

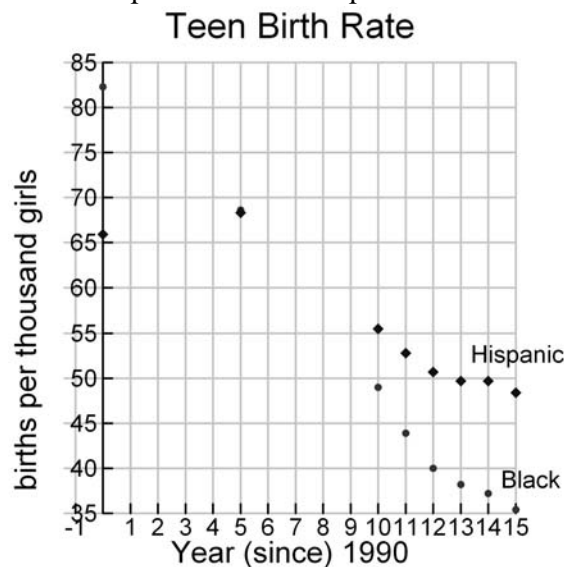
Teen Pregnancy

Investigating Cubic Functions

“When am I ever going to use this?”
Using the concepts in this worksheet, you will be able to use cubic function models to predict unknown results.

In any society, the choices of one person often impact the lives of others. One of the most dramatic life changes a teenage girl can experience is an unexpected pregnancy. This event can dramatically alter the young woman's educational and employment opportunities. Despite this fact, many young women have overcome the challenges of being a single mother and have achieved success in their personal and professional lives.

The scatter plots below show the pregnancy rate of 15 – 17 year old young women racially classified as Black and Hispanic. The birth rate is reported as births per 1000 women.



1. Based on the shape of the scatter plots, what type of function do you think will best fit each of the data sets? Explain.
2. The cubic function model for each of the data sets is given below together with the coefficient of determination (r^2). Use technology to find the point of intersection of the two functions.
Hispanic birth rate: $h(x) = 0.0280x^3 - 0.718x^2 + 3.34x + 65.9$; $r^2 = 0.997$
Black birth rate: $b(x) = 0.0215x^3 - 0.475x^2 - 0.846x + 82.3$; $r^2 = 0.999$

Teen Pregnancy

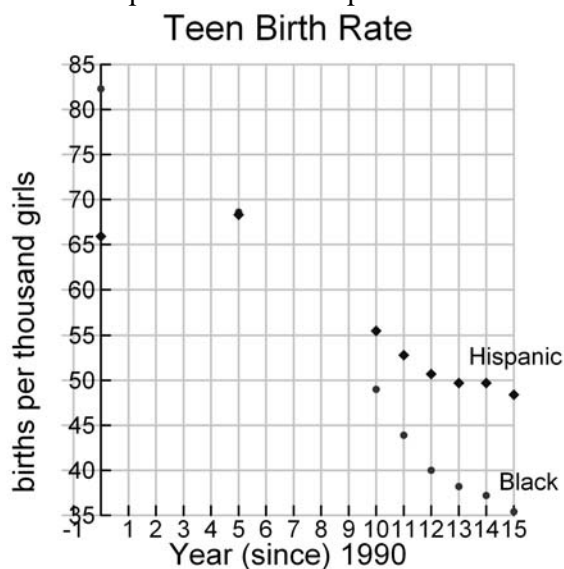
Investigating Cubic Functions



When am I ever going to use this? ”
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In any society, the choices of one person often impact the lives of others. One of the most dramatic life changes a teenage girl can experience is an unexpected pregnancy. This event can dramatically alter the young woman's educational and employment opportunities. Despite this fact, many young women have overcome the challenges of being a single mother and have achieved success in their personal and professional lives.

The scatter plots below show the pregnancy rate of 15 – 17 year old young women racially classified as Black and Hispanic. The birth rate is reported as births per 1000 women.



1. Based on the shape of the scatter plots, what type of function do you think will best fit each of the data sets? Explain.

