Topic 1: Exercise 2

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Function to compute mean vector

```
mean_vector <- function(pis, means) {
    mv <- c()
    for (i in 1:length(pis)) {
        mv <- c(mv, pis[i]*means[,i])
    }
    return(matrix(rowSums(matrix(mv, nrow=2)),nrow=2))
}
```

Testing mean vector

```
pis <- c(0.5, 0.5)
means <- matrix(c(0,0,3,3), nrow=length(pis))
mean_vector(pis,means)
```

```
##      [,1]
## [1,]  1.5
## [2,]  1.5
```

Function to compute covariance matrix

```
covariance_matrix <- function(pis, means, sigmas, meanvector) {
    result <- 0
    for (i in 1:length(pis)) {
        result <- result + pis[i]*(sigmas[[i]] + means[,i]%*%t(means[,i]))
    }
    return(result - meanvector%*%t(meanvector))
}
```

Testing covariance matrix

```
pis <- c(0.5, 0.5)
means <- matrix(c(0,0,3,3), nrow=length(pis))
sigmas <- list()
sigmas[[1]] <- matrix(c(1,0.7,0.7,1), nrow=length(pis))
sigmas[[2]] <- matrix(c(1,0.7,0.7,1), nrow=length(pis))
covariance_matrix(pis,means, sigmas, mean_vector(pis,means))
```

```
##      [,1] [,2]
## [1,] 3.25 2.95
## [2,] 2.95 3.25
```