1. Ron rode 8 miles on his bike in the **same amount of time** it took Harmony to ride 6 miles. Ron rides his bike at a rate of 4 miles per hour (mph) faster than Harmony.

X = HARMONY'S RATE OF SPEED

How fast was Harmony riding on her bike?

IF DISTANCES ARE THE SAME	$R_1T_1 = R_2T_2$
IF RATES ARE THE SAME	$\frac{D_1}{T_1} = \frac{D_2}{T_2}$
IF TIMES ARE THE SAME	$\frac{D_1}{R_1} = \frac{D_2}{R_2}$

$\frac{D_1}{R_1} = \frac{D_2}{R_2}$

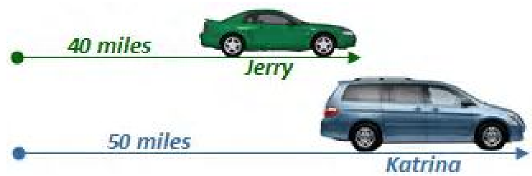
$\frac{6}{x} = \frac{8}{x+4}$

$8x = 6x + 24$
$-6x \quad -6x$
$2x = 24$

$\frac{2x}{2} = \frac{24}{2}$

$\boxed{x = 12 \text{ MPH}}$

2. Jerry drove his car a total of 40 miles in the **same time** it took his wife Katrina to drive 50 miles. Jerry drives his car at a rate of 10 miles per hour (mph) slower than Katrina.



X = KATRINA'S RATE

How fast was Katrina driving?

IF DISTANCES ARE THE SAME	$R_1T_1 = R_2T_2$
IF RATES ARE THE SAME	$\frac{D_1}{T_1} = \frac{D_2}{T_2}$
IF TIMES ARE THE SAME	$\frac{D_1}{R_1} = \frac{D_2}{R_2}$

$\frac{D_1}{R_1} = \frac{D_2}{R_2}$

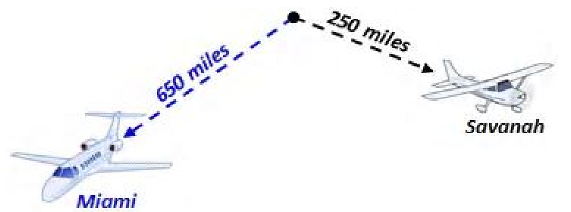
$\frac{40}{x-10} = \frac{50}{x}$

$50x - 500 = 40x$
$-50x \quad -50x$
$-500 = -10x$

$\frac{-500}{-10} = \frac{-10x}{-10}$

$\boxed{50 \text{ MPH} = x}$

3. A passenger jet flew from Atlanta to Miami (650 miles) in the **same time** it took a propeller plane to fly from Atlanta to Savanah (250 miles). The jet was flying at a rate of 400 miles per hour (mph) faster than the propeller plan.



X = PROP'S RATE OF SPEED

How fast is the propeller plane flying?

IF DISTANCES ARE THE SAME	$R_1T_1 = R_2T_2$
IF RATES ARE THE SAME	$\frac{D_1}{T_1} = \frac{D_2}{T_2}$
IF TIMES ARE THE SAME	$\frac{D_1}{R_1} = \frac{D_2}{R_2}$

$\frac{D_1}{R_1} = \frac{D_2}{R_2}$

$\frac{650}{x+400} = \frac{250}{x}$

$250x + 100000 = 650x$
$-250x \quad -250x$
$100000 = 400x$

$\frac{100000}{400} = \frac{400x}{400}$

$\boxed{250 \text{ MPH} = x}$

4. A motorboat is traveling on the Mississippi River. The boat travels at 20 miles per hour (mph) in still water. The boat went 6 miles downriver with the current in the **same amount of time** it took the boat to travel 5 miles upstream against the current.

How fast is the current?

