LESSON 8.1 Comparing Additive and Multiplicative Relationships

? ESSENTIAL QUESTION

How do you represent, describe, and compare additive and multiplicative relationships?

EXPLORE ACTIVITY Real World **TEKS** 6.4.A

Discovering Additive and Multiplicative Relationships

A Every state has two U.S. senators. The number of electoral votes a state has is equal to the total number of U.S. senators and U.S. representatives.

The number of electoral votes is _____ the number of representatives.

Complete the table.

Representatives	1	2	5	25	41
Electoral votes	3	4			

Describe the rule: The number of electoral votes is equal to

the number of representatives | **plus / times** | _____.

B Frannie orders three DVDs per month from her DVD club.

Complete the table.

Months	1	2	4	13	22
DVDs ordered	3	6			

Describe the rule: The number of DVDs ordered is equal to

the number of months | **plus / times** | _____.

Reflect

1. **Look for a Pattern** What operation did you use to complete the tables in **A** and **B** ?

_____

Graphing Additive and Multiplicative Relationships

To find the number of electoral votes in part A of the Explore, add 2 to the number of representatives. We call this an *additive relationship*.

To find the number of DVDs Frannie has ordered after a given number of months, multiply the number of months by 3. We call this a *multiplicative relationship*.

EXAMPLE 1 Real World   TEKS 6.4.A

A Jolene is packing her lunch for school. The empty lunch box weighs five ounces. Graph the relationship between the weight of the items in Jolene's lunch and the total weight of the packed lunchbox.

STEP 1 Make a table relating the weight of the items to the total weight.

The total weight is equal to the weight of the items plus the weight of the lunchbox. The relationship is additive.

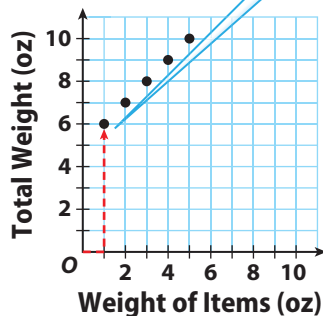| Weight of items (oz)	1	2	3	4	5
Total weight (oz)	6	7	8	9	10

To find the total weight, add the weight of the items and the weight of the lunchbox.

Total weight	=	Weight of items	+	Weight of lunchbox

$$9 = 4 + 5$$

STEP 2 List the ordered pairs from the table.

The ordered pairs are (1, 6), (2, 7), (3, 8), (4, 9), and (5, 10).

STEP 3 Graph the ordered pairs on a coordinate plane.

To plot (1,6), go right 1 unit from the origin and then up 6 units.

The points of the graph form a straight line for an additive relationship.

A line drawn through the points would not go through the origin.

B Oskar sells bracelets for two dollars each and donates the money he collects to a charity. Graph the relationship between the number of bracelets sold and the total donation.

STEP 1 Complete the table.

Bracelets sold	1	2	3	4	5
Total donation ($)	2	4	6	8	10

To find the total donation, multiply the number of bracelets sold by the donation per bracelet.

Total donation	=	Bracelets sold	×	Donation per bracelet
10	=	5	×	2

His donation is equal to the number of bracelets sold times the donation for each bracelet. The relationship is multiplicative.

STEP 2 List the ordered pairs from the table.

The ordered pairs are (1, 2), (2, 4), (3, 6), (4, 8), and (5, 10).

STEP 3 Graph the ordered pairs on a coordinate plane.
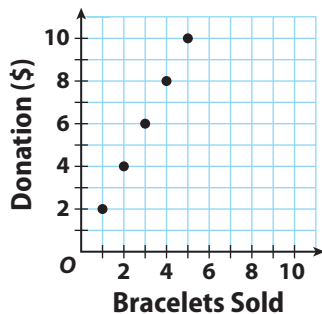
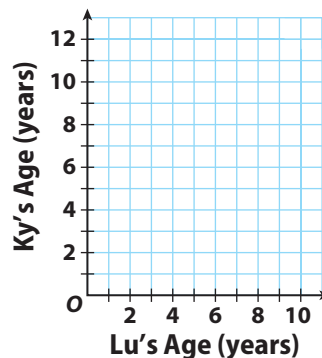The points of the graph form a straight line for a multiplicative pattern.

A line drawn through the points would intersect the origin.

The line is steeper than the line in part A.

Math Talk
Mathematical Processes

How are the graphs in part A and part B the same? How are they different?

YOUR TURN

2. Ky is seven years older than his sister Lu. Graph the relationship between Ky's age and Lu's age. Is the relationship additive or multiplicative? Explain.

Lu's age	1	2	3	4	5
Ky's age					

_____

_____

Personal Math Trainer

Online Assessment and Intervention

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1. Fred's family already has two dogs. They adopt more dogs. Complete the table for the total number of dogs they will have. Then describe the rule. (Explore Activity)
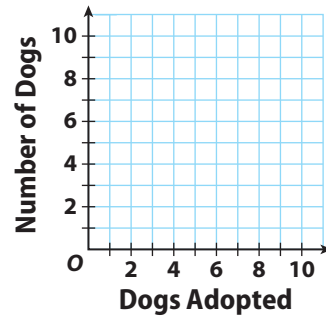
Dogs adopted	1	2	3	4
Total number of dogs				

_____

_____

_____

2. Graph the relationship between the number of dogs adopted and the total number of dogs. (Example 1)

3. Frank's karate class meets three days every week. Complete the table for the total number of days the class meets. Then describe the rule. (Explore Activity)
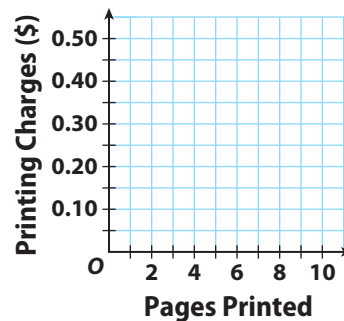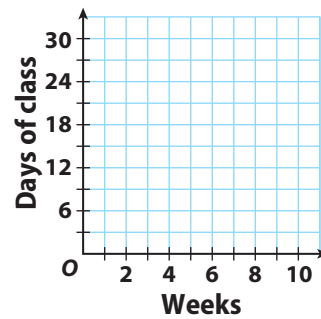
Weeks	1	2	3	4
Days of class				

_____

_____

4. Graph the relationship between the number of weeks and the number of days of class. (Example 1)

5. An internet café charges ten cents for each page printed. Graph the relationship between the number of pages printed and the printing charge. Is the relationship additive or multiplicative? Explain. (Example 1)

_____

_____

_____

? ESSENTIAL QUESTION CHECK-IN

6. How do you represent, describe, and compare additive and multiplicative relationships?

_____

_____

_____

8.1 Independent Practice

TEKS 6.4.A

The tables give the price of a kayak rental from two different companies.

Raging River Kayaks				
Hours	1	3	6	8
Cost ($)	9	27	54	72

Paddlers				
Hours	2	4	5	10
Cost ($)	42	44	45	50

7. Is the relationship shown in each table multiplicative or additive? Explain.

_____

_____

_____

_____

8. Yvonne wants to rent a kayak for 7 hours. How much would this cost at each company? Which one should she choose?

_____

_____

_____

9. After how many hours is the cost for both kayak rental companies the same? Explain how you found your answer.

_____

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_____

The graph represents the distance traveled by a car and the number of hours it takes.
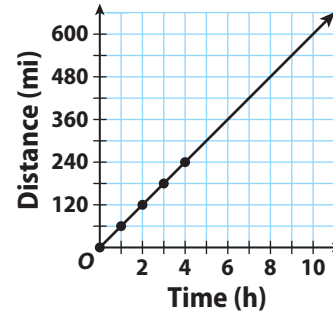
10. Persevere in Problem Solving Based on the graph, was the car traveling at a constant speed? At what speed was the car traveling?

_____

_____

11. Make a Prediction If the pattern shown in the graph continues, how far will the car have traveled after 6 hours? Explain how you found your answer.

_____

_____

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_____

12. What If? If the car had been traveling at 40 miles per hour, how would the graph be different?

_____

_____

_____

Use the graph for Exercises 13–15.

13. Which set of points represents an additive relationship? Which set of points represents a multiplicative relationship?

_____

14. **Represent Real-World Problems** What is a real-life relationship that might be described by the red points?

_____

15. **Represent Real-World Problems** What is a real-life relationship that might be described by the black points?

_____
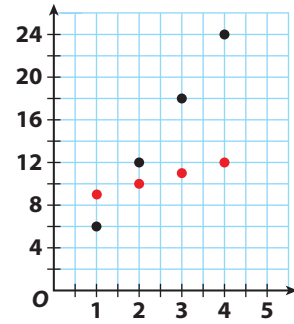
H.O.T. **FOCUS ON HIGHER ORDER THINKING**

16. **Explain the Error** An elevator leaves the ground floor and rises three feet per second. Lili makes the table shown to analyze the relationship. What error did she make?

Time (s)	1	2	3	4
Distance (ft)	4	5	6	7

_____

_____

17. **Analyze Relationships** Complete each table. Show an additive relationship in the first table and a multiplicative relationship in the second table.

A	1	2	3
B			

A	1	2	3
B	16	32	

Use two columns of each table. Which table shows equivalent ratios? Name two ratios shown in the table that are equivalent.

_____

18. **Represent Real-World Problems** Describe a real-world situation that represents an additive relationship and one that represents a multiplicative relationship.

_____

_____

_____

_____

Work Area