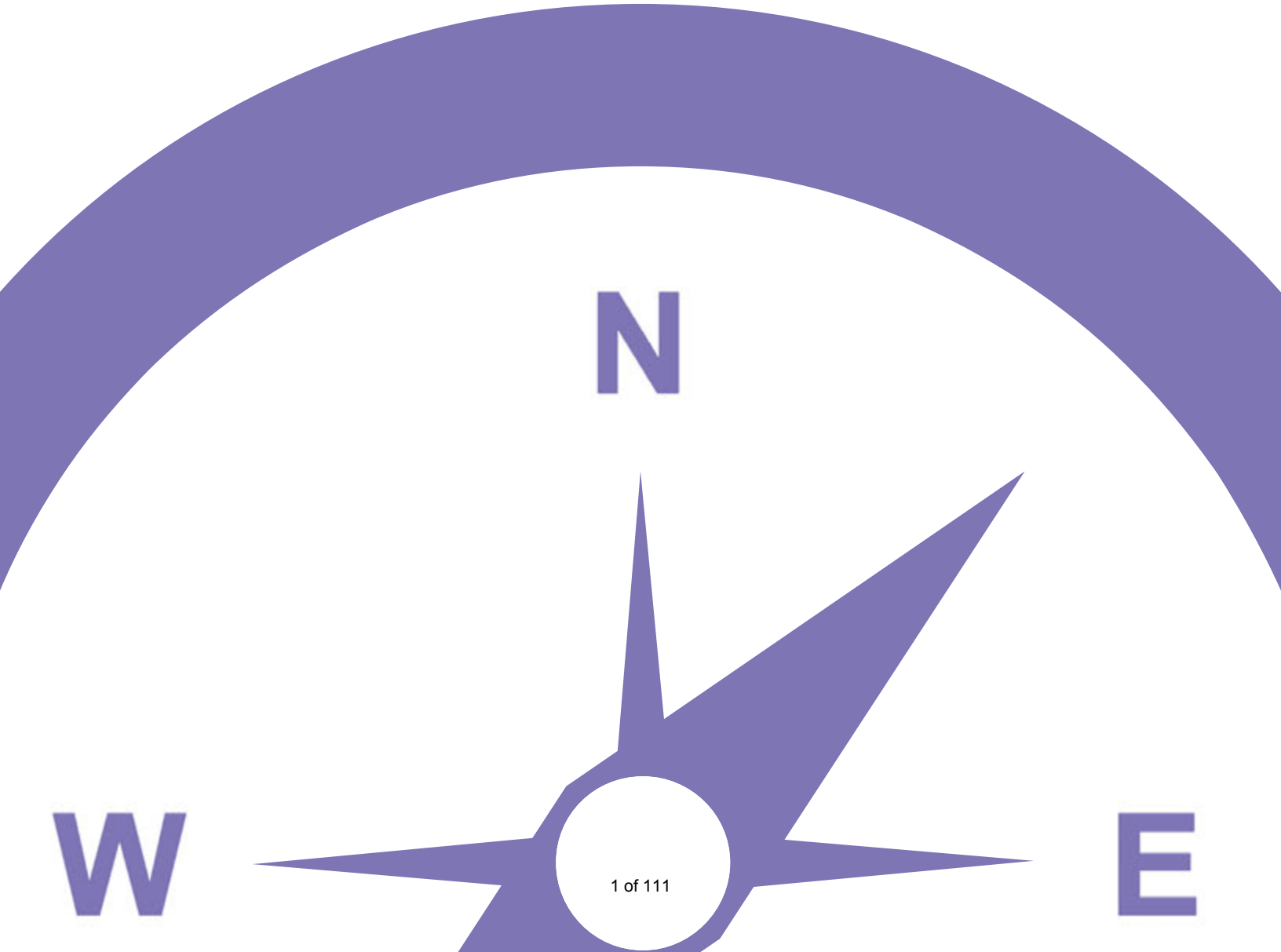
Ascend Math® Compass

Teacher Guides for Ascend Math Explorations



Ascend Objectives

Ascend Math Teacher Guide

E1.02

Addition

Overview, Purpose and Objective:

The student will be able to add single-digit addends.

Prior Knowledge Needed:

The student should:

- Have mastered counting
- Basic knowledge >, <, =

Lesson Details:

- Create addition problems on white board and place correct number of counters by each addend. (Make sure counters are different in some way for each addend.
- Combine, count record. Teach vocabulary within lesson.
- Practice for mastery with white boards (Introduce using playing cards to create these problems. Compare answers using >, <, =.
- Distribute Recording Sheet for each student, counters (40) plus deck of cards per partner group.
- Direct students to draw two cards. Write addition problem, solve by placing counters by ones and compare with partner. Record comparisons. Repeat for problems 2 through 5.
- Circulate and assist.

Check for Understanding:

Students should discuss and answer the following questions:

- When two numbers are added, will the sum be less than or greater than either addend? Why?
- Name a time when you would add in real life.

Additional Activity (Independent/group activity to reinforce lesson):

Journal Entry:

- "I can" statement
- Students use playing cards to create an addition equation and write it in journal. Solve.
- Self evaluation score.

2 I am starting to understand this skill.

3 I could pass a test on this and understand it.

4 I am confident with this skill and could teach it to a peer.

Teaching Aids/Materials Needed for Activity:

- two-sided colored counters
- decks of playing cards with jokers and face cards removed (one deck per partner group)
- recording sheet (attached) for each student

Vocabulary:

- addend
- sum
- combine
- total

Notes:

Compared to my partner, my number was:

1) _____ + _____ = _____ < > =

2) _____ + _____ = _____ < > =

3) _____ + _____ = _____ < > =

4) _____ + _____ = _____ < > =

5) _____ + _____ = _____ < > =

Ascend Math Teacher Guide

E3.10

Division Review

Overview, Purpose and Objective:

The purpose of this lesson is to review student knowledge on computing whole-number quotients of whole numbers.

Prior Knowledge Needed:

The student should know:

•division •dividend •divisor
•quotient •array •equal groups

Lesson Details:

The explore activity provides practice for dividing whole numbers dividends and whole number divisors. The activity begins with an interactive array model that computes the quotient and remainder (if applicable) of the division number sentence. The answer for division equation will appear to the right of the interactive array model. There is also a brief explanation of how many groups the quotient can be divided into as well as how many is in each group. The quotient of the division equation can be changed by moving the green circle up and down the interactive array model. The green number represents the quotient and the blue number represents the divisor. As the green circle is moved up and down, the blue area will change to represent the corresponding array to the division equation. The red area represents the remainder of a division equation. To eliminate a remainder in the answer, manipulate the green circle so that there are not any red blocks. Type a new dividend in the white box or use the increase and decrease buttons to begin a new equation.

Check for Understanding:

To check for student understanding:

•What math operation are we using?
•What is the dividend and divisor?
•How many are in each group?
•How many groups can the dividend be equally divided into?
•Name the whole number quotient.
•How can you use an array to compute the quotient?

Additional Activity (Independent/ group activity to reinforce lesson):

The same lesson can be duplicated using an array model and equal groups model. Provide students with a division equation. Students can solve the equation in two different methods. In the array model the student will count out a total number of square inch titles equal to the dividend. The student will then arrange an array with the square tiles. The student must create a rectangle with all the square tiles. The number of columns of the array must match the divisor of the division equation. To find, the student can select any column of the array and count the number of square tiles. This is the quotient. In the equal groups model, the divisor determines how many groups will be needed for the equation. The student will count out the number of paper plates equal to the divisor. Next, the student will count out the number of dried beans equal to the dividend. The student will place a bean in each plate and continue the process until all the beans have been used. Select one plate and count how many beans are in that group. This number is the quotient. Division equations can be written on dry erase boards.

Teaching Aids/ Materials Needed for Activity:

*dried beans *colored paper plates * square inch tiles
*dry erase boards *dry erase markers *dry erase boards

Vocabulary:

•Dividend – the number we are dividing
•Division – separating an object into equal parts
•Divisor – the number we are dividing by
•Equation – a mathematical sentence that uses the equal sign (=) to show that two expressions are equal;
•Product – the result or answer from multiplying
•Quotient – the answer

Ascend Math Teacher Guide

E4.04

Understanding Fractions

Overview, Purpose and Objective:

The purpose of this lesson is to create a visual representation of a fraction by shading in portions of a circle or square.

Prior Knowledge Needed:

The student should know:
•the meaning of the numerator of a fraction
•the meaning of the denominator of a fraction

Lesson Details:

As the student begins the explore, he/she is shown four circles. Under each circle is a given fraction. The student clicks on the arrow pointing up to slice the circle into the correct number of pieces needed to form the given fraction. The student may adjust the number of slices by using the up and down arrows. The student must then click on the fraction pieces to shade in the correct amount for the given fraction. The student completes all four fraction circles and then clicks check. If correct, the fraction will appear on the number line. If all are correct, the student selects “new” and new set is given for the student to represent. If any are incorrect a prompt will alert the student to correct the mistake. In the upper-left corner, the student has the option to complete a similar activity using squares. Instead of slices the student must now create the fractions using rows and /or columns.

Check for Understanding:

Does the student have a clear understanding of what both the numerator and denominator represent? In working with the square, does the student understand he/she may be able to represent some fractions in multiple ways using columns and rows? Does the student realize he/she may shade in ⅔ for the given fraction of ⅘? Does the student understand how to place fractions on a number line in order from least to greatest?

Additional Activity (Independent/ group activity to reinforce lesson):

Have four to eight students remove one or both of their shoes and place them on the floor at the front of the room. Have a volunteer count up the total number of shoes and write that number on the board. Discuss what part of the fraction the total number is. Ask various questions such as: What part of the total shoes are sneakers? What part of the total shoes have laces? etc. Students can also come up with questions and volunteers should write the results as fractions on the chart paper. The teacher may choose to extend the activity to discuss ordering fractions, equivalent fractions, and simplifying fractions.

Teaching Aids/ Materials Needed for Activity:

•chart paper and markers or white board/chalkboard
•shoes from your students

Vocabulary:

Other Resources (Websites, Books, etc.)

http://www.mathwarehouse.com/fractions/manipulatives/fraction-maker-online.php
http://www.education.com/activity/fractions/

Notes:

Ascend Math Teacher Guide

E5.09

Area of Plane Figures

Overview, Purpose and Objective:

The purpose of Lesson E5.09 is to allow students to find the area of a plane figure by counting the square units of a plane figure. The students will manipulate squares and rectangles in the Explore item to find the area of various size plan figures.

Prior Knowledge Needed:

•The student should know and understand the terms length, width, area, square unit, plane figure, and perimeter.
•The student should have a working knowledge of plane figures such as squares and rectangles.

Lesson Details:

The student will create various sized plane figures (squares and rectangles) and identify its attributes: *area*, *perimeter*, *length*, and *width*.
As the student begins the Explore item, they will see a plane figure of a red square and the squares attributes of height, base (width), area, and perimeter to the right of the square. The student will also see the position of the red square as it related to the interactive graph paper. The student counts the number of red shaded blocks to find the length, width, area and perimeter. The student can then check their answers to the right. At this point, the square can be manipulated to make squares and rectangles of different sizes. This allows the students to explore plane figures attributes of a various sized figures. The student can also use the freeze feature to freeze their current figure in place and create another plane figure to compare attributes. The frozen figure will be a blue color and the active figure will be red. The Explore feature continues this process, enabling the student to find additional plan figure attributes.

Check for Understanding:

•Does the student notice area and perimeter are found by different counting strategies?
•Does the student understand area is the product of the height multiplied by the base (width)?
•Can the student find the area of larger plane figures?
•What are the different operations needed for find area and perimeter?

Additional Activity (Independent/ group activity to reinforce lesson):

With teacher guidance, students will use the interactive graph paper to find area and perimeter of plane figures.

Teaching Aids/ Materials Needed for Activity:

•Graph paper

Vocabulary:

Other Resources (Websites, Books, etc.)

http://www.corestandards.org/Math/Content/3/MD/

Notes:

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E5.12.A

Concept of Area and Perimeter

Overview, Purpose and Objective:

The student will be able to calculate the perimeter and area of a regular rectangle and give its dimensions.

Prior Knowledge Needed:

The student should:

*Understand basic addition and multiplication facts
•Have basic knowledge of rectangles

Lesson Details:

•Teach, reteach, and review finding area and perimeter of a rectangle defining given vocabulary within lesson. Include purpose for calculations in discussion.
•Practice graph posters/paper to each student.
•Explain they will be creating their Dream House, but to be accepted by the builder, each room must have area (A) and Perimeter (P) calculated with dimensions provided.
•Circulate and assist as students create Dream Houses, label rooms, write dimensions and calculate each room's area and perimeter.
•Display in room or hallway; name community.

Check for Understanding:

Students should discuss and answer the following questions:

•What is the definition of area? perimeter?
•Why would you need to compute area? perimeter?
•How do you compute area? perimeter?

Additional Activity (Independent/group activity to reinforce lesson):

Journal Entry:

•Write "I can" statement.
•Using one room from student's dream house have students write a word problem for area and one for perimeter. Give skeleton word problem for them to follow: (see additional page)
•Solve both problems.
•Do self-evaluation score.

2 I am starting to understand this skill.

3 I could pass a test on this and understand it.

4 I am confident with this skill and could teach it to a peer.

Teaching Aids/Materials Needed for Activity:

•graph paper taped together or large post-it note graph poster paper
•pencils and markers
•student white boards

Vocabulary:

•perimeter
•area
•rectangle

Notes:

Skeleton word problem for area journal entry:

_____ has decided to put _____ in his/her _____.
Name flooring type room

The dimensions of the _____ are _____. How much _____
room dimensions flooring type

should he/she buy?

Skeleton word problem for perimeter journal entry:

_____ wants to hang lights around the perimeter of his/her _____.
Name room

The dimensions of the _____ are _____. How long of a string of lights
room dimensions

will _____ need to buy?
name

Ascend Math Teacher Guide

1011

Whole Numbers and Place Value

Overview, Purpose and Objective:

The purpose of this lesson is to know and understand the place value chart and to be able to label the periods within the chart.

Prior Knowledge Needed:

The student should know: the definition of whole numbers

- the place value chart
- the definition of period as it relates to the place value chart
- the value of a digit on the place value chart
- how to read numbers through the millions

Lesson Details:

As the student begins the Explore, he/she is instructed to label the place value chart by dragging the words to the correct location on the chart from the ones to the ten millions. The student can then check their answer or reset and try again. For the next three problems, the student is instructed to click on the number in a given period. Each problem is checked before a new problem is given.

Check for Understanding:

- Is the student able to write the place value chart from memory?
- Does the student know the difference between the place value and the period?
- Is the student able to read and write numbers into the millions?

Additional Activity (Independent/ group activity to reinforce lesson):

High-Number Toss is where students are trying to form the largest number possible. Students are instructed to draw a specified number of blanks on their paper. Students take turns choosing cards or rolling the number cube. As the digit is called out, each student writes the digit on any given blank. Once a number is written down, it may not be changed. The students read their number aloud, and the student with the largest number receives a point. You can vary this game using fractions and decimals and also changing the directions to build the smallest number. (Reminder, a number may not begin with 0)

Teaching Aids/ Materials Needed for Activity:

- number cube or a polyhedral die or cards with the digits 0-9
- paper and pencil or white boards

Vocabulary:

- Digits – Any numeral from 0-9; Indefinitely - without any limit of time or number
- Place Value - the value of a digit in a number based on the location of the digit
- Rounding – change a number to one less exact but more convenient for calculations
- Whole numbers – numbers that start at 0 and go forever in the positive direction

Other Resources (Websites, Books, etc.)

www.mathwire.com/number sense/morepv.html
www.gamequarium.com/placevalue.html

Notes:

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1012

Adding Whole Numbers with a Number Line Diagram

Overview, Purpose and Objective:

The purpose of this lesson is to show the sum of addends on a number line.

Prior Knowledge Needed:

The student should know:

- the meaning of the words addends and sum
- how to draw a number line
- which direction the positive numbers point on a number line

Lesson Details:

As the student begins the explore, a simple addition problem with single digit addends is shown. The student is instructed to represent the sum by dragging the addends to the number line. After the addends are dragged to the number line, he/she is asked What is the sum?. The student enters the sum in the box where the addition problem is shown, clicks check and then new. The student may continue to practice several problems.

Check for Understanding:

- Does the student understand the terms addend and sum?
- Does the student understand which direction positive numbers point on a number line?
- Can the student write their own math problem and represent the sum using the number line?
- Can the student predict what an arrow pointing to the left would represent?

Additional Activity (Independent/ group activity to reinforce lesson):

Students should create a large number line from 0 to 12 on chart paper or a white board. If the number line is made on paper it should be cut out so it can be used for several problems. Each pair of students is given 8-10 dominoes in a bag. Be sure to have a couple of pairs of identical dominoes in each bag. One student pulls out a domino from the bag and the students work together to draw arrows for each addend to represent the sum on the number line. Students repeat this until activity until they have represented sums for all of the dominoes given. This is an ideal opportunity for the teacher to introduce the commutative property with the identical dominoes $4 + 5 = 5 + 4$.

Teaching Aids/ Materials Needed for Activity:

- dominoes in a bag
- markers and large sheets of paper or a white board and markers

Other Resources (Websites, Books, etc.)

www.math-aides.com/Number_Lines/Adding_Number_Lines.html
www.superteacherworksheets.com/number-lines.html

Notes:

Ascend Math Teacher Guide

1012

Adding Whole Numbers with a Number Line Diagram

Overview, Purpose and Objective:

The purpose of this lesson is to build student knowledge on adding whole numbers on a number line.

Prior Knowledge Needed:

The student should know:

- how to read a number line
- whole numbers
- addition symbol

Lesson Details:

The explore activity provides practice for adding whole numbers on a number line. Each addition problem begins with a number line and two arrows representing the addends. Drag each arrow above the number line. Record the number the last arrow stops at in the sum box. Click the check button to check the sum. If correct, click the next bottom to begin a new problem.

Check for Understanding:

To check for student understanding:

- What math operation are we using?
- Name the whole number?
- What is the sum?
- What are the addends?
- What whole number does this arrow represent?
- How can you use the number line to compute the sum?

Additional Activity (Independent/ group activity to reinforce lesson):

The same lesson can be duplicated using a number line made of register tape. Measure 2 yards of the measuring tape and cut. Create a giant-sized number line with tick marks by drawing 11 equally spaced intervals approximately 6 to 7 inches apart. Measure each tick mark as whole numbers 0,1,2,3,4,5,6,7,8,9, 10. The beginning of the number line is 0 and the end of the number line is 10. Use flash cards to display addition problems with sums within 10. Students will jump along the number line to add the whole numbers. The student will begin at the first addend and jump a number of times as indicated by the second addend. For example, the student begins on whole number 3 and jumps twice to represent 3 +5. The student will move to a new whole number each time they jump. The number the student lands on will be the sum.

Teaching Aids/ Materials Needed for Activity:

- register tape
- marker
- yard stick
- flash card
- Laminated number line for more use and durability

Vocabulary:

- Addend - Numbers added together in an addition problem
- Length - How far from end to end or from one point to another
- Number line - A straight line with “zero” point in the middle, with positive and negative numbers listed on either side of zero and going in indefinitely
- Positive numbers - Any number that represents more than zero of anything
- Sum - result or answer from an addition problem
- Visualize - to recall or form mental images or pictures.

Ascend Math Teacher Guide

1024

Introduction to Exponents

Overview, Purpose and Objective:

The purpose of this lesson is understanding how to evaluate and read exponential expressions.

Prior Knowledge Needed:

The student should know how to:

- multiply whole numbers
- identify the base and exponent

Lesson Details:

The explore activity starts with instructions that read: Match the exponential expressions with its equivalent form. Eight exponential expressions are given with eight solutions or word sentences that match one of the expressions. You drag the solution/word sentence to the appropriate yellow section. Once the student completes this activity he/she will press the check button. If the student is correct he/she will proceed to the next activity. The instructions for the next two activities read, Which of the following expressions is equal to [exponential expression given]? Choose all that are correct. The student cannot proceed unless he/she chooses all of the appropriate solutions.

Check for Understanding:

Students should discuss and answer the following questions/topics:

- Why do we use exponents?
- How do you convert between standard form, exponential form, and expanded form?
- What are some real-life examples that we would use/evaluate exponential expressions?

Additional Activity (Independent/ group activity to reinforce lesson):

Exponents with Dice: Students will work in groups of 2-4. Each student will be handed two dice. (Optional: put dice in small plastic containers.) Students will roll their dice and create exponential expressions. One dice number will represent the base and the other will represent the exponent. Students need to figure what will be the largest value by interchanging the base and exponent. i.e. A student rolls a 2 & 5. He/She can create five to the second power which equals 25 or two to the fifth power which equals 32. Everyone in the group will compare their largest exponential expression. Whoever has the largest solution wins and receives a point. The game can continue until the first person receives a total of 10 points.

Teaching Aids/ Materials Needed for Activity:

- Two dice for each student
- Pencil/paper
- Score board

Vocabulary:

- Base - the number being raised to a power or being multiplied.
- Evaluate - determine the value of multiplication of the same factor.
- Exponent - shorthand notation for repeated
- Factors - numbers you can multiply together to get another number.

Other Resources (Websites, Books, etc.)

http://www.pbslearningmedia.org/resource/vtl07.math.number.exp.lpexpopad/the-use-of-exponents/

Notes:

Ascend Math Teacher Guide

1033

Modeling Division of Whole Numbers

Overview, Purpose and Objective:

Students will be able to compute division problems with divisors up to two digits and dividends up to eight digits long.

Prior Knowledge Needed:

The student should:

- Have the ability to create multiple lists
- Have basic understanding of the concept of division
- Have the ability to complete subtraction computation

Lesson Details:

- Review making multiple lists for 1-digit and 2-digit numbers using repeated addition and/or multiplication.
- Practice on individual white boards as a brain warm-up.
- Teach long division Box Method:

5
10
15
20
25
30
35
40
45

1. Begin with single-digit divisor into thre-digit dividend. 695 ÷ 5
2. Draw rectangular box with as many sections as digits in dividend.

	1	3	9
5	6	19	45
	- 5	15	45
	1	4	0

3. Write dividend digits in sections. BE SURE they “hug” the right side!!
4. Create multiple list for divisor.
5. Look at first section. See if you can get close without going over - you can! 1 step. Write 1 on top.
6. Find the value of 1 step (5). Enter it inside the box and subtract.
7. Move that answer to next box and repeat.

- Practice for mastery using individual white boards and slowly removing assistance.
- Move into 2-digit divisors. 25,025 ÷ 35

35
70
105
140
175
210
245
280
315

	x	x	7	1	5
35	2	25	250	52	175
			245	35	175
			005	17	0

Check for Understanding:

Students should discuss and

- Explain how to use the box method to compute multi-digit long division.

Teaching Aids/Materials Needed for Activity:

- white boards
- journals

Additional Activity (Independent/group activity to reinforce lesson):

Journal Entry:
•Students write “I can...” statements for long division.
•Give students a problem. They will enter it and solve it in their journal.
•Students record self-evaluation score:

2 I am starting to understand this skill.

3 I could pass a test on this and understand it.

4 I am confident with this skill and could teach it to a peer.

Vocabulary:

•divisor
•dividend
•multiple list

Notes:

Ascend Math Teacher Guide

1052

Greatest Common Factor

Overview, Purpose and Objective:

The purpose of this lesson is to find the greatest common factor of two or more numbers.

Prior Knowledge Needed:

The student should know:

- the meaning of factors vs. multiples
- what the word product means
- what a prime number is
- what a composite number is

Lesson Details:

As the student begins the explore, he/she will be given a pair of numbers for which they will need to find the greatest common factor. Students may use the number line to see if a factor selected is common to the pair given. The student will continue to use the number line, by increasing the value of the common factor using the + /- boxes to look for additional common factors. Once the student determines the GCF, they will submit the answer and check their solution. The student will practice several more problems, until they have completed the explore activity.

Check for Understanding:

Students should discuss and answer the following questions:

- Does the student understand the difference between factor and multiple?
- Does the student understand how to write a number as a product of prime factors?
- Does the student understand that there may be several common factors?

Additional Activity (Independent/ group activity to reinforce lesson):

Create a Venn Diagram of two circles using string or yarn. Each group should receive two bags containing numbers. One bag should contain higher numbers like 20, 24, 30, 36, etc. The other bag should contain all prime factors of the numbers in the first bag. Reminder: you will need several of each factor. Students work together to complete the Venn diagram and then multiply the common factors that are in the center of the Venn Diagram.

Teaching Aids/ Materials Needed for Activity:

- String or yarn to create Venn Diagram circles
- Index cards with various numbers
- Brown paper bags to hold numbers

Vocabulary:

- Greatest common factor – of a list of numbers is the largest common factor of the numbers in the list
- Factor - numbers you can multiply together to get another number
- Prime number – a prime number can be divided evenly only by 1, or itself, and it must be a whole number greater than 1
- Prime factor – a factor that is a prime number: one of the prime numbers that, when multiplied, give the original number

Other Resources (Websites, Books, etc.)

www.sheppardsoftware.com/math games/fractions
www.mathplayground.com/factortrees.html

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Least Common Multiple

Overview, Purpose and Objective:

The purpose of this lesson is to find the least common multiple of two numbers.

