

**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.  $\frac{1}{3}$  Alive  $\frac{2}{3}$   $3,000,000 \left(\frac{2}{3}\right)^x$  Ratio:  $\frac{2}{3}$   
 Factor:  $-\frac{1}{3} \rightarrow 33\%$

- 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  
 Factor:  $1 \rightarrow 2 + 1 \rightarrow 100\%$

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

Dec  
 Ratio:  $\frac{1}{5}$   
 Factor:  $-\frac{4}{5}$   
 OR  $-80\%$

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

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

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

Ratio:  $\frac{4}{5}$   
 Factor:  $-\frac{1}{5}$

f)  $y = 1.45^x$

Ratio: 1.45  
 Factor: 0.45  
 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	
3	
4	
5	
6	
7	5672.14

$\frac{4204.65}{4000}$

- 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?)

1.06417  $\left(1 + \frac{0.05}{12}\right)$

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

Geometric  $\rightarrow$  multiply by constant Ratio

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

$$A_0 = 4000 \quad A_1 = 4204.65 \quad r = 1.00417 \quad 4204.65(1.00417)^{n-1}$$

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

$$n = nt \rightarrow \text{time (yr, monthly)}$$

6) How does  $A_1$  relate to the principle amount or future value in the compound interest formula?

$$A_0 = \text{principle amount}$$

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

$$A_n = \text{Future Value}$$

### 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 ratings. 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?

$$2499 + 159(36) = \$8223$$

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

$$8000 \times 0.15 = \$1200 \rightarrow \times 3 = \$3600$$

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

$$8223 + 3600 = \$11823$$

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

Gas, insurance, tag, registration/title, oil changes, tire rotations

7. How much is the option to purchase?

$$\$12,066$$

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

No  $\rightarrow$  cost too much