We are given a linear array consisting of $M=12$ elements uniformly spaced with $d=1$
The data field of the array data is described by the equation

$$x_m(n) = s_1(n).\cos\left[\frac{\pi}{2}(n-1) + \frac{2\pi d}{\lambda}(m-1)\sin\theta_1\right] +$$

$$+ s_2(n)\cos\left[\frac{\pi}{2}(n-1) + \frac{2\pi d}{\lambda}(m-1)\sin\theta_2\right] +$$

$$+ w_m(n)$$

$$m = 1, 2, \ldots, 12 \;\; ; \;\; n = 1, 2, \ldots, 512$$

where, $s_1(n)$ and $s_2(n)$ are narrowband signals and $w_m(n)$ white Gaussian noise independent from the data and $w_i(n)$ independent from $w_j(n)$.
The variance of $w_m(n) = \sigma_w^2 = 0.5$

1) Apply the MDL criterion to determine. the number of sources

2) Apply the signal subspace (ML, AR) and noise subspace (MUSIC) methods on the following cases

i) $\theta_1 = 30°$, $\theta_2 = 25°$, $\frac{d}{\lambda} = \frac{1}{2}$

ii) $\theta_1 = 30°$, $\theta_2 = 40°$, $\frac{d}{\lambda} = \frac{1}{2}$

iii) $\theta_1 = 30°$, $\theta_2 = 45°$, $\frac{d}{\lambda} = 1$

iv) $\theta_1 = 30°$, $\theta_2 = 45°$, $\frac{d}{\lambda} = \frac{1}{4}$

v) $\theta_1 = 30°$, $\theta_2 = 60°$, $d/\lambda = \frac{1}{4}$

Plot in dB the Power versus bearing : $[-90°, \ldots, 0°, \ldots, 90°]$.