Prior Knowledge Needed:

The student should know:

- the meaning of factors vs. multiples
- what a prime number is
- how to write a prime factorization using exponents

Lesson Details:

The student is given two numbers and asked to find the Least Common Multiple of the pair. The student can solve or check their answer by clicking on the +/- buttons until the product is the same. Once the product is equivalent, the student can submit the answer and click check. The student continues to solve several problems in the explore.

Check for Understanding:

Students should discuss and answer the following questions:

- Does the student understand the difference between factors and multiples?
- Is the student able to write a prime factorization using exponents?
- Does the student understand there may be several common multiples?

Additional Activity (Independent/ group activity to reinforce lesson):

To find the least common multiple of 4 and 6, first use graph paper and colored pencils to color in groups of 4 boxes. Directly below, choose a different color and color in groups of 6 boxes until the ends of the groups line up. The student should discover that it takes 3 groups of 4 (12 boxes) and 2 groups of 6 (12 boxes) to line up the groups. Therefore the LCM is 12. Students can explore finding the LCM of several pairs of numbers using this method. Integer rods can also be used if available.

Teaching Aids/ Materials Needed for Activity:

- graph paper
- colored pencils

Vocabulary:

- Multiple - the product of the number with one of the natural numbers
- Natural numbers - counting numbers
- Prime number - a prime number can be divided evenly only by 1, or itself, and it must be a whole number greater than 1
- Prime factor - a factor that is a prime number: one of the prime numbers that, when multiplied, give the original number
- Least Common Multiple - of a list of numbers is the smallest natural or positive number that is a multiple of each number in the list.
- Prime factor - a factor that is a prime number: one of the prime numbers that, when multiplied, give the original number
- Least Common Multiple – of a list of numbers is the smallest natural or positive number that is a multiple of each number in the list.

Other Resources (Websites, Books, etc.)

www.math4children.com
www.fun4thebrain.com/beyond facts/lcmsnowball.html
www.sheppardsoftware.com/math games/fractions/LeastCommonMultiple.htm
www.edhelper.com

Notes:

Ascend Math Teacher Guide

1061

Order of Operations: Parentheses, Brackets, and Braces

Overview, Purpose and Objective:

The purpose of this lesson is to practice solving problems using the order of operations.

Prior Knowledge Needed:

The student should know:

- the order of operations
- what the word *evaluate* means

Lesson Details:

As the student begins the Explore, the directions are to put the steps in the correct order. There are three boxes on the left side stating the order of operations, which can be dragged to the right side in order. Upon completion, the student clicks “check” and then moves on to the next phase. In this phase a problem is shown which includes parentheses and multiple operations. The student is instructed to choose the first step to evaluate this expression. When the student chooses the operation, a box around the operation turns red. When the student clicks “check answer”, if the answer is correct, the box turns green, and the computer completes the computation for the first step then instructs the student to once again choose the next step to evaluate this expression. This continues until the problem is solved. In the final phase, the student is given a true/false question to solve.

Check for Understanding:

- Does the student know the order of operations?
- When given both multiplication and division in the same problem, does the student understand that the must complete whichever comes first in the problem from left to right, and the same for addition and subtraction?
- Does the student understand why they need to follow the order of operations?

Additional Activity (Independent/ group activity to reinforce lesson):

Divide the class into groups of 3 for an order of operations relay race. Have the students in each group sit one behind the other at their desks. Pass out a paper with the same problem to the first person in each group. The first person would solve the parentheses and pass the paper to the second person. The second person would check the work from the first person and then solve multiplication and division, left to right and then pass the paper to the next person. The third person checks the work of the second person and then solves the addition and subtraction portions of the problem and returns the paper to the first person who checks the work on the previous person and submits the answer. The group who submits a correct answer the fastest gets a point. Wrong answers receive a penalty of 2 points. Continue until a score of 10 is reached by a team. Scoring can vary as desired.

Teaching Aids/ Materials Needed for Activity:

- white boards and markers or paper and pencil
- papers with one problem on each paper, multiple copies of the same problem equal to the number of groups

Vocabulary:

•Braces - grouping symbols that look like this { }
•Brackets - grouping symbols that look like this [ ]
•Evaluating - process of replacing the variables in and expression with the numerical values and simplifying it to make it easier to solve
•Order of operations – The rules that say which calculation comes first in an expression.
They are: Do everything inside braces, brackets, or parentheses first.
Then do exponents, like x2.
Then do multiplies and divides from left to right.
Then do the addition and subtraction from left to right
•Parentheses - grouping symbols that look like this ( )

Other Resources (Websites, Books, etc.)

www.brighthubeducation.com
https://writingtolearntoteach.wordpress.com/2012/08/10/my-favorite-order-of-operations-activity

Notes:

Ascend Math Teacher Guide

2061

Introductions to Fractions

Overview, Purpose and Objective:

Students will be able to label parts of a fraction, create equivalent fractions and match equivalent fractions.

Prior Knowledge Needed:

The student should:

- Understand that a fraction is an equal portion of a whole.
- Have basic multiplication fact mastery.

Lesson Details:

Whole Group:

- Distribute fraction bars and allow brief exploration time.
- Using fraction bars, elicit fractions equal to one whole implicitly teaching and reviewing vocabulary while writing on board.
- Discuss Multiplication Identity Property (any number times itself equals that number). Compare to looking in a mirror - you are still you no matter what you are wearing.
- Using student white boards generate fraction equal to one whole.
- Explicitly teach any fraction times one whole (no matter what "clothes" the one has on) equals that fraction. i.e.: $\frac{1}{2} \times 1 = \frac{1}{2}$ so, $\frac{1}{2} \times \frac{2}{2} = \frac{2}{4}$ therefore $\frac{1}{2} = \frac{2}{4}$.
- Practice with student white boards.

Team Activity:

- Break into groups of no more than three and distribute poster paper with given fraction at the top.
- Teams generate a list of equivalent fractions for their poster's given fraction. Circulate and support.

Whole Group:

- Explicitly teach finding the correct fraction "clothes" equal to one whole for finding missing numerators and denominators. Use both smaller to larger and reverse.
- Practice with individual white boards for mastery.

Check for Understanding:

Students should discuss and answer the following questions:

- What is an equivalent fraction?
- Locate the numerator and denominator and tell what each number stands for.
- Create three fractions equal to one whole.
- Determine the numerator for the following fractions to make the numerical statement correct:

$$\frac{5}{20} = \frac{?}{5} \quad \text{and} \quad \frac{3}{4} = \frac{?}{16}$$

Additional Activity (Independent/group activity to reinforce lesson):

Journal Entry:

- Students generate "I can" statement.
- Students write given fraction and generate a list of equivalent fractions.
- Students write correct numerator for given problem. (i.e. $\frac{5}{20} = \frac{?}{5}$)
- Students self-reflect and score comprehension level:

2 I am starting to understand this skill.

3 I could pass a test on this and understand it.

4 I am confident with this skill and could teach it to a peer.

Teaching Aids/Materials Needed for Activity:

- fraction bars
- student individual white boards
- large poster paper

Vocabulary:

- equivalent fraction
- numerator
- denominator
- identify property of multiplication

Notes:

Ascend Math Teacher Guide

2063

Comparing Fractions

Overview, Purpose and Objective:

Students will be able to compare fractions with like and unlike denominators using >, <, and = signs.

Prior Knowledge Needed:

The student should:

- Have a basic understanding of fractions.
- Have basic multiplication fact mastery.

Lesson Details:

This exploration allows stduents to compare fractions visually and using the number line. On the top left, there is a slider that allows the exploration to show Circles or Squares.

- Change the exploration to **Squares**.
- Add rows and columns to the squares using the arrows.
- Color the parts by clicking on them.

Check for Understanding:

Students should discuss:

- What do you observe about these fractions?
- Which color has the greatest amount shaded? Which one has the least amount shaded?
- Do any fractions have the same numerator? Which color shaded is largest?
- How does the denominator compare on the larger color versus the smaller color?
- How does that compare if you were to apply that concept to sharing a pizza or a cookie?
- Have students come up with more real-word fraction examples.
- Now select **Check**.
- How do your observations relate to how the numbers display on the number line?

Additional Activity (Independent/group activity to reinforce lesson):

Pass out fraction bars and allow for short free discovery period. Review that fractions can only be compared when they have a common denominator. Review comparing two written fractions with common denominator and students prove using fractions bars.

1. Review method taught in lesson for comparing fractions with unlike denominators and have students prove with fraction bars.
2. Teach BUTTERFLY METHOD. Have students practice using included white box and prove using fraction bars. (see attached sheet for BUTTERFLY METHOD)

Teaching Aids/Materials Needed for Activity:

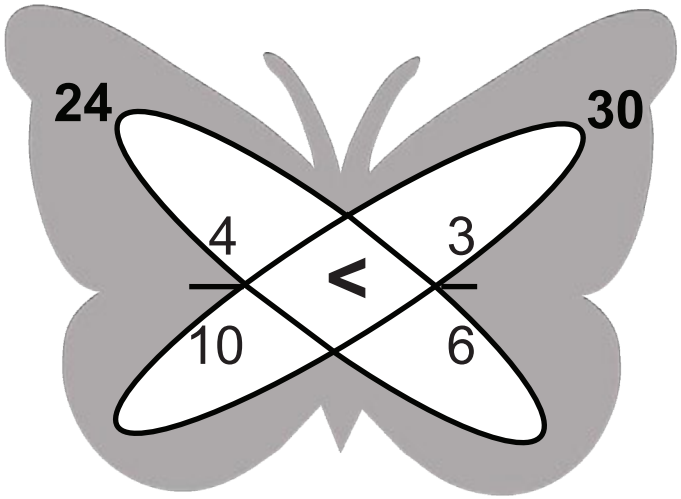
- fraction bars
- white boards/markers
- journals

Vocabulary:

- fraction
- numerator
- denominator
- equivalent fraction
- common denominator

Notes:

Butterfly Method for Comparing Fractions with Unlike Denominators



- Write fractions horizontally
- Circle denominator and numerator as shown
- Multiply numbers circles i.e. 10 x 3 and 4 x 6
- Write products at the top of “wings”
- Compare written products

Given example 24 < 30 so $\frac{4}{10} < \frac{3}{6}$

Ascend Math Teacher Guide

2071

Multiplying Fractions by Fractions

Overview, Purpose and Objective:

Multiply fractions by fractions using the area model and standard algorithm.

Prior Knowledge Needed:

The student should:

- Know how to multiply whole numbers
- Know and identify the parts of a fraction (numerator and denominator)

Lesson Details:

Students should be provided with two different colored pencils or two different colored highlighters. Distribute the 'multiplying fractions practice' to students. Walk them through the example provided discussing each step. Have students complete number 1 with your guidance. Students then work in pairs to answer numbers 2 and 3 on the back. Students should be building the connection between the factors and product in each problem in order to understand the standard algorithm for multiplying a fraction by a fraction. Students answer number 4 and discuss the response as a class in order to ensure all students understand the standard algorithm for multiplying a fraction by a fraction. Discuss simplifying fractions with students also after they have solved each problem.

Check for Understanding:

Students should discuss and answer the following questions:

- Describe the standard algorithm for multiplying a fraction by a fraction.
- How did you demonstrate this relationship by using the area model and shading in your rows and columns?

Additional Activity (Independent/group activity to reinforce lesson):

After students have worked through the 'multiplying fractions practice' worksheet group students in pairs. Provide each pair of students with a die. Have student A roll the die four times to create the numerator and denominator of two fractions. Student B should then multiply the two fractions student A created using either the area model or standard algorithm. Student A checks student B's work. Now Student B will roll the die four times to create the numerator and denominator of two fractions. Student A should then multiply the two fractions student B created using either the area model or standard algorithm. Student B checks student A's work. Have students continue this pattern as time permits.

Teaching Aids/Materials Needed for Activity:

- Multiplying Fractions Practice worksheet and answer key
- colored pencils or different colored highlighters
- dice

Vocabulary:

- factor
- numerator
- simplify
- product
- denominator

Notes:

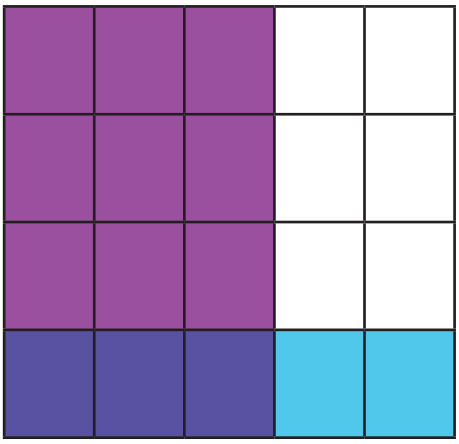
Review the example below with students.

Multiply $\frac{1}{4} \times \frac{3}{5}$.

Step 1: Partition the square horizontally into fourths (the denominator of the first fraction) and shade in one section (the numerator of the first fraction).

Step 2: Partition the square vertically into fifths (the denominator of the second fraction) and shade in three sections (the numerator of the second fraction).

Step 3: What fraction of the entire square is doubly shaded?



Step 4: Do you see a relationship between the factors and the product? Explain.

Complete #1 below with students using steps 1-4 above as a guide.

1. $\frac{2}{3} \times \frac{1}{2} =$

Step 1:

Step 2:

Step 3:

Step 4:

Students work in partners to complete numbers 2 and 3.

2. $\frac{2}{5} \times \frac{3}{4} =$

3. $\frac{1}{4} \times \frac{5}{6} =$

Using only the patterns you have discovered between the factors and the product for each problem above, can you multiply the fraction below without using the area model (partitioning and shading the square)?

4. $\frac{5}{8} \times \frac{2}{3} =$

Answer Key

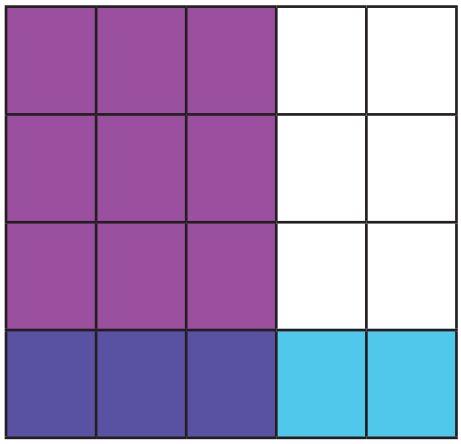
Review the example below with students.

Multiply $\frac{1}{4} \times \frac{3}{5}$.

Step 1: Partition the square horizontally into fourths (the denominator of the first fraction) and shade in one section (the numerator of the first fraction).

Step 2: Partition the square vertically into fifths (the denominator of the second fraction) and shade in three sections (the numerator of the second fraction).

Step 3: What fraction of the entire square is doubly shaded?



Step 4: Do you see a relationship between the factors and the product? Explain.

Complete #1 below with students using steps 1-4 above as a guide.

1. $\frac{2}{3} \times \frac{1}{2} =$

Step 1: Partition the square into thirds horizontally and shade in two rows. (as shown to the right)

Step 2: Partition the square into half vertically and shade in one column. (as shown to the right)

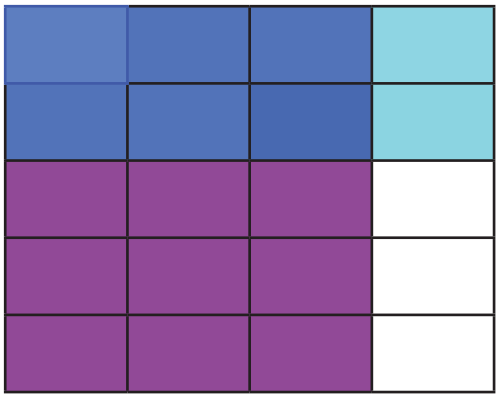
Step 3: $\frac{2}{6}$

Step 4: $\frac{2}{3} \times \frac{1}{2} = \frac{2}{6}$ If you multiply the numerators (2 × 1) and the denominators (3 × 2) of the factors, you get the numerator and denominator of the product $\frac{2}{6}$. Ask students to simplify the product.

Answer Key

Students work in partners to complete numbers 2 and 3.

2. $\frac{2}{5} \times \frac{3}{4} =$



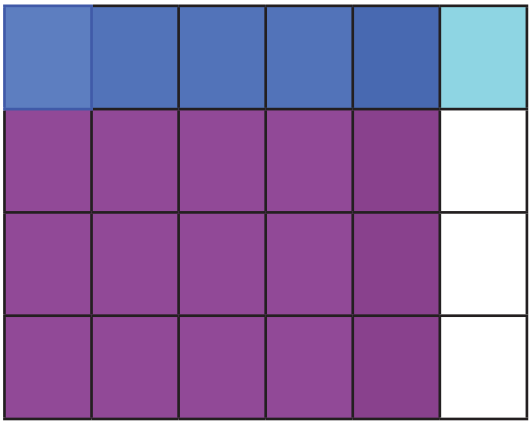
Step 1: Partition the square into fourths horizontally and shade in one row. (as shown to the right)

Step 2: Partition the square into sixths vertically and shade in five columns. (as shown to the right)

Step 3: $\frac{6}{20}$

Step 4: $\frac{2}{5} \times \frac{3}{4} = \frac{6}{20}$ If you multiply the numerators (2 × 3) and the denominators (3 × 4) of the factors, you get the numerator and denominator of the product $\frac{6}{20}$. Ask students to simplify the product.

3. $\frac{1}{4} \times \frac{5}{6} =$



Step 1: Partition the square into fourths horizontally and shade in one row. (as shown to the right)

Step 2: Partition the square into sixths vertically and shade in five columns. (as shown to the right)

Step 3: $\frac{5}{24}$

Step 4: $\frac{1}{4} \times \frac{5}{6} = \frac{5}{24}$ If you multiply the numerators (1 × 5) and the denominators (4 × 6) of the factors, you get the numerator and denominator of the product $\frac{5}{24}$.

Using only the patterns you have discovered between the factors and the product for each problem above, can you multiply the fraction below without using the area model (partitioning and shading the square)?

4. $\frac{5}{8} \times \frac{2}{3} = \frac{5 \times 2}{8 \times 3} = \frac{10}{24}$ which can be simplified to $\frac{5}{12}$.

Ascend Math Teacher Guide

2074

Modeling Multiplication and Division of Fractions

Overview, Purpose and Objective:

The purpose of this lesson is to model multiplication and division of fractions through real-world problems.

Prior Knowledge Needed:

The student should:

- Know how to multiply fractions
- Know how to divide fractions
- Know and identify the parts of a fraction (numerator and denominator)

Lesson Details:

Using the study guide for objective 2074 and the Think-Pair-Share referenced below, present a different way for students to think about the questions being asked. For example, the model question reads, “How many ¼ pound hamburgers can be made from 5 pounds of meat?” Instead give students the following statement: “I have 5 pounds of hamburger meat and want to make hamburger patties that are ¼ pound each.” Have students complete their Think-Pair-Share sheet for this statement. Ask them, “What do you notice about this statement? What do you wonder?” By encouraging students to make sense of the problem being asked and creating their own questions about the situation, you will be surprised with everything the students discover! Provide students with the attached, 2074 Study Guide Re-framed worksheet and have them work with a partner (during the Pair and Share parts) on the questions provided.

Check for Understanding:

Students should discuss and answer the following questions:

- How do you know whether you have to multiply the given fractions or divide them?
- What is the process for multiplying two fractions?
- What is the process for dividing two fractions?

Additional Activity (Independent/ group activity to reinforce lesson):

If necessary, you can provide students with additional multiplying and dividing fractions word problems and remove the question itself at first. Continue to have students identify what they notice and wonder about the situation. Once students have completed this task, you can ask the original question for each problem and have students discuss the answer.

Teaching Aids/ Materials Needed for Activity:

- Think-Pair-Share worksheet
- 2074 Study Guide Re-framed worksheet

Vocabulary:

- factor
- numerator
- simplify
- product
- denominator

Other Resources (Websites, Books, etc.)

http://ascendmath.com/PDFs/Ascend-Math-Think-View-Share.pdf

Notes:

1. ⅔ of the students in a mathematics class passed the course. Of those who passed, ¼ received B's.

What do you notice about this situation?	What do you wonder?

2. ⅓ of the students in a mathematics class did not pass the course. Of those who did not pass, ⅖ received F's.

What do you notice about this situation?	What do you wonder?

3. You have 3 gallons of orange juice. You need to pour the orange juice into ½ gallon pitchers.

What do you notice about this situation?	What do you wonder?

4. You have 6 pounds of dough to make pumpernickel bread. You want each loaf of bread to be ½ pound.

What do you notice about this situation?	What do you wonder?

5. Of the products coming off an assembly line, $\frac{4}{5}$ are rated "good."

a. Of the good parts, $\frac{1}{10}$ needed extensive repair before sale.

What do you notice about this situation?	What do you wonder?

b. Of the good parts, $\frac{3}{4}$ needed a moderate amount of repair before sale.

What do you notice about this situation?	What do you wonder?

c. Of the parts that were not rated as "good", $\frac{3}{7}$ had to be trashed completely.

What do you notice about this situation?	What do you wonder?

6. Of the automobiles for sale at a local dealership, $\frac{1}{3}$ are SUV's.

a. Of the SUV's, $\frac{2}{5}$ are black.

What do you notice about this situation?	What do you wonder?

b. Of the SUV's, $\frac{1}{8}$ are red.

What do you notice about this situation?	What do you wonder?

c. Of the automobiles that are not SUV's, $\frac{3}{8}$ are blue.

What do you notice about this situation?	What do you wonder?

Ascend Math Teacher Guide

2081

Adding Fractions with Common Denominators

Overview, Purpose and Objective:

The purpose of this lesson is to build student knowledge on adding and subtracting fraction with like denominators and simplifying improper fractions.

Prior Knowledge Needed:

The student should know:

•numerator •denominator •improper fractions •simplifying fractions •mixed fractions
•addition of single digits •whole fractions

Lesson Details:

The explore activity provides practice for adding fractions with like denominators. Each addition problem begins with two images of fraction circles. Each fraction circle will represent a fraction. The student has to count the number of shaded parts for the numerator. The student will type the numerator in the top box of the fraction. The student counts all the pieces of the whole for the denominator. The student will type the denominator in the bottom box of the fraction. Repeat for the second fraction circle. Click the check button and another set of fraction circles will appear. Drag the colored fraction circles to the blank circle fractions to merge the two fraction circles together. Count all the shaded areas (in both fraction circles) and place that number in the numerator box. Place the same denominator as before in the denominator box. Click the check button again. If the numerator is larger than the denominator, the fraction will have to be simplified before reaching a correct answer.

Check for Understanding:

To check for student understanding: What is the numerator of this fraction circle? What is the denominator of the fraction circle? Does the fraction circle show a whole or part of a whole? What will the numerator be when you add both numerators? Will the denominator stay the same when adding fractions? Does this fraction have to be simplified? How do you know? What will be the mixed fraction if we simplify the improper fraction?

Additional Activity (Independent/ group activity to reinforce lesson):

The same lesson can be duplicated using fraction circles. It would be best to use paper fraction circles because they are easy to manipulate and duplicate. Begin with two sets of blank fraction circle templates (not shaded) and 2-3 sets of colored fraction circle templates (Cut into fraction pieces). Place two blank fraction circles templates side by side. Make sure that they have the same number of pieces. Students can practice adding fractions by placing the colored circle fraction piece on top of the blank fraction circle. They may choose however many pieces as long as it does not exceed the denominator. The student will repeat this again for the second blank fraction circle. Once complete the student can add the two fraction circles to make a new fraction. Use dry erase boards to write the fraction addition sentence and answer. Answers can be simplified if needed.

Teaching Aids/ Materials Needed for Activity:

•blank paper fraction circle pieces
•colored paper fraction circle pieces
•dry erase boards, dry erase markers and erasers
**Laminate fraction circles for more use and durability*

Vocabulary:

•Common Denominator - a common multiple of the denominators of two or more fractions
•Common factor - a number that divides two or more numbers exactly
•Denominator - the bottom part of the fraction. It shows how many equal parts that the item has been divided into
•Fractions - a part of a whole. It is made up of a numerator and a denominator
•Like fractions - fractions that have the exact same denominator
•Lowest term Fraction - a fraction that has been fully reduced
•Numerator - the top part of a fraction. It shows how many equal parts of the denominator are represented
•Sectors - an area or portion that is distinct from others

Other Resources (Websites, Books, etc.)

http://www.cehd.umn.edu/ci/rationalnumberproject/RNP1-09/CirclesOutlines.pdf
http://www.cehd.umn.edu/ci/rationalnumberproject/RNP1-09/CirclesColored.pdf

Notes:

Ascend Math Teacher Guide

2082

Adding Fractions with Different Denominators

Overview, Purpose and Objective:

The purpose of this lesson is to build student knowledge on adding and subtracting fractions with different denominators.

