ALPHA PLUS

TEACHER'S GUIDE

Math 4

SUCCESS with OAS

Oklahoma Academic Standards

TEACHER'S GUIDE

SUCCESS with OAS

Math 4

Ensuring Student Success
with
Oklahoma Academic Standards

Written by Oklahoma Teachers for Oklahoma Teachers

Aarti Hartfield

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SUCCESS with OAS

Aarti Hartfield graduated from SWOSU with a B.A. in Elementary Education in 2009. She landed her first teaching job as a 3rd grade teacher, and went on to teach 4th grade for six years, while pursuing her master's. In 2015, Aarti graduated from SWOSU with a master's degree in Elementary Administration. She is currently working as an instructional coach who mentors teachers to efficiently implement instructional practices and strategies.

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FOREWORD

Adopted in 2016 by the State Board of Education, the Oklahoma Academic Standards (OAS) mathematics objectives are measurably more rigorous in content and different in terms of vertical alignment than previous curriculum frameworks.

Immediately, Alpha Plus Educational Systems sought highly qualified teachers to develop a teaching and learning resource specifically aligned to the new standards. CEO Jan Barrick also enlisted my help and that of Dr. Frank Wang, President of the Oklahoma School of Science and Mathematics (OSSM), who is a nationally known, accomplished mathematics educator and an experienced textbook publisher. It has been my pleasure to help ensure the content is of high quality and will provide a solid mathematical foundation.

Written by Oklahoma teachers for Oklahoma teachers, the *Success with OAS: Alpha Plus Mathematics* series provides a robust set of resources relating mathematical skills to the real world of Oklahoma students.

-- Edna McDuffie Manning, *EdD., Mathematics*
Founder and President Emerita, Oklahoma School of Science and Mathematics

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INTRODUCTION

The *Success with OAS: Alpha Plus Mathematics* framework for instruction, independent student work, and continuous review will prepare students for comprehensive assessments at each grade level. Following is a summary addressing the most effective way to use each element.

Teacher's Guide

Objective Statement: At the beginning of each lesson, the OAS objective is stated as adopted. This is helpful when writing lesson plans and understanding the focus of the lesson.

Real-World Connections: Students must be engaged and must relate the concept to their daily lives. Connecting to a real-world application taps into students' prior knowledge and shows the practicality behind the concept. It is suggested that the teacher start with a relevant, age-appropriate game, class discussion, website or video, role-play, or other group activity. This will illustrate the need to learn the skill so that students can use it in their daily lives.

Vocabulary: A list of vocabulary words critical to each OAS Objective is provided, particularly those used in the state's *Test and Item Specifications*. A complete vocabulary definition can be found in the student workbook and in the comprehensive Glossary at the end of the book.

Modeling: The Modeling section provides step-by-step instructions for one or more ways to teach the objective and the skills related to the lesson. Teachers may use this to direct students and add more examples or details as needed for the teachers' lesson plans.

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Extension Activities: This is a list of possible resources to enhance the objective lesson. Every author provided links to tools they use in class, to online content available at no charge for teacher use, and to other lesson-planning resources.

Answer Key: Every Teacher's Guide includes a complete Answer Key for each assessment item in the student workbook. The Answer Key for the Continuous Review designates what objectives are assessed.

Comprehensive Examination: A Comprehensive Examination was developed to resemble the state assessment and encompasses every objective taught. It can be used as a pre-test and post-test for the school year to better prepare students for state-mandated tests. The Answer Key provides the answers with objective numbers.

Student Workbook

Objective Statement: At the beginning of each student lesson is the objective statement. It clearly defines the focus of the lesson.

Real-World Connections: Written in age-appropriate language, this section reminds students of prior knowledge they have on the topic and how they might use this skill in their daily lives. Relevance is essential to student engagement in the lesson. Teachers can highlight this scenario for the students with a game, role-play, or other group activity.

Vocabulary: Each lesson includes a vocabulary list with definitions for the words the students will encounter on state assessments. Students should also learn to use the Glossary in the back of the book.

