

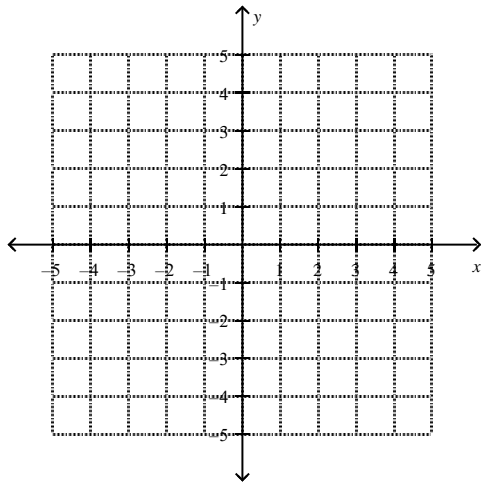
Linear Modeling/Regression

FUNCTION NOTATION

Given the function notation of a coordinate:

a) Rewrite the coordinate as (x, y) b) Plot the point on the graph and give the quadrant it lies in

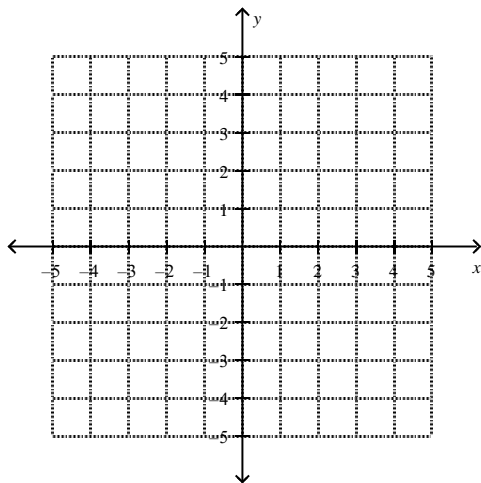
- 1) $f(3) = 4$ 2) $f(-2) = 3$ 3) $f(-4) = -2$ 4) $f(5) = -1$



Given the function find the following coordinates and then graph the function

1. $f(x) = -2x + 4$

- a) $f(3) = 4$ b) $f(-2) =$ c) $f(-4) =$ d) $f(5) =$



Given the function and the functions value find the following coordinates and then graph the function

1. $f(x) = -2x + 4$

a) $f(x) = 4$

b) $f(x) = -10$

c) $f(x) = -6$

d) $f(x) = 5$

Arithmetic Sequences: Function and Recursive Rules

Find the function/explicit rule from the table given below.

x	0	1	2	3	4
f(x)	9	12	15	18	21

Find the recursive rule from the table given below.

n	0	1	2	3	4
a_n	9	12	15	18	21

Find the function/explicit rule from the table given below.

x	0	1	2	3	4
f(x)	5	3	1	-1	-3

Find the recursive rule from the table given below.

n	0	1	2	3	4
a_n	5	3	1	-1	-3

Find the function/explicit rule from the table given below.

x	1	2	3	4	5
f(x)	20	15	10	5	0

Find the recursive rule from the table given below.

n	1	2	3	4	5
a _n	20	15	10	5	0

Find the function/explicit rule from the table given below.

x	1	2	3	4	5
f(x)	10	12	14	16	18

Find the function/explicit rule from the table given below.

n	1	2	3	4	5
a _n	10	12	14	16	18

Given the function rule, make a table for the values of $x = 0, 1, 2, 3, 4$

A) $f(x) = -4x + 10$

B) $f(x) = 5x - 50$

Given the recursive rule, find the first 5 terms of the sequence

A) $a_n = a_{n-1} + 3$ $a_0 = 5$

B) $a_{n+1} = a_n - 2$ $a_1 = 10$

C) $a_n = a_{n-1} + 10$ $a_0 = 10$

D) $a_{n+1} = a_n - 5$ $a_1 = 10$

Complete the table and then write the function/explicit rule and the recursive rule

Term	1st	2nd	3rd	4th	5th	6th	7th	8th
Value	66	50	34	18				

Term	1st	2nd	3rd	4th	5th	6th	7th	8th
Value	-9	-2	5	12				

Fill in the table. Then write the function/explicit rule and the recursive rule

13. You run a business making birdhouses. You spend \$600 to start your business, and it costs you \$5.00 to make each birdhouse.

