Pre-Calcuclus 12 **5.8 Extra Practice** **Name:** _____

1. $2000 is invested at 6%/annum for 10 years. Determine the accumulated amont if the interest is compounded:

a) annually b) semi-annually c) quarterly d) monthly

$P = 2000\left(1+\frac{0.06}{1}\right)^{10(1)}$ $P = 2000\left(1+\frac{0.06}{2}\right)^{10(2)}$ $P = 2000\left(1+\frac{0.06}{4}\right)^{10(4)}$ $P = 2000\left(1+\frac{0.06}{12}\right)^{10(12)}$

$= 2000(1.06)^{10}$ $= 2000(1.03)^{20}$ $= 2000(1.015)^{40}$ $= 2000(1.005)^{120}$

$= 3581.70$ $= 3612.22$ $= 3628.04$ $= 3,638.79$

2. How long will it take an investment of $700 to double in value at a rate of 3%/annum compounded monthly?

$1400 = 700\left(1+\frac{0.03}{12}\right)^{12t}$

$2 = 1.0025^{12t}$

$\log 2 = 12t \log 1.0025$

$t = \frac{\log 2}{12 \log 1.0025}$

$= 23.1$ years

3. A certain element has a half-life of 12 days.

a) From a 50 mg sample, how much will remain after 20 days?

$P = 50\left(\frac{1}{2}\right)^{20/12} = 15.7$ g

b) How long will it take the 50 mg sample to decay to 10 mg?

$10 = 50\left(\frac{1}{2}\right)^{t/12}$

$0.2 = \left(\frac{1}{2}\right)^{t/12}$

$\log 0.2 = \frac{t}{12}\log\left(\frac{1}{2}\right)$

$t = \frac{12 \log .2}{\log(0.5)}$

$= 27.9$ days

4. A car depreciates in value by 8% per year. If you bought a new car for $30,000, how much will it be worth in 5 years?

$1 - 0.08 = 0.92$

$P = 30,000(0.92)^5$

$= \$19,772.45$

5. The population of a town is decreasing each year. 8 years ago the population was 500,000 and is now 400,000. At what rate is the town decreasing?

$400,000 = 500,000(i)^8$

$0.8 = i^8$

$0.978 = i$

$i = 97.8\%$

decrease by 3%

6. The population of germs on a door handle doubles every 5 minutes. If there are now 100,000 germs on the door, how many germs was there 1 hour ago? 1 hour = 60 min

$100,000 = P_0(2)^{60/5}$

$\frac{100,000}{2^{12}} = P_0$ $\longrightarrow$ $P_0 = 24.4$

25 germs.

7. The populations of insects triples every 3 weeks. After 20 weeks, how many times greater is the population after 10 weeks?

$$\frac{P_0 3^{20/3}}{P_0 3^{10/3}} = 3^{20/3 - 10/3} = 3^{10/3} = 38.9 \text{ times.}$$

8. Consider the following sounds: Whisper – 30dB, Conversation – 60dB, Street traffic – 85dB
How many times as loud as:

a) A whisper is a conversation?

$$\frac{10^{60/10}}{10^{30/10}} = 10^{6-3} = 10^3 = 1000 \text{ times}$$

b) A whisper is street traffic?

$$\frac{10^{85/10}}{10^{30/10}} = 10^{\frac{85-30}{10}} = 10^{5.5} = 316,228 \text{ time.}$$

9. How loud is a chainsaw if it is twice as loud as street traffic?

$$\frac{\text{chainsaw}}{\text{street}} = 2 \rightarrow \frac{10^{x/10}}{10^{85/10}} = 2 \rightarrow 10^{\frac{x-85}{10}} = 2$$

$$\left(\frac{x-85}{10}\right)\log 10 = \log 2$$

$$\frac{x-85}{10} = \frac{\log 2}{\log 10}$$

$$x = 10\frac{\log 2}{\log 10} + 85$$

$$= 10\log 2 + 85$$

$$= 88$$

10. Consider the following earthquakes measured on the Richter Scale:
Morocco – 5.8, San Francisco – 6.9, B.C. Coast – 9.0. How many times as intense was:

a) The San Francisco (6.9) earthquake as the Morocco (5.8) earthquake?

$$\frac{10^{6.9}}{10^{5.8}} = 10^{6.9-5.8} = 10^{1.1} = 12.6 \text{ times.}$$

b) The B.C. Coast (9) earthquake as the San Francisco (6.9) earthquake?

$$\frac{10^{9}}{10^{6.9}} = 10^{2.1} = 126 \text{ time}$$

11. What is the intensity of an earthquake that is half as intense as the San Francisco earthquake?

$$\frac{10^x}{10^{6.9}} = \frac{1}{2} \Rightarrow 10^{x-6.9} = \frac{1}{2}$$

$$(x-6.9)\log 10 = \log \tfrac{1}{2}$$

$$x - 6.9 = \log \tfrac{1}{2}$$

$$x = 6.9 + \log\left(\tfrac{1}{2}\right)$$

$$= 6.6$$

6.6

12. Soda water has a pH of 3.8. What is the pH of a solution that is 5 times more acidic than soda water?

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$$\frac{10^{3.8}}{10^x} = 5$$

$$10^{3.8-x} = 5$$

$$(3.8-x)\log 10 = \log 5$$

$$3.8 - x = \log 5$$

$$3.8 - \log 5 = x$$

$$3.1 = x$$

$pH = 3.1$