Converting rates: raise $\frac{1}{n}$

Name Schlansky
Mr. Schlansky

Date ____________
Algebra II

Converting Rates

Round all coefficients to 6 decimal places

1. Gerard took out a $72000 loan for college that has a 12.7% interest rate. An equation to represent this situation is given as $A(t) = 72000(1.127)^t$.

Write an equation to find the monthly growth rate after *t* years.

$1.127^{\frac{1}{12}} = 1.010013$

$A(t) = 72000(1.010013)^{12t}$ you get the monthly rate 12 times per year

Write an equation to find the monthly growth rate after *m* months.

$A(m) = 72000(1.010013)^{m}$ you get the monthly rate 1 time per month.

What is the monthly growth rate rounded to the nearest thousandth of a percent?

$1.010013 - 1 = .010013(100) = 1.001\%$

Write an equation to find the weekly growth rate after *t* years.

$1.127^{\frac{1}{52}} = 1.002302$

$A(t) = 72000(1.002302)^{52t}$ you get the weekly rate 52 times per year

Write an equation to find the weekly growth rate after *w* weeks.

$A(w) = 72000(1.002302)^{w}$ you get the weekly rate 1 time per week.

What is the weekly growth rate to the nearest thousandth of a percent?

$1.002302 - 1 = .002302(100) = .230\%$

Write an equation to find the daily growth rate after *t* years.

$1.127^{\frac{1}{365}} = 1.000327$

$A(t) = 72000(1.000327)^{365t}$ you get the daily rate 365 times per year

Write an equation to find the daily growth rate after *d* days.

$A(d) = 72000(1.000327)^{d}$ you get the daily rate 1 time per day.

What is the daily growth rate to the nearest thousandth of a percent?

$1.000327 - 1 = .000327(100) = .033\%$

2. The population of a small neighborhood in Brooklyn, NY is 452,000 and is growing by a rate of 11.6% each year. An equation to represent this situation is given as $A(t) = 452000(1.116)^t$.

Write an equation to find the monthly growth rate after t years.

$1.116^{\frac{1}{12}} = 1.009188$

$A(t) = 452000(1.009188)^{12t}$ monthly rate 12 times per year

Write an equation to find the monthly growth rate after m months.

$A(m) = 452000(1.009188)^m$ monthly rate 1 time per month

What is the monthly growth rate to the nearest thousandth of a percent?

$1.009188 - 1 = .009188(100) = .919\%$

Write an equation to find the weekly growth rate after t years.

$1.116^{\frac{1}{52}} = 1.002113$

$A(t) = 452000(1.002113)^{52t}$ weekly rate 52 times per year

Write an equation to find the weekly growth rate after w weeks.

$A(w) = 452000(1.002113)^w$ weekly rate 1 time per week

What is the weekly growth rate to the nearest thousandth of a percent?

$1.002113 - 1 = .002113(100) = .211\%$

Write an equation to find the daily growth rate after t years.

$1.116^{\frac{1}{365}} = 1.000301$

$A(t) = 452000(1.000301)^{365t}$ daily rate 365 times per year

Write an equation to find the daily growth rate after d days.

$A(d) = 452000(1.000301)^d$ daily rate 1 time per day

What is the daily growth rate to the nearest thousandth of a percent?

$1.000301 - 1 = .000301(100) = .030\%$

3. Stephanie found that the number of white-winged cross bills in an area can be represented by the formula $C = 550(1.08)^t$, where t represents the number of years since 2010. Which equation correctly represents the number of white-winged cross bills in terms of the monthly rate of population growth?

$1.08^{\frac{1}{12}} = 1.06643$

1) $C = 550(1.00643)^t$

2) $C = 550(1.00643)^{12t}$ monthly rate 12 times per year

3) $C = 550(1.00643)^{\frac{t}{12}}$

4) $C = 550(1.00643)^{t+12}$

4. On average, college seniors graduating in 2012 could compute their growing student loan debt using the function $D(t) = 29,400(1.068)^t$, where t is time in years. Which expression is equivalent to $29,400(1.068)^t$ and could be used by students to identify an approximate daily interest rate on their loans?

$1.068^{\frac{1}{365}}$

1) $29,400\left(1.068^{\frac{1}{365}}\right)^t$

2) $29,400\left(\frac{1.068}{365}\right)^{365t}$

3) $29,400\left(1+\frac{0.068}{365}\right)^t$

4) $29,400\left(1.068^{\frac{1}{365}}\right)^{365t}$ daily rate 365 times per year.

