Implementing Whole Class Discussions in a Seventh Grade Unit on Ratios

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Implementing Whole Class Discussions in a Seventh Grade Unit on Ratios

Lauren Cannon

August 2014

A thesis submitted to the Department of Education and Human Development of The College at Brockport, State University of New York in partial fulfillment of the requirements for the degree of Master of Science in Education
Abstract

The National Council of Teachers of Mathematics (NCTM) (2004) stated that in order to demonstrate knowledge and understanding of mathematics, students must be able to communicate about it. As a teacher-researcher, I have identified several of the reasons that there has been increased emphasis placed on communication in the mathematics classroom. Additionally, I explored the theoretical background of and research-based effects of implementation of discussion into the secondary mathematics classroom in order to support my claim that discussion is an effective way to meet NCTM’s requirements while also aiding in implementation of the Common Core State Standards for Mathematics (New York State Education Department, 2014). I have proposed a method for introducing discussion into the math classroom by including an a seventh grade mathematics unit plan on rates with multiple discussion opportunities weaved into each lesson.
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Chapter One: Introduction

As a teacher of mathematics, I am constantly on the search for the best pedagogical practices I can incorporate into my classroom. In order to do this, I must be reflective of my instruction and my students’ results. Additionally, I must welcome the ideas, criticisms and research of others. I do this for several reasons, including but not limited to: (1) to ensure my students’ mastery of mathematical concepts, (2) to pass on my own appreciation for the study of mathematics and (3) to be consistent with valid educational research and reforms.

The National Council of Teachers of Mathematics (NCTM) (2004) states, “Instructional programs from pre-kindergarten through grade 12 should enable all students to organize and consolidate their mathematical thinking through communication and communicate their mathematical thinking clearly and coherently to peers, teachers, and others…” (Standards section, Communication subsection). I recognize that such a goal should have significant implications for mathematics classroom practices in my classroom and classrooms across the United States. However, at times I am reluctant or unsure of how to incorporate varied forms of communication into classroom.

Communication in my secondary math classroom can take on multiple forms from ranging from oral, written, or technology based. My students use written communication in the form of paper and pencil assessments and other assignments. Technology based communication has become more popular with the introduction of digital responders for sets of mathematical problems. Verbal communication is common place in the math classroom as well, but many times I am the only one who is verbalizing mathematical concepts.

Definitions

Carpenter, Frank and Levi suggest that in order for secondary mathematics students to attain understanding of math concepts, discussion must take place (as cited by Walshaw & Anthony, 2007). My area of focus was promoting verbal communication through the use of discussion in the secondary math classroom. For
the purposes of this paper, I define the term “discussion” as explanation, argumentation and defense of mathematical ideas (Walshaw & Anthony, 2007).

I use the term “small group discussion” refers to discussions occurring between two to four members of a class that are loosely monitored by the teacher. I use the term “whole group discussions” or “whole class discussions” to describe discussions occurring between all members of a class (teacher and students) where the teacher serves as a discussion facilitator by asking probing and follow up questions when needed.

**Problem Statement**

Communication is a requirement for mathematics education in the United States, and I believe that discussion is a way to meet that requirement. To that end, it is my opinion that the introduction of structured and effective opportunities for mathematical discussion must occur. As educational reforms take place, teachers are required to change their instruction to accommodate these reforms. Unfortunately, concrete pedagogical methods and tools are not always provided as an aid in this process. The fact that many secondary mathematics teachers are unsure of how to blend discussion into the existing curriculum is a problem that needs a clear solution.

**Significance of Problem**

In July of 2010, New York State officially adopted the Common Core Learning Standards for both mathematics and English language arts (EngageNY, [https://www.engageny.org/common-core-curriculum-assessments](https://www.engageny.org/common-core-curriculum-assessments)). In December 2010 state officials announced that students in third through eighth grade would be assessed on the new common core standards during the 2012-2013 school year (Gewertz, 2013).

As a seventh and eighth grade mathematics teacher, I have experienced the first two years of the common core state standard assessments first hand. It has been a challenging adjustment period for me and my students.
The main reason for this challenge is stated by the State Education Department as follows: “These standards define what students should understand and be able to do in their study of mathematics. Asking a student to understand something means asking a teacher to assess whether a student has understood it” (p. 4). The ability to justify why mathematical statements or laws work was identified as the main method by which teachers can assess student understanding.

I find this to be significant because as state assessments have shifted away from assessing knowledge of mathematical procedures toward a broader understanding of concepts, pedagogical changes must follow. It is my opinion that one way to increase students’ ability to justify their reasoning and understanding of concepts is to allow them to participate in mathematical discussions and conversations on a regular basis.

**Rationale**

My belief is that implementing a form of the “Teach-Ok” (Battle, 2014) strategy between partners in secondary mathematics classrooms will increase the number of students engaged in whole class discussion as well as the level of responses elicited during such discussion. It has been my experience that short episodes (15 – 60 seconds each) of “Teach-Ok” with a partner can serve as an opportunity for students to gain confidence and collect more “chips.” When this strategy is implemented with well planned questioning, students feel more confident and ready to then participate in whole-class discussion.

The topic of rates with a focus on unit rates for seventh grade is the subject matter covered in this subsequent curriculum project. I chose this topic because ratios are the focus of the NYS math curriculum for grades 6-8. In seventh grade, students must gain a deep understanding of the meaning of unit rates as this will carry through as an understanding of rate of change or slope in eighth grade. It is my opinion that without a strong background on unit rates, students will not be able to understand real world applications of linear functions. This needs to occur in order for students to be successful in secondary mathematics and in turn have a chance to study
mathematics further down the road in their post-secondary education. This is due to the fact that the concept of the rate of change of functions will continue to be a key concept through calculus courses. I believe if students do not gain understanding of rates while in middle school, they will struggle to succeed in subsequent math courses.
Chapter Two: Literature Review

Mathematics teachers who are working towards incorporating the NCTM’s communication standards into daily instruction are running what has been coined a reformed classroom (Chazan & Ball, 1995). This is a relevant issue in mathematics education due to the above referenced NCTM communication standards as well as research based benefits of incorporating discussion into the math classroom, such as increasing students’ levels of content understanding.

In order to introduce the value of discussion in the mathematics classroom, teachers must first be made aware of the requirements of the NCTM as well as some theoretical background that anchors them. Thompson and Chappel (2007) cite the NCTM’s 2000 revision of *Principles and Standards of School Mathematics*. According to Thompson and Chappel, k-12 mathematics program must enable students to:

- Organize and consolidate their mathematical thinking through communication;
- Communicate their mathematical thinking coherently and clearly to peers, teachers, and others;
- Analyze and evaluate the mathematical thinking and strategies of others;
- Use the language of mathematics to express mathematical ideas precisely (pp. 179-180).

These standards require students to apply a wide range of cognitive processes to the subject of mathematics. Some explanation as to the relevance of these standards may provide motivation for teachers to incorporate them. Bloom’s Taxonomy (Bloom, 1956) is a descriptive list of the levels of learning all teachers should strive to have their students achieve; it has been widely accepted in the teaching community for many years (Buxkemper and Hartfiel (2003). Buxkemper and Hartfiel (2003) list Bloom’s Taxonomy (levels of
learning) as (1) knowledge, (2) comprehension, (3) application, (4) analysis, (5) synthesis, and (6) evaluation. However, these researchers point out that this taxonomy, though widely used in education, does not mesh well with mathematics because many of these levels overlap in mathematics and are difficult to distinguish. For example, analysis and synthesis often occur together and are then combined with evaluation in order to reach application (p. 802).

Biggs and Collis (1982) developed a taxonomy for quality of learning that more closely matches the types of tasks elicited in the study of mathematics. The levels of tasks are (1) translate – to be able to put information into a form other than the way it was presented; (2) extend – to in some way fill in missing gaps in information; (3) judge – make conclusions based on accuracy or comparing and contrasting; and (4) ideas – learn how and why a concept works (as cited by Buxkemper & Hartfiel, 2003, pp. 802-803). All the elements of Bloom’s taxonomy are present here. Translate contains Bloom’s comprehension, extend contains and goes beyond application, judge and ideas contain analysis, synthesis and evaluation. Mathematical tasks fall into these categories more naturally. In addition, since one natural way to reach all levels of both Biggs’ and Collis’ taxonomy is through various forms of communication, Biggs’ and Collis’ taxonomy aligns well with the NCTM’s communication standards.

**Importance of Discussion**

When educational reforms take place, teachers are required to change their instruction to accommodate them. Unfortunately, concrete examples and tools are not always provided as an aid in this process. NCTM’s call for a greater emphasis on communication in mathematics education was provided by Huang, Normandia, and Greer (2005). The researchers wanted to determine what level of knowledge structures were given by both teachers and students during discussions. They found that teachers consistently display higher level knowledge
structures, but students often only display lower level knowledge structures. However students’ communication displayed high-level thinking when they were responsible for teaching their classmates.

Ketch (2005) suggested that talking enables learning to occur for students, and teachers should therefore provide many opportunities for conversations to occur amongst students. As an issue of social relevance, Lubienski (2000) stated that an increased emphasis on collaboration and discussion in the mathematics classroom is believed to help groups underrepresented in mathematical careers. The skills students practice in a discussion rich reform mathematics classrooms mimic the skills people need to be successful in most industries. Lubienski says that students from middle or upper class backgrounds are usually brought up in an environment that supports participation in academic discussions while students from working class backgrounds are generally not. Lubienski’s results suggested that discussion rich classrooms would give working class students these skills if teachers explicitly taught students how to participate in discussions.

The pressure of achieving positive outcomes on standardized tests is a reality for today’s teachers and students that cannot be ignored. According to Allen (2011), today’s students are taught the ins and outs of succeeding on tests at the expense of learning to be mathematical thinkers (p. 6). Lampert (1990) found that teachers in reformed math classrooms can accomplish both outcomes. Lampert’s study compared students who were taught mathematics with an emphasis on understanding with those who were focused on memorizing mathematical procedures. The researchers found that the students for whom understanding was emphasized had improved performances on standardized tests as opposed to those who were taught procedurally. Teaching for understanding consisted of working on a small number of in depth problems along with discussions (as cited by Hicks, 1995-1996, p. 74).

Adhering to NCTM’s standards is not the only reason to incorporate communication into the mathematics classroom. Mercer and Sams (2006) conducted a study with results that suggest that when students learn to verbally communicate with classmates about mathematics, they experience higher levels of classroom
participation and academic achievement. Communication, student participation or engagement, and achievement were all shown to be related in this study. Jones and Tanner (2002) conducted a qualitative research study in which they examined the effectiveness of increasing interaction in mathematics classrooms. The participating teachers increased articulation, reflection, and scaffolding in their classrooms. The results showed that students’ confidence in mathematics increased after their teachers changed their approaches. The researchers suggested that teachers must examine the levels of mathematical conversation they hear in their classroom and teach mathematics in a more interactive manner.

There are many forms of communication that can be combined to meet the standards in mathematics education, but the focus of this paper and subsequent curriculum project will be communication in the form of discussion. According to Silver and Smith (1996), discussion is a necessary component of the current vision of math education (p. 1).

Piccolo et al (2008) explain that students need to be given opportunities to articulate their understanding of content. Piccolo and colleagues made video recordings of several teachers and then analyzed and coded the paths that led to discussions or lack of discussion. One trend the researchers found was that questions asked by the teacher often lead to simple explanation of calculations or processes. Conversely, questioning by students led to richer discussions.

In mathematics, it is necessary for students to demonstrate their knowledge by successfully completing tasks that meet academic objectives. However, teachers should give students many types of opportunities to understand and internalize the content they are expected to master. Brown and Kane (1988) found that students who verbally elaborate upon ideas outperform those who are given explanations support Piccolo et al’s findings (as cited by Piccolo et al, 2008, p.403). Additionally, Au (1993) stated that listening and speaking skills are developed through oral communication, which is necessary for social and academic success (as cited in David & Capraro, 2001).
Discussion for Mathematical Reasoning

The study of mathematics is important for more reasons than simply obtaining the ability to accurately calculate solutions to straightforward problems. Students need to learn to be problem solvers and critical thinkers in today’s world. Mevarech and Kramarski (1997) found that when students discuss various areas of mathematics, such as comprehension, strategies, and mathematical principles, their mathematical reasoning skills increase (as cited in David & Capraro, 2001). Mathematical reasoning skills are imperative for students to put the mathematics concepts they learn into practice in the real world.

According to Moses and Cobb (2001), our society is becoming increasingly dependent upon technology and its use in solving problems. Because of this, people are now required to constantly process large amounts of information. The mathematical skills of generalizing patterns, solving new problems and using combinations of problem solving strategies are as important today as reading and writing were in the 19th century (as cited by Allen, 2011). In order for students to gain these skills, teachers must impart the foundational belief that mathematics is a way of thinking, not simply a class to pass (Allen, 2011). Given that the skills of generalizing patterns, solving new problems and using combinations of problem solving strategies are a necessity in today’s world, teachers must use the best practices possible to give students understanding.

Anytime students learn a mathematical concept, one goal should be that they be able to transfer their knowledge to new situations. This can mean applying the concept to a new set of numbers or variables or to various real life situations. Boaler (2002) recognized that discussing mathematical ideas as opposed to textbook practice alone led students to a more flexible knowledge base that could be applied and extended towards many scenarios.

Boaler and Greeno’s (2000) found that when teachers use the practice of memorizing procedures for the majority of their instruction, some students are led away from the study of mathematics because they feel more successful when allowed to interpret material themselves (as cited by Boaler, 2002). Boaler’s (2002) research
results revealed students’ attitudes towards mathematics when taught in traditional classrooms versus those taught in discussion rich classrooms. Students from traditional classrooms generally did not feel any connection to mathematics and did not plan to pursue it after completing required courses. Students taught in discussion rich classrooms felt that the way they participated in mathematics was similar to the way they participated in the rest of their lives. Given the importance of acquiring mathematical reasoning skills, students cannot afford to stray for such reasons. Huang and Normandia (2009) found that while students will resist mathematical discussions at first, they are aware of the benefits they can reap from them. The researchers stated that talking about the theory behind common mathematical practices helped students achieve greater understanding.

Oral communication is not only beneficial for the speaking student; listeners benefit as well. Breyfogle (2005) stated that students revoicing ideas and listening to peers were both characteristics of meaningful math discussion (p. 2). Additionally, students themselves described an increase in understanding when they listened to their classmates explain mathematical concepts (Huang & Normandia, 2009, p. 11). Ball (1993) suggested that discussion promotes higher level thinking because as students question each other and explain their own ideas their behaviors mirror those of expert mathematicians.

Difficulties of Discussion

There is a significant body of research that shows how integrating discussion opportunities in a mathematics class can be beneficial (Boaler, 2002; Breyfogle, 2005; Huang & Normandia, 2009; Lampner, 1990; Mercer & Sams, 2006). Why, then, is it not occurring in every mathematics classroom? Teaching students to communicate about mathematics requires implementation of new pedagogical practices and social norms in the classroom. According to Silver and Smith (1996), creating such an atmosphere is challenging and will take multiple attempts for teachers (p. 2). Teachers need support and resources in order to do so effectively.
In addition, teachers need to examine the ways in which their roles will change. Teachers will spend more time developing worthwhile questions and tasks that elicit discussion (Bennett, 2010). More time will be spent managing student discussion than preventing it (Silver & Smith, 1996). Many secondary mathematics teachers run their classrooms with little input from their students (Jansen, 2006). That is to say students are expected to listen without speaking and to do problems using the prescribed methods. According to Jansen (2006), this practice is detrimental to students because they need autonomy in order to develop their full academic capacity.

