

Name: key

Date: _____

Period: _____

SAS 2: Recursion and Linear Functions

Warm Up:

1. Scatterplots display bi-variate data. Scatterplots are discrete functions. (You do NOT connect the dots)

2. Given the following graph, answer the questions below.



a) What information does the graph above provide?

age vs. weight comparison

b) Describe the scatterplot in terms of form, direction, and strength.

form - relatively linear; direction - positive; strength - fairly strong

c) Can you infer that the older a person is the more he/she weighs?

yes, but one doesn't necessarily cause the other.

d) Does the graph display a cause and effect relationship?

no - weight is not caused by age. ex. you can gain & lose weight whenever

3. Read the scenarios below and determine whether it represents correlation or causation.

➤ A recent study showed that college students were more likely to vote than their peers who were not in school.

correlation

➤ Mr. Duncan noticed that there was more trash in the hallways after 2nd period than 1st period.

correlation

➤ You hit your little sister and she cries.

causation

4. Read the scenarios below and determine whether it represents positive, negative, or no correlation

➤ The number of hours workers receive safety training vs. the number of accidents on the job. negative

➤ The number of students at Chattahoochee vs. the number of pet iguanas in Atlanta. no correlation

➤ The number of rice dishes eaten vs. the number of cars on I-285 throughout the day. no correlation

➤ The number of calories burned vs. the amount of hours walked positive

➤ The number of hours you work and the amount of money you make positive

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SAS 2: Recursion and Linear Functions

1. Coen decides to take a job with a company that sells magazine subscriptions. He is paid \$20 to start selling and then earns \$1.50 for each subscription he sells. Fill in the following table, showing the amount of money (**M**) Coen earns for selling **n** subscriptions. Use the process column to note what is happening in each line.

n	Process	M_n
0		$M_0 = \$20$
1	$20 + 1.50 = 21.50$ or $M_1 = M_0 + 1.50$	$M_1 = \$21.50$
2	$21.50 + 1.50$	$M_2 = \$23$
3	$23 + 1.50$	$M_3 = \$24.50$
4	$24.50 + 1.50$	$M_4 = \$26$

2. Write a recursive rule using the following format for the amount of money Coen can earn selling magazine subscriptions.

$$M_{n+1} = M_n + \underline{1.50}, \text{ where } n = 0, 1, 2, 3, \dots \text{ and } M_0 = \underline{20}$$

What does M_{n+1} represent? (explicit rule)
the next term in the sequence (based off the 0th term $\rightarrow a_0$)

What does M_n represent?
the "nth" term in the sequence

3. **REFLECTION:** The rule in Question 2 defines a term (M_{n+1}) with respect to the term that precedes it (M_n). Write a rule that defines a term (M_n) with respect to the term that precedes it (M_{n-1})? How is this rule similar to and different from the rule you wrote in Question 2?

$$M_n = M_{n-1} + \underline{1.50}, \text{ where } n = 1, 2, 3, \dots \text{ and } M_0 = \underline{20}$$

What does M_{n-1} represent? (explicit rule)
the next term in the sequence based off the 1st term $\rightarrow a_1$

Now what does M_n represent?
your "nth" term in the sequence

you've seen it as $M_n = dn + M_0$

4. Write an explicit function rule for the n th term in the sequence describing the amount of money Coen can earn. Describe any domain restrictions in your rule.

$$M_n = 20 + 1.5n ; n = 0, 1, 2, 3, \dots$$

What is the constant difference of this function?

$d = 1.5 \rightarrow$ constant rate of change

What is the start value?