Guided Practice: Every objective lesson includes a Guided Practice, which is a set of items available for use in class as part of, or after, instruction. The ten practice problems reflect every skill students will use when they work independently.

Independent Practice: The Independent Practice is a series of twenty questions and activities the student may do independently, either in the classroom or for homework. The Independent Practice can also be used for reinforcement or review as needed.

Continuous Review: At the end of each lesson, there is a Continuous Review with ten questions covering objectives taught previously in the book or aligned to key skills from previous grade level(s). The Answer Key designates the objective each question assesses. The Continuous Review is in sequence after each objective lesson or can be used as a weekly assessment to reinforce past skills.

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4.GM.1.3 Given two three-dimensional shapes, identify similarities, and differences.

Real-World Connections

Students will be able to compare and contrast the characteristics of two different three-dimensional shapes by counting the number of faces, vertices, and edges. Discussion of three-dimensional objects could start with "3D" movies, virtual-reality gaming systems, etc.

Vocabulary

solid figure, face, vertex (vertices), base, edge

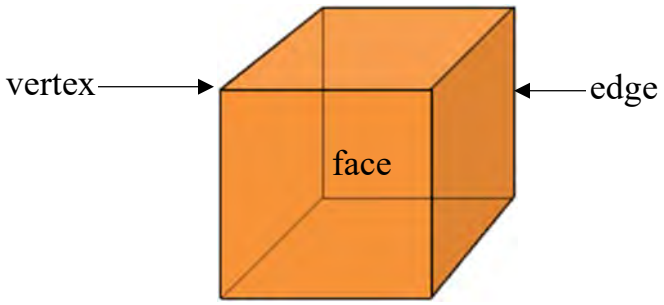
Modeling

Step 1: Discuss three-dimensional shapes.

A three-dimensional shape has length, width, and depth, and takes up space. The cylinder, sphere, triangular pyramid, rectangular prism, cube, and triangular prism are all examples of a three-dimensional shapes.

Step 2: Discuss attributes of a three-dimensional of a cube.

A solid figure or space figure is a shape that is not flat but has volume. A cube is a solid figure. Some examples of cubes are building blocks, ice cubes, and a box. A cube is made up of squares. The flat part of the square is the **face**. A cube has 6 faces. The line where two faces meet is called an **edge**. A cube has 12 edges. The point or corner where three faces meet is the **vertex**. A cube has 8 vertices.



Step 3: Discuss attributes of various three-dimensional figures.

See chart on the next page.

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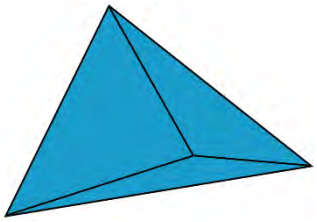
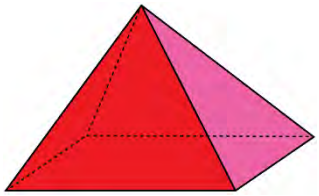
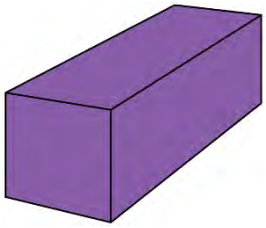
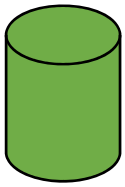
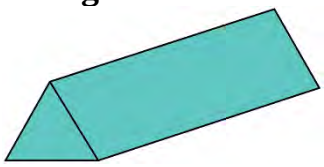
Solid Figure	Faces/Base	Edges	Vertices
Triangular Pyramid 	**4**	**6**	**4**
Rectangular Pyramid 	**5**	**8**	**5**
Rectangular Prism 	**6**	**12**	**8**
Cylinder 	**2**	**0**	**0**
Triangular Prism 	**5**	**9**	**6**

Step 4: Discuss congruent.

When you compare items and they are the same, they are known to be **congruent**. Congruent means you have two identical or same shapes that are the same size.

