North Caldwell Mathematics

Grade Level: 6

Contents

Instructional Materials

Connected Mathematics Project 3 (CMP3)
© Pearson 2012
http://dashweb.pearsoncmg.com/
https://connectedmath.msu.edu/

Supplemental Resources

- Illustrative Mathematics https://www.illustrativemathematics.org/
- Khan Academy https://www.khanacademy.org/
- National Council of Teachers of Mathematics http://www.nctm.org/
- National Library of Virtual Manipulatives http://nlvm.usu.edu/
- NCTM Illuminations Resources for Teaching Math http://illuminations.nctm.org/

Interdisciplinary Connections

Mathematics is a unified body of knowledge whose concepts build upon each other. Connecting mathematical concepts includes linking ideas to related ideas learned previously.

Major emphasis should be given to ideas and concepts across mathematical content areas that help students see that mathematics is a web of closely connected ideas. Students need to connect their mathematical learning to appropriate real-world contexts. They need to create interest and maintain the interest after the novelty of the work has worn off.

Mathematics is the language of science and is greatly utilized in industry and business. It gives us the power to solve difficult real-world problems, but also helps us to understand how the universe operates.

Every mathematics teacher needs to make students unafraid of the subject by convincing the students of the usefulness of learning mathematics in their daily lives and for higher studies. The world today, which leans more and more heavily on Science and Technology, demands more from mathematics. Tomorrow's world will, no doubt, make still greater demands from mathematics.

Interdisciplinary Connections for Grade 6

Covering & Surrounding

Language Arts/Science –

- Design an Aquarium – Unit Project

Comparing Bits & Pieces

Geography/Maps/Weather

- Extend the Number Line – Problem 3.1 E #1;
- Ace Question 24 – above/below sea level
- Ace Questions 16 – 19 temperatures

Science

- Microscope lens – Ace Question 93

Variables & Patterns

Physical Education

- Jumping Jacks – Problem 1.1

Social Studies/History

- Bike trip – Investigation 1

Business

- Income/Cost/Profit – Investigation 2

Construction

- Ace Question 42

New Jersey Student Learning Standards (NJSLS)

In Grade 6, instructional time should focus on four critical areas: (1) connecting ratio and rate to whole number multiplication and division and using concepts of ratio and rate to solve problems; (2) completing understanding of division of fractions and extending the notion of number to the system of rational numbers, which includes negative numbers; (3) writing, interpreting, and using expressions and equations; and (4) developing understanding of statistical thinking.

(1) Students use reasoning about multiplication and division to solve ratio and rate problems about quantities. By viewing equivalent ratios and rates as deriving from, and extending, pairs of rows (or columns) in the multiplication table, and by analyzing simple drawings that indicate the relative size of quantities, students connect their understanding of multiplication and division with ratios and rates. Thus students expand the scope of problems for which they can use multiplication and division to solve problems, and they connect ratios and fractions. Students solve a wide variety of problems involving ratios and rates.

(2) Students use the meaning of fractions, the meanings of multiplication and division, and the relationship between multiplication and division to understand and explain why the procedures for dividing fractions make sense. Students use these operations to solve problems. Students extend their previous understandings of number and the ordering of numbers to the full system of rational numbers, which includes negative rational numbers, and in particular negative integers. They reason about the order and absolute value of rational numbers and about the location of points in all four quadrants of the coordinate plane.

(3) Students understand the use of variables in mathematical expressions. They write expressions and equations that correspond to given situations, evaluate expressions, and use expressions and formulas to solve problems. Students understand that expressions in different forms can be equivalent, and they use the properties of operations to rewrite expressions in equivalent forms. Students know that the solutions of an equation are the values of the variables that make the equation true. Students use properties of operations and the idea of maintaining the equality of both sides of an equation to solve simple one-step equations. Students construct and analyze tables, such as tables of quantities that are in equivalent ratios, and they use equations (such as $3x = y$) to describe relationships between quantities.

(4) Building on and reinforcing their understanding of number, students begin to develop their ability to think statistically. Students recognize that a data distribution may not have a definite center and that different ways to measure center yield different values. The median measures center in the sense that it is roughly the middle value. The mean measures center in the sense that it is the value that each data point would take on if the total of the data values were redistributed equally, and also in the sense that it is a balance point. Students recognize that a measure of variability (interquartile range or mean absolute deviation) can also be useful for summarizing data because two very different sets of data can have the same mean and median yet be distinguished by their variability. Students learn to describe and summarize numerical data sets, identifying clusters, peaks, gaps, and symmetry, considering the context in which the data were collected.

Students in Grade 6 also build on their work with area in elementary school by reasoning about relationships among shapes to determine area, surface area, and volume. They find areas of right triangles, other triangles, and special quadrilaterals by decomposing these shapes, rearranging or removing pieces, and relating the shapes to rectangles. Using these methods, students discuss, develop, and justify formulas for areas of triangles and parallelograms. Students find areas of polygons and surface areas of prisms and pyramids by decomposing them into pieces whose area they can determine. They reason about right rectangular prisms with fractional side lengths to extend formulas for the volume of a right rectangular prism to fractional side lengths. They prepare for work on scale drawings and constructions in Grade 7 by drawing polygons in the coordinate plane.

Ratios and Proportional Relationships

Understand ratio concepts and use ratio reasoning to solve problems.

6.RP.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. *For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."*

6.RP.2 Understand the concept of a unit rate *a/b* associated with a ratio *a:b* with b ≠ 0, and use rate language in the context of a ratio relationship. *For example, "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is 3/4 cup of flour for each cup of sugar." "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger."*[1]

6.RP.3 Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.

- a. Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.
- b. Solve unit rate problems including those involving unit pricing and constant speed. *For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?*
- c. Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.
- d. Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.

[1] Expectations for unit rates in this grade are limited to non-complex fractions.

Understandings	Essential Questions
Students will understand that… • ratios compare two values. • unit rates are *a/b* given that the ratio is *a:b*, such that *b ≠ 0*.	• Why does one need to compare numbers? • When does one need to use ratios to compare numbers? • How can one compare and contrast numbers?

Knowledge	Skills
Students will know… • ratio language (the ratio of *a:b* means that there is *a* of something for every *b* of a corresponding item). • *a/b* is the same as *a:b* or *a to b*. • how to relate a percent of a quantity to a rate per 100.	Students will be able to... • use ratio language to describe a ratio relationship between two quantities. • use rate language in the context of a ratio relationship. • use ratio and rate reasoning to solve real-world and mathematical problems. • make a table of equivalent ratios relating quantities with whole-number measurements. • solve unit rate problems including those involving unit pricing and constant rate. • find a percent of a quantity as a rate per 100 and solve problems involving finding the whole, given a part or the percent. • use ratio reasoning to convert measurement units. • manipulate and transform units appropriately when multiplying or dividing quantities.

RESOURCES

- Comparing Bits and Pieces: Inv. 1, 2, 3, 4; Decimal OPS: Inv. 1, 4; Variables and Patterns Inv. 3, 4

The Number System

Apply and extend previous understandings of multiplication and division to divide fractions by fractions.

6.NS.1 Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, create a story context for (2/3) ÷ (3/4) and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that (2/3) ÷ (3/4) = 8/9 because 3/4 of 8/9 is 2/3.*
(In general, ***(a/b) ÷ (c/d) = ad/bc.)*** *How much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 3/4-cup servings are in 2/3 of a cup of yogurt? How wide is a rectangular strip of land with length 3/4 mi and area 1/2 square mi?*

Understandings	**Essential Questions**
Students will understand that… • the size of a factor impacts the size of the answer with respect to the other factor. • division by a rational number may result in a quotient whose value is bigger than, equal to, or smaller than the value of the dividend.	• What is represented by division of a fraction by a fraction? • What type of visual models can be used to represent division of fractions? • How are division and multiplication of a fraction by a fraction related?

Knowledge	**Skills**
Students will know… • multiplication with fractions represents part of a part. • division of a fraction by a <u>proper fraction</u> creates a larger answer. • multiplication of a fraction by a <u>proper fraction</u> creates a smaller answer.	Students will be able to... • compute quotients of fractions. • interpret quotients of fractions. • create a story context for division. • solve word problems involving division of fractions.

RESOURCES

- Let's Be Rational: Inv. 3, 4

The Number System

Compute fluently with multi-digit numbers and find common factors and multiples.

6.NS.2 Fluently divide **multi-digit numbers** using **the standard algorithm**.

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

6.NS.4 Find the **greatest common factor** of two whole numbers less than or equal to 100 and the **least common multiple** of two whole numbers less than or equal to 12. Use the **distributive property** to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor. *For example, express 36 + 8 as 4 (9 + 2).*

Understandings	Essential Questions
Students will understand that… • the proper operations and procedures must be determined in order to solve problems. • factors of a (whole) number are always less than or equal to the number itself. • multiples of a (whole) number are always greater than or equal to the number itself.	• Why would one need to find common factors and multiples? • In what situation would one want to use the distributive property to add two whole numbers? • What type(s) of problems require using multi-digit decimal operations?

Knowledge	Skills
Students will know… • the standard algorithm for division of multi-digit numbers • the standard algorithms for addition, subtraction, multiplication, and division of multi-digit decimals • the definition of a factor. • the process of finding a factor. • the definition of a multiple. • the process of finding a multiple. • how to find the prime factorization of a number. • how to factor out a number from the sum of two whole numbers	Students will be able to... • fluently divide using the standard algorithm. • fluently add multi-digit decimals using the standard algorithm. • fluently subtract multi-digit decimals using the standard algorithm. • fluently multiply multi-digit decimals using the standard algorithm. • fluently divide multi-digit decimals using the standard algorithm. • find the greatest common factor of two whole numbers less than or equal to 100 • find the least common multiple of two whole numbers less than or equal to 12. • use the distributive property to express a sum of two whole numbers 1-100 with a common factor as a multiple of the sum of two whole numbers with no common factor. *For example, express 36 + 8 as 4(9 + 2).*

RESOURCES

- Comparing Bits and Pieces: Inv. 1, 2, 3, 4; Let's Be Rational: Inv. 1, 2, 3, 4; Decimal OPS: Inv. 1, 2, 3, 4; Data About Us: Inv. 3; Prime Time: Inv. 2

The Number System

Apply and extend previous understandings of numbers to the system of rational numbers.

6.NS.5 Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.

6.NS.6 Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.

a. Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., –(–3) = 3, and that 0 is its own opposite.
b. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes.
c. Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.

6.NS.7 Understand ordering and absolute value of rational numbers.

a. Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. *For example, interpret –3 > –7 as a statement that –3 is located to the right of –7 on a number line oriented from left to right.*
b. Write, interpret, and explain statements of order for rational numbers in real-world contexts. *For example, write –3 ºC > –7 ºC to express the fact that –3 ºC is warmer than –7 ºC.*
c. Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. *For example, for an account balance of –30 dollars, write |–30| = 30 to describe the size of the debt in dollars.*
d. Distinguish comparisons of absolute value from statements about order. *For example, recognize that an account balance less than –30 dollars represents a debt greater than 30 dollars.*

6.NS.8 Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.

Understandings	Essential Questions
Students will understand that… • positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge). • a rational number is a point on the number line. • rational numbers on the number line are oriented from left to right • rational numbers have an order that exists related to their location on a number line. • the absolute value of a rational number is its distance from 0 on the number line. • the distance from a point on the coordinate system to the origin (0,0) is related to the absolute value of its x- and y-coordinates .	• What are some rational numbers around us? • What are some non-rational numbers around us? • How can ordering of rational numbers help to make sense of the world around us? • When is the absolute value of a rational number used in real life?
Knowledge	**Skills**

Students will know…	Students will be able to...
• opposite signs of numbers indicate locations on opposite sides of 0 on the number line. • the opposite of the opposite of a number is the number itself, e.g., –(–3) = 3, and that 0 is its own opposite. • signs of numbers in ordered pairs indicate locations in quadrants of the coordinate plane. • that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes. • how to find the absolute value of a rational number.	• use positive and negative numbers to represent quantities in real-world contexts. • explain the meaning of 0 in situations using positive and negative numbers. • extend number-line diagrams and coordinate axes to represent points on the line and in the plane with negative number coordinates. • find and position integers and other rational numbers on a horizontal or vertical number line diagram. • find and position pairs of integers and other rational numbers on a coordinate plane. • interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. *For example, interpret –3 > –7 as a statement that –3 is located to the right of –7 on a number line oriented from left to right.* • write, interpret, and explain statements of order for rational numbers in real-world contexts. *For example, write –3 °C > –7 °C to express the fact that –3 °C is warmer than –7 °C.* • interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. *For example, for an account balance of –30 dollars, write |–30| = 30 to describe the size of the debt in dollars.* • distinguish comparisons of absolute value from statements about order. *For example, recognize that an account balance less than –30 dollars represents a debt greater than 30 dollars.* • solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. • find distances between points with the same first coordinate or the same second coordinate, using coordinates and absolute value.

RESOURCES

- Comparing Bits and Pieces: Inv. 3; Let's Be Rational: Inv. 1; Variables and Patterns: Inv. 1, 2, 3, 4; Covering and Surrounding: Inv. 1

Expressions and Equations

Apply and extend previous understandings of arithmetic to algebraic expressions.

6.EE.1 Write and evaluate numerical expressions involving whole-number exponents.

6.EE.2 Write, read, and evaluate expressions in which letters stand for numbers.

a. Write expressions that record operations with numbers and with letters standing for numbers. *For example, express the calculation "Subtract y from 5" as 5 – y.*
b. Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity. *For example, describe the expression 2 (8 + 7) as a product of two factors; view (8 + 7) as both a single entity and a sum of two terms.*
c. Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). *For example, use the formulas* $V = s^3$ *and* $A = 6\ s^2$ *to find the volume and surface area of a cube with sides of length* $s = 1/2$.

6.EE.3 Apply the properties of operations to generate equivalent expressions. *For example, apply the distributive property to the expression 3 (2 + x) to produce the equivalent expression 6 + 3x; apply the distributive property to the expression 24x + 18y to produce the equivalent expression 6 (4x + 3y); apply properties of operations to y + y + y to produce the equivalent expression 3y.*

6.EE.4 Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). *For example, the expressions y + y + y and 3y are equivalent because they name the same number regardless of which number y stands for.*

Understandings	Essential Questions
Students will understand that… • algebraic expressions have letters that stand for numbers and arithmetic expressions have only numbers and no letters. • numbers can be substituted in place of letters in algebraic expressions • algebraic expressions can be equivalent to each other • area, perimeter, or volume formulas are algebraic expressions • that verbal sentences or expressions can be written as algebraic expressions	• How are mathematical expressions in which letters stand for numbers useful in real life? • What is the purpose of identifying equivalent expressions? • What is the difference between an algebraic expression and an arithmetic expression?

Knowledge	Skills
Students will know… • the definition of sum, term, product, factor, quotient, coefficient. • how to identify two algebraic expressions that are equivalent . • to apply the conventional order of operations when no parentheses are given. • how to apply the distributive property.	Students will be able to... • write numerical expressions involving whole-number exponents. • evaluate numerical expressions involving whole-number exponents. • write expressions in which letters stand for numbers. • read expressions in which letters stand for numbers. • evaluate expressions in which letters stand for numbers. • write expressions that record operations with numbers and with letters standing for numbers. • identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity. • evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). • apply the properties of operations to generate equivalent expressions. Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them).

RESOURCES
• Prime Time: Inv. 1, 2, 3, 4; Let’s Be Rational: Inv. 4; Covering and Surrounding: Inv. 1, 2, 3, 4; Decimal OPS: Inv. 2, 3; Variables and Patterns: Inv. 3, 4; Data About Us: Inv. 3

Expressions and Equations

Reason about and solve one-variable equations and inequalities.

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

6.EE.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.

6.EE.7 Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p, q and x are all nonnegative rational numbers.

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

Understandings	Essential Questions
Students will understand that… • solving an equation or inequality will find the value(s) that will make the statement true. • a variable can represent an unknown number. • a variable can represent any number in a specified set.	• What is the difference between an equation and an inequality? • What does it mean when a number does not satisfy an equation or inequality?

