Unit 7: Family Letter

Home Link 6-14

NAME DATE TIME

Multiplication of Mixed Numbers; Geometry; Graphs

At the beginning of Unit 7 students apply and extend their knowledge of multiplication to learn two strategies for multiplying mixed numbers. In Lesson 7-1 they review the idea that factors in a multiplication problem can be broken into smaller parts to make the multiplication easier. They apply this strategy to the multiplication of mixed numbers, using area models to illustrate the calculation, as shown at the right below.

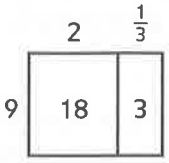
For example, to solve $2\frac{1}{3} * 9$, they think:

$2\frac{1}{3} = 2 + \frac{1}{3}$

I can multiply each part of $2\frac{1}{3}$ *by 9 and add the partial products.*

$2 * 9 = 18$ *and* $\frac{1}{3} * 9 = \frac{9}{3} = 3$

$18 + 3 = 21$, *so* $2\frac{1}{3} * 9 = 21$



Area model for $2\frac{1}{3} * 9$

In Lesson 7-2 students review the fraction multiplication algorithm they learned earlier in the year: to multiply two fractions, multiply the numerators and then multiply the denominators. They convert mixed numbers to fractions greater than 1 and then use the algorithm to multiply the mixed numbers. For example, to solve $1\frac{1}{2} * 3\frac{3}{4}$, they think:

$1\frac{1}{2}$ *is the same as* $\frac{3}{2}$. $3\frac{3}{4}$ *is the same as* $\frac{15}{4}$. $\frac{3}{2} * \frac{15}{4} = \frac{(3 * 15)}{(2 * 4)} = \frac{45}{8} = 5\frac{5}{8}$.

So $1\frac{1}{2} * 3\frac{3}{4} = \frac{45}{8}$, *or* $5\frac{5}{8}$.

In Lesson 7-3 students apply these strategies for mixed-number multiplication to find areas of rectangles with fractional side lengths using the formula $A = l \times w$. In Lesson 7-4 they review strategies for dividing fractions and discuss how it can be useful to rewrite division problems with common denominators.

In the middle of the unit students review properties of triangles, quadrilaterals, and other polygons, including attributes such as same-length sides, parallel sides, and right angles. They use attributes to sort and classify shapes. In Lessons 7-5 through 7-8 students explore a new classification system called a *hierarchy*. Hierarchies organize objects into categories and subcategories. Subcategories get more specific as you move down a hierarchy. An example of a hierarchy of polygons is shown at the right.

Polygons
↓
Polygons with a right angle
↓
Polygons with a right angle and at least one pair of parallel sides

In the last part of Unit 7 students continue exploring line plots and coordinate grids. They use line plots to organize and interpret fractional measurement data. They create graphs on coordinate grids to visualize numerical patterns and represent real-world problems. For example, in Lesson 7-13 students use a graph to explore patterns in the eruption length and wait time between eruptions of the geyser Old Faithful.

Vocabulary

Important terms in Unit 7:

adjacent Next to each other. For example, adjacent sides of a *polygon* are two sides that share a vertex.

attribute A characteristic or *property* of an object or common characteristic of a set of objects. For example, one attribute of all *squares* is that they have four sides of the same length. Same as *property*.

category A group or class defined by a feature or *attribute*. Objects can be sorted into categories. For example, "triangles" is a category of *polygons*, defined by the attribute of having three sides.

formula A general *rule* for finding the value of something. A formula is usually written as an equation with variables.

hierarchy of shapes A classification system in which shapes are organized into *categories* and *subcategories*. For each category, every defining *attribute* of a shape in that category is also a defining attribute of all shapes in its subcategories. A hierarchy is often shown in a diagram with the most general category at the top and lines or arrows connecting categories to their subcategories. See page 247 for an example.

kite A *quadrilateral* that has two non-overlapping pairs of *adjacent* equal-length sides.

parallelogram A *trapezoid* that has two pairs of parallel sides.

partial products Intermediate products found when the factors in a multiplication problem are broken into easier parts. See page 247 for an example using a whole number and a mixed number.

polygon A closed 2-dimensional figure with straight sides that meet only at their endpoints, such as a triangle or square.