IF DISTANCES ARE THE SAME	$R_1T_1 = R_2T_2$
IF RATES ARE THE SAME	$\frac{D_1}{T_1} = \frac{D_2}{T_2}$
IF TIMES ARE THE SAME	$\frac{D_1}{R_1} = \frac{D_2}{R_2}$

$\frac{D_1}{R_1} = \frac{D_2}{R_2}$

$\frac{6}{20+c} = \frac{5}{20-c}$

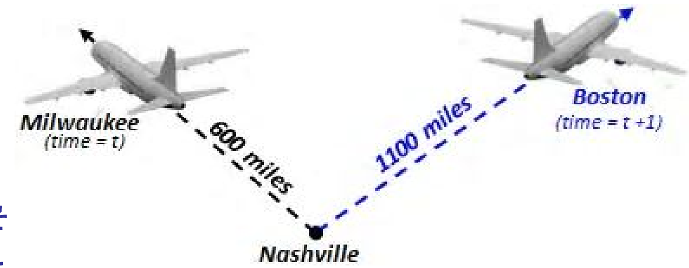
$100 + 5c = 120 - \cancel{6c}$
$+6c \quad \cancel{+6c}$
$100 + 11c = 120$

$\cancel{100} + 11c = 120$
$\cancel{-100} \quad -100$
$11c = 20$

$\frac{11c}{11} = \frac{20}{11}$

$\boxed{c \approx 1.8 \text{ MPH}}$

5. Two planes left from Nashville at the **same rate of speed**. The first plane flew to Boston for a total of 1100 miles. The second plane flew to Milwaukee for a total of 600 miles. It took the first plane flying to Boston an hour longer to reach its destination. How long did it take the second plane to travel to Milwaukee?



IF DISTANCES ARE THE SAME	: $R_1T_1 = R_2T_2$
IF RATES ARE THE SAME	: $\frac{D_1}{T_1} = \frac{D_2}{T_2}$
IF TIMES ARE THE SAME	: $\frac{D_1}{R_1} = \frac{D_2}{R_2}$

$\frac{D_1}{T_1} = \frac{D_2}{T_2}$

$\frac{600}{t} = \frac{1100}{t+1}$

$1100t = \cancel{600t} + 600$

$-600t \quad -\cancel{600t}$

$500t = 600$

$\frac{500t}{500} = \frac{600}{500}$

$\boxed{t = 1.2 \text{ hours}}$

6. A child went to a winter fair outside and got a balloon at the fair. The temperature outside was 280° Kelvin (about 44° F). When the child brought the balloon the temperature was 300° Kelvin (about 80° F). The balloon increased in size by 0.5 liters of air. How many liters of air did the balloon contain originally at the Fair?

Outside:
Temperature$_1$ = 280°K
Volume$_1$ = x

Inside:
Temperature$_2$ = 300°K
Volume$_2$ = x + 0.5

Use Charles Law: $\frac{V_1}{T_1} = \frac{V_2}{T_2}$

$\frac{x}{280} = \frac{x+.5}{300}$

$280x + 140 = 300x$

$-280x \quad -280x$

$140 = 20x$

$\frac{140}{20} = \frac{20x}{20}$

$\boxed{7\ell = x}$

7. Consider the Compound Interest Formula: $A = P\left(1 + \frac{r}{n}\right)^{nt}$

A = Value of Account after Compounding
P = Original Amount Invested
r = Annual Interest Rate as a decimal
n = Compounds per Year
t = Number of Years Interest is Accrued

a. Determine the Value of an account in which a person invested $4000 for 8 years at an annual rate of 11% compounded quarterly (n = 4).

