate
  interval = 1.0 / freq                  # interval of sample
  samplesPerCycle = interval * sr    # samples / cycle
  maxCycle = 2 * pi
  for pos in range( 1, getLength( buildSin ) + 1 ) :
    rawSample = sin(( pos / samplesPerCycle) * maxCycle)
    sampleVal = int( amplitude * rawSample )
    setSampleValueAt( buildSin, pos, sampleVal )
  return buildSin
```

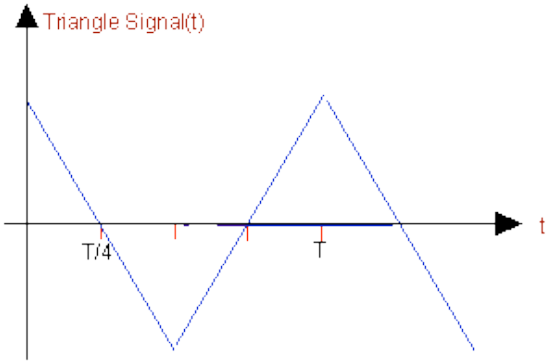
Square wave

- recipe 72




```
def squareWave( freq, amplitude ) :
  mySound = getMediaPath("sec1silence.wav")
  square = makeSound(mySound)
  samplingRate = getSamplingRate(square)   # sampling rate
  seconds = 1
  interval = 1.0 * seconds / freq                    # interval of sample
  samplesPerCycle = interval * samplingRate # samples / cycle
  samplesPerHalfCycle = int(samplesPerCycle / 2)
  sampleVal = amplitude
  i = 1
  for s in range( 1, getLength( square ) + 1 ) :
    if (i > samplesPerHalfCycle):
      sampleVal = sampleVal * -1
      i = 0
    setSampleValueAt( square,s, sampleVal )
    i = i + 1
  return square
```

Triangluar wave



- recipe 73, modified

```
def triangleWave( freq ) :
  amplitude = 6000
  samplingRate = 22050                          # sampling rate
  seconds = 1
  triangle = makeEmptySound( seconds  )     # create a sound object (the book uses “sec1silence.wav”)
  interval = 1.0 * seconds / freq               # interval of sample
  samplesPerCycle = interval * samplingRate # samples / cycle
  samplesPerHalfCycle = int(samplesPerCycle / 2)
  increment = int( amplitude / samplesPerHalfCycle )
  sampleVal = -amplitude
  i = 1
  for s in range( 1, samplingRate + 1 ) :
    if (i > samplesPerHalfCycle):
      increment = increment * -1
      i = 0
    sampleVal = sampleVal + increment
    setSampleValueAt( triangle, s, sampleVal )
    i = i + 1
  return triangle                               # return the sound (the book says play)
```

Adding

- recipe 71 (part 2)

```
def addSounds( sound1, sound2) :
  for index in range( 1, getLength(sound1) + 1 ) :
    s1Sample = getSampleValueAt( sound1, index )
    s2Sample = getSampleValueAt( sound2, index )
    setSampleValueAt( sound2, index, s1Sample + s2Sample )
  return sound2
```

Echo, echo, echo, echo

- recipe 64

```
def echoes( soundFile, delay, num ) :
  s1 = makeSound( soundFile )
  ends1 = getLength( s1 )
  ends2 = ends1 + (delay - num)
  s2 = makeEmptySound(1 + int( ends2 / getSamplingRate(s1)  )  )
  echoAmplitude = 1.0
  for echoCount in range( 1, num + 1 ) :
    echoAmplitude = echoAmplitude * 0.6        # each echo is 60% of previous
    for posn1 in range( 1, ends1 ) :
      posn2 = posn1 + (delay* echoCount )
      values1 = getSampleValueAt( s1, posn1) * echoAmplitude
      values2 = getSampleValueAt( s2, posn2)
      setSampleValueAt( s2, posn2, values1 + values2 )
  return s2
```

Shifting the frequency

- recipe 68, modified
- how sampling keyboards work....

```
def shift( soundFile, factor ) :
  source = makeSound( soundFile )
  target = makeSound( soundFile )
  sourceIndex = 1
  sourceLength = getLength( source )

  for targetIndex in range( 1, sourceLength + 1 ) :
    setSampleValueAt( target, targetIndex, getSampleValueAt( source, int( sourceIndex )))
    sourceIndex = sourceIndex + factor
    if sourceIndex > sourceLength :
      sourceIndex = 1

  return target
```

Exquisite Corpse 2: sound

- What should we do?
- Need to have everyone contribute a sound
- What rules should we create?
- Consider our experience with the visual exquisite corpse.
- We'll decide on Friday.