property Same as *attribute*.

quadrilateral A *polygon* with four sides.

rectangle A *parallelogram* with four right angles.

rhombus A *parallelogram* with four sides of the same length.

rule A statement that expresses a pattern and can be used to continue the pattern. For example, in the *sequence* 2, 4, 6, 8, 10, . . . , the rule $+ 2$ can be used to generate subsequent numbers.

sequence An ordered list of numbers, often with an underlying *rule* that can be used to generate subsequent numbers in the list.

square A *rectangle* with four sides of the same length. All squares are both rectangles and *rhombuses*.

subcategory A more specific *category* contained entirely within a given category. Subcategories are usually defined by an *attribute* shared by some, but not all, of the members of the larger category. For example, right triangles are a subcategory of the category of triangles because all right triangles are triangles but not all triangles have a right angle.

trapezoid A *quadrilateral* with at least one pair of parallel sides.

unit fraction A fraction with a numerator of 1.

Do-Anytime Activities

To work with your child on the key concepts in this unit, try some of these activities.

1. Have your child measure the length and width of rectangular objects to the nearest $\frac{1}{2}$ or $\frac{1}{4}$ inch and multiply the dimensions to find the area of the objects in square inches.
2. Point out a group or category of objects. Have your child name a subcategory and describe the attribute needed to fit into the subcategory. For example, given the category "Trees on this street," your child might notice that some, but not all, of the trees are maple trees and choose "Maple trees on this street" as the subcategory.
3. Have your child measure a set of objects (such as the pens and pencils in a desk drawer) to the nearest $\frac{1}{2}$, $\frac{1}{4}$, or $\frac{1}{8}$ inch and organize the data on a line plot.
4. Look in newspapers or magazines for real-world examples of rules, tables, or graphs. Discuss any patterns you see in the data and what each representation shows you about the data.

Building Skills through Games

As your child builds new skills in Unit 7, he or she will also play games and complete activities to maintain skills and understandings from previous units. The games listed below will help reinforce new concepts and maintain past learning. Detailed instructions for each game are in the *Student Reference Book*. Many of these games can be played at home with materials you likely already have; gameboards and card decks can be copied for home use.

Decimal Domination See *Student Reference Book*, page 295. Two players need number cards 0–9 (4 of each), 4 counters (2 per player), and a coin to play this game. *Decimal Domination* provides practice with multiplying decimals.

Exponent Ball See *Student Reference Book*, pages 303–304. Two players need number cards 1–4 (4 of each), two 6-sided dice, a counter, and the *Exponent Ball* gameboard from *Math Masters*, page G28 to play this game. *Exponent Ball* provides practice with multiplying and dividing decimals by powers of 10.

Fraction Top-It: Addition See *Student Reference Book*, page 309. Two players need fraction cards with denominators of 2, 3, 4, 5, 6, 8, 10, and 12. *Fraction Top-It: Addition* provides practice with adding and comparing fractions with unlike denominators.

Property Pandemonium See *Student Reference Book*, page 320. Two players need the *Property Pandemonium* Card Deck and Record Sheet from *Math Masters*, pages G32 and G33 to play. *Property Pandemonium* provides practice with naming and classifying quadrilaterals.

Spoon Scramble See *Student Reference Book*, page 324. Four players need the *Spoon Scramble* cards from *Math Masters*, page G30 and three spoons to play. *Spoon Scramble* provides practice with multiplying fractions and multiplying and dividing by powers of 10.

As You Help Your Child with Homework

As your child brings assignments home, you might want to go over the instructions together, clarifying them as necessary. The answers listed below will guide you through this unit's Home Links.

