Name:_____ Date:_____

Pre Calculus 12 HW Section 7.7 Applications of Exponential and Logarithmic Functions:

$A = P\left(1+\frac{r}{n}\right)^{n\times t}$ $I = A - P$ $F = I \times N^{\frac{A}{L}}$ [EQ] $\frac{I_F}{I_o} = 10^{R_F - R_o}$ [Sound] $\frac{I_F}{I_o} = 10^{\frac{D_f - D_o}{10}}$

1. The formula $A = P\left(1+\frac{r}{n}\right)^{n\times t}$ is used for compound interests. What do the variables "A", "P", "r", "n" and "t' represent? Explain:

2. In the compound interest formula, why is the interest rate 'r" divided by 'n'? Explain:

3. What does the ratio $\frac{A}{P}$ represent? Explain:

4. When using the FINAL equation, $F = I \times N^{\frac{A}{L}}$, what do the variables "F", "I", "N", "A", and "L" represent?

5. If we dealing with a scenario that involves "half-life" of a radioactive substance, what does "N" and "L" represent? Explain.

6. If we are comparing earthquake intensities with the Richter scale, what does "N" and "L" equal? Explain:

7. What does an increase of one magnitude on the Richter scale represent?

8. If we are comparing sound intensities with the decibel scale, what does "N" and "L" equal? Explain:

9. What does an increase of 20 decibels on the sound scale represent? Explain:

10. Sarah went to TD bank and deposited $50,000 at a GIC that gave an annual interest of 4.5% compounded monthly
    a) Write an equation to show how much Sarah will earn in interest after "t" years

    b) How much will Sarah earn after 7.5 years?

    c) How long will it take Sarah to earn $25,000 in interest?

    d) Suppose CIBC offers a similar GIC that gives an annual interest rate of 4.55% but is compounded annually. Which bank will allow Sarah to earn more interest? Explain and show your work:

11. Suzie plans to grow her investment from $50,000 to $85,000 in 2 years. An investment portfolio compounds their interest monthly. How much does the annual interest rate need to be for Suzie to meet her investment goals?

12. How much more is generated when interest is compounded semi-annually vs monthly vs daily? Explain:

13. BMO offers a mutual fund that gives an annual interest rate of 5.75% compounded semi-annually. At a local credit union, they offer investments that are compounded daily. At what interest rate should the credit union offer if the two institutions are to offer the same investment returns?

14. C-14 has a half life of 5370 years. C12 is stable and does not decay. Living fossils begin with equal amounts of C12 and C14. A large piece of fossil was found to contain 1200kg of C12 and 500g of C14. How old is this fossil?

15. Francium 87, is a radio active element that has a half life of 22 minutes. It decays into radium 223 that is used for radiation treatments to kill cancer cells. Francium appears naturally in the earth's crust in Uranium mines. Suppose you found 55g of francium, how long will it take to decay to 1g?

16. A radio active substance decayed from 600g to 580g in 15 years.

a) What is the half-life of the radio active substance?

b) How much of this radio active substance will be left after 100 years?

c) After how many years will there be only 1% of the substance left?

17. The intensity of an earthquake is understood as the strength in the shaking produced. For each increase of one magnitude on the Richter scale, the intensity increases by 10 folds. On April 10, 2023, at 3:54am, there was an earthquake with a magnitude of 4.7. In 1960, Chile experienced an earthquake with magnitude of 9.5. How many times more intense what the earthquake in 1960 than the one last week?

18. How many times more intense is an earthquake with a magnitude of 7.7 (Turkey) compared with one with a magnitude of 4.4 [Vancouver Island 2018]?

19. Suppose a recent earthquake was three times more intense that the recent earthquake of magnitude 4.7 in Chile. What is the magnitude on the Richter scale of this earthquake?

20. Earthquakes are also measured in Magnitudes, a measure of the amount of energy released at the source of the earthquake. For each increase in magnitude on the Richter scale, the amount of energy released will increase by 32 times. Scientists predict that a megathrust quake with the Juan de Fuca plate near western BC within the next 100 to 150 years. How much more energy will this earthquake release compared to the recent 4.7 in Chile?

21. An earthquake of magnitude of 5 will release 794,328,234,724 J of energy at the epicenter. Although deemed impossible, how many joules of energy will be released by an earthquake of magnitude 10?

22. A research was conducted to test the noise levels in restaurants. Acceptable noise levels for conversations range from 40 to 75db. How many times louder is noise at 75db compared to 40db?

23. Noise levels at 110db or more can damage your hearing if exposed for long periods of time. Exposure at 90db for 8 hours or less is acceptable. For every increase in 5 db, the acceptable exposure time is reduced by half.
    a) What is the acceptable exposure time for a loud concert at 115db?

    b) What is the acceptable exposure time for a loud argument at 100db?

    c) What is acceptable exposure time when swimming next to a sperm whale that is clicking at 233 db?