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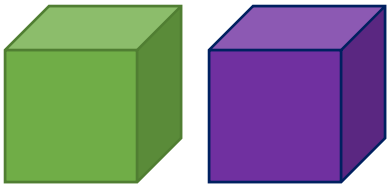
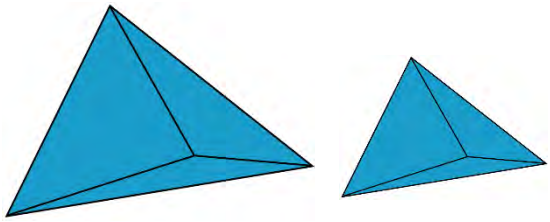


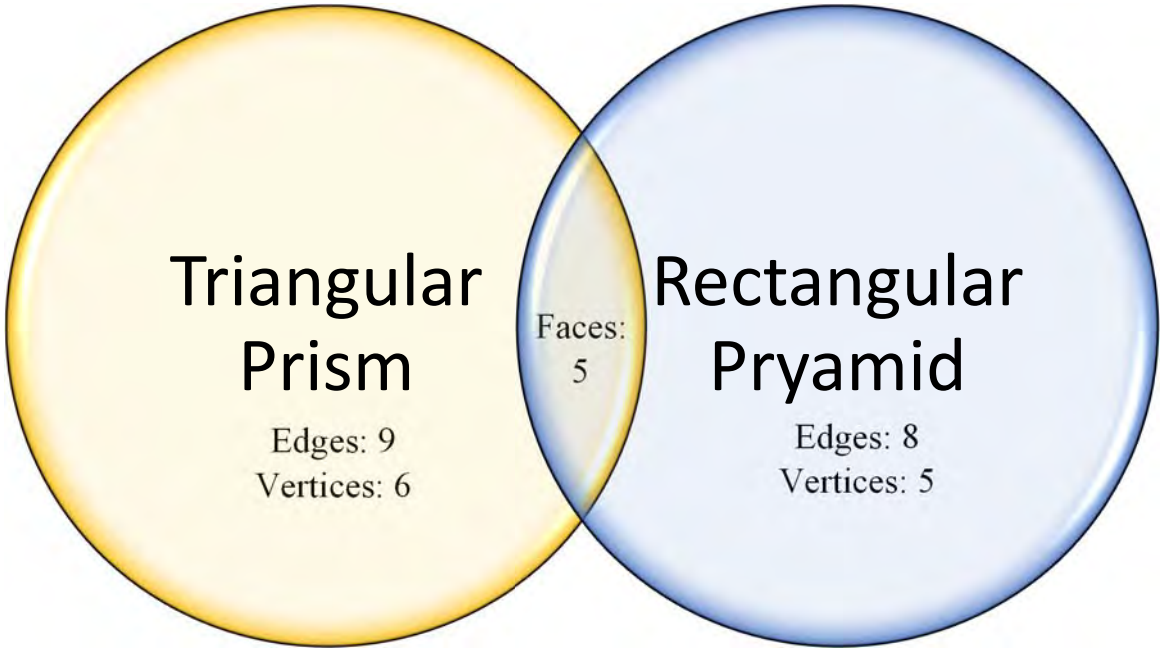
The two cubes are congruent. They both have the same size and same shape. They do not have to have the same color.



These shapes are not congruent. They are the same shape but are not the same size.

Step 5: Discuss Venn-diagrams

A way to compare two or more objects is to use a Venn-Diagram



In the Venn-diagram above you are comparing a triangular prism with a rectangular pyramid. The triangular prism had 9 edges and 6 vertices. The rectangular pyramid has 8 edges and 5 vertices. They both have 5 faces. When comparing like objects, what they have in common is places in the middle of the diagram where the two circles overlap.

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Extension Activities

Create a matching sort for a center using the different number vertices, bases and edges matching to the shapes.

