

Median-Median part #1

Calculation

First sort the data by the independent variable and divide the data into three equal-size groups (or nearly equal-size groups) by the ordered pairs. In this example, we have 10 points, and we divide the data into the

Left group - the 3 leftmost points

Middle group - the 4 points in the center

Right group - the 3 rightmost points

For each group, we find a summary point that is the order pair (median of independent variable, median of dependent variable).

The slope of the line is found by finding the slope of the Left and Right summary points.

Use the left summary point and the slope, find the y-intercept of the line (call it b13).

Use the middle summary point and the slope, find the y-intercept of the line (call it b2).

Calculate the y-intercept of the median-median line by weighting b13 twice and b2 once.

Table of Data Sorted

```
In[ ]:= xpoint = {7, 16, 1, 8, 13, 6, 11, 14, 10, 3}
```

```
Out[ ]:= {7, 16, 1, 8, 13, 6, 11, 14, 10, 3}
```

```
In[ ]:=
```

```
In[ ]:= ypoint = {8, 15, 5, 9, 22, 7, 8, 9, 6, 2}
```

```
Out[ ]:= {8, 15, 5, 9, 22, 7, 8, 9, 6, 2}
```

```
In[ ]:= tab = Transpose[{xpoint, ypoint}]
```

```
Out[ ]:= {{7, 8}, {16, 15}, {1, 5}, {8, 9}, {13, 22}, {6, 7}, {11, 8}, {14, 9}, {10, 6}, {3, 2}}
```

```
In[ ]:= sort = Sort[tab]
```

```
Out[ ]:= {{1, 5}, {3, 2}, {6, 7}, {7, 8}, {8, 9}, {10, 6}, {11, 8}, {13, 22}, {14, 9}, {16, 15}}
```

```
In[ ]:= first = Take[sort, 3]
```

```
Out[ ]:= {{1, 5}, {3, 2}, {6, 7}}
```

```
In[ ]:= second = Take[sort, {4, 7}]
```

```
Out[ ]:= {{7, 8}, {8, 9}, {10, 6}, {11, 8}}
```

```
In[ ]:= last = Take[sort, {8, 10}]
```

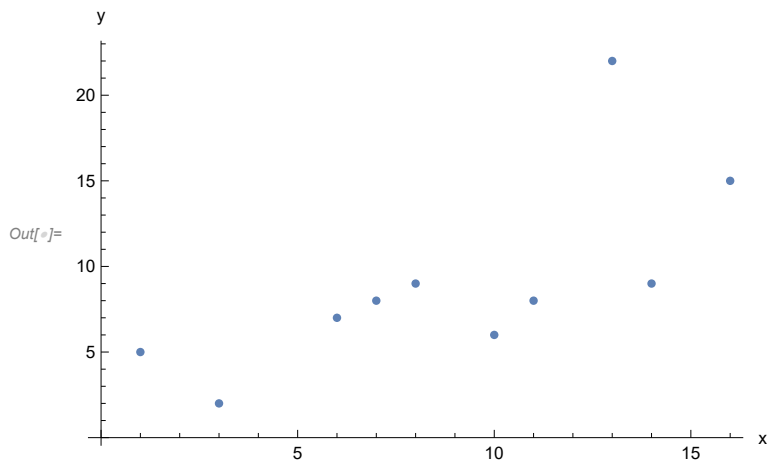
```
Out[ ]:= {{13, 22}, {14, 9}, {16, 15}}
```

```
In[ ]:= Text[Grid[Prepend[sort, {"x", "y"}], Alignment -> Center, Dividers -> {All, All}]]
```

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

Graph of Data Set

```
In[ ]:= ListPlot[sort, AxesLabel -> {"x", "y"}]
```



Calculations and Graph for Med-Med Line

```
In[ ]:=
```

```
In[ ]:= s1 = Median[first]
```

```
Out[ ]:= {3, 5}
```

```
In[ ]:= s2 = Median[second]
```

```
Out[ ]:= {9, 8}
```

```
In[ ]:= s3 = Median[last]
```

```
Out[ ]:= {14, 15}
```

```
In[ ]:= points = {s1, s2, s3}
```

```
Out[ ]:= {{3, 5}, {9, 8}, {14, 15}}
```

```
In[ ]:= m1 = (5 - 15) / (3 - 14)
```

```
Out[ ]:=  $\frac{10}{11}$ 
```

```
In[ ]:=  $\frac{10}{11}$ 
```

```
Out[ ]:=  $\frac{10}{11}$ 
```

```
In[ ]:=
```

```
In[ ]:= f[z_] := m1 (z - 3) + 5
```

```
In[ ]:= y1 = f[0]
```

```
Out[ ]:=  $\frac{25}{11}$ 
```

```
In[ ]:= g[m_] := m1 (m - 9) + 8
```

```
In[ ]:= Function[m, m1 (m - 9) + 8]
```

```
Out[ ]:= Function[m, m1 (m - 9) + 8]
```

```
In[ ]:= y2 = g[0]
```

```
Out[ ]:=  $-\frac{2}{11}$ 
```

```
In[ ]:= q[x_] := m1 * x + (2 * y1 + y2) / (3)
```

```
In[ ]:= yfinal = q[0]
```

```
Out[ ]:=  $\frac{16}{11}$ 
```

```
In[ ]:= line = m1 * x + yfinal
```

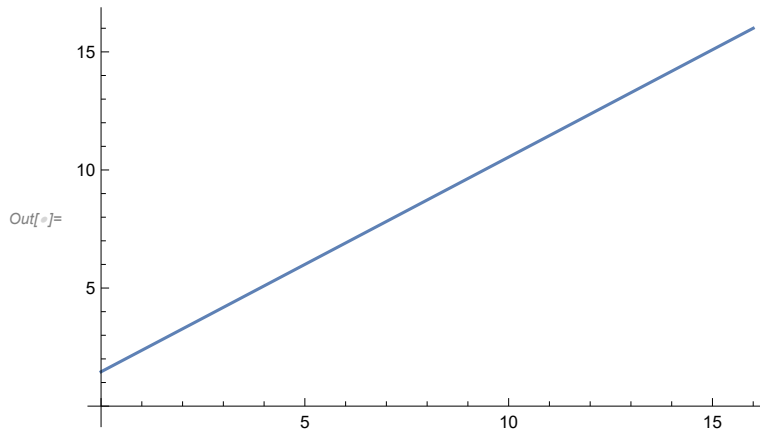
```
Out[ ]:=  $\frac{16}{11} + \frac{10x}{11}$ 
```

```
In[ ]:=
```

```
In[ ]:=
```

```
In[ ]:=
```

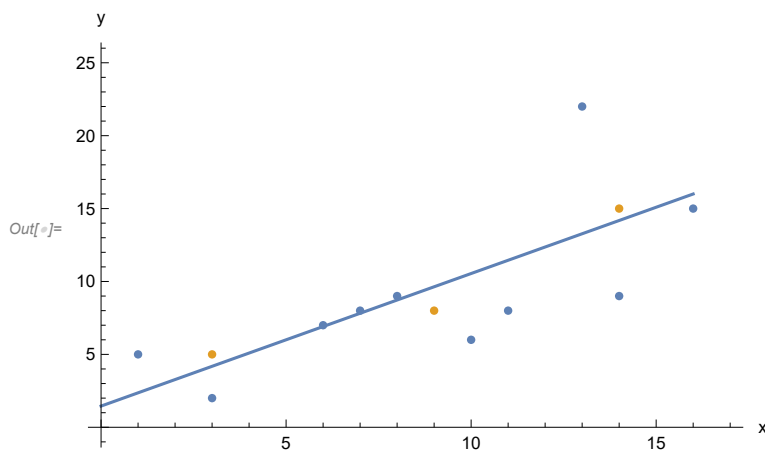
```
In[ ]:= l = Plot[line, {x, 0, 16}]
```



```
In[ ]:=
```

```
In[ ]:=
```

```
In[ ]:= Show[l, ListPlot[{sort, points}], PlotRange -> {{0, 17}, {0, 25}}, AxesLabel -> {"x", "y"}]
```



Residuals

```
In[ ]:= xvals = Sort[xpoint]
```

```
Out[ ]:= {1, 3, 6, 7, 8, 10, 11, 13, 14, 16}
```

```
In[ ]:= ty = Table[q[xvals[[i]]], {i, 1, 10}]
```

```
Out[ ]:= {26/11, 46/11, 76/11, 86/11, 96/11, 116/11, 126/11, 146/11, 156/11, 16}
```

```
In[ ]:= yval = {}
```

```
Out[ ]:= {}
```

```
In[ ]:= For[i = 1, i <= 10, i++, AppendTo[yval, sort[[i]][[2]]]]
```

In[]:= **yval**

Out[]:= {5, 2, 7, 8, 9, 6, 8, 22, 9, 15}

In[]:= **residuals = yval - ty**

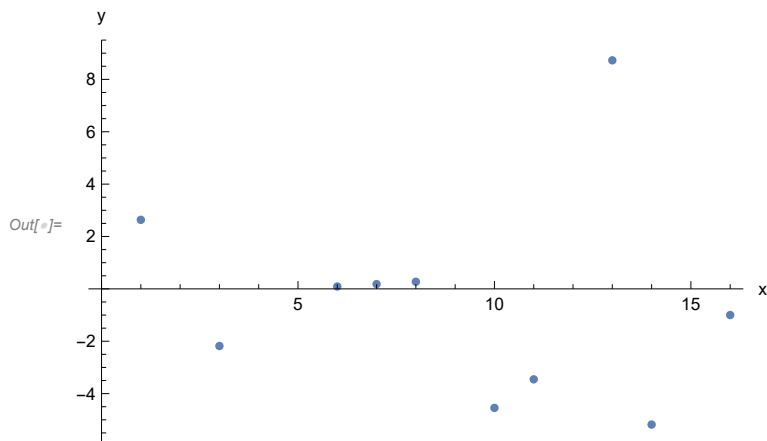
Out[]:= $\left\{ \frac{29}{11}, -\frac{24}{11}, \frac{1}{11}, \frac{2}{11}, \frac{3}{11}, -\frac{50}{11}, -\frac{38}{11}, \frac{96}{11}, -\frac{57}{11}, -1 \right\}$

In[]:=

In[]:= **res = Transpose[{xvals, residuals}]**

Out[]:= $\left\{ \left\{ 1, \frac{29}{11} \right\}, \left\{ 3, -\frac{24}{11} \right\}, \left\{ 6, \frac{1}{11} \right\}, \left\{ 7, \frac{2}{11} \right\}, \left\{ 8, \frac{3}{11} \right\}, \right.$
 $\left. \left\{ 10, -\frac{50}{11} \right\}, \left\{ 11, -\frac{38}{11} \right\}, \left\{ 13, \frac{96}{11} \right\}, \left\{ 14, -\frac{57}{11} \right\}, \left\{ 16, -1 \right\} \right\}$

In[]:= **ListPlot[res, AxesLabel → {"x", "y"}]**



In[]:=

In[]:= **sumOfResiduals = $\frac{29}{11} - \frac{24}{11} + \frac{1}{11} + \frac{2}{11} + \frac{3}{11} - \frac{50}{11} - \frac{38}{11} + \frac{96}{11} - \frac{57}{11} - 1$**

Out[]:= $-\frac{49}{11}$

In[]:=

In[]:=