One difficulty teachers experience while infusing discussion is ensuring that the discussion is on task. According to Mercer and Sams (2006), when students are asked to discuss something in groups, they often become off task and unproductive. If discussions are to be fruitful, teachers must spend class time teaching students how to communicate effectively with peers. Increasing the amount of discussion in a classroom will also likely introduce more disagreements between students. According to Chazan and Ball (1995), this is an issue in discussion rich math classrooms.

Canfield and Wells (1976) describe the challenge of introducing discussion into a mathematics classroom as the “poker chip theory,” which implies that students experienced varied levels of academic success and failure. The more academic successes a student experiences, the more “chips” he or she has. Students who have experienced a lot of success are often willing to take risks in whole-class discussions because they have “chips to spare,” but students who have not had a high success rate in school are often hesitant to participate in whole group settings (as cited in Bennett, 2010, pp. 79-80).

Bennett (2010) finds that most students, even those with few chips to spare, will participate in small group discussions. The issue is that it is impossible for one teacher to successfully facilitate multiple small group discussions occurring simultaneously. Teachers must find a way to create an environment where all students feel confident enough to share their knowledge and ideas in a whole-group setting.
According to Doerr (2006), another challenge facing teachers during periods of classroom discussion is the task of taking the many ideas and thoughts presented by students and making sense of the developments of multiple ideas. Adding to this difficulty is the fact that what is offered by students may not fit in with the learning objectives for the lesson. Taking multiple ideas from the class and weaving the appropriate ones together to support learning goals is a skill requiring practice.

Motivation to learn mathematics is another factor that affects discussion in the classroom. A lack of student motivation may lead to difficulties in student engagement during discussions. Motivation plays a significant role in mathematics education, and its impact is worth mentioning in terms of engaging discussion. Rugutt and Chemosit (2009) looked at the effects of student-to-student relations and student-to-faculty interactions on motivation and found that both were important variables in student motivation. Thus, the researchers highlighted that educators should focus on providing educational experiences that encourage the development of an environment in which students feel free to express their ideas and participate in discussions. In the case of a structured discussion-rich classroom, the goal itself should increase student motivation.

**Implementing Discussion**

Richards (1991) stated that “students will not become active learners by accident, but by design” (as cited in Huang & Normandia, 2009, p. 3). In other words, a discussion rich math classroom will not exist without implementing a plan over what may be a long period of time. According to Wood (2001), student participation in classroom discussions is dependent on the social structures implemented by the teacher in that classroom (as cited by Nuhrenborger, 2009). When students are off-task during whole class discussions, the blame cannot be placed entirely on them.

Pirie and Schwartzenberger (1988) suggest that the tasks that teachers present as discussion opportunities should be only those that will maximize the potential for deeper understandings to occur (as cited by McNair,
Students cannot be expected to discover hidden meanings from or through discussions. The teacher must provide sound content knowledge and structure to discussions to ensure that this occurs (McNair, 2000). A teacher’s reflective approach to his or her instruction and past experiences is necessary for this.

Bennett (2010) noted through his work as a mentor to a secondary mathematics teacher and a college professor that new teachers required support in order to begin successfully implementing discussion into their classrooms. Over the course of a school year, he documented the number and types of questions (probing, follow up) asked by two new teachers. The results showed notable increases in both the number of questions asked, the level of questioning practiced by each teacher and in turn improved engagement of students. This was measured in terms of the number of engaged students and in the cognitive value of responses given (Bennett, 2010). Bennett found that new teachers can achieve results through support in the form of frequent data driven observation and feedback.

Rosenfeld, Richman, and Bowen (2000), as cited by Frisby and Martin (2010), found that a classroom in which students feel supported by both teachers and peers can lead to a higher attendance rate and academic engagement among other positive outcomes. Frisby and Martin’s (2010) study examined the effects of the relationships between teachers and students as well as students and students. The results showed that students participated more in classes where they felt they had positive relationships with the teacher and classmates as well as a supportive and communicative classroom environment. Additionally, Jansen (2006) found that one reason students enjoy participating in classroom discussions is that they feel it will help increase their classmates understanding of content.

The most common method for establishing a discussion rich math classroom is that the teacher must model the social skills and behaviors that he or she will expect from students in terms of appropriate ways to pose questions and give responses (Nuhrenborger, 2009; Silver & Smith, 1996). Teachers should not assume that students know how to ask thought-provoking questions or respond to classmates responses appropriately. These
factors are essential to model because students will need to learn how to judge ideas without criticizing or insulting the person who presents them (Silver & Smith, 1996). The teacher must be the first to model such behaviors and dispositions.

Creating an environment in which discussions are a regular part of instruction requires teachers to reexamine the role they play in the classroom. Piccolo et al (2008) asserted that one role of the teacher is to take a probing approach to guided dialogue. McNair (2008) explained that during whole group discussions, teachers should model strategies such as reciprocal teaching, asking clarifying questions, and making predictions. Modeling in a whole class discussion can transfer into students’ small group discussions. Cayden (2001) noted that for discussions to be part of the mathematics classroom, students must adopt the belief that providing an explanation for the answers they present are as important as the answers themselves (as cited by Schleppenbach et al, 2007). Teachers can lead by example by doing so themselves.

In order for a teacher to facilitate a discussion rich math classroom where communication is a common occurrence, they must give up some of the control they are used to having in their classroom. They must be open to the ideas and reflections of their students and respond appropriately to them. This must be done on a consistent basis in order to create the environment needed for a discussion rich classroom (Jansen, 2006). Developing such an environment requires effort from both the teacher and students. Teachers must consider themselves learners in the classroom along with their students in order for students to feel that their thoughts and ideas will be appreciated (Allen, 2011).

If teachers expect students to participate in classroom discussions in a meaningful way, they must give students adequate reasons to believe in the importance of such mathematical talk (Cross, 2009). If this is to occur, the importance of teachers’ beliefs and attitudes cannot be underestimated. According to Cross (2009), an environment in which students can become powerful mathematical thinkers is created by a teacher who believes in learner-oriented environments. This supports Jansen’s (2006) statement that in order to facilitate a discussion
Brain Science and Education

Many researchers have explored the different functions of the left and right hemispheres of the human brain and related their results to the realm of education in hopes of improving instruction and increasing engagement of students (Duman, 2010; Tatar & Ditiki, 2008; Zull, 2002). Jansen’s (2008) describes brain-based education as “the engagement of strategies based on principles derived from an understanding of the brain” (p. 4). According to Tileston (2005), brain researchers have found that to fully engage the brain, teachers should teach to individual differences, diversify teaching strategies, and maximize the brain’s natural learning processes (as cited by Duman, 2010).

Duman (2010) conducted a study to determine if there is a difference in achievement between students taught using the Brain Based Learning (BBL) method and those taught using traditional methods, especially in terms of students with different learning styles. BBL is a method in which the teacher makes instructional decisions based on the way the brain functions. One main purpose in this approach is to provide equal learning opportunities for all individuals in a classroom.

The five basic principles of BBL are (1) The brain works in unity, (2) each brain is unique, (3) the brain contains two hemispheres with different functions, (4) the left brain is analytic and abstract, the right brain is holistic and concrete, and (5) the brain has four lobes, each lobe performing different functions and duties (Duman, 2010). Because each brain is unique, its functionality for each person is different causing different learning styles to be dominant.

One technique involved with the BBL method is a teacher’s incorporation of discussion into the classroom. Specifically, this includes discussions about lessons and classroom experiences that occur among
students. Zull (2002) stated that the learning cycle occurs in the way a student processes information through the four lobes of the brain. A student’s concrete experiences go through the sensory cortex, reflective observation, of which discussion is one form, occurs in the integrative cortex. New abstract concepts are created in the integrative cortex, and active testing takes place in the motor brain. By including all steps in this process, a student will more effectively store the information.

Before Duman (2010) conducted research, the experimental (BBL) and control (traditional) groups completed an academic achievement test and Kolb’s learning style inventory. Statistical analyses of the results of these tests determined no significant differences between distribution of learning styles or achievement between the groups. The experiment itself was the teaching of a unit on statistics. The experimental (BBL) group was taught using methods that incorporated music, a variety of visual representations, discussions, and individual reading and processing. The control (traditional group) was taught mainly by lecture. The results of the study showed a greater increase in achievement for the experimental (BBL) group for all learning styles except the accommodating learning style. The diverging, assimilating, and converging styles all showed an increase in achievement.

Tatar and Dikici (2008) conducted a study to determine whether a method known as the 4mat method was beneficial for students of mathematics. According to McCarthy (1990) the 4mat method is a cycle of instruction based on the preferred learning styles of students as well as brain hemisphere processing dominance (as cited in Tatar and Dikici, 2008). In the 4mat system, there are four categories of learning styles. Type one learners want to make personal meaning from information, type two learners desire conceptual understanding, type three learners are interesting in how things work and the goal of type four learners is self-discovery. When employing the 4mat method, teachers teach for each of those styles so that every student’s strengths will be used while encouraging development of his or her less prevalent learning styles.
In Tatar and Ditiki’s study, the teacher taught the experimental group with the 4mat method and the control group using traditional methods. Results of the students’ pre-tests showed no significant differences between the two groups in terms of mathematical knowledge or attitudes. The results of the students’ post-tests showed a significant difference in achievement in favor of the experimental group taught with the 4mat method.

McCarthy (1987) elaborated on how to use learning style assessments to determine hemisphere dominance and therefore which teaching methods teachers should select when planning instruction using 4mat for a group of students. According to McCarthy, students who favor the right hemisphere of the brain are imaginative and dynamic learners and best process new information by interacting with others. Conversely, McCarthy stated that students who favor the left hemisphere of the brain are analytic learners and best process information independently. Based on McCarthy’s research, Beck (2001) asserts that while most people favor one particular hemisphere, the highest level of functioning occurs when both hemispheres are engaged and are complementing each other. Therefore, teachers should select methods that support both hemispheres when designing lessons for any group of students (as cited by Beck, 2001).

While both Duman’s and Tatar and Dikici’s studies were conducted on a fairly small scale (Duman had 34 student participants; Tatar and Dikici had 58 student participants), their positive results support the call to connect aspects of brain science to education. I believe that the implications of McCarthy’s description of the various learning styles and brain hemisphere dominance combined with Beck’s statement that both hemispheres should be engaged for optimal results are significant for educators. It is my opinion that teachers who seek to provide the best learning environment for their students should explore practices that provide positive outcomes in terms of achievement.

Singh and O’Boyle (2004) compared the speed and accuracy when completing academic tasks of students who were of average mathematical ability to that of mathematically gifted students. They found that students who are mathematically gifted displayed greater speed and accuracy when presented with information bilaterally,
between the right and left hemispheres. Students of average mathematical ability had higher speed and accuracy when presented with information unilaterally, or aimed toward one specific hemisphere of the brain (as cited by O’Boyle, 2005).

Although O’Boyle (2005) says that research in this area is limited, he reasons that this finding has implications for teachers in terms of instruction. This supports Beck’s (2001) assertion that students will benefit from instruction geared towards both brain hemispheres. In terms of classroom practices, McCarthy’s (1987) description of the learning preferences for hemisphere dominance can be referenced. Right hemisphere learners generally prefer to process information by interacting with others, while left hemisphere learners prefer independent work. Based on this research (Beck, 2001; McCarthy, 1987; O’Boyle, 2005), I propose that the most effective mathematics instruction should incorporate both independent work along with interaction among class members. In light of NCTM’s communication requirements and research on discussion in the mathematics classroom (Allen, 2011; Cayden, 2001; Jansen, 2006; Ketch, 2005; Lubienski, 2000), discussion should be a means of achieving this student interaction.

**Whole Brain Teaching**

I propose that using the pedagogical method of whole brain teaching can aid in the process of implementing brain science. Pederson (2014) of Whole Brain Teaching, LLC, defines whole brain teaching (formerly referred to as Power Teaching) as “a large amount of educational tomfoolery” (http://www.wholebrainteaching.com/index.php?option=com_k2&view=item&id=135:whole-brain-teachers-of-america&Itemid=105). This means that students are having fun while learning. I believe that parts of this pedagogical method can be used to systematically infuse mathematical discussion into a classroom to support the implications that brain science principles have on education.
While Pederson’s definition of whole brain teaching is vague, whole brain teaching can be better understood by explaining one of its routines called “Teach-Ok” that must be established in the classroom by the teacher. Battle (2014) states that “Teach-Ok” engages students by using sight, hearing, speaking and movement which results in effective learning. To use “Teach-Ok”, the teacher tells students what they are to discuss, explain or review with their neighbor. When the teacher says, “Teach!” the students respond, “Ok!” and turn to their neighbor. According to Battle, this technique is useful because it makes the transition to partner work and conversation smooth and easy since it is an established classroom routine. When using “Teach-Ok” students are verbally communicating with at least one of their classmates. Biffle (2014), the creator of whole brain teaching, recommends using additional strategies along with “Teach-Ok”, but these will not be included in my curriculum project as they do not aid in implementation of discussion.
## Chapter Three: Unit Plan

### Seventh Grade Outline For Unit Plan on Rates

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<tr>
<td>1</td>
<td>7.RP.1 Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units</td>
<td>SWBAT determine ratios to compare data</td>
</tr>
<tr>
<td>2</td>
<td>7.RP.1 Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units</td>
<td>SWBAT determine unit rates</td>
</tr>
<tr>
<td>3</td>
<td>7.RP.1 Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units</td>
<td>SWBAT determine unit rates with complex fractions</td>
</tr>
<tr>
<td>4</td>
<td>7.RP.1 Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units</td>
<td>SWBAT Compare unit rates</td>
</tr>
<tr>
<td>5</td>
<td>7.RP.1 Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units</td>
<td>SWBAT Convert unit rates day 2</td>
</tr>
<tr>
<td>6</td>
<td>7.RP.1 Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units</td>
<td>SWBAT use a scale factor to interpret maps</td>
</tr>
<tr>
<td>7</td>
<td>7.RP.1 Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units</td>
<td>SWBAT use a scale factor to interpret maps day 2</td>
</tr>
<tr>
<td>8</td>
<td>7.RP.1 Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units</td>
<td>Review</td>
</tr>
<tr>
<td>9</td>
<td>7.RP.1 Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units</td>
<td>Quiz</td>
</tr>
</tbody>
</table>
Context

This unit was originally designed for three seventh grade classes at an urban charter school in western New York. I designed the unit to meet the New York Common Core State Standards for mathematics, but it was the first year we taught this unit aligned to these standards. During the 2013-2014 school year, I incorporated opportunities for partner and whole class into all math classrooms in the school, but it was not done in a structured manner.

The goal of this unit plan was to take the materials previously created and highlight opportunities for discussion within each lesson. I have done this by giving students space to organize their own thoughts along with information presented by their classmates during discussions. I have also inserted comments throughout the lessons to show what questions I believe should be asked in order for students’ discussions to lead to conceptual understanding. It is my hope that this unit plan will assist teachers in two ways. First, I hope the lessons and questions included within the lessons will be useful for seventh grade teachers in teaching unit rates. Additionally, I hope that the method I will present to incorporate discussion into the mathematics classroom will serve as a useful model for teachers who are looking to increase discussion opportunities for their students.

Method

In order to implement this unit effectively, each individual student will need a copy of the lesson being taught that day. Teachers may decide what presentation equipment to use. My classroom has an ELMO and an LCD projector that will be used during lessons. They will also need writing utensils, but no other materials should be necessary.