Home Link 7-1

1. $20\frac{15}{8}$, or $21\frac{7}{8}$ **2.** $7\frac{25}{15}$, or $8\frac{10}{15}$

4. $\frac{31}{24}$, or $1\frac{7}{24}$ **5.** $\frac{13}{16}$

Home Link 7-2

1. $\frac{48}{5}$, or $9\frac{3}{5}$ **2.** $\frac{99}{12}$, or $8\frac{3}{12}$ **3.** $\frac{35}{12}$, or $2\frac{11}{12}$

4. $\frac{11}{8}$, or $1\frac{3}{8}$ **5.** $\frac{2}{12}$, or $\frac{1}{6}$ **6.** $\frac{17}{24}$

Home Link 7-3

1. $65\frac{1}{4}$ in.^{2} **2a.** 900 tiles **2b.** 225 ft^2

3a. $9\frac{5}{8}$ ft^2 **3b.** 154 squares

4. $7\frac{19}{24}$ **5.** $3\frac{8}{18}$

Home Link 7-4

1. 15 **2.** 32 **3.** $\frac{1}{24}$ **4.** $\frac{1}{30}$

6. $2\frac{3}{4}$ **7.** $1\frac{13}{24}$

Home Link 7-5

1a. Yes. **1b.** No. **1c.** No.

Home Link 7-6

2a. Yes.

2b. Parallelograms, rhombuses, rectangles, and squares

3. $\frac{1}{32}$ **4.** $\frac{1}{30}$ **5.** $\frac{1}{12}$ **6.** $\frac{1}{60}$

Home Link 7-7

2. 27 **3.** 20 **4.** 20 **5.** 48

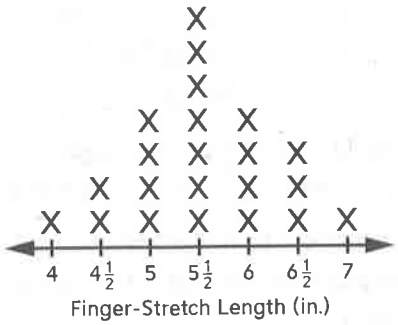
Home Link 7-8

3. 6,800 **4.** 0.00127

5. 10^4 **6.** 10^2

Home Link 7-9

1.



2. $19\frac{1}{2}$ **3.** $38\frac{1}{2}$ **4.** 122

5. $\frac{21}{15}$, or $1\frac{6}{15}$ **6.** $\frac{493}{24}$, or $20\frac{13}{24}$

Home Link 7-10

1a. in (x): 2; 4; 6; 8; 10 out (y): 8; 6; 4; 2; 0

1b. Sample answer: Subtract *in* from 10 to get *out*. **1c.** (2, 8); (4, 6); (6, 4); (8, 2); (10, 0)

3. 35.8 **4.** 168.96

Home Link 7-11

1a. 2.50; 7.50; 6; 25.00

1b. (1, 2.50); (3, 7.50); (6, 15.00); (10, 25.00)

1d. $20.00 **1e.** No. **2.** 1,837.85 **3.** 1,028.28

Home Link 7-12

1a. Ami (y): 12; 18; 30; Derek (y): 22; 32; 37

2. Ami **3.** 136 **4.** 36; $792 \div 22 = 36$

Home Link 7-13

1. in (x): 2; 3; 4; 5; out (y): 17; 23; 29; 35

2. *in* number $* 6 + 5 =$ *out* number

3. (0, 5); (1, 11); (2, 17); (3, 23); (4, 29); (5, 35)

5a. 53 **5b.** 10 **6.** $\frac{128}{15}$, or $8\frac{8}{15}$

7. $\frac{204}{2}$, or 102 **8.** $\frac{324}{7}$, or $46\frac{2}{7}$

Mixed-Number Multiplication

Home Link 7-1

NAME DATE TIME

SRB 204-205

For Problems 1 and 2:

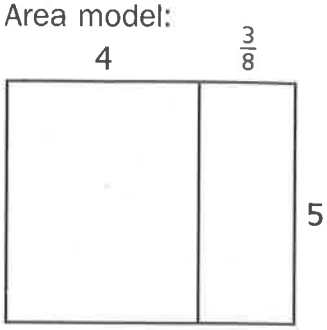
- Use the rectangle to make an area model. Label the sides. The model in Problem 1 has been started for you.
- Find and list the partial products. Label the partial products in the area model.
- Add the partial products to find your answer. You may need to rename fractions with a common denominator.