This YouTube® song can be used as an introduction for the lesson to hook students.

https://www.youtube.com/watch?v=uZ8Jy1xgqPU

Oklahoma State Department of Education objective analysis of 4.GM.1.3:

http://okmathframework.pbworks.com/w/page/112172368/4-GM-1-3

Use models to represent and explain mathematical concepts, go to:

http://www.insidemathematics.org/assets/common-core-math-tasks/how%20many%20cubes.pdf

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Answer Key 4.GM.1.3

Guided Practice

1. 6, 4
2. 6,12
3. 0, 0
4. 2, 0, 0
5. 5, 6
6. Congruent, same size
7. Not Congruent, not same size
8. Congruent, same size and same shape
9. Rectangular prism: 6 faces, 12 edges, 8 vertices
   Rectangular pyramid: 5 faces, 8 edges, 5 vertices
10. 0

Independent Practice

1. Rectangular prism
2. Triangular prism
3. Sphere
4. A cylinder has 2 faces (see students' answers)
5. Rectangular pyramid
6. No, they are not the same shape
7. 12 edges
8. 8 vertices
9. C
10. B
11. False
12. False
13. True
14. True
15. False
16. Triangular Pyramid
17. Rectangular Prism
18. Cylinder
19. Triangular Prism
20. Sphere

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Answer Key 4.GM.1.3

Continuous Review

1. (4.GM.1.2) Trapezoid
2. (4.GM.1.2) Square, rectangle, parallelogram, rhombus
3. (4.GM.1.2) Rectangle, parallelogram
4. (4.GM.1.2) C
5. (4.GM.1.2) D
6. (4.GM.1.1) Parallel lines
7. (4.GM.1.1) Acute angle
8. (4.GM.1.1) Line segment
9. (3.GM.3.2) $5.00
10. (3.GM.2.6) 52°F

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Guided Practice Name: _____

4.GM.1.3 Given two three-dimensional shapes, identify similarities, and differences.

Real-World Connections

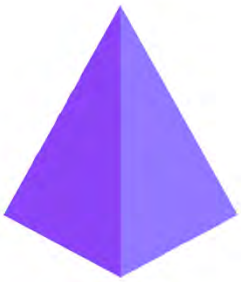
What is the difference between 2D and 3D movies? When you look at a flat surface, such as an interactive whiteboard, T.V., photographs, or book pages, you are seeing examples of "2D," or two-dimensional, objects. However, when you can pick up an object, or you see an image that seems to jump out of a movie, those are examples of "3D," or three-dimensional, objects. Have you ever gone to a 3D movie that seems to come to life or makes you feel like you are riding a roller coaster, or dodging a T-Rex? That is called a 3D effect.

Vocabulary

solid figure	a three-dimensional shape classified by its length, height, and width
face	any flat surface of a solid
vertex	where three or more faces meet in a solid figure, or the point of a cone (plural: vertices)
base	a face on which the figure sits
edge	a line segment where two faces meet
congruent	the same shape and size

Examples

Triangular Pyramid



4 faces, 6 edges, 4 vertices

Rectangular Prism

6 faces, 12 edges, 8 vertices

Sphere

0 faces, 0 edges, 0 vertices

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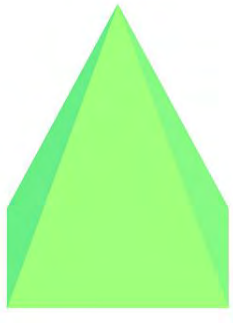
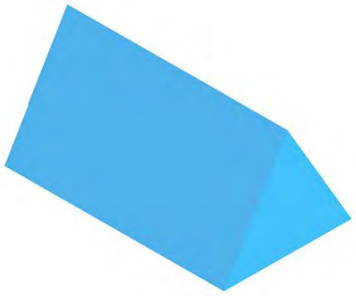
Guided Practice (4.GM.1.3) Name: _____

Rectangular Pyramid



5 faces, 8 edges, 5 vertices

Triangular Prism



5 faces, 9 edges, 6 vertices

Cylinder

2 circular bases

Figures are "congruent" if they have the same size and same shape.

Here is an example of congruent figures:

The following figures are not congruent:

Although these are the same shape, they are not the same size.

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Guided Practice (4.GM.1.3) Name: _____

For questions 1 through 5, complete the following table.