# of birdhouses	1	2	3	4	5	6	7
Total cost to build							

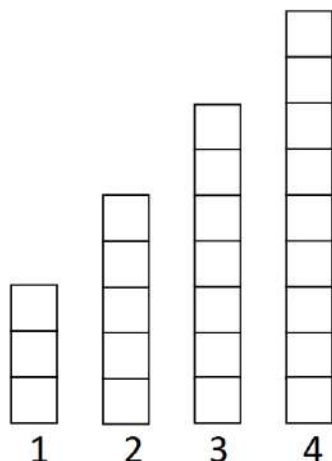
14. You borrow \$500 from a relative, and you agree to pay back the debt at a rate of \$15 per month.

# of months	1	2	3	4	5	6	7
Amount of money owed							

16. You are saving for a bike and can save \$10 per week. You have \$25 already saved.

# of weeks	1	2	3	4	5	6	7
Amount of money saved							

Scott has decided to add push-ups to his daily exercise routine. He is keeping track of the number of push-ups he completes each day in the bar graph below, with day one showing he completed three push-ups. After four days, Scott is certain he can continue this pattern of increasing the number of push-ups he completes each day.



1. How many push-ups will Scott do on day 10?
2. Model the number of push-ups Scott will complete on any given day as a function/explicit rule.
3. Model the number of push-ups Scott will complete on any given day as a recursive rule.

Find the next 3 terms in each sequence. Identify the constant difference. Write a recursive function and an explicit function for each sequence. (The first number is the 1st term, not the 0th). Circle the constant difference in both functions.

4. 3, 8, 13, 18, 23, _____, _____, _____, ... Constant Difference: _____

Recursive Function: _____ Explicit Function: _____

5. 11, 9, 7, 5, 3, _____, _____, _____, ... Constant Difference: _____

Recursive Function: _____ Explicit Function: _____

6. 3, 1.5, 0, -1.5, -3, _____, _____, _____, ... Constant Difference: _____

Recursive Function: _____ Explicit Function: _____

Find the missing terms for each arithmetic sequence and state the constant difference.

1. 5, 11, ____, 23, 29, ____...

Constant Difference = _____

2. 7, 3, -1, ____, ____, -13...

Constant Difference = _____

3. 8, ____, ____, 47, 60...

Constant Difference = _____

4. 0, ____, ____, 2, $\frac{8}{3}$...

Constant Difference = _____

5. 5, ____, ____, ____, 25...

Constant Difference = _____

6. 3, ____, ____, ____, -13 ...

Constant Difference = _____

Two consecutive terms in an arithmetic sequence are given. Find the constant difference and the recursive equation.

7. If $f(3) = 5$ and $f(4) = 8$

$f(5) = \underline{\hspace{2cm}}$. $f(6) = \underline{\hspace{2cm}}$. Recursive Function: _____

8. If $f(2) = 20$ and $f(3) = 12$.

$f(4) = \underline{\hspace{2cm}}$. $f(5) = \underline{\hspace{2cm}}$. Recursive Function: _____

9. If $f(5) = 3.7$ and $f(6) = 8.7$.

$f(7) = \underline{\hspace{2cm}}$. $f(8) = \underline{\hspace{2cm}}$. Recursive Function: _____

Selling Credit Cards: Companies that offer credit cards pay the people who collect applications for those cards and the people who contact current cardholders to sell them additional financial services

How are patterns in tables of values, graphs, symbolic rules, and problem conditions for linear functions related to each other?

1. For collecting credit card applications, Barry's daily pay B is related to the number of applications he collects n by the rule $B = 5 + 10n$.

a. Use the function rule to complete this table of sample (n, B) values:

Number of Applications	0	1	2	3	4	5	10	20	50
Daily Pay (in dollars)									

b. Graph the data on a piece of graph paper.

c. i) How much will Barry earn on a day when he does not collect any credit card applications?

ii) How can this information be seen in the rule $B = 5 + 10n$?

iii) How can this information be seen In the table of sample (n, B) values?

iv) How can this information be seen In the graph?

d. i) How much additional money does Barry earn for each application he collects?

ii) How can this information be seen in the rule $B = 5 + 10n$?

iii) How can this information be seen in the table?

iv) How can this information be seen in the In the graph?

e. Write a recursive rule for the situation described above.

Cheri also works for the credit card company. She calls existing customers to sell them additional services for their account. The next table shows how much Cheri earns for selling selected numbers of additional services

Number of Services sold	10	20	30	40	50
Daily Pay (In dollars)	50	80	110	140	170

a. Does Cheri's daily pay appear to be a linear function of the number of services sold? Explain.

b. Assume that Cheri's daily pay is a linear function of the number of services she sells, and calculate the missing entries in the next table.

