Median-Median: Part 1 Solution

The goal of this exercise is to generate a median-median regression line given a dataset of (x, y) pairs.

The Data

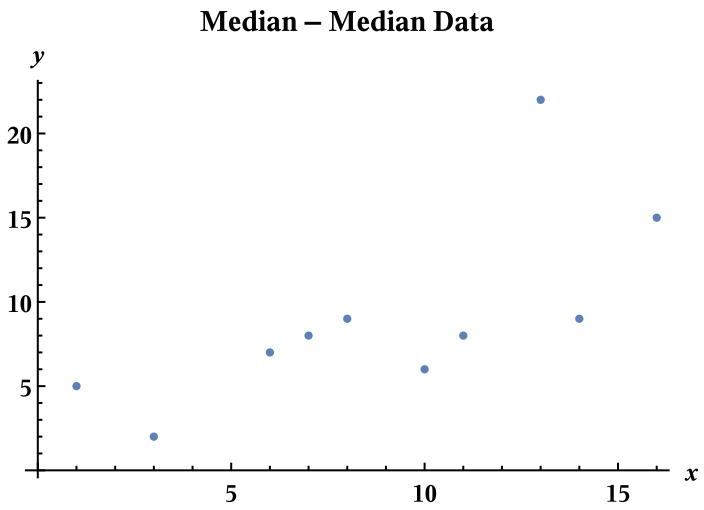
```
x := {7, 16, 1, 8, 13, 6, 11, 14, 10, 3}
y := {8, 15, 5, 9, 22, 7, 8, 9, 6, 2}
data := Transpose[{x, y}]
data = SortBy[data, First]
Grid[{Join[{"x"}, x], Join[{"y"}, y]}, Alignment → Left,
 Spacings → {2, 1}, Frame → All, ItemStyle → "Text"]
```

```
{{1, 5}, {3, 2}, {6, 7}, {7, 8}, {8, 9}, {10, 6}, {11, 8}, {13, 22}, {14, 9}, {16, 15}}
```

x	7	16	1	8	13	6	11	14	10	3
y	8	15	5	9	22	7	8	9	6	2

```
listplot := ListPlot[data]
```

```
Show[%73, AxesLabel → {HoldForm[x], HoldForm[y]},
 PlotLabel → HoldForm[Median – Median Data],
 LabelStyle → {FontFamily → "TI-Nspire", 13, GrayLevel[0], Bold}]
```

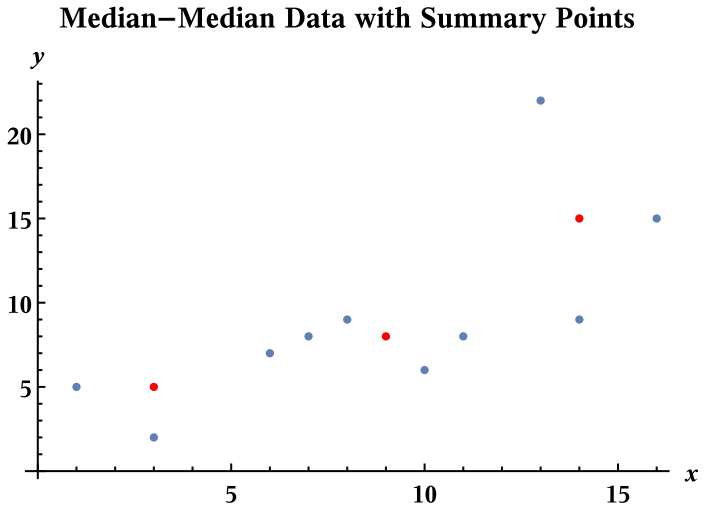


Calculation of Summary Points

We use a 3-4-3 split to segment the data into 3 groups.

```
s1 := Median[data[[ ;; 3]]]
s2 := Median[data[[4 ;; 7]]]
s3 := Median[data[[8 ;; 10]]]
summary := {s1, s2, s3}
summaryplot := ListPlot[summary, PlotStyle → Red]
```