	Solid Figure	Faces/Base	Edges	Vertices
1.	**Triangular Pyramid**	**4**		
2.	**Rectangular Prism**			**8**
3.	**Sphere**		**0**	
4.	**Cylinder**			
5.	**Triangular Prism**		**9**	

6. Are these figures congruent? Why or why not?

_____

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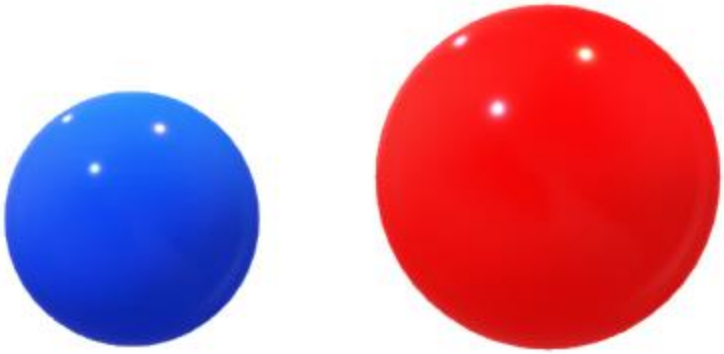
Guided Practice (4.GM.1.3) Name: _____

Are these figures congruent? Why or why not?

7.



_____

8.

_____

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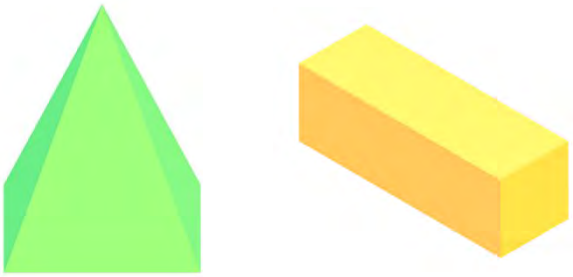
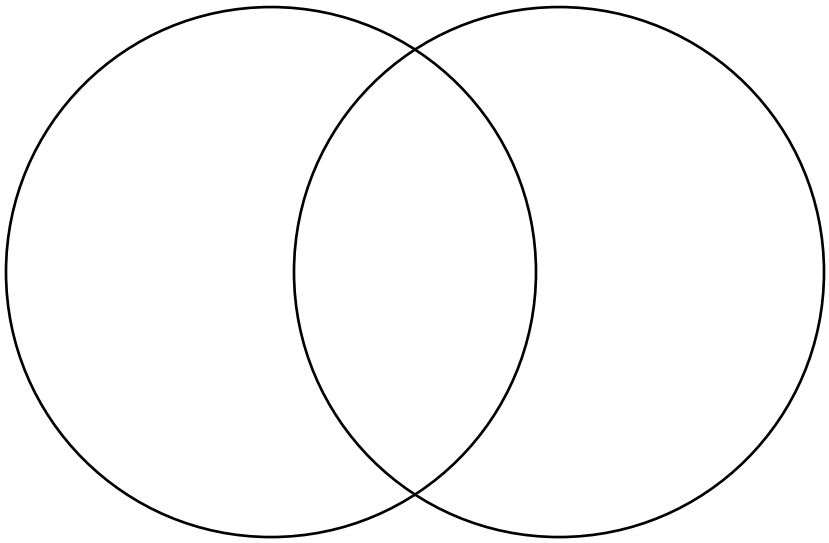
Guided Practice (4.GM.1.3) Name: _____

Answer the following questions.

9. What is the difference between a rectangular pyramid and rectangular prism? Use the Venn diagram to illustrate.





10. How many bases does a sphere have? _____

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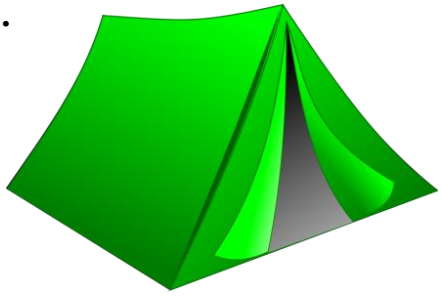
Independent Practice Name: _____

4.GM.1.3 Given two three-dimensional shapes, identify similarities, and differences.

For questions 1 through 3, identify each solid figure.

1. 

