Ratio vs. Rate

Figure out the ratio and the rate for each problem.

a) High school teachers are trying to kill the flu. Each day they spray their room with Lysol so that they can try and keep the germs to a minimum. Mrs. Forrester starts out with 3 million flu germs in her room and each day 1/3 die.

Ratio: $\frac{2}{3}$ $3000000\left(\frac{2}{3}\right)^x$ $\frac{1}{3}$ dies $\frac{2}{3}$ stays

Decay Rate → $-\frac{1}{3}$ OR -33%

b) You are having a bake sale. Each day you try to sell twice as much as the day before.

$40(2)^x$ Ratio = 2   Growth
$1 \to 2$
$+1 \to +100\%$

Decay

c) $A = 650\left(\frac{1}{5}\right)^t$

Ratio: $\frac{1}{5}$

Decay Rate: $-\frac{4}{5}$
$1 \to \frac{1}{5}$

d) $y = \frac{1}{2}(4)^x$

Ratio: 4
Growth Rate: 300%
$1 \to 4 +3$
$A = p\left(1 + \frac{r}{n}\right)^{nt}$

e) $A = 900\left(\frac{4}{5}\right)^t$

Decay

Ratio: $\frac{4}{5}$

Decay Factor $-\frac{1}{5}$

f) $y = 1.45^x$

Growth
Ratio: 1.45

Growth Factor: 45%
$1 \to 1.45$
$+0.45$

1. Complete table for the total amount owed after t years if p = 4,000 at a fixed rate, r = 5%, compounded monthly.

$4000\left(1 + \frac{0.05}{12}\right)^{12(2)}$

t (years)	$A = p\left(1 + \frac{r}{n}\right)^{nt}$
0	$4,000.00
1	4,204.65
2	4419.77
3	
4	
5	
6	
7	5672.14

2) Determine the pattern for the future amount of a loan at time t, calculated using simple interest. (In other words, what is the pattern in the table from problem #1; what is the ratio that each amount is being multiplied by?)

1.05116 (dividing) $\left(1 + \frac{0.05}{12}\right) = 1.0042$

3) Is the pattern that you have figured out arithmetic or geometric? Explain!

Geometric – multiply by ratio OR base

1.05116   1.0042

4) Write the explicit formula for the sequence of future values using the numbers from #1.

$A_n = A_1(r)^{n-1}$ $A_0 = 4000$ $4000(1.0042)^n$ or $4000(1.05116)^n$
$A_1 = 4204.65$

5) How does the n in the geometric seqeunce relate to the interest in the compound interest formula for future value?

$n \rightarrow$ exponent $n = nt$ $n = time$ $nt = time$ & compound times

6) How does a_1 relate to the principle amount or future value in the compound interest formula?

$a_1 =$ Principle amount (start $)

7) How does a_n relate to the principle amount or future value in the compound interest formula?

$A_n =$ future Value $n \rightarrow time$ (where you end) (end Amount)

Car

1. Your car dies and you decide that you will try to buy a new car. You can't afford an expensive car and you look on the Honda website. They advertise a Honda Civic for $159 per month for 36 months with $2,499 due at signing. Sounds pretty good, so you look at the fine print.

   Closed end lease for 20XX Civic Sedan CVT LX available from April XX, 20XX through May XX, 20XX, to well-qualified lessees approved by Honda Financial Services. Not all lessees will qualify. Higher lease rates apply for lessees with lower credit rating. MSRP $20,110.00 (includes destination, excludes tax, license, title, registration, documentation fees, options, insurance and the like). Actual net capitalized cost $16,863.12. Net capitalized cost includes $595 acquisition fee. Dealer contribution may vary and could affect actual lease payment. Total monthly payments $5,724.00. Option to purchase at lease end $12,066.00. Must take new retail delivery on vehicle from dealer stock by May 11, 20XX. Lessee responsible for maintenance, excessive wear/tear and 15¢/mile over 12,000 miles/year for vehicles with MSRP less than $30,000, and 20¢/mile over 12,000 miles/year for vehicles with MSRP of $30,000 or more. See your Honda dealer for complete details.

2. Are they advertising a lease or a loan to buy the car?

   lease (rent)

3. Suppose you pay $2,499 and pay $159 per month for 36 months. How much will you have paid, in total?

   $2499 + 159(36) = \$8233$

4. Suppose you average driving 20,000 miles per year. What is the excessive wear/tear charge for one year? For three years?

   8000 over $8000 \times 0.15 = \$1200$ 3 yrs $\downarrow \times 3 = \$3600$

5. How much will you have paid over three years (#3 and #4)?

   $8233 + 3600 = \$11,833$

6. Are there other costs to driving a leased car? What are they?

   Gas, oil, tire rotation, insurance, tag, title

7. How much is the option to purchase?

   $20,011

8. Would you purchase the car after 3 years? Why or why not?

   No, you still have $9000 to pay