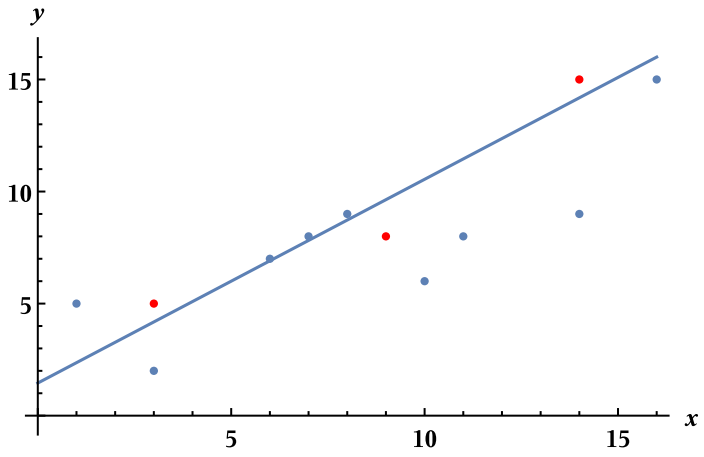
```
Show[%107, AxesLabel → {HoldForm[x], HoldForm[y]},
 PlotLabel → HoldForm["Median-Median Data with Summary Points"],
 LabelStyle → {FontFamily → "TI-Nspire", 13, GrayLevel[0], Bold}]
```



Line of Best Fit

```
m := (s3[[2]] - s1[[2]]) / (s3[[1]] - s1[[1]])
b1 := s1[[2]] - m * s1[[1]]
b2 := s2[[2]] - m * s2[[1]]
b := (2 * b1 + b2) / 3
f[x_] := m * x + b
l := Plot[f[x], {x, 0, 16}]
```

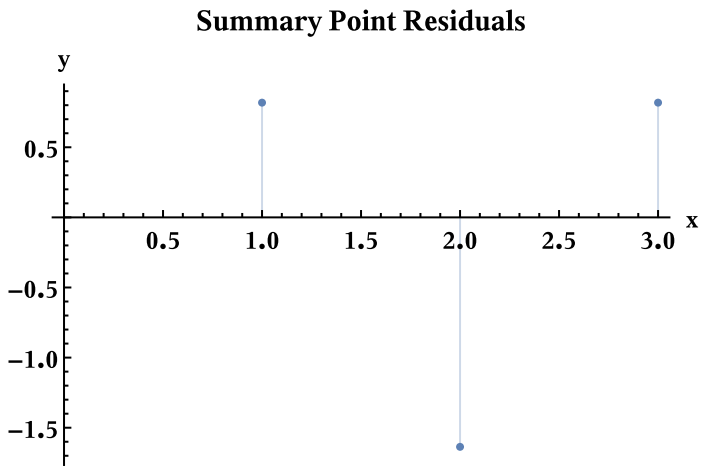
```
Show[%154, AxesLabel → {HoldForm[x], HoldForm[y]},
 PlotLabel → HoldForm["Median-Median: Line of Best Fit"],
 LabelStyle → {FontFamily → "TI-Nspire", 13, GrayLevel[0], Bold}]
```



Summary Point Residuals

```
pred := f[Transpose[summary]⟦1⟧]
res := Transpose[summary]⟦2⟧ - pred
```

```
Show[%204, PlotLabel → HoldForm[Summary Point Residuals],
 LabelStyle → {FontFamily → "TI-Nspire", 13, GrayLevel[0], Bold}]
```




```
Total[res]
```

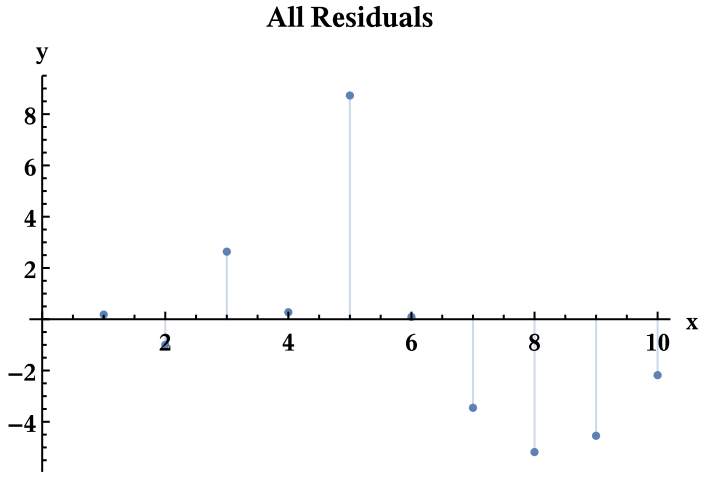
```
0
```

Nice!

All Residuals

```
pred := f[x]
res := y - pred
```

```
Show[%228, PlotLabel → HoldForm[All Residuals],
 LabelStyle → {FontFamily → "TI-Nspire", 13, GrayLevel[0], Bold}]
```



```
Total[res]
```

$$-\frac{49}{11}$$