Prior Knowledge Needed:

The student should know:

- numerator
- improper fractions
- mixed fractions
- whole fractions
- denominator
- simplifying fractions
- addition and multiplication facts
- Least Common Denominator

Lesson Details:

The explore activity provides practice for adding fractions with different denominators. Each addition problem begins with two images of fraction circles. Each fraction circle will represent a fraction. The student has to count the number of shaded parts for the numerator. The student will type the numerator in the top box of the fraction. The student counts all the pieces of the whole for the denominator. The student will type the denominator in the bottom box of the fraction. Repeat for the second fraction circle. Click the check button. The student will now have to determine the least common denominator of the two fractions. Click the check button and another fraction circle(s) will appear. The student will have to determine the numerator for both fraction circles but this time the numerator has changed for one or both fractions. Click the check button again and drag the colored fraction circles to the blank circle fraction (s)s to merge the two existing fraction circles together. Count all the shaded areas and place that number in the numerator box. Count all the pieces of the whole and place that number in the denominator box. Click the check button to finish the problem.

Check for Understanding:

To check for student understanding:

- What is the numerator of this fraction circle?
- What is the denominator of the fraction circle?
- Does the fraction circle show a whole or part of a whole?
- What is the least common denominator of both fractions?
- How did you use multiplication to find the least common denominator?
- How did the numerator change?

Additional Activity (Independent/ group activity to reinforce lesson):

The same lesson can be duplicated using fraction circles. It would be best to use paper fraction circles because they are easy to manipulate and duplicate. Begin with 3 sets of blank fraction circle templates (not shaded) and 3 sets of colored fraction circle templates (Cut into fraction pieces). Place two blank fraction circles templates side by side. Pick two fractions circles that share a least common denominator. Students can practice adding fractions be placing the colored circle fraction piece on top of the blank fraction circle. They may choose however many pieces as long as it does not exceed the denominator. The student will repeat this again for the second blank fraction circle. Once complete the student can determine the least common denominators and change the numerators if needed. Next, add the two fractions. Use the fraction circles to show the answer. Use dry erase boards to write the fraction addition sentence and answers.

Teaching Aids/ Materials Needed for Activity:

•blank paper fraction circle pieces
•colored paper fraction circle pieces
•dry erase boards
•dry erase markers and erasers
**Laminate fraction circles for more use and durability*

Vocabulary:

•Divisible - capable of being divided by another number without a remainder
•Equivalent Fraction - different fractions that name the same number
•Least Common Denominator - the smallest whole number that is divisible by each of the denominators
•Mixed Numbers - a whole number and a fraction
•Product - the result of multiplying or and expression that identifies factors to be multiplied

Other Resources (Websites, Books, etc.)

http://www.cehd.umn.edu/ci/rationalnumberproject/RNP1-09/CirclesOutlines.pdf
http://www.cehd.umn.edu/ci/rationalnumberproject/RNP1-09/CirclesColored.pdf

Notes:

Ascend Math Teacher Guide

2091

Modeling Perimeter and Area Using Fractions

Overview, Purpose and Objective:

Solve for area and perimeter of figures with whole number and fractional side lengths.

Prior Knowledge Needed:

The student should:

- how to convert a mixed number to an improper fraction
- how to convert an improper fraction to a mixed number
- how to add fractions and mixed numbers
- how to multiply fractions

Lesson Details:

This lesson applies the knowledge students have of how to convert between a mixed number and improper fraction, how to add fractions and mixed numbers, and how to multiply fractions to solving area and perimeter problems. Students may struggle with one or several of the prerequisite topics outlined above. Assess your students, using the pre-assessment for Objective 2091 sheet, to determine which concept your students may be struggling with. Continue to the flex groups outlined below once you have scored your student's work. For students struggling with converting between mixed numbers and improper fractions, have them watch the video for and complete the explore section for objective 2065. Have students discuss their understanding with other students in their flex group. For students struggling with adding fractions with unlike denominators, have them watch the video for and complete the explore section for objective 2082. Have students discuss their understanding with other students in their flex group. For students struggling with multiplying fractions, have them watch the video for and complete the explore section for objective 2071. Have students discuss their understanding with other students in their flex group. For students who do not struggle with any of the prerequisite skills, the teacher should work with a small group on the problems outlined on the study guide for objective 2091. Have students walk you through the steps for finding the area and perimeter of the shapes given.

Check for Understanding:

Students should discuss and answer the following questions:

- What is the process for turning a mixed number into an improper fraction?
- What is the process for turning an improper fraction into a mixed number?
- What is the process for adding fractions?
- What is the process for multiplying fractions?
- What operation do you perform when finding area of a figure?
- What operation do you perform when finding perimeter of a figure?

Additional Activity (Independent/group activity to reinforce lesson):

After students have worked through their flex groups as determined by their performance on the pre-assessment, provide students with shapes and ask them to measure the sides and calculate the perimeter and area of each 2-dimensional quadrilateral. (Most schools will have 2-dimensional 4 sided shapes in their supply closet).

Teaching Aids/Materials Needed for Activity:

- 2-dimensional quadrilaterals
- rulers

Vocabulary:

- area
- proper fraction
- denominator
- mixed number
- numerator
- simplify
- perimeter
- improper fraction
- least common denominator

Ascend Math Teacher Guide

2116.1

Modeling Whole Numbers Divided by Unit Fractions

Overview, Purpose and Objective:

The purpose of this lesson is to evaluate whole numbers divided by unit fractions in division sentences and word problems.

Prior Knowledge Needed:

The student should know how to:
•Divide whole numbers
•Find the reciprocal of a number

Lesson Details:

The explore activity starts with instructions that read, solve. The student can solve the problem on paper and check his/her solution at the end of each mini explore. The student proceeds by pressing next. The next slide's instructions tell the student to rearrange the numbers to create a multiplication problem. The student drags the purple numbers to the appropriate white boxes to turn the division sentence into a multiplication sentence. If the student is incorrect he/she will be directed to try the equation again. The student will press check until he/she has completed that slide. The next slide reads, "Drag the parts to find the product of [division and multiplication equation given in the previous slide]". The student will drag two fraction models to the right side of the equation. The solution is the overlap of the two colors. Four options for the solution appear after the student drags the two fractions models together. The student is directed to 'try again' if he/she is incorrect. Once the student chooses the correct answer he/she will continue answering more problems with the same format explained.

Check for Understanding:

Students should discuss and answer the following questions/topics:
•Besides using the 'keep, change, flip' algorithm for division of fractions, what are some other ways to find the solution to a division problem involving fractions?
•What are some real-life examples that involve dividing whole numbers and fractions?

Additional Activity (Independent/ group activity to reinforce lesson):

Students can use fraction bars, number lines, and area models to show the quotient of whole numbers and fractions and to show the connection between those models and the multiplication of fractions. Break students into groups of 2-4. Each group will need to answer a series of questions that involve division of whole number and unit fractions. The group will use large chart paper to draw a model to represent their answer. Example of one question: How many half-miles are in 12 miles? 12 ÷ 1/2= 24.

Teaching Aids/ Materials Needed for Activity:

•large chart paper
•colored pencils

Vocabulary:

•Whole numbers – numbers that start at 0 and go forever in the positive direction.
•Unit fractions – fractions where the top number (the "numerator") is 1

Other Resources (Websites, Books, etc.)

https://www.khanacademy.org/math/arithmetic/fractions/dividing-fractions-tutorial/e/dividing fractions

Notes:

Ascend Math Teacher Guide

2119

Modeling Addition and Subtraction of Fractions

Overview, Purpose and Objective:

Students will know that addition and subtraction of fractions require like denominators and will be able to complete addition and subtraction of fractions.

Prior Knowledge Needed:

The student should:

- Have basic knowledge that fractions are equal parts of a whole.
- Have addition and subtraction computation mastery.

Lesson Details:

- Using fraction bars, demonstrate that in order to add or subtract fractions, you must have like/common denominators.
- Discuss fractions being EQUAL PARTS! Give example and non-example of adding and subtracting fractions using both number on board and visual representation.
- Distribute worksheet and cup of same 3 colors of candy to each student; explain they each now have 1 whole cup of candy.
- Label circles on worksheet and sort candies by color; label circles with fractional amounts.
- Complete given addition and subtraction problems.

Check for Understanding:

1) Ja'nae had a pan of brownies for her friends. She cut the brownies into 8 equal pieces. Ja'nae and her 2 friends ate 1 brownie each. What fraction of brownies was left in the pan? Write a problem and solve.

   Ans: $\frac{8}{8} - \frac{3}{8} = \frac{5}{8}$

2) The garden club needed 10 containers of flowers for their sale. One member brought in 3 containers, one member brought in 2 containers and one member donated 1 container. Write a problem to show what fractional amount the club has collected for the sale.

   Ans: $\frac{3}{10} + \frac{2}{10} + \frac{1}{10} = \frac{6}{10}$

3) Write a problem and solve to show the fractional amount the garden club still needs.

   Ans: $\frac{10}{10} - \frac{6}{10} = \frac{4}{10}$

Additional Activity (Independent/group activity to reinforce lesson):

Journal Entry:

Students generate "I can" statements. Using data created in lesson, students write one addition and one subtraction problem and solve. Students record self-evaluation score.

2 I am starting to understand this skill.

3 I could pass a test on this and understand it.

4 I am confident with this skill and could teach it to a peer.

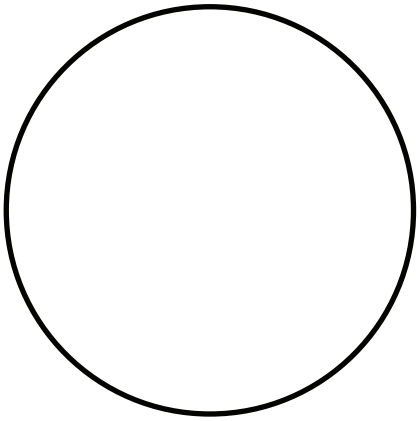
Teaching Aids/Materials Needed for Activity:

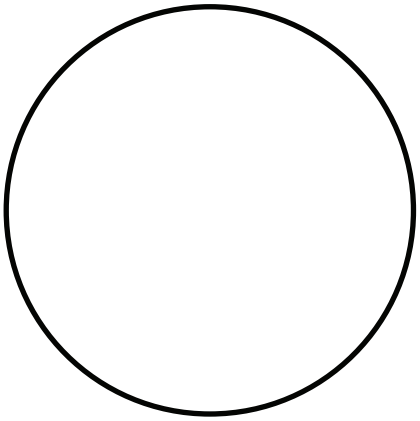
- fraction bars
- cup with 10 candies (same colors in each) per student
- worksheet (attached)

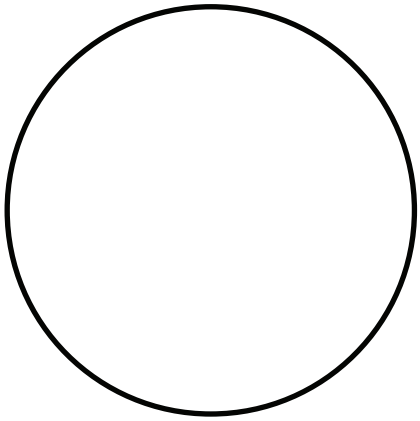
Vocabulary:

- numerator
- denominator
- fraction
- common denominator

Notes:







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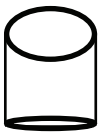
1. ___ + ___ + ___ = ___ = 

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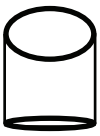
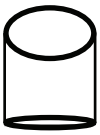
2.  = ___ - ___ = ___

color.....

3.  = ___ - ___ = ___

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Ascend Math Teacher Guide

2220

Line Plots to Display Fractional Data

Overview, Purpose and Objective:

Students will be able to construct a fractional line plot, labeling each fractional section, to include a line plot representing mixed numbers. Students will label given data points and draw conclusions from given data.

Prior Knowledge Needed:

The student should:

- Have basic understanding of fractions, to include beginning knowledge of equivalent fractions.
- Have basic understanding of mixed numbers.
- Have basic understanding of a line plot as a representation of data.

Lesson Details:

- Copy and cut on dotted line, blank line plot templates. Make sure there are at least 3 blank templates per student and teacher.
- Whole group: explicitly reteach vocabulary.
- Model folding your blank template in half. Label the endpoint 0 and new half-mark ½. (Make a line at the crease.) Let students complete this step. Model and guide refolding in half and folding in half again. Open and label ¼, ¾, etc. Model and guide returning to ½ and ¼ folds and folding in half again creating ⅛, ⅜, etc. Label all crease marks.
- Discuss equivalent fractions and elicit observations and conclusions from students.
- Repeat folding exercise with next blank template. Label this end point 1. Have teacher original visible.
- Repeat folding and labeling third blank template with beginning end point labeled 2 and end labeled 3; tape to second template and discuss the line plot created (0 to 3).
- Display teacher copy of “Driving to Grandma’s House” data and give shoulder partner teams each a copy. (Provided)
- Work through data table labeling data points with family names. Begin with explicit instruction, fading support as mastery improves.
- When all data points are labeled, elicit what students “know”.

Check for Understanding:

Pass out Driving to Grandma’s House questions and have shoulder partner teams use the fractional line plots created to answer the questions. (Questions on sheet listed below.)

- Which two families’ grandmas may have both lived in the same town as one another?
- Which family would have the quickest trip to their grandma’s house?
- How much longer did the Deacon family spend in the car than the Little family?
- Which family spent less time in the car, the Goldmans or the Deacons? How do you know?
- How many hours did the Reeves family spend in the car? Was it more or less time than the Monroe family?

Additional Activity (Independent/group activity to reinforce lesson):

Journal Entry:

- Tape fractional line plots into journals (folding 1 and 3 on top of 2 if necessary).
- Students create and write “I can” statement and list two things they know from data.
- Students self-reflect and enter a 2 if they have some understanding, a 3 if they could pass a test on the skill, a 4 if they could teach a peer.

Teaching Aids/Materials Needed for Activity:

•Copies of provided sheets (line plot template, data chart, check for understanding questions)
•Journals and tape

Vocabulary:

•fractional line plot
•data
•equivalent fraction
•mixed number
•fraction greater than 1

Notes:

Driving to Grandma's House

On the way home from school, a group of friends discovered that all of their families would be spending the weekend at their grandma's houses. They all found out how many hours it would take to get there and they created this data table.

Family Name	Number of hours in the car
Painters Family	½
Goldman Family	2½
Little Family	¾
Reeves Family	1¼
Monroe Family	1½
Jasper Family	2⅝
Deacon Family	2¾

Check for Understanding:

•Which two families' grandmas may have both lived in the same town as one another?

•Which family would have the quickest trip to their grandma's house?

•How much longer did the Deacon family spend in the car than the Little family?

•Which family spent less time in the car, the Goldmans or the Deacons? How do you know?

•How many hours did the Reeves family spend in the car? Was it more or less time than the Monroe family?

Ascend Math Teacher Guide

3103

Decimals

Overview, Purpose and Objective:

Students will show mastery of multiplying multi-digit numbers with decimals using the standard multiplication algorithm.

Prior Knowledge Needed:

The student should:

- Have beginning to basic understanding of the standard multiplications algorithm
- Have basic understanding that a multi-digit number that includes a decimal is a whole number with a fractional part.

Lesson Details:

•Small Group Reteach/Review standard x algorithm, using teacher's white board plus attached sheet
•Work through problem #1 and review product and partial product
•Introduce/ Review decimal point and work remaining problems. (When reteaching the placement of the decimal point in the product have students count the number of digits behind/on the right side of the decimal point(s). Students then place pencil at the end of the product and move to the left the number counted.

IE: 2.4 x 1.06 = 2.544
count: 1 23 3 2 1

•Continue to work provided problems moving from 100% modeling to independent completion as student mastery occurs.

Check for Understanding:

Students should discuss and answer the following questions:

- •Given a multiplication problem written/solved using the standard algorithm, students will locate partial products, decimal point, and product.
- •Students will be able to explain how the placement of the decimal point in the final product is determined.

Additional Activity (Independent/group activity to reinforce lesson):

•Hand out one deck of playing cards with tens, Jokers, and face cards removed, per partner set. Hand out provided blank skill sheet, one copy per student. Pass out black dime-sized decimal points.
•Have students shuffle cards and turn them over to create math problems of the size given on the skill sheet.
Students place decimal where they want in both factors and both write problem on paper. Students solve and compare for accuracy.
•Repeat with partner turning over cards.

OR

Journal Entry:

Students write "I can..." statement and then create a problem using playing cards. Students write problem in journal and solve. Students then self-reflect on mastery of multiplying multi-digit numbers with decimals and record their "score" in a box.

2 I am starting to understand this skill.

3 I could pass a test on this and understand it.

4 I am confident with this skill and could teach it to a peer.

Teaching Aids/Materials Needed for Activity:

- playing cards
- dime to nickel-sized cutout decimal points
- copy of 2 pages provided per student

Vocabulary:

- decimal point
- product
- partial product

Notes:

1.

		2	4
	x	5	6
+			

2.

	-	2.	8
x	3	1.	3
+			

START

2 1

3.

		6	9.	3
	x	0.	4	2
+				

START

3 2 1

4.

	4	2.	5
x	0.	1	1
+			

COUNT

MOVE

5.

		4.	9	2
		x	6.	7
+				

6.

		4.	0	5	6
		x	2.	3	8
+					

Ascend Math Teacher Guide

3103

Decimals

Directions: Create a problem of the correct digit size using cards. Place decimal points and fill in digits on this paper. Solve with partner, compare and use math talk. Switch roles (partner creates next problem), and repeat steps.

1.

					COUNT
		x	0.		
+					
					MOVE

4 digit x 1 digit

2.

	x	0.		
+				

3 digit x 2 digit

3.

		x	0.		
+					

3 digit x 2 digit

4.

		x	0.		
+					

4 digit x 2 digit

Ascend Math Teacher Guide

3113

Converting Fractions to Decimals and Decimals to Fractions

Overview, Purpose and Objective:

The purpose of this lesson is to investigate the relationship and equivalency between fractions and decimals.

Prior Knowledge Needed:

The student should:

- Understand the terms- *fraction*, *numerator*, *denominator*, *decimal*, *tenths*, *hundredths*
- Have a working knowledge of fractions and decimals

Lesson Details:

As the student begins the Explore item, a partially-shaded hundred grid is shown. The student can change the number of grid squares shaded by dragging his/her mouse over the squares. The number of squares shaded can also be changed by typing the selected number in to the white box beside the words “Shaded Squares”. Clicking on the purple arrow buttons is another way to quickly manipulate the number of grid squares shaded in the hundred grid. Several representations are shown to the student during this process: percent of squares shaded, decimal of squares shaded, fraction of squares shaded. The fraction is also shown in lowest terms, if needed. These representations change fluidly as the student changes the grid squares that are shaded. Once the student completes the simulation he/she can move on to the practice problems.

Check for Understanding:

Students should discuss and answer the following questions:

- How are fractions and decimals different representations of the same thing?
- Why does saying each decimal in its proper mathematical way help make converting decimals to fractions simple?
- What are some fractions/decimals that would be easy to convert? Why?
- What are some fraction/decimals that would be more difficult to convert? Why?
- Discuss possible misconceptions/common errors.

Additional Activity (Independent/ group activity to reinforce lesson):

Fraction/Decimal War: With teacher guidance, students will split t into four groups. Elect a team leader for each group and distribute and equal number of decimal and fraction cards to each team leader. Have students place all their cards face down on their desks. At a time you designate, have each team leader flip one card over for their group. Write each team’s number on the board. As a group, students must order the numbers on the board from greatest to least. There will be a mix of fractions and decimals on the board, so conversions will be necessary in order for sequencing to take place. The team that has the highest card takes all cards. This continues until one team has all the cards, and they are the winner. This activity will allow students to become familiar with converting fractions to decimals, and decimals to fractions. Record all work.

Teaching Aids/ Materials Needed for Activity:

- decimal number cards
- fraction number cards (or make your own)

Other Resources (Websites, Books, etc.)

http://www.corestandards.org/Math/Content/7/NS/

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3121

Writing Ratios Using Fraction Notation

Overview, Purpose and Objective:

The purpose of this lesson is to write a ratio as a fraction in simplest form.

Prior Knowledge Needed:

The student should know:

- The definition of a ratio
- How to simplify a ratio

Lesson Details:

The student will be given a pictorial representation of items (ducks, flowers, dogs, etc.). The student will be given directions such as what is the ratio of dogs to ducks. He/she will click on the numerical representation, from the keypad displayed, for the numerator of the given ratio. He/she will do the same for the denominator. The student will click check and then new problem to continue. If the ratio is not in simplest form, a prompt will say The ratio can be reduced further. Try again. The student continues until the explore is complete.

Check for Understanding:

Students should discuss and answer the following questions:

- Does the student know the 3 ways to write a ratio?
- Does the student know how to simplify a ratio?

Additional Activity (Independent/ group activity to reinforce lesson):

Each group/student should be given a bag with 12 cubes of various colors and a set of cards with each color written on a separate card. The students choose 2 cards, the first for the numerator and the second for the denominator. They then write the ratio in simplest form remembering to leave the fraction improper and not convert to a mixed number if this happens. The students continue to practice. To differentiate, add a card “total” for the denominator only and add cards that have multiple colors for example “blue or red”, for the numerator.

Teaching Aids/ Materials Needed for Activity:

- cubes of any size, several colors
- index cards with the colors written on them or colored index cards matching the colors of the cubes

Vocabulary:

- Unit - a word or symbol that qualifies what a number describes
- Ratio - a comparison of like units
- Quotient - The answer after you divide one number by another dividend ÷ divisor = quotient
- Convert - cause to change in form or function
- Complex fractions - fractions that have a fraction or mixed number in the numerator and/or the denominator.
- Improper fractions - An Improper Fraction has a top number larger than (or equal to) the bottom number
- Mixed numbers - a whole number and a fraction

Other Resources (Websites, Books, etc.)

www.mathworksheets4kids.com/ratio/pic.pdf
www.mathblaster.com/teachers/math-worksheets/all-printable-math-worksheets

Notes:

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3131

Modeling Proportional Relationships I

Overview, Purpose and Objective:

The purpose of this lesson is to set up proportions in order to solve for the unknown.

Prior Knowledge Needed:

The student should:

- Understand the terms-proportion, ratio, products.
- Have a working knowledge of multiplication and division of whole numbers.

Lesson Details:

As the student begins the Explore item, two similar triangles are shown. Two sides of one triangle are labeled with their measurements. The corresponding measurements on the second triangle are also labeled, but one is an unknown. An equation template is set up under the shapes. The student takes each labeled measurement, and unknown, and drags them to their appropriate place in the equation. From here he/she may check the answer to ensure the equation is set up properly. The student cannot proceed until he/she chooses the correctly. The equation is now ready so that the student can solve for the unknown. Once the student completes the this and check the answer, a new example is given.

Check for Understanding:

Students should discuss and answer the following questions:

- What are some real-world examples of ratios being used?
- What are the different ways a ratio can be written?
- What are the steps you take to check that a proportion is correct?
- How does cross-multiplication work?
- Discuss possible misconceptions/common errors.

Additional Activity (Independent/ group activity to reinforce lesson):

Card Proportions: With teacher guidance, students divide in to groups of four. Explain that the goal of this activity is to create two equal proportions out of the four cards in their hand.

1. Each group leader will deal four cards to each player.
2. Have each player take their piece of paper and draw two fraction bars with an equal space between them. This will be their proportion template.
3. Players take turn discarding one card and drawing a new card. They are simultaneously looking for four numbers that can be used to make a proportion (for example, a 4, 6, 2, 3 would make the proportion 4/6 = 2/3).
4. Each time a player finds a proportion, he/she should yell “Prop!”, and show the teammates. If the player is correct, he/she gets a point.
5. Continue playing until the deck is depleted, or time is up. Deck can be reshuffled for a longer game.

Teaching Aids/ Materials Needed for Activity:

- Deck of cards with the face cards removed, paper, pencils (for each group)

Vocabulary:

Other Resources (Websites, Books, etc.)

http://www.corestandards.org/Math/Content/8/EE/

Notes:

Overview, Purpose and Objective:

Students will be able to convert given fractions into percents and to convert given percents into fractions with a denominator of 100.

Prior Knowledge Needed:

The student should:

- Basic fraction knowledge
- Ability to complete division computation
- Basic decimal knowledge

Lesson Details:

- Reteach meaning of percent and discuss when this would be used in real-life situations
- Reteach 25% = $\frac{25}{100}$
- Reteach finding equivalent fraction with a denominator of 100 as a way to find percent.

$\frac{3}{4} \times \frac{25}{25} = \frac{75}{100} = 75\%$

New instruction

- Teach finding percents from fractions whose denominators are not factor/multiples of 100
- Explain that $\frac{4}{5}$ is actually a ÷ sign, so $\frac{4}{5}$ can be seen as 4 ÷ 5. Practice on individual student white boards.
- Teach $5\overline{)4}$ requires the decimal knowledge they have mastered. $5\overline{)4.00}$.
- Work the problem with the whole group with students using individual white boards.
- Continue reminding that two places are required to turn this answer into a percent.
- Continue to stress percent means per 100.