$$a_0 = 20$$

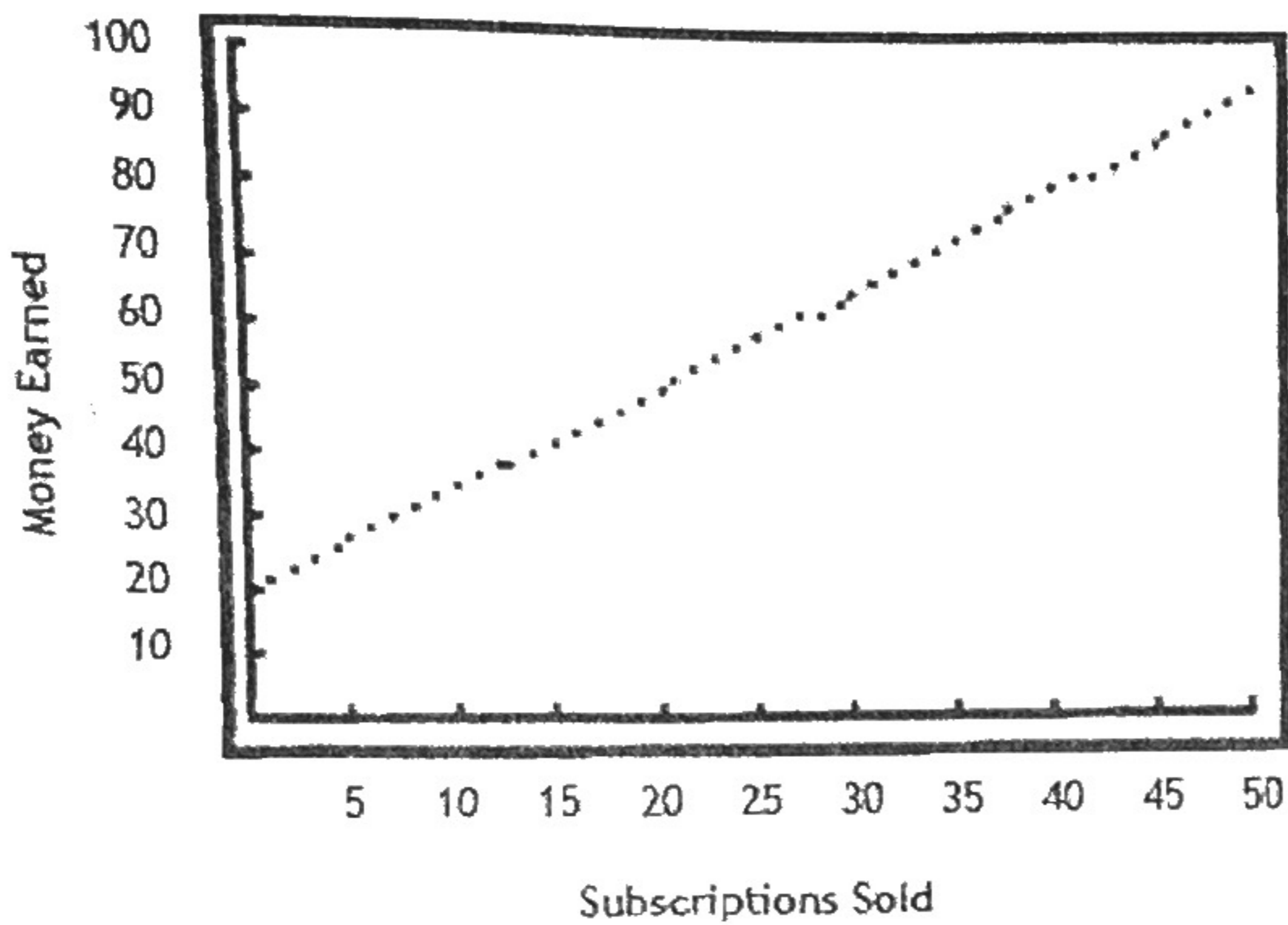
Explicit Function Rule for Arithmetic Sequences: $M_n = M_1 + (n-1)d$

(you've seen $a_n = a_1 + (n-1)d$)

OR $M_n = dn + M_0$

$$M_n = 21.5 + (n-1)(1.5)$$

5. Describe the scatterplot shown. Be sure to include form, direction, and relative strength in your description.



The scatterplot shows that the data lies along a straight line. The data is strongly associated and has a positive correlation. This is expected since the data was generated by adding the constant 1.5 to each term in the sequence.

6. How much does Coen earn if he sells 100 magazine subscriptions?

$$M_n = 1.5n + 20$$

$$M_{100} = 1.5(100) + 20 = 150 + 20 = \$170$$

Which rule did you use to answer this question?

$$M_n = 1.5n + 20 \text{ solve for } n=100.$$

Why did you choose that rule?

with $n=100$, the explicit rule is the most helpful.

7. Coen is trying to earn enough money to buy a new MP3 player. He needs \$225 to cover the cost and tax on the MP3 player. How many magazine subscriptions does Coen need to sell to buy his new MP3 player? Justify your answer. Which rule did you use to answer this question? Why did you choose that rule?

$$225 = 1.5n + 20$$

$$205 = 1.5n$$

$$n = 136.67 = 137$$

He needs to sell 137 magazines.

I used explicit but you could also use recursive or the table generated by the function rule.

8. Your phone service allows you to add international long distance to your phone. The cost is a \$5 flat fee each month and 3¢ a minute for calls made.

$$s = \text{phone service cost} \quad 5, 5.03, 5.06, \dots$$

Write a recursive rule describing your monthly cost for international calls.

$$S_n = S_{n-1} + 0.03, S_0 = 5, n \geq 0$$

Write an explicit rule for the n minutes of calls made in a month.

$$S_n = 0.03n + 5, n \geq 0$$