Knowledge	Skills
Students will know… • that a random number may not make an equation or inequality true. • that a variable in an equation or inequality represents an unknown number. • inequalities of the form $x > c$ or $x <$ c have infinitely many solutions. • that solutions of inequalities of form x>c or x<c can be represented as intervals on the number line. • that while inequalities may have infinitely many solutions, equations have a finite number of solutions.	Students will be able to... • use substitution to determine whether a given number in a specified set will make an equation or inequality true. • use variables to represent numbers • solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ for cases in which p, q and x are all nonnegative rational numbers. • solve real-world and mathematical problems by writing and solving equations of the form $px = q$ for cases in which p, q and x are all nonnegative rational numbers. • write inequality of the form $x > c$ or $x < c$ to represent a constraint or condition in a real-world or mathematical problem. • recognize that inequalities of the form $x > c$ or $x <$ c have infinitely many solutions • represent solutions of inequalities on number line diagrams

RESOURCES

- Let's Be Rational: Inv. 4; Variables and Patterns: Inv. 3, 4; Covering and Surrounding: Inv. 1, 2, 4

Expressions and Equations

6.EE.9 Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using **graphs and tables, and relate these to the equation**. *For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation d = 65t to represent the relationship between distance and time.*

Understandings	Essential Questions
Students will understand that… • quantities can change in relation to one another and the relationship can be expressed as an equation relating the two. • the value of one quantity determines the value of the second quantity. • two quantities may or may not be related.	• How is a relationship represented in tables? • How is a relationship represented in graphs? • How is a relationship represented in an equation? • How can one tell that there is a relationship between two quantities? • Why is it useful to write an equation to express one quantity in terms of another quantity?
Knowledge	**Skills**
Students will know… • the meaning of a dependent variable. • the meaning of an independent variable. • when two quantities are related to each other.	Students will be able to... • use variables to represent two quantities in a real-world problem that change in relationship to one another. • write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. • analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. • use the equation of a relationship between two dependent and independent variables to predict ordered pairs that are not displaced in a given graph or table

RESOURCES

- Variables and Patterns: Inv. 1, 2, 3, 4; Covering and Surrounding: Inv. 1

Geometry

6.G.1 Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.

6.G.2. Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas $V = l\ w\ h$ and $V = b\ h$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.

6.G.3. Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.

6.G.4. Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.

Understandings	Essential Questions
Students will understand that… • triangles and rectangles can be used to find areas of other polygons • a 2-D net of a 3-D figure can be used to find the surface area of the figure • surface area is related to “wrapping” or “covering” of a surface with square units, i.e. squares with side length of one unit • volume is related to “filling” of space with cubic units, i.e. cubes with edges of one-unit length	• Why would one want to calculate areas of polygons? • How are areas of polygons found? • How are volume and surface area of a right rectangular prism found? • Why are volumes represented in cubic units? • What is the connection between the net and surface area of 3-D figures?

Knowledge	Skills
Students will know… • that areas of triangles, including right triangles, and rectangles can be used to find areas of other polygons, when the other polygons are decomposed into triangles or composed into rectangles • that the volume of a right rectangular prism is the number of unit cubes it contains (of the appropriate unit fraction edge length) • the total area of a net of a 3-D figure is the surface area of the figure	Students will be able to... • find the area of right triangles. • find the area of other triangles. • find the area of special quadrilaterals. • find the areas of polygons by composing them into rectangles or decomposing them into triangles • represent three-dimensional figures using nets • to find the surface area of a 3-D figure by finding the total area of its 2-D net

RESOURCES

- Covering and Surrounding: Inv. 1, 2, 3, 4; Decimal OPS: Inv. 3

Statistics and Probability

6.SP.1. Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. *For example, "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages.*

6.SP.2. Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.

6.SP.3. Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.

Understandings	Essential Questions
Students will understand that… • statistical questions anticipate variability • a set of data has a distribution • center and spread are two related but different ways of describing a set of data	• What is a statistical question? • What is a distribution? • What is the difference between the center and the spread of a numerical set? • How are data sets described?

Knowledge	Skills
Students will know… • that a set of data can be described by its center, spread, and overall shape • how to find the center of a numerical data set • the center summarizes a data set with a single number • the spread is a measure of variation of all values in a data set about the center	Students will be able to... • recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. *For example, "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages.* • understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. • recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.

RESOURCES

- Data About Us: Inv. 1, 2, 3, 4

Statistics and Probability

Summarize and describe distributions.

6.SP.4. Display numerical data in plots on a number line, including dot plots, histograms, and box plots.

6.SP.5. Summarize numerical data sets in relation to their context, such as by:

a. Reporting the number of observations.
b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.
c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.
d. Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.

Understandings	Essential Questions
Students will understand that… • numerical data can be displayed in multiple ways. • summaries of numerical data vary based on their contexts. • overall patterns of numerical data can vary. • some patters in numerical data can have striking deviations.	• How do measures of center and variability help us make sense of the world around us? • In what contexts are the measures of center and variability preferred descriptions of the data? • Why do we need multiple ways of describing numerical data?

Knowledge	Skills
Students will know… • how to display numerical data using dot plots, histograms, and box plots. • how to summarize numerical data in multiple ways. • that the choice of measures of center and variability depends on the context. • how to identify a striking deviation from the overall pattern. • real life examples of patterns with, and without, striking deviations.	Students will be able to... • construct dot plots, histograms, and box plots. • summarize numerical data by: o reporting the number of observations; o describing the nature of the attribute under investigation, including how it was measured and its units of measurement; o giving quantitative measures of center (median and/or mean) o giving quantitative measures of variability (interquartile range and/or mean absolute deviation); o describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered; o relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.

RESOURCES

- Data About Us: Inv. 1, 2, 3, 4

Connecting the Standards for Mathematical Content to the Standards for Mathematical Practice

The Standards for Mathematical Practice describe ways in which developing student practitioners of the discipline of mathematics increasingly ought to engage with the subject matter as they grow in mathematical maturity and expertise throughout the elementary, middle and high school years. Designers of curricula, assessments, and professional development should all attend to the need to connect the mathematical practices to mathematical content in mathematics instruction.

The Standards for Mathematical Content are a balanced combination of procedure and understanding. Expectations that begin with the word "understand" are often especially good opportunities to connect the practices to the content. Students who lack understanding of a topic may rely on procedures too heavily. Without a flexible base from which to work, they may be less likely to consider analogous problems, represent problems coherently, justify conclusions, apply the mathematics to practical situations, use technology mindfully to work with the mathematics, explain the mathematics accurately to other students, step back for an overview, or deviate from a known procedure to find a shortcut. In short, a lack of understanding effectively prevents a student from engaging in the mathematical practices.

In this respect, those content standards, which set an expectation of understanding, are potential "points of intersection" between the Standards for Mathematical Content and the Standards for Mathematical Practice. These points of intersection are intended to be weighted toward central and generative concepts in the school mathematics curriculum that most merit the time, resources, innovative energies, and focus necessary to qualitatively improve the curriculum, instruction, assessment, professional development, and student achievement in mathematics.

Standards for Mathematical Practice

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. The first of these are the NCTM process standards of problem solving, reasoning and proof, communication, representation, and connections. The second are the strands of mathematical proficiency specified in the National Research Council's report *Adding It Up*: adaptive reasoning, strategic competence, conceptual understanding (comprehension of mathematical concepts, operations and relations), procedural fluency (skill in carrying out procedures flexibly, accurately, efficiently and appropriately), and productive disposition (habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy).

1. Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

2. Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to *decontextualize*—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to *contextualize*, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

3. Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

4. Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

5. Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

6. Attend to precision.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

7. Look for and make use of structure.

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7×8 equals the well-remembered $7 \times 5 + 7 \times 3$, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, older students can see the 14 as 2×7 and the 9 as $2 + 7$. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 – 3(x – y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

8. Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation $(y – 2)/(x – 1) = 3$. Noticing the regularity in the way terms cancel when expanding $(x – 1)(x + 1)$, $(x – 1)(x^2 + x + 1)$, and $(x – 1)(x^3 + x^2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Standard 9
21st Century Life and Careers

In today's global economy, students need to be lifelong learners who have the knowledge and skills to adapt to an evolving workplace and world. To address these demands, Standard 9, 21st Century Life and Careers, which includes the 12 Career Ready Practices, establishes clear guidelines for what students need to know and be able to do in order to be successful in their future careers and to achieve financial independence.

Mission: *21st century life and career skills enable students to make informed decisions that prepare them to engage as active citizens in a dynamic global society and to successfully meet the challenges and opportunities of the 21st century global workplace.*

Vision: To integrate 21st Century life and career skills across the K-12 curriculum and in Career and Technical Education (CTE) programs to foster a population that:

- Continually self-reflects and seeks to improve the essential life and career practices that lead to success.
- Uses effective communication and collaboration skills and resources to interact with a global society.
- Is financially literate and financially responsible at home and in the broader community.
- Is knowledgeable about careers and can plan, execute, and alter career goals in response to changing societal and economic conditions.
- Seeks to attain skill and content mastery to achieve success in a chosen career path.

The Standards: Standard 9 is composed of the Career Ready Practices and Standard 9.1, 9.2, and 9.3 which are outlined below:

- **The 12 Career Ready Practices**
  These practices outline the skills that all individuals need to have to truly be adaptable, reflective, and proactive in life and careers. These are researched practices that are essential to career readiness.
- **9.1 Personal Financial Literacy**
  This standard outlines the important fiscal knowledge, habits, and skills that must be mastered in order for students to make informed decisions about personal finance. Financial literacy is an integral component of a student's college and career readiness, enabling students to achieve fulfilling, financially-secure, and successful careers.
- **9.2 Career Awareness, Exploration, and Preparation**
  This standard outlines the importance of being knowledgeable about one's interests and talents, and being well informed about postsecondary and career options, career planning, and career requirements.
- **9.3 Career and Technical Education**
  This standard outlines what students should know and be able to do upon completion of a CTE Program of Study.

For students to be college and career ready they must have opportunities to understand career concepts and financial literacy. This includes helping students make informed decisions about their future personal, educational, work, and financial goals. By integrating Standard 9 into instruction, New Jersey students will acquire the necessary academic and life skills to not only achieve individual success but also to contribute to the success of our society.

21st Century Themes

Career Ready Practices describe the career-ready skills that all educators in all content areas should seek to develop in their students. They are practices that have been linked to increase college, career, and life success. Career Ready Practices should be taught and reinforced in all career exploration and preparation programs with increasingly higher levels of complexity and expectation as a student advances through a program of study.

CRP1. Act as a responsible and contributing citizen and employee.

CRP2. Apply appropriate academic and technical skills.

CRP3. Attend to personal health and financial well-being.

CRP4. Communicate clearly and effectively and with reason.

CRP5. Consider the environmental, social and economic impacts of decisions.

CRP6. Demonstrate creativity and innovation.

CRP7. Employ valid and reliable research strategies.

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.

CRP9. Model integrity, ethical leadership and effective management.

CRP10. Plan education and career paths aligned to personal goals.

CRP11. Use technology to enhance productivity.

CRP12. Work productively in teams while using cultural global competence.

CRP1. **Act as a responsible and contributing citizen and employee**

Career-ready individuals understand the obligations and responsibilities of being a member of a community, and they demonstrate this understanding every day through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them. They think about the near-term and long-term consequences of their actions and seek to act in ways that contribute to the betterment of their teams, families, community and workplace. They are reliable and consistent in going beyond the minimum expectation and in participating in activities that serve the greater good.

CRP2. Apply appropriate academic and technical skills.

Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation

CRP3. Attend to personal health and financial well-being.

Career-ready individuals understand the relationship between personal health, workplace performance and personal well-being; they act on that understanding to regularly practice healthy diet, exercise and mental health activities. Career-ready individuals also take regular action to contribute to their personal financial wellbeing, understanding that personal financial security provides the peace of mind required to contribute more fully to their own career success.

CRP4. Communicate clearly and effectively and with reason.

Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.

CRP5. Consider the environmental, social and economic impacts of decisions.
Career-ready individuals understand the interrelated nature of their actions and regularly make decisions that positively impact and/or mitigate negative impact on other people, organization, and the environment. They are aware of and utilize new technologies, understandings, procedures, materials, and regulations affecting the nature of their work as it relates to the impact on the social condition, the environment and the profitability of the organization.

CRP6. Demonstrate creativity and innovation.
Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.

CRP7. Employ valid and reliable research strategies.
Career-ready individuals are discerning in accepting and using new information to make decisions, change practices or inform strategies. They use reliable research process to search for new information. They evaluate the validity of sources when considering the use and adoption of external information or practices in their workplace situation.

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.

CRP9. Model integrity, ethical leadership and effective management.
Career-ready individuals consistently act in ways that align personal and community-held ideals and principles while employing strategies to positively influence others in the workplace. They have a clear understanding of integrity and act on this understanding in every decision. They use a variety of means to positively impact the directions and actions of a team or organization, and they apply insights into human behavior to change others' action, attitudes and/or beliefs. They recognize the near-term and long-term effects that management's actions and attitudes can have on productivity, morals and organizational culture.

CRP10. Plan education and career paths aligned to personal goals.
Career-ready individuals take personal ownership of their own education and career goals, and they regularly act on a plan to attain these goals. They understand their own career interests, preferences, goals, and requirements. They have perspective regarding the pathways available to them and the time, effort, experience and other requirements to pursue each, including a path of entrepreneurship. They recognize the value of each step in the education and experiential process, and they recognize that nearly all career paths require ongoing education and experience. They seek counselors, mentors, and other experts to assist in the planning and execution of career and personal goals.

CRP11. Use technology to enhance productivity.
Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks-personal and organizational-of technology applications, and they take actions to prevent or mitigate these risks.

CRP12. Work productively in teams while using cultural global competence.
Career-ready individuals positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.

Differentiation Strategies

Students with Disabilities/ Students at Risk of School Failure

(For students with disabilities, appropriate accommodations, instructional adaptations, and/or modifications should be determined by the IEP or 504 team)

Modifications for Classroom

- Pair visual prompts with verbal presentations
- Ask students to restate information, directions, and assignments.
- Give repetition and practice exercises
- Model skills/techniques to be mastered
- Give extended time to complete class work
- Provide copy of class notes
- Determine if preferential seating would be beneficial
- Provide access to a computer
- Provide copies of textbooks for home
- Provide access to books on tape/CD/digital media, as available and appropriate
- Assign a peer helper in the class setting
- Provide oral reminders and check student work during independent work time
- Assist student with long and short term planning of assignments
- Encourage student to proofread assignments and tests
- Provide regular parent/school communication

Modifications for Homework and Assignments

- Provide extended time to complete assignments
- Break down assignments
- Provide the student with clearly stated (written) expectations and grading criteria for assignments
- Implement RAFT activities as they pertain to the types/modes of communication (role, audience, format, topic)

Modifications for Assessments

- Provide extended time on classroom tests and quizzes
- Provide alternate setting as needed
- Restate, reread, and clarify directions/questions
- Distribute study guide for classroom tests
- Establish procedures for accommodations /modifications for assessments

Differentiation Strategies

Gifted and Talented

(content, process, product and learning environment)

- Allow students to pursue independent projects based on their individual interests
- Provide enrichment activities that include more advanced material
- Allow team-teaching opportunities and collaboration
- Set individual goals
- Conduct research and provide presentation of appropriate topics
- Design surveys to generate and analyze data to be used in discussion.
- Use Higher-Level Questioning Techniques
- Provide assessments at a higher level of thinking

English Language Learners

Modifications for Classroom

- Pair visual prompts with verbal presentations
- Provide repetition and practice
- Model skills/techniques to be mastered

Modifications for Homework/Assignments

- Provide Native Language Translation (peer, online assistive technology, translation device, bilingual dictionary)
- Provide extended time for assignment completion as needed
- Highlight key vocabulary
- Use graphic organizers

Coordinate Graphing Mystery Picture - First Quadrant

Plot the ordered pairs and connect them with a straight line as you plot.

START
(9,21)
(9,24)
(10,25)
(12,25)
(13,24)
(13,20)
STOP

START
(20,31)
(26,32)
(27,35)
(27,36)
(26,37)
(23,37)
(21,35)
(20,33)
(20,31)
STOP

START
(1,18)
(1,17)
(2,16)
(3,16)
(4,17)
(4,18)
(3,19)
(2,19)
(1,18)
STOP

START
(11,32)
(11,31)
(12,31)
(12,32)
(11,32)
STOP

START
(20,31)
(25,30)
(28,29)
(30,27)
(32,21)
(32,19)
(30,13)
(28,10)
(25,8)
(20,8)
(20,31)
STOP

START
(6,23)
(4,23)
(4,21)
(6,21)
(6,23)
STOP

START
(8,22)
(8,25)
(6,27)
(3,27)
(1,25)
(1,22)
(3,20)
(6,20)
(8,22)
STOP

START
(25,30)
(25,8)
STOP

START
(20,31)
(14,32)
(13,35)
(13,36)
(14,37)
(17,37)
(19,35)
(20,33)
STOP

START
(7,26)
(6,30)
(5,31)
(5,32)
(4,32)
(4,31)
(5,31)
STOP

START
(1,22)
(0,20)
(0,17)
(2,15)
(6,14)
(10,14)
(14,15)
(16,17)
(16,20)
(15,22)
(15,30)
STOP

START
(10,23)
(10,21)
(12,21)
(12,23)
(10,23)
STOP

START
(7,21)
(7,24)
(6,25)
(4,25)
(3,24)
(3,20)
STOP

START
(6,19)
(6,18)
(7,17)
(9,17)
(10,18)
(10,19)
STOP

START
(32,21)
(34,20)
(32,19)
STOP

START
(15,16)
(15,9)
STOP

START
(9,26)
(10,30)
(11,31)
STOP

START
(30,27)
(30,13)
STOP

START
(20,31)
(15,30)
(13,29)
(11,27)
STOP

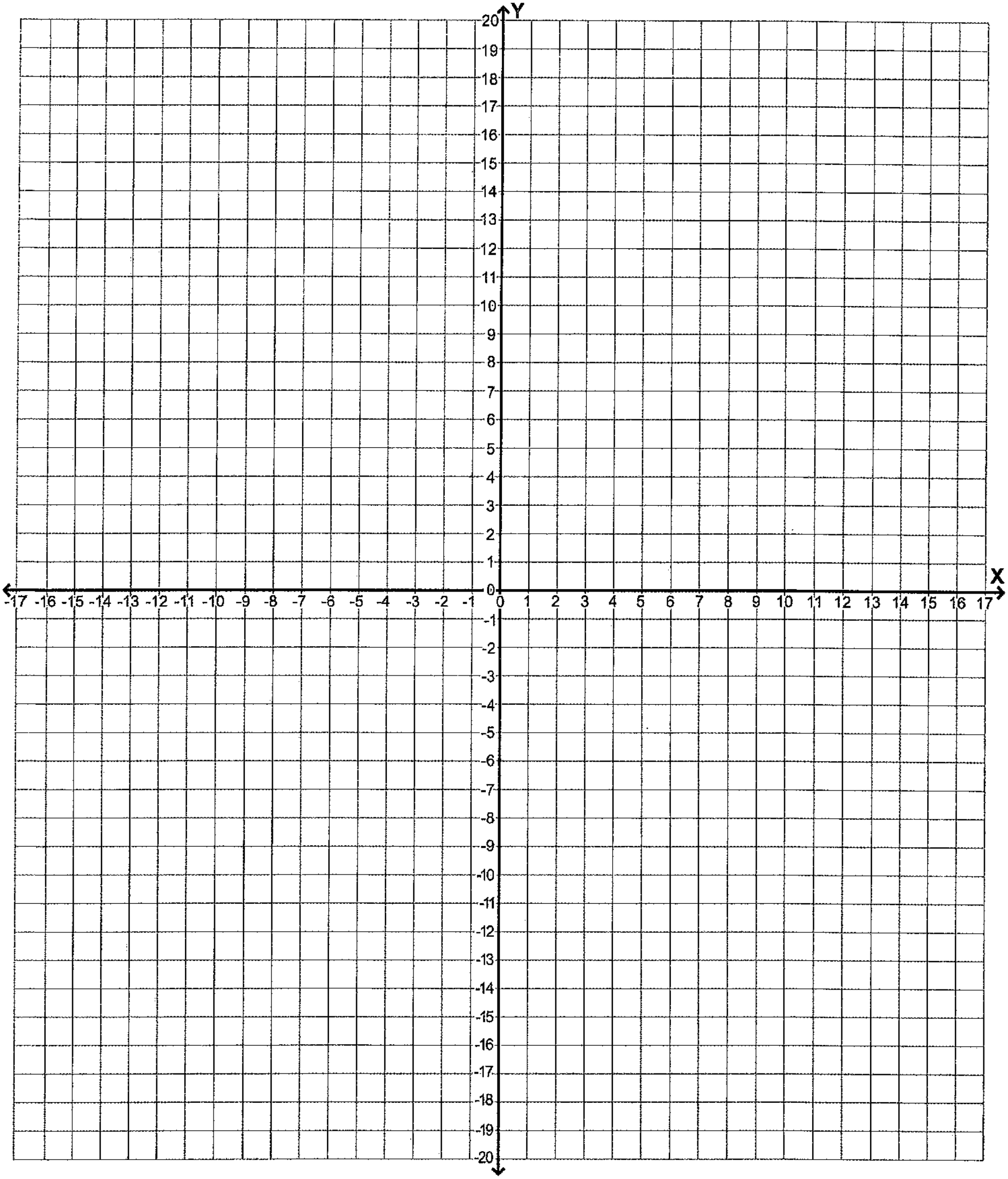
START
(10,14)
(11,12)
(15,9)
(17,8)
(20,8)
STOP

START
(8,22)
(10,20)
(13,20)
(15,22)
(15,25)
(13,27)
(10,27)
(8,25)
STOP

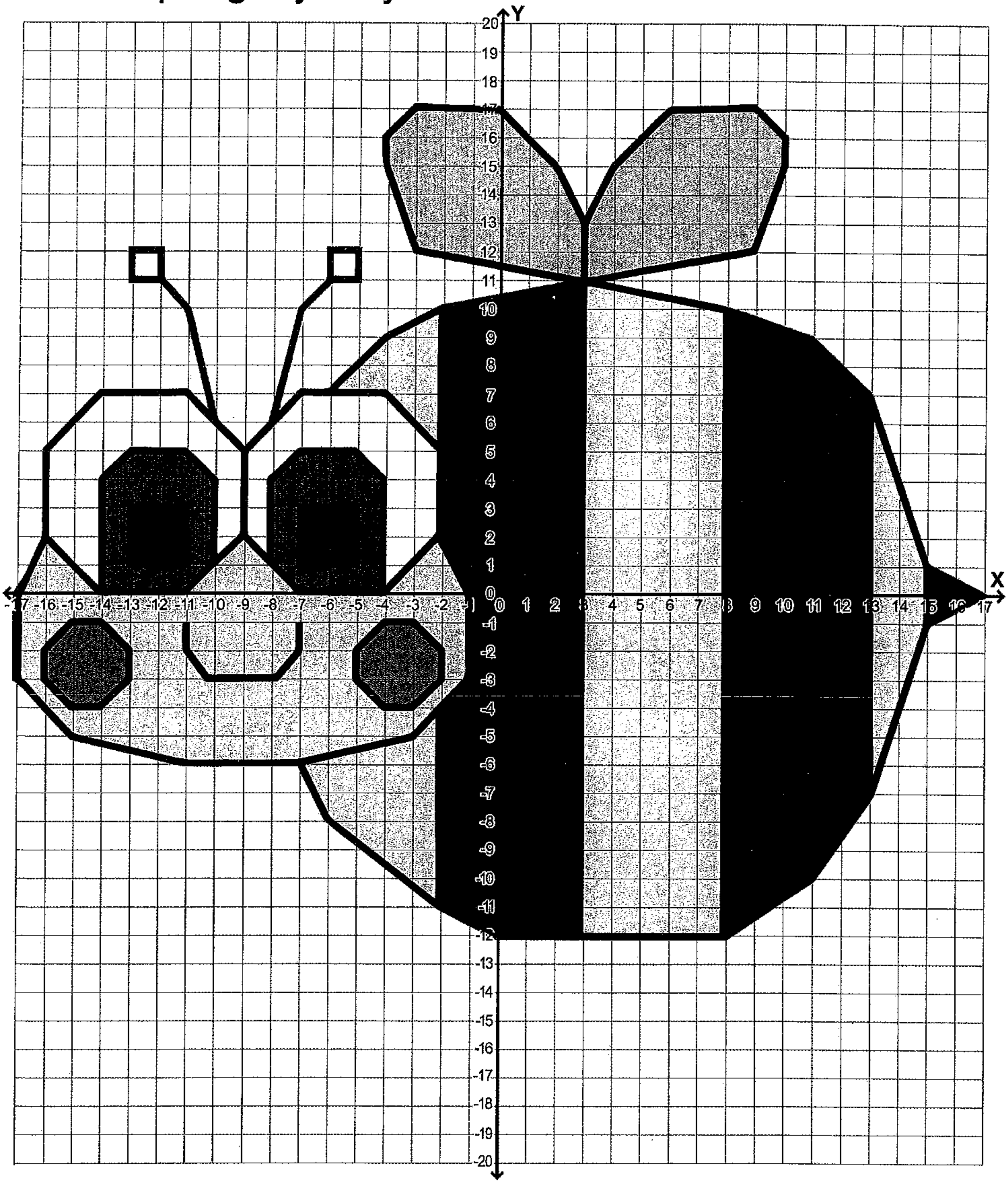
START
(12,18)
(12,17)
(13,16)
(14,16)
(15,17)
(15,18)
(14,19)
(13,19)
(12,18)
STOP

Coordinate Graphing Mystery Picture - Four Quadrants

Name:_____________________



Spring Mystery Picture - Bee - SPR MP2



Coordinate Graphing Mystery Picture - Four Quadrants

Plot the ordered pairs and connect them with a straight line as you plot.

START
(0,6)
(3,6)
(3,9)
(2,10)
(1,10)
(0,9)
(0,6)
STOP

START
(-5,-1)
(-7,-1)
(-11,-3)
(-13,-5)
(-14,-7)
(-14,-9)
(-13,-9)
(-11,-8)
(-11,-10)
(-10,-10)
(-9,-9)
(-8,-10)
(-7,-10)
(-7,-7)
(-5,-1)
STOP

START
(0,6)
(-3,6)
(-2,5)
(2,5)
(3,4)
(3,2)
(4,0)
(6,-1)
(7,0)
(6,1)
(5,3)
(5,5)
(3,6)
STOP

START
(-5,9)
(-6,12)
(-6,14)
(-4,18)
(-1,19)
(1,19)
(4,18)
(6,14)
(6,12)
(5,9)
STOP

START
(-2,8)
(-2,7)
(-1,7)
(-1,8)
(-2,8)
STOP

START
(3,-13)
(3,-17)
(2,-17)
(1,-19)
(2,-19)
(3,-18)
(3,-19)
(4,-19)
(4,-18)
(5,-19)
(6,-19)
(5,-17)
(4,-17)
(4,-13)
STOP

START
(13,-5)
(16,-4)
(17,-1)
(17,1)
(16,4)
(13,5)
STOP

START
(-6,12)
(-8,13)
(-12,13)
(-14,11)
(-15,7)
(-10,2)
(-5,-1)
STOP

START
(8,-10)
(8,-11)
(6,-13)
(-6,-13)
(-8,-11)
(-8,-10)
STOP

START
(-2,5)
(-1,2)
(0,1)
(1,2)
(2,5)
STOP

START
(1,8)
(1,7)
(2,7)
(2,8)
(1,8)
STOP

START
(5,-1)
(7,-1)
(11,-3)
(13,-5)
(14,-7)
(14,-9)
(13,-9)
(11,-8)
(11,-10)
(10,-10)
(9,-9)
(8,-10)
(7,-10)
(7,-7)
(5,-1)
STOP

START
(-5,-1)
(-3,0)
(-2,0)
STOP

START
(7,0)
(10,2)
(15,7)
(14,11)
(12,13)
(8,13)
(6,12)
STOP

START
(-4,-13)
(-4,-17)
(-5,-17)
(-6,-19)
(-5,-19)
(-4,-18)
(-4,-19)
(-3,-19)
(-3,-18)
(-2,-19)
(-1,-19)
(-2,-17)
(-3,-17)
(-3,-13)
STOP

START
(-13,5)
(-16,4)
(-17,1)
(-17,-1)
(-16,-4)
(-13,-5)
STOP

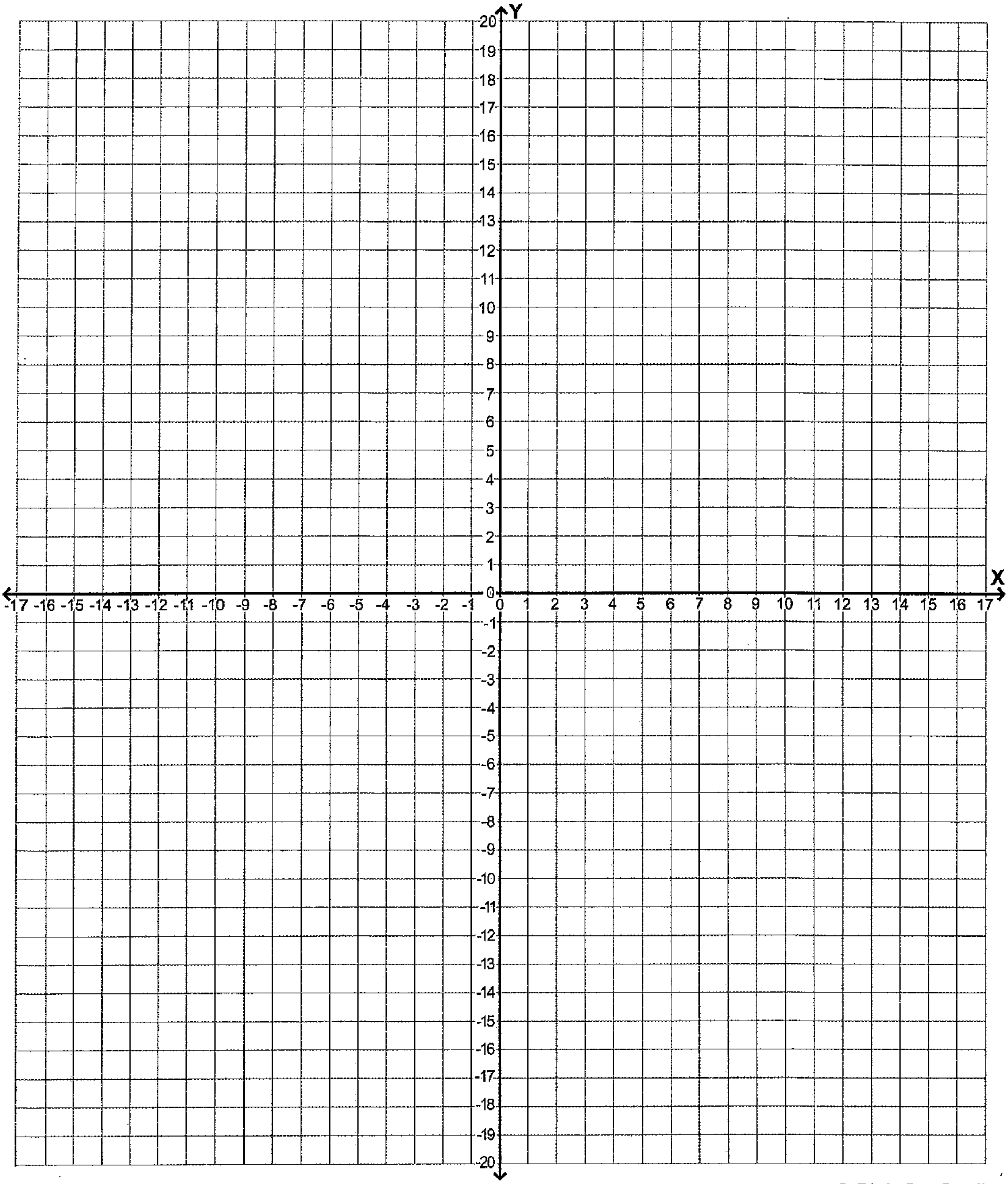
START
(-3,6)
(-3,9)
(-2,10)
(-1,10)
(0,9)
STOP