① $4\frac{3}{8} * 5 = ?$

Partial products:

$4\frac{3}{8} * 5 =$ _____

Area model:

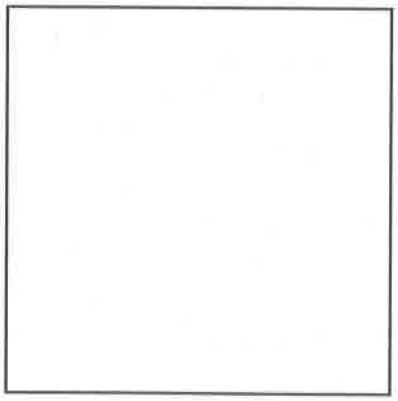


② $2\frac{3}{5} * 3\frac{1}{3} = ?$

Partial products:

$2\frac{3}{5} * 3\frac{1}{3} =$ _____

Area model:



③ Write a number story that matches Problem 1.

_____

_____

_____

Practice

Solve.

④ $\frac{2}{3} + \frac{5}{8} =$ _____

⑤ $\frac{1}{16} + \frac{3}{4} =$ _____

More Mixed-Number Multiplication

Home Link 7-2

NAME DATE TIME

Solve Problems 1 and 2 using the method in the example below. Show your work.

SRB 204-206

Example: $2\frac{1}{5} * 1\frac{3}{4}$

- Rename any mixed or whole numbers as fractions: $2\frac{1}{5} = \frac{11}{5}$; $1\frac{3}{4} = \frac{7}{4}$
- Rewrite the problem using the fractions as factors: $\frac{11}{5} * \frac{7}{4}$
- Multiply using a fraction multiplication algorithm: $\frac{(11 * 7)}{(5 * 4)} = \frac{77}{20}$, or $3\frac{17}{20}$

① $1\frac{3}{5} * 6 = ?$

$1\frac{3}{5} * 6 =$ _____

② $4\frac{1}{2} * 1\frac{5}{6} = ?$

$4\frac{1}{2} * 1\frac{5}{6} =$ _____

Solve Problems 3 and 4 using the method of your choice.

③ What is the area of a table that is $1\frac{1}{4}$ m long and $2\frac{1}{3}$ m wide? Write a number model with a letter for the unknown. Then solve. Show your work.

Number model: _____

Answer: The area of the table is _____ m^2.

④ Write a number story that can be solved by multiplying $2\frac{3}{4}$ and $\frac{1}{2}$. Then solve the problem. Show your work on the back of this page.

Number story: _____

_____

_____

Answer: _____

Practice

⑤ $\frac{11}{12} - \frac{3}{4} =$ _____

⑥ $\frac{7}{8} - \frac{1}{6} =$ _____

Solving More Area Problems

Home Link 7-3

NAME DATE TIME

SRB 204-206 225-226

Solve. Show your work. Write a number model to summarize each solution.

(1) The cover of Martina's book measures $7\frac{1}{4}$ inches by 9 inches. What is the area of the book cover?

Area: _____ Number model: _____

(2) The hallway floor in Ryan's school is covered with square tiles that are $\frac{1}{2}$ foot by $\frac{1}{2}$ foot. Ryan counted and found that the hallway is 15 tiles wide and 60 tiles long.

a. How many tiles cover the hallway floor? _____

b. What is the area of the hallway floor?

Area: _____ Number model: _____

(3) An artist made a stained-glass window that is $3\frac{1}{2}$ feet by $2\frac{3}{4}$ feet.

a. What is the area of the window?

Area: _____ Number model: _____

b. The artist's design used squares of colored glass that measure $\frac{1}{4}$ foot by $\frac{1}{4}$ foot. How many colored squares did the artist use?

Answer: _____ Number model: _____

Practice

(4) $3\frac{1}{8} + 4\frac{2}{3} =$ _____

(5) $2\frac{1}{6} + 1\frac{5}{18} =$ _____

Solving Fraction Division Problems

Home Link 7-4

NAME DATE TIME

SRB 210

Using Common Denominators to Divide

One way to divide fractions is to use common denominators. This method can be used to divide whole numbers by fractions and fractions by whole numbers.

Step 1 Rename the dividend and divisor as fractions with a common denominator.

Example:
$\frac{1}{3} \div 4 = \frac{1}{3} \div \frac{12}{3}$

Step 2 Divide the numerators.

$1 \div 12 = \frac{1}{12}$

Solve Problems 1–4. Show your work. Use multiplication to check your answer.

① $5 \div \frac{1}{3} = ?$

Answer: _____

Check: _____

② $4 \div \frac{1}{8} = ?$

Answer: _____

Check: _____

③ $\frac{1}{6} \div 4 = ?$

Answer: _____

Check: _____

④ $\frac{1}{5} \div 6 = ?$

Answer: _____

Check: _____

⑤ Write a number story to match Problem 2.

_____

_____

_____

Practice

⑥ $4\frac{1}{2} - 1\frac{3}{4} =$ _____

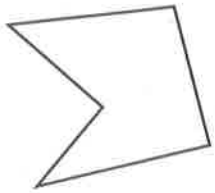
⑦ $2\frac{7}{8} - 1\frac{1}{3} =$ _____

Using a Hierarchy

Home Link 7-5

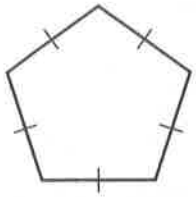
NAME DATE TIME

A *pentagon* is a shape with 5 sides. The shape below is a pentagon.



An *equilateral pentagon* is a pentagon with 5 sides that are all the same length. The shape below is an equilateral pentagon.

SRB 264–265



Consider the pentagon hierarchy below. Use it to answer the questions.

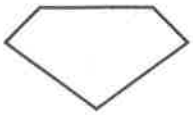
Pentagons

↓

Equilateral pentagons

↓

Equilateral pentagons with at least one right angle



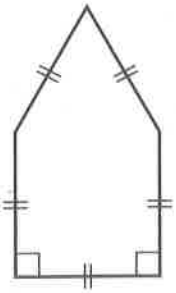
① Answer Parts a–c to classify this shape on the hierarchy.

a. Can this shape go in the top category, Pentagons? How do you know?

b. Can this shape go in the first subcategory, Equilateral pentagons? How do you know?

c. Can this shape go into the second subcategory, Equilateral pentagons with at least one right angle? How do you know?

② Describe how you would classify the shape below on the hierarchy. Start at the top and describe how you know if the shape fits in each category and subcategory.



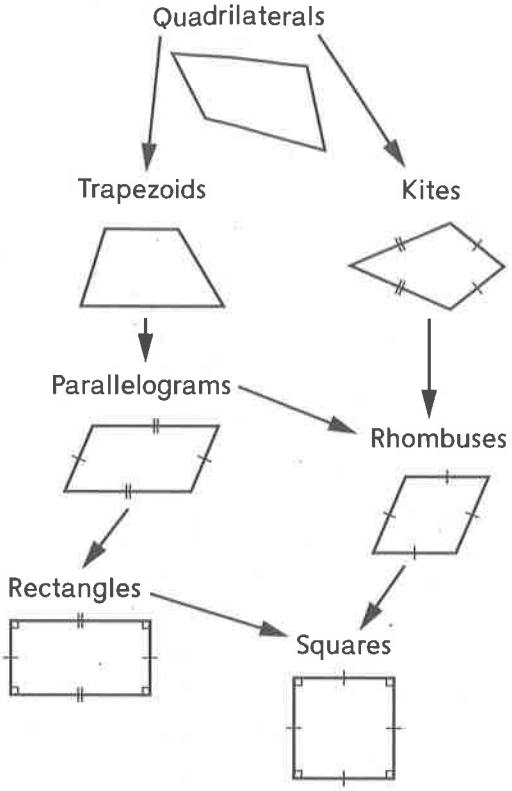
The Quadrilateral Hierarchy

Home Link 7-6

NAME DATE TIME

The quadrilateral hierarchy you used in class is below. Use it to answer the questions.

SRB 264-265, 268-269



(1) Fill in the blanks.

a. All *trapezoids* are *quadrilaterals*, but not all *quadrilaterals* are *trapezoids*.

b. All _____ are _____, but not all _____ are _____.

c. All _____ are _____, but not all _____ are _____.

(2) **a.** All parallelograms have two pairs of parallel sides. Does this mean that all rectangles have two pairs of parallel sides? Explain how you can tell by looking at the hierarchy.

_____

_____

b. All trapezoids have at least one pair of parallel sides. Which other shapes have at least one pair of parallel sides? Explain how you can tell by looking at the hierarchy.

_____

_____

_____

Practice

(3) $\frac{1}{4} \div 8 =$ _____

(4) $\frac{1}{10} \div 3 =$ _____

(5) $\frac{1}{6} \div 2 =$ _____

(6) $\frac{1}{5} \div 12 =$ _____

Property Pandemonium

Home Link 7-7

NAME DATE TIME

SRB 268-269 320

① Imagine that you are playing *Property Pandemonium*. You already chose all of your cards and filled in the Property and Quadrilateral columns. Complete the Drawing, Additional Names, and Points columns for each round. Then find your total score.

Round	Property	Quadrilateral	Drawing	Additional Names	Points
1	2 pairs of parallel sides	rhombus			
2	2 pairs of adjacent sides equal in length	parallelogram			
3	4 right angles	kite			
				TOTAL	

Practice

Divide.

② $9 \div \frac{1}{3} =$ _____

③ $4 \div \frac{1}{5} =$ _____

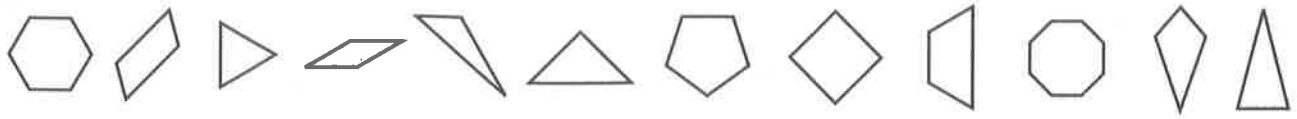
④ $2 \div \frac{1}{10} =$ _____

⑤ $12 \div \frac{1}{4} =$ _____

Classifying Polygons

Home Link 7-8

NAME DATE TIME



(1) Draw the 12 shapes above in the correct categories on the hierarchy.

SRB 256, 284-285

Polygons

At least 1 right angle

At least 1 obtuse angle

Exactly 4 right angles

All obtuse angles

(2) Explain how you decided where to place the hexagon.

Practice

Solve.

(3) $6.8 * 10^3 =$ _____

(4) $12.7 \div 10^4 =$ _____

(5) $0.4 *$ _____ $= 4{,}000$

(6) $64.3 \div$ _____ $= 0.643$

Plotting and Interpreting Line-Plot Data

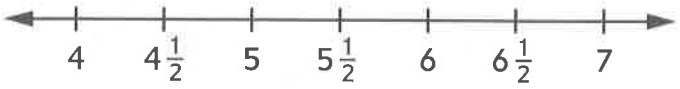
Home Link 7-9

NAME DATE TIME

SRB 187 204-206 244

Marisela and her class are finding their finger-stretch measurements. The finger stretch is measured from the tip of the pinkie to the tip of the index finger with an outstretched hand. Below are the measurements for Marisela and her classmates to the nearest $\frac{1}{2}$ inch.

4	$6\frac{1}{2}$	6
$5\frac{1}{2}$	5	5
$4\frac{1}{2}$	$5\frac{1}{2}$	$4\frac{1}{2}$
$5\frac{1}{2}$	$5\frac{1}{2}$	6
$5\frac{1}{2}$	5	5
$6\frac{1}{2}$	$5\frac{1}{2}$	6
6	7	$6\frac{1}{2}$
$5\frac{1}{2}$		



Finger-Stretch Length (in.)

① Plot the data on the line plot.

② Marisela wants to find the total length of all the $6\frac{1}{2}$-inch finger stretches. Write a number model using *addition* to help her find the total, then solve.

Number model: _____

Answer: _____ inches

③ Now Marisela wants to use *multiplication* to find the total length of all the $5\frac{1}{2}$-inch finger stretches. Write a number model. Then solve.

Number model: _____

Answer: _____ inches

④ Find the total length of all the finger stretches in Marisela's class.