_____

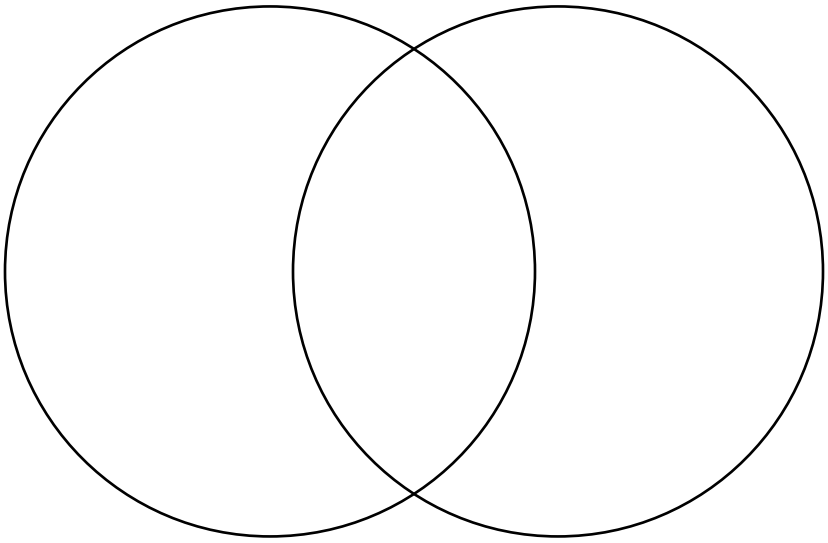
2. 

_____

3. 

_____

4. What is the difference between a cylinder and a sphere? Use the Venn diagram to illustrate.



5. Which solid figure has four triangular faces and one rectangular face?

_____

6. Are a triangular prism and a rectangular prism congruent? Why or why not?

_____

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Independent Practice (4.GM.1.3) Name: _____

For questions 7 and 8, use the rectangular prism shown.

7. How many edges does the rectangular prism have?

_____

8. To build a box, or a rectangular prism, that is congruent to the one pictured, how many vertices would it have?

_____

For questions 9 and 10, circle the correct answer to the question.

9. How many vertices does a rectangular pyramid have?

   A 3 vertices

   B 4 vertices

   C 5 vertices

   D 6 vertices

10. How many edges does a triangular pyramid have?

   A 4 edges

   B 6 edges

   C 8 edges

   D 10 edges

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Independent Practice (4.GM.1.3) Name: _____

For questions 11 through 15, tell whether the statement is True or False.

11. _____ A sphere has one face.

12. _____ A cylinder has one edge.

13. _____ A rectangular prism has 12 edges.

14. _____ A triangular pyramid has 4 vertices.

15. _____ A rectangular pyramid has 8 faces.

For questions 16 through 20, identify the figure using the geometric name.

Figure Name	Faces/ Base	Edges	Vertices
16.	**4**	**6**	**4**
17.	**6**	**12**	**8**
18.	**2**	**0**	**0**
19.	**5**	**9**	**6**
20.	**0**	**0**	**0**

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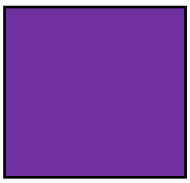
Continuous Review (4.GM.1.3) Name: _____

For questions 1 through 3, classify each quadrilateral with as many names as possible.

1. _____



2. _____

3. _____

On questions 4 and 5, choose the best answer.

4. Which of the following does NOT belong in the group?

   A Trapezoid

   B Rhombus

   C Cube

   D Quadrilateral

5. Which quadrilateral always has right angles?

   A Square

   B Rhombus

   C Rectangle

   D Both A and C

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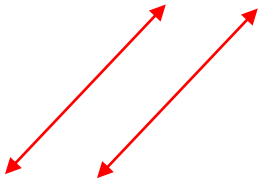
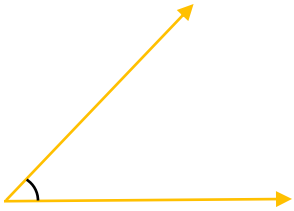
Continuous Review (4.GM.1.3) Name: _____

For questions 6 through 8, use geometric terms to describe the shape.