START
(2,0)
(3,0)
(5,-1)
STOP

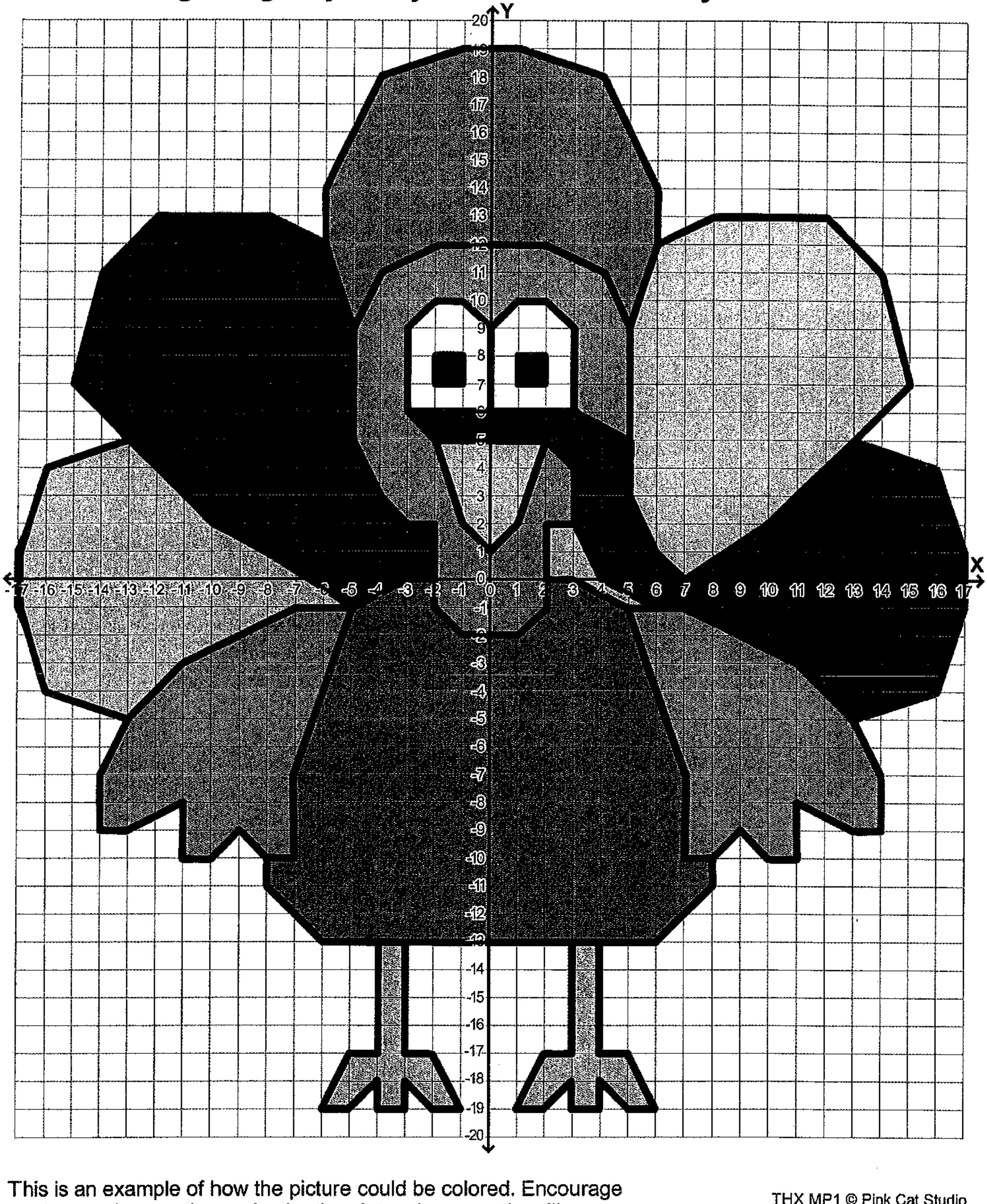
START
(5,5)
(5,9)
(4,11)
(2,12)
(-2,12)
(-4,11)
(-5,9)
(-5,5)
(-4,3)
(-3,2)
(-2,2)
(-2,-1)
(-1,-2)
(1,-2)
(2,-1)
(2,2)
(3,2)
STOP

Coordinate Graphing Mystery Picture - Four Quadrants

Name:____________________



Thanksgiving Mystery Picture - Turkey - THX MP1



This is an example of how the picture could be colored. Encourage students to be creative and color the picture however they like.

Coordinate Graphing Mystery Picture - Four Quadrants

Plot the ordered pairs and connect them with a straight line as you plot.

START
(1,4)
(3,4)
(3,6)
(1,6)
(1,4)
STOP

START
(-7,-5)
(-7,2)
STOP

START
(-7,13)
(-8,12)
(-8,11)
(-7,10)
(7,10)
(8,11)
(8,12)
(7,13)
(-7,13)
STOP

START
(-10,-8)
(-13,-9)
(-16,-8)
(-17,-6)
(-10,0)
STOP

START
(7,2)
(7,-5)
STOP

START
(2,1)
(4,1)
(7,2)
(9,3)
(10,0)
(10,-3)
(9,-4)
(7,-5)
(4,-6)
(-4,-6)
(-7,-5)
(-9,-4)
(-10,-3)
(-10,0)
(-9,3)
(-7,2)
(-4,1)
(-2,1)
STOP

START
(3,-15)
(2,-19)
(4,-20)
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(4,-6)
STOP

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(0,3)
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(-1,10)
STOP

START
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(8,8)
(9,3)
STOP

START
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STOP

START
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(-7,-20)
(-9,-17)
(-6,-14)
(-6,-9)
(-4,-6)
STOP

START
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(16,-8)
(17,-6)
(10,0)
STOP

START
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(-6,14)
(-4,17)
(-2,18)
(2,18)
(4,17)
(6,14)
(6,13)
STOP

START
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(-1,6)
(-3,6)
(-3,4)
STOP

START
(3,-6)
(3,1)
STOP

START
(-9,3)
(-8,8)
(-7,10)
STOP

START
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(6,4)
(4,2)
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(0,3)
STOP

START
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(-2,19)
(-1,20)
(1,20)
(2,19)
(2,18)
STOP

START
(1,10)
(0,9)
STOP

START
(-3,2)
(0,-1)
(3,2)
STOP

START
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(-10,-8)
(-8,-12)
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(-3,-15)
(3,-15)
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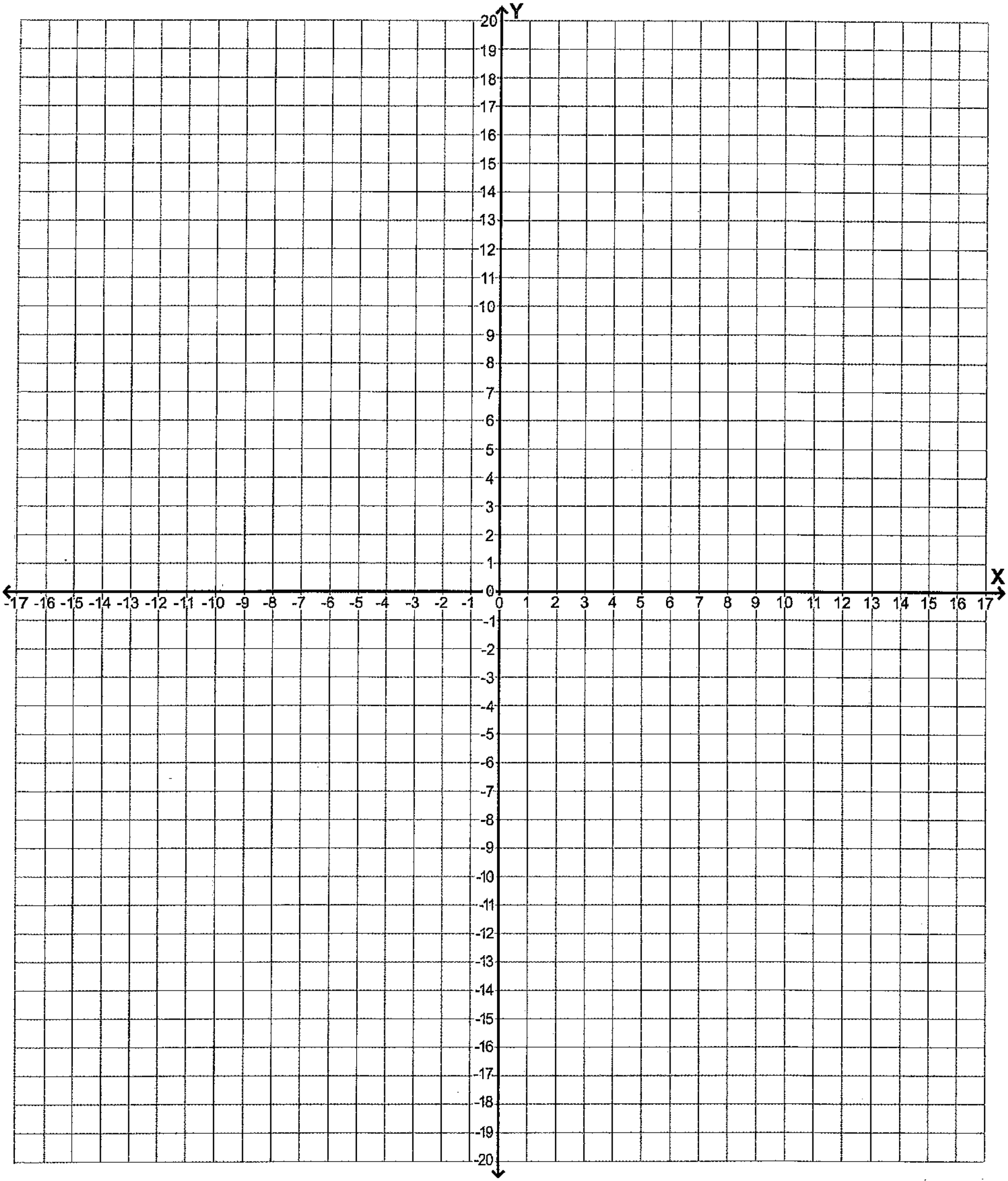
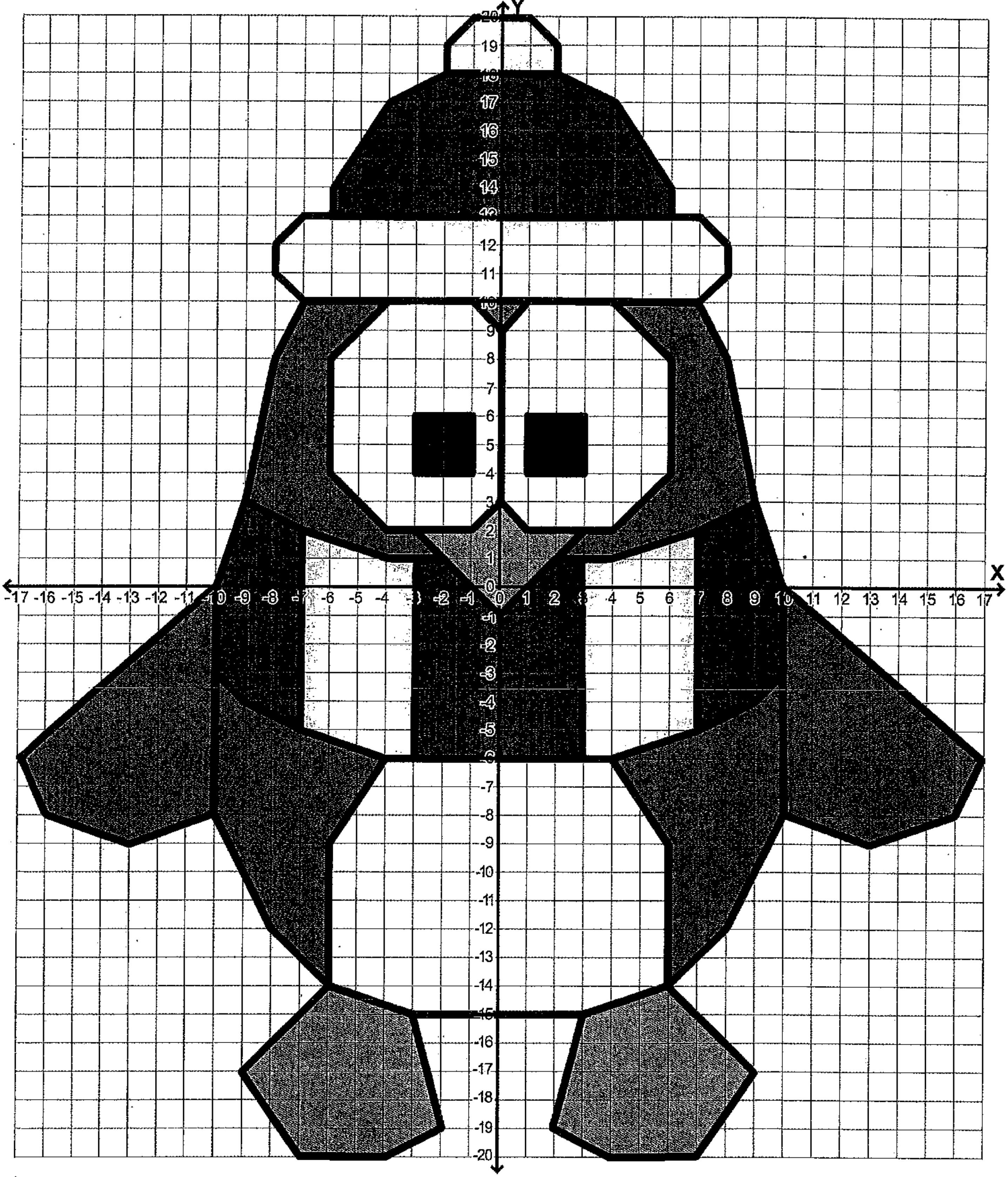
(10,-3)
STOP

Coordinate Graphing Mystery Picture - Four Quadrants

Name:____________________



Winter Mystery Picture - Penguin - WMP2



This is an example of how the picture could be colored. Encourage students to be creative and color the picture however they like.

Coordinate Graphing Mystery Picture - Four Quadrants

Plot the ordered pairs and connect them with a straight line as you plot.

START
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(2,-18)
STOP

START
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(10,4)
STOP

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(-9,-2)
(-7,-2)
(-7,-4)
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(-8,-5)
(-5,-4)
STOP

START
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(6,15)
(7,16)
(6,17)
(5,17)
(4,16)
(5,15)
(5,14)
STOP

START
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(6,-10)
(6,-9)
(5,-9)
(5,-10)
STOP

START
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(-4,7)
STOP

START
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(10,-1)
STOP

START
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STOP

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STOP

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STOP

START
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(1,-2)
STOP

START
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STOP

START
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(5,-15)
STOP

START
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(10,-2)
STOP

START
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(3,12)
STOP

START
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(7,-10)
STOP

START
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(3,-11)
STOP

START
(5,15)
(6,15)
STOP

START
(-1,4)
(1,4)
(1,6)
(-1,6)
(-1,4)
STOP

START
(6,-15)
(7,-15)
STOP

START
(3,-10)
(4,-10)
(4,-9)
(3,-9)
(3,-10)
STOP

START
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(15,-1)
(15,12)
(-4,12)
(-4,-1)
STOP

