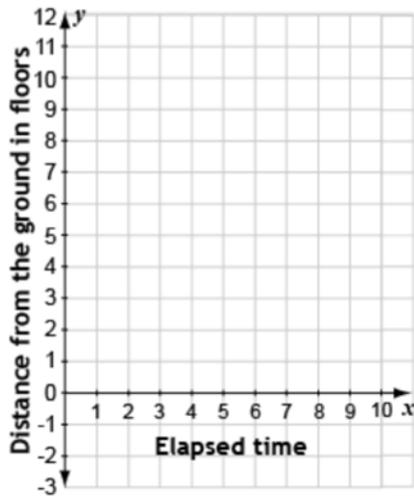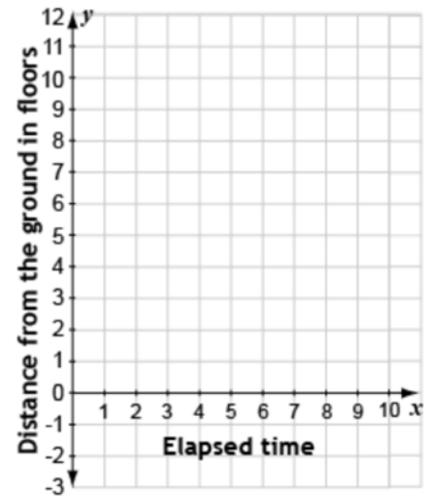# Rate of change
Student Activity Sheet 2; use with *Exploring* "Constant rates"

1. Sketch the graphs of Elevator A and Elevator B. Use a solid line for Elevator A and a dotted line for Elevator B.
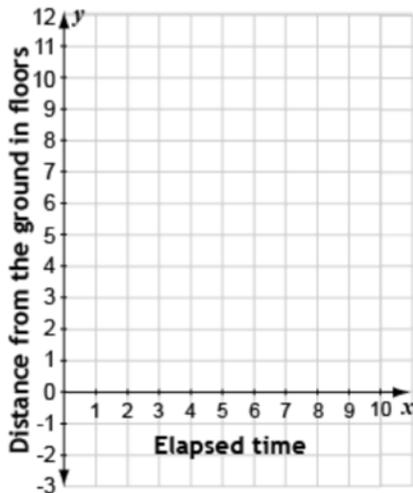
   a. Elevator A: Start at floor 3 at rate -2.
      Elevator B: Start at floor 3 at rate 2.
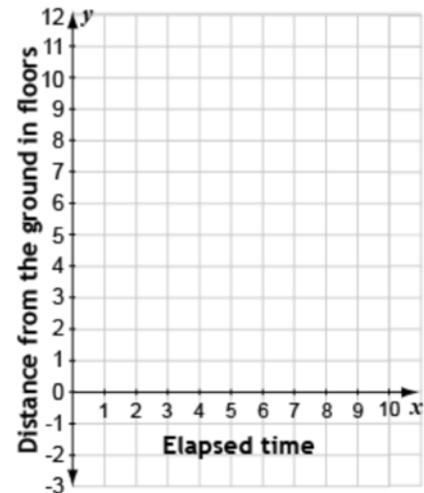
   b. Elevator A: Start at floor 11 at rate -2.
      Elevator B: Start at floor -3 at rate 2.

   c. Elevator A: Start at floor 12 at rate -1.
      Elevator B: Start at floor 12 at rate -2.