6. Use geometric terms to describe the shape _____



7. Use geometric terms to describe the shape _____



8. Use geometric terms to describe the shape

_____

Calculate the answers for questions 9 and 10.

9. Maggie bought a hamburger for $3.50 and a soda for $1.50. How much did she spend for her lunch?

_____

10. The temperature was 84°F when Jamie got home. It was 32°F cooler when she left for school that morning. What was the temperature when Jamie went to school?

_____

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OAS Mathematics Glossary 4th Grade

A

acute angle: has a measure of less than a right angle; it is open less than 90º
addends: are the digits in an addition problem that are being added
angle: two rays connected with a common endpoint called a vertex
angle ruler: similar to a protractor and is used to measure and draw angles
area: the number of square units needed to cover a region or a figure; the area is the inside area of a polygon; the formula is length × width = area

B

bar graph: a graph that displays data using different heights of bars
base: a face on which the figure sits
benchmark fractions: fractions that are easy to visualize or represent, such as, $\frac{1}{4}$, $\frac{1}{3}$, $\frac{1}{2}$, $\frac{2}{3}$, and $\frac{3}{4}$

C

centimeters: a measure of length; it is part of the metric system of measurement, which is followed around the world
change: the money that you get back when you've paid for something with more money than it actually costs
common factor: a factor that is divisible in the numerator and denominator greater than 1
concrete model: another way to show how to represent an equation using physical objects
congruent: the same shape and size
commutative property: numbers can be added or multiplied in any order
counting up method: is used to calculate the change received during a purchase; it is a backwards way of thinking
cubic units: a measure of volume; it is equal to the volume of a cube, which is 1 unit tall, 1 unit wide, and 1 unit long
customary capacity: the volume of a container measured in liquid units, such as cup (c), pint (pt), quart (qt), and gallon (gal)
customary length: is used to determine how long something is, such as inches (in), foot (ft), yards (yd), and miles (mi)

D

data: information that is collected

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decimal: a fraction written in a special form; instead of saying 1/2, or half; a decimal is written as 0.5
decompose: to break into smaller pieces
degree Fahrenheit (ºF): the customary unit of temperature
degrees Celsius (ºC): the metric unit of temperature
degrees: the term to use for measuring angles; the symbol º means degrees
denominator: the bottom number of the fraction, which shows how many total parts the whole has been divided into
distributive property: multiplying a number is the same as multiplying its addends by the number, then adding the products
dividend: the number being divided
divisor: a number by which another number is divided

E

edge: a line segment where 2 faces meet
elapsed time: the amount of time that passes from the start to the end of an event
equality: the state of being equal
equation: the problem sentence that is given to solve for a numerical pattern
equivalent expression: the equal state of two expressions using the properties of operations
equivalent fractions: fractions that name the same part of the whole by changing both the size and the number of parts of a given fraction
estimation: an answer that is closest to the exact answer
expanded form: a multi-digit number that is written as a sum of single-digit multiples of powers of ten

F

face: any flat surface of a solid
fact family: a group of related facts using the same numbers
factors: the numbers that are multiplied together in a multiplication problem to find the product
fraction: a number that expresses parts of a whole or a set
frequency chart: a way to organize a set of data that shows the number of times each item or number appears
function machine: another form of an input/output model that shows one number entering and a different number exiting based on a single rule

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G

geometric pattern: a pattern that is repeated using geometric shapes, like wallpaper or wrapping paper
geometric shape: a shape made up of a set of points or vertices and lines connecting the points in a closed chain, as well as the resulting interior points
greater than: means more than and uses the symbol >

H

hour: unit of time that equals 60 minutes
hour hand: the short arrow on an analog clock that shows what hour the time is on
hundredth: one part in one hundred equal parts; it is the second digit to the right of the decimal point

I

inches: a measure of length; it is a customary unit of measure, which is used in the United States
input/output table/chart: a table that shows how a value changes according to a rule
inverse operations: operations that undo each other

K

kite: has two pairs of congruent lines and two pairs of parallel lines

L

lattice multiplication: the process in which multi-digits can be multiplied together using a lattice grid
less than: means less than and uses the symbol <
line plot: a vertical graph that uses X's above a number line to show data
line segment: a part of a line with two endpoints
line(s): a straight path of points that goes on forever in two directions