Each lesson in this unit will present multiple opportunities for students to share and discuss their ideas and methods with a partner before students are asked to participate in a whole class discussion. Therefore, this unit plan is designed to be used in classrooms where students’ desks are arranged in partners. This should be done
prior to beginning this unit. I propose that teachers create the seating arrangement rather than the students. Teachers may do so in whatever manner they choose. When determining a seating arrangement, I consider students’ personalities and achievement levels. Some students with like achievement levels will be paired while other pairs may have mixed achievement levels. I propose that each teacher should make these decisions based on their unique classes.

A variation of Battle’s (2014) “Teach-Ok” method will be used in these lessons. Ideally, teachers should implement “TeachOk” at the beginning of the school year so that it is part of students’ daily routines in math class. Teachers may implement “Teach-Ok” during this unit but must be aware that students will need to practice the method before it runs smoothly. If the phrase “Teach-Ok” is not preferable to teachers, they may use another word, phrase or signal to begin and end partner discussions. Whatever is chosen for this procedure should be used consistently to ensure fast transitions.
Chapter 4: Unit Materials

Name: ___________________________ Date: ________

Homeroom: _______________________

Objective: SWBAT determine ratios to compare data.

IPOD (Integer Problems of the Day)
-15 + (-11) − 3 = _______
-7 − 11 − 4 = _______

Do Now:
1) The average times it takes Miguel to cut his lawn and his neighbor’s lawn are given in the table.

<table>
<thead>
<tr>
<th>Lawn</th>
<th>Time to Cut (h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miguel’s</td>
<td>$\frac{3}{4}$</td>
</tr>
<tr>
<td>Neighbor’s</td>
<td>$1\frac{1}{4}$</td>
</tr>
</tbody>
</table>

Last summer, he cut his lawn 10 times and his neighbor’s 6 times. How many hours did he spend cutting both lawns?

A  $13\frac{1}{2}$ h  C  $14\frac{1}{2}$ h
B  14 h               D  15 h

2) The fraction $\frac{7}{9}$ is found between which pair of fractions on a number line?

A  $\frac{3}{5}$ and $\frac{3}{4}$  C  $\frac{7}{10}$ and $\frac{3}{4}$
B  $\frac{7}{10}$ and $\frac{4}{5}$  D  $\frac{3}{5}$ and $\frac{2}{3}$

3) The crest of a mountain is 5740 feet above sea level. The base of the mountain is 25 feet below sea level. What is the difference between the crest and base of the mountain?

Answer: ___________________________
A surfer who rides inside the curl of a wave is said to be *tube riding*. The shape of the tube is described as *cylindrical, square, round, or almond*, depending on how its length compares to its width.

<table>
<thead>
<tr>
<th>Value of $\frac{\text{length}}{\text{width}}$</th>
<th>Shape of Tube</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 1</td>
<td>Square</td>
</tr>
<tr>
<td>Exactly 1</td>
<td>Cylindrical</td>
</tr>
<tr>
<td>Between 1 and 2</td>
<td>Round</td>
</tr>
<tr>
<td>Greater than 2</td>
<td>Almond</td>
</tr>
</tbody>
</table>

1) The tube of a wave is 12 feet long and 15 feet wide. Write the fraction $\frac{\text{length}}{\text{width}}$ in simplest form. Then describe the shape of the tube.

Answer: ________________________

2) The tube of a wave is 20 feet long and 15 feet wide. What is the shape of the tube?

Answer: ________________________

3) A surfer is riding in a tube that is cylindrical. The width of the tube is 10 feet. What is the length? Explain how you know.

Answer: ________________________
A ratio is a __________ of two quantities by _________________.

__________________________ can be represented in the following ways:

  ◦
  ◦
  ◦

**WE TRY**

1) **Express the ratio 12 baskets in 18 attempts as a fraction in simplest form.**
   Explain its meaning.

   Meaning: ___________________________________________________________________

   ___________________________________________________________________

2) **Refer to the table. Express the ratio of the life span of a bottlenose dolphin to the life span of a mouse as a ratio in simplest form.**
   Explain its meaning.

<table>
<thead>
<tr>
<th>Animal</th>
<th>Life Span (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>bottlenose dolphin</td>
<td>30</td>
</tr>
<tr>
<td>mouse</td>
<td>3</td>
</tr>
</tbody>
</table>

   Meaning: ___________________________________________________________________

   ___________________________________________________________________

3) **Express the ratio 8 ounces to 3 pounds as a fraction in simplest form.**

   Answer: ___________________________________________________________________

There is a small bag of skittles. The following quantities were included in that bag.
Write the ratios requested below.

4) lemon to lime

5) cherry to grape

6) orange : lime

7) lime : orange

8) \[
\frac{\text{grape}}{\text{total}}
\]

9) \[
\frac{\text{not orange}}{\text{total}}
\]

Use ratios to solve the following word problems.
10) In Harvard the ratio of boys to girls is 3:4. If there are 12 boys in Harvard, how many girls are there?

Answer: ________________________________

11) Chyna played in a soccer game. The ratio of saves to shots was 4 to 5. If there were 20 shots, how many saves were there?

Answer: ________________________________

12) In a flower bouquet, 2 out of every 3 flowers is a daisy. If you have 20 daisies, how many flowers are in the bouquet?

Answer: ________________________________

13) In a fruit salad the ratio of melons to berries is 2 to 3. If you have 9 cups of berries, how many cups of melons would you need?

Answer: ________________________________
14) The table shows the number of touchdowns and interceptions each NFL quarterback had in a recent season. Which quarterback had the best touchdown to interception ratio? Explain its meaning.

Meaning: ____________________________

15) Cross out the ratio that is not equivalent to 16 girls out of 24

\[
\frac{2}{3} \quad \frac{3}{4} \quad \frac{8}{12} \quad \frac{16}{24}
\]

How did you decide which ratio to cross out? ____________________________

16) Ten out of every 30 Americans own a portable MP3 player. Express this ratio as a fraction in simplest form. Explain its meaning.

Meaning: ____________________________

17) Use the following table to answer the questions below:

<table>
<thead>
<tr>
<th>Player</th>
<th>Touchdowns</th>
<th>Interceptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drew Brees</td>
<td>26</td>
<td>11</td>
</tr>
<tr>
<td>Carson Palmer</td>
<td>28</td>
<td>13</td>
</tr>
<tr>
<td>Tom Brady</td>
<td>24</td>
<td>12</td>
</tr>
<tr>
<td>Philip Rivers</td>
<td>22</td>
<td>9</td>
</tr>
</tbody>
</table>
### Justify Conclusions

The table shows the heart rates of different animals.

<table>
<thead>
<tr>
<th>Animal</th>
<th>Heart Rate (beats/min)</th>
<th>Mass (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>cat</td>
<td>150</td>
<td>2000</td>
</tr>
<tr>
<td>cow</td>
<td>65</td>
<td>800,000</td>
</tr>
<tr>
<td>hamster</td>
<td>450</td>
<td>60</td>
</tr>
<tr>
<td>horse</td>
<td>44</td>
<td>1,200,000</td>
</tr>
</tbody>
</table>

**a.** What is the ratio of a cat’s mass to its heart rate? Express the ratio as a fraction in simplest form.

**b.** Order the animals from greatest mass to heart rate ratio to least mass to heart rate ratio.

**c.** Which animal had the greatest ratio? Explain your reasoning.

---

**18)** **Compare each pair of ratios using \(<\), \(>\), or \(\leq\).**

A. \$27 for 9 key chains, \$45 for 15 key chains

B. 6 cases for \$48, 14 cases for \$88

C. 8 girls out of 18 students, 12 girls out of 22 students

D. 24 thriller movies out of 36 DVDs, 10 thriller movies out of 15 DVDs

**19)** Fifteen out of 100 campsites at a campground are reserved for campers with pets. Express this ratio as a fraction in simplest form. Explain its meaning.

Meaning: ____________________________________________

---

### Concept Landing:

**Building on the Essential Question** In a recent year, the Jacksonville Jaguars took the ball away from their opponents 21 times. They gave the ball up to their opponents 22 times. A sports writer claims the takeaway/giveaway ratio is 21 – 22.
20) 

__________________________________________________ ________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

21) A department store conducted a study to determine what age groups shop in its store.

a. Express the ratio of people ages 0–17 to people ages 18–30 as a fraction in simplest form.

b. Express the ratio of people 30 or under to people over the age of 30 as a fraction in simplest form.

c. Express the ratio of people ages 18–30 to the total number of people as a fraction in simplest form.

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–17</td>
<td>25</td>
</tr>
<tr>
<td>18–30</td>
<td>75</td>
</tr>
<tr>
<td>31–45</td>
<td>54</td>
</tr>
<tr>
<td>46+</td>
<td>26</td>
</tr>
</tbody>
</table>

22) The ratio of snow to syrup in a snow cone is 7:2. If there are 21 ounces of snow, how much syrup is there?
23) **Model with Mathematics** Give three different examples of ratios that might occur in a real-world situation.

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________

24) The ratio of cars to trucks in the parking lot is 7 to 5. If there are 25 trucks in the parking lot, how many cars are there?

Answer: _____________________________________________

25) Prepster Punch has 5 parts juice to 3 parts soda. If you have 10 cups of juice, how much soda do you need to make Prepster Punch?

Answer: _____________________________________________

26) **Which One Doesn’t Belong?** Select the ratio that does not have the same value as the other three. Explain your reasoning to a classmate.

- 2 boys:3 girls
- 2 qt:3 gal
- 2 spoons:3 utensils
- 2 ft:3 ft
27) Mr. Hassall has 3 orange erasers for every 2 green erasers. If he has 24 orange erasers, how many erasers does he have in all?

Answer: _____________________________________________

28) Which ratio is equivalent to 3 : 4?

A 9 : 16
B 12 : 9
C 9 : 12
D 16 : 12

29) A cell phone store displayed the phone at the right on a poster. The length of the phone on the poster is 3 feet 4 inches. Write a ratio comparing the length of the actual cell phone to the length of the cell phone on the poster as a fraction in simplest form.

Answer: __________________________

30) Which ratio is equivalent to 5 : 4?

A 20 : 16
B 15 : 20
C 20 : 25
D 25 : 16
31) When cooking a turkey, you should bake it for about 1 hour for every four pounds of meat. If an 18 pound turkey is cooked for 4 hours, was it cooked long enough? If not, how long should the turkey have been cooked?

Answer: ________________________________
32) Which ratio is equivalent to $\frac{9}{6}$?

A \hspace{1cm} \frac{6}{9} \\
B \hspace{1cm} \frac{12}{9} \\
C \hspace{1cm} \frac{12}{8} \\
D \hspace{1cm} \frac{8}{12}

33) Be Careful! Express the ratio 15 inches to 1 foot as a fraction in simplest form.

Answer: ____________________________

34) In Mr. Blackwell’s class, 15 out of 24 students play sports. Express this ratio as a fraction in simplest form. Explain its meaning. (Example 2)

35) When you want to write a ratio that compares two quantities, what must be the same?

A. 10 yards to 10 feet
B. 18 quarts to 4 gallons
C. 4 ounces to 2 pounds
D. 6 feet to 14 inches

36) **Express each ratio as a fraction in simplest form.** (Example 3)

A. 10 yards to 10 feet
B. 18 quarts to 4 gallons
C. 4 ounces to 2 pounds
D. 6 feet to 14 inches

A water park has 14 body slides, 8 tube slides, 2 types of swimming pools, and 6 water play areas. Use this information to write each ratio as a fraction in simplest form.
38) **Short Response** Marisol counted the number of coins she had in her piggy bank. The table shows her results.

<table>
<thead>
<tr>
<th>Pennies</th>
<th>Nickels</th>
<th>Dimes</th>
<th>Quarters</th>
</tr>
</thead>
<tbody>
<tr>
<td>47</td>
<td>14</td>
<td>18</td>
<td>21</td>
</tr>
</tbody>
</table>

Write a ratio that compares the number of dimes to the number of total coins.

Answer: ________________________________

**HARDER**

41) There are 24 pencils in Angelina’s pencil pouch. If 3 out of 4 of the pencils are sharp, how many dull pencils does Angelina have?

A 3 pencils
B 6 pencils
C 18 pencils
D 32 pencils

42) In a pencil box there is a ratio of 3 yellow pencils to 4 green pencils. If there are 12 yellow pencils, how many green pencils are there?
43) In a flower bouquet, 2 out of every 3 flowers is a rose. If you have 18 roses, how many flowers are not roses?

Answer: ________________

44) In Harvard the ratio of sharp pencils to dull pencils is 5 to 7. If there are 36 pencils total, how many dull pencils are there in Harvard?

Answer: ________________________________

45) In the breakfast bin, there are 2 blueberry muffins for every 5 chocolate chip muffins. If there are 28 muffins total, how many of them are blueberry?

Answer: ________________________________

How many of them are chocolate?

Answer: ________________________________

46) In the Kindergarten there are 3 girls for every 5 boys. If there are 80 kindergarten prepsters, how many are girls?
40

Answer: ________________________________

How many are boys?

Answer: ________________________________

47) In the bookcase the ratio of fiction to non-fiction is 7 to 3. If there are 200 books in the bookshelf, how many are fiction?

Answer: ________________________________

How many of them are non-fiction?

Answer: ________________________________

Name: ________________________________ Date: _________________

Homeroom: ________________ Exit Ticket #22
1) Of 48 orchestra members, 30 are girls. What ratio compares the number of boys to girls in the orchestra?

A 3:8  C 3:5
B 8:3  D 5:3

2) Which of the following ratios does not describe a relationship between the squares shown?

F 2 black:3 white  H 2 black:5 total
G 2 black:5 white  J 3 white:5 total

3) It takes 32 blueberries to make eight muffins. How many blueberries would it take to make just four muffins?

Answer: ____________________________

Name: _______________________________  Date: __________

Homeroom: ___________________________  7th Grade Math – HW #22
Express each ratio as a fraction in simplest form:

1) 9 out of 15 pets   Answer: 

2) 20 wins out of 36 games   Answer: 

3) 4 players to 52 cards   Answer: 

4) 45 out of 60 days   Answer: 

5) On a full-sized piano, there are 36 black keys and 52 white keys. Express the ratio of white keys to black keys as a fraction in simplest form. Then explain its meaning.

   Meaning: 

6) Of newly manufactured volleyballs, 12 were defective and 56 passed inspection. What ratio compares the number of defective volleyballs to the total number of volleyballs manufactured?

A 3:14   C 4:14
B 3:17   D 4:17
7) In a bag of skittles, 2 out of every 5 skittles are green. If there are 30 skittles total, how many of the skittles are green?

A  75 skittles
B  12 skittles
C  10 skittles
D  3 skittles

8) Which ratio is equivalent to 3 : 5?

A  18 : 25
B  15 : 20
C  12 : 20
D  12 : 16

9) There are 24 pencils in Angelina’s pencil pouch. If 3 out of 4 of the pencils are sharp, how many dull pencils does Angelina have?

A  3 pencils
B  6 pencils
C  18 pencils
D  32 pencils
Homeroom: ____________________________

Objective: SWBAT determine unit rates.

IPOD (Integer Problems of the Day)
15 + (-15) – 10 = __________
-11 – 11 – 11 = __________

Do Now:

1) Ronata is putting lace around the tablecloth shown below. How much lace will she need to cover all 4 sides?

