Exponential Applications

1. **Compound Interest**- $ 1000 is invested at 8% annual interest for 35 years. Determine the amount of money this grows to if interest is compounded:

(a) Annually
(b) Quarterly
(c) Monthly
(d) Continuously.

2. **Compound Interest** $ 1200 is invested at 7% annual interest for 30 years. Determine the amount of money this grows to if interest is compounded:

(a) Annually
(b) Quarterly
(c) Monthly
(d) Continuously.

3. **Compound Interest**- Suppose $25,000 is invested at 6% annual interest compounded continuously. In t years, it will grow to amount A given by $A(t) = 25{,}000e^{0.06t}$.
(a) How long will it take to accumulate $ 40,000 in the account?
(b) How long will it take for the investment to double?
(c) How long will it take for the investment to reach $ 65,000?

4 **Compound Interest**- Suppose $45,000 is invested at 8% annual interest compounded continuously. In t years, it will grow to amount A given by $A(t) = 45{,}000e^{0.08t}$.
(a) How long will it take to accumulate $ 75,000 in the account?
(b) How long will it take for the investment to double?
(c) How long will it take for the investment to reach $ 100,000?

5. **Text Messaging-** In 2000, there were approximately 60 thousand text messages sent each month through ELAC routers. This number has increased exponentially at an average rate of 16% per year. Determine the following:

(a) Exponential growth function that models this data.
(b) Estimate the number of text messages sent each month in 2005.
(c) How long will it take for text messages to double per month?
(d) How long will it take for text messages to triple per month?

6. **Text Messaging-** In 2000, there were approximately 80 thousand text messages sent each month through ELAC routers. This number has increased exponentially at an average rate of 18% per year. Determine the following:

(a) Exponential growth function that models this data.
(b) Estimate the number of text messages sent each month in 2008.
(c) How long will it take for text messages to double per month?
(d) How long will it take for text messages to triple per month?

7. **Cruise Ship Passengers**- In 1980, A cruise line carried 100,000 passengers. This number increased exponentially to 350,000 passengers in 1990.

(a) Determine the exponential growth rate and exponential growth function.
(b) Determine the year in which the cruise line will carry 1,000,000 passengers?

8. **Cruise Ship Passengers**- In 1985, A cruise line carried 150,000 passengers. This number increased exponentially to 400,000 passengers in 1992.

(a) Determine the exponential growth rate and exponential growth function.
(b) Determine the year in which the cruise line will carry 1,000,000 passengers?

9. **Half-Life-**The exponential decay rate of iodine-131 is 9.6% per day. What is its half-life?

10. **Half-Life-**The exponential decay rate of krypton-85 is 6.3% per year. What is its half-life?

11. **Caffeine**- The half-life of caffeine in the human body for a healthy adult is approximately 5 $hours$.

(a) What is the exponential decay rate?
(b) How long will it take for 95% of the caffeine consumed to leave the body?

12. **Caffeine**- The half-life of caffeine in the human body for a healthy adult is approximately 5 hours.

(a) What is the exponential decay rate?
(b) How long will it take for 80% of the caffeine consumed to leave the body?

13. **Archeology -** The half-life for carbon-14 is 5750 years. A date palm seeding is growing in Kibbutz Ketura, Israel, from seed found in King Herod's palace at Masada. The seed had lost 21% of it's carbon-14. How old is the seed?

14. **Archeology -** The half-life for carbon-14 is 5750 years. Soil from beneath the Kish Church in Azerbaijan was found to have lost 12% of it's carbon-14. How old is the soil?