Number of services sold	0	10	15	20	25	30	40	50	100	101
Daily Pay (In dollars)		50		80		110	140	170		

A key feature of any function is the way the value of the dependent variable changes as the value of the independent variable changes. Notice that as the number of services Cheri sells increases from 30 to 40, her pay increases from \$110 to \$140. This is an increase of \$30 in pay for an increase of 10 in the number of services sold, or an average of \$3 per sale. Her pay increases at a *rate* of \$3 per service sold.

c. i) Using your table from Part b, study the *rate of change* in Cheri's daily pay as the number of services she sells increases by completing entries in a table like the one below.

Change in Sales	Change in Pay	Rate of change = $\frac{\Delta y}{\Delta x} = \frac{\text{Change in Pay}}{\text{Change in Sales}}$
10 to 20		
20 to 25		
25 to 40		
50 to 100		

d. Write a recursive rule for the situation

e. Write a function rule for the situation

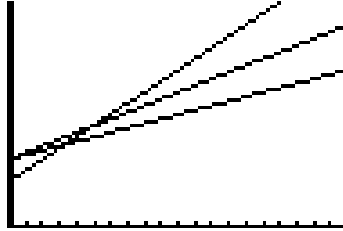
ii. What do the numbers in the rule(s) you wrote tell you about Cheri's daily pay?

3. The diagram below shows graphs of pay plans offered by three different banks to employees who collect credit card applications.

Atlantic Bank: $A = 30 + 3n$

Boston Bank: $B = 20 + 5n$

Consumers Bank: $C = 30 + 2n$



- a.** Match each function rule with its graph. Explain how you can make the matches without calculations or graphing tool help.
- b.** What do the numbers in the rule for the pay plan at Atlantic Bank tell you about the relationship between daily pay and number of credit card applications collected?
- c.** What do the numbers in the rule for the pay plan at Consumers Bank tell you about the relationship between daily pay and number of credit card applications collected?
- d.** What do the numbers in the rule for the pay plan at Boston Bank tell you about the relationship between daily pay and number of credit card applications collected?

4. Buying on Credit Electric Avenue sells audio/video, computer, and entertainment products. The store offers 0% interest for 12 months on purchases made using an Electric Avenue store credit card. Emily purchased a television for \$520 using an Electric Avenue store credit card. Suppose she pays the minimum monthly payment of \$30 each month for the first 12 months.

a. Complete a table of (*number of monthly payments, account balance*) values for the first 6 months after the purchase.

Number of Monthly Payments	0	1	2	3	4	5	6
Account Balance (in dollars)							

b. Graph the data on a piece of graph paper. c. Will Emily pay off the balance within 12 months?

d. Write a recursive rule for the situation above. e. Write a function rule for the situation above.

f. Determine the rate of change, including units, in the account balance as the number of monthly payments increases from:

Change in Sales	Change in Account Balance	Rate of change = $\frac{\Delta y}{\Delta x} = \frac{\text{Change in Pay}}{\text{Change in Sales}}$
0 to 2		
2 to 3		
3 to 6		

g. How does the rate of change reflect the fact that the account balance *decreases* as the number of monthly payments increases?

i. How can the rate of change be seen in the graph? ii) How can the rate of change be seen in the function rule.

iii) How can the rate of change be seen in the table.

h. What was the starting account balance for the situation?

i. How can the starting balance be seen in the graph? ii) How can the starting balance be seen in the table.

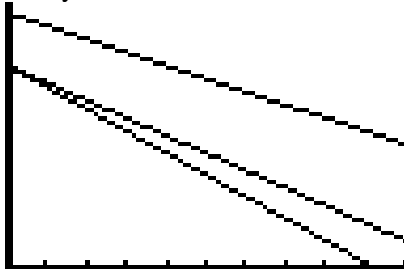
iii) How can the starting account balance be seen in the function rule.

5. The diagram below shows graphs of account balance functions for three Electric Avenue customers.

Emily: $E = 580 - 30m$

Darryl: $D = 460 - 50m$

Felicia: $F = 460 - 40m$



- a.** Match each function rule with its graph. Explain how you could make the matches without calculations or graphing tool help.
- b.** What do the numbers in the rules for Darryl's account balances tell you about the values of their purchases and their monthly payments?
- c.** What do the numbers in the rules for Felicia's account balances tell you about the values of their purchases and their monthly payments?
- d.** What do the numbers in the rules for Emily's account balances tell you about the values of their purchases and their monthly payments?