4 ÷ 5 or $(5\overline{)4})$ = 0.80 = 80%

Check for Understanding:

Students should discuss and answer the following questions:

- What is the definition of percent?
- Explain methods that can be used to find percents given fractions
- Describe real-life situations where percents are used.

Additional Activity (Independent/group activity to reinforce lesson):

Journal Entry:

- Write "I can..." statement
- Students write following fractions/percents in journal and change to the other form using various methods:

$\frac{1}{2}$ = _____% $\frac{1}{2} \times \frac{50}{50} = \frac{50}{100} = 50\%$

$\frac{4}{5}$ = _____% or $5\overline{)4.00}$ = 0.80 = 80% or

[2] I am starting to understand this skill.

[3] I could pass a test on this and understand it.

[4] I am confident with this skill and could teach it to a peer.

Teaching Aids/Materials Needed for Activity:

•individual white boards for practice
•journals

Vocabulary:

•percent (new) - [per 100]
•fraction
•numerator
•denominator
•decimal
•decimal point
•equivalent fraction
•multiple/factor

Notes:

Overview, Purpose and Objective:

Convert a fraction to a percent.

Prior Knowledge Needed:

The student should:

- Have a clear understanding of equivalent fractions.
- Be able to convert a fraction with a denominator of 2, 4, 5, 10, 20, 25, or 50 to a fraction with a denominator of 100.

Lesson Details:

1. Begin by asking students what factor they would multiply 2 by to get a product of 100.(50) Then continue to ask students what factor they would multiply by the given factor to get a product of 100 (see below).

2 x ____ = 100
4 x ____ = 100
5 x ____ = 100
10 x ____ = 100
20 x ____ = 100
25 x ____ = 100
50 x ____ = 100

2. Discuss the concept of equivalent fractions with students and tell them they will use equivalent fractions to turn a fraction into a percent. Percent means 'out of 100' therefore we will convert all fractions to fractions with a denominator of 100.
3. Work through numbers 1 and 2 on the Fractions to Percent Diagram Worksheet with students. Stress the importance of shading in the diagrams to show equivalent diagrams and connect that to the idea of equivalent fractions.
4. Have students work in pairs or small group to complete numbers 3 - 5 on the Fractions to Percent Diagram Worksheet. If still needed, students can draw diagrams to demonstrate their understanding. If students have developed an understanding of equivalent fractions without the diagram, they can abandon this scaffold.

Check for Understanding:

Students should discuss and answer the following questions:

- What are equivalent fractions?
- Do the numerators or denominators have to be equivalent in order for the fractions to be equivalent?
- Why does a percent fraction always have a denominator of 100?

Additional Activity (Independent/group activity to reinforce lesson):

Have students flip a coin 10 times and record the number of times their coin landed on heads. Express this ratio as a percent. Students take turns with a partner flipping the coin 10 times and recording their answer. Now have students take turns flipping a coin 5 times and expressing their ratio of tails flipped as a percent. Continue this process as long as you wish with denominators of 4, 20, 25, or even 50.

Teaching Aids/Materials Needed for Activity:

- Fraction to Percent Diagram worksheet
- Coins

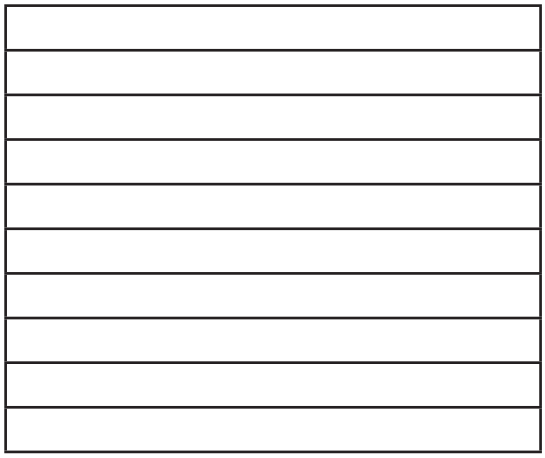
Vocabulary:

- percent - out of 100
- equivalent fractions - fractions with different numerators and denominators that represent the same value or proportion of the whole.

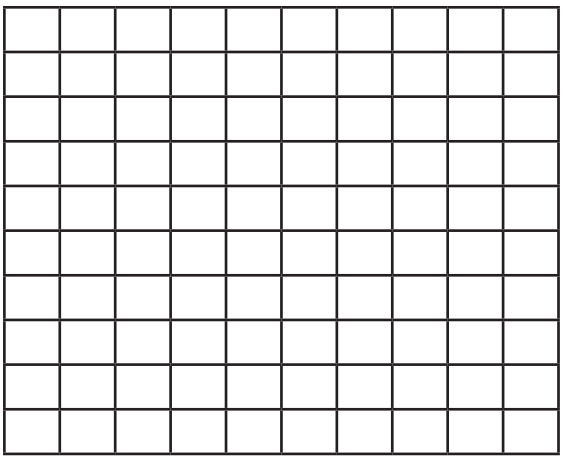
Name _____

Fraction to Percent Diagram Worksheet

1. Shade in 7 of the 10 bars in the diagram below.



Now shade in an equivalent number of bars in the 100's diagram below.



What fraction of the diagram did you shade? _____

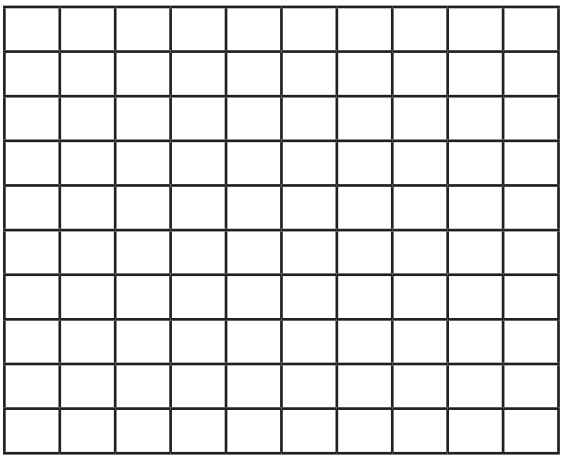
What fraction of the diagram did you shade? _____

What percent of each diagram did you shade? _____

This is true of each diagram above because _____ and _____ are equivalent fractions.

2. Shade in 2 of the 5 bars in the diagram below.

Now shade in an equivalent number of bars in the 100's diagram below.



What fraction of the diagram did you shade? _____

What fraction of the diagram did you shade? _____

What percent of each diagram did you shade? _____

This is true of each diagram above because _____ and _____ are equivalent fractions.

Complete each problem below.

3. $\frac{14}{20} = \frac{\_\_\_}{100} = \_\_\_\_\_ \%$

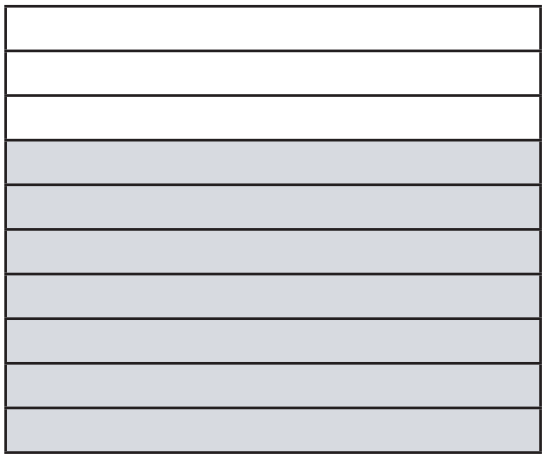
4. $\frac{1}{4} = \frac{\_\_\_}{100} = \_\_\_\_\_ \%$

5. $\frac{37}{50} = \frac{\_\_\_}{100} = \_\_\_\_\_ \%$

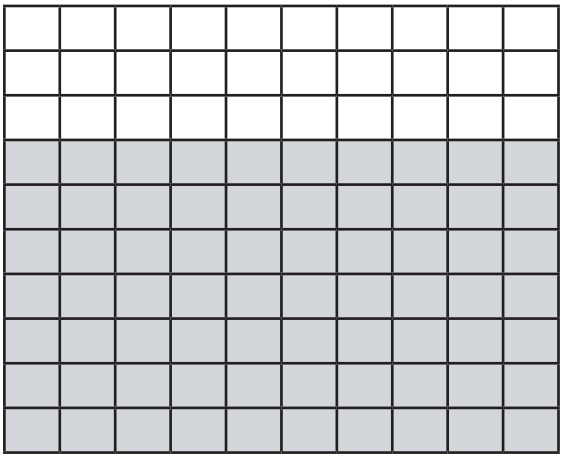
Name _____

Fraction to Percent Diagram Worksheet *Answer Key*

1. Shade in 7 of the 10 bars in the diagram below.



Now shade in an equivalent number of bars in the 100's diagram below.



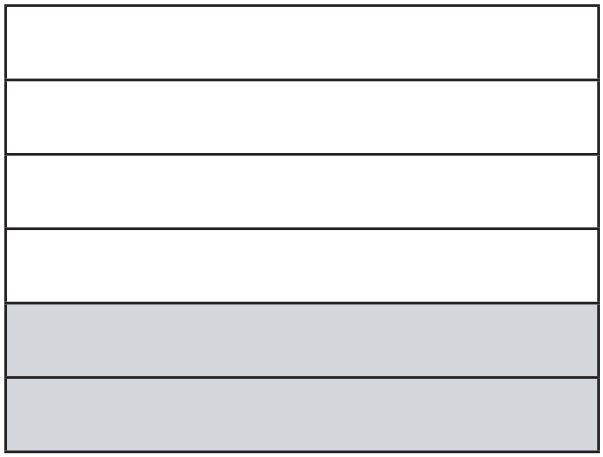
What fraction of the diagram did you shade? $\frac{7}{10}$

What fraction of the diagram did you shade? $\frac{70}{100}$

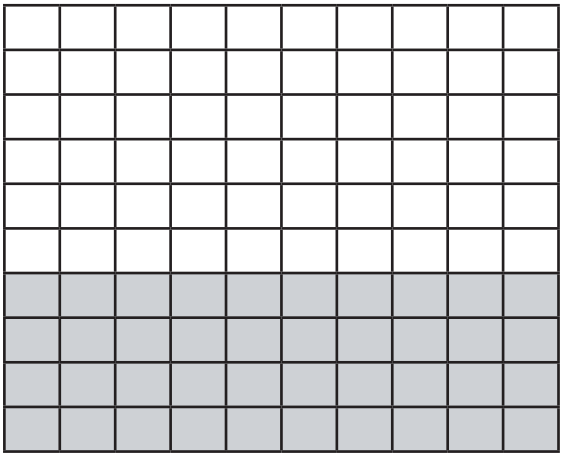
What percent of each diagram did you shade? 70%

This is true of each diagram above because $\frac{7}{10}$ and $\frac{70}{100}$ are equivalent fractions.

2. Shade in 2 of the 5 bars in the diagram below.



Now shade in an equivalent number of bars in the 100's diagram below.



What fraction of the diagram did you shade? $\frac{2}{5}$

What fraction of the diagram did you shade? $\frac{40}{100}$

What percent of each diagram did you shade? 40%

This is true of each diagram above because $\frac{2}{5}$ and $\frac{40}{100}$ are equivalent fractions.

Complete each problem below.

3. $\frac{14}{20} = \frac{70}{100} = 70\ \%$

4. $\frac{1}{4} = \frac{25}{100} = 25\ \%$

5. $\frac{37}{50} = \frac{74}{100} = 74\ \%$

Ascend Math Teacher Guide

4161

Percents to Fractions

Overview, Purpose and Objective:

The purpose of this lesson is to understand how to convert a percent to a fraction in simplest form.

Prior Knowledge Needed:

The student should:

- Understand that percent means “out of 100”
- Understand how to reduce a fraction using the rules of divisibility

Lesson Details:

1. Discuss with students the three most common rules for divisibility:
   1. If there is an even number in the ones place, the numerator and denominator are divisible by 2.
   2. If the numerator and denominator have a 0 or 5 in the ones place, they are divisible by 5.
   3. If the sum of the digits in the numerator or denominator is divisible by 3, then they are also divisible by 3.

   We will refer to these rules for divisibility throughout the lesson.
2. Have students use the rules of divisibility to reduce the fractions for 40%, 70%, and 75%. Discuss the process students use. (ie. 40% = $\frac{40}{100}$; both 40 and 100 end in 0 therefore they are divisible by 5. Dividing both by 5 produces an equivalent fraction of $\frac{8}{20}$. Both 8 and 20 are even numbers and can be divided by 2. This produces an equivalent fraction of $\frac{4}{10}$. This can be reduced again by dividing by 2, producing an equivalent fraction of $\frac{2}{5}$.) Discuss with students how, although this method of reducing fractions is effective, it is not efficient. Have students look for a larger factor that goes into both 40 and 100. They can try dividing the numerator and denominator by 10 or 20 for a more efficient form of reducing the fraction $\frac{40}{100}$.
3. Work with students through the exploration to discover using benchmark fractions/percents to visually see the relationship between fractions and percents.

Check for Understanding:

Students should discuss and answer the following questions:

- Although the rules for divisibility are effective, why are they sometimes not the most efficient way to reduce a fraction?

Additional Activity (Independent/group activity to reinforce lesson):

Have students draw fraction/percent diagrams on their own paper and practice partitioning into fifths then tenths, fourths then eights.

Teaching Aids/Materials Needed for Activity:

- video for lesson 4161
- exploration for lesson 4161

Vocabulary:

- percent - out of 100

Notes:

Ascend Math Teacher Guide

4171

Length, Capacity, and Weight

Overview, Purpose and Objective:

The purpose of this lesson is to convert units of measure between customary systems for length, capacity, and weight.

Prior Knowledge Needed:

The student should know:

- different measurements of length, capacity, and weight
- how to multiple and divide whole numbers and decimals

Lesson Details:

The explore activity gives the student a Unit Conversion Table. The student converts between different customary system of measurements by multiplying or dividing. He/she has the option to enter their answer or show the answer if they are struggling. The student will proceed to the next question by pressing new. The student should round all answers to two decimal places. An example of an Explore question: 12 yards= _____ decameters.

Check for Understanding:

Students should discuss and answer the following questions/topics:

- What are some different units you can use for length, capacity, and weight?
- What are some resources you can use to help convert units of measurement?
- How do you know if you should multiply or divide when converting?

Additional Activity (Independent/ group activity to reinforce lesson):

Create the Gallon Man: This activity will help students convert between gallons, quarts, pints, and cups. On a large piece of paper students will create a large G. The G represents one gallon. The space inside the G, the student will draw four Qs. The Q stands for quart. Within the space of each Q, the student will draw two Ps in each Q. The P stands for pint. Within the space of each P, the student will draw two Cs in each P. The C stands for cup. 1 gallon= 4 quarts = 8 pints = 16 cups.

Teaching Aids/ Materials Needed for Activity:

Vocabulary:

Other Resources (Websites, Books, etc.)

https://quizlet.com/214261/customary-system-of-measurement-length-weight-and-capacity-flash-cards/

Notes:

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5211

Complementary and Supplementary Angles

Overview, Purpose and Objective:

The purpose of this lesson is to construct supplementary, complementary, vertical and adjacent angles and apply the concepts of angle pairs to solve problems algebraically.

Lesson Details:

Task 1: Have students cut out angles (30°, 45°, 60°, 120° and 135°) from the Angle Sheet and then use them to construct and trace the following angle pairs: complementary angles, supplementary angles, vertical angles and adjacent angles.

Task 2: Challenge students to complete constructing and tracing a complementary angle pair and a supplementary angle pair in a different way. Have the students do a peer evaluation. For a twist, pair the students randomly by passing out cards that have angles on them along with directions to “find your complement” or “find your supplement”.

Task 3: Ask the students to describe in words how to construct vertical angles that are also complementary angles and then draw a diagram to support their answer.

Task 4: Finally, ask students what value of x would create the following angle pairs. Have the students write and solve an equation to fully support their reasoning. Ensure that students are aware of what it means to fully support your reasoning by providing samples answers from Task 4. Discuss what an acceptable answer looks like and then, if time allows, have students evaluate each other’s answers in a structured inside/outside circles activity.

Suggestions: during inside/outside circles, provide students with adequate time to read each other’s response, and then a separately assigned time frame to provide verbal feedback to each other. Verbally redirect students who begin discussing when it is still reading time.

Check for Understanding:

Check for students understanding by providing them with an Always, Sometimes, or Never handout. After reviewing the correct answers with the students, have them self evaluate their level of understanding by writing 3-5 sentences about their own strengths and weaknesses concerning the tasks.

Sample statements: Vertical angles are congruent. Complementary angles are congruent. The sum of the measures of supplementary angles is 180°. Supplementary angles are adjacent.

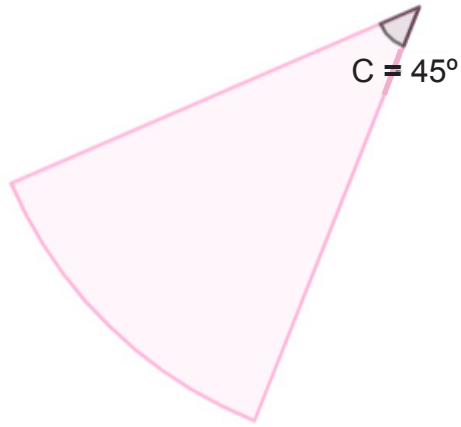
Teaching Aids/Materials Needed for Activity:

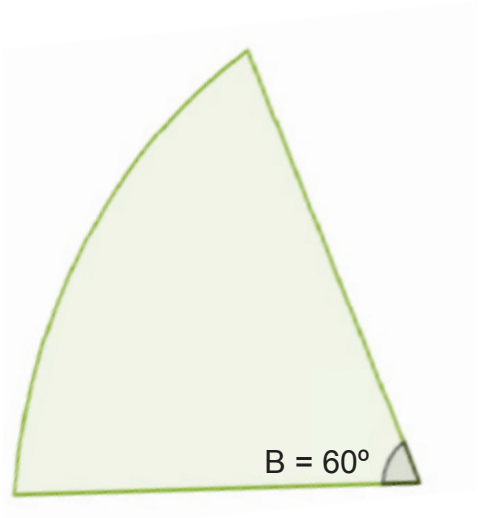
- Angle Pairs Activity Sheet
- Angle Sheet

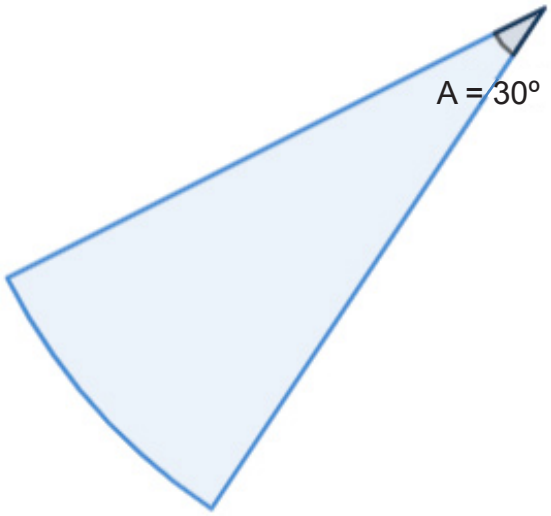
Vocabulary:

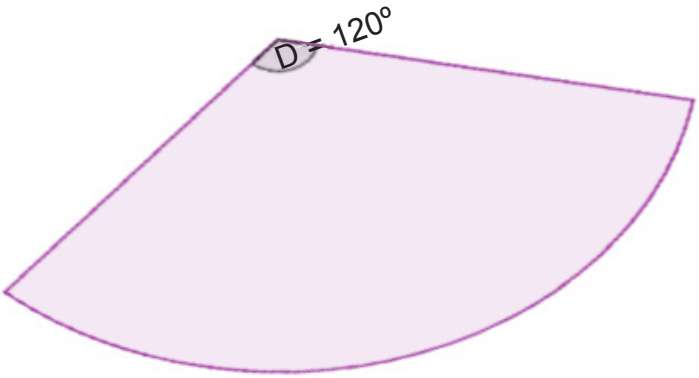
- complementary angles
- vertical angles
- supplementary angles
- adjacent angles

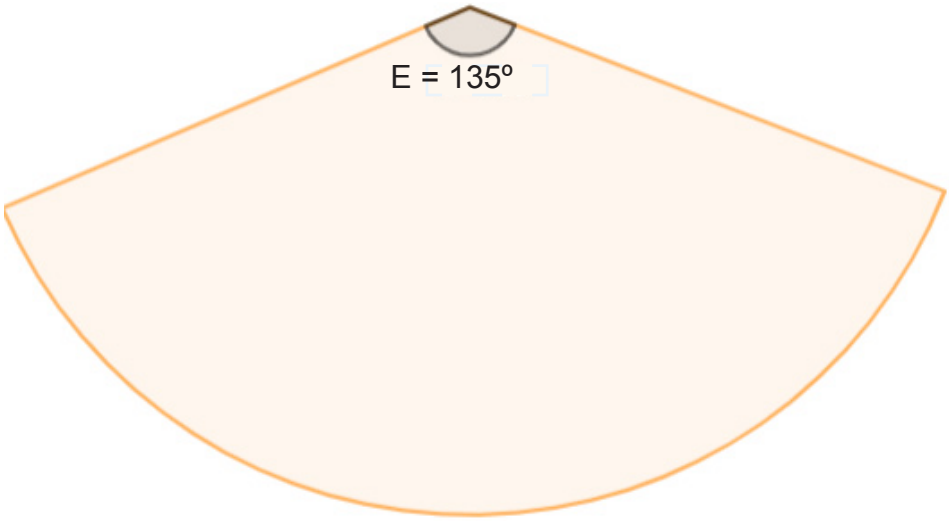
Notes:











Task 1: Cut out the angles provided on Angle Sheet 1. Use them to construct and then trace the following angle pairs.

1. **complementary angles**

2. **supplementary angles**

3. **vertical angles**

4. **adjacent angles**

5. **adjacent angles** that are also **complementary angles**

6. **adjacent angles** that are also **supplementary angles**

7. **vertical angles** that are also **complementary angles**

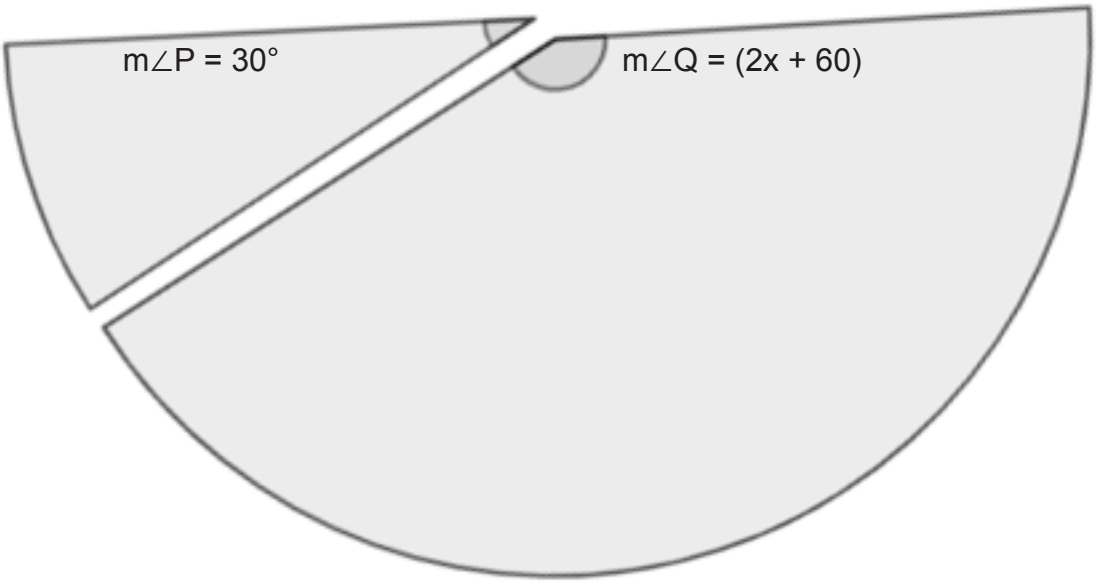
Task 2: Complete item 1 from above in a different way.

Complete item 2 from above in a different way.