START
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(-6,5)
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(-10,3)
(-11,1)
(-12,3)
(-14,5)
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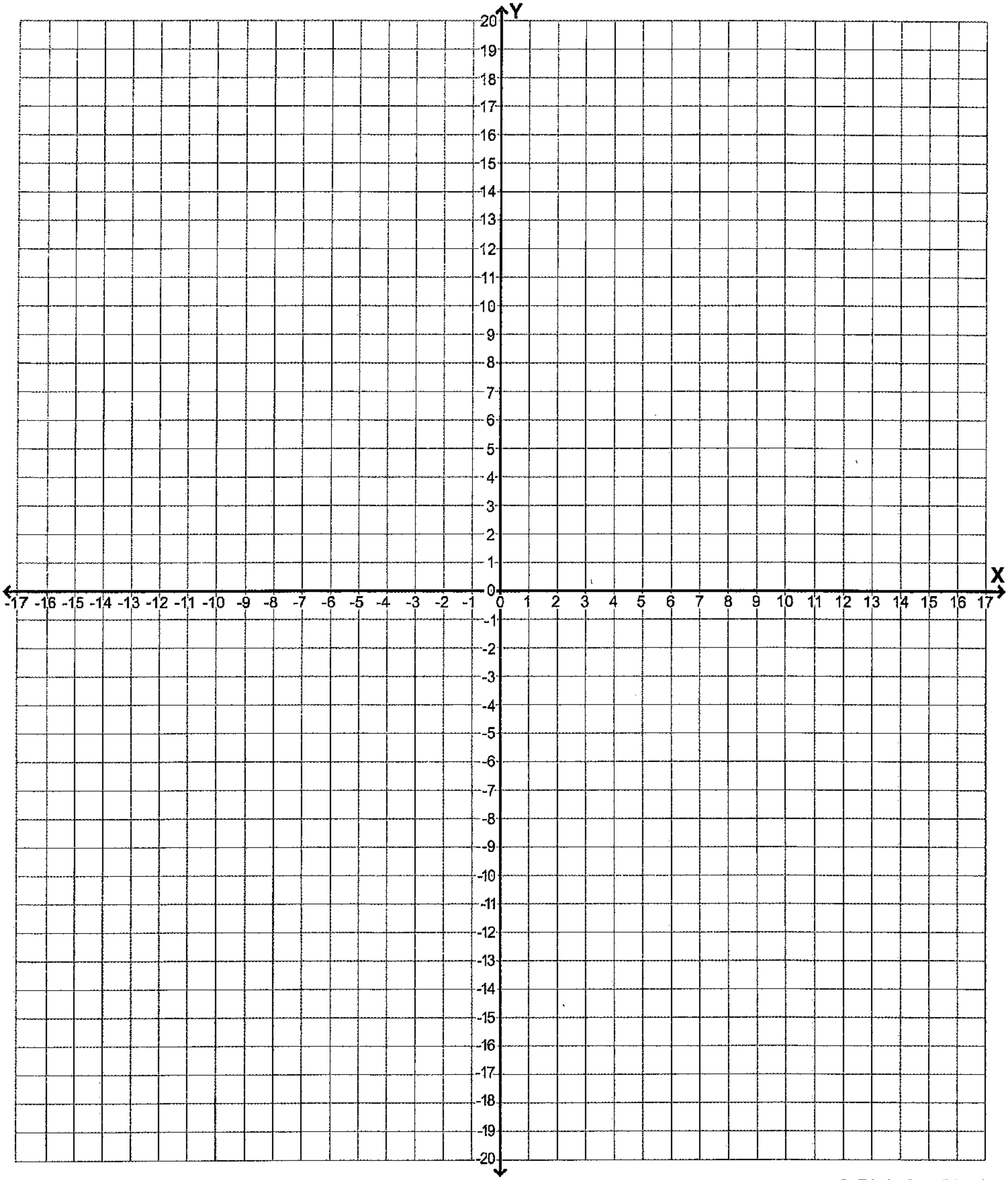
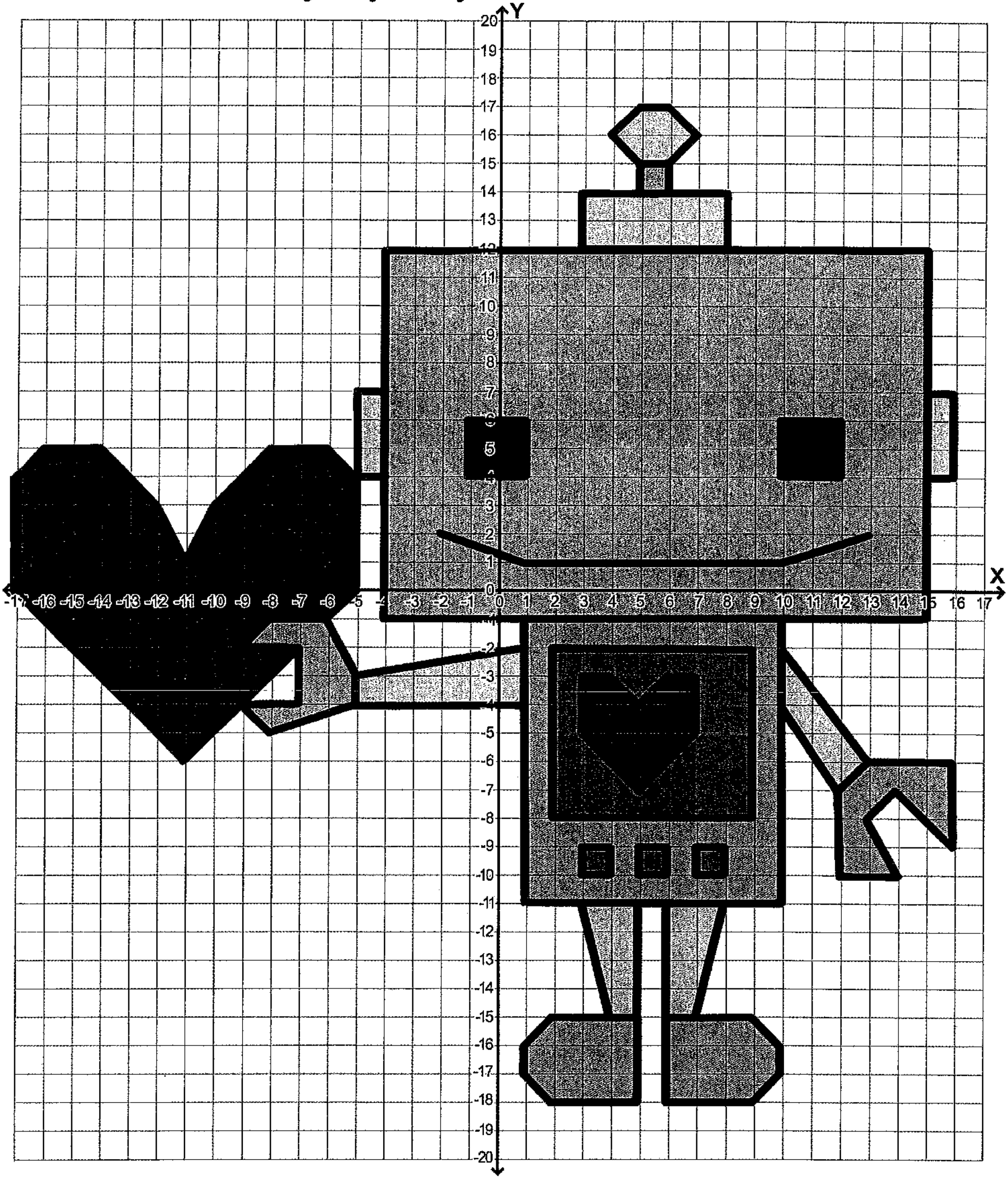
STOP

Coordinate Graphing Mystery Picture - Four Quadrants

Name:____________________



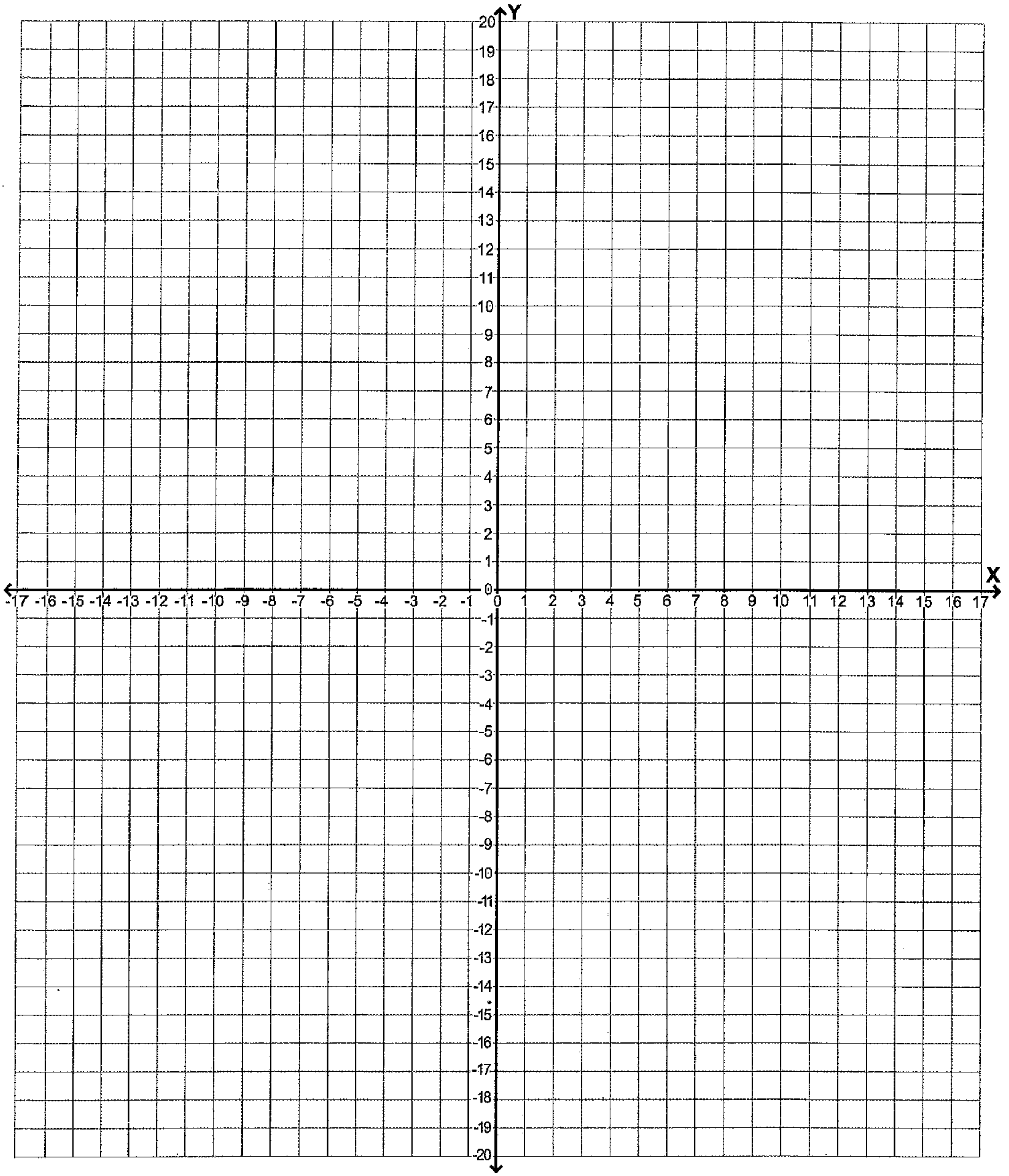
Valentine's Day Mystery Picture - Robot - VAL MP1



This is an example of how the picture could be colored. Encourage students to be creative and color the picture however they like.

Coordinate Graphing Mystery Picture - Four Quadrants

Name:____________________



Coordinate Graphing Mystery Picture - Four Quadrants

Plot the ordered pairs and connect them with a straight line as you plot.

START
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(6,-1)
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(8,4)
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(4,-1)
STOP

START
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(3,-11)
STOP

START
(6,-2)
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(8,-1)
STOP

START
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STOP

START
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(2,-7)
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STOP

START
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STOP

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STOP

START
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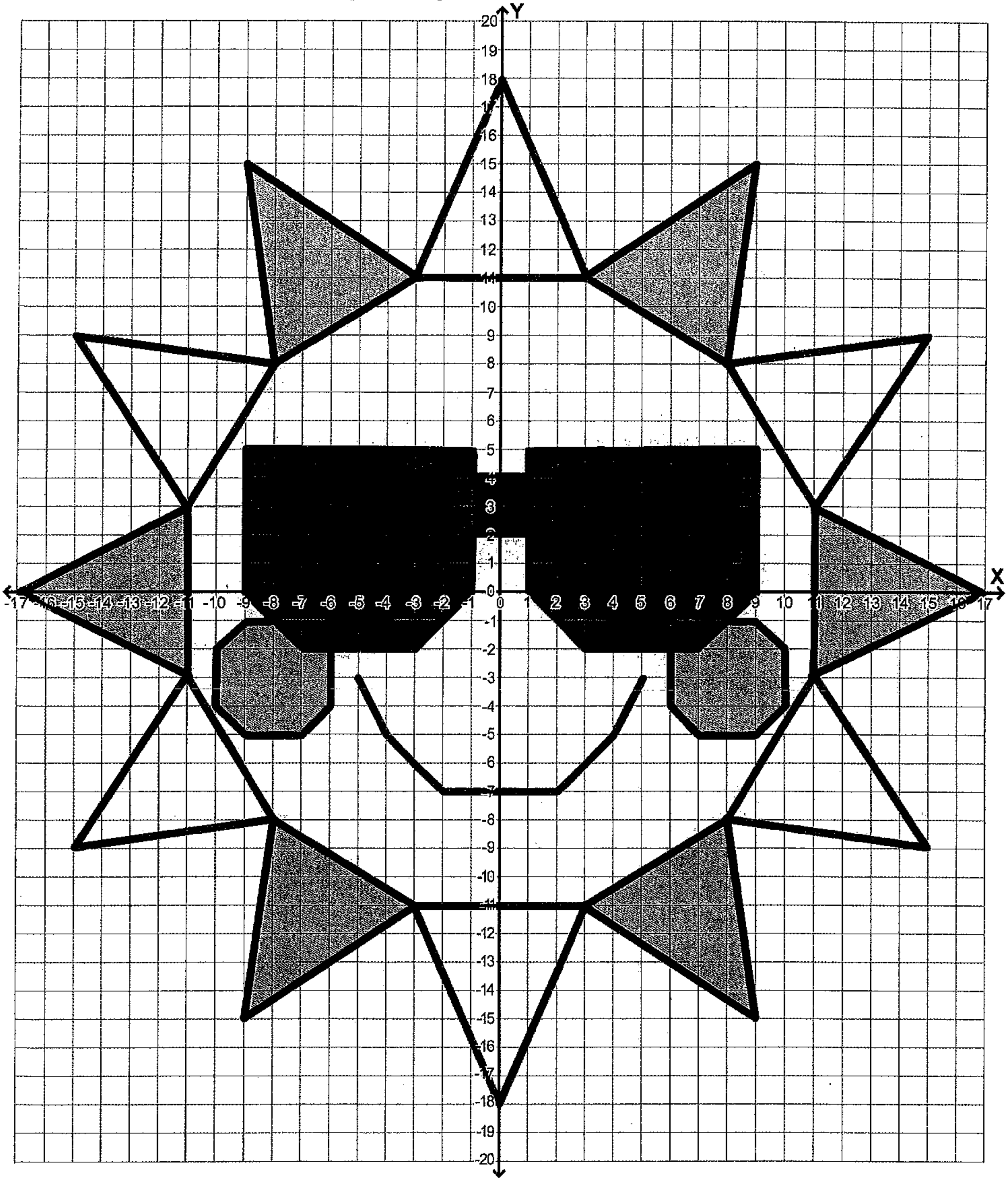
STOP

Summer Mystery Picture - Sun - S MP3



Supplemental for BHr option 1

BETTERLESSON

Ursula Lovings ALL CITY LEADERSHIP SECONDARY SCHOOL, BROOKLYN, NY
6th Grade Math : Unit #12 - Unit Rate : Lesson #2

Unit Rate Grocery Shopping Project

Objective: *SWBAT find the unit rate of grocery products.*

Standards: **6.RP.A.3b MP6**
Subject(s): Math
60 minutes

1 Do Now - 10 minutes

The Do Now is an introduction to this lesson's unit rate project. After 5 minutes, students will review their answers with their group.
Students will be given calculators since they haven't worked on long division problems with repeating or non-terminating decimals.
Do Now
Maya went to Key Food Supermarket and bought a 64 fl. oz container of juice for $2.49. What was the unit price of the juice? Round your answer to the nearest cent.

2 Hook - 5 minutes

To introduce the project, I share with students how helpful their work will be for me.
There are two grocery store in my neighborhood that I shop at. I'm a frugal shopper and I like to know that I'm getting the best deal when I shop. As a smart shopper, I always look at the flyers to see what's on sale.
I've picked up flyers for both of my local grocery stores and I've created my shopping list. I need your help figuring out which one has the better bargains.

3 Unit Rate Project - 40 minutes

For this project, students are heterogeneously seated in groups of 4. There is at least one high level and one low level student in each group. This will promote discussion among the groups.
Each student will receive a Unit Rate Grocery Project (http://betterlesson.com/lesson/resource/2850443/unit-rate-grocery-project-xls) Worksheet and each group will receive 2 different grocery store circulars. Students will use the circulars to complete the worksheet and answer the the question, "Which store offers the best deals?" See Shopping (http://betterlesson.com/lesson/resource/3188964/shopping-m4v) Video.

Although the groups will work independently, it is important to monitor their work and progress. I will circulate throughout the groups to make sure:
- Students are rounding their answers correctly (to the nearest cent).
- Students are using the correct items in the circular.
- Students are working cooperatively.

RESOURCES

Unit Rate Grocery Project.xls http://betterlesson.com/lesson/resource/2850443/unit-rate-grocery-project-xls

FullSizeRender-3.jpg http://betterlesson.com/lesson/resource/3188960/fullsizerender-3-jpg

Shopping.m4v http://betterlesson.com/lesson/resource/3188964/shopping-m4v

COMPLETING THE WORKSHEET: Real World Applications

When the groups of 4 are working with the flyers, it will be easier for them to pair up and choose one of the flyers. After they have completed one side of the worksheet for one supermarket, they can exchange flyers.
Groups will complete the worksheet at different times, depending on how quickly they are able to find the items. For groups that finished early, i assigned them the task of finding the unit price of 10 more items of their choosing. This created even more excitement over the activity because they were able to shop for what they would want.
This activity gives students an opportunity to see how finding unit price can be useful to them in the future.

4 Lesson Summary - 5 minutes

To conclude the lesson, I will ask students a series of questions to assess their understanding of the lesson.
What is the difference between ratios, rates, and unit rates?
Are all ratios rates?
Are all rates ratios?
How is a ratio or rate used to compare two quantities or values? Where can examples of ratios and rates be found?
How are unit rates used in everyday life?

supplemental for Bits option 2

Feeding Frenzy

GRADE: 6-8

PERIODS: 1

STANDARDS:

AUTHOR:

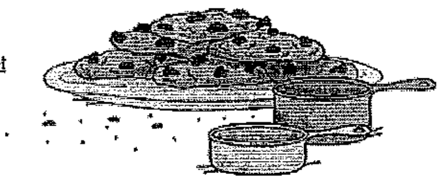
Katie Hendrickson
Albany, OH

In this activity, students will multiply and divide a recipe to feed groups of various sizes. Students will use unit rates or proportions and think critically about real world applications of a baking problem.

Instructional Plan	Objectives + Standards	Materials	Assessments + Extensions	Questions + Reflection	Related Resources	Print All

Begin the discussion by asking students if they cook at home. Call on a few students and ask them what they cook and if they follow a recipe. Then ask students if they have ever had to double, triple, or halve a recipe. Explain that most recipes tell how many people they will serve, and if you are cooking for more or fewer people, you may need to adjust the recipe. Ask students how they think they would adjust a recipe. Students will probably suggest multiplying or dividing by a factor, and may bring up ratios and proportions.

Feeding Frenzy Activity Sheet



Distribute the Feeding Frenzy Activity Sheet to each student. Explain to students that they will be looking at a recipe for chocolate chip cookies, and modifying it to feed different numbers of people. They will be calculating how to prepare 12 cookies for a family meal, 60 cookies for a party, 24 cookies for a class event, and 300 cookies for a bake sale. They need to determine how much of each ingredient they will need.

Before students begin their work, let them know that they should give all the answers as fractions because that is how ingredients are measured. They may choose to first find the amount as a decimal, but must then convert it to a fraction for their answer. For example, they should record $\frac{3}{4}$ rather than 0.75. Also, review the common abbreviations for measurements:

- tsp = teaspoon
- Tbsp = tablespoon
- c = cup

Allow students to begin working. After a few minutes, bring the class together to discuss strategies being used. Put an example of each strategy on the board as students contribute. Students may be using proportions, finding a unit rate, using a diagram to model the situation, or using another method not listed here.

Proportions

One way to solve the problem is to set up proportions. You may want to guide students to keep their proportions consistent by setting up a sample proportion for the chocolate chips used in the 60-serving recipe as follows:

$$\frac{chips}{servings} = original = new$$
$$\frac{chips}{servings} = \frac{3}{36} = \frac{x}{60}$$

Remind students to keep the same units in the numerator and in the denominator. Emphasize the labels and the importance of common units. At the same time, let students know they may set it up differently and still be correct. For example:

$$\frac{original}{new} = servings = chips$$
$$\frac{original}{new} = \frac{36}{60} = \frac{3}{x}$$

As long as the units are consistent, a proportion is correct. In the first proportion, both the servings values (original and new) were on the bottom. In the second proportion, both were on the left.

Unit Rate

Students may also find a unit rate, either by finding the amount of each ingredient used for 1 serving, or by finding the amount for 12 servings, since 12 is the greatest common factor of all the serving amounts. You may want to use the flour measurement as an example on the board:

$\frac{2\frac{1}{4}}{36} = \frac{1}{16}$, so each serving should contain $\frac{1}{16}$ c of flour

For 72 servings: $72 \times \frac{1}{16} = 4\frac{1}{2}$ c.

Diagrams

A third method students may use is drawing diagrams to represent the fractions. For example, they may draw 2 full cups and $\frac{1}{4}$ of a cup to represent $2\frac{1}{4}$ c flour. Then, to get 24 servings, they can shade $\frac{2}{3}$ of each drawing, since 24 is $\frac{2}{3}$ of 36. This results in the calculation:

$$\frac{2}{3} + \frac{2}{3} + \frac{1}{6} = 1\frac{1}{2} \text{ c flour}$$

Other Methods

Finally, students can use various methods of manipulating the numbers. For example, to get from 36 to 12, students may divide by 3. Then to get from 36 to 24, students may realize it's $\frac{2}{3}$ as much. In this case, they may double the recipe, then divide by 3, essentially multiplying by $\frac{2}{3}$ in 2 steps.

Since students have already had some time to work on the table, ask volunteers to demonstrate these methods and share with the other students. Make sure students realize that there are many correct methods. Students who have been struggling up to this point will now have multiple starting points. Allow students time to work on the activity sheet individually, while circulating throughout the room to help where needed and informally check that all students are on the right track.

Make measuring cups, sand, and bowls available to student. If you have enough, provide the materials to each student. Otherwise, set up a work station where students can come up and use the manipulatives when they feel they need them. As they work, encourage students to measure out the amount of the ingredient to check the reasonableness of their answers. You may want to have the pre-measured amount of each ingredient at the front of the room for reference. Students can then measure out the amount they calculated for 60 servings, for example, and compare the physical amounts. Since 60 is nearly double 36, they can see that the physical amounts look like approximately double the original. Similarly, their amount for 24 servings should look less than the amount for 36 servings. While this is just an estimation, it can help students visualize their answers and catch mistakes.

Once students have finished, go over the answers as a class. Ask students what methods they used. Discuss as a class how the different methods all led to the same, correct answers. You may wish to challenge students by having them consider why different methods can lead to the same answer, since this may be surprising to some students. Encourage them to bring real-world baking ideas and experiences into their answers. For example, in practice, you don't always double the amounts of all ingredients when you want to double the number of servings.

Feeding Frenzy Answer Key

Review the answers available on the Feeding Frenzy Answer Key. When you discuss Question 2, students should realize that you cannot purchase half a bag of chocolate chips. Therefore, the answers are 3 bags and 13 bags, not $2\frac{1}{2}$ bags and $12\frac{1}{2}$ bags. For Question 4, talk about the fact that when making such a large number of cookies, you may not have to make exactly that number. You can make more batter and either make the cookies a little bigger, or make extra cookies.

- Measuring cup and spoon
- Sand
- Large mixing bowl
- Feeding Frenzy Activity Sheet
- Feeding Frenzy Answer Key

Assessment Options

1. Give students another recipe and ask them to find the amount of each ingredient needed for a different number of servings.
2. Allow students to bring in their own recipes for chocolate chip cookies. If possible, test the conversions by baking the cookies and comparing the results. Ask students to write a journal entry about the way math was applied in this lesson and the other skills that they needed or learned.

Extensions

1. Students could plan an entire dinner party for 12, complete with shopping list. Have students bring in recipes for the dishes they wish to prepare, and then adjust all the recipes to serve 12.
2. Many recipe websites can automatically adjust a recipe to the desired number of servings. Have students explore these recipes, and then write about how the conversions they did in class compare to those on the websites.
3. Have students convert all the units to the simplest form for a particular ingredient. For example, students should have found that $3\frac{1}{3}$ tsp of vanilla is needed for 60 servings of chocolate chip cookies. Since 3 tsp =1 Tbsp, it would be easier to measure out 1 Tbsp + $\frac{1}{3}$ tsp of vanilla.
4. Students could convert all measurements into grams and other metric units, which are standard baking units in Europe, and then multiply the recipe for 300 servings. How does the process compare using different units? Which units are easier to calculate? Which units are easier to use when baking?

Questions for Students

1. Did you notice any shortcuts as you worked through the problems?

[Some students may have found that they could repeat their baking soda values for butter (and change the units), and repeat the egg values for vanilla extract. They may also have found that they could multiply their values for baking soda by 2 to get the values for eggs, and so on.]

2. Do you think the calculations would have been easier if you gave your answers in decimals? Why do you think cooking measurements are made in fractions?

[Answers will vary depending on students' comfort with fractions. There is no correct answer for why measurements are made this way—it is just a convention. In fact, in other areas of the world that use the metric system, decimals are used in recipes.]

3. What practical knowledge do you need to bake cookies? Is it enough to calculate the quantities of the ingredients?

[Answers will vary depending on students' knowledge of baking. Most students will easily understand why using $\frac{2}{3}$ of an egg is undesirable, but they may not realize that using a whole egg instead makes little difference in the recipe. Regardless, it should be clear to all students by the end of the lesson that more than math skills are necessary to bake a good batch of cookies.]

Teacher Reflection

- Did students work well on their own? Would they do better in pairs or groups?
- Did students understand the meaning of the proportion?
- Did students have a different way of working out the problem that was not mentioned here?
- Were students encouraged by the problem context? Were students who have no baking background discouraged?

Learning Objectives

Students will:

- Use ratios and solve proportions.
- Combine math with practical knowledge to analyze a problem.

NCTM Standards and Expectations

- Select appropriate methods and tools for computing with whole numbers from among mental computation, estimation, calculators, and paper and pencil according to the context and nature of the computation and use the selected method or tools.

- Work flexibly with fractions, decimals, and percents to solve problems.
- Develop and analyze algorithms for computing with fractions, decimals, and integers and develop flue
- Develop, analyze, and explain methods for solving problems involving proportions, such as scaling and finding equivalent ratios.

Common Core State Standards – Mathematics

Grade 7, Ratio & Proportion

- CCSS.Math.Content.7.RP.A.3
  Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.

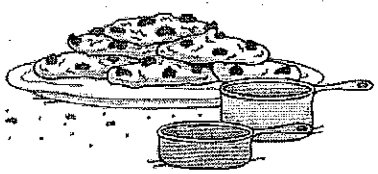
Feeding Frenzy

NAME____________________

1. A friend gave you a recipe for chocolate chip cookies that makes 36 servings. Determine the amount of each ingredient needed for your family (12 servings), for a party (60 servings), for your class (24 servings), and for a bake sale (300 servings). Record measurements as common fractions (for example, use $\frac{3}{4}$ rather than 0.75).

INGREDIENT	AMOUNT IN RECIPE (36 SERVINGS)	AMOUNT FOR 12 SERVINGS	AMOUNT FOR 60 SERVINGS	AMOUNT FOR 24 SERVINGS	AMOUNT FOR 300 SERVINGS
all-purpose flour	$2\frac{1}{4}$ c				
baking soda	1 tsp				
salt	$\frac{1}{2}$ tsp				
butter, softened	1 c				
white sugar	$\frac{3}{4}$ c				
eggs	2				
vanilla extract	2 tsp				
semisweet chocolate chips	3 c				
chopped walnuts	$1\frac{1}{2}$ c				

2. A bag of chocolate chips contains 2 cups. How many bags would you need to serve 60? to serve 300?



3. How would you measure out $\frac{1}{3}$ of an egg?

4. Looking at the original recipe, is there an easier number of cookies to make for the bake sale? Why is that number easier?

supplemental Activity for Bits (enrichment) option 3

Highway Robbery

GRADE: 6-8
PERIODS: 1

STANDARDS:

AUTHOR:
Kimberly Rubin
Alexandria, VA

The National Bank of Illuminations has been robbed! Students apply their knowledge of ratios, unit rates, and proportions to sort through the clues and deduce which suspect is the true culprit.

Instructional Plan	Objectives + Standards	Materials	Assessments + Extensions	Questions + Reflection	Related Resources	Print All

In this lesson, students assume the role of a detective investigating a bank robbery. Students wear police badges from a party store or that you make, and use four clues to help them apprehend the thief.

Below is a suspect matrix with the clue values needed to make a particular suspect the actual thief. Before class, choose one, and fill in the blanks on the Clue Sheet Overhead.

Clue Sheet Overhead

The information you put on the overhead will lead the students to your chosen thief.

Suspect Matrix

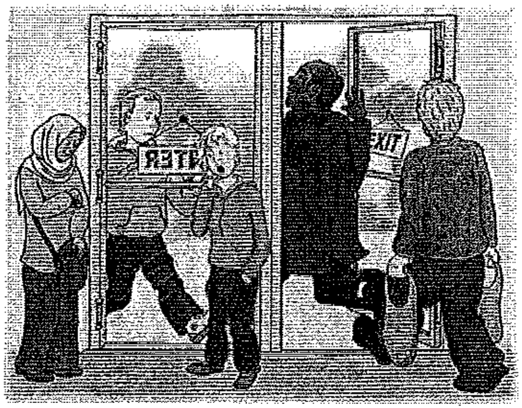
Roy G. Biv	Jen Eric	Matthew Matics
Clue 1 Question 1: 15 cm	Clue 1 Question 1: 13.2 cm	Clue 1 Question 1: 15 cm
Clue 2 Question 2: 25 pounds	Clue 2 Question 2: 25 pounds	Clue 2 Question 2: 32 pounds
Clue 3 Question 5: 16 miles/gallon	Clue 3 Question 5: 9 miles/gallon	Clue 3 Question 5: 8 miles/gallon
Polly Hedron	**Evan Number**	**Al T. Tude**
Clue 1 Question 1: 13.2 cm	Clue 1 Question 1: 13.2 cm	Clue 1 Question 1: 15 cm
Clue 2 Question 2: 32 pounds	Clue 2 Question 2: 25 pounds	Clue 2 Question 2: 32 pounds
Clue 3 Question 5: 8 miles/gallon	Clue 3 Question 5: 25 miles/gallon	Clue 3 Question 5: 16 miles/gallon

The Suspect List Activity Sheet summarizes what is known about each person.

Suspect List Activity Sheet

You can also create your own suspect list, using people you make up or people you know, such as other teachers or classmates. Having two or three possible values for each characteristic makes it easier to have students find suspects to match their calculations.

Give each student a pretend police badge as they enter the classroom. You can find them at most party stores, or make them yourself. Address the class as if they are a police academy with an opening statement like, "Detectives, we have received an urgent email from the captain of police. We have been chosen for this task because of our superior math skills. I have created a copy of the note for everyone."



Give students the option of working in pairs or individually. Groups larger than two tend to result in students being off-task with an unequal distribution of work.

Pass out the Clue Sheet Activity Sheet to each student and place the Clue Sheet Overhead on the board.

Clue Sheet Activity Sheet

Lead a class discussion about the clues. Ask, "What they would do with ____ pounds of quarters?" or "If the perpetrator's car gets ___ miles per gallon, do you think he/she is very far away?" Some students, especially students whose first language is not English, may not be familiar with the vocabulary words perpetrator, apprehend, and deduction. As you read the letter, pause to ask for volunteers who can define each of these words.

- *Perpetrator*- a person who committed the crime
- *Apprehend*- to arrest someone
- *Deduction*- to reach a conclusion

Then, have students fill in the blanks in Questions 1, 2, and 5.

Review conversions that students will need to solve problems: 12 inches in 1 foot, 4 quarters in 1 dollar. Suggest that students write word ratios to write a proportion. For example, Question 1 compares the centimeters in the photo to the inches in reality. A word ratio would be photo/real or centimeters/inches. Remind students that for these word ratios, all "photo," or "centimeter," measurements must be in the numerator. All "real," or "inch," measurements must be in the denominator.

Be conscious that proportions are not required to solve Questions 3, 4 or 5. Alternate solution methods can lead to the correct results, so if you want students to use proportions, clearly state so.

Pass out the Suspect List Activity Sheet. Read the Question 1 of the suspect list out loud with the class and let them know that they can work with both the clue sheet and suspect list at the same time to find the perpetrator.

Polly Hedron
Apprehended in Harrisburg, PA
With $640
Height: 5'6"

Monitor students' work, and listen for students who are struggling. Students may have problems correctly answering Question 1. Some students will leave their answers as decimals, but the suspect list does not have decimal heights. Ask, "Do any of your answers match the answers on the suspect list? What do you notice about the answers on the suspect sheet?"

[They are in feet and inches.]

"So what do you have to do?"

[Convert the decimal into inches.]

The most common problem will be students' making the decimal the number of inches, like 5.5 feet must be 5 feet 5 inches. Ask, "How many inches are in half a foot?"

[6 inches.]

"What should the height be?"

[5 feet 6 inches.]

Remind them to multiply 12 inches by the decimal part of their answer to find the number of inches.

For Clue 4, students use their answers from Clue 3 and measure the scale line in centimeters and use a proportion to calculate how far to measure on the map to find the perpetrator's city. Be prepared to help students read a ruler. Remind them that the smaller lines represents millimeters, which are 0.1 centimeters.

Have students submit their papers when they can identify the thief. Have students share who they think is the perpetrator. If students disagree, have them explain why their answer is correct. Or the teacher could ask what changes in the clues could lead to any of the other suspects.

- Centimeter rulers
- Plastic police badges (optional)

- 6 pictures of suspects (optional)
- Clue Sheet Activity Sheet
- Suspect List Activity Sheet
- Clue Sheet Overhead

Assessment Options

1. Have students work in groups to create their own mysteries. Each student is responsible for creating at least one clue. Groups swap mysteries and solve.
2. Have students work backwards. Assign different suspects to different students to create their own sets of clues. Then, students can swap and try to find the new perpetrator.

