

Name: <u>Key</u>	Date:
Topic:	Class:

Main Ideas/Questions	Notes/Examples
<b>Exponential Growth</b> 2nd $\frac{\square}{\square}$ gives % sign on calculator	Occurs when a quantity exponentially increases over time. Formula: $y = a_0(1+r)^t$ or $y = a_0(1+\%)^t$
	$a =$ initial amount $r =$ rate - given as %; change to decimal $t =$ time (in years)
<b>Examples</b>	1. The original value of an investment is \$1400, and the value increases by 9% each year. Use an exponential growth function to find the value of the investment after 25 years. $a = 1400$ $1400(1+9\%)^{25} = 1400(1.09)^{25}$ $r = 9\%$ $\$12,072.31$ $t = 25$
	2. The cost of tuition at a college is \$12,000 and is increasing at a rate of 6% each year. Use an exponential function to find the tuition cost after 4 years. $a = 12,000$ $12,000(1+6\%)^4 = 12,000(1.06)^4$ $r = 6\%$ $\$15,149.72$ $t = 4$
	3. The number of student athletes at a local high school is 300 and is increasing at a rate of 8% per year. Use an exponential function to find the number of student athletes after 5 years. $a = 300$ $300(1+8\%)^5 = 300(1.08)^5$ $r = 8\%$ $440.80 \approx 440$ student athletes $t = 5$
	4. Annual sales for a company are \$149,999 and are increasing at a rate of 6% per year. Use an exponential function to find the annual sales after 7 years. $a = 149,999$ $149,999(1+6\%)^7 = 149,999(1.06)^7$ $r = 6\%$ $\$225,543.04$ $t = 7$
	5. The population of a small town is 1600 and is increasing at a rate of 3% per year. Use an exponential function to find the population of the town after 10 years. $a = 1600$ $1600(1+3\%)^{10} = 1600(1.03)^{10}$ $r = 3\%$ $2,150.27 \approx 2,150$ people $t = 10$
	6. In 1985, there were 285 cell phone subscribers in Mayville. The number of subscribers increased by 75% per year after 1985. Find the number of subscribers in 2008. $a = 285$ $285(1+75\%)^{23} = 285(1.75)^{23}$ $r = 75\%$ $110,845,988.3 \approx 110,845,988$ subscribers $t = 2008 - 1985 = 23$

Exponential Decay	Occurs when a quantity exponentially decreases over time.	
	Formula: $y = a_0(1-r)^t$ or $y = a_0(1-\%)^t$	$a$ = <u>initial amount</u> $r$ = <u>rate - given as %</u> $t$ = <u>time (years)</u>
Examples	7. The population of a town is <u>decreasing</u> at a rate of 1% per year. In 2000 there were 1300 people. Use an exponential function to find the population in 2008.	
	$a = 1300$ $r = 1\%$ $t = 2008 - 2000 = 8$	$1300(1-1\%)^8 = 1300(0.99)^8$ $1199.57 \approx \boxed{1199}$ people
	8. The value of a car is \$18,000 and <u>depreciating</u> at a rate of 12% per year. Use an exponential function to find the value of the car after 10 years.	
	$a = 18,000$ $r = 12\%$ $t = 10$	$18,000(1-12\%)^{10} = 18,000(0.88)^{10}$ $\boxed{\$5013.02}$
	9. A farmer buys a tractor for \$50,000. If the tractor <u>depreciates</u> 10% per year, use an exponential function to find the value of the tractor in 7 years.	
	$a = 50,000$ $r = 10\%$ $t = 7$	$50,000(1-10\%)^7 = 50,000(0.9)^7$ $\boxed{\$23914.85}$
	10. An investment of \$8200 loses value at a rate of 2% per year. Use an exponential function to find the value of the investment after 9 years.	
	$a = 8200$ $r = 2\%$ $t = 9$	$8200(1-2\%)^9 = 8200(0.98)^9$ $\boxed{\$6836.73}$
	11. The initial value of a book is \$58 and <u>decreases</u> at a rate of 7% per year. Use an exponential function to find the value of the book after 8 years.	
	$a = 58$ $r = 7\%$ $t = 8$	$58(1-7\%)^8 = 58(0.93)^8$ $\boxed{\$32.46}$
	12. The population of a town is <u>decreasing</u> at a rate of 2.5% per year. If the population in 2000 was 28,000, what is the expected population in 2015 if this rate of decrease continues?	
	$a = 28,000$ $r = 2.5\%$ $t = 2015 - 2000 = 15$	$28,000(1-2.5\%)^{15} = 28,000(0.975)^{15}$ $19152.58 \approx \boxed{19152}$ people