Big League Salary

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Introduction: Every year, professional athletes' salaries increase and every year these increases bring up conversations about salary caps and in Major League Baseball. Recently, USA Today created a website that contains information about each Major League team, its team payroll, and the salaries of the 25 highest paid players for the last 22 years.

Materials: Computers with Internet Access and Excel (or Graphing Calculators), Worksheet

Objective: To apply models of best fit to real-world data.

NCSCOS: Algebra II: 2.04 Create and use best-fit mathematical models of linear, exponential, and quadratic functions to solve problems involving sets of data.

NCTM Standards: Problem Solving, Communication, Multiple Representations

21st Century Skills: Core Subject, Critical Thinking, Communication, Collaboration, Technology Skills, Life and Career Skills

Activities:
Provide background on data and introduce worksheet.
Have students work in small groups stopping to discuss conclusions from each part with the entire class.
*Most of the data is provided in tables on the worksheet for convenience and time considerations. If more time and computers are available, the worksheet without data filled in can be used and students can find the data themselves using this website: http://content.usatoday.com/sports/baseball/salaries/default.aspx.

Part I: Students analyze data from a graph displaying the most expensive player's salary since 1990 and make predictions about the most expensive player's salary in 2020 as the beginning step in using trendlines without actually finding the line of best fit. They will also compare the "cost per home run" of the four Yankee players with the most homeruns this season. This comparison can be used as part of the justification in Part IV.

Part II: Similar to Part I, but this time students will predict the most expensive team payroll in 2015; students will then construct a scatter plot from a table of data containing the most expensive team payroll since 1990 using Excel or graphing calculators if computers with Excel are not available. From the scatter plot, students will choose a line of best fit and use it to check their previous prediction.

Part III: Students construct another scatter plot comparing total payroll to wins in 2010, describe the relationship, and then make a conclusion related to the data.

Part IV: Culmination of the previous three parts where students use results from the other parts to justify why the MLB should or should not institute a salary cap. Groups should construct their arguments to briefly present to the class. All members should be encouraged to participate in the presentation since the group's argument should include at least one point for each person to explain.

> *Additional information for Part IV: MLB has 9 different World Series champions for the last 10 seasons including this season. The teams that made the playoffs this year ranked 1^{st}, 4^{th}, 10^{th}, 11^{th}, 15^{th}, 19^{th}, 21^{st}, and 27^{th} in total payroll.

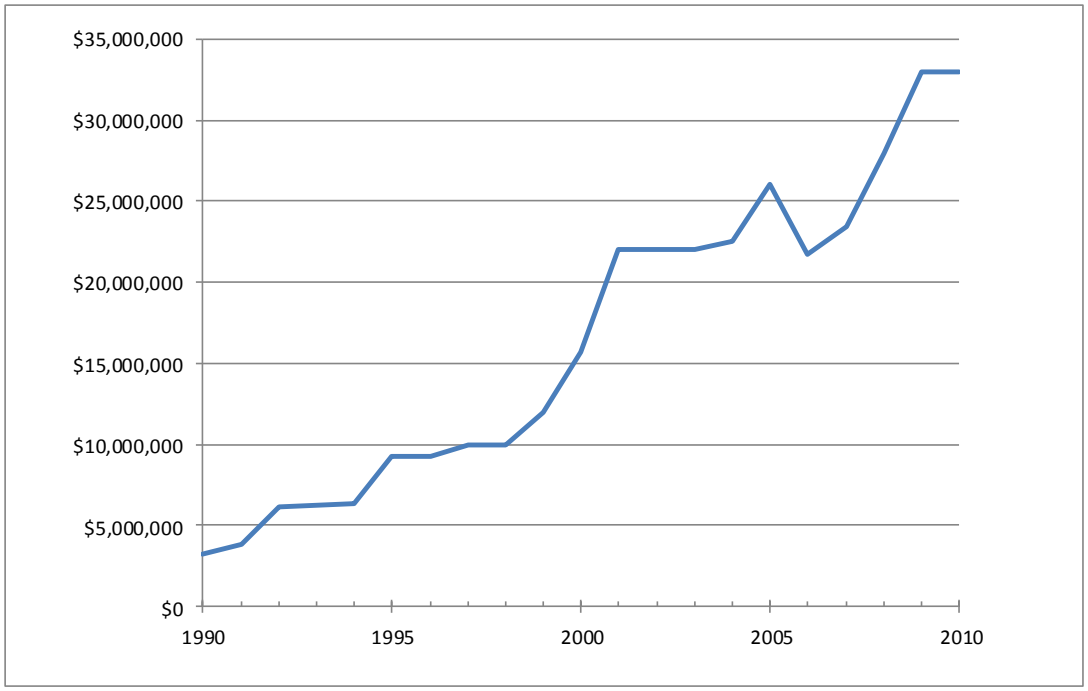
Assessment:

Groups will turn in their worksheets and each group will present, to the class, its final conclusion of whether a salary cap should be imposed on the league.

Big League Salary

Name: _____

Part I: Most Expensive Individual Player Salary



1. In which 5 year period did the salary of the highest paid player increase the most? _____

   _____

2. How much do you think the salary of the most expensive player in 2020 will be? _____

   _____

3. In 2010, Alex Rodriguez was the highest paid player in baseball with a salary of $33 million. Use the statistics at http://espn.go.com/mlb/team/stats/batting/_/name/nyy/seasontype/2/new-york-yankees to determine the "cost" of each of his homeruns in the 2010 season. _____

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4. Compare Rodriguez's cost per home run to 3 of his Yankee teammates: Robinson Cano, Mark Teixeira, and Nick Swisher using the Statistics from ESPN.com and the USA Today Salary Database: http://content.usatoday.com/sports/baseball/salaries/teamdetail.aspx?year=2010&team=9&loc=interstitialskip

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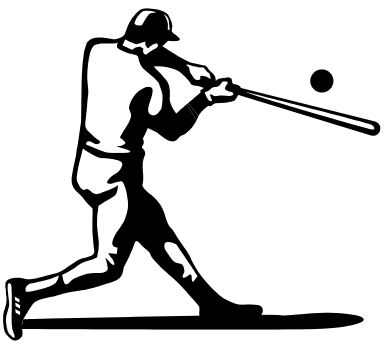
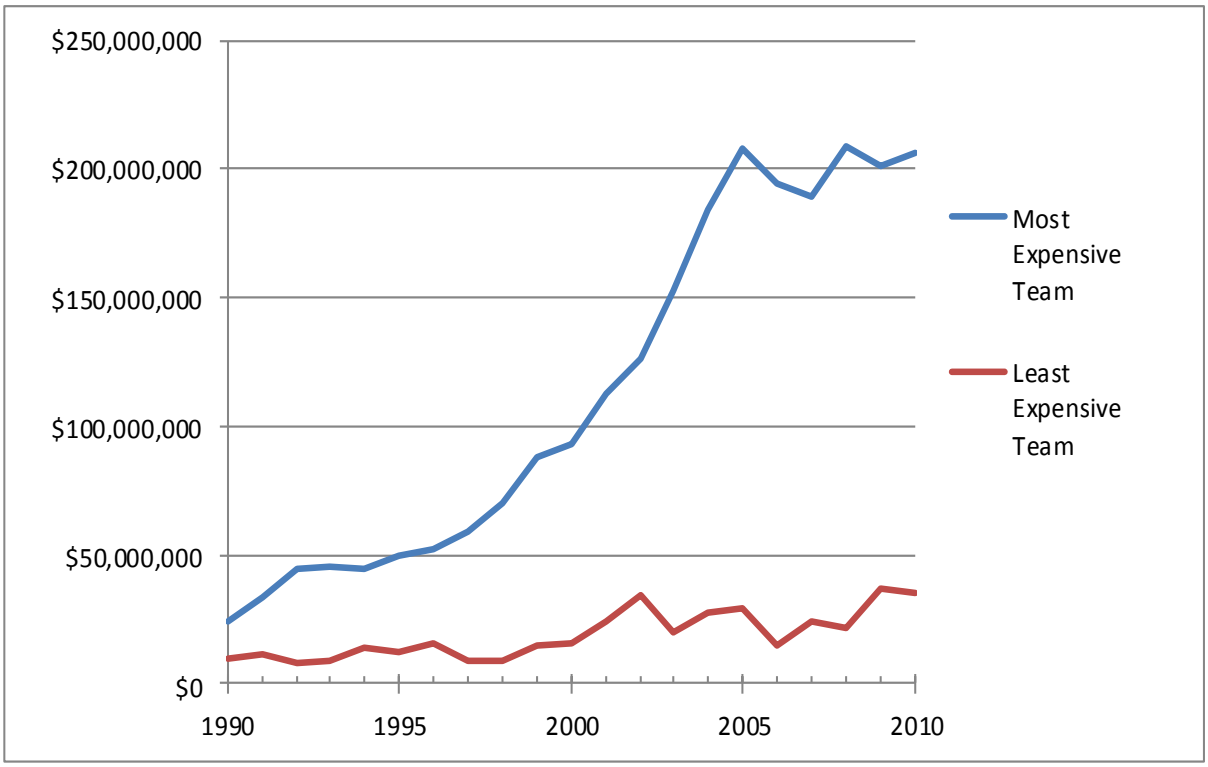


Part II: Most/Least Expensive Team Payroll



5. In 1995, the most expensive team cost about four times as much as the least expensive team. Use the graph to determine the ratio of the most and least expensive teams in 2010. _____

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6. If the current pattern continues, estimate the cost of the most expensive team in baseball for the 2015 season. Justify your answer. _____

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7. Use the data to the right to construct a scatter plot in Excel of the most expensive team in baseball. Find the line of best fit and use it to check your guess from #6. Is a linear model realistic for predicting team payroll? Explain. _____

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Year	Total Payroll
1990	$23,873,745
1991	$33,632,500
1992	$44,352,002
1993	$45,747,666
1994	$44,785,334
1995	$49,791,500
1996	$52,189,370
1997	$59,148,877
1998	$70,408,134
1999	$88,130,709
2000	$92,938,260
2001	$112,287,143
2002	$125,928,583
2003	$152,749,814
2004	$184,193,950
2005	$208,306,817
2006	$194,663,079
2007	$189,639,045
2008	$209,081,577
2009	$201,449,189
2010	$206,333,389

Part III: Team Payroll vs. Wins in 2010

Team	Payroll	Wins
NYY	$206,333,389	95
BOS	$162,447,333	89
CHC	$146,609,000	75
PHI	$141,928,379	97
NYM	$134,422,942	79
DET	$122,864,928	81
CHW	$105,530,000	88
LAA	$104,963,866	80
SF	$98,641,333	92
MIN	$97,599,166	94
LAD	$95,358,016	80
STL	$93,540,751	86
HOU	$92,355,500	76
SEA	$86,510,000	61
ATL	$84,423,666	91
COL	$84,227,000	83
BAL	$81,612,500	66
MIL	$81,108,278	77
TAM	$71,923,471	96
CIN	$71,761,542	91
KC	$71,405,210	67
TOR	$62,234,000	85
WAS	$61,400,000	69
CLE	$61,203,966	69
ARI	$60,718,166	65
FLA	$57,034,719	80
TEX	$55,250,544	90
OAK	$51,654,900	81
SD	$37,799,300	90
PIT	$34,943,000	57

8. Using the data to the left and Excel, construct a scatter plot comparing a team's payroll to its wins. Sketch below.

9. Describe the relationship between wins and payroll in your scatterplot. _____

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10. In this data set, several teams had a lower payroll and a high number of wins, or a higher payroll and a low number of wins. Name at least two reasons why a team could outperform or underperform its payroll. (Hint: Consider factors such as the age and health of the team's roster) _____

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Part IV: Conclusions

Unlike other professional sports leagues, Major League Baseball does not have a salary cap, which limits the amount of money a single team can spend on player salaries. Use the data from Parts I, II, and III to explain why baseball would or would not benefit from a salary cap.

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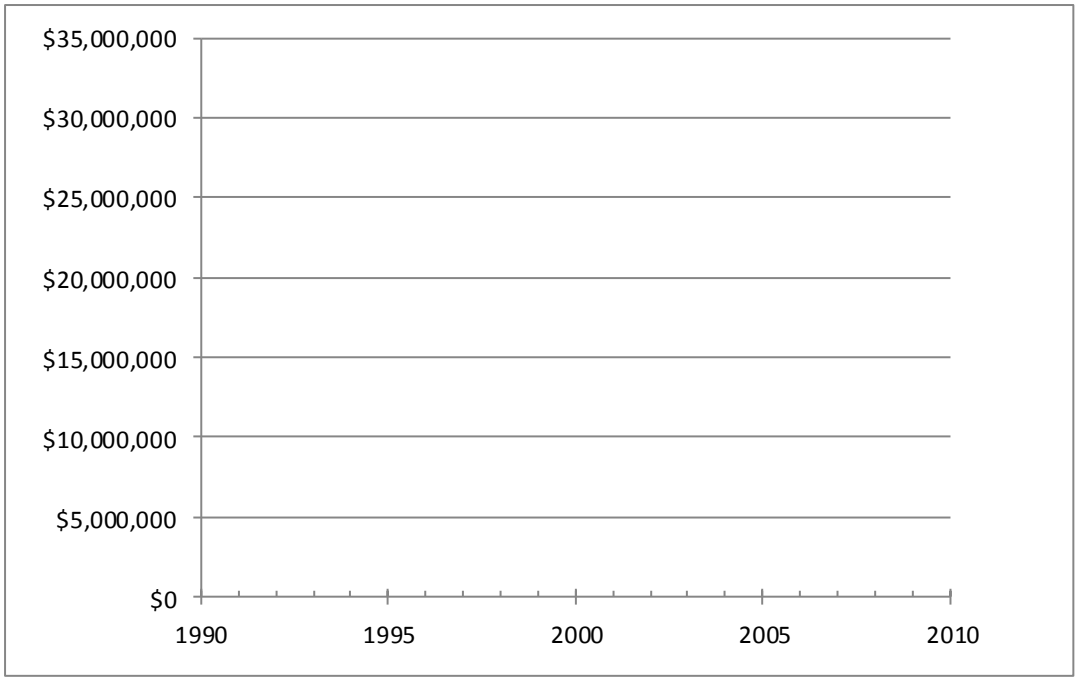
Big League Salary

Name: _____

Part I: Most Expensive Individual Player Salary



Plot on the graph the most expensive player's salary from 1990 to 2010.

1. In which 5 year period did the salary of the highest paid player increase the most? _____

   _____

2. How much do you think the salary of the most expensive player in 2020 will be? _____

   _____

3. In 2010, Alex Rodriguez was the highest paid player in baseball with a salary of $33 million. Use the statistics at http://espn.go.com/mlb/team/stats/batting/_/name/nyy/seasontype/2/new-york-yankees to determine the "cost" of each of his homeruns in the 2010 season. _____

   _____

4. Compare Rodriguez's cost per home run to 3 of his Yankee teammates: Robinson Cano, Mark Teixeira, and Nick Swisher using the Statistics from ESPN.com and the USA Today Salary Database: http://content.usatoday.com/sports/baseball/salaries/teamdetail.aspx?year=2010&team=9&loc=interstitialskip

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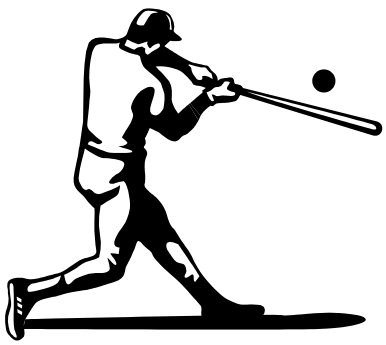
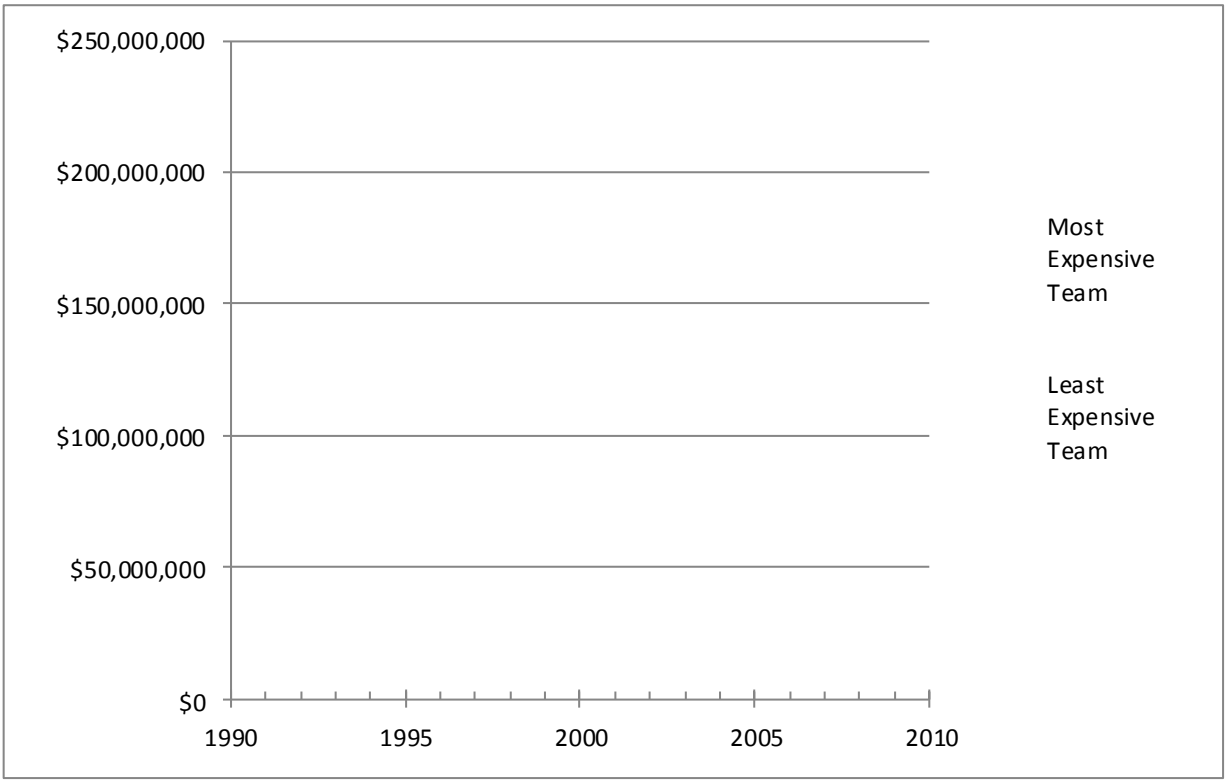


Part II: Most/Least Expensive Team Payroll



Plot on the graph the most and least expensive team payrolls since 1990.

5. As you can see, in 1995, the most expensive team cost about four times as much as the least expensive team, determine the ratio of the most and least expensive teams in 2010. _____

6. If the current pattern continues, estimate the cost of the most expensive team in baseball for the 2015 season. Justify your answer. _____

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7. Fill in the table to the right with the most expensive team payroll since 1990 and construct a scatter plot in Excel. Find the line of best fit and use it to check your guess from #6. Is a linear model realistic for predicting team payroll? Explain. _____

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Year	Total Payroll
1990	
1991	
1992	
1993	
1994	
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2002	
2003	
2004	
2005	
2006	
2007	
2008	
2009	
2010	

Part III: Team Payroll vs. Wins in 2010

Team	Payroll	Wins
NYY		95
BOS		89
CHC		75
PHI		97
NYM		79
DET		81
CHW		88
LAA		80
SF		92
MIN		94
LAD		80
STL		86
HOU		76
SEA		61
ATL		91
COL		83
BAL		66
MIL		77
TAM		96
CIN		91
KC		67
TOR		85
WAS		69
CLE		69
ARI		65
FLA		80
TEX		90
OAK		81
SD		90
PIT		57

8. Fill in the total payroll for each team in the table to the left and in Excel, construct a scatter plot comparing a team's payroll to its wins. Sketch below.

9. Describe the relationship between wins and payroll in your scatter-plot. _____

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10. In this data set, several teams had a lower payroll and a high number of wins, or a higher payroll and a low number of wins. Name at least two reasons why a team could outperform or underperform its payroll. (Hint: Consider factors such as the age and health of the team's roster) _____

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Part IV: Conclusions

Unlike other professional sports leagues, Major League Baseball does not have a salary cap, which limits the amount of money a single team can spend on player salaries. Use the data from Parts I, II, and III to explain why baseball would or would not benefit from a salary cap.

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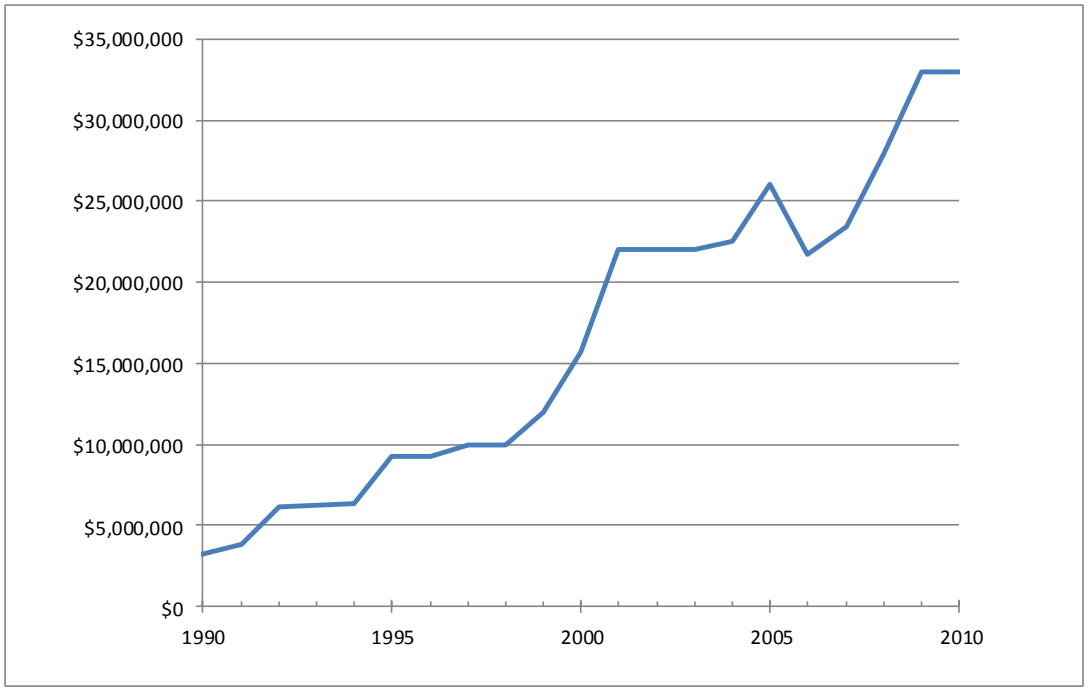
Part I: Most Expensive Individual Player Salary



1. In which 5 year period did the salary of the highest paid player increase the most? __2000-2005_____

   _____

2. How much do you think the salary of the most expensive player in 2020 will be? __~$50,000,000_____

   _____

3. In 2010, Alex Rodriguez was the highest paid player in baseball with a salary of $33 million. Use the statistics at http://espn.go.com/mlb/team/stats/batting/_/name/nyy/seasontype/2/new-york-yankees to determine the "cost" of each of his homeruns in the 2010 season. __~$1,100,000 (30 homeruns)_____

   _____

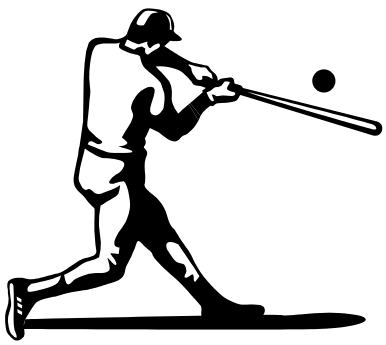
   _____

4. Compare Rodriguez's cost per home run to 3 of his Yankee teammates: Robinson Cano, Mark Teixeira, and Nick Swisher using the Statistics from ESPN.com and the USA Today Salary Database: http://content.usatoday.com/sports/baseball/salaries/teamdetail.aspx?year=2010&team=9&loc=interstitialskip

   ___Cano: 29 homeruns, $9,000,000 salary, ~$310,350/hr_____

   ___Teixeira: 33 homeruns, $20,625,000 salary, ~$625,000/hr_____

   ___Swisher: 29 homeruns, $6,850,000 salary, ~$236,210/hr_____



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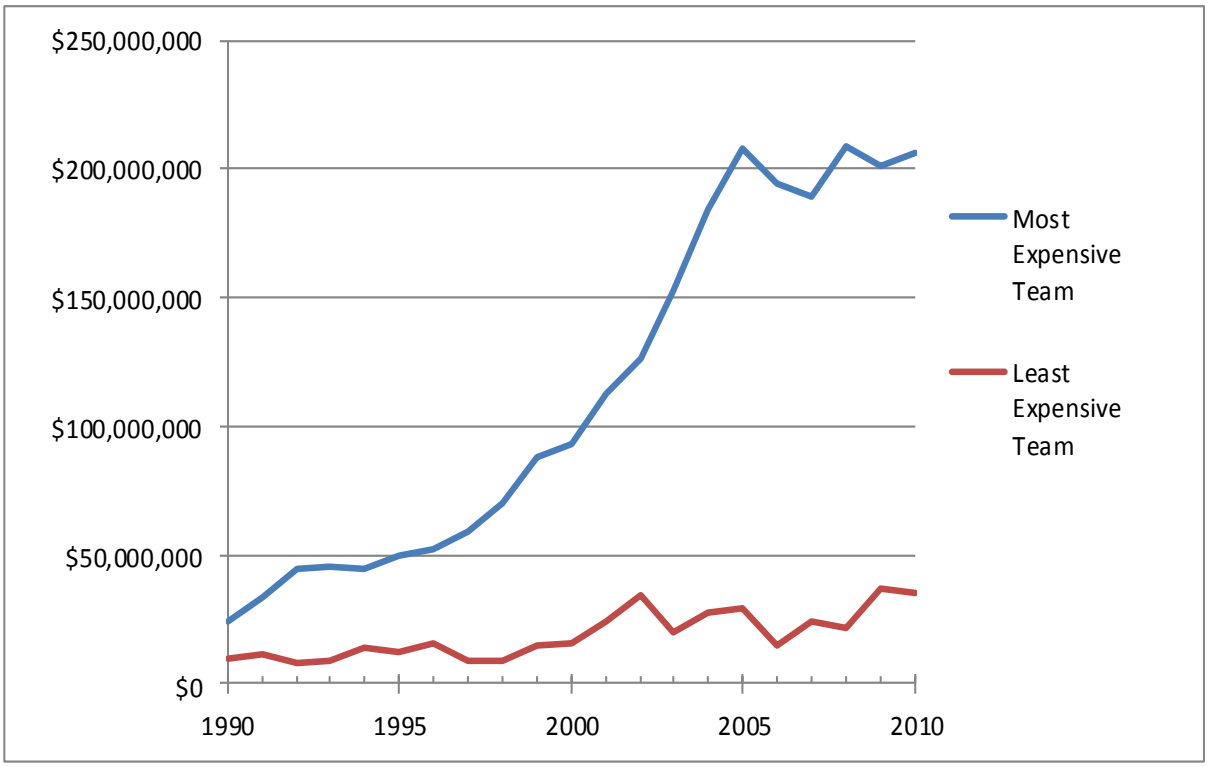

5. In 1995, the most expensive team cost about four times as much as the least expensive team. Use the graph to determine the ratio of the most and least expensive teams in 2010. ~5:1

6. If the current pattern continues, estimate the cost of the most expensive team in baseball for the 2015 season. Justify your answer. ~$210,000,000

7. Use the data to the right to construct a scatter plot in Excel of the most expensive team in baseball. Find the line of best fit and use it to check your guess from #6. Is a linear model realistic for predicting team payroll? Explain. Linear: $y = 10{,}773{,}875.86x - 21{,}433{,}959{,}782.19$; $R^2 = 0.93$

Exponential: $y = 5.46571E\text{-}89e^{0.110784212x}$; $R^2 = 0.95$

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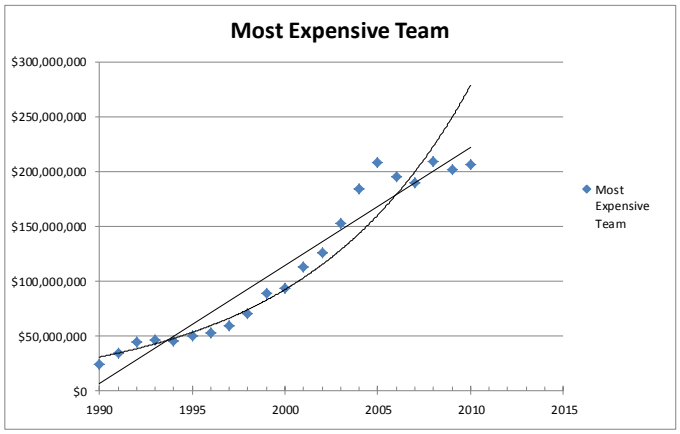

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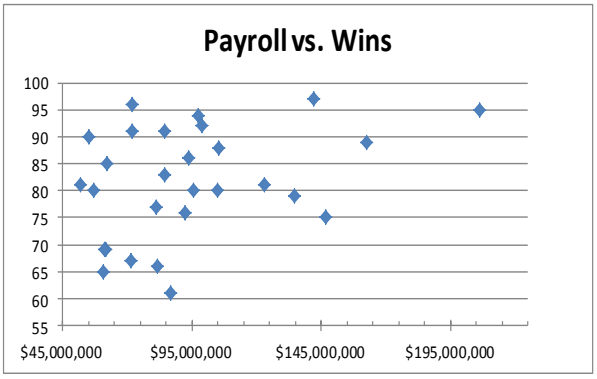
PIT	$34,943,000	57

8. Using the data to the left and Excel, construct a scatter plot comparing a team's payroll to its wins. Sketch below.



9. Describe the relationship between wins and payroll in your scatterplot. No correlation/slight positive

10. In this data set, several teams had a lower payroll and a high number of wins, or a higher payroll and a low number of wins. Name at least two reasons why a team could outperform or underperform its payroll. (Hint: Consider factors such as the age and health of the team's roster)

Part IV: Conclusions

Unlike other professional sports leagues, Major League Baseball does not have a salary cap, which limits the amount of money a single team can spend on player salaries. Use the data from Parts I, II, and III to explain why baseball would or would not benefit from a salary cap.