Linear or Non-Linear Given a Table

x	5	10	15	20
y	13	28	43	58

x	3	6	9	12
y	12	10	8	6

Building	Stories	Height (ft)
Harris Bank III	35	510
One Financial Place	40	515
Kluczynski Federal Building	45	545
Mid Continental Plaza	50	582
North Harbor Tower	55	556

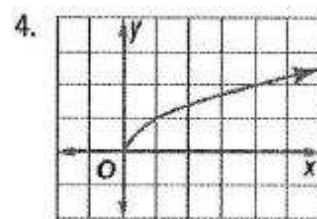
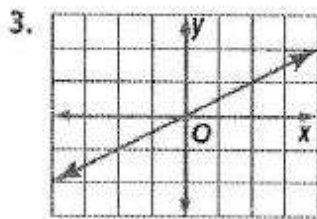
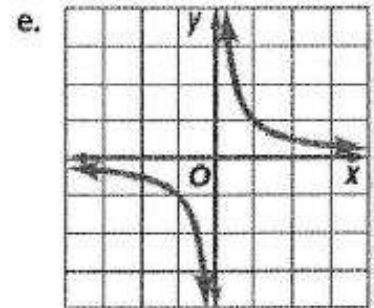
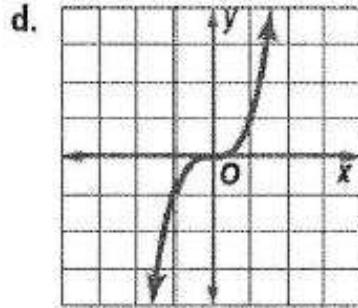
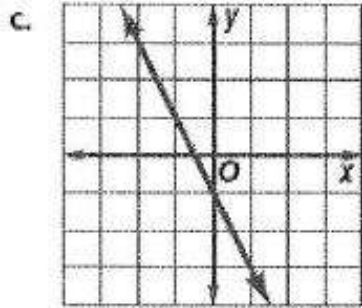
Source: *The World Almanac*

x	y
13	7
15	10
17	13
19	16

x	y
10	3
15	6
25	9
30	12

Time (h)	1	2	3	4
Distance (mi)	65	130	195	260

Linear or Non-Linear Given a Graph or Equation



f. $y = 2x^3 + 1$

g. $y = 3x$

h. $y = \frac{x}{5}$

5. $y = \frac{x}{3}$

6. $y = 2x^2$

How do you use information in a table, a graph, or the conditions of a problem to write a symbolic rule for a linear function?

1. Dunking Booth Profits The student council at Eastern High School decided to rent a dunking booth for a fund-raiser. They were quite sure that students would pay for chances to hit a target with a ball to dunk a teacher or administrator in a tub of cold water. The dunking booth costs \$200 to rent for the event, and the student council decided to charge students \$0.25 per throw.

a. How do you know from the problem description that *profit* is a linear function of the *number of throws*?

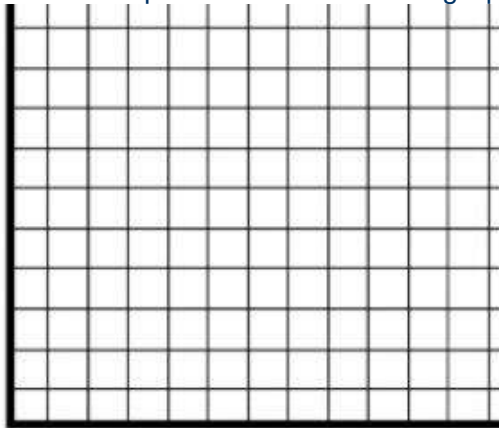
b. Write a recursive rule for the dunking booth profits.

c. Write a function rule that shows how to calculate the profit P in dollars if t throws are purchased.

d. i. What do the coefficient of t and the constant term in your rule from Part c tell about: the graph of profit as a function of number of throws?

ii. What do the coefficient of t and the constant term in your rule from Part c tell about: a table of sample (*number of throws*, *profit*) values?

e. Graph the function on the graph below



Arcade Prices : The owners of Game Time, Inc. operate a chain of video game arcades. They keep a close eye on prices for new arcade games and the resale value of their existing games. One set of predictions is the resale value of their existing games. One set of predictions is shown in the graph below.

a. Which of the linear functions in the graph predicts the future price of **classic arcade games**?



b. Which predicts the future resale value of arcade games that are **purchased now**? **i.** Find the slope and y-intercept for the classic arcade games.

Classic Arcade Games: slope = y-intercept = equation =

Games purchased now: slope = y-intercept = equation =

ii. Explain what these values tell about classic arcade game prices.

3. Turtles The Terrapin Candy Company sells its specialty—turtles made from pecans, caramel, and chocolate—through orders placed online. The company web page shows a table of prices for sample orders. Each price includes a fixed shipping-and-handling cost plus a cost per box of candy.