Both data sets start out concave down but appear to change to concave up part way through the data set. Since there is a change in concavity, a cubic function model may fit each data set.

2. The cubic function model for each of the data sets is given below together with the coefficient of determination (r^2). Use technology to find the point of intersection of the two functions.

Hispanic birth rate: $h(x) = 0.0280x^3 - 0.718x^2 + 3.34x + 65.9$; $r^2 = 0.997$

Black birth rate: $b(x) = 0.0215x^3 - 0.475x^2 - 0.846x + 82.3$; $r^2 = 0.999$

Using a graphing calculator, we find the point of intersection is (5.33,67.5).

3. What is the real-life meaning of the point of intersection in (3)?

$(5.33, 67.5)$ tells us that Hispanic teens and Black teens had the same birth rate about 4 months into 1996. ($t = 5$ is the end of 1995. The extra 0.33 puts us about 4 months into 1996.) At that time, the birth rate was 67.5 births per thousand teens aged 15 – 17 years.

4. From the scatter plots, does it appear that efforts to educate youth about abstinence and safe sex are having an impact? Explain.

Yes. Both of the data sets are decreasing. For Black teens, the birth rate dropped from approximately 82 to 36 between 1990 and 2005. For Hispanic teens, the birth rate dropped from 66 to 49 over the same time period.

5. Use each model to predict the birth rate in 2010.

Hispanic birth rate: $h(20) = 0.0280(20)^3 - 0.718(20)^2 + 3.34(20) + 65.9 = 69.5$

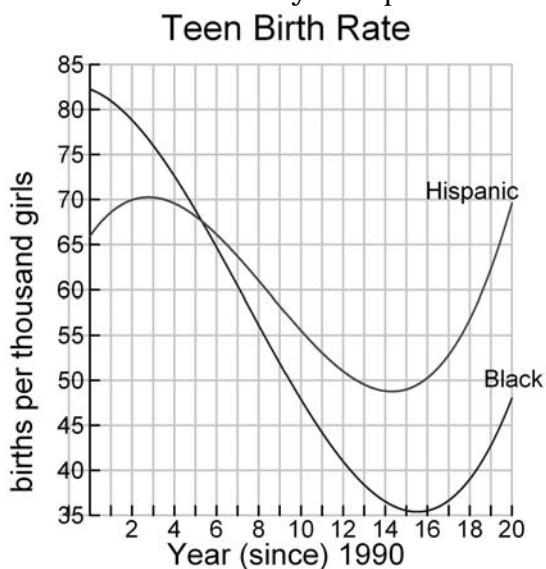
Black birth rate: $b(20) = 0.0215(20)^3 - 0.475(20)^2 - 0.846(20) + 82.3 = 47.38$

The models predict the Hispanic birth rate to be 69.5 births per thousand and the Black birth rate to be 47.38 births per thousand.

6. Do the pregnancy rates in (5) seem reasonable? Explain.

Between 1995 and 2005, both data sets are decreasing. The projected birth rates for 2010 represent an increase not a decrease in the birth rate of both groups. Consequently, we don't think that these predictions are reasonable.

7. Over what domain do you expect the models will give reasonable results? Explain.



We expect the birth rate to decrease or remain flat. Both models begin to increase around $t = 15$. Therefore, we pick the interval $[0, 15]$ to be a reasonable domain for the model.

<i>Worksheet Title</i>	Teen Pregnancy: Investigating Cubic Functions			<i>Filename:</i>	m3010
<i>Keywords</i>	Birth rate, Black, Hispanic, teen, modeling, scatter plot, intersection point, cubic function, modeling, forecasting, regression				
<i>NCTM Standard</i>		Content Standards			Process Standards
		Number and Operations		X	Problem Solving
	X	Algebra			Reasoning and Proof
		Geometry		X	Communication
		Measurement		X	Connections
	X	Data Analysis and Probability		X	Representations
<i>Grade Band</i>		PreK – 2			
		3 – 5			
		6 – 8			
	X	9 – 12			
<i>Data Type</i>	Graph, Equation				

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