hw1

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```
knitr::opts_chunk$set(fig.width = 5, fig.height = 3.5, fig.align = "center")
```

1

i

Using:

```
x <- c(2.7, 4.0, 2.3, 5.4, -5.3, 1.8, -1.3, -2.9, 2.1, 3.9,
       -1.8, 0.4, -4.2, 0.5, -0.1, 1.5, -0.7)
y <- c(1.4, 2.5, 2.6, 5.6, -2.2, 0.4, 0.1, -3.0, 2.2, 0.9,
       -2.4, 1.6, -2.5, 0.1, -9.9, 1.1, -1.7)
```

Five-number summary of x:

```
summary(x)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -5.3000 -1.3000  0.5000  0.4882  2.3000  5.4000
```

Five-number summary of y:

```
summary(y)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -9.9000 -2.2000  0.4000 -0.1882  1.6000  5.6000
```

Sample variance of x:

```
var(x)
```

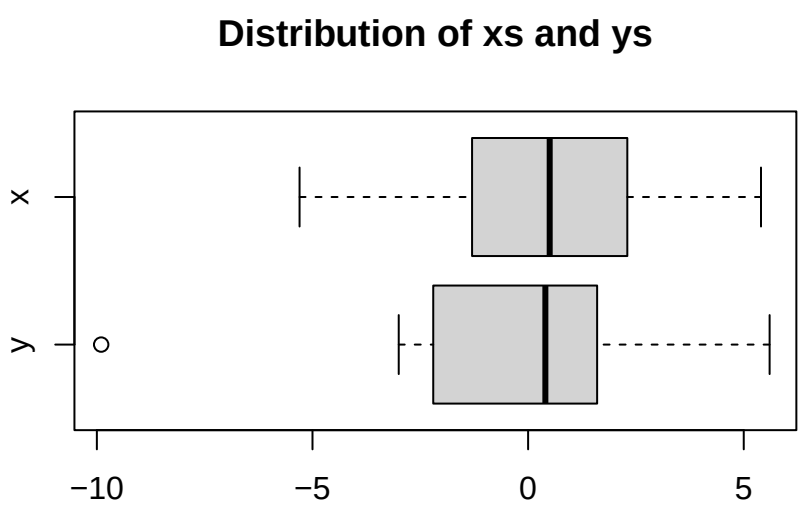
```
## [1] 8.673603
```

Sample variance of y:

```
var(y)
```

```
## [1] 11.37985
```

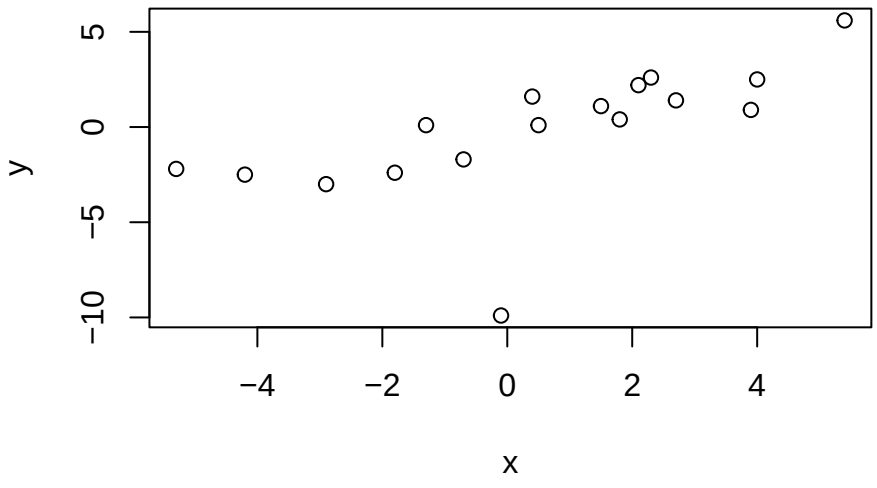
```
boxplot(y,x,
  main = "Distribution of xs and ys",
  names = c("y", "x"),
  horizontal = TRUE
)
```



The ys are skewed right while the $xs have no skew. The outlier is the y-value -9.9 from the point $(-0.1, -9.9)$.

ii

```
plot(x, y)
```



Correlation coefficient:

```
cor(x, y)
```

```
## [1] 0.6289777
```

Which means x and y are moderately linearly correlated.

iii

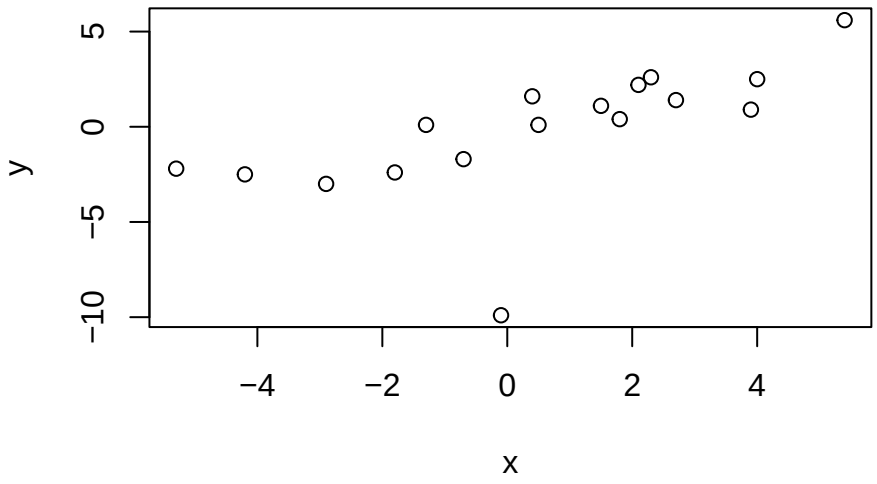
Yes; $(-0.1, -9.9)$ is an outlier.

```
x2 <- c(2.7, 4.0, 2.3, 5.4, -5.3, 1.8, -1.3, -2.9, 2.1, 3.9,
        -1.8, 0.4, -4.2, 0.5, 1.5, -0.7)
y2 <- c(1.4, 2.5, 2.6, 5.6, -2.2, 0.4, 0.1, -3.0, 2.2, 0.9,
        -2.4, 1.6, -2.5, 0.1, 1.1, -1.7)
cor(x2, y2)
```

```
## [1] 0.8822511
```

iv

```
plot(x, y)
```



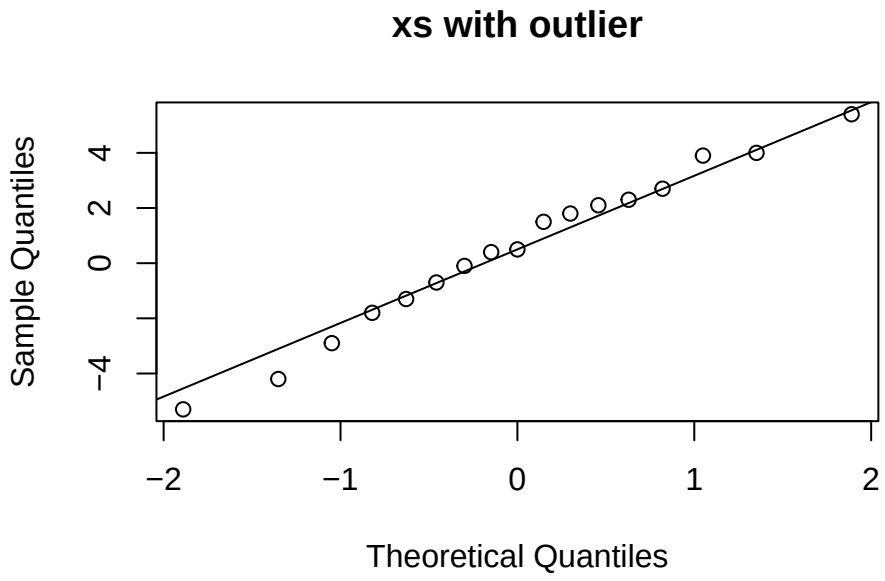
I can see the outlier $(-0.1, -9.9)$ at the bottom-center of the graph.

v

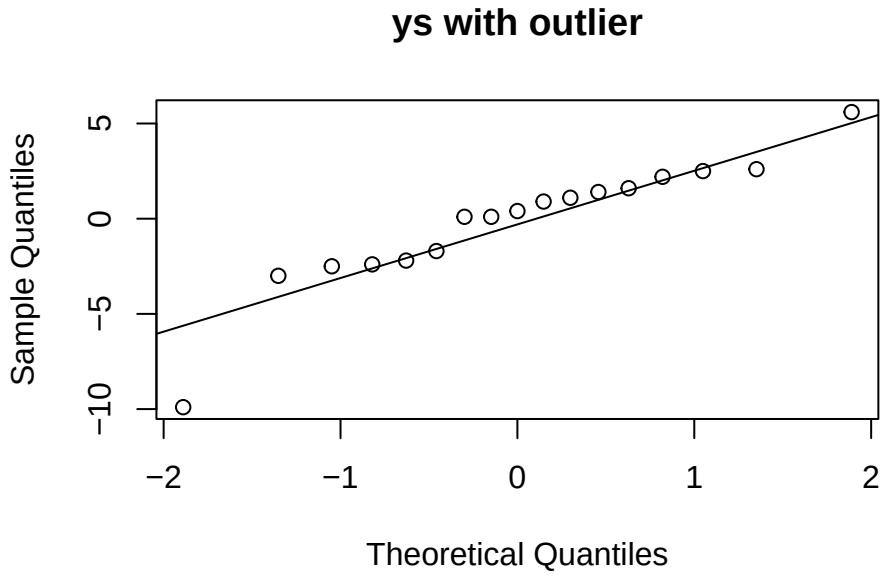
The sample correlation coefficient in iii is much higher than the one in ii.

vi