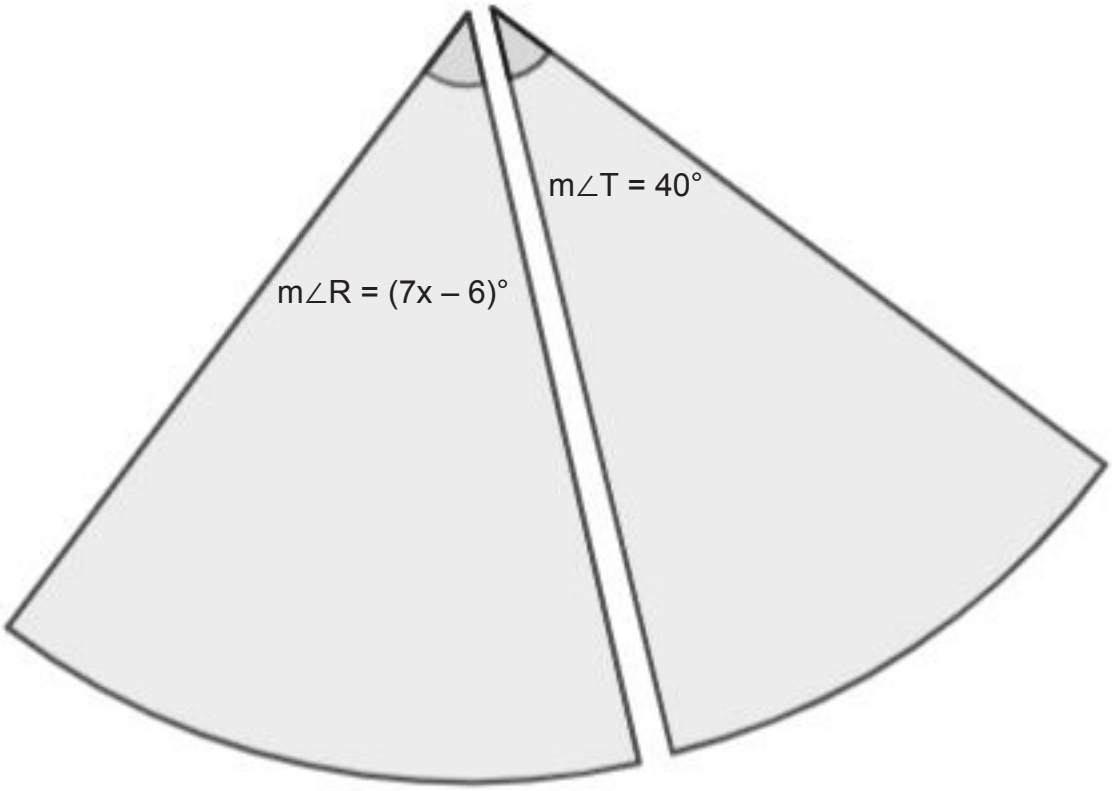
Task 3: Describe, in words, how you could construct vertical angles that are also complementary angles. Then draw a diagram to support your answer.

Task 4: For what value of x would create the following angle pairs? Write and solve an equation to fully support your reasoning.

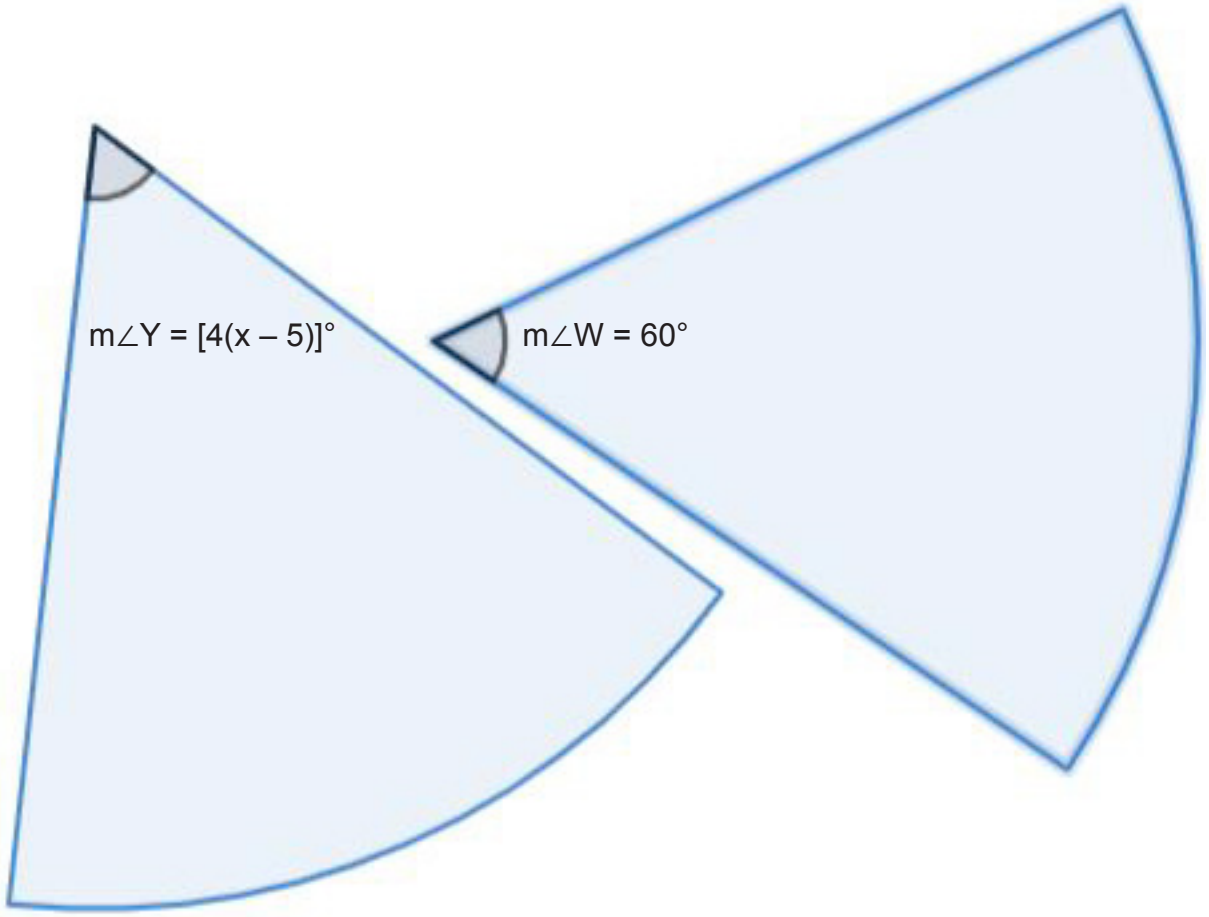
1. **supplementary angles**



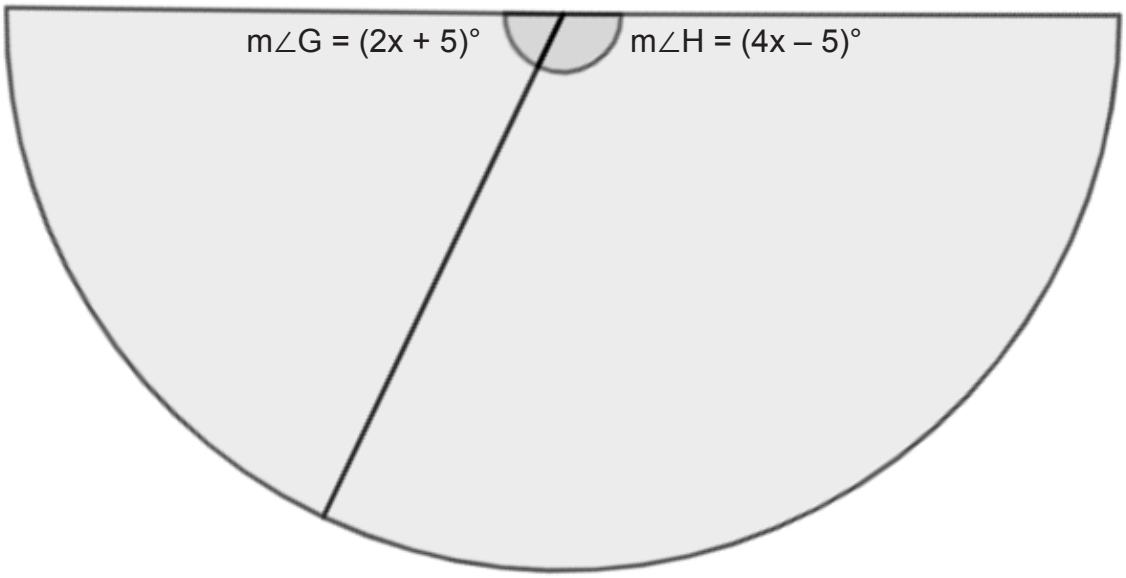
2. complementary angles



3. vertical angles



4. adjacent angles



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Intro to Symmetry

Overview, Purpose and Objective:

The purpose of this lesson is to identify a line of symmetry on a two-dimensional figure by drawing a line or folding the figure to create a mirror image or matching sides.

Prior Knowledge Needed:

The student should know the meaning of the words

•corresponding •coincide •diagonal
•parallelogram •diameter •infinite

Lesson Details:

As the student begins the explore, he/she is given a board with 10 two-dimensional objects on one side and the first object enlarged on the other side on what looks like a large peg board. There is a line through it with a blue dot that the student will use to move the line around from the center like a wheel to find the lines of symmetry in each object. There is a box above the 10 objects that keeps count of each line of symmetry the student finds. The student cannot go on to the next object until all the lines of symmetry are found. When a line of symmetry is found, it leaves a light gray mark to show all the lines once they have all been found.

Check for Understanding:

•Does the student understand what corresponding halves means?
•Does the student understand what mirror image means and what it means that both sides must coincide or be equal?

Additional Activity (Independent/ group activity to reinforce lesson):

Students work with a partner. They first make a line with a rubber band that will divide the geoboard down the middle. They work together to make one big shape that is exactly the same on both sides of the line. One partner works on one side first (it must touch the line without crossing it).The other partner makes the other half of the same shape so that it is a mirror image. It must also touch the line without crossing it. Students then copy the rubber band line and shape on geoboard paper, cut it out, and fold it to see if it is symmetrical.

Teaching Aids/ Materials Needed for Activity:

•geoboards •rubber bands
•geopaper •pencils •scissors

Vocabulary:

•Line of symmetry - a line that divides a figure into two equal parts where each part is a mirror image of the other
•Shape - The form of an object - how it is laid out in space (not what it is made of, or where it is).

Other Resources (Websites, Books, etc.)

www.K-5mathteachingresources.com; www.internet4classrooms.com

Notes:

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Transformations

Overview, Purpose and Objective:

The purpose of this lesson is to investigate rigid transformations (translations, rotations, and reflections) on a coordinate grid.

Prior Knowledge Needed:

The student should:

- Understand the terms-x-axis, y-axis, horizontal, vertical, slide, flip, turn
- Have a working knowledge of a 4-quadrant coordinate grid.

Lesson Details:

The exploration activity allows students to practice rigid transformations on a dot grid. Students may have an easier time performing rigid transformations on a 4-quadrant coordinate grid. For a translation (slide), students should know that they are either moving the figure up or down, left or right, a given number of units. For a rotation (turn), students should always start with a shape at the origin. They can rotate either clockwise or counterclockwise and either 90°, 180°, or 270°. For a reflection (flip) students should begin by reflecting the figure over either the x- or y- axis. Students can progress to reflecting a figure over any horizontal or vertical line. Once students have developed an understanding of rigid transformations using a coordinate grid, they can complete the explore activity to understand performing these transformations under more broad circumstances.

Check for Understanding:

Students should discuss and answer the following questions:

- What is the difference between a rigid and a non-rigid transformation?
- What is a synonym for translate? For rotate? For reflect?

Additional Activity (Independent/group activity to reinforce lesson):

Students can use a full-page coordinate grid and any polygon to perform these transformations themselves. The teacher can instruct students, for example, to place their polygon with a vertex on the ordered pair (1,1). [Teachers can scaffold this activity by giving polygons with fewer vertices, (i.e. triangle or rectangle), to more struggling students and giving polygons with more vertices (i.e. trapezoids, regular pentagons, regular hexagons) to more advanced students.] The teacher can then provide students with directions for how to transform their polygon. (i.e. Reflect your polygon over the x-axis. Rotate your polygon 90° counterclockwise about the origin. Translate your polygon 3 units up and 4 units left. Students could, along the way, write down the coordinates of their transformed polygon.

Teaching Aids/Materials Needed for Activity:

- Coordinate grids
- Polygons

Vocabulary:

- rotation
- reflection
- translation
- rigid transformation

Other Resources (Websites, Books, etc.)

https://robertkaplinsky.com/work/ms-pac-man/

Notes:

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Similar Triangles and Applications

Overview, Purpose and Objective:

The purpose of this lesson is to investigate the relationships formed by similar triangles.

Prior Knowledge Needed:

The student should:

- Understand the what congruent means.
- Have a working knowledge of cross-multiplication, simplifying and equivalent fractions.

Lesson Details:

In the exploration, the students are first asked to set up a proportion by dragging the dimensions into the correct parts of a proportion. Once students do this correctly, the computer automatically sets them up to u se cross multiplication to solve the proportion. Ask students to first consider if there is an easier way to solve this proportion. [In the first example students set up the proportion 11/z = 33/12. This proportion can easily be solved by demonstrating that 11 x 3 = 33 therefore z x 3 will equal 12. Students should be allowed to use this strategy as well as cross multiply and divide. Have students do a comparison of congruent and similar. This could include terms, symbols, examples, etc. Students could divide their paper into two columns labeling each column with congruent and similar. Students could use the Think-View-Share template (referenced below) to first write down what they know about the two terms. They can then share their understanding with a partner and make adjustments as needed, then repeat this process again.

Check for Understanding:

Students should discuss and answer the following questions:

- How are proportions similar to equivalent fractions?
- How are they different?
- How do you cross multiply and divide a proportion?
- Students must understand that If one quantity in a ratio is multiplied or divided by a factor, then the other quantity must be multipled or divided by the same factor to maintain the proportional relationship

Additional Activity (Independent/group activity to reinforce lesson):

Provide students with a stack of 5-7 index cards each with a triangle with given side lengths and angle measures. Students should take turns choosing an index card from the pile of face down cards. Have students recreate a triangle similar to the one provided on their white boards. Students can check each others answers based on what they understand about similar triangles. Then have students create a triangle congruent to a given triangle. Again, students can check each others answers based on what they understand about congruent triangles. Repeat this until all index cards are used.

Teaching Aids/Materials Needed for Activity:

- index cards with triangles (teacher created)
- white boards
- erasers
- markers

Vocabulary:

- similar
- proportion
- congruent

Other Resources (Websites, Books, etc.)

Ascend Math Think View Share Worksheet
https://ascendmath.com/rewards-resources/

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Perimeter and Circumference

Overview, Purpose and Objective:

The purpose of this lesson is to explore the area and perimeter of a rectangle.

Prior Knowledge Needed:

The student should know:

- the formula for perimeter of a rectangle
- the formula for area of a rectangle
- be familiar with the terms height and base

Lesson Details:

As the student begins the Explore, the instructions say, “To find the Area and Perimeter drag the sides of the figure or type in the height and the base.” Students can drag the sides of the rectangle to increase or decrease the base and the height, or they can type in an amount for the base and the height. The perimeter and area totals are then shown. The students can explore how the perimeters and areas change as you increase or decrease the dimensions.

Check for Understanding:

The students should explore and discuss the following questions:

- What happens to the perimeter if both the base and height are doubled?
- What happens to the area if both the base and the height are doubled?
- Is there more than one way to make a rectangle with a perimeter of 20?
- Is there more than one way to make a rectangle with an area of 20?
- Is the area always larger than the perimeter?

Additional Activity (Independent/ group activity to reinforce lesson):

Divide students in groups and have them draw as many rectangles as possible with a perimeter of 20. Be sure to label both the length and width. Use the 1-inch square tiles to make as many different rectangles using 20 tiles. Label both the length and width. Compare solutions with other groups.

Teaching Aids/ Materials Needed for Activity:

- large chart graph paper with 1-inch squares
- colored pencils
- 1-inch square tiles

Vocabulary:

- Area – The size of a surface. The amount of space inside the boundary of a flat (2-dimensional) object
- Circumference – a special perimeter, or distance around a circle
- Diameter – A straight line going through the center of a circle connecting two points on the circumference
- Perimeter – the distance around a plane figure
- Perimeter of a polygon – the sum of all lengths of its sides
- Pi – The ratio of a circle’s circumference to its diameter. Equal to 3.14159265358979323846... (the digits go on forever without repeating)
- Polygon – A plane shape (two-dimensional) with straight sides. Examples: triangles, rectangles and pentagons
- Radius – The distance from the center to the edge of a circle; half of the circle’s diameter
- Volume – The amount of 3-dimensional space an object occupies; Capacity

Other Resources (Websites, Books, etc.)

www.mathplayground.com/area_perimeter.html
www.mathgoodies.com/lessons/vol1/area_rectangle.html

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Volume

Overview, Purpose and Objective:

The purpose of this lesson is to explore the surface area and volume of rectangular solids.

Prior Knowledge Needed:

The student should know:
•be able to use the formula for volume of a rectangular solid
•be able to use the formula for surface area of a rectangular solid

Lesson Details:

As the student begins the Explore, he/she is given a choice to display the rectangular solid transparently or in the form of cubes. He/she also has the choice of show me or quiz me. The student is given directions to drag the sliders to change the size of the rectangular solid. If the student has chosen show me, as the sliders are moved, both the volume and surface area are computed. If the student has chosen quiz me, the student must compute the volume and surface area, enter the solutions, and select check. The student may continue to explore the surface and volume of several rectangular solids.

Check for Understanding:

The students should discuss the following questions:
•What do you know about surface area and when would you need to calculate the surface area?
•What do you know about volume and when would you need to calculate the volume of something?
•Does the student know the difference between surface area and volume?

Additional Activity (Independent/ group activity to reinforce lesson):

The students should discuss the following questions:
•What do you know about surface area and when would you need to calculate the surface area?
•What do you know about volume and when would you need to calculate the volume of something?
•Does the student know the difference between surface area and volume?

Teaching Aids/ Materials Needed for Activity:

•shoe boxes of various sizes or other types of boxes
•Unifix cubes

Vocabulary:

Other Resources (Websites, Books, etc.)

www.learner.org/interactives/geometry/area_volume.html
www.superteacherworksheets.com/volume.html

Notes:

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Graph Proportional Relationships

Overview, Purpose and Objective:

The purpose of this lesson is graph proportional relationships and interpret the unit rate as the slope of the graph

Prior Knowledge Needed:

•Order of Operations
•Evaluate expressions (input/output)
•Graph points on a Cartesian Plane

Lesson Details:

Students are grouped into trios; teacher strategically has each student identified as an A, B, or C with A being the high, B the medium-high, and C the medium tiered student. Each student receives a handout that has a real-world problem on it (ex: Sasha visited a farmer's market where oranges are $2.00 each…), as well as tasks with the appropriate amount of support:

A: Students are prompted answer some questions about their situation to ensure understanding, create a table of values for their given situation and then graph. Student A's problem might have a decimal involved (ex: Ja'lyn found sweaters on sale for $17.50 each).

B: Student B has increased support, possibly a whole number slope with input values provided in the table.

C: Student C has a whole number slope, input values provided in the table and the graph's axis labeled that are appropriate for the given unit rate.

Students are encouraged to work within their trios to complete the handouts, starting with person C's, as the support provided there will serve as an example on how to approach the other problems.

After students have had adequate time to approach the problems, even if not completely done, all student As are grouped together in the front of the room, Bs in the middle and Cs in the back. Then students are given additional time to compare their work and solutions as now they are with students who have the same exact problem as them. The teacher might choose to create small (groups of 2 or 3) within each letter group.

Check for Understanding:

The teacher will then provide a fourth problem (D) with just the table provided and the students will be asked to analyze what about the situation they can derive from just the table (i.e.: the item cost $6.00 each) and subsequently a fifth problem (E) with just the graph provided and the students will be asked to analyze what about the situation they can derive from just the graph (i.e.: the slope of the line is 4 because the item cost $4.00 each).

Additional Activity (Independent/group activity to reinforce lesson):

Students are given two additional problems where they are asked to create the table, the graph and then answer questions about the unit rate and its relationship to slope.

Teaching Aids/Materials Needed for Activity:

•Handouts A, B and C.
•Additional real-world problems D and E.
•If independent practice is desired, provide problems F and G for your students.

Vocabulary:

•Unit rate
•Slope

Objective:

•Graph proportional relationships

•Interpret the unit rate as the slope of the graph

Ja'lyn found sweaters on sale for $17.50 each.

1. The two variables are: *number of sweaters* and *cost*. Determine which is the independent and dependent variable.

   Independent variable: _____

   Dependent variable: _____

2. Create a table of values for the given situation.

3. Graph your data.

Answer items 4-7 after you've completed the graph.

4. What is the unit rate for the sweaters (cost per sweater)?

5. Where can this be found within your graph?

6. What is the slope of the line created by your data points?

7. Where can this be found within Ja'lyn's given situation?

B

Objective:

•Graph proportional relationships

•Interpret the unit rate as the slope of the graph

Sasha drove 65 miles per hour on the highway.

1. Identify the two variables within the real-world situation:

   Independent variable: _____

   Dependent variable: _____

2. Create a table of values for the given situation.

3. Label and title appropriately. Graph your data.

Highway Speed	
Time (h)	Distance (mi)

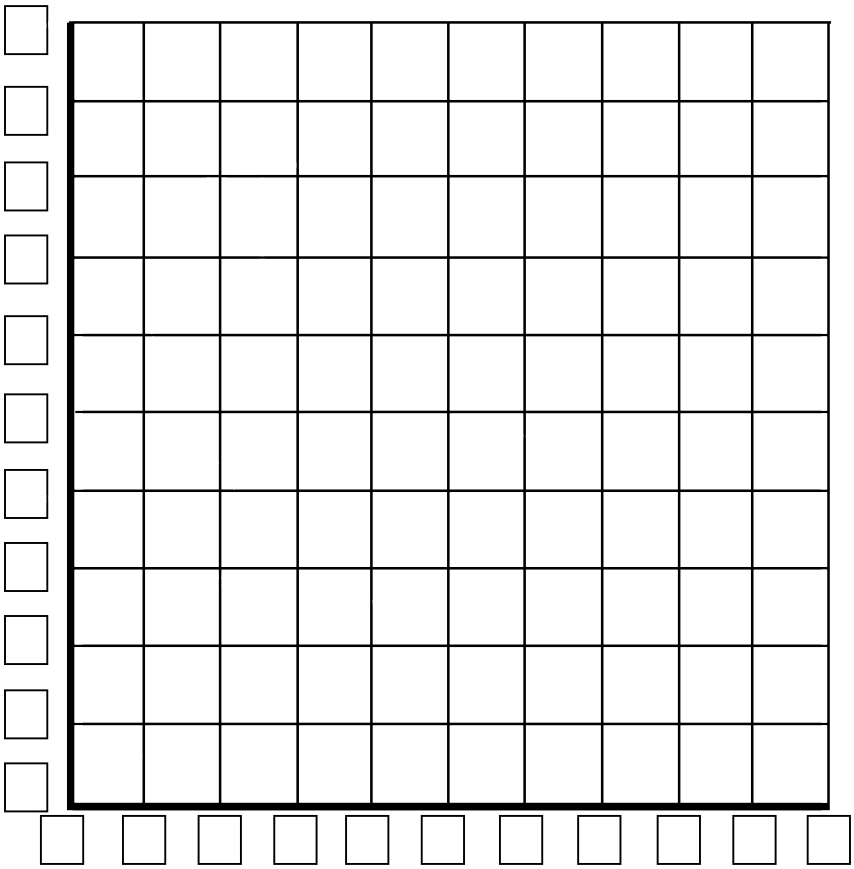
Answer items 4-7 after you've completed the graph.

4. What is the unit rate for the speed at which Sasha travels?

5. Where can this be found within your graph?

6. What is the slope of the line created by your data points?

7. Where can this be found within Sasha's given situation?



C

Objective:

•Graph proportional relationships

•Interpret the unit rate as the slope of the graph

Taylor's most recent typing test showed that she typed 32 words per minute.