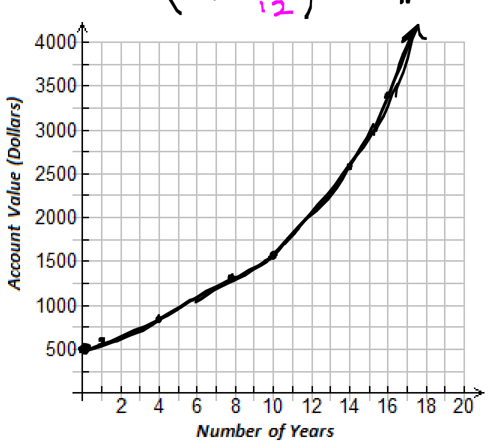
$A = 4000\left(1 + \frac{.11}{4}\right)^{4 \cdot 8} = $ 4000(1+.11/4)^(4*8) 9529.685514 $= \$9529.69$

ANNUALY : n=1
SEMI ANNUAL : n=2
QUARTERLY : n=4
MONTHLY : n=12
WEEKLY : n=52
DAILY: n=365

b. Create a sketch of a graph showing the value of an account over *t* years given an initial investment of $500 at an annual rate of 12% compounded monthly (n = 12).

$A = 500\left(1 + \frac{.12}{12}\right)^{12 \cdot 1} = \$563.41$

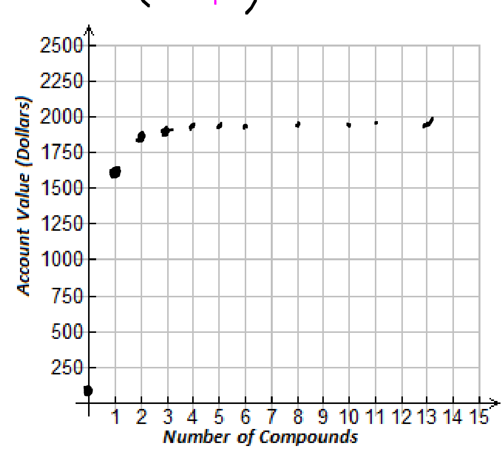
Years	Value
1	$563.41
2	$634.87
4	$806.11
8	$1299.64
10	$1650.19
12	$2095.31
14	$2660.48
16	$3378.11
20	$5446.23



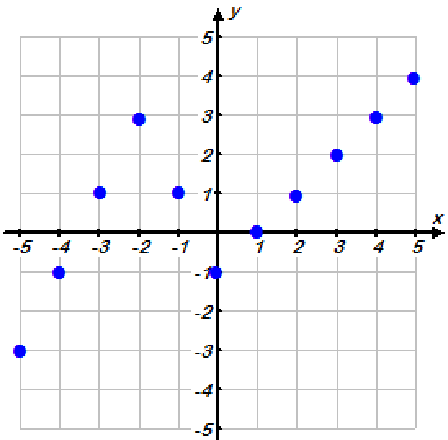
c. Create a sketch of a graph showing the value of an account for different numbers of compounds per year given the initial investment of $100 at an annual rate of 15% compounded *n* times over the course of 20 years.

$A = 100\left(1 + \frac{.15}{1}\right)^{1 \cdot 20}$

Compound	Value
1	$1636.65
2	$1804.42
3	$1867.92
4	$1909.21
6	$1935.81
8	$1953.53
10	$1964.30
12	$1971.55
14	$1976.76