```
qqnorm(x, main="xs with outlier"); qqline(x)
```

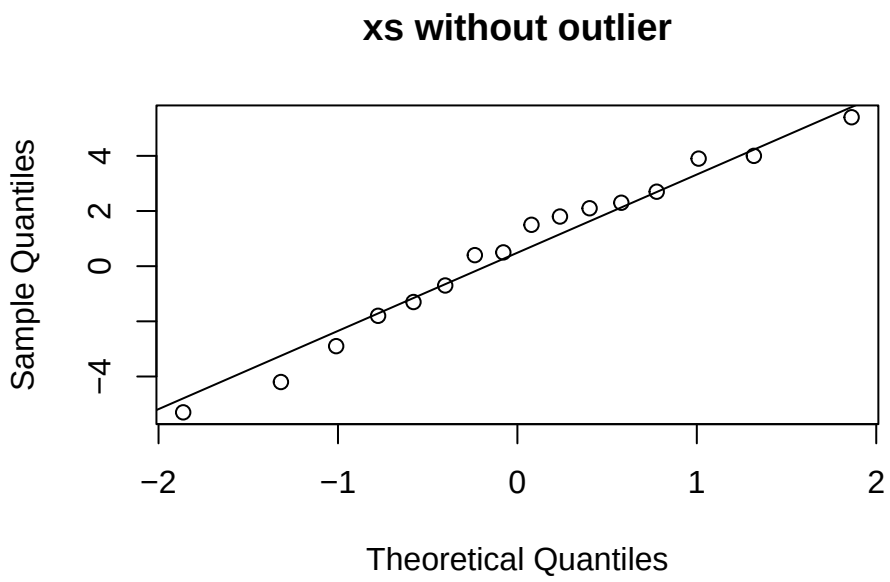



```
qqnorm(y, main="ys with outlier"); qqline(y)
```

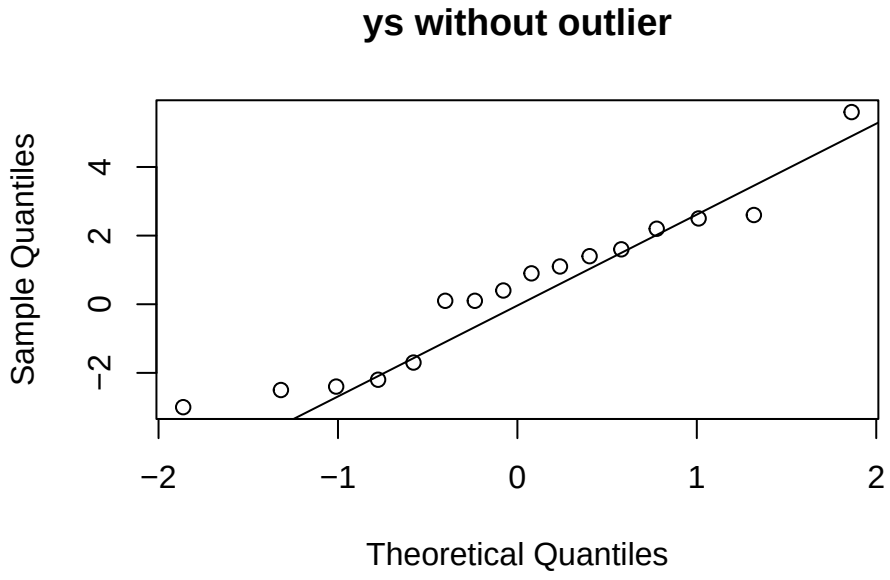


The xs look much closer to normal distribution than the ys.

```
qqnorm(x2, main="xs without outlier"); qqline(x2)
```




```
qqnorm(y2, main="ys without outlier"); qqline(y2)
```



The xs still look much closer to normal distribution than the ys.