   d. Elevator A: Start at floor 12 at rate -1.
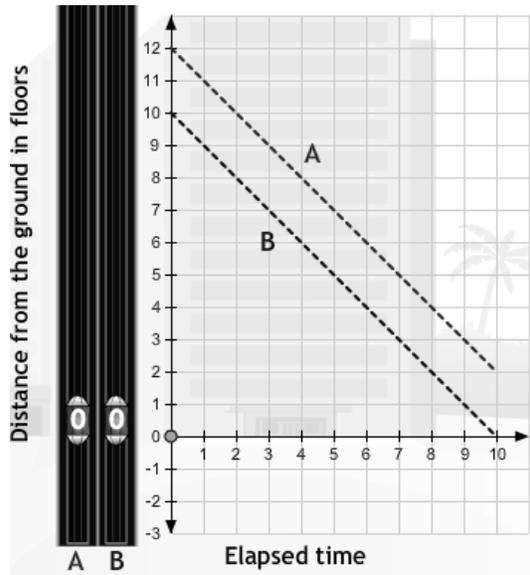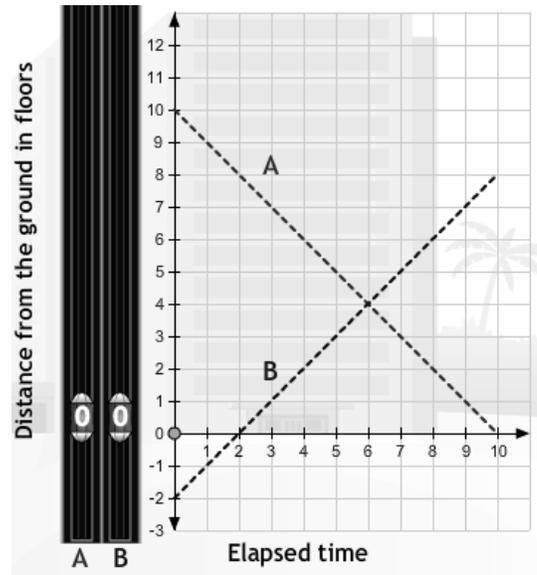   Elevator B: Start at floor 8 at rate -1.

Rate of change
Student Activity Sheet 2; use with *Exploring* "Constant rates"

2. Use the animation to match the graph by changing the elevator settings.

a. Elevator A: Start: ___ Rate: ____
   Elevator B: Start: ___ Rate: ____

b. Elevator A: Start: ____ Rate: ____
   Elevator B: Start: ____ Rate: ____

c. Elevator A: Start: ____ Rate: ____
   Elevator B: Start: ____ Rate: ____

d. Elevator A: Start: ____ Rate: ____
   Elevator B: Start: ____ Rate: ____

Rate of change
Student Activity Sheet 2; use with *Exploring* "Constant rates"

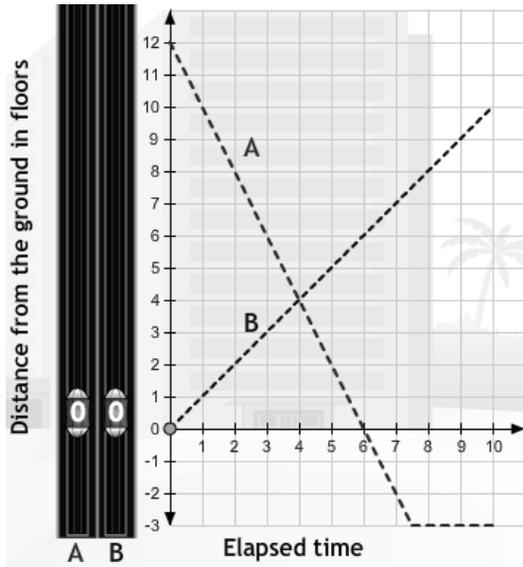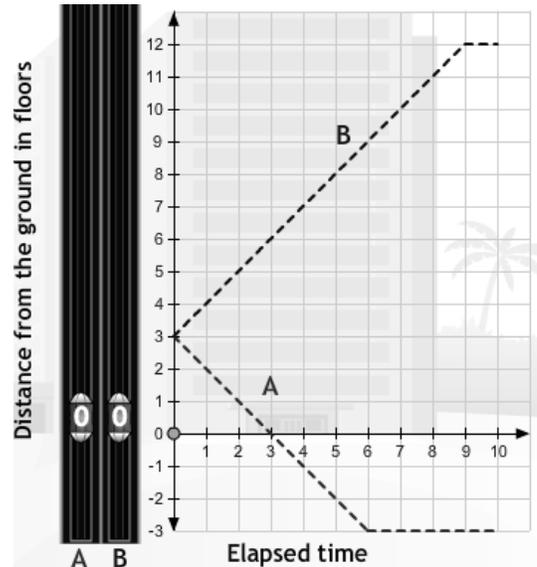e. Elevator A: Start: _____ Rate: _____
    Elevator B: Start: _____ Rate: _____

f. Elevator A: Start: _____ Rate: _____
    Elevator B: Start: _____ Rate: _____

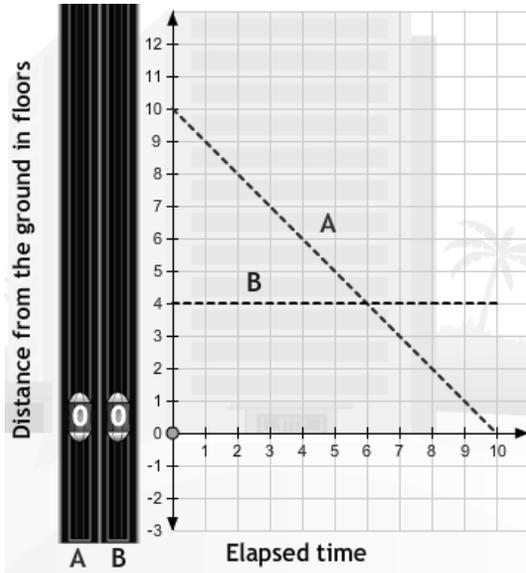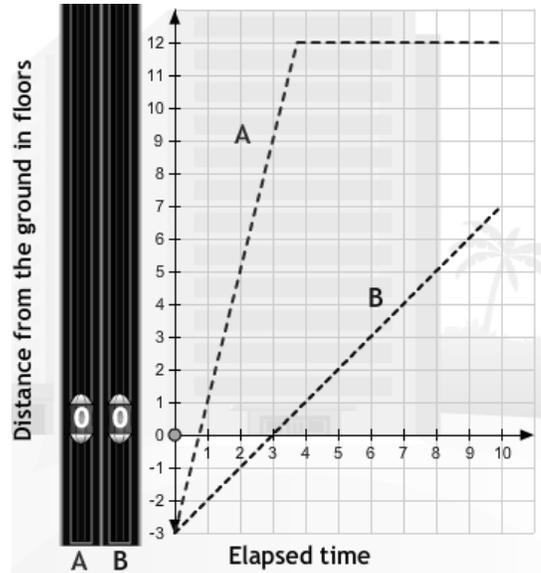3. Now look back over your work on matching elevator graphs as you answer the following questions.

    a. How did you decide what the starting floor was?

    b. How did you decide what the rate was?

Rate of change
Student Activity Sheet 2; use with *Exploring* "Constant rates"

4. Now think about all the work you have done with elevator graphs.

   a. What were the rates when the elevator graphs looked the steepest?

   b. What were the rates when the elevator graphs looked the least steep?

5. Complete the following statements and answer the question to distinguish between **speed** and **rate**.

   a. Speed describes a change in _____ relative to a change in _____. A speed can never be _____.

   b. What are some examples of rates? What do all of the examples have in common?

6. Is it possible to have two elevators moving at different rates but the same speed? Explain.

Rate of change
Student Activity Sheet 2; use with *Exploring* "Constant rates"

7. **REINFORCE** Sketch the graphs of Elevator A and Elevator B. Use a solid line for Elevator A and a dotted line for Elevator B.

a. Elevator A: Start at floor 11 at rate -1.
   Elevator B: Start at floor 11 at rate -3.
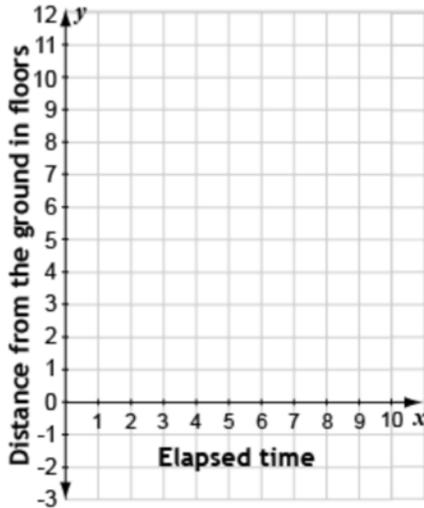
b. Elevator A: Start at floor 1 at rate -1.
   Elevator B: Start at floor 12 at rate -3.
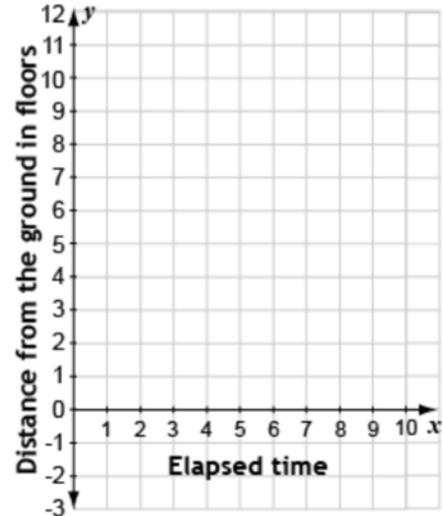
c. Elevator A: Start at floor 1 at rate -1.
   Elevator B: Start at floor 10 at rate -4.
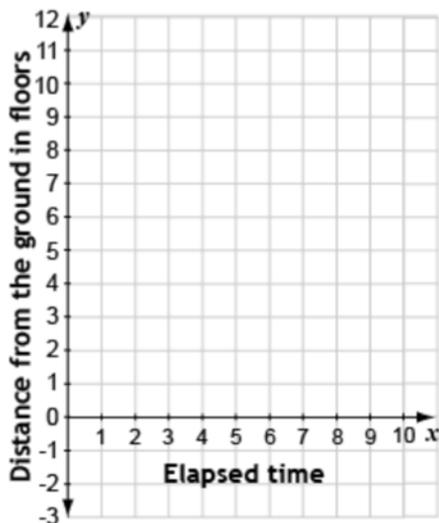
d. Elevator A: Start at floor 1 at rate 1.
   Elevator B: Start at floor 10 at rate -3.
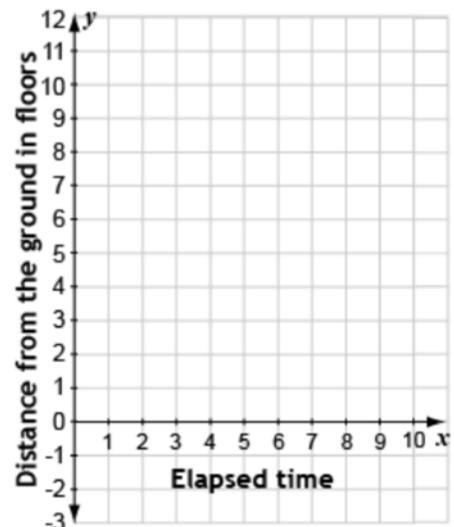
Rate of change
Student Activity Sheet 2; use with *Exploring* "Constant rates"

8. **REINFORCE** Here is the graph of one elevator ride. Interpret the graph by answering the following questions.

    a. Where did the elevator start? How do you know?

    b. What happened between 0 and 4 seconds? How do you know?

    c. What happened between 4 and 6 seconds? How do you know?

    d. What happened between 8 and 9 seconds? How do you know?
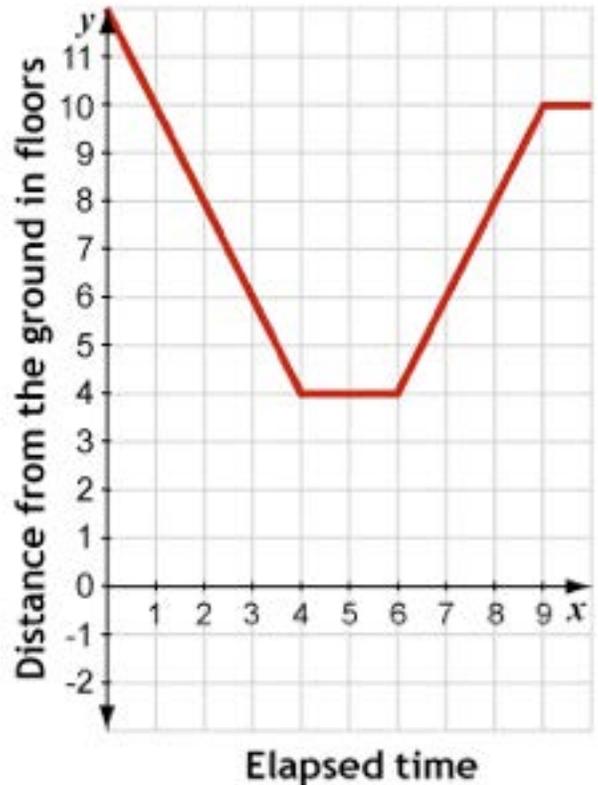
Rate of change
Student Activity Sheet 2; use with *Exploring* "Constant rates"

9. **REINFORCE** Sketch a graph of an elevator whose movement is described.

   a. The elevator starts on floor 5 and moves at a rate of 0.5 floors per second for 4 seconds. Then, it pauses for 2 seconds and then moves at a rate of -2 floors per second for 4 seconds.
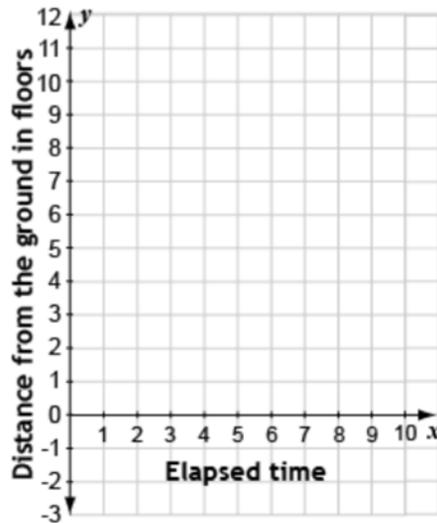
   b. The elevator starts on floor 0 and moves at a rate of -1 floors per second for 3 seconds. Then, it pauses for 3 seconds and then moves at a rate of 3 floors per second for 4 seconds.
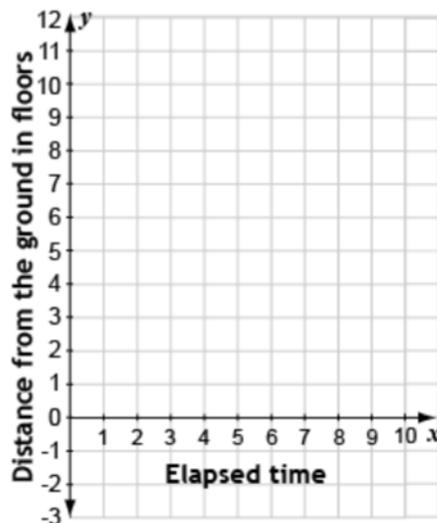
Rate of change
Student Activity Sheet 2; use with *Exploring* "Constant rates"

10. Fill in the table to show the volume of water in Marino's pool at different times.

Elapsed time draining in hours	Volume of water in pool in gallons

11. Based on the values in the table, how does the volume of water in the pool change over time?

12. Use the table from question 10 to calculate the ratio of the change in volume of water in the pool to the change in elapsed time for each time interval as the pool drained.

With space for student work

Rate of change
Student Activity Sheet 2; use with *Exploring* "Constant rates"

13. Consider your work in the previous question.

   a. What do you notice about all these ratios?

   b. What does this indicate about the rate of change?

14. What does the rate of -150 gallons per hour mean in the context of the problem situation?

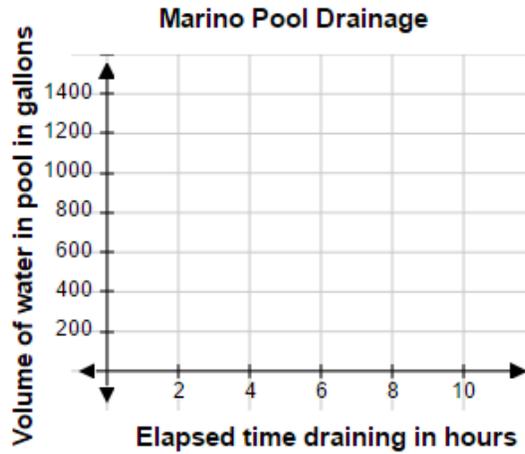15. Consider the rate you found for the pool situation.

   a. Does a negative rate of change for the amount of water in the swimming pool make sense for this situation? Explain.

   b. What would be happening in the pool if the rate of change for the volume of water were positive?

Rate of change
Student Activity Sheet 2; use with *Exploring* "Constant rates"

16. What would a graph of the data in the pool problem look like? Graph the data to check your conjecture.

Marino Pool Drainage

Volume of water in pool in gallons (vertical axis: 200, 400, 600, 800, 1000, 1200, 1400)

Elapsed time draining in hours (horizontal axis: 2, 4, 6, 8, 10)

17. If the rate of change for the pool volume were positive, would the graph rise or fall from left to right?

18. What is the rate of change for these data showing the amount of money collected in terms of the number of baseball caps sold?

Booster Club Cap Sales

Number of caps sold	Amount collected
0	$0.00
1	$10.00
3	$30.00
5	$50.00
6	$60.00
9	$90.00

Rate of change
Student Activity Sheet 2; use with *Exploring* "Constant rates"

19. When pedaling on a stationary exercise bicycle, the number of calories you burn depends on the number of minutes you pedal. Find the first differences in time and in calories burned. Then use those first differences to calculate the rate of calories burned per minute.

Bicycle workout					
Time in minutes	0	15	30	45	60
Calories burned	0	105	210	315	420

A   B   C   D
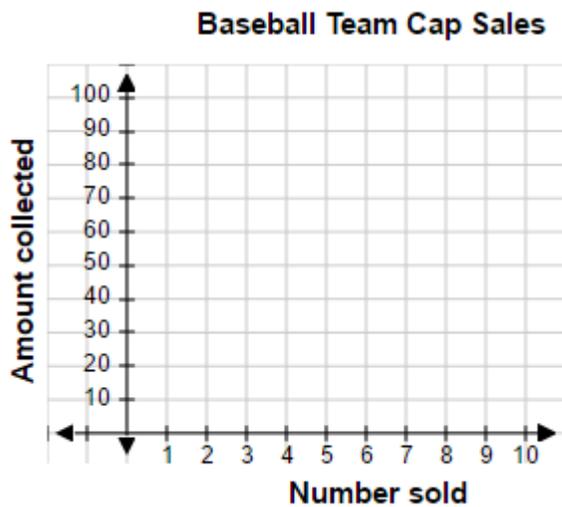
E   F   G   H

The rate is [ ]ᵢ calories per minute.

Rate of change
Student Activity Sheet 2; use with *Exploring* "Constant rates"

20. Compare graphs representing the baseball cap and bicycle workout situations.

a. Graph the data from the baseball cap and bicycle workout situations.

Baseball Team Cap Sales

Calories burned in bicycle workout

b. What do these two graphs have in common?

Rate of change
Student Activity Sheet 2; use with *Exploring* "Constant rates"

21. **REINFORCE** Read each of the following scenarios. Sketch graphs that could represent the situations described.

a. A ceramic tile factory produces 100 plain tiles per hour. The factory also produces 20 decorated tiles each hour. Sketch two graphs on the same set of axes showing the relationship between hours and number of tiles produced. Sketch one graph for each type of square foot tile. Be sure it is clear which graph represents each type of tile.
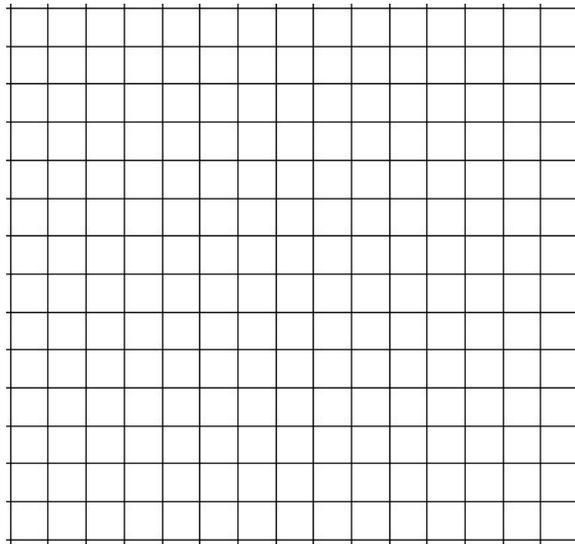
b. Jeriah borrowed $200 dollars from his older sister to buy a bike. He agreed to pay her back $15 each week. Sketch a graph showing the relationship between the number of weeks and the amount of money Jeriah owes his sister.
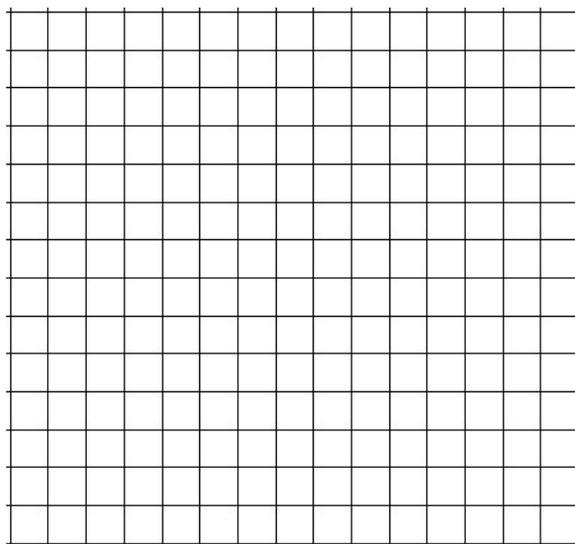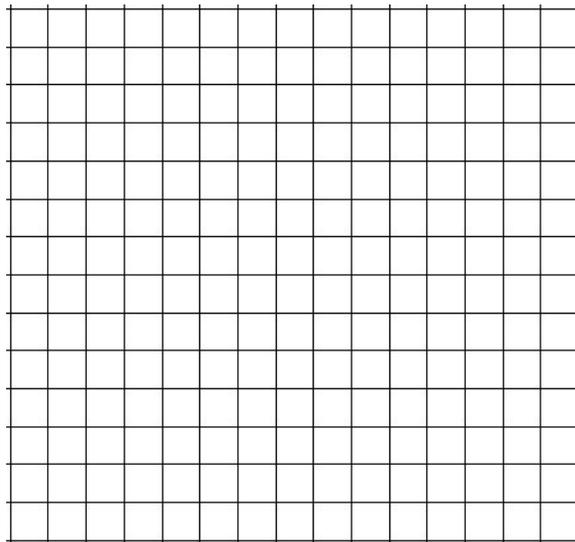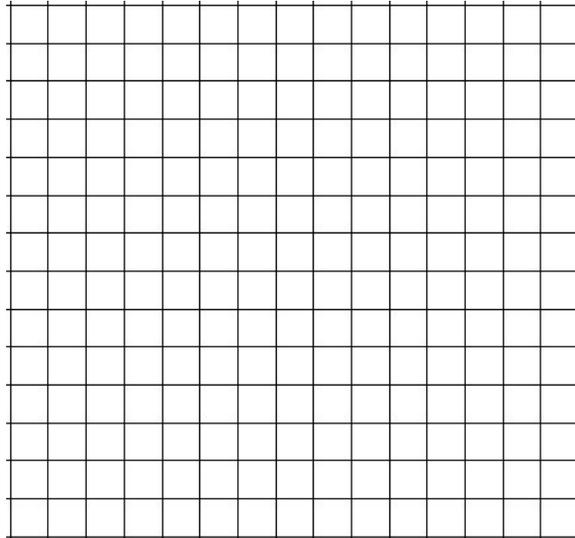
Rate of change
Student Activity Sheet 2; use with *Exploring* "Constant rates"

c. Brian and Brad were each given $500 by their grandmother to start savings accounts. Twice a month Brian deposits an additional $10 into his account. Brad deposits an additional $50 into his account every other month. Sketch a graph showing the relationship between the number of months and the total amount in Brian's account during the first year. Then, sketch a graph showing the relationship between the number of months and the total amount in Brad's account during the first year.

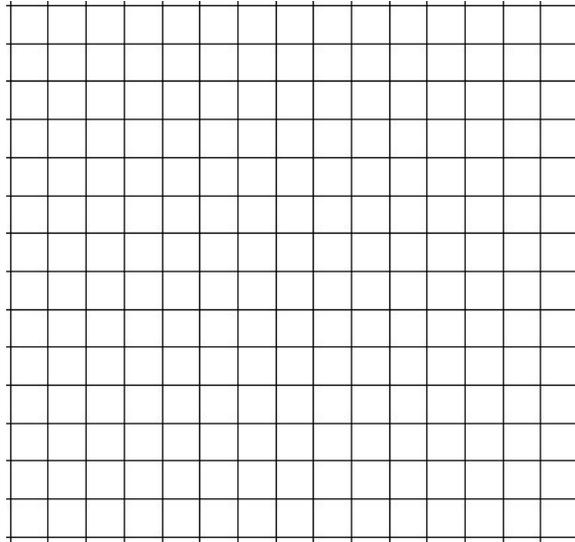# Rate of change
Student Activity Sheet 2; use with *Exploring* "Constant rates"

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d. Jace's mother bought a 4-pound container of gourmet jelly beans. Every day she puts 2 ounces of jelly beans in Jace's lunch box. Sketch a graph showing the relationship between the number of lunches and the number of ounces of jelly beans remaining in the original container. (There are 16 ounces in 1 pound.)

Rate of change
Student Activity Sheet 2; use with *Exploring* "Constant rates"

22. **REINFORCE** For each of the following situations, calculate the rate of change shown in the table.

a. The table shows the number of 8-ounce packages of fish-shaped cheese crackers produced at a cracker factory for different numbers of hours of production.

Hours of production	Number of packages produced
2	1040
5	2600
9	4680
12	6240

b. The table shows how many gallons of saltwater were in the jellyfish tank of the Benton Aquarium at different times as the tank was being emptied for its periodic cleaning.

Time emptying (in minutes)	Amount of saltwater (in gallons)
5	437.5
8	400
14	325
23	212.5

Rate of change
Student Activity Sheet 2; use with *Exploring* "Constant rates"

23. **REINFORCE** Jayne recently started working for the Benton water department. Her job is to record the reservoir levels. She took measurements every day starting May 1.

Using the data in the table, describe what is happening in the situation. As part of your description, comment on the rate of change.

Day since May 1	Reservoir level (in feet)
0	836
2	834.5
5	832.25
6	831.5
9	835
13	832.75