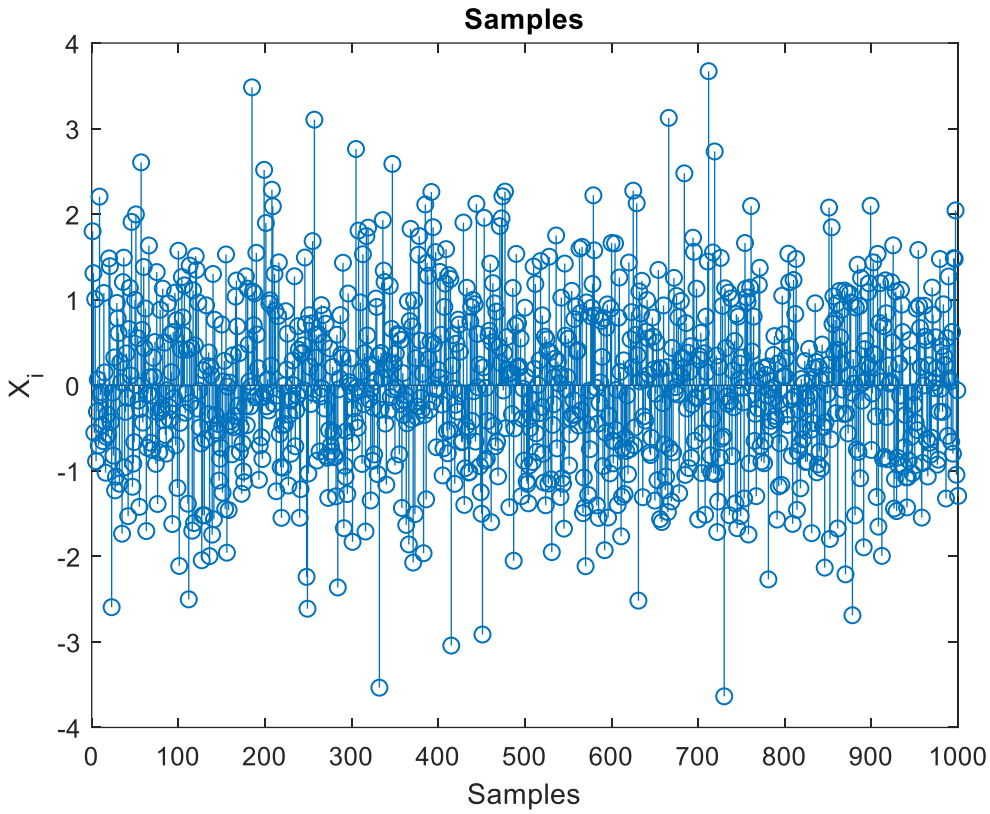
Task 1:



The functions are given as follows:

```
function [meu] =
samplemean(X)
N = length(X);
meu = (1/N)*sum(X);
end
```

```
function [v] = samplevar(X)
N = length(X);
meu = samplemean(X);
v = (1/(N-1))*sum((X-
meu).^2);
end
```

Mean and variance are given as:

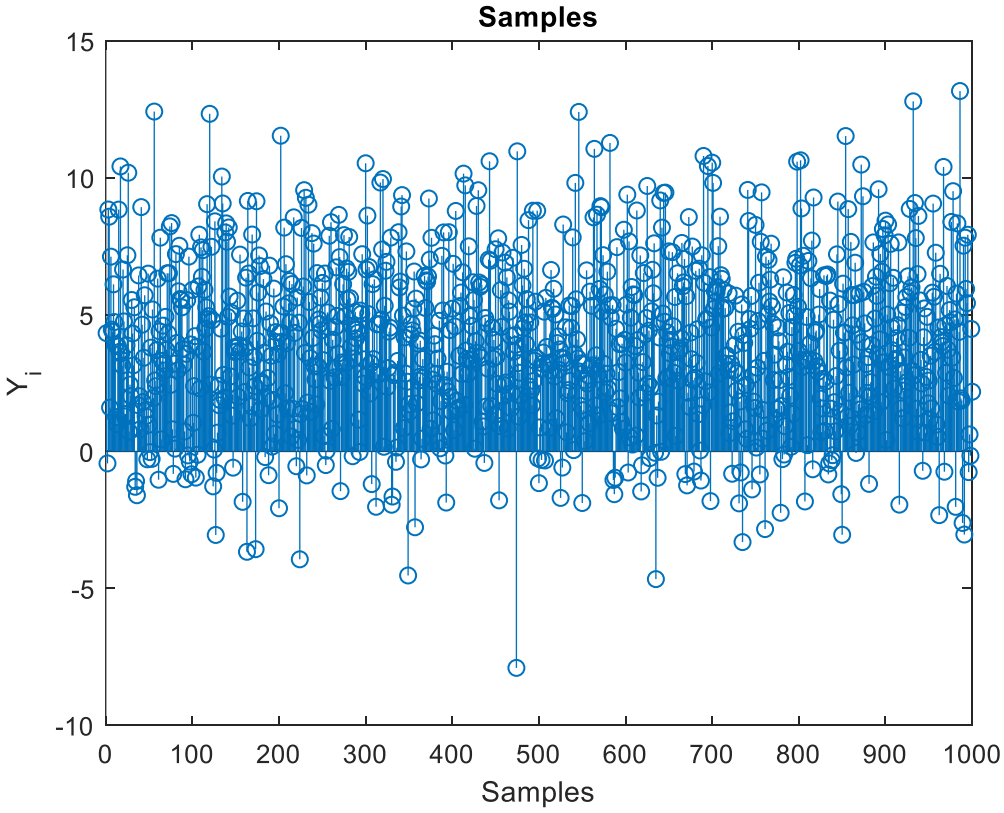
$$\mu = -0.0043$$
$$\sigma^2 = 1.0244$$

Since there are finite samples, hence the sample mean and variance are just an approximations of the true mean and variance. If we increase the no. of samples, the approximation error would decrease.

Task 2:

The transformation can be written as:

```
b = 4;
a = 3;
Y=a*X + b;
```



The mean and variance is given as:

$$\mu = 3.9964$$
$$\sigma^2 = 9.0210$$

Task 3:

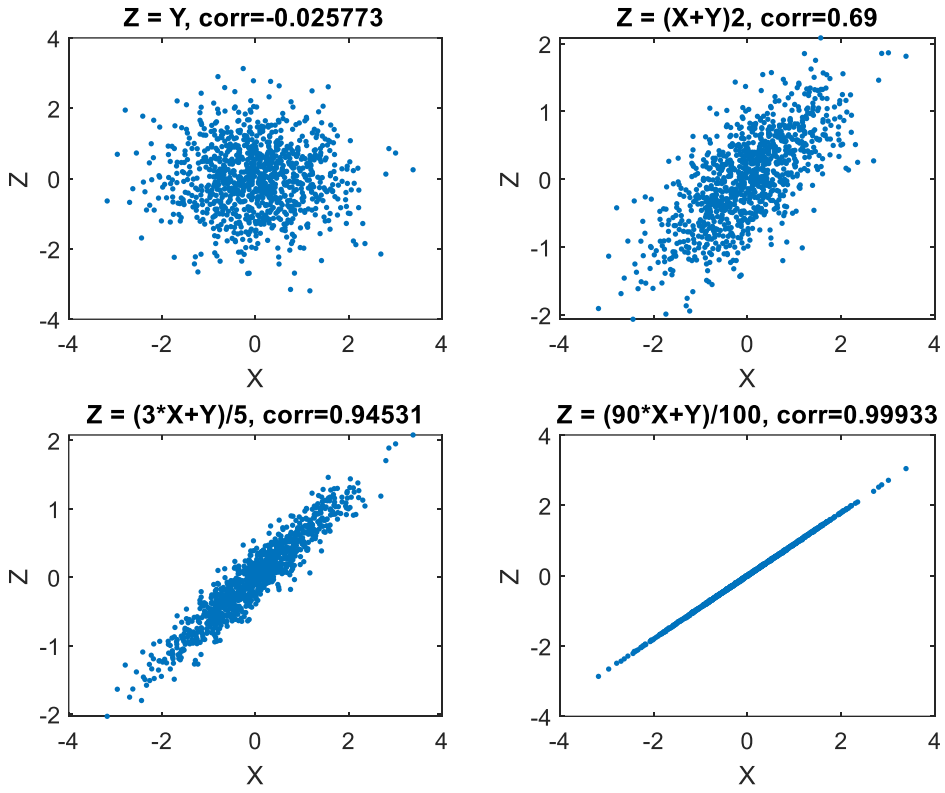


Figure 3.1: Scatter plot

Explanation:

In the First plot, we see that there is no trend in the graph of X, Z i.e. increase X doesn't increase/decrease Y. Hence there is ≈ 0 correlation between the two variables.

In the second plot, we see some trend. As X increases, Z also *tends* to increase. But it is not perfectly consistent as points don't line up perfectly onto a straight line. Hence the correlation is <1 but none the less high.

In the third plot, we see that the relationship between X and Z is almost linear in nature and a straight line can fit the curve (increasing x increases Y). Hence there is a very high correlation amongst the two variables, as is indicated by their correlation coefficient.

In the fourth plot, there almost a perfect linear relationship between X and Z (increasing x increases Y). So there should be perfect correlation between the two variables. We observe the correlation coefficient to be approx. perfect i.e. equal to 0.99.