72 $\frac{2}{3}$ in.

52 $\frac{1}{3}$ in.

A 20 $\frac{1}{2}$ in. C 125 in.
B 41 in. D 250 in.

2) A bag of potting soil contains 4 $\frac{1}{4}$ pounds of soil. Each flower that Mr. Henderson plants will need $\frac{1}{8}$ pound of soil. How many flowers will he be able to plant?

F 16 H 32
G 28 J 34

3) Of 48 orchestra members, 30 are girls. What ratio compares the number of boys to girls in the orchestra?

A 3:8 C 3:5
B 8:3 D 5:3
Pulse Rate  You can take a person’s pulse by placing your middle and index finger on the underside of their wrist. Choose a partner and take their pulse for two minutes.

1. Record the results in the diagram below.

   [Diagram with blank spaces for beats and minutes]

2. Use the results from Exercise 1 to complete the bar diagram and determine the number of beats per minute for your partner.

<table>
<thead>
<tr>
<th>Beats in 2 minutes = [ ]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of beats</td>
</tr>
<tr>
<td>in 1 minute.</td>
</tr>
<tr>
<td>[ ]</td>
</tr>
<tr>
<td>Number of beats</td>
</tr>
<tr>
<td>in 1 minute.</td>
</tr>
<tr>
<td>[ ]</td>
</tr>
<tr>
<td>-------------------------</td>
</tr>
<tr>
<td>[ ] beats - [ ] beats</td>
</tr>
</tbody>
</table>

   So, your partner's heart beats [ ] times per minute.

3. Use the results from Exercise 1 to determine the number of beats for \( \frac{1}{2} \) minute for your partner.

   Answer: ____________________________

4) Explain how you found your answer in question 3

<table>
<thead>
<tr>
<th>STOP AND JOT</th>
<th>TEACH-OK</th>
<th>WHOLE CLASS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**RULES & TOOLS: Rates**

- A ratio that compares two quantities with different kinds of units is called a ______.
- When a rate is simplified so that it has a ___________ of 1 unit, it is called a unit rate.
- Common unit rates:

<table>
<thead>
<tr>
<th>Rate</th>
<th>Unit Rate</th>
<th>Abbreviation</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>miles</td>
<td>per hour</td>
<td>mi/h or mph</td>
<td>average speed</td>
</tr>
<tr>
<td>miles</td>
<td>per gallon</td>
<td>mi/gal or mpg</td>
<td>gas mileage</td>
</tr>
<tr>
<td>price</td>
<td>per pound</td>
<td>dollars/lb</td>
<td>unit price</td>
</tr>
</tbody>
</table>

**WE TRY**

1) Adrienne biked 24 miles in 4 hours. If she biked at a constant speed, how many miles did she ride in one hour?

Answer: _____________________________

2) Use the unit rate you determined in question 1 to answer the following: How many miles could Adrienne bike in 6 hours?

Answer: _____________________________

How is #2 different from #1?

STOP AND JOT  | TEACH-OK  | WHOLE CLASS

3) A typical bottlenose dolphin will take about 34 breaths in 4 hours. How many breaths will a bottlenose dolphin take in 7 hours?
4) Find the unit price if it costs $2 for eight juice boxes.

Answer: ____________________________

Explain its meaning: ____________________________

5) The prices of 3 different bags of dog food are given in the table. Which size bag has the lowest price per pound?

<table>
<thead>
<tr>
<th>Dog Food Prices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bag Size (lb)</td>
</tr>
<tr>
<td>40</td>
</tr>
<tr>
<td>20</td>
</tr>
<tr>
<td>8</td>
</tr>
</tbody>
</table>

Answer: ____________________________

YOU DO

Lexi painted 2 faces in 8 minutes at the Crafts Fair. At this rate, how many faces can she paint in 40 minutes?
1) 

Answer: ____________________________

2) A bakery can make 195 doughnuts in 3 hours. At this rate, how many doughnuts can the bakery make in 8 hours?

Answer: ____________________________

3) Which swimmer has the fastest rate?

<table>
<thead>
<tr>
<th>Swimmer</th>
<th>Jenny</th>
<th>Dana</th>
<th>Kaitlin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Event</td>
<td>50 m</td>
<td>100 m</td>
<td>200 m</td>
</tr>
<tr>
<td>Time (s)</td>
<td>25.02</td>
<td>119.2</td>
<td>248.07</td>
</tr>
</tbody>
</table>

Answer: ____________________________

Concept Landing
4) **Find the Error** Seth is trying to find the unit price for a package of blank compact discs on sale at 10 for $5.49. Find his mistake and correct it.

---

What was Seth’s mistake? How do you know your answer is correct? 

---

---

5) On Monday, Ms. Moseley drove 340 miles in 5 hours. On Tuesday, she drove 198 miles in 3 hours. Based on these rates, which statement is true?

A Her rate on Monday was 2 miles per hour slower than her rate on Tuesday.

B Her rate on Tuesday was 2 miles per hour slower than her rate on Monday.

C Her rate on Monday was the same as her rate on Tuesday.

D Her rate on Tuesday was 2 miles per hour faster than her rate on Monday.

---

6) A farmers’ market sells ears of sweet corn. At this same rate, how much will it cost to buy 28 ears of sweet corn? (Example 3)

---

Answer: __________________________

7) You are in the grocery store buying some snacks. One of the bags has a price of $1.50 for 12 ounces, the other bag (for the same snack) has a
price of $3.00 for 30 ounces. Which is the better buy? How do you know?

8) CD Express offers 4 CDs for $60. Music Place offers 6 CDs for $75. Which store offers the better buy? (Examples 1–3)

Answer: __________________________

9) The record for the Boston Marathon’s wheelchair division is 1 hour, 18 minutes, and 27 seconds.
   a. The Boston Marathon is 26.2 miles long. What was the average speed of the record winner of the wheelchair division?
      Round to the nearest hundredth. __________________________

   b. At this rate, about how long would it take this competitor to complete a 30-mile race? __________________________

10) The table shows the total distance traveled by a car driving at a constant rate of speed. How far will the car have traveled after 10 hours?
    A  520 miles
    B  585 miles

11) At Tire Depot, a pair of new tires sells for $216. The manager’s special advertises the same tires selling at a rate of $380 for 4 tires. How much do you save per tire if you purchase the manager’s special? _______
12) Mrs. Ross needs to buy dish soap. There are four different sized containers.

<table>
<thead>
<tr>
<th>Dish Soap Prices</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Brand</strong></td>
</tr>
<tr>
<td>Lots of Suds</td>
</tr>
<tr>
<td>Bright Wash</td>
</tr>
<tr>
<td>Spotless Soap</td>
</tr>
<tr>
<td>Lemon Bright</td>
</tr>
</tbody>
</table>

Which brand costs the least per ounce?

- A Lots of Suds
- B Bright Wash
- C Spotless Soap
- D Lemon Bright

13) Kenji buys 3 yards of fabric for $7.47. Then he realizes that he needs 2 more yards. How much will the extra fabric cost? (Example 4)

Answer: __________________________

14) **Justify Conclusions** Dalila earns $108.75 for working 15 hours as a holiday helper wrapping gifts. At this rate, how much money will she earn if she works 18 hours the next week? Explain.
15) **Find the Error** Nadia writes the rate $15.75 for 4 pounds as a unit rate. Find her mistake and correct it.

\[
\frac{15.75}{4 \text{ pounds}} = \frac{3.9375}{1 \text{ pound}}
\]

How did you know what Nadia’s mistake was? What would you do to correct it?

16) Tito wants to buy some peanut butter to donate to the local food pantry. Tito wants to buy as much peanut butter as possible. Which brand should he buy?

<table>
<thead>
<tr>
<th>Peanut Butter Sales</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Brand</strong></td>
</tr>
<tr>
<td>Nutty</td>
</tr>
<tr>
<td>Grandma’s</td>
</tr>
<tr>
<td>Bee’s</td>
</tr>
<tr>
<td>Save-A-Lot</td>
</tr>
</tbody>
</table>

17) **Short Response** The table shows the costs of different-sized bags of snack mix.

<table>
<thead>
<tr>
<th>Snack Mix</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Size</strong></td>
</tr>
<tr>
<td>x-small</td>
</tr>
</tbody>
</table>
Answer: __________________________
Exit Ticket #23

1) On Monday, Ms. Moseley drove 340 miles in 5 hours. On Tuesday, she drove 198 miles in 3 hours. Based on these rates, which statement is true?

   A  Her rate on Monday was 2 miles per hour slower than her rate on Tuesday.

   B  Her rate on Tuesday was 2 miles per hour slower than her rate on Monday.

   C  Her rate on Monday was the same as her rate on Tuesday.

   D  Her rate on Tuesday was 2 miles per hour faster than her rate on Monday.

2) Kalyin keyboards at a rate of 60 words per minute for 5 minutes and 45 words per minute for 10 minutes. How many words did she type in all?

   F  105  H  650
   G  510  J  750
1) The Jimenez family took a four-day road trip. They traveled 300 miles in 5 hours on Sunday, 200 miles in 3 hours on Monday, 150 miles in 2.5 hours on Tuesday, and 250 miles in 6 hours on Wednesday. On which day did they average the greatest miles per hour?
   - F Sunday
   - H Tuesday
   - G Monday
   - I Wednesday

2) **Short Response** Borita spent $2.00 for 20 pencils, Jamal spent $1.50 for 10 pencils, and Hasina spent $2.10 for 15 pencils. List the students from least to greatest according to unit price paid.

Answer: ________________________________

3) **Find each unit rate. Round to the nearest hundredth if necessary.**
   
a. $300 for 6 hours
   
b. 220 miles on 8 gallons
4) Financial Literacy  The Party Planner sells 10 paper plates for $2.50. Use the table to determine which company sells paper plates for the same price per plate.

<table>
<thead>
<tr>
<th>Store</th>
<th>Number of Plates</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Party Time</td>
<td>15</td>
<td>$3.75</td>
</tr>
<tr>
<td>Good Times</td>
<td>20</td>
<td>$6.00</td>
</tr>
<tr>
<td>Birthday, Inc.</td>
<td>25</td>
<td>$7.50</td>
</tr>
</tbody>
</table>

Answer: ____________________________

5) Persevere with Problems  A 96-ounce container of orange juice costs $4.80. At what price should a 128-ounce container be sold in order for the unit rate for both containers to be the same? Explain your reasoning.

Answer: ____________________________

6) Explain your reasoning from question 5: ____________________________

______________________________

______________________________

______________________________

______________________________

______________________________

______________________________

______________________________
Objective: SWBAT determine unit rates.

Do Now:

IPOD (Integer Problems of the Day)

1. Mr. Belanger dove off a diving board that was 10 feet above the water. He continued to go down until he was 3 feet below the surface of the water. Which of the following expressions can be used to find the total distance Mr. Belanger traveled?

A. $|10 + (-3)|$
B. $|10 - 3|$
C. $|10 - (-3)|$
D. $|-10 + 3|$

2. Kalyin keyboards at a rate of 60 words per minute for 5 minutes and 45 words per minute for 10 minutes. How many words did she type in all?

F. 105  
H. 650
G. 510  
J. 750

3. Which of the following has a sum of $2\frac{3}{2}$?

A. $\frac{3}{4} + 1\frac{1}{2}$
B. $\frac{1}{4} + 2\frac{1}{4}$
C. $\frac{1}{3} + 1\frac{3}{4}$
D. $\frac{1}{5} + 1\frac{4}{5}$
Jimmy and Johnny looked up banana prices at two different grocery stores last Sunday to see where they could find the best deal. The prices for each store are shown below:

<table>
<thead>
<tr>
<th>Price Chopper</th>
<th>Walmart</th>
</tr>
</thead>
<tbody>
<tr>
<td>$4 for 2 pounds</td>
<td>$10 for 5 pounds</td>
</tr>
</tbody>
</table>

Which store has less expensive bananas?

**Answer:** ________________

Explain your answer.
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

STOP AND JOT TEACH-OK WHOLE CLASS

<table>
<thead>
<tr>
<th>STOP AND JOT</th>
<th>TEACH-OK</th>
<th>WHOLE CLASS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## RULES & TOOLS: Unit Rates

Unit Rates are ____________ with a denominator of _________.

1. Write a ______________ for a given situation.
2. ____________________ the numerator by the denominator.

### WE TRY

1) Mrs. Trahan’s heart beats 300 times in 5 minutes. What is her heart rate per minute?

   Answer: __________________________________

2) Mr. Hassall takes 75 minutes to run 10 miles. How many minutes does it take him to run 1 mile?

   Answer: __________________________________

3) Malachi can knit 32 scarves every 8 days. Which of the following is the unit rate for producing the scarves, in scarves per day?

   A  32 : 1  
   B  32 : 8  
   C  1 : 4  
   D  4 : 1

<table>
<thead>
<tr>
<th>YOU</th>
<th>TEACH-OK</th>
<th>WHOLE CLASS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

59
YOU DO

1) Ms. Pascual can read 225 pages in 5 hours. What is her rate per hour?

Answer: ________________________________

2) Mr. Pastore can type 441 words in 7 minutes. What is his rate per minute?

Answer: ________________________________

3) Calentha can dribble a basketball 50 times in 2 minutes. Which of the following is the unit rate, in dribbles per minute?

A 25 : 1  
B 1 : 25  
C 50 : 2  
D 2 : 50

4) Mr. Zarkhi drinks 28 cups of coffee over 7 days. What is his unit rate per day?

Answer: ________________________________

5) Which of the following ratios is a unit rate?

A \[ \frac{120 \text{ miles}}{3 \text{ gallons}} \]  
B \[ \frac{24 \text{ gallons}}{6 \text{ minutes}} \]
6) A new printer can print 350 pages in 5 minutes. The old printer prints 225 pages in 3 minutes. Which is the faster printer?

Answer: _______________________________

On the lines below, explain how you determined your answer.
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Write a unit price for each situation.

7) Celeste purchased 30 juices for $6. What is the unit price per soda?

Answer: _______________________________

8) Abby purchased 4 lift tickets for $232. What is the unit price per ticket?

Answer: _______________________________
9) Ms. Cleveland was looking to buy 3 quarts of bleach. The price is shown in the picture below. What is the unit price per quart?

Answer: ________________________________

You are in the grocery store buying some snacks. One of the bags has a price of $1.50 for 12 ounces, the other bag (for the same snack) has a price of $3.00 for 30 ounces. Which is the better buy? How do you know?

10) CD Express offers 4 CDs for $60. Music Place offers 6 CDs for $75. Which store offers the better buy? (Examples 1-3)

Answer: ________________________________

11) The table shows the total distance traveled by a car driving at a constant rate of speed. How far will the car have traveled after 10 hours?

<table>
<thead>
<tr>
<th>Time (h)</th>
<th>Distance (mi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>130</td>
</tr>
<tr>
<td>3.5</td>
<td>227.5</td>
</tr>
<tr>
<td>4</td>
<td>260</td>
</tr>
<tr>
<td>7</td>
<td>455</td>
</tr>
</tbody>
</table>

A 520 miles
B 585 miles
C 650 miles
D 715 miles
12) At Tire Depot, a pair of new tires sells for $216. The manager’s special advertises the same tires selling at a rate of $380 for 4 tires. How much do you save per tire if you purchase the manager’s special? 

Answer: ________________________________

13) Mrs. Ross needs to buy dish soap. There are four different sized containers.

