

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

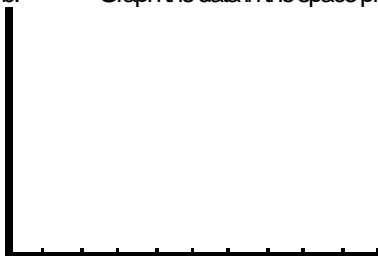
Selling Credit Cards Companies that offer credit cards pay the people who collect applications for those cards and the people who contact current cardholders to sell them additional financial services.

1. For collecting credit card applications, Barry's daily pay B is related to the number of applications he collects n by the rule $B = 20 + 5n$.

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 in the space provided below.



c. Compare the pattern of change shown in your table with that shown in the graph.

d. 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 $B = 20 + 5n$?

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 $B = 20 + 5n$?

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

iv) How can this information be seen 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) | 60 | 80 | 100 | 120 | 140 |

- 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 Earnings (in dollars) | | 60 | | 80 | | 100 | 120 | 140 | | |

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 \$100 to \$120. This is an increase of \$20 in pay for an increase of 10 in the number of services sold, or an average of \$2 per sale. Her pay increases at a *rate* of \$2 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 (in \$) | Rate of Change (in \$ per sale) |
|------------------------|------------------------------|--|
| 10 to 20 | | |
| 20 to 25 | | |
| 25 to 40 | | |
| 50 to 100 | | |

- c. ii) What do you notice about the rate of change in Cheri's daily pay as the number of services she sells increases?
- d. Write a recursive rule that describes the situation above
- e. Consider the following function rules.

i) $C = 2 + 40n$ ii) $C = n + 2$ iii) $C = 40 + 2n$ iv) $C = 50 + \frac{n}{2}$ v) $C = 50 + 2n$

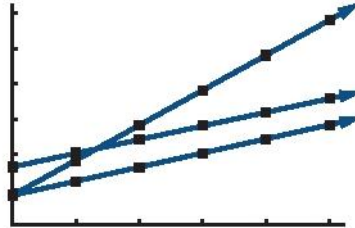
- i. Which of the rules show how to calculate Cheri's daily pay C for any number of services n she sells? How do you know?
- ii. What do the numbers in the rule(s) you selected tell you about Cheri's daily pay?

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

Atlantic Bank: $A = 20 + 2n$

Boston Bank: $B = 20 + 5n$

Consumers Bank: $C = 40 + 2n$



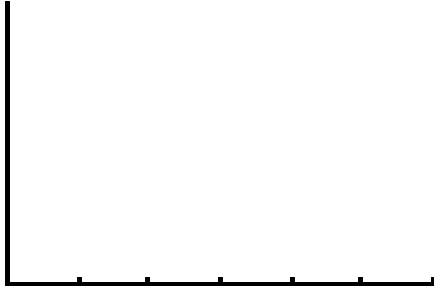
- a.** Match each function rule with its graph. Explain how you can make the matches without calculations or graphing tool help.
- b.** What do the numbers in the rule for the pay plan at Atlantic Bank tell you about the relationship between daily pay and number of credit card applications collected?
- 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?
- b.** 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 \$480 using an Electric Avenue store credit card. Suppose she pays the minimum monthly payment of \$20 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, then plot those values on a graph.

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



b. Will Emily pay off the balance within 12 months? How do you know?

c. Write a recursive rule for the situation above.

d. Which of the following function rules gives Emily's account balance E after m monthly payments have been made?

i) $E = 20m - 480$ ii) $E = m - 20$ iii) $E = -20m + 480$ iv) $E = 480 + 20m$ v) $E = 480 - 20m$

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

| Monthly Payments | Rate of change |
|------------------|----------------|
| 0 to 2 | |
| 2 to 3 | |
| 3 to 6 | |

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

ii. How can the rate of change be seen in the graph from Part a?

iii) How can the rate of change be seen In the function rule(s) you selected in Part d?

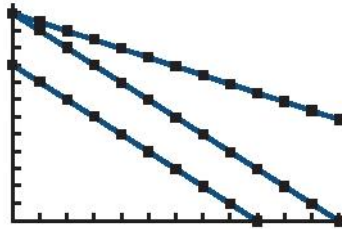
f. How can the starting account balance be seen in the table in Part a?

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

Emily: $E = 480 - 20m$

Darryl: $D = 480 - 40m$

Felicia: $F = 360 - 40m$



- 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?