Check Day 10 Key Online

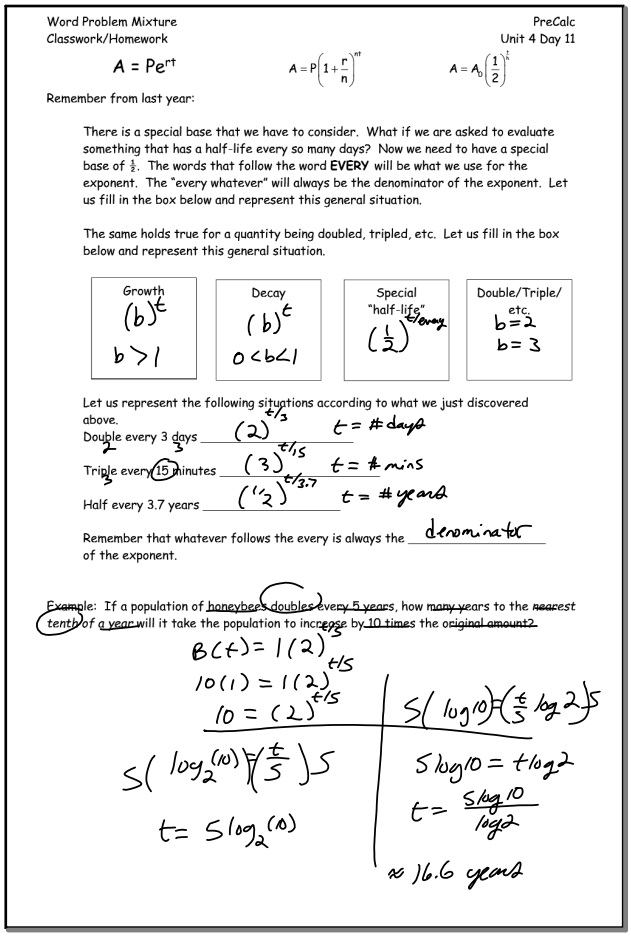
D11 Pg 1: We'll do together as a class

HW: Finish Classwork, Check Key Online Before Class

Quiz Thursday

GHW#8 Due Friday

Dec 1-9:12 PM



Word Problem Mixture
Classwork/Homework

PreCalc
Unit 4 Day 11

$A = Pe^{rt}$ $A = P\left(1+\frac{r}{n}\right)^{nt}$ $A = A_0\left(\frac{1}{2}\right)^{\frac{t}{s}}$

Remember from last year:

There is a special base that we have to consider. What if we are asked to evaluate something that has a half-life every so many days? Now we need to have a special base of $\frac{1}{2}$. The words that follow the word **EVERY** will be what we use for the exponent. The "every whatever" will always be the denominator of the exponent. Let us fill in the box below and represent this general situation.

The same holds true for a quantity being doubled, tripled, etc. Let us fill in the box below and represent this general situation.

Growth	Decay	Special "half-life"	Double/Triple/ etc.
$(b)^t$ $b>1$	$(b)^t$ $0<b<1$	$(\frac{1}{2})^{t/\text{every}}$	$b=2$ $b=3$

Let us represent the following situations according to what we just discovered above.

Double every 3 days $(2)^{t/3}$ t = # days

Triple every 15 minutes $(3)^{t/15}$ t = # mins

Half every 3.7 years $(\frac{1}{2})^{t/3.7}$ t = # years

Remember that whatever follows the every is always the denominator of the exponent.

Example: If a population of honeybees doubles every 5 years, how many years to the nearest tenth of a year will it take the population to increase by 10 times the original amount?

$B(t) = 1(2)^{t/5}$

$10(1) = 1(2)^{t/5}$

$10 = (2)^{t/5}$

$5(\log_2(10)) = (\frac{t}{5})5$

$t = 5\log_2(10)$

$5(\log 10) = (\frac{t}{5}\log 2)5$

$5\log 10 = t\log 2$

$t = \frac{5\log 10}{\log 2}$

≈ 16.6 years

For each question, solve for the missing variable before using your calculator to evaluate.

Dec 2-7:28 PM

For each question, solve for the missing variable before using your calculator to evaluate.