Answer: _____ inches

Practice

⑤ $4\frac{1}{5} * \frac{1}{3} =$ _____

⑥ $2\frac{5}{6} * 7\frac{1}{4} =$ _____

Identifying Patterns

Home Link 7-10

NAME DATE TIME

(1) **a.** Each column in the table below has a rule at the top. Use the rules to fill in the columns.

in (x) Rule: $+2$	out (y) Rule: -2
0	10

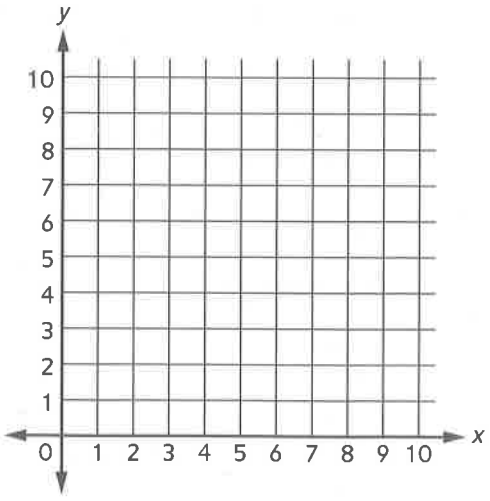
b. What rule relates the numbers in the *in* column to the numbers in the *out* column? *Hint:* What happens when you add the numbers in each row?

SRB 51-56 275

c. Write the numbers from the table as ordered pairs. Graph the ordered pairs on the grid. Draw a line to connect the points.

Ordered pairs:

(0, 10)



(2) How does your graph in Problem 1c show the $+2$ rule from the *in* column?

Practice

The digits in each product or quotient are given. Use an estimate to place the decimal point. Write a number sentence to show how you estimated.

(3) $42.96 \div 1.2 = 3\ 5\ 8$

Number sentence: _____

(4) $19.2 * 8.8 = 1\ 6\ 8\ 9\ 6$

Number sentence: _____

Working with Rules, Tables, and Graphs

Home Link 7-11

NAME DATE TIME

Use the rule to complete the table. Write ordered pairs to represent the data. Then graph the ordered pairs and answer the questions.

SRB 55-56 275

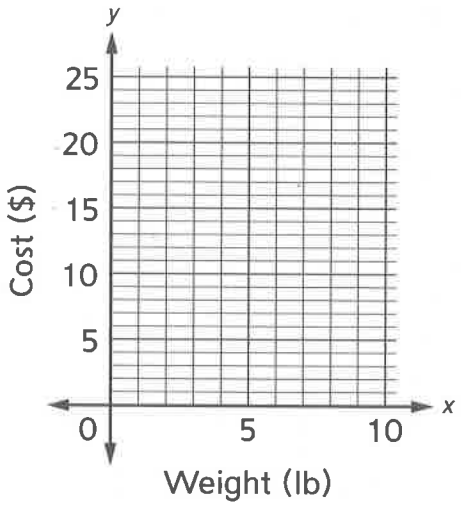
(1) Cherry tomatoes cost $2.50 per pound.

Rule: Cost = $2.50 * weight in pounds

a.

Weight (pounds) (x)	Cost (dollars) (y)
1	
3	
	15.00
10	

c.



b. Ordered pairs:

_____ _____ _____ _____

d. Plot a point to show the cost of 8 pounds of cherry tomatoes. What is the cost?

_____

e. Julius has $12.00. Does he have enough money to buy 5 pounds of cherry tomatoes? Explain.

_____

_____

f. Would you use the graph, the table, or the rule to find out how much 50 pounds of cherry tomatoes would cost? Explain.

_____

_____

Practice

Multiply. Show your work on the back of this page.

(2) 29.5 * 62.3 = _____

(3) 4.1 * 250.8 = _____

Interpreting Tables and Graphs

Home Link 7-12

NAME DATE TIME

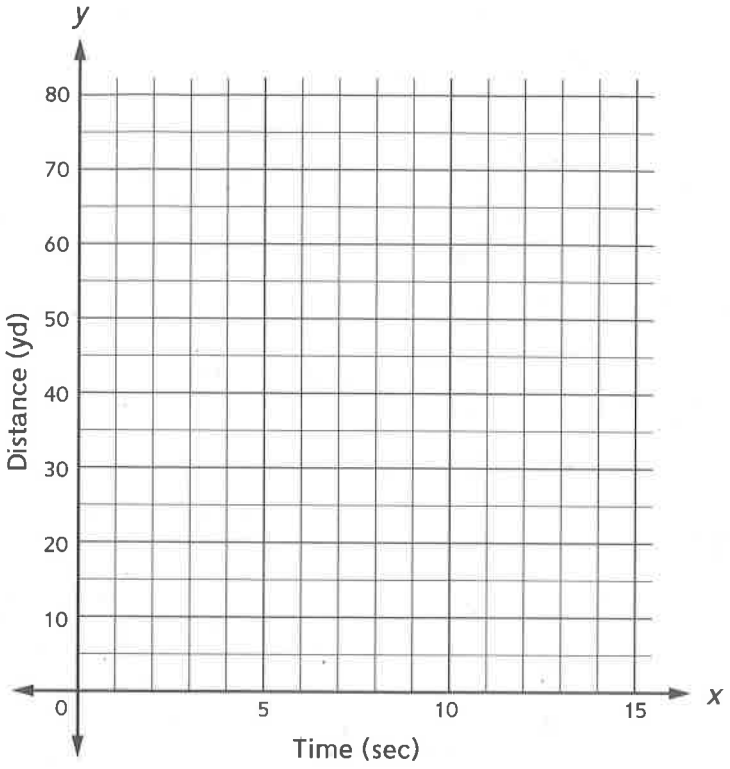
Ami runs 6 yards per second. Derek runs 5 yards per second. Ami challenged Derek to an 80-yard race. She told him he could have a 12-yard head start.

SRB 55-56 275

- Complete the tables to show the distances Ami and Derek are from the starting line during the first 5 seconds of the race.
- Write 3 ordered pairs each for Ami and Derek.
- Graph the ordered pairs you wrote and connect them with a line. Extend each line to the 80-yard mark to find out who wins. Label each line.

Ami	
Time in Seconds (x)	Distance in Yards (y)
0	0
1	6
2	
3	
4	24
5	

Derek	
Time in Seconds (x)	Distance in Yards (y)
0	12
1	17
2	
3	27
4	
5	



Ami _____ _____ _____

Derek _____ _____ _____

① Who wins the race? How do you know?

_____

_____

Practice

Write an equivalent problem with a whole-number divisor. Then solve.

② $68 \div 0.5 =$ _____

$680 \div 5 = 136$

Equivalent problem:

③ $7.92 \div 0.22 =$ _____

_____

Equivalent problem:

Analyzing Patterns and Relationships

Home Link 7-13

NAME DATE TIME

SRB 51-52 55-56

① Use the given rules to complete each column of the table.

② Find a rule that relates the *in* numbers to the corresponding *out* numbers.

Rule: _____

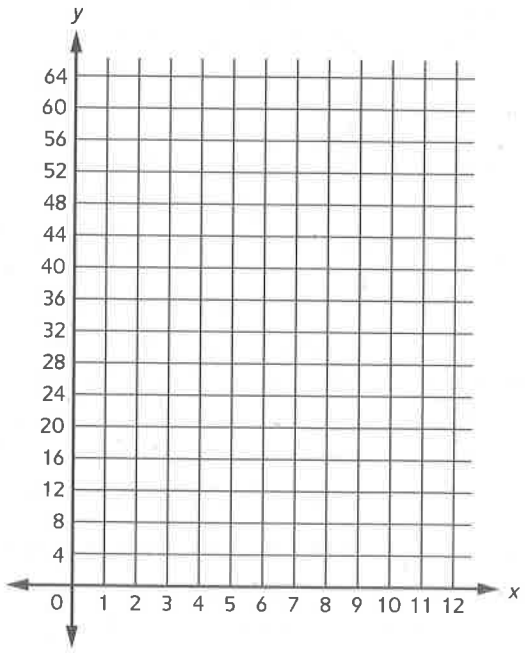
in (x) Rule: + 1	out (y) Rule: + 6
0	5
1	11

③ Write the numbers in the table as ordered pairs.

_____ _____ _____

_____ _____ _____

④ Graph the ordered pairs on the grid.



⑤ Use the graph to answer the questions below. Use the formula to check your answers.

a. When the *in* number is 8, what is the *out* number? _____

b. When y is 64, about how much is x? About _____

Practice

Solve. Show your work on the back of this page.

⑥ $3\frac{1}{5} * 2\frac{2}{3} =$ _____ ⑦ $8\frac{1}{2} * 12 =$ _____ ⑧ $9 * 5\frac{1}{7} =$ _____