1. Identify the two variables within the real-world situation:

   Independent variable: _____

   Dependent variable: _____

2. Complete the table of values for the given situation.

3. Use the boxes provided to label and title appropriately. Graph your data.

Typing Class	
Time (min)	Words
0	
5	
10	
15	
20	

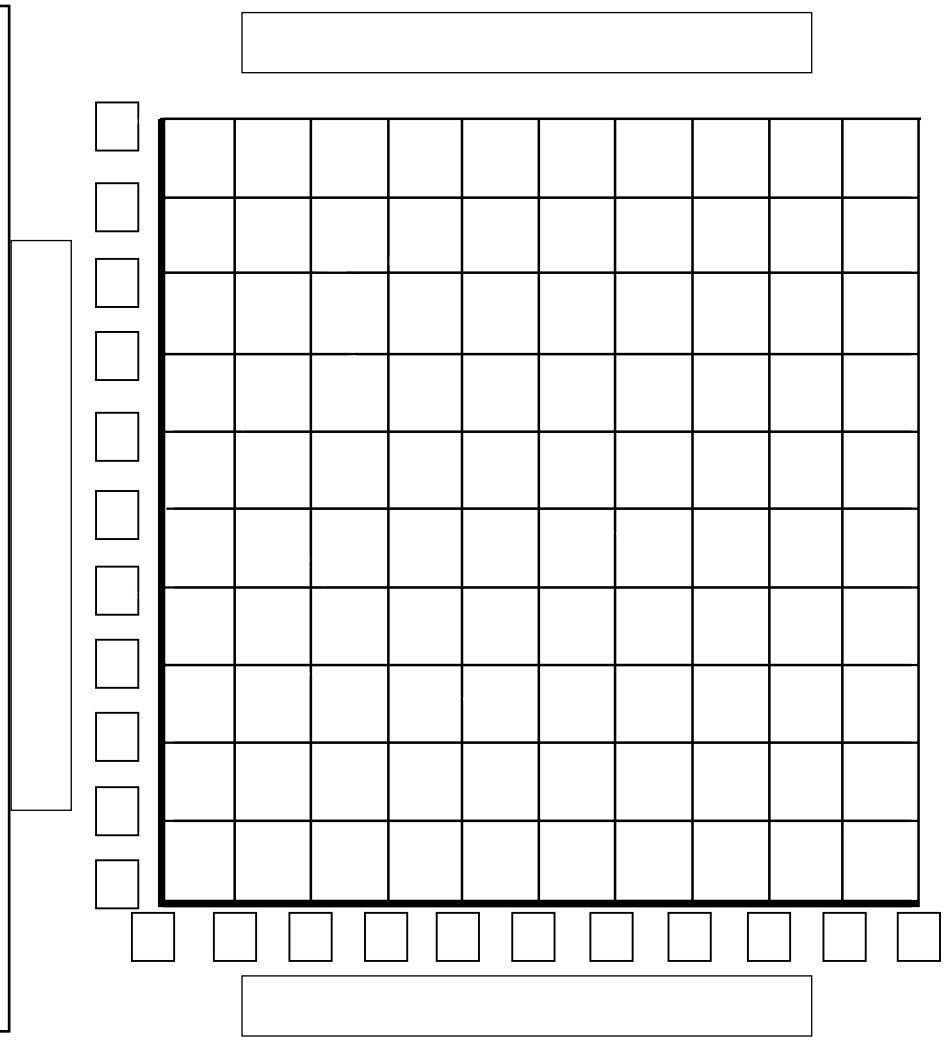
Answer items 4-7 after you've completed the graph.

4. What is the unit rate for Taylor's typing speed?

5. Where can this be found within your graph?

6. What is the slope of the line created by your data points?

7. Where can this be found within Taylor's given situation?



D

Objective:

•Graph proportional relationships

•Interpret the unit rate as the slope of the graph

The following table has been provided for you given Aydan's situation.

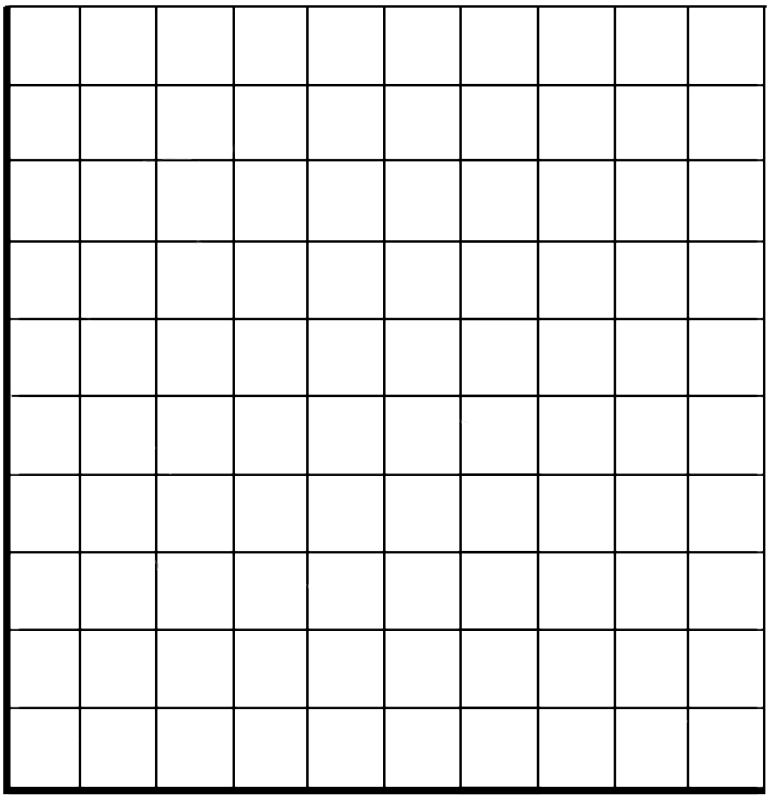
Farmer's Market	
Oranges	Cost
0	0
1	2.50
2	5.00
3	7.50
4	10.00

1. Write a sentence describing Aydan's real-world situation.

2. What is unit rate? (Label your answer.)

3. What would be the slope of the graph of Aydan's data? Explain.

4. Create a graph from the given information.

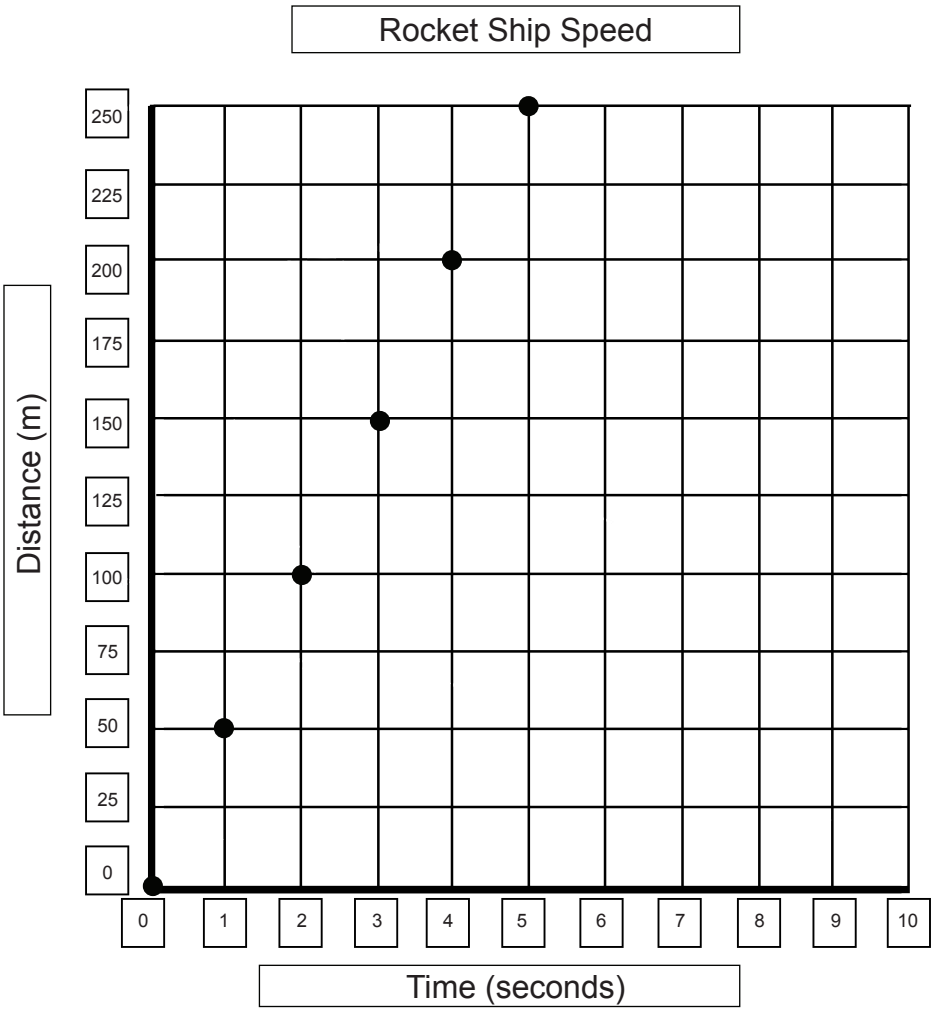


E

Objective:

•Graph proportional relationships •Interpret the unit rate as the slope of the graph

The following graph has been provided for you given Devante's situation.



1. Write a sentence describing Devante's real-world situation.

2. What is the unit rate? (Label your answer.)

3. What would be the slope of the graph of Devante's data? Explain.

4. Create a table of values. Use the table provided to the right.

Ascend Math Teacher Guide

5316.1

Identifying Geometric Shapes and Their Attributes

Overview, Purpose and Objective:

Students will be able to identify geometric shapes and their attributes.

Prior Knowledge Needed:

The student should:

- Have a basic understanding of shapes and the vocabulary associated with them.

Lesson Details:

Teach names of shapes listed in attached sheet while imbedding vocabulary in instruction. Teach/elicit multiple lables for various shapes.

Activity 1: Pass out sets of pre-made shapes (from attached sheet).
Call out attributes from provided attribute cards and have student groups hold up all shapes that fit the read attribute.

Activity 2: Pass out geometric picture and shape attribute/label pages (provided).
Students label each shape with correct attribute/label letter.
Color if there is time.

Check for Understanding:

Students should discuss and answer the following questions:

- Discuss how various shapes have multiple name/labels
- Discuss how shapes can be sorted/organized into different categories based on various attributes. i.e. number of vertices, number of line segments, types of angles

Additional Activity (Independent/group activity to reinforce lesson):

Journal entry:

- Students write “I can...” statement for this skill
- Students select a minimum of three cardstock shapes used in Activity 1. Trace them on journal page and list labels and attributes for each selected.
- Self-evaluation score:

2 I am starting to understand this skill.

3 I could pass a test on this and understand it.

4 I am confident with this skill and could teach it to a peer.

Teaching Aids/Materials Needed for Activity:

- Copy of geometric picture and attribute label page (provided) for each student
- Set of large shape on cardstock for each small group
- Journals

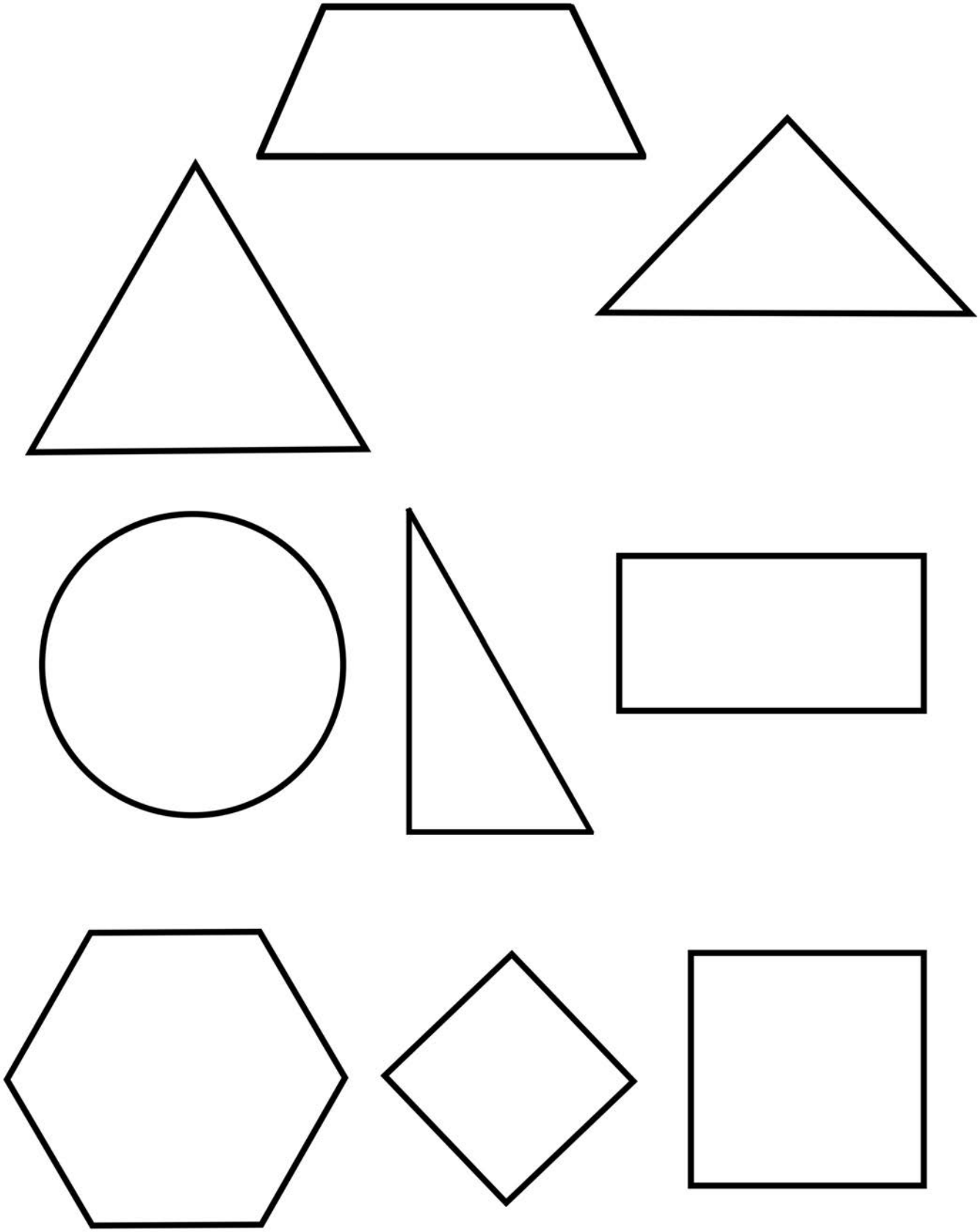
Notes:

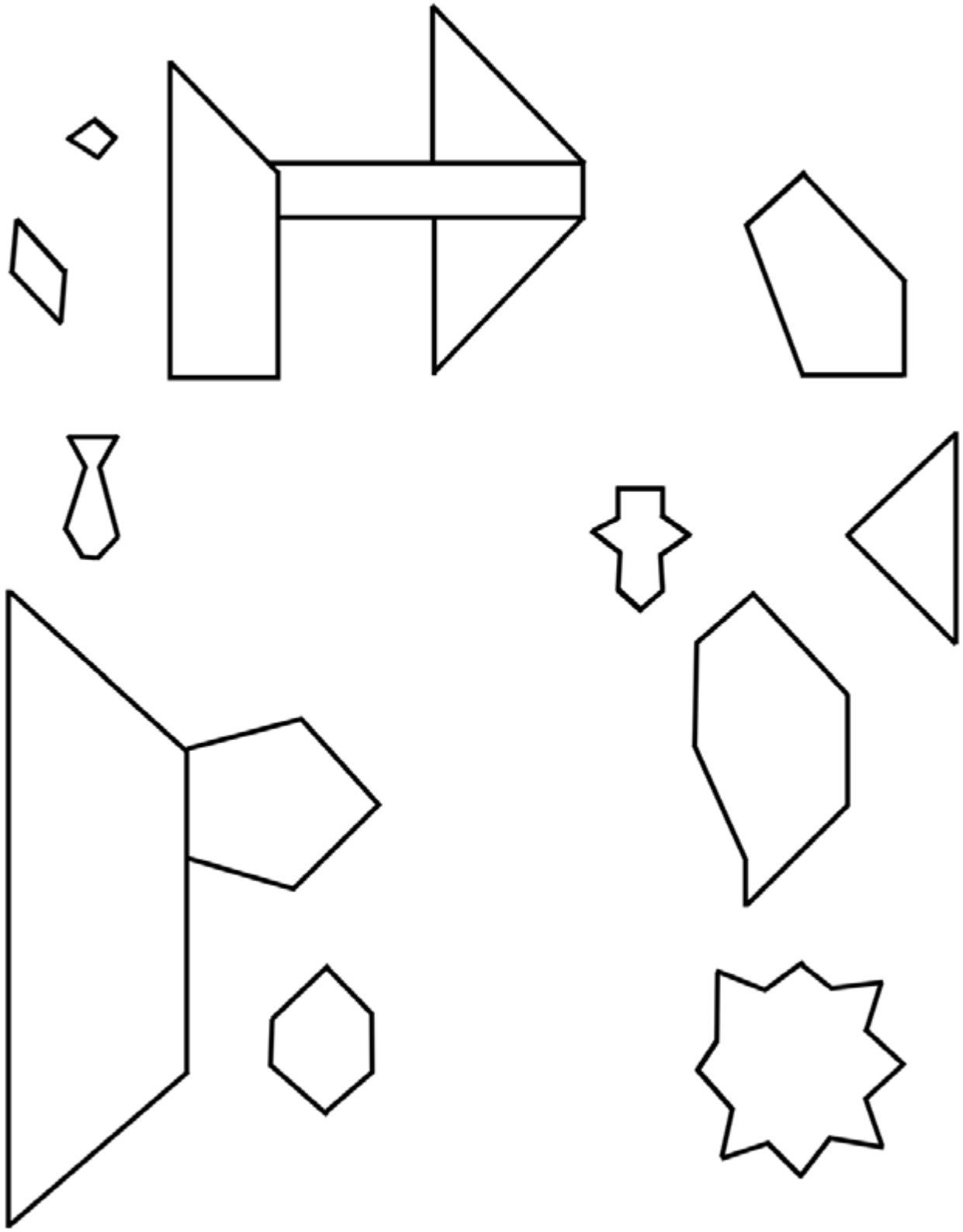
Activity 1 Attribute List

1. I have an acute angle.
2. I have an infinite number of lines of symmetry.
3. I am a rhombus.
4. I am a hexagon.
5. When you combine all my angles it will always equal 180º.
6. I have at least one set of parallel lines.
7. I am a scalene triangle.
8. I am a trapezoid.
9. I am an isosceles triangle.
10. I am an equilateral triangle.
11. I am a right triangle.
12. I am a quadrilateral.
13. I am NOT a quadrilateral.
14. I am a rectangle.
15. I have zero lines of symmetry.
16. I have a right angle.
17. I have more than two lines of symmetry.
18. I have an obtuse angle.
19. I have at least one set of perpendicular lines.
20. I have more than 3 vertices.

Activity 2 Attribute List

A. I am an irregular polygon with 2 right angles.
B. I am a hexagon.
C. I am a parallelogram and a quadrilateral.
D. I am an irregular polygon with 8 line segments.
E. I am a pentagon.
F. I am a right triangle.
G. I am a trapezoid.
H. I am an irregular polygon with 7 line segments, 5 obtuse angles, and 2 acute angles.
I. I am a right triangle.
J. I am an irregular polygon with 16 line segments.
K. I am a quadrilateral, a polygon, and a diamond.
L. I am a quadrilateral with 2 right angles, 1 acute angle, and 1 obtuse angle.
M. I am a quadrilateral and a rectangle.
N. I am an acute triangle.
O. I am an irregular polygon with 5 sides.





Ascend Math Teacher Guide

5321

Determining Volume Using Unit Cubes

Overview, Purpose and Objective:

•Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit.

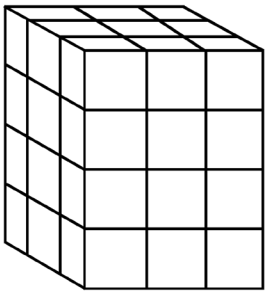
•Apply the formulas V = (length) × (width) × (height) and V = (area of base) × (height) to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.

Prior Knowledge Needed:

The student should:

- •Understand the term: cubic foot and area
- •Area of a Rectangle formula: length(width)

Lesson Details:



Students are introduced to the idea of volume through cubic units composing a larger rectangular prism. Students are given a rectangular prism that has a base of 3 units by 3 units and a height of 4 units.

Students are asked how many *layers* there are in the rectangular prism; there are 4 layers. Students are asked to first determine the area of each *layer* of a rectangular prism. (Each layer is 3 by 3 so each layer is composed of 9 cubes.) Since there are four layers, students are told that 9(4) = 36 cubic feet.

Then students are asked “What if we didn’t want to add up the number of all of the cubes?” Students are then provided the formula (length times width times height) for volume and led through applying it to this problem. The same answer is gained. Students are also shown that the length times the width is the same as the area of the base and provided with the alternate formula for volume of: area of the base times the height.

Students are then given a second rectangular prism, one that has a base 5 by 3 and a height of 4 units and asked to find the volume. The solution is then provided, and a subsequent practice problem is given (6 by 7 by 5) in which the students are asked to calculate and then enter the volume of the prism.

Finally, students are provided with a real-world application of the rectangular prism in the form of a stack of papers that are 12 by 9 by 2 inches. They are asked to identify the shape as a rectangular prism in a multiple-choice type situation and are then led through finding the volume of the prism. Another application problem is provided in the form a fish tank that has a base of 3 by 1 and a height of 2 feet. Students are asked to find the volume and enter their answer.

Check for Understanding:

Students should discuss and answer the following question:

- •How could they apply what they learned in the video to a similar problem?

Teaching Aids/Materials Needed for Activity:

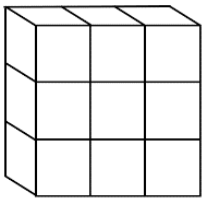
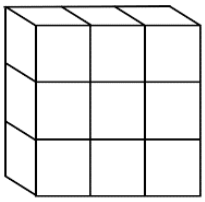
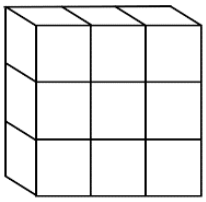
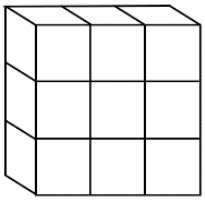
•Ascend video Determining Volume Using Unit Cubes
•Poster paper or 12” by 18” paper for the Check for Understanding
•Cubes, if teacher selects to have students build layers instead of drawing the diagrams

Vocabulary:

•Cubic foot

Additional Activity (Independent/group activity to reinforce lesson):

Teacher Tip: To help students fully understand what the video is verbalizing, at 1:51 pause the video and encourage students to draw (or build) a diagram of the layers.

Layer 1	Layer 2	Layer 3	Layer 4
			
9	9	9	9

Tell students to show on their paper how many cubes there are total and how they arrived at their answer. After adequate time is given, resume the video.

Teacher Tip: To lead students to developing the formula for volume of a rectangular prism, pause the video at 2:16. Provide the students with another example similar to the original given rectangular prism (example: a rectangular prism with a base of 2 units by 4 units and a height of 5 units). Ask students to again draw diagrams of each layer and determine the number of cubes in each layer. Ask students to discuss with a partner how they determined the number of cubes in each layer (some will have counted them individually, where as some will begin to multiply length(width)). After students have had adequate time to discuss (30-60 seconds), explain that you heard some impressive discussions and you even heard several students remember a faster way than just counting to determine the number of cubes in each layer. Use this opportunity to reintroduce (pull forward prior knowledge) the area formula for a rectangle. Remind students that multiplying is efficient way of adding multiple times. Ask students to proceed to determine the number of cubes in the rectangular prism (all the layers together). At this point, some might add the cubes in each layer, and some might begin to multiply. Provide a visual on the board that looks something like this:

	Length	Width	Height	Volume
Prism 1	3	3	4	36
Prism 2	2	4	5	40
Prism 3				

Verbalize that the first prism had 4 - 3 by 3 layers and the second had 5 – 2 by 4 layers. Give the students some think time and ask them if they can develop a different way of getting the volume. Give students an opportunity to share their idea(s) with a neighbor. If students are stuck, remind them again about the area formula and how multiplying can sometimes be a more efficient way of adding multiple times.

Once students have discovered the formula, help them write it in the appropriate way: V = lwh. Students should continue with the video either individually or as a class.

Subsequent Activities: Ask students, in pairs, to develop an anchor chart for volume of a rectangular prism. Explain that this chart (or poster) should help viewers understand how to find volume and why the formula work. If time permits, create a structure for peer evaluation of the projects (what pieces of the display would be helpful to learners who didn't already know how to find the volume? In what ways could the creators have made the display more helpful to learners trying to understand volume (draw diagrams of your suggestions if necessary)?

Students can be provided with additional practice as needed.

Ascend Math Teacher Guide

6261

Reading and Interpreting Pictographs, Bar Graphs, and Line Graphs

Overview, Purpose and Objective:

The purpose of this lesson is to build student knowledge on reading and interpreting bar graphs, line graphs, and circle graphs.

Prior Knowledge Needed:

The student should know:

- data table
- bar graph
- line graph
- pictograph
- characteristics of a graph

Lesson Details:

The explore activity provides practice for bar graphs, line graphs, and circle graphs. The activity will begin with a bar graph. The student may interact with the graph by changing the Fields of: title, items, value, item name, and amount of the value. The value amount can be changed and the change will display on the graph. The activity has an option to change the type of graph to line or circle graphs. Students can interchange graphs types to view the same data in various forms.

Check for Understanding:

To check for student understanding:

- How does the graph represent the data table?
- What are the differences between a bar, line, and circle graph?
- What happens to the graph when the value is changed?
- Does the value of the item change if the graph changes?

