Family Guide to CPM CHAPTER 7

In this chapter, students will learn how to:

- Calculate rates, including unit rates.
- Compare ratios and rates with different units.
- Divide more efficiently with fractions, mixed numbers, and decimals.
- Rewrite expressions by combining like terms and using the Distributive Property.

Chapter 7 Main Ideas

Section 7.1

Section 7.1 extends the concept of ratios as comparisons that began in Chapter 4. Students will use situations involving fundraising, running, and triathlons to solve rate problems. They will use ratios, tables, and graphs to compare rates with both like and unlike units. They will identify that steeper lines on the same graph indicate faster rates.

Section 7.2

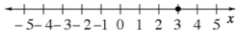
Students extend their learning about operations with portions to include methods for efficiently dividing with fractions, mixed numbers, and decimals. Students build on the work that they did in Chapter 6 where they relied on diagrams and reasoning to move to an algorithm.

Section 7.3

Students analyze mathematical "magic tricks" in which any number can be chosen to start, but after a series of operations, the same result always occurs. These number tricks motivate simplifying expressions and working with the Distributive Property. Students will represent the tricks with algebra tiles and then variables in order to understand how the trick is operating. From the visual representation with algebra tiles, students will transition to writing algebraic expressions to represent the steps of the trick. Students will draw connections between the words of the trick, the concrete representation with algebra tiles, and the algebraic expressions. Students will also build expressions with algebra tiles on an expression mat and simplify them. Students identify inverse operations as they determine why specific results occur and as they construct their own magic tricks. They will also briefly look at one-variable inequalities, comparing them to equations and learning how to graph them on number lines.

Key Words

boundary point- The endpoint or endpoints of a ray or segment on a number line where an inequality is true, marked with a solid dot. For strict inequalities (that is, inequalities involving < or >), the point is not part of the solution, and is marked with an open dot. Boundary points may be found by solving the equality associated with the given inequality. For example, the solution to the equation $2x = 6$ is $x = 3$, so the inequality $2x \geq 6$ has a boundary point at 3. A boundary point is also sometimes called a "dividing point."



inequality- An inequality consists of two expressions on either side of an inequality symbol. For example, the inequality $7x + 4.2 < -8$ states that the expression $7x + 4.2$ has a value less than –8

inverse operation- An operation that undoes another operation. For example, multiplication is the inverse operation for division

multiplicative inverse- The multiplicative inverse for a non-zero number is the number we can multiply by to get the multiplicative identity, 1. For example, for the number 5, the multiplicative inverse is $\frac{1}{5}$; for the number $\frac{2}{3}$ the multiplicative inverse is $\frac{3}{2}$.

rate- A ratio comparing two quantities, often a comparison of time. For example, miles per hour.

reciprocal- The reciprocal of a nonzero number is its multiplicative inverse, that is, the reciprocal of x is $\frac{1}{x}$.

unit rate- A rate with a denominator of one when simplified.

Where These Topics Are Revisited

Rate problems continue in Chapter 8 when they work with distance, rate, time, and unit conversions. They will also return to ratios when they learn applications of percent in Chapter 9. Continued use of equation solving skills in Chapter 8 while working with multiplication equations and in Chapter 9 where they solve percent equations.

What's Coming Up in the Next Chapter

Students will look at Statistics and Multiplication Equations in Chapter 8.

How You Can Help at Home

Encourage your student by asking them to think about these questions:
"What is being compared?"
"What does the comparison tell me?"
"How else can I represent it?"
"What is the relationship?"
"Are they equivalent?"

On the Chapter 7 assessment, students will be expected to show their understanding of the following:

6.RP.2 Understand the concept of a unit rate a/b associated with a ratio $a:b$ with $b \neq 0$, and use rate language in the context of a ratio relationship.

6.RP.3a Make tables of equivalent ratios relating quantities with whole number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.

6.NS.1 Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem

6.NS.3 Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation

6.EE.3 Apply the properties of operations to generate equivalent expressions.

6.EE.5 Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.

6.EE.8 Write an inequality of the form $x > c$ or $x < c$ to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form $x > c$ or $x < c$ have infinitely many solutions; represent solutions of such inequalities on number line diagrams

Sample Problems from the Chapter

Cheryl was thinking more about Malik's idea of using a Giant One to help divide and realized it could be used with two fractions. She used the problem $\frac{1}{6} \div \frac{3}{4}$ to demonstrate her idea, doing the work shown at right.

Cheryl said, *"Can we use a Giant One like you did? This time, let's choose a number to use in the Giant One that will make the denominator of our answer equal to 1."*

What number could Cheryl use in her Giant One? In other words, what number multiplied by $\frac{3}{4}$ will give the answer 1? What is that number called?

Copy and complete Cheryl's calculation. Cheryl called a Giant One made by two fractions a Super Giant One.

Show how to write $\frac{4}{5} \div \frac{1}{2}$ Cheryl's way and then solve it using a Super Giant One.

Helpful Strategy

A fraction that is equal to 1. Multiplying any fraction by a Giant One will create a new fraction equivalent to the original fraction.

$$\frac{2}{3} \cdot \boxed{\frac{2}{2}} = \frac{4}{6}$$

If someone runs at a rate of 36 feet in 3 seconds, how fast is she running in yards per minutes? Note the second and third multipliers are just Giant Ones.

$$\frac{36 \text{ feet}}{3 \text{ sec}} \cdot \boxed{\left(\frac{60 \text{ sec}}{1 \text{ min}}\right)} \cdot \boxed{\left(\frac{1 \text{ yard}}{3 \text{ feet}}\right)}$$

$$= \frac{(36 \text{ feet})}{(3 \text{ feet})} \cdot \frac{(60 \text{ sec})}{(3 \text{ sec})} \cdot \frac{(1 \text{ yard})}{(1 \text{ min})}$$

$$= 12 \cdot 20 \left(\frac{\text{yards}}{\text{min}}\right)$$

$$= 240 \frac{\text{yards}}{\text{min}}$$

Which company offers the lowest unit rate per minute? Show how you decided.

Company	Price	# of minutes
AB & C	$19.95	100
Berizon	$24.95	150
Cinguling	$9.95	60
DWest	$14.75	100

Recall that parentheses allow us to consider the number of groups of tiles that are present.

Below are four steps of a math magic trick. Write the result of the steps in two different ways. Build it with tiles if it helps you.

1. Pick a number.
2. Triple it.
3. Add 1.
4. Multiply by 2.

Write $4(2x + 3)$ in another way.

Build $9x + 3$ with algebra tiles.

How many groups can you divide the tiles into evenly?

Write the expression two ways, one with parentheses and one without.

Build $15x + 10$ with tiles and write the expression another way.