Number of Boxes	1	2	3	4	5	10
Price(in Dollars)	20	40	60	80	100	200

a. Explain why that price seems to be a linear function of the number of boxes ordered.

b. What is the rate of change in order price as the number of boxes increases?

c. Write a rule for calculating the price P in dollars for n boxes of turtle candies.

d. Use your rule to find the price for 6 boxes and the price for 9 boxes of turtle candies.

Mult. Representations – Car Mileage Toolkit

Name: _____

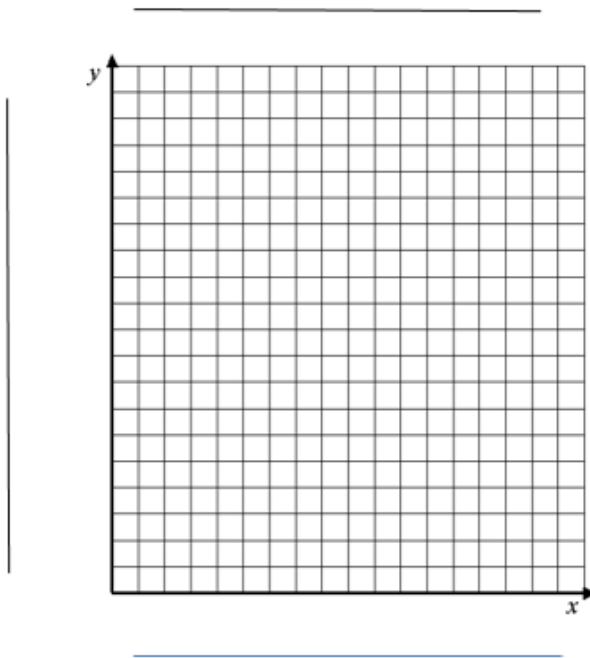
1. Your new Honda Civic car uses 1 gallon of gasoline every 25 miles. Right after filling the tank you start keeping track of how far you have driven.

a.) Fill in the data table below and then make a graph to show the distance the truck travels on various amounts of fuel.

Start	1 gal	2 gal	3 gal	4 gal	5 gal

b.) What is the rate of change?

c.) Draw a graph of this relationship. Be sure to label your axes.



c.) Write a " $f(x) =$ " rule for this relationship.

d.) Check your rule against the table. Use the " $f(x) =$ " rule to find how many miles you have driven after using 4 gallons of gas.

e.) How far have you traveled after you have used 10.5 gallons?

f.) How many gallons does it take to drive 245 miles in your car?

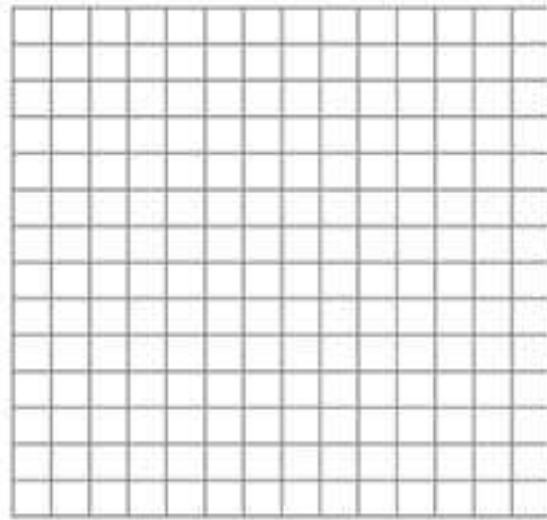
g. If your car holds 15 gallons of gasoline. Can you drive 360 miles on one tank of gas? _____ Explain Your answer.

2. Charlie purchased a new iPad mini. He borrowed the money from his parents who generously will not charge him interest. Suppose he pays his parents the same amount each month. The table below shows the account balance after each monthly payment up to 6 months.

Number of Monthly Payments	1	2	3	4	5	6
Account Balance (in dollars)	400	360	320	280	240	200

a) Make a graph of the data provided in the table. Be sure to clearly label the axes and use appropriate scales.

b) Does Charlie's account balance appear to be a linear function of the number of monthly payments Explain.



c) How much is Charlie paying each month? (this is the rate of change) _____

d) What did the iPad Mini cost? _____ How can you see this on the graph? _____

e) Write a rule that gives Charlie's balance, B , after m monthly payments have been made. _____

f) How much will Charlie's balance be after 1 **year**? _____ After 18 **months**? _____

g) When will Charlie owe only \$40? (Show your work)