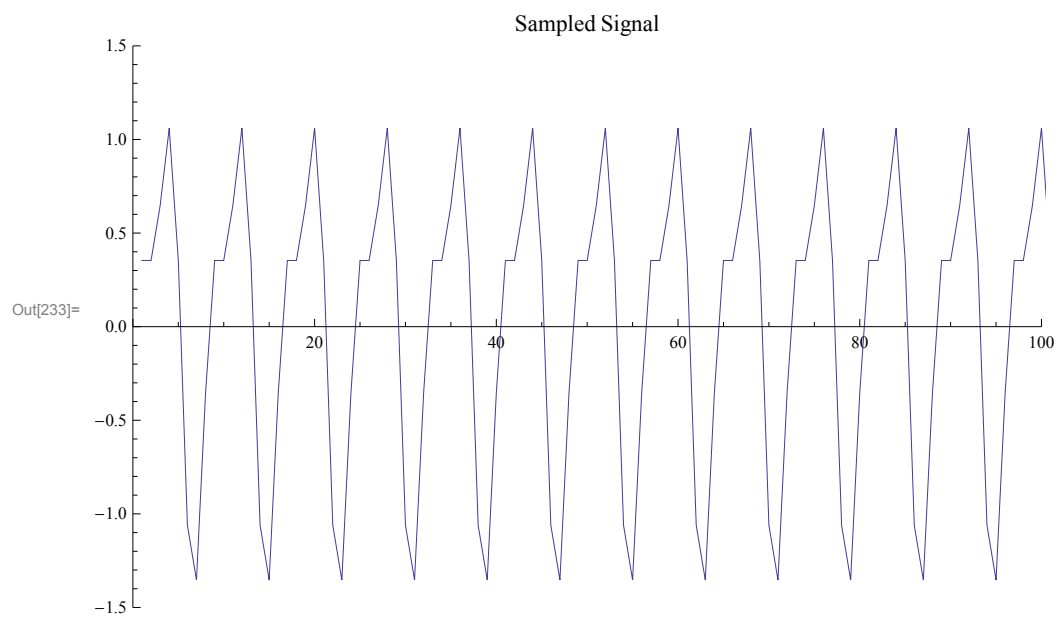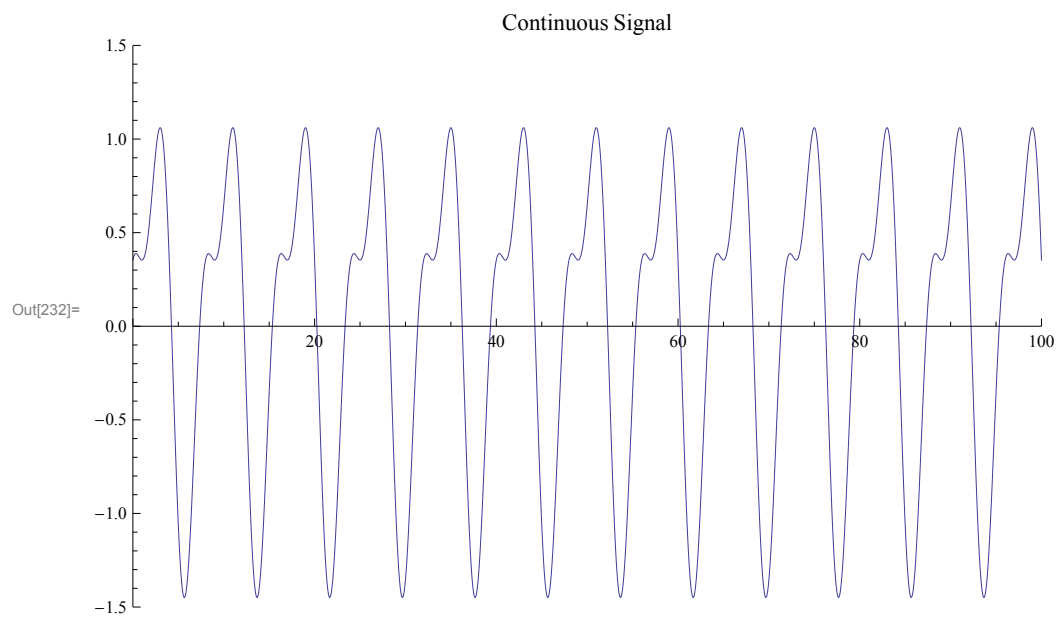# Example 1