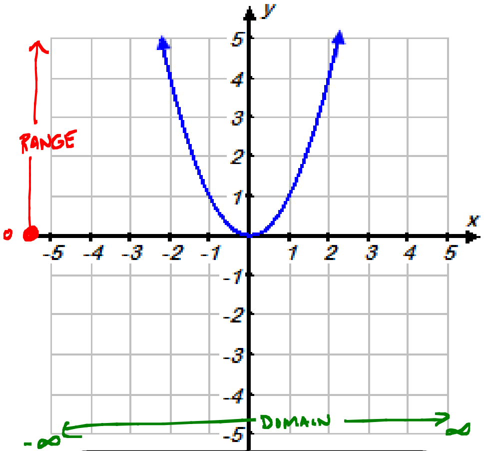


8. Describe the domain and range of each function below as **DISCRETE** or **CONTINUOUS**



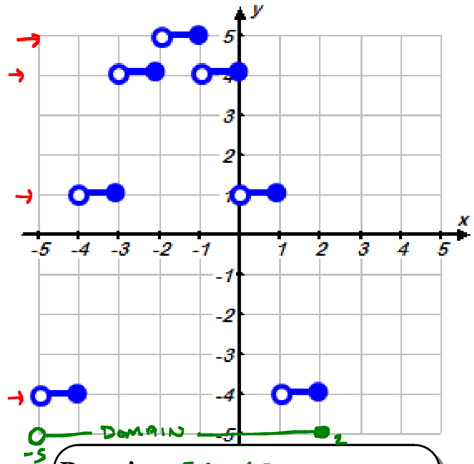
Domain: {-5, -4, -3, ..., 3, 4, 5} DISCRETE

Range: {-3, -1, 0, 1, 2, 3, 4} DISCRETE



Domain: ALL REALS (ℝ) (-∞, ∞) CONTINUOUS

Range: y ≥ 0 [0, ∞) CONTINUOUS



Domain: -5 < x ≤ 2 (-5, 2] CONTINUOUS

Range: {-4, 1, 4, 5} DISCRETE

9. A postal company delivers packages based on their weight but will not ship anything over 50 pounds. The company charges $0.50 per pound (ROUNDED UP TO NEAREST POUND) to deliver the package anywhere in the United States. If we consider this situation a function where the number of pounds, ***x***, is the independent variable and the cost in dollars, ***y***, is the dependent variable determine the domain and range.

$0.50, $1.00, (50 POUNDS)(.50) 25.00

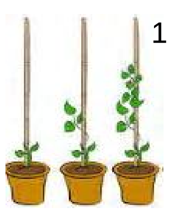
Domain: 0 < x ≤ 50 (CONTINUOUS)

Range: {$0.50, $1.00, $1.50, ... $25} (DISCRETE)

10. A limousine company rents their limousine by the hour. The company charges $85 per hour. The minimum time is 2 hours and a maximum of 12 hours. If we consider this situation a function where the number of hours, ***x***, is the independent variable and the cost in dollars of renting the limousine, ***y***, is the dependent variable determine the domain and range.

Domain: 2 ≤ x ≤ 12 [2, 12] (CONTINUOUS)

Range: {$170, $170.01, $170.02, ..., $1020} (DISCRETE)



11. A student is growing a bean plant outside for a science project. The plants grow for 12 weeks before reaching their maximum height. The student consider the week she started growing the plant to be week 0 and then realized that the plant closely followed the function model $h(x) = 1.5 \cdot (1.2)^x$, where ***x*** represents the number of weeks grown and $\boldsymbol{h(x)}$ represents the height of the plant in inches. Using the function model describe the appropriate domain and range.

```
1.5(1.2)^0
              1.5
1.5(1.2)^12
        13.37415067
```

Domain: 0 ≤ x ≤ 12 (CONTINUOUS)

Range: 1.5 ≤ y ≤ 1.37 (CONTINUOUS)

12. A vending company realized a relationship between the number of people present at the stadium during a Braves game and the number of hot dogs they sold. The minimum attendance due to players and support staff is 361 people and the maximum people that could be at the stadium is 86,436 people. The relationship that describes the number of hot dogs sold very closely followed the function model $h(x) = 15 \cdot \sqrt{x}$ where ***x*** represents the number of people at the stadium and $\boldsymbol{h(x)}$ represents the number of hot dogs sold. What is the domain and range of the model?

```
15√(361)
           285
15√(86436)
           4410
```

ANY INTEGER FROM 361 TO 86436 →

Domain: {361, 362, ..., 86436} DISCRETE

ANY INTEGER FROM 285 TO 4410. →

Range: {285, 286, ..., 4410} DISCRETE