5. A study of the annual population of the red-winged blackbird in Ft. Mill, South Carolina, shows the population, $B(t)$, can be represented by the function $B(t) = 750(1.16)^t$, where the t represents the number of years since the study began. In terms of the monthly rate of growth, the population of red-winged blackbirds can be best approximated by the function

$1.16^{\frac{1}{12}} = 1.012$

1) $B(t) = 750(1.012)^t$

2) $B(t) = 750(1.16)^{12t}$

3) $B(t) = 750(1.012)^{12t}$ monthly rate 12 times per year.

4) $B(t) = 750(1.16)^{\frac{t}{12}}$

6. The population, $p(t)$, of a small county in Western New York has grown according to the formula $p(t) = 87218(1.421)^t$ after t years. What is the *weekly* percent of increase rounded to the nearest hundredth of a percent?

$1.421^{\frac{1}{52}} = 1.006779..$
-1
$.006779(100)$
$.68\%$

7. A student studying public policy created a model for the population of Detroit, where the population decreased 25% over a decade. He used the model $P = 714(0.75)^d$, where P is the population, in thousands, d decades after 2010. Another student, Suzanne, wants to use a model that would predict the population after y years. Suzanne's model is best represented by

1) $P = 714(0.6500)^y$

2) $P = 714(0.8500)^y$

3) $P = 714(0.9716)^y$ yearly rate 1 time per year.

4) $P = 714(0.9750)^y$

$.75^{\frac{1}{10}} = .9716$

8. A population of insects grows according to the formula $p(t)=2100(1.37)^t$ where $p(t)$ is the population of insects after t weeks. What is the daily interest rate rounded to the nearest tenth of a percent?

$1.37^{\frac{1}{365}} = 1.00086..$

-1

$.00086(100)$

$.1\%$

9. Each year, the amount of students in Eastbury High School increases by 7.15%. Which of the following expressions could be used to find the *weekly* rate of increase of Eastbury High School after w weeks?

1) $(1.0715)^w$ 2) $(1.0715^{\frac{1}{52}})^{52w}$ 3) $(1.0715^{\frac{1}{52}})^w$ 4) $(1.0715)^{52w}$

weekly rate 1 time per week

$1+.0715=(1.0715)^t$

$1.0715^{\frac{1}{52}}$

10. Each year, the amount of students in Eastbury High School increases by 7.15%. Which of the following expressions could be used to find the *weekly* rate of increase of Eastbury High School after t years?

1) $(1.0715^{\frac{1}{52}})^t$ 2) $(1.0715^{\frac{1}{52}})^{52t}$ 3) $(1.0715)^{52t}$ 4) $(1.0715)^t$

weekly rate 52 times per year.

$1+.0715=(1.0715)^t$

$1.0715^{\frac{1}{52}}$

11. Last year, the total revenue for Home Style, a national restaurant chain, increased 5.25% over the previous year. If this trend were to continue, which expression could the company's chief financial officer use to approximate their monthly percent increase in revenue? [Let m represent months.]

1) $(1.0525)^m$ 3) $(1.00427)^m$

2) $(1.0525)^{\frac{12}{m}}$ 4) $(1.00427)^{\frac{m}{12}}$

monthly rate one time per month

$1+.0525=1.0525$

$1.0525^{\frac{1}{12}}$

1.00427

12. Rasmus invested $65,000 in the stock market and makes an average of 9.2% each year on his investments. Which equation could be used to find his monthly percent increase after t years?

1) $v=65000(1.092)^t$ 3) $v=65000(1.0074)^t$

2) $v=65000(1.0074)^{12t}$ 4) $v=65000(1.092)^{12t}$

monthly rates 12 times per year

$65,000(1+.092)^t$

$65,000(1.092)^t$

$1.092^{\frac{1}{12}}$

1.0074

13. Over the past several years, the value of a stock has ~~decreased~~ increased by 3.2% each year. The value of the stock is now $87.24. Which of the following equations does not represent the value of the stock after t years or m months?

1) $a(t)=87.24(1.032)^t$ 3) $a(m)=87.24(1.0026)^{12m}$

2) $a(t)=87.24(1.0026)^{12t}$ 4) $a(m)=87.24(1.0026)^m$

monthly rate 12 times per year

monthly rate 1 time per month

$87.24(1+.032)^t$

$87.24(1.032)^t$

$1.032^{\frac{1}{12}}$

1.0026