1. The half-life of iodine-131 is 8 days. What percent would be left after 21 days?

$A = 1\left(\frac{1}{2}\right)^{21/8}$

$A = .1621$

16.21%

2. Iridium-192 is an isotope of iridium and has a half-life of 73.83 days. If a scientist starts with 100 grams of Iridium-192, how many grams would he have left after 157 days?

$A = 100\left(\frac{1}{2}\right)^{157/73.83}$

$A =$ 22.9 grams

3. The population of China was 850,000,000 in 1990 and was growing at a rate at 4% per year (hint: base e). When did the population reach 1,000,000,000?

$1000 = 850e^{.04t}$

$\frac{20}{17} = e^{.04t}$

$\frac{\ln \frac{20}{17}}{.04} = \frac{.04t}{.04}$

$t = 4.06$

During 1994

4. A scientist discovers his sample is tripling every twenty minutes. If he started with a 5 mg sample, how long until his sample reaches 2652 mg? Round to the nearest minute.

$2652 = 5(3)^{m/20}$

$530.4 = 3^{m/20}$

$\log_3 530.4 = \frac{m}{20}$

$m = 20\log_3 530.4$

m = 114 minutes

5. The population in Britain in 1600 is believed to have been about 5 million. Three hundred fifty years later the population had increased 50 to million. What was the average percent growth rate during that period? (assume the growth rate is constant)

$50 = 5e^{350r}$

$10 = e^{350r}$

$\frac{\ln 10}{350} = r$

$r = .00657$

Growth Rate: .66%

6. A town had an initial population of 2000 and grew at a constant rate, if the population doubled after 20 years, what is the growth rate? (Hint: base e)

$2 = e^{20r}$

$\frac{\ln 2}{20} = r$

r = 3.5%

7. The weight of a culture of bacteria doubles every 8 hours. If it originally weighed 10 grams how much did it weigh after 14 hours?

$A = 10(2)^{14/8}$

$A = 33.6$ grams

8. A super-deadly strain of bacteria is causing the zombie population to double every 2 days. Currently, there are 25 zombies. After how many days will there be 25,600 zombies?

$25600 = 25(2)^{t/2}$

$1024 = 2^{t/2}$

$2^{10} = 2^{t/2}$

$10 = \frac{t}{2}$

$t = 20$

OR

$\log_2 1024 = \frac{t}{2}$

$2\log_2 1024 = t$

$t = 20$

9. You need \$5000 in 18 months when you start college. You found an interest rate of 3.5% compounded monthly. How much do you need to invest today?

$5000 = P\left(1 + \frac{.035}{12}\right)^{18}$

$P = \frac{5000}{\left(1 + \frac{.035}{12}\right)^{18}}$

$P = \$4744.63$

10. If interest is compounded quarterly, what annual rate must you receive if your investment of \$6500 is to grow to \$10,000 in 12 years?

$100 = 65\left(1 + \frac{r}{4}\right)^{48}$

$\frac{20}{13} = \left(1 + \frac{r}{4}\right)^{48}$

$\sqrt[48]{\frac{20}{13}} = 1 + \frac{r}{4}$

$4\left(\sqrt[48]{\frac{20}{13}} - 1\right) = r$

$r = 3.6\%$

In 11 & 12, round to the nearest thousandth.

11. $6^{x+1} = 11^{2-3x}$

$(x+1)\log 6 = (2-3x)\log 11$

$x\log 6 + \log 6 = 2\log 11 - 3x\log 11$

$x\log 6 + 3x\log 11 = 2\log 11 - \log 6$

$x(\log 6 + 3\log 11) = 2\log 11 - \log 6$

$x = \frac{2\log 11 - \log 6}{\log 6 + 3\log 11}$

$x = .334$

12. $5^{1-2x} = 7^{x+3}$

$(1-2x)\log 5 = (x+3)\log 7$

$\log 5 - 2x\log 5 = x\log 7 + 3\log 7$

$\log 5 - 3\log 7 = x\log 7 + 2x\log 5$

$\frac{\log 5 - 3\log 7}{\log 7 + 2\log 5} = x$

$x = -.819$

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