Extensions

1. The thief escaped the police and was able to make way toward his home in Corpus Christi, Texas. Have students determine whether the perpetrator can make it within 24 hours before an arrest. Students should use the same gas mileage used in the Clue Sheet, but using current gasoline prices. Using a map of the United States have students plot the quickest route from the hideout city to Corpus Christi. They need to consider state speed limits and whether the culprit has to make any stops. Using proportions and the formula $d = rt$, students conclude whether the thief escapes and justify their conclusions mathematically.
2. The thief had some accomplices to help him pull off the crime. The original plan was to split up the money. The thief was to receive 65% of the loot. Accomplice A was to receive 30% of what was left. Accomplice B was to receive 15% of what is left after Accomplice A and the thief each get their share. Accomplice C gets the rest. Students should calculate how much each accomplice gets.

Questions for Students

1. How did you know when to use a proportion to solve a problem?

[Student answers may vary. Students might say that they saw that two objects were compared.]

2.If you did not use a proportion, how did you solve the problems?

[Students may have solved using a method similar to a proportion without setting one up. In the unit rate problems, students may have simply multiplied or divided.]

3. What are some things in real life that would have affected the answers you got?

[Questions 2 and 3 assume that all the quarters weigh exactly the same. Question 6 assumes that the car was getting 25 miles per gallon. Gas mileage varies based on driving conditions, such as speed.]

4. What is a tip you can give a student who is struggling setting up their proportion?

[Look for the two different units in the problem or the two different objects being compared. Then write a ratio using those words to help to organize the information.]

5.Does it matter what variable you choose to represent the missing value? [No.] Why not? [No matter what letter you choose for the variable, the answer will remain the same.]

Teacher Reflection

- Was students' level of enthusiasm/involvement high or low? Explain why.
- How do you think the grouping of your students affected their learning?
- What were some of the ways the students illustrated that they were actively engaged in the learning process?
- For those students who chose to work in pairs, how did you ensure that each group member was participating rather than one person completing all the work?
- Did the lesson help students deepen their understanding of proportions? How?

Learning Objectives

Students will:

- Practice computation of ratios, unit rates, and proportions.
- Apply skills to an authentic context.

- Develop problem solving and deductive skills.

Common Core State Standards – Mathematics

Grade 6, Ratio & Proportion

- CCSS.Math.Content.6.RP.A.1
  Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."

Grade 6, Ratio & Proportion

- CCSS.Math.Content.6.RP.A.2
  Understand the concept of a unit rate a/b associated with a ratio a:b with b ≠ 0, and use rate language in the context of a ratio relationship. For example, "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is 3/4 cup of flour for each cup of sugar." "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger."

Grade 7, Ratio & Proportion

- CCSS.Math.Content.7.RP.A.1
  Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. For example, if a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction (1/2)/(1/4) miles per hour, equivalently 2 miles per hour.

Grade 7, Ratio & Proportion

- CCSS.Math.Content.7.RP.A.3
  Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.

Grade 7, The Number System

- CCSS.Math.Content.7.NS.A.3
  Solve real-world and mathematical problems involving the four operations with rational numbers.

Grade 7, Expression/Equation

- CCSS.Math.Content.7.EE.B.3
  Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. For example: If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.

Common Core State Standards – Practice

- CCSS.Math.Practice.MP1
  Make sense of problems and persevere in solving them.
- CCSS.Math.Practice.MP2
  Reason abstractly and quantitatively.
- CCSS.Math.Practice.MP4
  Model with mathematics.
- CCSS.Math.Practice.MP5
  Use appropriate tools strategically.
- CCSS.Math.Practice.MP7
  Look for and make use of structure.

Clue Sheet

Dear Detective,

Someone has robbed the National Bank of Illuminations in Washington D.C. It is your job to use the clues left by the perpetrators to locate and apprehend the robber. Your tools will be your power of deduction and your mathematical knowledge. Good luck cracking this case!

Sincerely,
Captain P. Thagoras

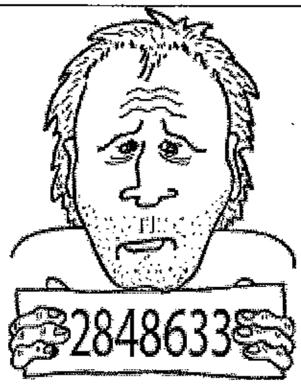
CLUES:

- The perpetrator is ______cm tall in the security camera image.
- ______pounds of quarters were stolen.
- The getaway car was a silver 1989 HN Cosine which travels ______miles per gallon of gas.

Suspect List

NAME ______________________

1. Below is a list of possible suspects, their heights, where they were arrested, and how much stolen money they had. Use the answers from the Clue Sheet to select the culprit.



ROY G. BIV
APPREHENDED IN PITTSBURGH, PA
WITH $500
HEIGHT: 6'3"

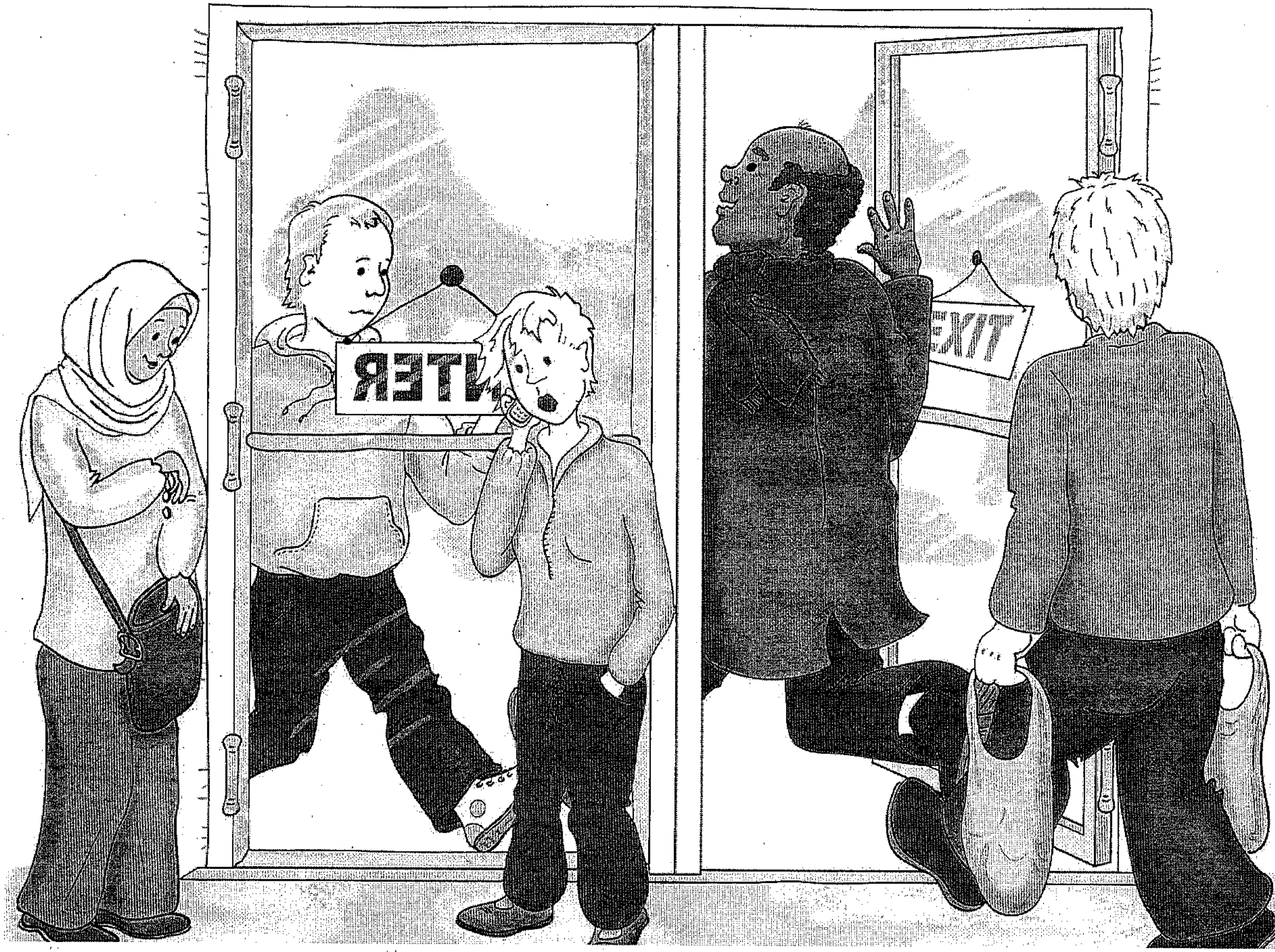
JEN ERIC
APPREHENDED IN PHILADELPHIA, PA
WITH $500
HEIGHT: 5'6"

MATTHEW MATICS
APPREHENDED IN RICHMOND, VA
WITH $640
HEIGHT: 6'3"

POLLY HEDRON
APPREHENDED IN HARRISBURG, PA
WITH $640
HEIGHT: 5'6"

EVAN NUMBER
APPREHENDED IN COLUMBUS, OHIO
WITH $500
HEIGHT: 5'6"

AL T. TUDE
APPREHENDED IN NEW YORK CITY
WITH $640
HEIGHT: 6'3"



ILLUMINATIONS
Resources for Teaching Math

Clues Sheet

NAME______________________

Dear Detective,

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Sincerely,
Captain P. Thagoras

Clue 1

1. One surveillance camera was able to capture the image on the next page. The image shows the thief standing next to the door. In real life the door measures 84 inches but it is only 16.8 centimeters in the picture. If the person in the photo is _______cm tall, how tall is suspect in real life? Report the height in feet and inches.

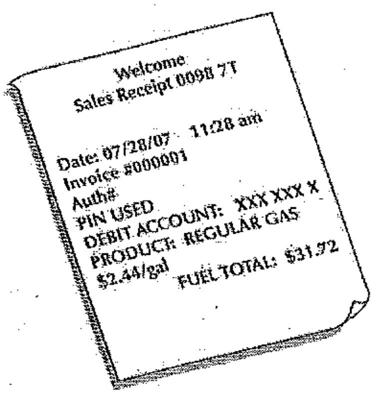
Clue 2

2. The robber stole only ______ pounds of quarters out of the coin machine. Quarters are weighed in ounces. If there are 16 ounces in 1 pound, how many ounces of quarters were stolen?

3. Each quarter weighs 0.2 ounces. How much money has been stolen from the bank?

Clue 3

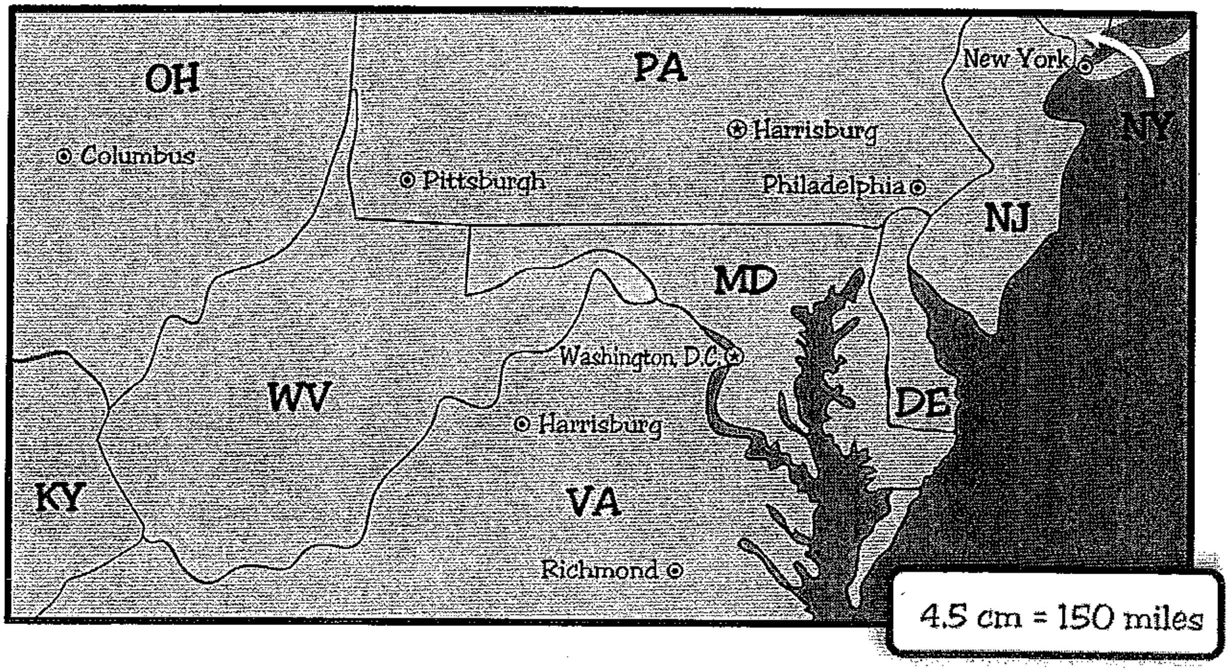
4. A witness at the bank saw the getaway car stop at a nearby gas station. The gas station attendant said that the thief's tank was practically empty, and that he filled it completely. Luckily, he was also able to find the thief's receipt. Determine how many gallons of gas the thief purchased.



5. The getaway car was a silver 1989 HN Cosine. The car gets _________miles per gallon of gas. If the car continued until it ran out of gas again, how far could it go?

Clue 4

6. Using only one tank of gas, what is the farthest city that the thief can reach?

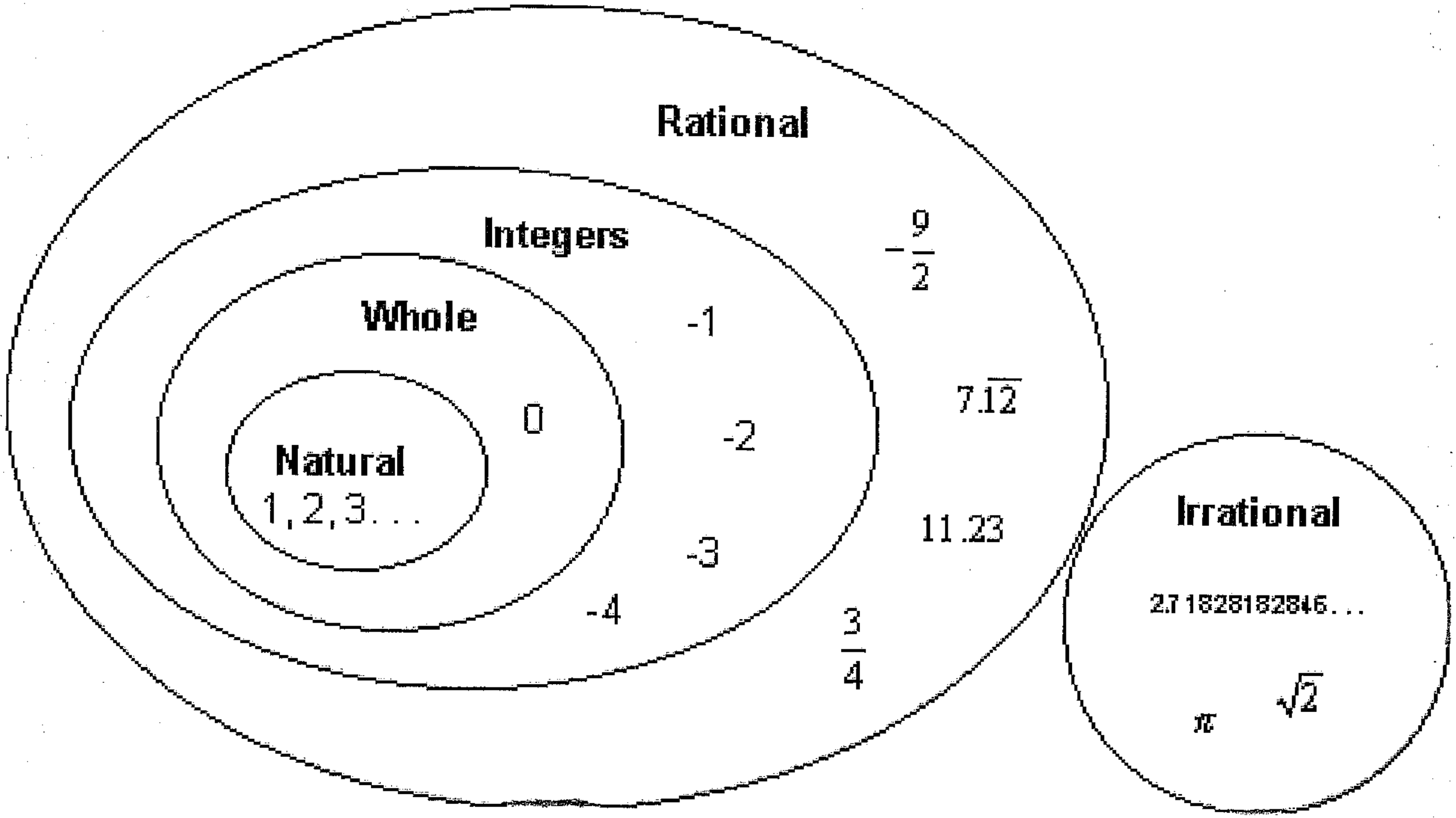


2. Write a letter to the Captain explaining who you think is the thief. Make sure to justify your answer by explaining how you came to your decision.