M

mass: the amount of matter that something contains, such as gram (g) and kilogram (kg)
metric capacity: the volume of a container measured in liquid units, such as milliliter (mL) and liter (L)
metric length: used to measure length, such as millimeter (mm), centimeter (cm), meter (m), and kilometer (km)

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minute: unit of time that equals 60 seconds or 1/60th of an hour
minute hand: the short arrow on an analog clock that shows what minute the time is on
money: a measure of value or a form of payment represented using digits, decimal place values, and a decimal point
multiple: the product of any two whole numbers

N

non-equivalent expression: the non-equal state of two expressions
number line: a line in which numbers are marked
number sentence: a mathematical sentence written in numerals and mathematical symbols
numerator: the top number of the fraction and represents how many parts we have
numerical patterns: a sequence or arrangement with some rule that determines the next term in the sequence

O

obtuse angle: a measure of greater than a right angle; it is open more than 90°, but less than 180°
operation: a general term used to describe the process of addition, subtraction, multiplication, or division in a math problem
order of operations: the rules to use when solving a problem that has more than one operation
outlier: an item of data that lies outside of the main group of the data

P

parallel lines: two line segments that stay the same distance apart and never intersect
parallelogram: has 2 pairs of parallel sides and opposite sides are equal and parallel; parallelogram has no right angles.
perpendicular lines: line segments that cross each other to form square corners
pictorial model: a way to show an equation using pictures
place value: the value given to a digit by its place in any given number
point: an exact location in space
product: the answer to any type of multiplication problem
protractor: a tool that is used to measure and draw angles

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Q

quadrilateral: a polygon with 4 sides and 4 corners
quotient: the answer in a division problem

R

ray: has one endpoint and goes on forever in only one other direction
real-world situation: a connection between a mathematical problem and a real-life situation
rectangle: has 4 sides and 4 right angles; opposite sides of the rectangle are equal and parallel; a rectangle is also a parallelogram
remainder: the "leftover" amount that cannot be divided by the divisor
rhombus: has opposite sides that are parallel and all of its sides are the same length; a rhombus does not have right angles; also, includes any parallelogram with equal sides, including a square
right angle: forms a square corner and measures 90°
rounding: finding the nearest value of a number based on a given place value
rule: the problem sentence that is given to solve for a numerical pattern
ruler: a tool used to measure the length of an object in centimeters or inches

S

scale: the equally spaced marks along a graph
second: unit of time that equals $1/60^{th}$ of a minute
simplest form: a fraction in which the numerator and denominator have no common factor greater than 1
solid figure: a three-dimensional shape classified by its length, height, width
square: has 4 equal sides and 4 right angles; it also has 2 pairs of equal parallel lines.; a square is also a rectangle, parallelogram, and rhombus
square units: a square that is used to measure area; the sides are a given unit of length
standard form: a way to write numbers using the digits zero through nine including many different numeric symbols
straight angle: forms a straight line and has a measure of 180°
survey: a collection of data that answers a question or a set of questions; it can be anonymous

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T

table: a set of data that is arranged in rows and columns
tally chart: a record of counting by making a mark for each item counted and placed in a chart or graphic organizer
tenth: one part in ten equal parts; it is also the first digit to the right of the decimal point
timeline: a representation of key events in chronological order
trapezoid: has 1 pair of parallel lines

U

unknowns: are letters that represent a number that you do not know or an unknown quantity

V

variables: are non-numerical representations that fill in the place for unknown numbers
Venn diagram: a diagram that uses circles that overlap to organize and show data
vertex: where 3 or more faces meet in a solid figure, or the point of a cone (plural: vertices)
volume: the number of cubic units needed to fill a solid figure ($l \times w \times h$)

W

weight: how heavy an object is, such as ounce (oz), pound (lb), and ton (T)
wide division: a strategy to use to solve division problems, instead of long division
word form: a number written out in words to represent the value of the digits
word problem: a math problem presented as a scenario in text form with a variety of number sentences

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