<table>
<thead>
<tr>
<th>Dish Soap Prices</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Brand</strong></td>
</tr>
<tr>
<td>-----------</td>
</tr>
<tr>
<td>Lots of Suds</td>
</tr>
<tr>
<td>Bright Wash</td>
</tr>
<tr>
<td>Spotless Soap</td>
</tr>
<tr>
<td>Lemon Bright</td>
</tr>
</tbody>
</table>

Which brand costs the least per ounce?

A. Lots of Suds  
B. Bright Wash  
C. Spotless Soap  
D. Lemon Bright

14) Kenji buys 3 yards of fabric for $7.47. Then he realizes that he needs 2 more yards. How much will the extra fabric cost? (Example 4)

Answer: ________________________________

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15) Ms. Jensen spent $25 on 5 containers of tea. What is the unit price per container?

Answer: ________________________________

16) Ms. Sprentall drove 399 miles on 12 gallons of gasoline. What is the unit rate per gallon?

Answer: ________________________________

17) Mr. Dill purchased 20 slices of pizza for $40. What was the unit price per slice?

Answer: ________________________________

18) **Justify Conclusions** Dalila earns $108.75 for working 15 hours as a holiday helper wrapping gifts. At this rate, how much money will she earn if she works 18 hours the next week? Explain.

Answer:  ____________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
19) Find the Error Nadia writes the rate $15.75 for 4 pounds as a unit rate. Find her mistake and correct it.

\[
\frac{15.75}{4 \text{ pounds}} = \frac{7.88}{2 \text{ pounds}}
\]

How did you know what Nadia’s mistake was? What would you do to correct it?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

20) Tito wants to buy some peanut butter to donate to the local food pantry. Tito wants to buy as much peanut butter as possible. Which brand should he buy?

<table>
<thead>
<tr>
<th>Peanut Butter Sales</th>
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<tbody>
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<tr>
<td>Bee’s</td>
</tr>
<tr>
<td>Save-A-Lot</td>
</tr>
</tbody>
</table>

Answer: __________________________
1) Mr. Pastore paid $50 for 5 pizzas to bring to the Trillionaires club. What was the price per pizza?

*Answer:* _______________________________

2) Susan and Peter are driving from New York to California. If it takes them 20 hours to drive 400 miles, how many miles did they drive per hour?

*Answer:* _______________________________

3) Azaria painted 3 faces in 9 minutes at the New York State Fair. At this rate, how many faces can she paint in 30 minutes?

*Answer:* _______________________________

4) Miss Hanson can produce 25 bottles of hot sauce every 5 hours. Which of the following is the unit rate for producing the hot sauce, in bottles per hour?

A  25 : 1
B  25 : 5
C  5 : 1
D  5 : 5
1) Mr. Hassall's heart beats 350 times in 5 minutes. What is the unit rate
beats per minute?

Answer: ________________________________

2) Mrs. Catlett takes 70 minutes to run 10 miles. What is her unit rate in
minutes per mile?

Answer: ________________________________

3) The Jimenez family took a four-day road
trip. They traveled 300 miles in 5 hours on
Sunday, 200 miles in 3 hours on Monday,
150 miles in 2.5 hours on Tuesday, and
250 miles in 6 hours on Wednesday. On
which day did they average the greatest
miles per hour?

- F Sunday
- G Monday
- H Tuesday
- I Wednesday
4) Which of the following ratios is a unit rate?

A \[
\frac{30 \text{ miles}}{1 \text{ gallon}}
\]

B \[
\frac{24 \text{ gallons}}{2 \text{ minutes}}
\]

C \[
\frac{\$18}{4 \text{ gallons}}
\]

D \[
\frac{1,200 \text{ texts}}{2 \text{ month}}
\]

5) **Short Response** The table shows the costs of different-sized bags of snack mix.

<table>
<thead>
<tr>
<th>Snack Mix</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
</tr>
<tr>
<td>-----------</td>
</tr>
<tr>
<td>x-small</td>
</tr>
<tr>
<td>small</td>
</tr>
<tr>
<td>large</td>
</tr>
<tr>
<td>x-large</td>
</tr>
</tbody>
</table>

Pilar wants to buy the one that costs the least per ounce. What size should she buy? Explain.

Answer: __________________________

6) \[
\frac{\frac{5}{3}}{\frac{5}{9}} = 
\]

Answer: ______________
Objective: 
SWBAT simplify complex fractions and find unit rates.

IPOD (Integer Problems of the Day)
13 - (-15) - 10 = _________
-11 - (-11) - 9 = _________

Do Now:
1) Of 48 orchestra members, 30 are girls. What ratio compares the number of boys to girls in the orchestra?

A 3:8  
B 8:3  
C 3:5  
D 5:3

2) Which of the following equations is modeled by the number line below?

F -2(-6) = -12  
G -2(6) = -12  
H 2(6) = -12  
J 2(-6) = -12

3) **Short Response** The graph shows the results of an election for class president. What fraction of the votes did Michaela receive?

**Class Election Results**

Answer: ____________________________
**Math Lab**

**Speed Skating** Dana is skating laps to train for a speed skating competition. She can skate 1 lap in 40 seconds.

1. Write a ratio in simplest form comparing Dana’s time to her number of laps.

   Dana’s time (s) \(\to\) 
   Number of Laps \(\to\)

2. Suppose Dana skates for 20 seconds. How many laps will she skate?

   Answer: ____________________

3. Write the ratio of Dana’s time from Exercise 2 to her number of laps.

   Dana’s time \(\to\)
   Number of Laps \(\to\)

4. How could you simplify the ratio you wrote in Exercise 3?

   ___________________________________
   ___________________________________
   ___________________________________
   ___________________________________

<table>
<thead>
<tr>
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<tbody>
<tr>
<td></td>
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</tbody>
</table>
RULES & TOOLS: Complex Fractions and Unit Rates

Unit Rates are ______________ with a denominator of ______________.

3. Write a ______________ for a given situation.

4. ______________ the numerator by the denominator.

  • Dividing Fractions, don’t be shy, ______________ the divisor and ______________!

WE TRY

1) Simplify.
   1a. \( \frac{3}{4} \)  
   1b. \( \frac{18}{3} \)  
   1c. \( \frac{7}{1} \)  

2) Josiah can jog \( \frac{1}{3} \) miles in \( \frac{1}{4} \) hour. Find his average speed in miles per hour.

   Write a rate that compares the number of miles to hours.

Answer: ________________________________

STOP AND JOT | TEACH-OK | WHOLE CLASS

3) A truck driver drove 350 miles in \( 8 \frac{3}{4} \) hours. What is the speed of the truck in miles per hour?
Answer: ________________________________

4) Use your answer from question 3 to determine how many miles the truck driver could drive in 9.5 hours.

Answer: ________________________________

5) A county sales tax is \(6\frac{2}{3}\)% Write the percent as a fraction in simplest form. (Example 5) __________________

Answer: ________________________________

YOU DO

6) Debra can run \(20\frac{1}{2}\) miles in \(2\frac{1}{4}\) hours. How many miles per hour can she run?

A 46\(\frac{1}{8}\) miles per hour

B 22\(\frac{3}{4}\) miles per hour
7) **Justify Conclusions**  For a project, Karl measured the wingspan of a butterfly and a moth. His measurements are shown below. How many times larger is the moth than the butterfly? Justify your answer.

![Black Swallowtail Butterfly](image1.png) ![Hummingbird Moth](image2.png)

**Answer:** ____________________________

8) **Justify Conclusions**  The value of a certain stock increased by $1\frac{1}{4}\%$.

Explain how to write $1\frac{1}{4}\%$ as a fraction in simplest form. ____________________________

9) Aubrey can walk $4\frac{1}{2}$ miles in $1\frac{1}{2}$ hours. Find her average speed in miles per hour.
10) Mary is making pillows for her Life Skills class. She bought $2\frac{1}{2}$ yards of fabric. Her total cost was $15. What was the cost per yard? (Examples 3 and 4)

Answer: ________________________

11) On Javier’s soccer team, about $33\frac{1}{3}\%$ of the players have scored a goal. Write $33\frac{1}{3}\%$ as a fraction in simplest form.

Answer: ________________________

Explain your answers meaning: ________________________

12) Which statement explains how to use the model to simplify the complex fraction?

\[ \frac{2}{3} \div \frac{1}{12} \]

\[ \begin{array}{cccccccccc}
\hline
& & & & & & & & & \\
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& & & & & & & & & \\
\hline
\end{array} \]

\(A\) Count the twelfths that fit within $\frac{2}{3}$ of the figure.

\(B\) Remove $\frac{2}{3}$ of the twelfths, and count those remaining.

\(C\) Count the number of thirds in the figure. Multiply this number by 12.

\(D\) Divide this number by 3.

13) Mrs. Frasier is making costumes for the school play. Each costume requires 0.75 yard of fabric. She bought 6 yards of fabric. How many costumes can Mrs. Frasier make?
Answer: ______________________________

14) A lawn company advertises that they can spread 7,500 square feet of grass seed in $2\frac{1}{2}$ hours. Find the number of square feet of grass seed that can be spread per hour.

Answer: ______________________________

15) Monica reads $7\frac{1}{2}$ pages of a mystery book in 9 minutes. What is her average reading rate in pages per minute? (Examples 3 and 4) ____________

Answer: ______________________________

16) Tia is painting her house. She paints $34\frac{1}{2}$ square feet in $\frac{3}{4}$ hour. At this rate, how many square feet can she paint each hour?

Answer: ______________________________

17) A bank is offering home loans at an interest rate of $5\frac{1}{2}$%. Write the percent as a fraction in simplest form. (Example 5) ____________
18) Mrs. Frasier is making costumes for the school play. The table shows the amount of material needed for each complete costume. She bought 14 3/4 yards of material.

a. How many complete costumes can she make? How much material will be left over?

Answer: ________________________________

b. If she spent a total of $44.25 on fabric, what was the cost per yard? Explain how you solved.

Answer: ________________________________

<table>
<thead>
<tr>
<th>Play Costumes</th>
</tr>
</thead>
<tbody>
<tr>
<td>top</td>
</tr>
<tr>
<td>bottom</td>
</tr>
</tbody>
</table>

Concept Landing:

19) **Persevere with Problems** A motorized scooter has tires with a circumference of 22 inches. The tires make one revolution every 1/10 second. Find the speed of the scooter in inches per second. (Hint: The speed of an object spinning in a circle is equal to the circumference divided by the time it takes to complete one revolution.)
William got an answer of 220 in./s. Marques got an answer of $2 \frac{1}{5}$ in./s

Who is correct? What misconception might the person who got it incorrect have had? __________________________________________________________

_______________________________________________________________

_______________________________________________________________

_______________________________________________________________

_______________________________________________________________

_______________________________________________________________

_______________________________________________________________

_______________________________________________________________

_______________________________________________________________

Name: ____________________________ Date: __________

Homeroom: _______________________

Exit Ticket #25
1) Tina wants to give away 6 bundles of thyme from her herb garden. If she has $\frac{1}{2}$ pound of thyme, how much will each bundle weigh?

- $\text{F} \frac{1}{2} \text{ lb}$
- $\text{H} \frac{1}{12} \text{ lb}$
- $\text{G} 3 \text{ lb}$
- $\text{J} 12 \text{ lb}$

2) Which of the following is equivalent to $\frac{1}{2}$?

- $\text{F} \frac{1}{4}$
- $\text{H} \frac{1}{4}$
- $\text{G} \frac{1}{2}$
- $\text{I} \frac{1}{8}$

3) Write each percent as a fraction in simplest form.

$8\frac{1}{3}\% = \frac{25}{3}$

Answer: ________________________________

Name: ________________________________ Date: ______________

Homeroom: ____________________________ $7^{\text{th}}$ Grade Math – HW #25

Simplify. (Examples 1 and 2)

1. $\frac{18}{3} \frac{3}{4} = \underline{\hspace{2cm}}$
2. $\frac{3}{6} \frac{6}{4} = \underline{\hspace{2cm}}$
3. $\frac{1}{3} \frac{1}{4} = \underline{\hspace{2cm}}$
4) Tina wants to give away 6 bundles of thyme from her herb garden. If she has \( \frac{1}{2} \) pound of thyme, how much will each bundle weigh?

A) \( \frac{1}{2} \) lb
B) 3 lb
C) \( \frac{1}{12} \) lb
D) 12 lb

5) Emma runs \( \frac{3}{4} \) mile in 6 minutes. Joanie runs \( 1 \frac{1}{2} \) miles in 11 minutes. Whose speed is greater?
Answer: ______________________

6) (Don’t be alarmed by your answer!!)

**Short Response** Write $32\frac{1}{8}\%$ as a fraction in simplest form.

Answer: ______________________

Name: ____________________________ Date: ____________

Homeroom: _______________________

Objective: SWBAT compare unit rates.

IPOD (Integer Problems of the Day)

$15 - (-15) - 10 = \underline{______}$

$-11 - (-12) - (-11) = \underline{______}$
Do Now:

1) Brianna spent $2.00 for 20 pencils, Jahiana spent $1.50 for 10 pencils, and Jahnay spent $2.10 for 15 pencils. List the students from least to greatest according to unit price paid.

Answer: ________________________________

2) The Franklins have a home loan with an interest rate of \( \frac{1}{4} \)%. Write the percent as a fraction in simplest form.

Answer: ________________________________

3) Tina wants to give away 6 bundles of thyme from her herb garden. If she has \( \frac{1}{2} \) pound of thyme, how much will each bundle weigh?
   - A \( \frac{1}{2} \) lb
   - B 3 lb
   - C \( \frac{1}{12} \) lb
   - D 12 lb

Math Lab

1) The table shows the distance traveled by a car driving at a constant rate of speed.

<table>
<thead>
<tr>
<th>Time (h)</th>
<th>Distance (mi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>130</td>
</tr>
<tr>
<td>3.5</td>
<td>227.5</td>
</tr>
<tr>
<td>4</td>
<td>260</td>
</tr>
<tr>
<td>7</td>
<td>455</td>
</tr>
</tbody>
</table>
2) Why is it important that the car is driving at a constant rate of speed when finding the unit rate?

3) Find the unit rate:

Answer:

4) At this rate, how far did the car travel in 11 hours?

Answer:

5) How can #4 be solved by using a proportion?:

<table>
<thead>
<tr>
<th>STOP AND JOT</th>
<th>TEACH-OK</th>
<th>WHOLE CLASS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**RULES & TOOLS: Unit Rates and Proportions**

- Set up a __________________
  - _____________ hand ratio has your __________________
    _____.
Right hand ratio has what you are ______________________ for.

WE TRY

1) Edward purchased the juice boxes below. He bought 8 juice boxes for $2. What would be the cost of 10 juice boxes?

Answer: ____________________

STOP AND JOT | TEACH-OK | WHOLE CLASS

<table>
<thead>
<tr>
<th>STOP AND JOT</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2) Monica reads $\frac{7 \frac{1}{2}}{2}$ pages of a mystery book in 9 minutes. How many pages can she read in 15 minutes?

Answer: ____________________

3) Caroline drove 350 miles to her grandmother’s house. The trip took her 5 $\frac{3}{4}$ hours. Her uncle lives 200 miles away from her grandmother. If she plans to drive to her uncles house, at the same rate, how long will it take?

Answer: ____________________
YOU DO

1) A small airplane used \(5 \frac{2}{3}\) gallons of fuel to fly a 2 hour trip. At this rate, how many gallons of fuel will be needed to fly for 4 hours?

Answer: _____________________________

2) A truck driver drove 120 miles in \(1 \frac{3}{4}\) hours. If he drove for 4 hours, how far did he travel?

Answer: _____________________________

3) Charlotte reads \(8 \frac{1}{3}\) pages of a book in 10 minutes. Based on her reading rate, how many minutes did it take Charlotte to read 32 pages?

Answer: _____________________________

4) Russell runs \(\frac{9}{10}\) mile in 5 minutes. At this rate, how far could Russell run in 15 minutes?
5) Anita is making a curtain to surround a table. She bought $3\frac{3}{4}$ yards of fabric. Her total cost was $13. Anita then had to purchase 2 more yards. How much would the additional 2 yards cost?

Answer: ________________

Concept Landing:

5) **Persevere with Problems** A 96-ounce container of orange juice costs $4.80. At what price should a 128-ounce container be sold in order for the unit rate for both containers to be the same? Explain your reasoning.

Answer: ________________

10) What method did you use to solve this problem? Why?

<table>
<thead>
<tr>
<th>STOP AND JOT</th>
<th>TEACH-OK</th>
<th>WHOLE CLASS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**RULES & TOOLS:** Comparing Unit Rates

1. Write a ___________ for both situations. Must
   
   have same ________________

2. Divide to find the _______________ rates.

3. ________________.
1) Through Verizon Wireless you can get 4GB of data for $32. At AT&T you can get 2GB of data for $20. Which of these plans is the better deal per GB?

Answer: ____________________________

2) Emma runs $\frac{3}{4}$ mile in 6 minutes. Joanie runs $1\frac{1}{2}$ miles in 11 minutes. Whose speed is greater?

Answer: ____________________________

YOU DO

3) At a new sub shop you can buy a 6 inch sub for $2.40, and at Subway you can buy a 12 inch sub for $6.00. Which shop has the better deal per inch?
4) Alina’s recipe uses 2 cups of sugar to make $2 \frac{1}{2}$ dozen cupcakes. Deja’s recipe uses 2 cups of sugar to make 3 dozen cupcakes. Which recipe uses more sugar for a dozen cookies?

Answer: 

5) A new coffee maker can brew 12 cups of coffee in 2 minutes. The old coffee maker took 5 minutes to brew 15 cups of coffee. Which is the faster coffee maker?

Answer: 

6) A grocery store sells different types of Trail Mix. The cost and weight of each type is shown in the table.

<table>
<thead>
<tr>
<th></th>
<th>Trail Mix A</th>
<th>Trail Mix B</th>
<th>Mix C</th>
<th>Trail Mix C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost  ($)</td>
<td>6</td>
<td>8.50</td>
<td>2.25</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>¾ lb.</td>
<td>1 lb.</td>
<td>¼ lb.</td>
<td></td>
</tr>
</tbody>
</table>

Which statement is correct?
A  Trail Mix A is the best buy
B  Trail Mix B is the best buy
C  Trail Mix C is the best buy
D  They are all the same price

7) Two friends worked out on treadmills at the gym.

Alden walked 2 miles in ¾ hour.
Kira walked 1 ¾ miles in 30 minutes.
**Who walked at a faster rate?**

**Answer:**

8) At Tire Depot, a pair of new tires sells for $216. The manager’s special advertises the same tires selling at a rate of $380 for 4 tires. How much do you save per tire if you purchase the manager’s special?

**Answer:**

9) A restaurant uses 8 \( \frac{1}{4} \) pounds of carrots to make 6 carrot cakes. Frank wants to use the same recipe. How many pounds of carrots does Frank need to make one carrot cake?
Exit Ticket #26

1) Johnathan can jog \(3\frac{2}{5}\) miles in \(\frac{7}{8}\) hour. How far can he jog in 2 hours?
Answer: ______________________________

2) Herbert’s recipe uses 3 cups of sugar to make $2 \frac{1}{2}$ dozen cupcakes. Dontae’s recipe use $3 \frac{1}{4}$ cups of sugar to make 4 dozen cupcakes. Which recipe uses more sugar for a dozen cookies?

Answer: ______________________________

3) Which of the following ratios is a unit rate?

A  \[
\frac{120 \text{ miles}}{3 \text{ gallons}}
\]
B  \[
\frac{24 \text{ gallons}}{6 \text{ minutes}}
\]
C  \[
\frac{$18}{4 \text{ gallons}}
\]
D  \[
\frac{1,200 \text{ texts}}{1 \text{ month}}
\]

Name: ________________________________ Date: ______________

Homeroom: ____________________________

Objective: SWBAT convert units of measure between derived units to solve problems.

IPOD (Integer Problems of the Day)

4 + (-15) – 6 = _____________

-32 – (-11) + 24 = ____________

Do Now:
1) Russell runs \(\frac{9}{10}\) mile in 5 minutes. At this rate, how far could Russell run in 15 minutes?

Answer: ________________

2) There are 24 pencils in Angelina’s pencil pouch. If 3 out of 4 of the pencils are sharp, how many dull pencils does Angelina have?

A 3 pencils  
B 6 pencils  
C 18 pencils  
D 32 pencils

3) Of newly manufactured volleyballs, 12 were defective and 56 passed inspection. What ratio compares the number of defective volleyballs to the total number of volleyballs manufactured?

A 3:14  
B 3:17  
C 4:14  
D 4:17
**Animals** Squirrels, chipmunks, and rabbits are capable of running at fast speeds. The table shows the top running speeds of these animals.

<table>
<thead>
<tr>
<th>Animal</th>
<th>Speed (mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Squirrel</td>
<td>10</td>
</tr>
<tr>
<td>Chipmunk</td>
<td>15</td>
</tr>
<tr>
<td>Cottontail Rabbit</td>
<td>30</td>
</tr>
</tbody>
</table>

1. How many feet are in 1 mile? 10 miles?
   1 mile = _______ feet
   10 miles = _______ feet

2. How many seconds are in 1 minute? 1 hour?
   1 minute = _______ seconds
   1 hour = _______ seconds

3. How could you determine the number of feet per second a squirrel can run?

<table>
<thead>
<tr>
<th>STOP AND JOT</th>
<th>TEACH-OK</th>
<th>WHOLE CLASS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. Complete the following statement. Round to the nearest tenth.
   10 miles per hour ≈ _______ feet per second

**RULES & TOOLS:** Convert Unit Rates
Write the __________________ of the information given.

Determine what you are __________________ for – put it to the side.

Use __________________ and multiplication to eliminate unwanted ______ ______.

### Customary Units of Measure

<table>
<thead>
<tr>
<th>Smaller</th>
<th>Larger</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 inches</td>
<td>1 foot</td>
</tr>
<tr>
<td>16 ounces</td>
<td>1 pound</td>
</tr>
<tr>
<td>8 pints</td>
<td>1 gallon</td>
</tr>
<tr>
<td>3 feet</td>
<td>1 yard</td>
</tr>
<tr>
<td>5,280 feet</td>
<td>1 mile</td>
</tr>
</tbody>
</table>

### Metric Units of Measure

<table>
<thead>
<tr>
<th>Smaller</th>
<th>Larger</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 centimeters</td>
<td>1 meter</td>
</tr>
<tr>
<td>1,000 grams</td>
<td>1 kilogram</td>
</tr>
<tr>
<td>1,000 milliliters</td>
<td>1 liter</td>
</tr>
<tr>
<td>10 millimeters</td>
<td>1 centimeter</td>
</tr>
<tr>
<td>1,000 milligrams</td>
<td>1 gram</td>
</tr>
</tbody>
</table>

**WE TRY**

1) The average speed of one team in a relay race is about 10 miles per hour. What is this speed in feet per second?

<table>
<thead>
<tr>
<th>STOP AND JOT</th>
<th>TEACH-OK</th>
<th>WHOLE CLASS</th>
</tr>
</thead>
</table>

Answer:

2) A skydiver is falling at about 176 feet per second. How many inches per minute is he falling?
3) Lorenzo rides his bike at a rate of 5 yards per second. About how many miles per hour can Lorenzo ride his bike? (Hint: 1 mile = 1,760 yards) (Example 4)

Answer: ________________________________

YOU DO

4) A salt truck drops 39 kilograms of salt per minute. How many grams of salt does the truck drop per second?
   A  600       C  650
   B  625       D  6,000

5) **Building on the Essential Question** Explain why the ratio \(\frac{3 \text{ feet}}{1 \text{ yard}}\) has a value of one.
6) Thirty-five miles per hour is the same rate as which of the following?
  A) 150 feet per minute  
  B) 1,500 feet per minute  
  C) 2,200 feet per minute  
  D) 3,080 feet per minute

7) Use the space below to answer the following:

The table shows the speed and number of wing beats per second for various flying insects.

<table>
<thead>
<tr>
<th>Insect</th>
<th>Speed (miles per hour)</th>
<th>Wing Beats per Second</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housefly</td>
<td>4.4</td>
<td>190</td>
</tr>
<tr>
<td>Honeybee</td>
<td>5.7</td>
<td>250</td>
</tr>
<tr>
<td>Dragonfly</td>
<td>15.6</td>
<td>38</td>
</tr>
<tr>
<td>Hornet</td>
<td>12.8</td>
<td>100</td>
</tr>
<tr>
<td>Bumblebee</td>
<td>6.4</td>
<td>130</td>
</tr>
</tbody>
</table>

   a. What is the speed of a housefly in feet per second? Round to the nearest hundredth.

   b. How many times does a dragonfly's wing beat per minute?

   c. About how many miles can a bumblebee travel in one minute?

   d. How many times can a honeybee beat its wings in one hour?

Explain how you would find the number of times a dragonfly beats its wings in 3 minutes: ____________________________

Concept Landing:

Model with Mathematics  Refer to the graphic novel frame below. Seth traveled 1 mile in 57.1 seconds. About how fast does Seth travel in miles per hour?
8) Answer: ____________________________

Explain how you found your answer:
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

9) **Short Response** An oil tanker empties at 3.5 gallons per minute. Convert this rate to cups per second. Round to the nearest tenth. Show the steps you used.

Hint: There are 16 cups in 1 gallon.

Answer: __________________

10) And. How many miles per hour
11) A gull can fly at a speed of 22 miles per hour. About how many feet per minute can the gull fly?

Answer: ________________________________

12) Water weighs about 8.34 pounds per gallon. About how many ounces per gallon is the weight of the water? (Examples 1 and 2) _______

Answer: ________________________________

13) A peregrine falcon can fly 322 kilometers per hour. How many meters per hour can the falcon fly? (Example 3)
How many meters per second can the falcon fly?

Answer: ______________________________

15) [Reason Inductively] When you convert 100 feet per second to inches per second, will there be more or less than 100 inches. Explain.

Explain how you know your answer is correct:

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

Name: ___________________________ Date: ____________
1) A swordfish can swim at a rate of 60 miles per hour. How many feet per second is this?

Answer: _________________________________

2) An AMTRAK train travels at 125 miles per hour. How many feet per minute is this?

Answer: _________________________________
1) The fastest a human has ever run is 27 miles per hour. How many miles per minute did the human run? (Example 3)

Answer: __________________________

2) A pipe is leaking at 1.5 cups per day. About how many gallons per week is the pipe leaking? (Hint: 1 gallon = 16 cups) (Example 4)

3) Charlie runs at a speed of 3 yards per second. About how many miles per hour does Charlie run? (Example 4)

Answer: __________________________

Answer: __________________________

Name: _____________________________

Date: ________________

Homeroom: _______________________

Objective:
SWBAT convert units of measure between derived units to solve problems.
Do Now:

1) Arnold and Lucy are sharing a birthday cake. Arnold eats $\frac{2}{7}$ of the cake, and Lucy eats $\frac{1}{8}$ of the cake. What fraction or decimal number represents $\frac{2}{6}$ of the total amount of cake that they both ate?

Answer: ________________

2) Which expression is equivalent to $12 – 80$?

A  $-80 + 12$
B  $-12 + 80$
C  $80 – 12$
D  $-80 - 12$

3) Beth plays a video game in which she starts with 0 points. In round 1, she loses $3\frac{1}{2}$ points; in round 2, she wins $28 \frac{1}{2}$ points; and in round 3, she loses another $3 \frac{1}{2}$ points. What is her final score?

A  $-18 \frac{1}{2}$
B  $18 \frac{1}{2}$
C  $21 \frac{3}{2}$
D  $35 \frac{1}{2}$

Math Lab

1) Tyree and three friends attend skydiving class before their first jump. The instructor tells them they will travel at about 176 feet per second. How many miles per hour is this?
A. What are we converting? ________________________________

B. 1 mile = _________________ feet

C. How many seconds are there in 1 hour? __________________

D. Use the information you just found to determine your answer:

Answer: ________________________________

2) Adrian said that there are 60 seconds in 1 hour. He got an answer of 2 miles per hour. What error(s) could have caused this incorrect answer?

RULES & TOOLS: Convert Unit Rates

• Write the __________________ of the information given.
• Determine what you are ________________ for – put it to the side.
• Use ________________ and multiplication to eliminate unwanted ______ ________.

Use the following table to assist you in the questions that follow:

<table>
<thead>
<tr>
<th>Key Concept</th>
<th>Measurement Conversions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Length</strong></td>
<td></td>
</tr>
<tr>
<td>Customary to Metric</td>
<td>Metric to Customary</td>
</tr>
<tr>
<td>1 in. ≈ 2.540 cm</td>
<td>1 cm ≈ 0.394 in.</td>
</tr>
<tr>
<td>1 ft ≈ 0.305 m</td>
<td>1 m ≈ 3.279 ft</td>
</tr>
<tr>
<td>1 yd ≈ 0.914 m</td>
<td>1 m ≈ 1.094 yd</td>
</tr>
<tr>
<td>1 mi ≈ 1.609 km</td>
<td>1 km ≈ 0.621 mi</td>
</tr>
<tr>
<td><strong>Capacity</strong></td>
<td></td>
</tr>
<tr>
<td>Customary to Metric</td>
<td>Metric to Customary</td>
</tr>
<tr>
<td>1 fl oz ≈ 29.574 mL</td>
<td>1 mL ≈ 0.034 fl oz</td>
</tr>
<tr>
<td>1 pt ≈ 0.473 L</td>
<td>1 L ≈ 2.114 pt</td>
</tr>
<tr>
<td>1 qt ≈ 0.946 L</td>
<td>1 L ≈ 1.057 qt</td>
</tr>
<tr>
<td>1 gal ≈ 3.785 L</td>
<td>1 L ≈ 0.264 gal</td>
</tr>
<tr>
<td><strong>Mass or Weight</strong></td>
<td></td>
</tr>
<tr>
<td>Customary to Metric</td>
<td>Metric to Customary</td>
</tr>
<tr>
<td>1 oz ≈ 28.350 g</td>
<td>1 g ≈ 0.035 oz</td>
</tr>
<tr>
<td>1 lb ≈ 0.454 kg</td>
<td>1 kg ≈ 2.203 lb</td>
</tr>
</tbody>
</table>

**WE TRY**

1) **At top speed, a giant tortoise can travel about 900 feet per hour. How many centimeters per second can a giant tortoise travel at top speed?**

Answer:

2) **Complete each conversion. Round to the nearest hundredth.**
   a. 12 centimeters to inches
Answer: ____________________________

b. 4 quarts to liters

Answer: ____________________________

<table>
<thead>
<tr>
<th>STOP AND JOT</th>
<th>TEACH-OK</th>
<th>WHOLE CLASS</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>a.</td>
<td>a.</td>
</tr>
<tr>
<td>b.</td>
<td>b.</td>
<td>b.</td>
</tr>
</tbody>
</table>

3) Crystal's times for each portion of a triathlon are shown in the table. Round to the nearest hundredth.

a. How many meters per second did she run?

Answer: ____________________________

b. What was her speed in miles per hour for the aquabike portion (swimming and biking)?

Answer: ____________________________

YOU DO

4) A candy company can produce 4800 sour lemon candies per minute. How many candies can they produce each hour? (Example 1)
5) The average American student spends almost 1500 hours per year watching television. To the nearest hundredth, how many minutes per day is this? (Example 2)

Answer: ________________________________

6) A speed of 55 miles per hour is the same rate as which of the following?

A 34 kilometers per hour
B 50 kilometers per hour
C 88 kilometers per hour
D 98 kilometers per hour

7) Explain how you would convert 10 miles per hour to meters per second:

_____________________________________________________
_____________________________________________________
_____________________________________________________

Answer: ________________________________
Concept Landing:

8) A cheetah can run short distances at a speed of up to 75 miles per hour. How many feet per second is this?

Gerrod showed the following work:

\[ \frac{75 \text{ mi}}{1 \text{ h}} \times \frac{3600 \text{ s}}{1 \text{ h}} \times \frac{5280 \text{ ft}}{1 \text{ mi}} \times \frac{1 \text{ h}}{3600 \text{ s}} \]

Is Gerrod correct? Why or why not? ____________________________

9) **Persevere with Problems** A recipe for fruit punch uses the ingredients shown in the table. About how many cups of each ingredient are needed? Round to the nearest tenth.

<table>
<thead>
<tr>
<th>Fruit Punch</th>
<th>900 mL</th>
<th>cranberry juice</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>700 mL</td>
<td>apple juice</td>
</tr>
<tr>
<td></td>
<td>300 mL</td>
<td>pineapple juice</td>
</tr>
</tbody>
</table>
A. Cranberry Juice: __________________________

B. Apple Juice: __________________________

C. Pineapple Juice: __________________________

D. Lemon Juice: __________________________

E. Club Soda: __________________________

10) The average American consumes 20 gallons of ice cream in one year. At this rate, how many liters of ice cream will 50 Americans consume in one week? Round to the nearest hundredth.

Answer: __________________________

11) STEM The sprinkler system in the Willis Tower pumps up to 1500 gallons of water per minute. How many liters of water can the system pump in 1/4 minute? Round to the nearest hundredth.

Answer: __________________________

12) Which One Doesn’t Belong? Select the rate that does not have the same value as the other three. Explain your reasoning.

60 mi/h  88 ft/s  500 ft/min  1440 mi/day
13) A piece of notebook paper measures \(8 \frac{1}{2}\) inches by 11 inches. Which of the following metric approximations is the same?

- **F** 2 m by 2.8 m
- **G** 3 cm by 4 cm
- **H** 22 cm by 28 cm
- **J** 30 m by 40 m

14) An elephant can eat up to 440 pounds of vegetation every day. How many grams per minute is this? Round to the nearest hundredth. (Example 4)

Answer: ________________________________

15) At a recent Winter Olympics, USA short track speed skater Apolo Ohno won a gold medal by skating about 12 meters per second. Rounded to the nearest hundredth, how many miles per hour is this?

Answer: ________________________________

Name: ________________________________ Date: __________

Homeroom: ____________________________

Exit Ticket #28
1) A car’s mileage is registered at 29,345.5 miles. The driver sees a sign that warns of road work in 1000 feet. What will be the car’s mileage when the road work begins?

A 29,345.7
B 29,345.9
C 29,356.2
D 29,356.5

2) A certain car in Canada can travel 15 kilometers per 1 liter of gasoline. How many miles per gallon is this? Round to the nearest hundredth. (Example 4)

Answer: ____________________________

Name: ____________________________ Date: ____________

Homeroom: ____________________________ 7th Grade Math – HW #28

1) In Brazil, about 20 acres of rain forest are destroyed each minute. At this rate, how much rain forest is destroyed per day? (Example 1)
Answer: ________________________________

2) Lexi can paint 5 yards of fencing in one hour. At this rate, how many inches does she paint per minute?  (Example 2)

Answer: ________________________________

3) A piece of notebook paper measures \(8\frac{1}{2}\) inches by 11 inches. Which of the following metric approximations is the same?

- F 2 m by 2.8 m
- H 22 cm by 28 cm
- G 3 cm by 4 cm
- J 30 m by 40 m

4) STEM The velocity of sound through wood at 0° Celsius is 1454 meters per second. How many miles is this per hour? Round to the nearest hundredth.  (Example 4)

Answer: ________________________________

5) Crystal's times for each portion of a triathlon are shown in the table. Round to the nearest hundredth.

<table>
<thead>
<tr>
<th>Distance (km)</th>
<th>Swim</th>
<th>Bike</th>
<th>Run</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5</td>
<td>40</td>
<td>86</td>
<td>64</td>
</tr>
</tbody>
</table>

a. How many meters per second did she run?

b. What was her speed in miles per hour for the aquabike portion (swimming and biking)?
Objective: SWBAT convert units of currency.

IPOD (Integer Problems of the Day)

-6 – 3 + 8 =
-34 – (-21) + 8 =
Do Now:

1) What is the value of the following expression?

\[
\left(\frac{2}{3}\right)^2
\]

A \(\frac{4}{3}\) \hspace{1cm} C \(\frac{4}{9}\)

B \(\frac{2}{9}\) \hspace{1cm} D \(\frac{4}{6}\)

2) If \(|x| = 1\), what is the value of \(x\)?

F 1 \hspace{1cm} H \(-1\) and 0

G \(-1\) \hspace{1cm} J \(1\) and \(-1\)

3) Which of the following statements is false if \(a = 3\) and \(b = -3\)?

A \(|b| = a\) \hspace{1cm} C \(|b| = |a|\)

B \(|b| > 0\) \hspace{1cm} D \(|b| < 0\)

4) Between which two consecutive whole numbers is \(\sqrt{150}\)?

A 149 and 151 \hspace{1cm} C 74 and 76

B 144 and 169 \hspace{1cm} D 12 and 13

Math Lab
When you travel to a foreign country, you often need to change your country’s money into the other country’s money in order to pay for things. Another word for “type of money” is ___________________________. Different currencies are used around the world.

An ______________________________ is a conversion ratio that allows you to change an amount of money from one currency to another.

1) Why might it be important to know the exchange rate when you go to another country?

### RULES & TOOLS: Currency Conversions

**Currency** is the form of __________________________ within a country. AKA __________________________!

To **convert** between two __________________________ currencies…
1. Write a _______________________ with the given ________________ rate.
2. Set up a proportion comparing the exchange rate to the conversion you want to make.
3. ___________ ______________ and solve.

WE TRY
Use the given exchange rate to solve the problems below.

<table>
<thead>
<tr>
<th>United States (USD)</th>
<th>Canada (CAD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1.00 USD</td>
<td>$1.02 CAD</td>
</tr>
</tbody>
</table>

1) Mr. Hassall wants to go see the Red Sox play in Toronto. He has $150 USD. How much money would this be in Canadian Dollars?

Answer: $_____________________ CAD

2) If tickets to the game cost $50 CAD, how much would this cost Mr. Hassall in USD? Round your answer to the nearest cent.

Answer: $_____________________ USD

YOU DO
Use the given exchange rate to solve the problems below.

<table>
<thead>
<tr>
<th>United States (USD)</th>
<th>Mexico (Peso)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1.00 USD</td>
<td>$14 MXN</td>
</tr>
</tbody>
</table>
3) Ms. Pascual wants to take a trip to Mexico. If the plane tickets cost $400 USD, how much would this be in Pesos?

Answer: $_____________________ MXN

4) While in Mexico she notices a beautiful necklace that costs $420 MXN. How much would this cost her in US dollars?

Answer: $_____________________ USD

5) At the end of her trip, Ms. Pascual has $1470 in Mexican Pesos. How much money does she have in USD?

Answer: $_____________________ USD

Concept Landing:

Using the exchange table below, convert $413 to Algerian dinars using a proportion.
Anthony says that the answer should be about 29,498 Dinars. Nasir states that the answer should be about 5 Dinars. Who is incorrect? What error was made? 

______________________________

______________________________

______________________________

______________________________

______________________________

______________

**ANOTHER**

Use the given exchange rate to solve the problems below.

<table>
<thead>
<tr>
<th>United States (USD)</th>
<th>Brazil (Real)</th>
</tr>
</thead>
</table>

116
6) Mr. Zarkhi wants to create a new Brazilian Blend Coffee. He orders $1500 USD worth of beans. How much is this in Brazilian Reals?

Answer: R$ _______________ BRL

7) Another variety of bean costs R$123 BRL per bushel. How much would this cost in USD?

Answer: $___________________ USD

8) The company Mr. Zarkhi purchases from also charged him shipping totaling $160 USD. How much is this in Brazilian Reals?

Answer: R$ _______________ BRL

9) Tyrone travels internationally on business. On a trip to Japan, Tyrone uses the exchange rates in the tables shown below.

<table>
<thead>
<tr>
<th>U.S. Dollar</th>
<th>Japanese Yen</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1.00</td>
<td>117</td>
</tr>
<tr>
<td></td>
<td>115.19¥</td>
</tr>
</tbody>
</table>
Explain how you determined your answer on the lines below: ________________________________

_________________________________________________________________________________

_________________________________________________________________________________

_________________________________________________________________________________

_________________________________________________________________________________

_________________________________________________________________________________

Use the exchange table to the right for #10 – 17

<table>
<thead>
<tr>
<th>USD (U.S.-dollar)</th>
<th>EUR (Europe-euro)</th>
<th>JPY (Japan-yen)</th>
<th>CAD (Canada-dollar)</th>
<th>MXN (Mexican-peso)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.78</td>
<td>104.55</td>
<td>1.26</td>
<td>14.18</td>
</tr>
<tr>
<td>1.26</td>
<td>1</td>
<td>133.84</td>
<td>1.61</td>
<td>14.91</td>
</tr>
</tbody>
</table>
Amelia traveled to Europe with 512 pesos. How much did Amelia have in euros?

A 7,326.72
B 526.31
C 497.69
D 35.78

Eric traveled to Mexico with 125 U.S. dollars. How much did Eric have in pesos?

F 1,397.50
G 136.18
H 113.82
J 0.09

Beth traveled to Europe with 156 Canadian dollars. How much did Beth have in euros?

A 96.90
B 154.39
C 157.61
D 251.16

Doug traveled to Europe with 651 U.S. dollars. How much did Doug have in euros?

F 5.16
G 50.70
H 507.78
J 534.62

Andrea traveled to Canada with 255 U.S. dollars. How much did Andrea have in Canadian dollars?

A 202.38
B 321.30
C 3,213
D 32,130

Jun traveled to France with 364 yen. How much did Jun have in euros?

F 2.72
G 273.68
H 4,818.24
J 48,717.76

Kim traveled to Japan with 642 U.S. dollars. How much did Kim have in yen?

A 671,211
B 67,121.10
C 61,40
D 6,14

John traveled to Mexico with 362 euros. How much did John have in pesos?

F 25.30
G 253
H 518.02
J 5,189.22

18) Lori traveled to Europe on February 7, 2005, with 965 pesos. How much did Lori have in euros?
Answer: 

b. Use what you know about converting currency to explain why your answer is correct. Use words and/or numbers to support your explanation. 


19) $14 to Japanese yen

20) 800 Kenyan shillings to U.S. dollars
21) $64 to Canadian dollars

22) $90 to Australian dollars

23) 2,500 Indian rupees to U.S. dollars

24) 8 Danish kroner to U.S. dollars

AGAIN

Use the given exchange rate to solve the problems below.

<table>
<thead>
<tr>
<th>United States (USD)</th>
<th>Japan (Yen)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1.00 USD</td>
<td>¥ 80.00 JPY</td>
</tr>
</tbody>
</table>
25) Mr. Smith is travelling to Japan to compete in a Volleyball tournament. Plane tickets cost $800 USD. How much is this in Japanese Yen?

Answer: ¥______________________ JPY

26) While there he wants to buy a protein shake to recover between games. The shake costs ¥240. How much is this in USD?

Answer: $_____________________ USD

27) Mr. Smith’s team won the tournament and received ¥ 100,000 in prize money. How much is this in USD?

Answer: $_____________________ USD

Name: ___________________________________ Date: __________

Homeroom: ______________________________ Exit

Ticket #29
Use the given exchange rate to solve the problems below.

<table>
<thead>
<tr>
<th>United States (USD)</th>
<th>China Yuan</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1.00 USD</td>
<td>¥6.35 CNY</td>
</tr>
</tbody>
</table>

1) Diligence flew to China to rescue Tom Foolery. While there, Diligence purchased a bottle of Chinese Hot Sauce for ¥127 CNY. How much did this cost him in USD?

Answer: $____________________ USD

2) Diligence has $50 USD to spend on hot wings. How much is this in Chinese Yuan?

Answer: ¥___________________ CNY

Name: ___________________________  Date: __________

Homeroom: ________________________  7th Grade Math – HW #29

Use the given exchange rate to solve the problems below.

<table>
<thead>
<tr>
<th>United States (USD)</th>
<th>Europe (Euro)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1.00 USD</td>
<td>€0.75 EUR</td>
</tr>
</tbody>
</table>
1) Ms. Sprentall is travelling to Europe. She has $2500 USD to spend. How much is this in Euros?

Answer: €_____________________ EUR

2) While there, she noticed a painting she really wanted. The price of the painting is €240 EUR. How much is this in USD?

Answer: $_____________________ USD

3) The plane ticket back costs $500 USD. How much is this in Euros?

Answer: €_____________________ EUR

Convert the Following:

4) 600 Kenyan shillings to U.S. dollars.
5) $84 to Canadian dollars

6) $100 to Australian dollars

Name: ______________________________ Date: __________

Homeroom: __________________________

Objective: SWBAT use scale factor to interpret scale drawings.
Do Now:

1) Debra can run $20\frac{1}{2}$ miles in $2\frac{1}{4}$ hours. How many miles per hour can she run?
   - A $46\frac{1}{8}$ miles per hour
   - B $22\frac{3}{4}$ miles per hour
   - C $18\frac{1}{4}$ miles per hour
   - D $9\frac{1}{9}$ miles per hour

2) CD Express offers 4 CDs for $60. Music Place offers 6 CDs for $75. Which store offers the better buy? (Examples 1-3)

   Answer: ____________________________

3) Monica reads $7\frac{1}{2}$ pages of a mystery book in 9 minutes. How many pages can she read in 15 minutes?

   Answer: ____________________________
1) Johnny measured the distance on the map and found that the distance between Los Angeles and San Diego is 2 ½ inches. Jimmy measured the distance on the map and found that the distance between Los Angeles and San Diego is 150 miles. Who is correct? Explain.

________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________

2) Let’s say you are not given the scale above, but you know that the distance on the map is 2 ½ inches and the distance in real life is 150 miles. How would you determine the scale if it is not provided?

<table>
<thead>
<tr>
<th>STOP AND JOT</th>
<th>TEACH-OK</th>
<th>WHOLE CLASS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**RULES & TOOLS:** Scale Drawings/Scale Factor
1. Set up a _______________________ and write the ______________ measurement.

2. Calculate the requested _______________________ using ______________ multiplication or ____________ ______________.

3. Determine _______________________ by writing the scale in simplest form without units (you will most likely need to do a ___________________________!)

