The National Debt and Wars

NAME _____

In this activity, you will study the history of the U.S. National Debt, compare the impact of the major wars on the national debt, and determine how to represent the debt using a function and by illustrating it graphically.

Pre-Activity Questions

1. Pick values for A_0, b and k and write the related exponential function in the form $A(t) = A_0 b^{kt}$.

Your choice of values: A_0 = _____ k = _____ b = _____

$A(t)$ = _____

2. Use a spreadsheet to calculate $A(t)$ for the following values of t and to calculate the percent change between values. Based on your function, fill in the following table.

t	$A(t)$ = _____	PERCENT CHANGE IN $A(t)$
2		
4		
6		
8		
10		

3. Based on the results above, what can you predict about percent change of an exponential growth curve over uniform time periods? Compare your results with curves of other groups to see if you come to the same conclusion regardless of the particular exponential growth curve you made up.

Activity 1: The National Debt from its Inception

When the U.S. National Bank was first established in 1791, it immediately recorded a debt (i.e., "the national debt") of $75,463,476.52, which predominantly represented the cost of purchasing properties for federal land and the cost of constructing the first federal buildings. Since that time, the debt has had some ups and downs, but overall, it has generally increased.

A Record of the National Debt[1]

YEAR	MONTH & DAY OF RECORD	NATIONAL DEBT (IN DOLLARS)
1791	January 1	75,463,476.52
1801	January 1	83,038,050.80
1811	January 1	48,005,587.76
1821	January 1	89,987,427.66
1831	January 1	39,123,191.68
1841	January 1	5,250,875.54
1851	July 1	68,304,796.02
1861	July 1	90,580,873.72
1871	July 1	2,353,211,332.32
1881	July 1	2,069,013,569.58
1891	July 1	1,545,996,591.61
1901	July 1	2,143,326,933.89
1911	July 1	2,765,600,606.69
1921	June 30	23,977,450,552.54
1931	June 30	16,801,281,491.71
1941	June 30	48,961,443,535.71
1951	June 29	255,221,976,814.93
1961	December 29	296,168,761,214.92
1971	December 31	424,130,961,959.95
1981	December 31	1,028,729,000,000.00[2]
1991	September 30	3,665,303,351,697.03
2001	September 30	5,807,463,412,200.06

[1] Information obtained from the Bureau of Public Debt web site, http://www.publicdebt.treas.gov/, February 2006.

[2] The 1981 record was rounded to the nearest million.

1. Using a spreadsheet or graphing calculator, input the data above into two columns and graph the curve formed by the points. Sketch the graph below, with appropriate labels for types of quantities and scales.

2. Based on the shape of the curve, what kind of function appears to best represent the data—linear, polynomial, or exponential? Explain how you know.

3. Based on your decision, find the curve of best fit to represent the data. Record the function below along with an explanation of what the independent and dependent variables represent as they relate to the national debt.

4. How well does the function fit the data?

a. Plot a graph of the function over the scatterplot of the data. Discuss how well the function appears to model the data. Sketch the graph below.

b. What is the correlation (*r*-value) for your curve of best fit? How does that confirm or discount your conclusion from part *a*?

c. In your spreadsheet, calculate the percent change in the national debt for each decade. Create a bar graph of the percent changes for each decade. Discuss how the percent change confirms or calls to question your reasoning above on how well your curve fits the data. Attach a copy of the spreadsheet and bar graph.

Activity 2: The National Debt and Major U.S. Wars

In this activity, each group will explore one of three different major U.S. wars (Civil War, World War I, and World War II) and its apparent impact on the National Debt.

5. The following tables record the National Debt for the three years prior to, the years of, and the three years after each of the major wars.

Civil War (January, 1861 – April, 1865)

YEAR	MONTH & DAY OF RECORD	NATIONAL DEBT (IN DOLLARS)
1858	July 1	31,972,537.90
1859	July 1	58,496,837.88
1860	July1	64,842,287.88
1861	July 1	90,580,873.72
1862	July 1	524,176,412.13
1863	July 1	1,119,772,138.63
1864	July 1	1,815,784,370.57
1865	July 1	2,680,647,869.74
1866	July 1	2,773,236,173.69
1867	July 1	2,678,126,103.87
1868	July 1	2,611,687,851.19

World War I (August, 1914 – November, 1918)

YEAR	MONTH & DAY OF RECORD	NATIONAL DEBT (IN DOLLARS)
1911	July 1	2,765,600,606.69
1912	July 1	2,868,373,874.16
1913	July 1	2,916,204,913.66
1914	July 1	2,912,499,269.16
1915	July 1	3,058,136,873.16
1916	July 1	3,609,244,262.16
1917	July 1	5,717,770,279.52
1918	July 1	14,592,161,414.00
1919	July 1	27,390,970,113.12
1920	July 1	25,952,456,406.16
1921	June 30	23,977,450,552.54

World War II (September, 1939 – September, 1945)

Year	Month & Day of Record	National Debt (in Dollars)
1936	June 30	33,778,543,493.73
1937	June 30	36,424,613,732.29
1938	June 30	37,164,740,315.45
1939	June 30	40,439,532,411.11
1940	June 29	42,967,531,037.68
1941	June 30	48,961,443,535.71
1942	June 30	72,422,445,116.22
1943	June 30	136,696,090,329.90
1944	June 30	201,003,387,221.13
1945	June 30	258,682,187,409.93
1946	June 28	269,422,099,173.26
1947	June 30	258,286,383,108.67
1948	June 30	252,292,246,512.99

a. Record the data from above in a two-column table (in your spreadsheet program). In the first column, record the year; in the second column, record the national debt, rounded as appropriate. (You may want to record the values in millions, for example, and write 1,325,789 as 1.3, with the header indicating that the value is in millions of dollars.)

b. Create a graph of the data, appropriately labeling the axes and scales. On the graph and cells of the spreadsheet, identify when the war started and ended. Attach a copy of the spread sheet and graph.

6. Discuss what kind of curve (or curves) could represent the data. Can the curve be well represented by a single function? Are there different curves for different sections of the graph?

7. Reflect upon the apparent impact the war had on the national debt, and discuss this topic with members of your group. Record the highlights of your discussion below.

Summary Questions:

8. It has been said that any curve can be approximated as linear over short intervals. Discuss what this means and whether you think it is true.

9. For an exponential growth (or decay) curve, describe the graph of percent change in the dependent values over uniform time intervals.

10. On January 1, 1834, the national debt was $4,760,000,000. By January 1, 1835, it had sharply declined to $34,000.

a. What was the decrease in the debt from January 1, 1834 to January 1, 1835?

b. What was the percent decrease during the same time period?

11. From 1920 to 1930, the debt declined from $ $25,952,000,000 to $16,185,000,000. By 1940, the debt jumped to $42,968,000,000. What was going on in the country economically during the 1920's and 1930's that would cause a decline and then an increase in the national debt?

Note to teacher: The following page only needs to be photocopied if you would like students to research the national debt themselves. Otherwise, students may use the data included previously on this activity sheet.

For each decade from 1791 to 2001, record the national debt, rounded to the nearest million dollars. Data can be obtained from the Bureau of Public Debt web site, http://www.publicdebt.treas.gov.

YEAR	NATIONAL DEBT, IN MILLIONS OF DOLLARS (ROUNDED TO THE NEAREST MILLION)
1791	
1801	
1811	
1821	
1831	
1841	
1851	
1861	
1871	
1881	
1891	
1901	
1911	
1921	
1931	
1941	
1951	
1961	
1971	
1981	
1991	
2001	