Additional Activity (Independent/ group activity to reinforce lesson):

The same lesson can be duplicated using construction paper chain links. The teacher or student can cut construction paper in strips and roll the strips into circles to make a construction paper chain. To begin, collect data in a classroom survey. The data should survey no more than six items. For example, complete a class survey on favorite after school activities. Conduct the survey and record the results in a visible area of the classroom. Create index cards with the item name and the item value. Now create six (or groups equal to the amount of survey items) student groups to represent each survey item. If there are 5 survey items then there will be 5 student groups. Distribute an index card to each group. Also, distribute construction paper strips to each group. Each group should receive a different color. To make the pictograph, each group will the make the appropriate loops to match their item value. The loops will not be linked to make a pictograph. Students can then make a pictograph in a visible area. To make a bar graph, student groups will repeat the process again with the paper loops. This time link the loops together to make chains. Each chain will make a bar. Position or hang the bars in a visible area to produce the bar graph. The same process can be modified for a circle graph. Instead, all students work together to make a circle graph. Each group will make a chain to represent their item value and link their chain with another group. The last group will link their chain to the first group and produce a circle. The circle should show different color representations of the item values. To make a line graph, students can independently graph the items value on inch graph paper.

Teaching Aids/ Materials Needed for Activity:

- construction paper
- scissors
- glue
- graph paper with 1-inch squares
- crayons or markers
- pencil

Vocabulary:

•Statistics - a branch of mathematics used to collect, analyze, interpret and present data.
•Data - a statistical measurement and may have many forms
•Pictograph - data is compared through pictures or symbols and a key is provided to let us know the value of or quantity for each symbol
•Key - on a pictograph tells us how many each picture stands for
•Symbol - A pattern or image used instead of words
•Estimate - A close guess of the actual value, usually with some thought or calculation involved
•Bar graph - can have vertical or horizontal bars and uses a scale to measure data
•Line graph - helps visualize the relationship between two quantities
•Vertical - means up and down
•Horizontal - left to right

Other Resources (Websites, Books, etc.)

http://mathlearnnc.sharpschool.com/UserFiles/Servers/Server_4507209/File/Instructional%20Resources/G4V2BL2.pdf

Notes:

Reading and Interpreting Pictographs, Bar Graphs, and Line Graphs

Overview, Purpose and Objective:

The purpose of this lesson is to explore three types of graphs; bar graphs, line graphs, and pie graphs.

Prior Knowledge Needed:

The student should know:

- the difference between a pictograph, bar graph, line graph, and pie graph
- how to read and interpret a key

Lesson Details:

In this Explore the student is shown a data table showing colors and a numerical value next to each color. The student has the option of changing from a bar graph to a line graph or a pie graph. He/she may also add a title, change any portion of the given data, and choose they type of display that would best fit the data.

Check for Understanding:

The students should explore and discuss the various types of graphs shown.

- Is the student able to decide which type of graph would best represent the given data?
- Is one type of graph always better than another?

Additional Activity (Independent/ group activity to reinforce lesson):

Small groups of students should create a survey question to ask 20 students at lunch. They would then display their data on graph paper or large chart paper in the form of bar graph, line graph and a pie graph if time permits. Students will then use the Explore activity on the computer, enter their data, and check the computer results with their hand-drawn graphs.

Teaching Aids/ Materials Needed for Activity:

- paper and pencil
- graph paper and/or large chart paper
- markers

Other Resources (Websites, Books, etc.)

www.commoncoresheets.com/BarGraphs.php

www.kidsmathgamesonline.com/numbers/mathdata.html

Notes:

Ascend Math Teacher Guide

6271

Mean, Median, Mode and Range

Overview, Purpose and Objective:

The purpose of this lesson is to explore the mean, median, mode and range of a list of numbers.

Prior Knowledge Needed:

The student should know:

- the definitions of mean, median, mode, and range
- how to calculate the mean, median, mode and range
- how to create and read a line plot

Lesson Details:

As the student begins the Explore, he/she is instructed to create a list of numbers. As the list is created, the computer organizes the data from least to greatest and calculates the mean, median, mode and range. Additionally the data is displayed in a line plot. Students may create additional lists of varying lengths and the data will be calculated and displayed.

Check for Understanding:

Students should discuss and share the following:

- What are some real-life examples of when to use each type of central tendency?
- How do you find the mean, median, mode, and range from a given line plot?

Additional Activity (Independent/ group activity to reinforce lesson):

Groups of students can create a survey question, involving numbers to ask 20 of their classmates during lunch. For example: How many pets do you have? How many hours a week do you spend on homework? Each group will calculate the mean, median, mode and range. On the large chart paper they will create a line plot of the data. Students can exchange chart papers and calculate the mean, median, mode and range from the line plot.

Teaching Aids/ Materials Needed for Activity:

- chart paper
- colored markers

Vocabulary:

Other Resources (Websites, Books, etc.)

www.kidsmathgamesonline.com/numbers/meanmedianmode.html
www.commoncoresheets.com/MMMR.php
www.math-aids.com/Mean_Mode_Median

Notes:

Ascend Math Teacher Guide

6289.1

Plotting Points on a Coordinate Grid

Overview, Purpose and Objective:

The purpose of this lesson is to understand the details of the coordinate grid, the 4 quadrants, and how to plot points on the coordinate grid.

Prior Knowledge Needed:

The student should:

- Understand how to move along a coordinate grid

Lesson Details:

Work through the coordinate grid notes and practice worksheet with students. Have them shade the parts of the coordinate grid accordingly. Work with students to plot points A and B then have them practice plotting points C, D, and E. Check their work. Work with students to locate the panda and monkey, then have them locate the remainder of the animals at the zoo. Stress that, just like x comes before y in the alphabet, the x-coordinate comes before the y-coordinate in an ordered pair. Likewise, we also move along the x-axis first, then the y-axis second.

Check for Understanding:

Students should discuss and answer the following questions:

- When plotting points, do I first move left/right or up/down? Why?
- If a point lies on the x- or y-axis, is it in a quadrant?

Additional Activity (Independent/group activity to reinforce lesson):

Have students work with a partner to draw shapes at locations along the coordinate grid, then have their partner identify the location of the shapes. Give each other directions such as, “Draw a red square at the point (3, -4)”. Students get choice for placement of shapes and directions, then work together to answer each other’s questions.

Teaching Aids/Materials Needed for Activity:

- Coordinate Grid notes and practice worksheet
- Blank coordinate grids and colored pencils for additional activity

Vocabulary:

- coordinate grid
- y-axis
- origin
- x-axis
- quadrants
- ordered pair

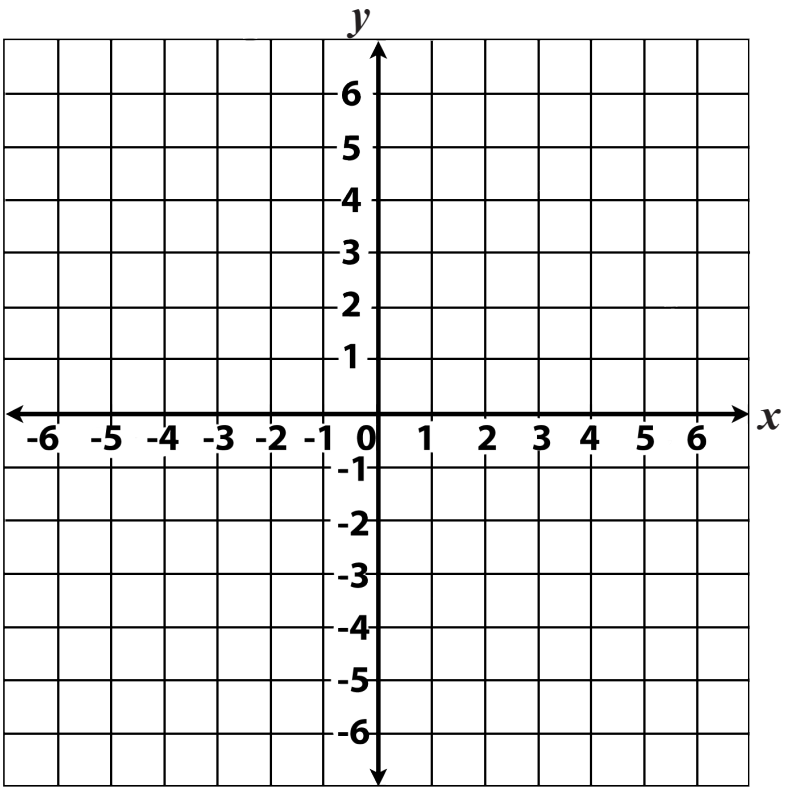
Notes:

Understanding the Coordinate Plane

A _____ is a grid containing two _____

_____ that intersect in a _____ angle at ____. The number lines, called the

_____ and _____, divide the plane into four _____.



- Use a purple colored pencil to trace the x-axis.
- Use a brown colored pencil to trace the y-axis.
- Draw a red dot at the origin (coordinates (0,0))
- Shade Quadrant I orange.
- Shade Quadrant II yellow.
- Shade Quadrant III green.
- Shade Quadrant IV blue.

Plotting Points on a Coordinate Plane

Plot the points below on the coordinate plane to the right.

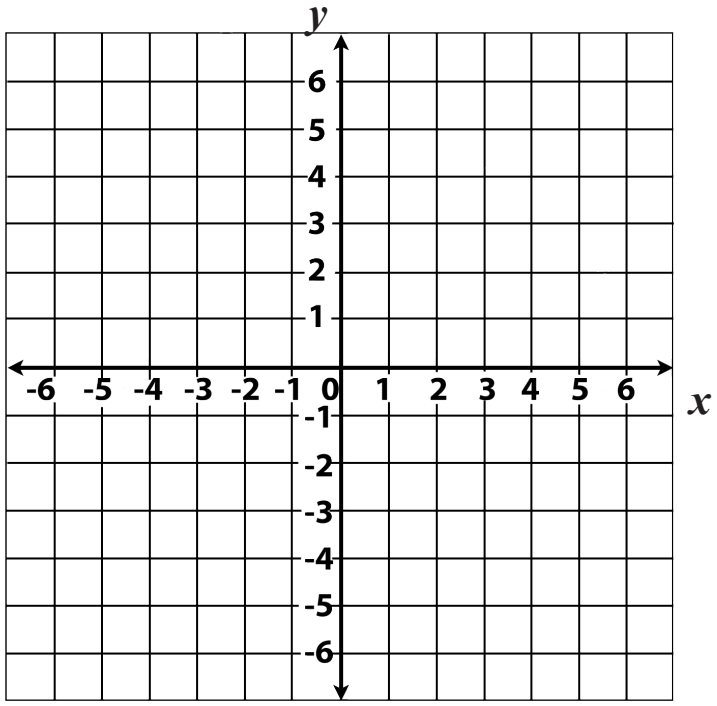
A (4, 2)

B (-3, 5)

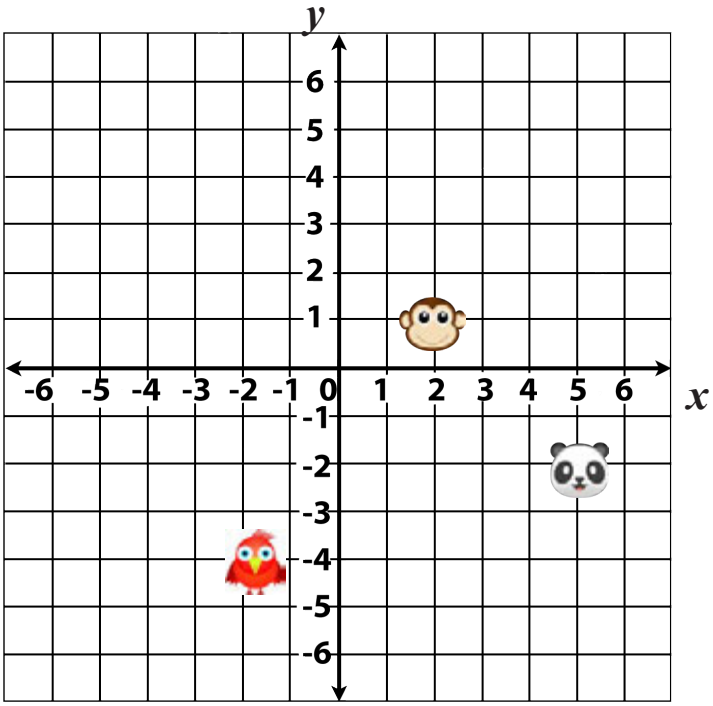
C (2, -1)

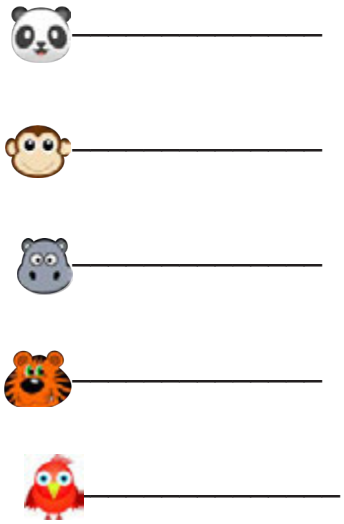
D (-1, -3)

E (0, -5)



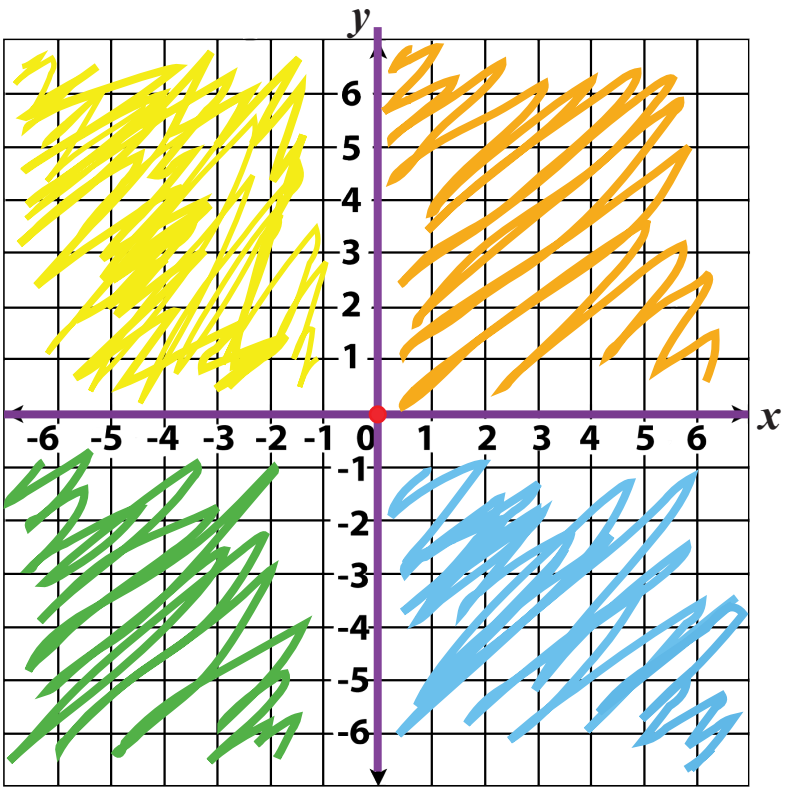
Write the location of each animal at the zoon by giving its coordinates.





Understanding the Coordinate Plane

A coordinate grid is a grid containing two axes that intersect in a right angle at the origin. The number lines, called the x-axis and y-axis, divide the plane into four quadrants.



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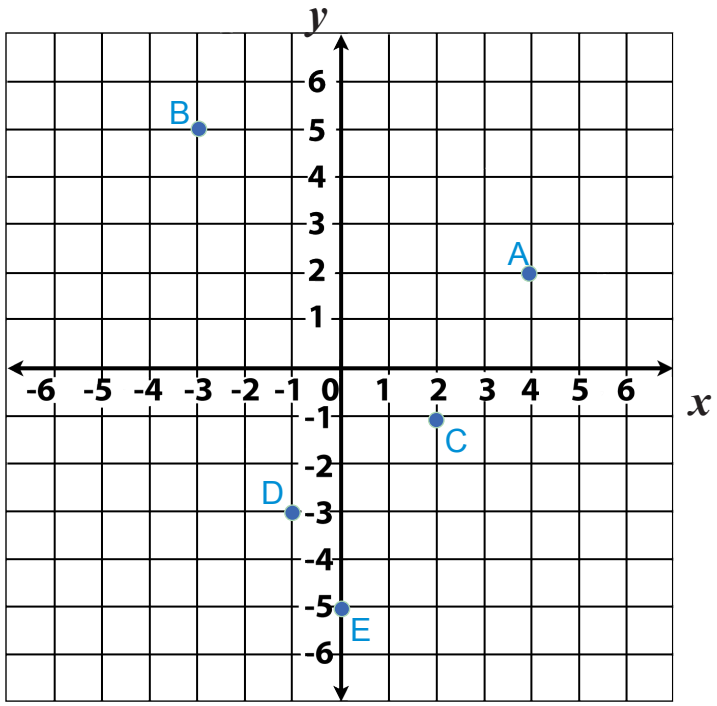
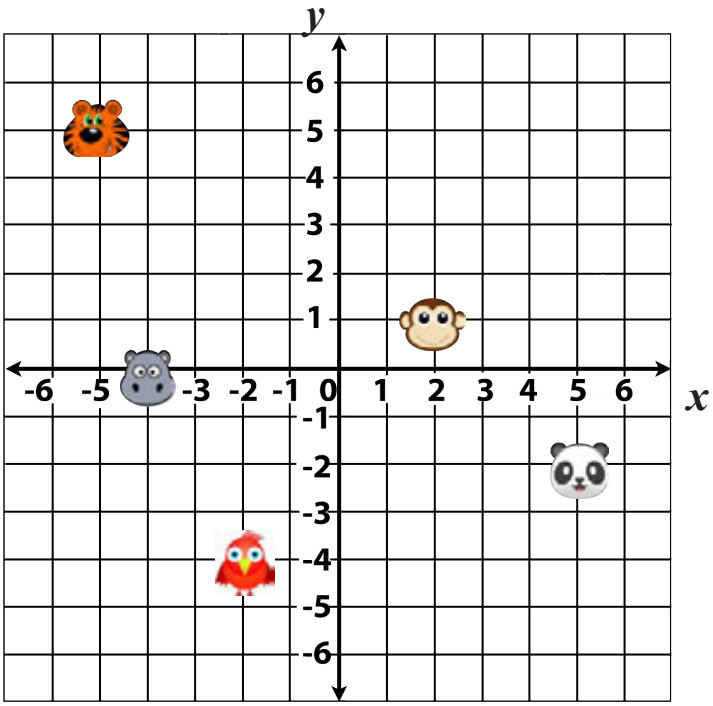
C (2, -1)

D (-1, -3)

E (0, -5)



Write the location of each animal at the zoon by giving its coordinates.



 (5, -2)

 (2, 1)

 (-4, 0)

 (-5, 5)

 (-2, -4)

Ascend Math Teacher Guide

7290

Comparing Numbers in the Real World on a Number Line

Overview, Purpose and Objective:

The purpose of this lesson is to investigate the relationship between positive and negative numbers on a number line.

Prior Knowledge Needed:

The student should:
•Understand the terms-greater than, less than, number line, positive number, negative number, opposites
•Have a working knowledge of number lines.

Lesson Details:

As the student begins the Explore item, a number line is presented. The number line represents the numbers negative ten through positive ten, with only -10, 0, and +10 labeled. The student is given two numbers (purple) and asked to drag them to their correct spots on the number line. The student cannot proceed until he/she places the numbers in their correct position. Once the student completes this part of the task, he/she moves on to the second step. The student is asked to click on the number that is greater. When this has been accomplished, the student is able to move on to a new Explore item.

Check for Understanding:

Students should discuss and answer the following questions: How can a number line help in comparing two numbers? What are some real-world situations where this skill would be helpful? On a horizontal number line, do the numbers increase or decrease as you move further to the right of zero? Discuss possible mis-conceptions/common errors.

Additional Activity (Independent/ group activity to reinforce lesson):

Number Line Construction: With teacher guidance, students will use graph paper and pencils to create their own number lines. Each student will draw a line on the graph paper to represent their number line. Near the center of the line, they will mark and label zero. Using the grid for accuracy, each student will mark and label his or her number line, starting with positive one and negative one (making sure each number is exactly the exact distance away from zero. The student will continue this process, extending and labeling his/her number line as far as space/time allows.

Teaching Aids/ Materials Needed for Activity:

•graph paper
•pencils

Vocabulary:

Other Resources (Websites, Books, etc.)

http://www.corestandards.org/Math/Content/6/NS/

Notes:

Ascend Math Teacher Guide

7333

Writing and Solving Linear Equations

Overview, Purpose and Objective:

The purpose of this lesson is to understand how to write and solve multi-step linear equations.

Prior Knowledge Needed:

The student should:
• Understand the terms-equation, inverse operations, variable, variable term, constant term.
• Have a working knowledge of using inverse operations to solve one- and two-step equations.

Lesson Details:

The first question on the study guide and video says: A 14-foot board is to be cut into 2 pieces so that one piece is 2 feet longer than the other. How long should each piece be? Prior to showing this question to students, give them the following statement: A 14-foot board is to be cut into 2 pieces. Then ask them to complete a think-pair-share of the following questions. (Think-pair-share is a cooperative learning strategy where students first think of the answer themselves, then discuss with a partner, then share out with the whole class; see template in appendix.) What do you notice about this statement? What do you wonder? {Students might notice that the total length will always be 14 feet. They may even start to list pairs of lengths, i.e. 1 and 13, 2 and 12, 3 and 11, etc.} After discussing what students notice and wonder, add the rest of the sentence: so that one piece is 2 feet longer than the other. Ask students to, in pairs, refine what they wrote down before to now fit the new information. Then ask the final question to students, How long should each piece be? Have students discuss.

Exploration: The exploration section has students identify which operation students need to complete in order to solve for the given variable. The goal of the exploration is to have students solve the equations in as few steps as possible. Students should complete the process of solving an equation using inverse operations with precision. Students who struggle with this process of using inverse operations to solve for a given variable can use the flow chart provided on the second page of the study guide to assist them. Please note the use of this flow chart should be scaffolded and students should eventually be able to perform inverse operations without this process guide.

Check for Understanding:

Students should discuss and answer the following questions when asked to write a two-step equation: What do you notice about this question? What do you wonder? Does my equation make sense in the context of the problem? Students should discuss and answer the following questions when asked to solve a multi-step equation in the Exploration: Can I combine like terms on either side of the equation? What is my constant term? What are my variable term(s)? Does my answer work when I plug it back into the original equation?

Additional Activity (Independent/ group activity to reinforce lesson):

Solving multi-step equations using algebra tiles: With teacher guidance, students will algebra tiles to set up and solve each step of a multi-step equation. See Additional Activity worksheet in appendix.

Teaching Aids/ Materials Needed for Activity:

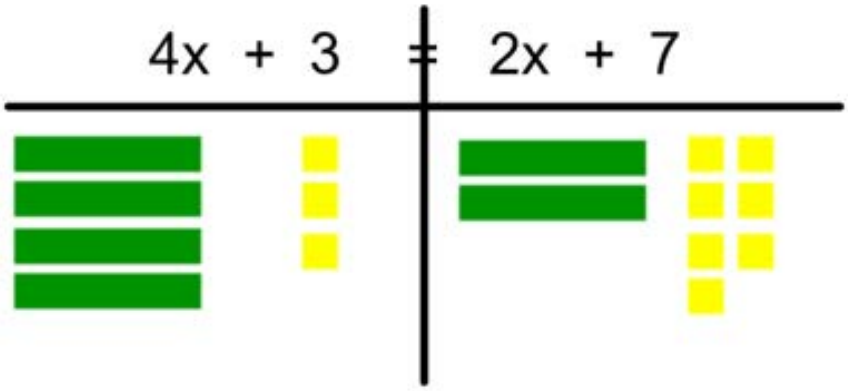
•Flow chart process guide on page 2 of the study guide
•Algebra tiles
•Think-View-Share explanation from appendix
•Additional Activity worksheet from appendix or download from the link in Other Resources

Vocabulary:

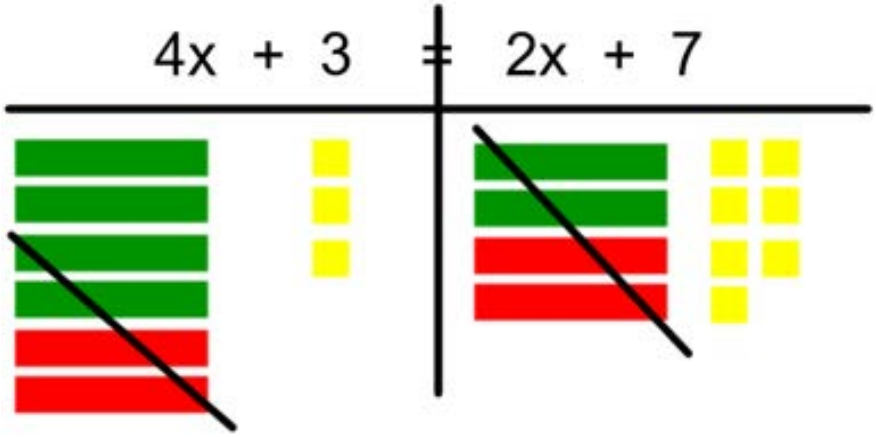
•equation
•variable
•term
•variable term
•constant term
•inverse operations

Other Resources (Websites, Books, etc.)