- Simple combination of two Sine functions with different frequency
- Frequencies are chosen in such a way that in frequency domain we have sharp peeks

```
sizeIm = 500;
samplerate = 512;
Samples = 8 * 512;
Clear[f1, f2, a1, a2, analogSignal,
   discreteSignal, SampledData, DataforSpectra, DFTSpectra, result];
f1 = 1 / 8; f2 = 2 / 8;
a1 = 1.0; a2 = 0.5;
analogSignal[k_] := a1 * Sin[2 * Pi * f1 * k] + a2 * Sin[2 * Pi * f2 * k + (3 Pi / 4)];
discreteSignal[k_Integer] := a1 * Sin[2 * Pi * f1 * k] + a2 * Sin[2 * Pi * f2 * k + (3 Pi / 4)];
SampledData = Table[discreteSignal[k], {k, 0, Samples - 1}];
DataforSpectra = Take[SampledData, samplerate];
DFTSpectra = Fourier[DataforSpectra, FourierParameters → {1, -1}];

Clear[result];
listlength = Length[SampledData];
result = List[];
For[f = 1, f ≤ listlength, f++,
   result = Append[result, {SampledData[[f]], 0}];
 ];
path = "D:\\Skola\\Projekty\\Artemis\\";
Export[path <> "example1.tap", result, "Table", "FieldSeparators" → " "];

Export[path <> "example1.tap", SampledData, "Table", "FieldSeparators" → " "];

Plot[analogSignal[k], {k, 0, 100},
 PlotRange → {{0, 100}, {-1.5, 1.5}}, PlotLabel → "Continuous Signal"]
ListLinePlot[SampledData, PlotRange → {{0, 100}, {-1.5, 1.5}},
 ImageSize → sizeIm, PlotLabel → "Sampled Signal"]
ListPlot[Abs[DFTSpectra], Filling → Axis, PlotRange → All,
 ImageSize → sizeIm, PlotLabel → "Frequency domain"]
```

Continuous Signal

Out[232]=

Sampled Signal

Out[233]=

Example1_Whole.nb | **3**

Frequency domain

Out[234]=
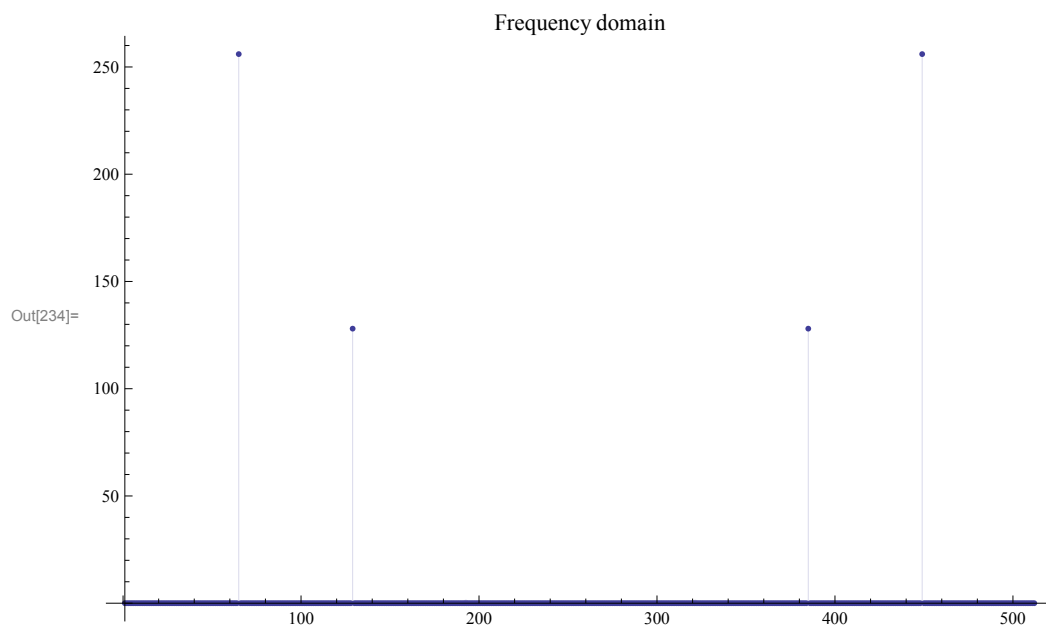
```
In[190]:= indatawithDFT = Import["example1_w_DFT.dat", Path → "d:\\skola\\Projekty\\artemis\\"];
indatawithDFTcomplex = Table[
    indatawithDFT[[i, 1]] + I * indatawithDFT[[i, 2]], {i, 1, Length[indatawithDFT]}];


ListLinePlot[RotateLeft[ Abs[indatawithDFTcomplex] , 257 ], PlotRange → All,
 ImageSize → 500, PlotLabel → "Frequency domain after FIR Filter"]
```

Frequency domain after FIR Filter

Out[192]=