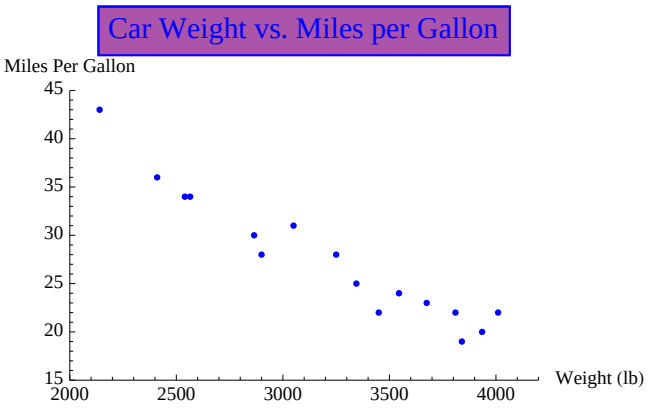
```
Needs["PlotLegends`"]

weight = {3250, 3675, 3840, 3935, 2140, 4010,
  2565, 3450, 2900, 3345, 3545, 3050, 2540, 2410, 2865, 3810}
mpg = {28, 23, 19, 20, 43, 22, 34, 22, 28, 25, 24, 31, 34, 36, 30, 22}
```

```
{3250, 3675, 3840, 3935, 2140, 4010, 2565, 3450, 2900, 3345, 3545, 3050, 2540, 2410, 2865, 3810}

{28, 23, 19, 20, 43, 22, 34, 22, 28, 25, 24, 31, 34, 36, 30, 22}
```

```
frplt = Transpose[{weight, mpg}]
```

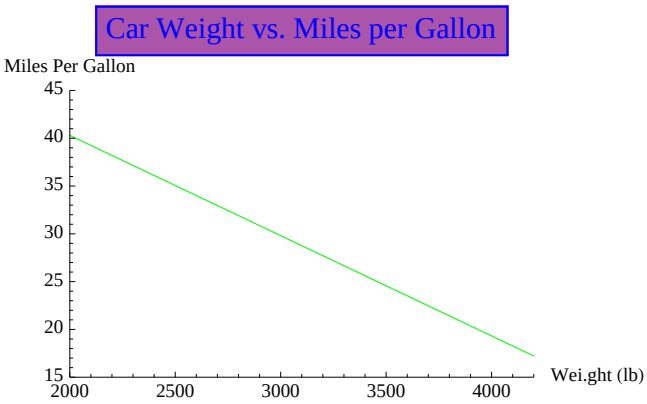
```
{{3250, 28}, {3675, 23}, {3840, 19}, {3935, 20}, {2140, 43}, {4010, 22}, {2565, 34}, {3450, 22},
 {2900, 28}, {3345, 25}, {3545, 24}, {3050, 31}, {2540, 34}, {2410, 36}, {2865, 30}, {3810, 22}}

{{3250, 28}, {3675, 23}, {3840, 19}, {3935, 20}, {2140, 43}, {4010, 22}, {2565, 34}, {3450, 22},
 {2900, 28}, {3345, 25}, {3545, 24}, {3050, 31}, {2540, 34}, {2410, 36}, {2865, 30}, {3810, 22}}

{{3250, 28}, {3675, 23}, {3840, 19}, {3935, 20}, {2140, 43}, {4010, 22}, {2565, 34}, {3450, 22},
 {2900, 28}, {3345, 25}, {3545, 24}, {3050, 31}, {2540, 34}, {2410, 36}, {2865, 30}, {3810, 22}}
```

```
plt1 = ListPlot[frplt, PlotRange → {{2000, 4200}, {15, 45}},
  AxesLabel → {"Weight (lb)", "Miles Per Gallon"}, PlotStyle → Blue, PlotLabel →
   Style["Car Weight vs. Miles per Gallon", 14, Blue, Background → Lighter[Purple]]]
```




```
myline[x_] :=
 N[Expand[(frplt[[14]][[2]] - frplt[[4]][[2]])/(frplt[[14]][[1]] - frplt[[4]][[1]]) (x - frplt[[14]][[1]]) + (frplt[[14]][[2]])], 3]
```

```
plt2 = Plot[myline[x], {x, 2000, 4200}, PlotRange → {{2000, 4200}, {15, 45}},
  AxesLabel → {"Wei.ght (lb)", "Miles Per Gallon"}, PlotStyle → Green, PlotLabel →
   Style["Car Weight vs. Miles per Gallon", 14, Blue, Background → Lighter[Purple]]]
```




```
frplto = Sort[frplt]
```

```
{{2140, 43}, {2410, 36}, {2540, 34}, {2565, 34}, {2865, 30}, {2900, 28}, {3050, 31}, {3250, 28},
 {3345, 25}, {3450, 22}, {3545, 24}, {3675, 23}, {3810, 22}, {3840, 19}, {3935, 20}, {4010, 22}}
```

```
set1 = Median[Take[frplto, {1, 5}]]
set2 = Median[Take[frplto, {6, 11}]]
set3 = Median[Take[frplto, {12, 16}]]
```

```
{2540, 34}
```

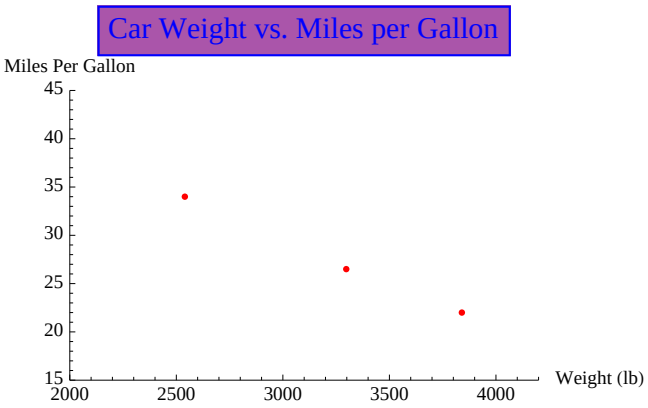
$$\left\{\frac{6595}{2}, \frac{53}{2}\right\}$$

```
{3840, 22}
```

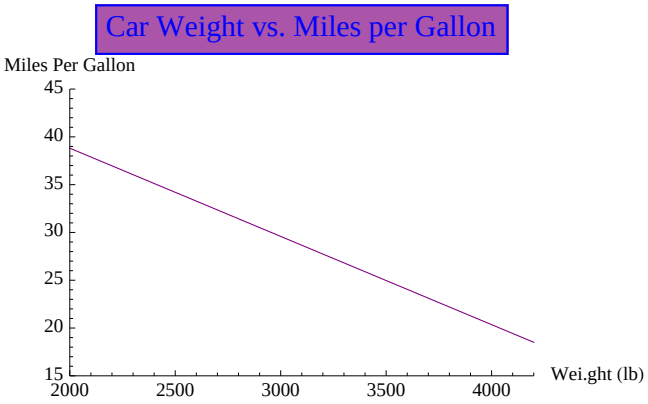
```
sum = {set1, set2, set3}
```

$$\left\{\{2540, 34\}, \left\{\frac{6595}{2}, \frac{53}{2}\right\}, \{3840, 22\}\right\}$$

```
plt3 = ListPlot[sum, PlotRange → {{2000, 4200}, {15, 45}},
  AxesLabel → {"Weight (lb)", "Miles Per Gallon"}, PlotStyle → Red, PlotLabel →
   Style["Car Weight vs. Miles per Gallon", 14, Blue, Background → Lighter[Purple]]]
```




```
med1[x_] := (((sum[[1]][[2]]) - (sum[[3]][[2]])) / ((sum[[1]][[1]]) - (sum[[3]][[1]]))) × (x - sum[[1]][[1]]) + (sum[[1]][[2]])

med2[x_] := (((sum[[1]][[2]]) - (sum[[3]][[2]])) / ((sum[[1]][[1]]) - (sum[[3]][[1]]))) × (x - sum[[1]][[1]]) +
  ((sum[[1]][[2]]) + ((1 / 3) × ((sum[[2]][[2]]) - (med1[sum[[2]][[1]]]))))

plt4 = Plot[med2[x], {x, 2000, 4200}, PlotRange → {{2000, 4200}, {15, 45}},
  AxesLabel → {"Wei.ght (lb)", "Miles Per Gallon"}, PlotStyle → Purple, PlotLabel →
   Style["Car Weight vs. Miles per Gallon", 14, Blue, Background → Lighter[Purple]]]
```




```
n = 16
```

16

```
variA = Σ_{i=1}^{n} Take[mpg, {i, i}]^2
```

{12829}

```
variB = Sum[Take[mpg, {i, i}] * Take[weight, {i, i}], {i, 1, n}]
```

```
{1357880}
```

```
variC = Sum[Take[mpg, {i, i}], {i, 1, n}]
```

```
{441}
```

```
variD = Sum[Take[weight, {i, i}]^2, {i, 1, n}]
```

```
{169891950}
```

```
variE = Sum[Take[weight, {i, i}], {i, 1, n}]
```

```
{51330}
```

$$\text{varim} = \frac{(n \times \text{variB}) - (\text{variC} \times \text{variE})}{(n \times \text{variD}) - (\text{variE})^2}$$

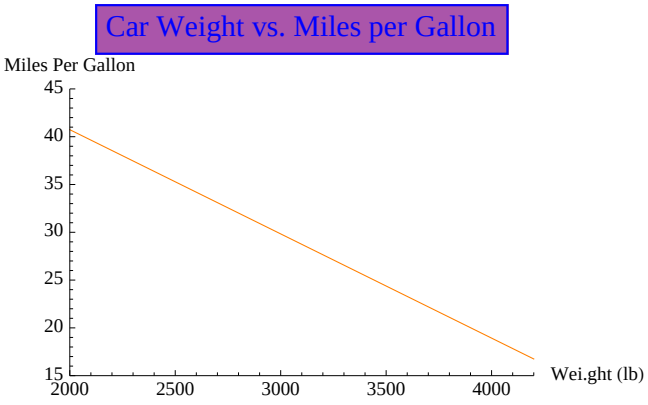
$$\left\{-\frac{18209}{1670046}\right\}$$

$$\text{varib} = \frac{(\text{variC} \times \text{variD}) - (\text{variB} \times \text{variE})}{(n \times \text{variD}) - \left(\text{variE}^2\right)}$$

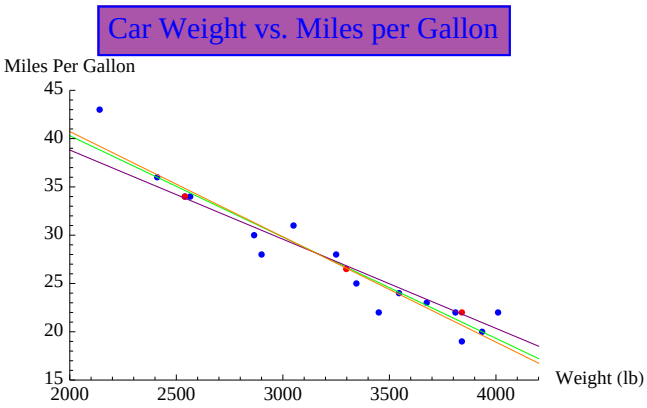
$$\left\{\frac{34815797}{556682}\right\}$$

```
sqrline[x_] := (varim * x) + (varib)
```

```
plt5 = Plot[sqrline[x], {x, 2000, 4200}, PlotRange → {{2000, 4200}, {15, 45}},
  AxesLabel → {"Wei.ght (lb)", "Miles Per Gallon"}, PlotStyle → Orange, PlotLabel →
   Style["Car Weight vs. Miles per Gallon", 14, Blue, Background → Lighter[Purple]]]
```



```
Show[plt1, plt2, plt3, plt4, plt5]
```




```
resids1 = mpg - myline[weight]
```

$$\{0.8, 0.3, -2.0, 0. \times 10^{-2}, 4.2, 2.8, -0.4, -3.1, -2.9, -1.2, -0. \times 10^{-2}, 1.7, -0.6, 0. \times 10^{-2}, -1.2, 0.7\}$$

```
resids2 = mpg - med2[weight]
```

$$\left\{\frac{47}{65}, -\frac{23}{65}, -\frac{184}{65}, -\frac{62}{65}, \frac{356}{65}, \frac{113}{65}, \frac{2}{5}, -\frac{223}{65}, -\frac{163}{65}, -\frac{7}{5}, -\frac{36}{65}, \frac{122}{65}, \frac{11}{65}, \frac{63}{65}, -\frac{54}{65}, -\frac{7}{65}\right\}$$

```
Total[resids1^2]
```

$$5. \times 10^{1}$$

```
Total[resids2^2]
```

$$\frac{288\,433}{4225}$$

```
((frplt[[14]][[2]] - frplt[[4]][[2]])/(frplt[[14]][[1]] - frplt[[4]][[1]])) ((8114) - frplt[[14]][[1]]) + (frplt[[14]][[2]])
```

$$-\frac{36\,364}{1525}$$

```
((sum[[1]][[2]]) - (sum[[3]][[2]]))/((sum[[1]][[1]]) - (sum[[3]][[1]])) × ((8114) - sum[[1]][[1]]) +
 ((sum[[1]][[2]]) + ((1 / 3) × ((sum[[2]][[2]]) - (med1[sum[[2]][[1]]]))))
```

$$-\frac{5727}{325}$$

```
varim (8114) + varib
```

$$\left\{-\frac{43\,300\,435}{1\,670\,046}\right\}$$

A mpg value cannot be below zero, so none of these predictions are accurate.

```
(frplt[[14]][[2]] - frplt[[4]][[2]]) / (frplt[[14]][[1]] - frplt[[4]][[1]]) ((2315) - frplt[[14]][[1]]) + (frplt[[14]][[2]])
```

$$\frac{11\,284}{305}$$

```
((sum[[1]][[2]]) - (sum[[3]][[2]])) / ((sum[[1]][[1]]) - (sum[[3]][[1]])) × ((2315) - sum[[1]][[1]]) +
 ((sum[[1]][[2]]) + ((1 / 3) × ((sum[[2]][[2]]) - (med1[sum[[2]][[1]]]))))
```

$$\frac{2334}{65}$$

```
varim (2315) + varib
```

$$\left\{\frac{31\,146\,778}{835\,023}\right\}$$

The greatest value is most plausible because a realistic value for mpg should not be this small.