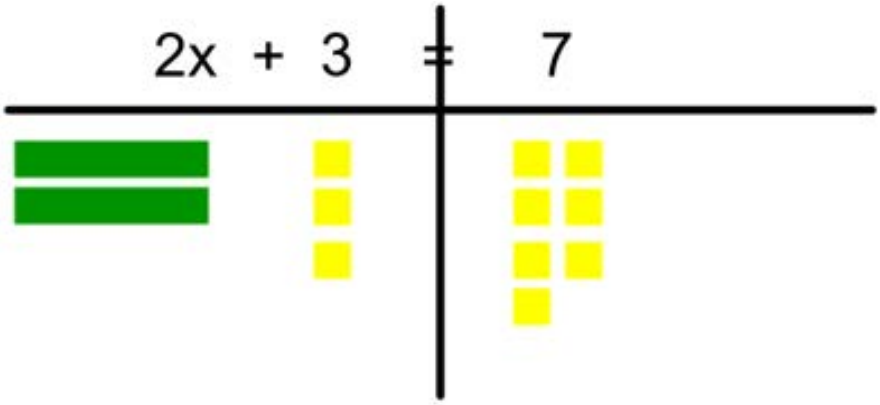
http://ascendmath.com/PDFs/Ascend-Math-Think-View-Share.pdf
Ascend Math Solving Multi-Step Equations Using Algebra Tiles



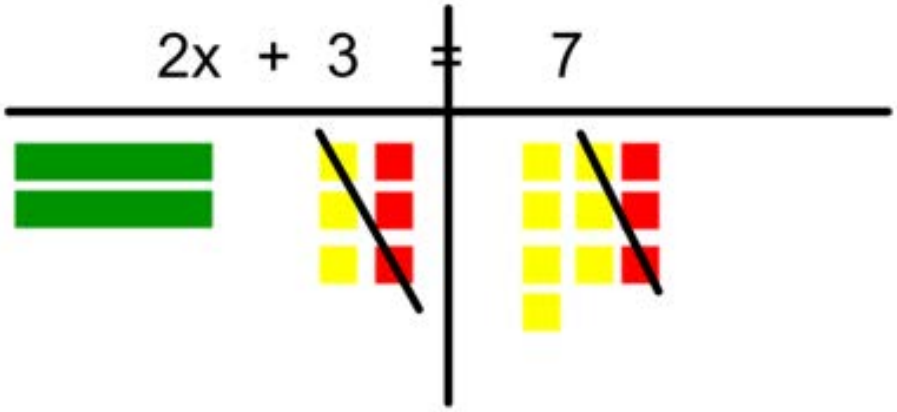
Step 1: Set up the problem with Algebra Tiles



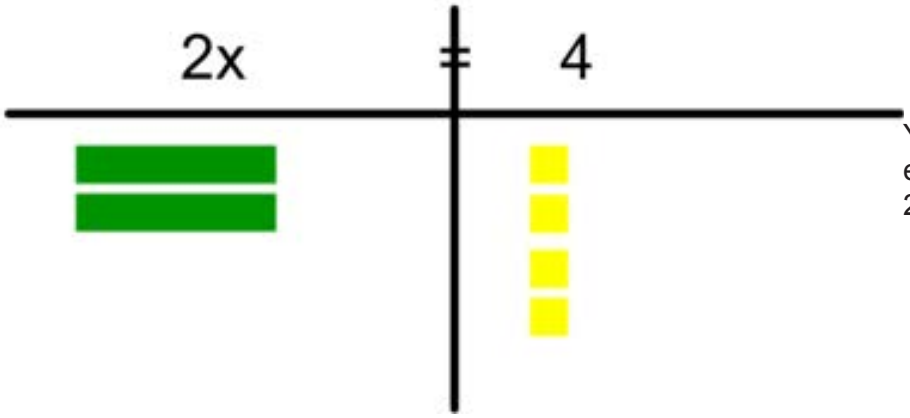
Step 2: Form zero pairs ($2x$) on the right side to cancel out the variable term. Do the same on the left side.



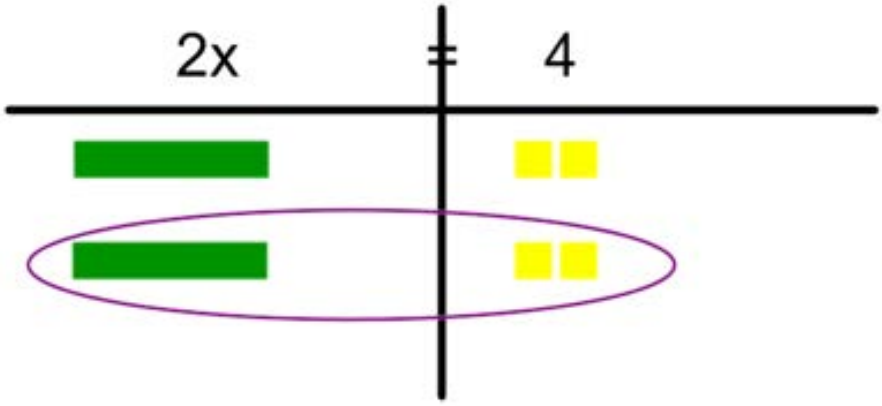
Your new equation is $2x + 3 = 7$



Step 3: Form zero pairs (+3) on the left side to cancel out the constant term. Do the same on the right side.



Your new equation is $2x = 4$



Step 4: Equally divide your variable tiles on the left with your constant tiles on the right.

Your solution is $1x = 2$; or $x = 2$

Ascend Math Teacher Guide

8352

Intercepts

Overview, Purpose and Objective:

The purpose of this lesson is to graph a linear line by evaluating the x- intercept and y-intercept.

Prior Knowledge Needed:

The student should know how to read and graph:

•linear lines •slope-intercept form •point-slope form
•standard form •points on a coordinate plane

Lesson Details:

The explore starts with instructions that read, “Drag the dots or type in a number to change the X or Y intercepts.” Students are given a coordinate plane that they can adjust the x- and y- intercepts. Students have the option to display the slope-intercept form, point-slope form, and standard form in either decimal or fraction notation. Once students alter the x- and y- intercepts the three equations are adjusted to correlate with the graph. The students can view and explore many graphs.

Check for Understanding:

Students should discuss and answer the following questions/topics:

- Identify the x- and y- axis on a coordinate plane.
- How does graphing a linear line by using the x- and y- intercepts, slope-intercept form, point-slope form, and stand form all relate?
- How do you find the x- and y- intercepts from an equation?
- How do you graph and label the x- and y- intercepts on a coordinate plane?

Additional Activity (Independent/ group activity to reinforce lesson):

Graphing with Chalk: A group of two students will create a large coordinate plane outside using chalk. Label the x- and y-axis and label each axis from -5 to 5. Pairs will work together to evaluate the x- and y- intercepts with a problems given. On their coordinate grid they will become human points that represent the x- and y- intercepts. Students will draw a linear line connecting their human points. Pairs will continue to graph 4-8 problems on their coordinate plane.

Teaching Aids/ Materials Needed for Activity:

•Chalk
•paper/pencil
•4-8 problems to solve for each pair of students

Vocabulary:

Other Resources (Websites, Books, etc.)

http://www.quia.com/rr/49074.html

Notes:

Ascend Math Teacher Guide

8362

Slope-Intercept Form of a Line

Overview, Purpose and Objective:

The purpose of this lesson is to understand slope-intercept form of a line.

Prior Knowledge Needed:

The student should:

* Know how to isolate a variable (y) using inverse operations.
* Have a working knowledge of how to graph on a 4-quadrant coordinate grid.

Lesson Details:

The exploration allows students to manipulate a line, varying its slope, y-intercept, and/or a point on the line then identify the equation of that line in slope-intercept, point-slope, and standard form. Students may need support writing an equation in slope-intercept form when the line is provided in standard form. Instruct students on how to isolate the variable y in order to write a line in slope-intercept form. Provide students with graph paper with 4-quadrant grids. Instruct students to graph a specific line, $y = 4x - 2$, for example, on their graph paper. Have students then graph the same equation using the explore feature of Ascend and compare their answer to the one on the computer. Also provide students with a given slope and y-intercept and instruct them to write the equation in slope-intercept form, and graph the line. Again, have students complete the problem online and compare their answer to the one on the Explore section of Ascend.

Check for Understanding:

Students should discuss and answer the following questions:

•When an equation is written in slope-intercept form, which variable represents the slope? The y-intercept?

•What do the variables x and y represent?

•What are the steps you take to rewrite an equation in slope-intercept form?

Additional Activity (Independent/group activity to reinforce lesson):

Students can work with a partner to complete the following activity. Provide the student pair with several problems where the slope and y-intercept are provided. For the first problem, partner A will use the information to write the equation in slope-intercept form. Partner B will graph that equation. Students will switch for problem 2 and continue until all problems are complete.

Teaching Aids/Materials Needed for Activity:

•Coordinate grid graph paper

Vocabulary:

•slope

•y-intercept

•slope-intercept form of a line

•standard form of a line

Notes:

Ascend Math Teacher Guide

8382

Using the Vertical Line Test

Overview, Purpose and Objective:

The purpose of this lesson is to determine if a given graph represents a function using the vertical line test.

Prior Knowledge Needed:

The student should:

- Understand how to plot an ordered pair.
- Have a working knowledge of how to graph a line on a 4-quadrant coordinate grid.

Lesson Details:

A function is defined as a special relationship where each input has a single output. Students should understand that the input is represented by the variable x, and an output is represented by the variable y. This means that in a given set of points, the x variables cannot repeat values. Provide students with 6 ordered pairs. Have them predict whether or not those ordered pairs will represent a function. Then have students type the ordered pairs into the explore feature in Ascend and use the given vertical line to determine if they represent a function. Make sure to have students discuss their predictions then their actual findings so they can understand the relationship between ordered pairs that represent a function as compared to those that do not.

Check for Understanding:

Students should discuss and answer the following questions:

- When given a graph, how do you know if the line represents a function?
- When given a set of ordered pairs, how do you know if they represent a function?
- What is the difference between a linear and a non-linear function?

Additional Activity (Independent/ group activity to reinforce lesson):

Students work in pairs or small groups to complete this activity. Students cut out and glue together the cube in the cube template. Students should also have a coin. Tell students that heads represents a function and tails represents not a function. Have student A roll the cube and flip a coin without anyone else seeing. Student A would then create whatever they rolled/flipped and present this problem to their partner or other members of their group. The other members would then decide if this represents a function or is not a function. Students will then continue rotating turns as time allots.

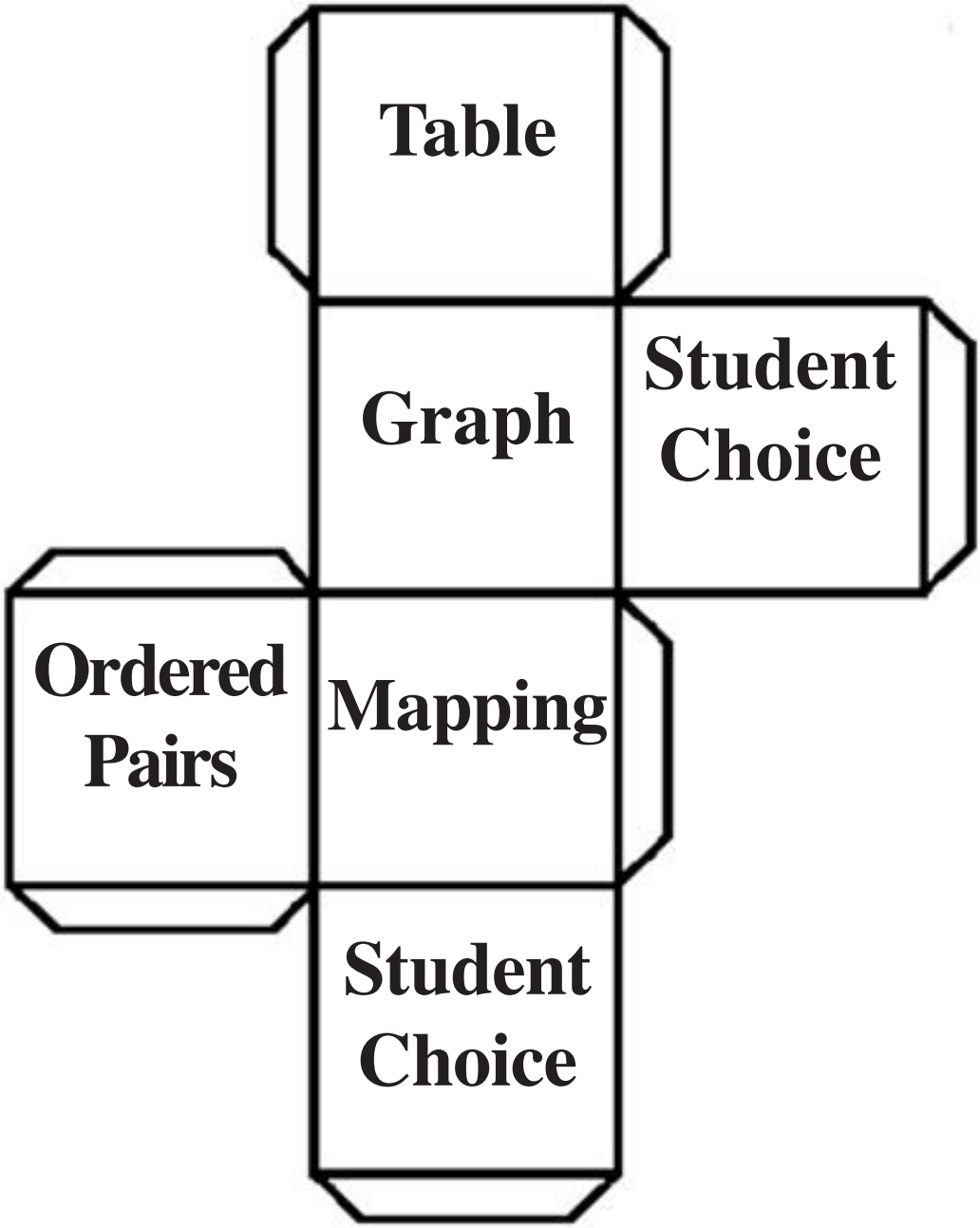
Teaching Aids/ Materials Needed for Activity:

- cube template
- coin

Vocabulary:

- function
- relation
- input
- output
- vertical line test

Notes:



Ascend Math Teacher Guide

A02_02_02

Adding Real Numbers

Overview, Purpose and Objective:

The purpose of this lesson is to find the sum of real numbers using the number line.

Prior Knowledge Needed:

The student should know:

- the term addends
- how to read a number line for the sum

Lesson Details:

As the student begins the explore, the directions say to represent the sum by dragging the addends to the number line. After the student drags the first addend to the number line, he/she drags the second addend from the end of the first addend where the sum is represented. The student then enters the sum in the box below the vertical addition problem. The student then clicks check to verify their answer followed by new. The student can continue to practice several problems.

Check for Understanding:

- Is the student able to identify the addends and the sum in a given problem?
- Is the student able to predict what will happen if a negative number is added to a given number?
- Is the student able to formulate any rules regarding adding real numbers?

Additional Activity (Independent/ group activity to reinforce lesson):

Using large chart paper or a white board, have students create a large number line from -10 to 10. If making the number line on paper, have students cut it out so it can be used for several problems. Apply the same procedure as was in the Explore, but now apply negative numbers. For example, 8 + (-3). Students should use markers to draw an arrow from 0 to 8 and a second arrow starting from 8 and going left 3 spaces toward the negative numbers. The sum of the numbers is shown at the end of the second arrow. Continue working several problems until students can formulate some rules.

Teaching Aids/ Materials Needed for Activity:

- large chart paper and markers or access to a white board

Vocabulary:

Other Resources (Websites, Books, etc.)

jamesbrennan.org/algebra/numbers/addition_and_subtraction_of_real.htm
www.math-drills.com/numberlineworksheets.shtml

Notes:

Ascend Math Teacher Guide

A02_04_01

Multiplying Real Numbers

Overview, Purpose and Objective:

The purpose of this lesson is to multiply real numbers with like and unlike signs.

Prior Knowledge Needed:

The student should know how to:

- multiply all positive real numbers
- substitute numbers into variables and evaluate expressions
- evaluate exponents

Lesson Details:

The explore activity starts with instructions that read, " Drag the dots to change the product." The explore shows a 10 by 10 grid. The student can adjust what is shaded in the grid by moving the green and red squares in the upper and lower corners of the shaded region. Moving the red block adjusts the vertical shaded units and moving the green block adjusts the horizontal shaded units. When the student alters the 10 by 10 grid the explore changes the product sentence that aligns with the shaded units. For instance if the 10 by 10 grid is shaded 3 by 2. The explore shows the product of 3 and 2. The commutative property is given $3 \times 2 = 2 \times 3 = 6$.

Check for Understanding:

Students should discuss and answer the following questions/topics:
Explain why multiplying two negative numbers has the product of a positive number. What are some real life examples that involve using the product of negative and positive numbers? What are the rules for multiplying a real number expression with more than two terms?

Additional Activity (Independent/ group activity to reinforce lesson):

Integer War: Create groups of two. Each pair will be handed a deck of cards. Red cards represent negative numbers and black cards represent positive numbers. Face cards will also have values, Ace=1 or -1, Jack= 11 or -11, Queen= 12 or -12, and King= 13 or -13. The group will separate the deck so each player has the same number of cards. The game will begin with each player flipping two cards from their pile of cards. Each player will multiply their cards together, whoever has the highest value from that round wins a point. The players can put the used cards to the side and continue playing. The player that reaches 10 points first wins.

Teaching Aids/ Materials Needed for Activity:

- deck of cards for each pair of students
- pencil/paper

Vocabulary:

Other Resources (Websites, Books, etc.)

http://primarygamesarena.com/Multiplying-Negative-Numbers410

Notes:

Ascend Math Teacher Guide

A02_05_01

Dividing Real Numbers

Overview, Purpose and Objective:

The purpose of this lesson is to understand the rules for dividing real numbers.

Prior Knowledge Needed:

The student should:

- Understand the term real number.
- Have a working knowledge of basic division facts.

Lesson Details:

Students should create a foldable as outlined in the link below. Students can use this foldable while dividing real numbers until they commit the rules to memory. Students should use the foldable while working through the exploration and practice problems on the Ascend objective. If students are struggling with their basic division skills, they should utilize the flash card math section on their home screen. Students can set a timer and log how many problems they can correctly answer in the given time. They could complete 3 trials then take their best score.

Check for Understanding:

Students should discuss and answer the following questions:

- How are multiplication and division similar?
- When two signs are the same, the answer will always be...?
- When two signs are different, the answer will always be...?

Additional Activity (Independent/group activity to reinforce lesson):

Provide students with a deck of cards. Number cards represent the numbers outlined on the card. Face cards are represented as follows: A = 20, K = 30, Q = 42, J = 48
Instruct students that red cards represent negative integers and black cards represent positive integers. Students flip over two cards. If the values can be divided, students complete that problem on their white boards acknowledging the integer signs (red and black cards) as necessary. If the values cannot be divided, students multiply the values following the same integer rules. Students continue until all cards are used.

Teaching Aids/Materials Needed for Activity:

- Deck of cards
- white boards
- dry erase markers
- erasers
- foldable description worksheet

Vocabulary:

- real number
- integer

Other Resources (Websites, Books, etc.)

Foldable description worksheet

Notes:

Students begin by making a ‘hamburger’ fold that leaves about 1 inch at the bottom showing. Label outside folds as shown below:

Same Signs	Different Signs

Dividing Real Numbers

Students should copy and fill in the inside of their foldable as shown below:

Rule: When you divide integers with the <u>same sign</u>, the answer is always _____. Example:	Rule: When you divide integers with the <u>different sign</u>, the answer is always _____. Example:

Dividing Real Numbers

The teacher should provide examples for the students.

Ascend Math Teacher Guide

A05_03_01

Geometric Formulas

Overview, Purpose and Objective:

The purpose of this lesson is to use geometric formulas or concepts to solve applications.

Prior Knowledge Needed:

The student should:
•Understand the terms-area, perimeter.
•Have a working knowledge of geometrical shapes and basic formulas.

Lesson Details:

As the student begins the Explore item, a grid is shown with height and base labeled as such. A purple square is shown on the grid, measuring 5x5. This figure is called the active figure. The active figure's base and height are shown beside the grid. The active figure's perimeter and area are also shown. The active figure can be resized by typing in a new number for the height and/or base. When new measurements are entered, the active figure automatically changes shape. The perimeter and area become updated as well. Additionally, the active figure can be manipulated by dragging the mouse over the shape to make it taller or wider. The active figure can be "frozen" by clicking freeze. A second figure can then be created from the active figure. The second figure's base, height, perimeter, and area are now shown next to the frozen figure. Once the student completes the simulation he/she can move on to the practice problems.

Check for Understanding:

Students should discuss and answer the following questions:
•How can you determine if two angles are complements?
•Why do the perimeter and area change when the base and/or the height change?
•Can the area and the perimeter of a shape ever be the same number?
•Discuss possible misconceptions/common errors.

Additional Activity (Independent/ group activity to reinforce lesson):

I'm a Decorator!: With teacher guidance, students split in to small groups. Explain to the students that their classroom needs re-carpeting and repainting, and that together as a class, they will decide what to do. 1. Instruct each class to pick a color combination for walls/floor. 2. Ask the students how they will decide how much paint and carpet to purchase. 3. Students will work together using geometric formulas and measuring tools to find out how much material they need to purchase. 4. Students may present their findings to the teacher/class when complete. ***This activity may be taken a step further by incorporating advertisements for paint and carpet. Students can use their area measurements to figure out the actual cost of the supplies they need.

Teaching Aids/ Materials Needed for Activity:

•Tape measures •rulers
•paper •pencils
(Optional: imaginary or actual advertisements for paint and carpet)

Vocabulary:

Other Resources (Websites, Books, etc.)

http://www.corestandards.org/Math/Content/8/G/

Notes:

Ascend Math Teacher Guide

H500

Applications: Proportions

Overview, Purpose and Objective:

The purpose of this lesson is to investigate proportional relationships.

Prior Knowledge Needed:

The student should:
* Understand the terms-ratio; proportion; equivalent; fraction
* Have a working knowledge of cross-multiplication, simplifying and equivalent fractions.

Lesson Details:

The first question on the study guide is also the first question on the video: Jane wants to enlarge a photograph. The rectangular photograph has a width of 4 inches and a length of 6 inches. If the enlargement has a width of 18 inches, how long will it be if proportions are maintained? Consider chunking this word problem for students and providing them with graph paper to draw a picture to represent the problem and their thinking. Inform students that, on the graph paper, one square represents one inch in this problem. To chunk the word problem, begin by just telling students that Jane wants to enlarge a photograph. The rectangular photograph has a width of 4 inches and a length of 6 inches. Ask students to draw this photograph on their graph paper. Continue to tell students more about the problem therefore scaffolding the solving of this word problem.
In the exploration, the students are first asked to set up a proportion by dragging the dimensions into the correct parts of a proportion. Once students do this correctly, the computer automatically sets them up to use cross multiplication to solve the proportion. Ask students to first consider if there is an easier way to solve this proportion. [In the first example students set up the proportion $11/z = 33/12$. This proportion can easily be solved by demonstrating that $11 \times 3 = 33$ therefore $z \times 3$ will equal 12. Students should be allowed to use this strategy as well as cross multiply and divide.

Check for Understanding:

Students should discuss and answer the following questions:
- What does it mean to enlarge a photograph?
- What does it mean for proportions to be maintained?
- How are proportions similar to equivalent fractions? How are they different?
- How do you cross multiply and divide a proportion?

Students must understand that if one quantity in a ratio is multiplied or divided by a factor, then the other quantity must be multiplied or divided by the same factor to maintain the proportional relationship.

Additional Activity (Independent/group activity to reinforce lesson):

Students can use cuisenaire rods or unifix cubes to model proportional relationships. The teacher can pose a relationship, e.g. “in a bag of candy, there are 3 red candies for every 5 yellow candies”. Students can model this relationship using the cuisenaire rods or unifix cubes (concrete). Students can then create a table to record their equivalent ratios. For example, 6 red candies for every 10 yellow candies, and so on. The teacher can continue asking students to model the relationships with manipulatives and record the equivalent ratios in a table until he/she feels the students can move on to drawing the picture (representational). Eventually we want to move all students to using multiplication of the same factor or cross multiplication as a strategy to solve (abstract).

Teaching Aids/Materials Needed for Activity:

Graph paper
cuisenaire rods
unifix cubes

Vocabulary:

•Proportion
•Proportional relationship
•Equivalent

Other Resources (Websites, Books, etc.)

https://www.nctm.org/Publications/Mathematics-Teaching-in-Middle-School/Blog/Playing-with-Proportions/

Notes: