Tupper High

Neil Kale - Section L

Original Data Set

In[100]:=
```
Clear[price, sales]
price = {55, 80, 95, 100, 120, 135, 155, 180};
sales = {140, 85, 45, 90, 115, 80, 65, 155};
list1 = Transpose[{price, sales}]
Text[Grid[Prepend[list1, {"price", "sales"}],
  Alignment → Center, Dividers -> {2 → True, 2 → True}, Spacings → {1, 1}]]
noAns = 914 - Total[sales];
Text[noAns " families (out of 914 total) didn't respond."]
```

Out[103]= {{55, 140}, {80, 85}, {95, 45}, {100, 90}, {120, 115}, {135, 80}, {155, 65}, {180, 155}}

Out[104]=

price	sales
55	140
80	85
95	45
100	90
120	115
135	80
155	65
180	155

Out[106]= 139 families (out of 914 total) didn't respond.

First Adjustment to the Data

In[107]:=
```
Clear[rsales, accrsales, raccrsales, list2]
rsales = Reverse[sales]
accrsales = Accumulate[rsales]
raccrsales = Reverse[accrsales]
list2 = Transpose[{price, raccrsales}];
Text[Grid[Prepend[list2, {"price", "acc sales"}],
  Alignment → Center, Dividers → {2 → True, 2 → True}, Spacings → {1, 1}]]
```

Out[108]= {155, 65, 80, 115, 90, 45, 85, 140}

Out[109]= {155, 220, 300, 415, 505, 550, 635, 775}

Out[110]= {775, 635, 550, 505, 415, 300, 220, 155}

Out[112]=

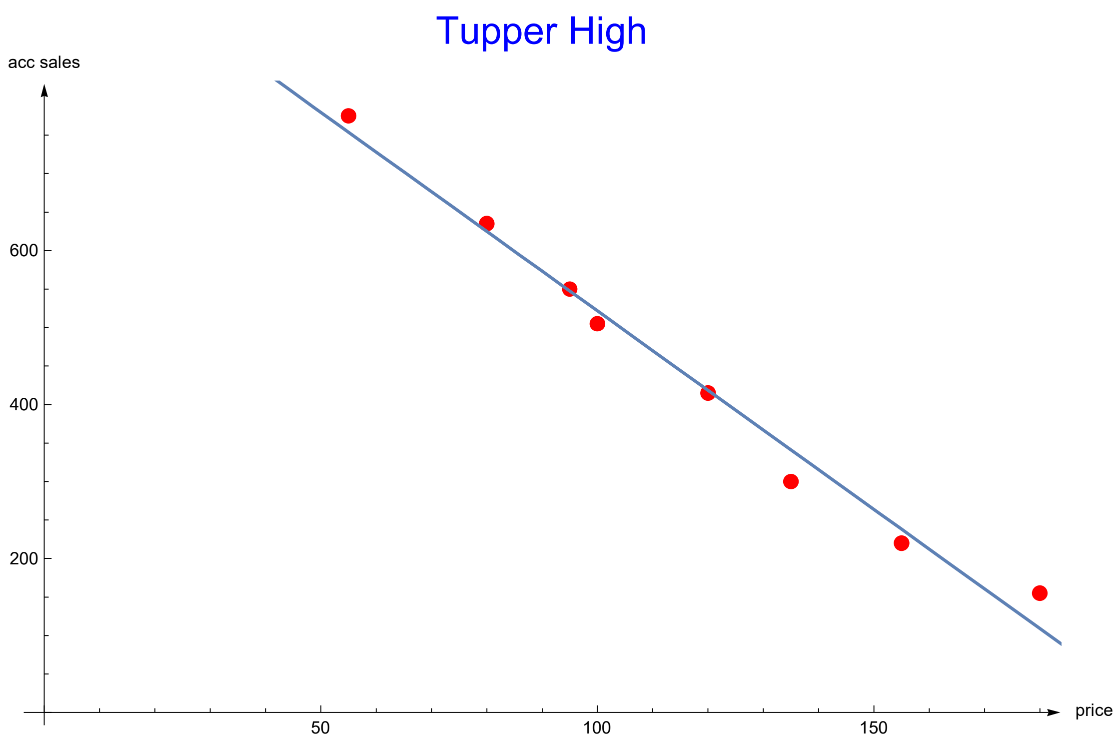
price	acc sales
55	775
80	635
95	550
100	505
120	415
135	300
155	220
180	155

A Curve of Best Fit - (price, list2)

In[113]:=
```
Clear[lp2, l2, p2]
lp2 = ListPlot[list2, AxesLabel → {"price", "acc sales"},
   ImageSize → Large, PlotStyle → {Red, PointSize[0.015]}, AxesOrigin → {0, 0},
   AxesStyle → Arrowheads[0.013], PlotLabel → Style["Tupper High", 20, Blue]];
l2 = Fit[list2, {1, x}, x]
p2 = Plot[l2, {x, 0, 200}];
Show[lp2, p2]
```

Out[115]= 1037.56 – 5.15812 x

Out[117]=



The Next Step

In[118]:=
```
Clear[revenue]
revenue = raccrsales * price
list3 = Transpose[{price, revenue}]
Text[Grid[Prepend[list3, {"price", "revenue"}],
  Alignment → Center, Dividers → {2 → True, 2 → True}, Spacings → {1, 1}]]
```

Out[119]= {42 625, 50 800, 52 250, 50 500, 49 800, 40 500, 34 100, 27 900}

Out[120]= {{55, 42 625}, {80, 50 800}, {95, 52 250}, {100, 50 500}, {120, 49 800}, {135, 40 500}, {155, 34 100}, {180, 27 900}}

Out[121]=

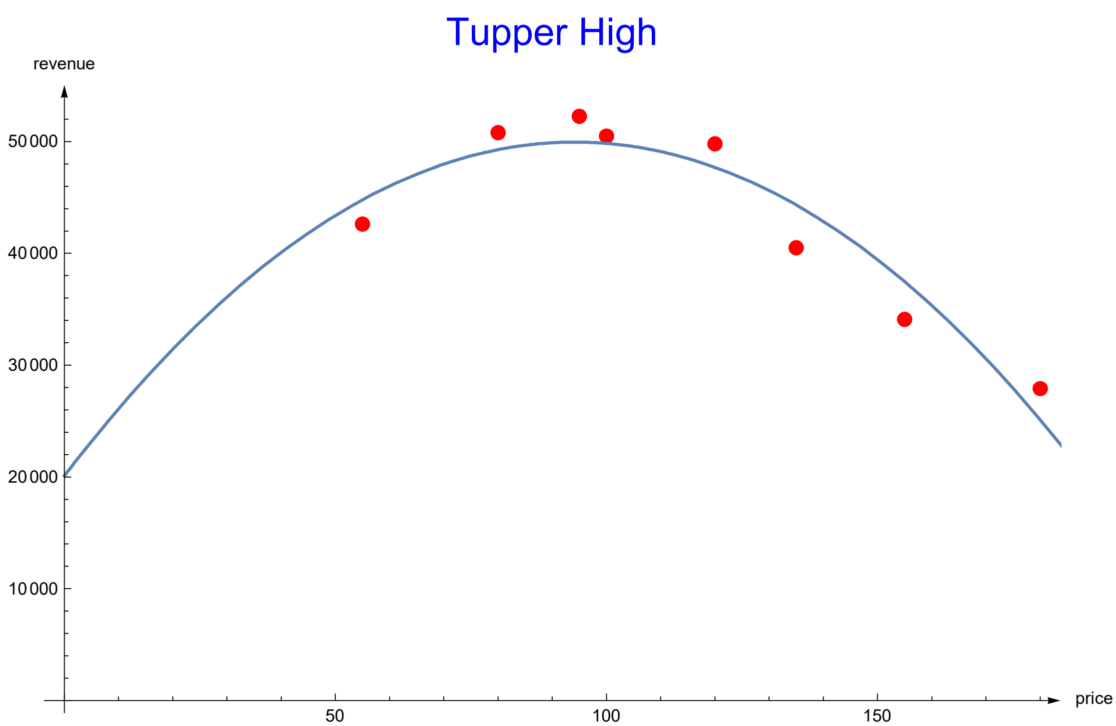
price	revenue
55	42 625
80	50 800
95	52 250
100	50 500
120	49 800
135	40 500
155	34 100
180	27 900

A Curve of Best Fit - (price, list3)

In[122]:=
```
Clear[lp3, l3, p3]
lp3 = ListPlot[list3, AxesLabel → {"price", "revenue"},
   ImageSize → Large, PlotStyle → {Red, PointSize[0.015]}, AxesOrigin → {0, 0},
   AxesStyle → Arrowheads[0.013], PlotLabel → Style["Tupper High", 20, Blue]];
l3 = Fit[list3, {1, x, x^2}, x]
p3 = Plot[l3, {x, 0, 200}];
Show[lp3, p3]
```

Out[124]= $20096.9 + 634.213\,x - 3.36831\,x^2$

Out[126]=



Maximum Revenue According to the Curve of Best Fit (list3)

In[127]:=
```
Maximize[l3, x] (* What is the maximum revenue, and what price generates it *)
```

Out[127]= {49 950.6, {x → 94.1441}}

In[128]:=
```
l2 /. x → 94.1441 (* # of buyers for max revenue situation *)
l3 /. x → 75 (* Revenue generated if ticket price is $75 *)
l2 /. x → 75 (* Tickets sold if revenue is $75 *)
```

Out[128]= 551.952

Out[129]= 48 716.1

Out[130]= 650.7

My Conclusion

Summary of the Results

According to the curve of best fit for list3, the maximum revenue from selling season tickets at Tupper High is $49,950.60. For this to occur, the price per ticket must be set at $94.14. From the linear regression for the price vs. accumulated sales data, 552 tickets would be sold.

Generalizations

Assuming that the data of Tupper High accurately represents other high schools, a medium ticket price tends to bring in the greatest revenue. In the data, this is represented by the parabolic curve of best fit. It increases until the price is $103.29, and then decreases as ticket prices go even higher. Logic supports the data: At low prices, the team will draw many customers, but make little money on each of them. Moreover, the number of customers caps out at the number of families in the school, plus or minus some other interested buyers such as former players. This means that the team can't fully capitalize on low ticket prices. At high ticket prices, the number of buyers diminishes until there are no buyers left, at which point the team makes zero profit. Therefore, there must be some midpoint in number of buyers and ticket price where the team makes the most profit.

Closing Remarks

While a $103.29 ticket might draw in the most revenue for the team, thus making it the "best ticket price" monetarily, according to the curve of best fit (l3) reducing the ticket price to $75 would only reduce the revenue by about $1200, but (according to linear regression, l2) it would draw in almost 100 additional buyers. This trade-off is difficult to quantify mathematically, however, there is certainly an intangible benefit to having more fans and supporters attending each game. Whether or not that benefit is worth $1000 is a question for future exploration. Also, note that the curve of best fit (l3) is only an accurate representation of the effect of price on revenue on the domain, price: [55,180]. An accurate model without domain restrictions should contain the point (0,0) - when ticket price is $0, the revenue must be $0. Finally, while the line of best fit suggests a price of exactly $94.14, in some ways, it is better to set the price to $95. This will be far more convenient, as the team won't have to deal with spare change during cash transactions. Moreover, $95 is doubly validated- by being near the maximum of the curve of best fit (l3), and also being the survey price which would generate the most revenue (list3).