**WE TRY**

1) **Suppose a model of a dragonfly has a wing length of 4 centimeters. If the length of the insect’s actual wing is 6 centimeters, what is the scale of the model?**

Answer: __________________________

In order to use a proportion to find the scale factor, what should be the units of the first ratio?

<table>
<thead>
<tr>
<th>STOP AND JOT</th>
<th>TEACH-OK</th>
<th>WHOLE CLASS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2) **The model of a car is shown at the right. The actual car is 14\(\frac{1}{2}\) feet long. What is the scale of the model car?** *(Example 1)*
Answer: 

What is the scale factor?

Answer: 

3) The length of a model of a bridge is 16 inches. The actual length of the bridge is 50 yards. What is the scale of the model?

Answer: 

What is the scale factor?

Answer: 

YOU DO

Find the scale factor for each scale.

11. 10 cm = 5 m
12. 6 in. = 10 ft
13. 0.5 in. = 3 ft
14. 5 ft = 15 yd
15. 4 cm = 2.5 mm
16. 8 in. = 200 mi
3) 

A.            C.            E. 
B.            D.            F. 

A. 

B. 

C. 

D. 

E. 

F. 

4) Julie is constructing a scale model of her room. The rectangular room is $10\frac{1}{4}$ inches by 8 inches. If 1 inch represents 2 feet of the actual room, what is the scale factor and the actual area of the room? (Examples 3 and 4)
Scale Factor: ________________________________

Area: ________________________________

What must happen before the actual area can be determined?

<table>
<thead>
<tr>
<th>STOP AND JOT</th>
<th>TEACH-OK</th>
<th>WHOLE CLASS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5) Building on the Essential Question Explain how you could use a map to estimate the actual distance between Miami, Florida, and Atlanta, Georgia.
6) A model airplane is built with a wing span of 23 inches. The actual wing span is 92 feet. What is the scale of the model. (Example 1)

Answer: _______________________________________________________________________

7) The pillars of the World War II memorial in Washington, D.C., are 17 feet tall. A scale model of the memorial has pillars that are 5 inches tall. What is the scale of the model?

Answer: _______________________________________________________________________

MIXED UP

8) A floor plan for a home is shown at the left where $\frac{1}{2}$ inch represents 3 feet of the actual home. What is the actual area of bedroom 1?
9) A skate park is 24 yards wide by 48 yards long. If Ms. Kreskow is creating a scale drawing, using the scale of \( \frac{1}{4} \) inch = 8 yards. What is the area of the drawing?

Answer: __________________________

Is the scale in the question above a scale factor? Why or why not? ______________

______________________________

______________________________

______________________________

10) A scale drawing of a swimming pool is shown.
11) An area rug is 9 feet wide. In a photograph, the image of the rug is 3 inches wide. What is the scale?  
(Example 1)

Answer: ______________________________

12) A graphic artist is creating an advertisement for this cell phone. If she uses a scale of 5 inches = 1 inch, what is the length of the cell phone on the advertisement?

Answer:

13) A floor plan is shown for the first floor of a new house. If one inch represents 24 feet, what are the actual dimensions of each of the rooms listed?  
(Example 2)

a. living room  
b. deck  
c. kitchen
14) Use the diagram above to determine:

The actual measurements for rooms are given. Using the floor plan and scale above, find the measurements on the floor plan.

a. master bedroom
   12 feet by 15 feet

b. den
   18 feet by 9 feet

c. dining room
   12 feet by 9 feet

15) On a map, the distance from Akron to Cleveland measures 2 centimeters. What is the actual distance if the scale of the map shows that 1 centimeter is equal to 30 kilometers? (Example 1)

16) Find the length of each model. Then find the scale factor. (Examples 2 and 3)
Length: ________________

Length: ________________

Scale Factor: __________

Scale Factor: __________

Name: ____________________________

Date: __________
1) A large American flag measures 255 feet wide. In an advertisement for renting this flag, the image of the flag is 4 inches wide. What is the scale of the flag?

Answer: ________________________________

2) How many miles are represented by 4 inches on this map?
   A  480 miles    C  30 miles
   B  120 miles    D  16 miles

3) Find the length of the model. Then find the scale factor. The length of an actual bird is shown at the right.

Answer: ________________________________

Name: ________________________________   Date: ____________

Homeroom: ___________________________   7th Grade Math – HW #31

1) A map has a scale of 1.5 inches = 500 miles. How many inches on the map would represent 850 miles? Round to the nearest tenth.
   A  2.2 inches    C  2.6 inches
   B  2.4 inches    D  2.8 inches
2) A landscape designer created the scale drawing below showing the bench that will be in the garden area.

Which of these was the scale used for the drawing if the actual width of the bench is 6 feet?

- A $\frac{1}{4}$ inch = 1 foot
- B 3 inches = 1 foot
- C $\frac{2}{3}$ inch = 1 foot
- D 1 inch = 3 feet

3) An area rug is 9 feet wide. In a photograph, the image of the rug is 3 inches wide. What is the scale? (Example 1)

Answer: __________________________________________________________

4) What is the scale factor in question #3?

Answer: __________________________________________________________

5) A scale drawing of a doctor’s office is shown.

What are the actual dimensions of the
6) A model of an apartment is shown where $\frac{1}{4}$ inch represents 3 feet in the actual apartment. Find the actual area of the master bedroom. \textit{(Example 4)}

Answer: ________________________________
Quiz Review!

Do Now:

1) There are 24 pencils in Angelina’s pencil pouch. If 3 out of 4 of the pencils are sharp, how many dull pencils does Angelina have?

A 3 pencils  
B 6 pencils  
C 18 pencils  
D 32 pencils

IPOD (Integer Problems of the Day)

-15 + (-11) – 3 =

-7 – 11 – (-4) =

2) Mrs. Ross needs to buy dish soap. There are four different sized containers.

<table>
<thead>
<tr>
<th>Dish Soap Prices</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Brand</strong></td>
</tr>
<tr>
<td>Lots of Suds</td>
</tr>
<tr>
<td>Bright Wash</td>
</tr>
</tbody>
</table>
3) Which of the following ratios is a unit rate?

A \[ \frac{120 \text{ miles}}{3 \text{ gallons}} \]  
B \[ \frac{24 \text{ gallons}}{6 \text{ minutes}} \]  
C \[ \frac{\$18}{4 \text{ gallons}} \]  
D \[ \frac{1,200 \text{ texts}}{1 \text{ month}} \]

4) CD Express offers 4 CDs for $60. Music Place offers 6 CDs for $75. Which store offers the better buy? (Examples 1–3)

5) Which of the following is equivalent to \( \frac{1}{2} \)?

A \[ \frac{1}{2} \]  
B \[ \frac{1}{2} \]  
C \[ \frac{1}{2} \]  
D \[ \frac{1}{2} \]  
E \[ \frac{1}{2} \]  
F \[ \frac{1}{2} \]  
G \[ \frac{1}{2} \]  
H \[ \frac{1}{2} \]  
I \[ \frac{1}{2} \]
6) Aubrey can walk $\frac{4}{2}$ miles in $\frac{1}{2}$ hours. Find her average speed in miles per hour.

Answer: ____________________________

7) Thirty-five miles per hour is the same rate as which of the following?

A 150 feet per minute
B 1,500 feet per minute
C 2,200 feet per minute
D 3,080 feet per minute
8) On a map, the distance from Diligence to Rochester Prep is $3\frac{1}{2}$ inches. If the scale conversion on this map is $\frac{1}{2}$ inch = 5 miles, how far is Diligence from Rochester Prep?

A 15.5 miles  
B 17.5 miles  
C 35 miles  
D 350 miles

9) An area rug is 9 feet wide. In a photograph, the image of the rug is 3 inches wide. What is the scale?

Answer: ____________________________

Use the table below to answer questions 10 and 11.
10) Amelia traveled to Europe with 512 pesos. How much did Amelia have in euros?

   A  7,326.72  
   B  526.31   
   C  497.69   
   D  35.78

11) Eric traveled to Mexico with 125 U.S. dollars. How much did Eric have in pesos?

   F  1,397.50  
   G  136.18   
   H  113.82  
   J  0.09

12) The tables shown represent the number of pages Martin and Gabriel read over time. Which situation represents a proportional relationship between the time spent reading and the number of pages read? Explain.

<table>
<thead>
<tr>
<th>Pages Martin Read</th>
<th>2</th>
<th>4</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time (min)</td>
<td>5</td>
<td>10</td>
<td>15</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pages Gabriel Read</th>
<th>3</th>
<th>4</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time (min)</td>
<td>5</td>
<td>10</td>
<td>15</td>
</tr>
</tbody>
</table>
1) Do you feel prepared for your test tomorrow? ________________________________

__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________

2) What will you do tonight to prepare? ________________________________

__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________

3) What are you still struggling with in particular? ________________________________

__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________

Name: __________________________________________ Rates Quiz
SHOW ALL WORK! Do not forget your units!

1) Marisol paid $3.00 for \( \frac{2}{5} \) pound of sliced turkey meat. What was the price per pound of the turkey meat?

A. $7.50 per pound
B. $6.50 per pound
C. $1.20 per pound
D. $3.40 per pound

2) A machine in a candy factory produces \( \frac{5\frac{1}{2}}{2} \) batches of milk balls every \( \frac{3}{4} \) hour. Which of the following is the unit rate for producing the milk balls, in batches per hour?

A. \( \frac{4\frac{1}{8}}{1} \)
B. \( \frac{5\frac{3}{4}}{1} \)
C. \( \frac{6\frac{1}{4}}{1} \)
D. \( \frac{7\frac{1}{3}}{1} \)

3) Pedro’s car odometer measures the distance driven in kilometers. Pedro determines that, for every \( \frac{8}{10} \) kilometer he drives, he drives the equivalent distance of \( \frac{5}{10} \) mile. What is that ratio as a unit rate of kilometers to miles?

A. \( 8 : 5 \)
B. \( 0.625 : 1 \)
C. \( 1.6 : 1 \)
D. \( 5 : 8 \)

4) Of newly manufactured volleyballs, 12 were defective and 56 passed inspection. What ratio compares the number of defective volleyballs to the total number of volleyballs manufactured?

A 3:14  C 4:14
B 3:17  D 4:17
5) Which of the following ratios is a unit rate?

A \[ \frac{120 \text{ miles}}{3 \text{ gallons}} \]

B \[ \frac{24 \text{ gallons}}{6 \text{ minutes}} \]

C \[ \frac{18 \text{ dollars}}{4 \text{ gallons}} \]

D \[ \frac{1,200 \text{ texts}}{1 \text{ month}} \]

6) The James family took a four-day road trip. They traveled 400 miles in 5 hours on Sunday, 200 miles in 3 hours on Monday, 150 miles in 2.5 hours on Tuesday, and 250 miles in 6 hours on Wednesday. On which day did they average the greatest miles per hour?

a. Sunday

b. Monday

c. Tuesday

d. Wednesday

7) On a map, the distance from Diligence to Rochester Prep is \(3\frac{1}{2}\) inches. If the scale conversion on this map is \(\frac{1}{2}\) inch = 5 miles, how far is Diligence from Rochester Prep?

A \[ 15.5 \text{ miles} \]

B \[ 17.5 \text{ miles} \]

C \[ 35 \text{ miles} \]

D \[ 350 \text{ miles} \]
Use the table below to determine your answer to question 8.

<table>
<thead>
<tr>
<th>Customary Units of Measure</th>
<th>Metric Units of Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Smaller</strong></td>
<td><strong>Larger</strong></td>
</tr>
<tr>
<td>12 inches</td>
<td>1 foot</td>
</tr>
<tr>
<td>16 ounces</td>
<td>1 pound</td>
</tr>
<tr>
<td>8 pints</td>
<td>1 gallon</td>
</tr>
<tr>
<td>3 feet</td>
<td>1 yard</td>
</tr>
<tr>
<td>5,280 feet</td>
<td>1 mile</td>
</tr>
<tr>
<td>100 centimeters</td>
<td>1 meter</td>
</tr>
<tr>
<td>1,000 grams</td>
<td>1 kilogram</td>
</tr>
<tr>
<td>1,000 milliliters</td>
<td>1 liter</td>
</tr>
<tr>
<td>10 millimeters</td>
<td>1 centimeter</td>
</tr>
<tr>
<td>1,000 milligrams</td>
<td>1 gram</td>
</tr>
</tbody>
</table>

8) Thirty-five miles per hour is the same rate as which of the following?
   A) 150 feet per minute
   B) 1,500 feet per minute
   C) 2,200 feet per minute
   D) 3,080 feet per minute

9) The Franklins have a home loan with an interest rate of $4 \frac{1}{4} \%$. Write the percent as a fraction in simplest form.

Answer: ________________________________
10) A truck driver drove 120 miles in $1 \frac{3}{4}$ hours. If he drove for 4 hours, how far did he travel?

Answer: ________________________________

Use the given exchange rate to solve the problem below.

<table>
<thead>
<tr>
<th>United States (USD)</th>
<th>Europe (Euro)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1.00 USD</td>
<td>€0.75 EUR</td>
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</tbody>
</table>

11) Ms. Sprentall is travelling to Europe. She has $2500 USD to spend. How much is this in Euros?

Answer: ________________________________

12) A model airplane is built with a wing span of 23 inches. The actual wing span is 92 feet. What is the scale of the model. [Example 1]

Answer: ________________________________
13) What is the scale factor in question 12?

Answer: ____________________________
I taught this rates unit to seventh grade students in an urban charter school in western New York in October, 2013. There were three classes of seventh graders, each consisting of approximately twenty nine students. The original structure of the lessons was very similar to what I shared in Chapter Four. All of the questions have remained the same. Some discussion was involved, but I often did not plan the discussion opportunities ahead of time.

Upon completion of the rates unit in October, I realized that while most students’ progress of computing rates and unit rates was satisfactory, their ability to describe the meanings of rates was not. They lacked the conceptual understanding needed to reach mastery level of the standard. I knew I needed to help my student develop this awareness as the mathematics standards beyond seventh grade require students to have conceptual understanding of rates.

I determined several changes that I needed to make so that after I teach the same unit again, my next group of students will develop the necessary conceptual understanding along with the ability to accurately compute rates and unit rates. First, I realized that I was rarely utilizing the fact that my students were seated with a partner every day. Each classroom in the school is set up in this way. A benefit of this arrangement is that transitions to partner work are fast and simple. Secondly, the discussion opportunities I used in October were not well planned. I needed to put more time into scripting out the questions that I wanted to ask. Finally, I did not want increased discussion time to lead to a lack of structure for the students. In order to enable students to organize their thoughts and the new information gleaned from discussions, I developed a table to insert into lessons.

Throughout the process of editing and refining my lessons for the new unit, I considered topics that had been a particular struggle for students during the rates unit. I used these topics to guide the suggested questioning I have offered in comments. I scripted questions that are tailored to my particular style of teaching; it is my
opinion that each individual teacher should modify these to fit their style or script their own questions based on their students' background knowledge.

I believe that by using my modified unit plan on rates, found in chapters three and four, my future students will have a greater number of opportunities to discuss ideas with their classmates. These opportunities will be more effective than those I provided last year because the quality and organization of questioning has increased.

My goal in creating this discussion rich unit plan has been two-fold. First, I believe that I have created materials that will lead my students to the deep conceptual understanding they need on the topic of rates. Additionally, it is my hope that the method I have presented to implement discussion into the mathematics classroom will serve as a blueprint for other teachers, new or veteran, hoping to do the same.
References