Dear Captain,
Using the clues you have given me, I have deduced that ______________________________ is the person that robbed the bank.

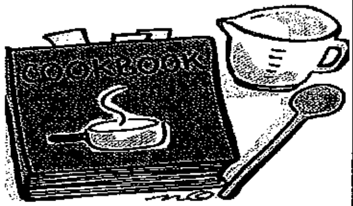
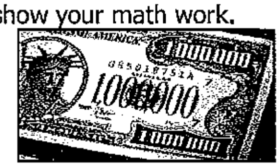
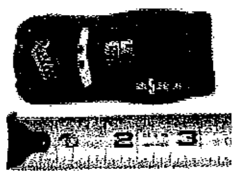
CASE CLOSED

10/12


Rational
Integers
Whole
Natural
1,2,3...
0
-1
-2
-3
-4
$-\frac{9}{2}$
$7.\overline{12}$
11.23
$\frac{3}{4}$
Irrational
2.718281828 46...
π
$\sqrt{2}$

Ratio and Proportion Math Enrichment Projects

Name: Date:

★Choose a recipe from a cookbook or online that serves 2-6 people. Convert the ingredient amounts of the recipe to serve 30 people. Rewrite the recipe and show your math work. 	★Research the height of the five tallest buildings in the United States and create a short pamphlet with each building. Illustrate each structure and convert the actual height of the buildings into a reduced scale of inches with a scale of 50 feet= 1 inch. For example if a building was 240 feet high, in your illustration it would be almost 5" high.	★ Determine how long it takes you to run a mile. Research the length of Texas and find out how long it would take you to run all the way across Texas from El Paso to Houston. Present your data in an organized mathematical presentation showing the amount of days for every 400 miles along your journey. Show your work. 
★On white butcher block paper or poster board, create a mini you, exactly one-half your size with the same proportions. Arms, legs, head, etc. must be in proportion just half your size. Finish by adding details to make it look distinctively like you.	★ Write a creative children's story book about proportions. It must have a cover/title page, and be at least eight pages long with illustrations on each page. Use a theme such sports. For example, "if a basketball was represented on a chart with a circumference of 5 inches, a football would have a circumference of 3 inches.	★ In your first job you are given a salary of $2,500 a year. How many years will you have to work to earn a million dollars at your place of employment? Explain and show your math work. 
★ Brainstorm a list of ten ways that ratio and proportion play a big role in your everyday life and create a powerpoint presentation to display yo 	★At Baskin-Robbins they are allowed to pour 3 tablespoons of hot fudge on a pint of ice cream. Create a picture graph to show how much hot fudge they would pour on two pints, a quart, and a gallon. Then create another table with another type of topping. 	★ Research the five largest land mammals on earth. Draw a proportional scale illustration of each animal with a scale of 1 inch = 3 feet. Make sure their heights and lengths are in proportion to their real measurements. Label the animals and organize them into a short book.

Complete three projects in tic tac toe order

Name ______________________ Date ______________________

	Listed Price	Ratio (Fraction)	Unit Price		Listed Price	Ratio (Fraction)	Unit Price	Which Store has the better buy?
1) Progresso Vegetable Classics (pg. 1)				Progresso Vegetable Classics (pg. 2)				
2) Dannon Yogurt (pg. 2)				Dannon Yogurt (pg. 4)				
3) Navel Oranges (pg. 3)				Navel Oranges (pg. 5)				
4) Mcilhenny Tabasco Pepper Sauce (pg. 4)				Mcilhenny Tabasco Sauce (pg. 2)				
5) Chicken of the Sea Chunk White Tuna (pg. 4)				Bumble Bee Chunk Light Tuna (pg. 3)				
6) Key Food Steamable Vegetables (pg. 2)				White Rose Steam Its Vegetables (pg. 4)				
7) Snapple Iced Tea (pg. 5)				Snapple Drinks or Tea (pg. 5)				
8) Hot House Cucumbers (pg. 3)				Super Select Cucumbers (pg. 5)				
9) Key Food Evaporated Milk (pg. 5)				Carnation Evaporated Milk (pg. 3)				
Challenge 10) Bounty Basic Paper Towels (pg. 1)				Challenge Scott Mega Roll Towels (pg. 3)				

Ratio and Proportion Vocabulary:

Ratio
A comparison of two quantities

Equalivalent Ratios
Two equal ratios that are multiplied or divided by the same number

Rate
A Ratio in which to units of measure are compared

Ratio Table
A table with columns filled with pairs of numbers that have the same ratio.

Unit Rate
The price for one unit of measure

Proportion
an equation stating that two ratios are equal

Greatest common factor
the largest factor that two or more numbers have in common

factor trees
a diagram showing the prime factorization of a number

prime factorization
a composite number expressed as the product of its prime factors

scale factor
a common ratio for pairs of corresponding sides of similar figures

scale
the ratio of the size of a figure on a drawing to the actual size of the figure.

Ratio and Proportion Project Rubric:

All components are included in the projects as provided in the directions.....30 pts. _____

Projects are neat and organized...25 pts. _____

All math concepts presented in the projects are accurate..............................25 pts. _____

Punctuation, grammar and spelling..10 pts. _____

Projects are neat and professional looking..10 pts. _____

Total Possible..100 Points

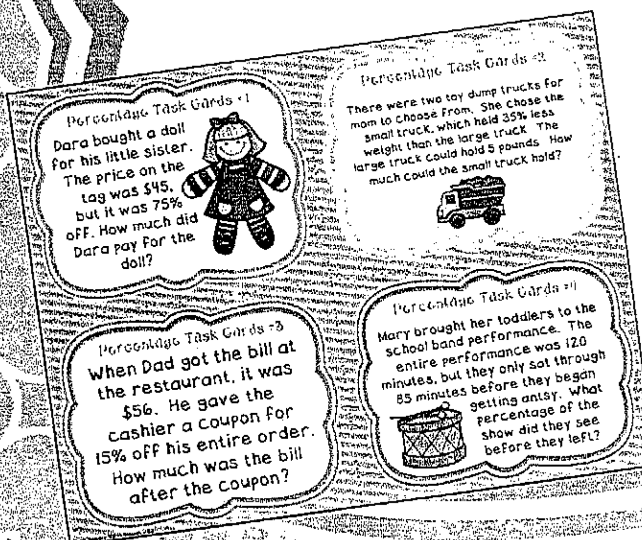
Student Name________________________

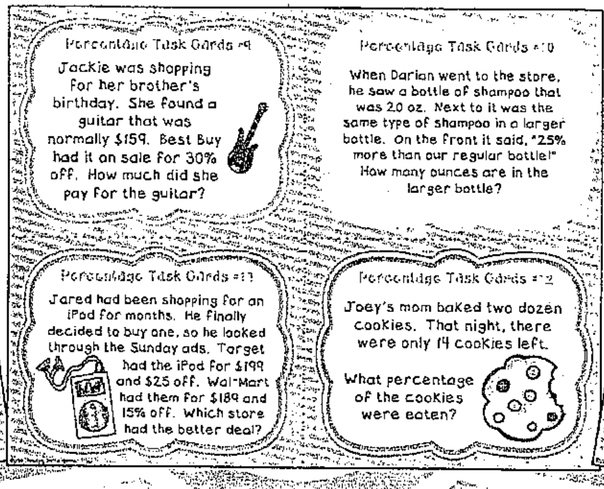
Total Points___________________

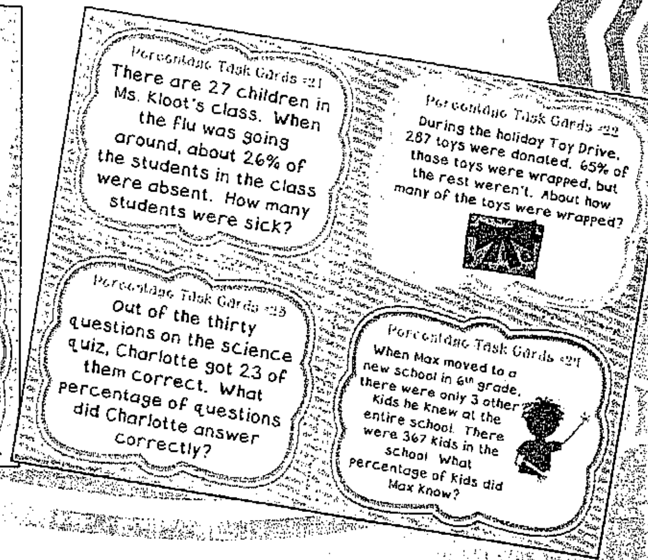
Grade____________________

Percentage

Task Cards







Thank You For Your Purchase!

I sincerely hope that you and your students enjoy these task cards! They are meant to bring a real life context to percentages as well as requiring multiple steps to answer questions.

If you have any questions, please feel free to contact me at

teachingwithamountainview@gmail.com

If you have trouble printing, see a small error, or have any questions, I encourage you to email me or use the "Ask Question" feature before leaving negative feedback. I will do everything I can for you ASAP!

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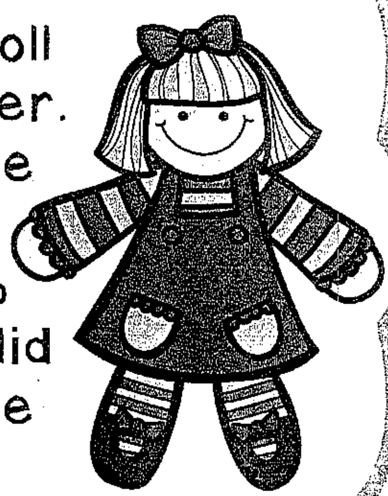
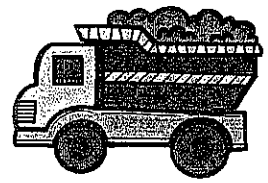
Percentage Task Cards #1

Dara bought a doll for his little sister. The price on the tag was $45, but it was 75% off. How much did Dara pay for the doll?



Percentage Task Cards #2

There were two toy dump trucks for mom to choose from. She chose the small truck, which held 35% less weight than the large truck. The large truck could hold 5 pounds. How much could the small truck hold?

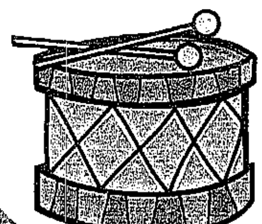


Percentage Task Cards #3

When Dad got the bill at the restaurant, it was $56. He gave the cashier a coupon for 15% off his entire order. How much was the bill after the coupon?

Percentage Task Cards #4

Mary brought her toddlers to the school band performance. The entire performance was 120 minutes, but they only sat through 85 minutes before they began getting antsy. What percentage of the show did they see before they left?

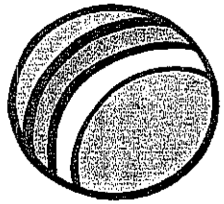


Percentage Task Cards #5

During Home Economics, Joey sewed this bear together. It took him four 65-minute class periods to complete it. He spent 20% of that time sewing the arms on. How much time did he spend sewing bear arms?

Percentage Task Cards #6

Kim and her dad were training their dog, Dasher, for a talent show. His trick was catching a ball in his mouth from 20 feet away, after bouncing it off the side of a wall. They practiced the trick 188 times the day before the show. He caught the ball 75% of the time. How many times did he drop the ball?

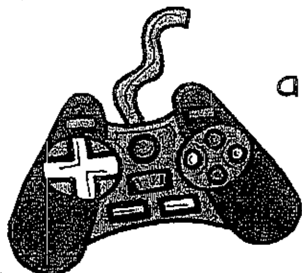


Percentage Task Cards #7

The train station in New York, NY kept a record of how often the trains left on time. Out of 140 departures one day, 80% of the trains departed on time. How many trains left on schedule?

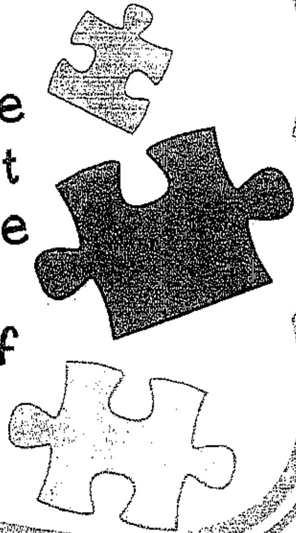
Percentage Task Cards #8

Russ bought a new video gaming system during a big sale. He spent $657 on the entire set up. About 87% of the cost was on the gaming system. The rest was spent on video games and accessories. About how much did he spend on the video games and accessories?



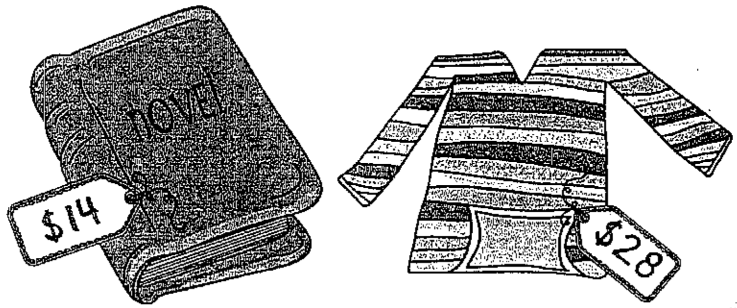
Percentage Task Cards #13

Max picked out an old Star Wars puzzle to put together. Out of the 250 pieces, he was missing 14. What percentage of pieces was he missing?



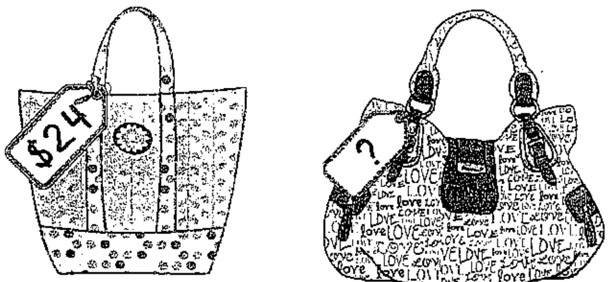
Percentage Task Cards #14

David was picking out a gift for his sister. He was deciding between a novel and a new sweater. What percentage less was the cost of the novel?



Percentage Task Cards #15

Clara was deciding between two different bags for her mom for Mother's Day. The price of the bag on the right was 38% more than the bag on the left. What is the price of the bag on the right?



Percentage Task Cards #16

After a cab ride, Jacob's total fare was $45. He paid the cab driver a 15% tip. How much was the tip?

Percentage Task Cards #9

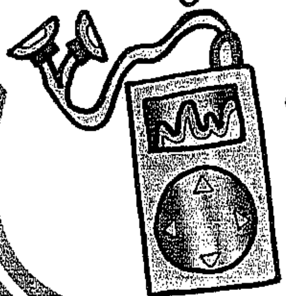
Jackie was shopping for her brother's birthday. She found a guitar that was normally $159. Best Buy had it on sale for 30% off. How much did she pay for the guitar?

Percentage Task Cards #10

When Darian went to the store, he saw a bottle of shampoo that was 20 oz. Next to it was the same type of shampoo in a larger bottle. On the front it said, "25% more than our regular bottle!" How many ounces are in the larger bottle?

Percentage Task Cards #11

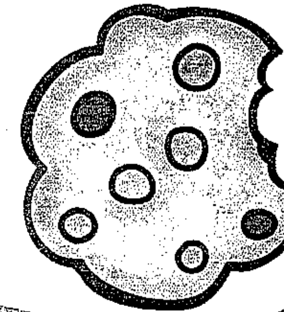
Jared had been shopping for an iPod for months. He finally decided to buy one, so he looked through the Sunday ads. Target had the iPod for $199 and $25 off. Wal*Mart had them for $189 and 15% off. Which store had the better deal?



Percentage Task Cards #12

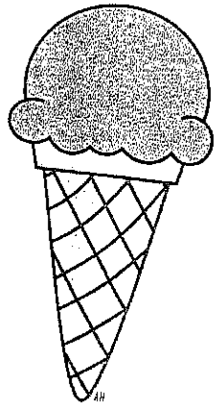
Joey's mom baked two dozen cookies. That night, there were only 14 cookies left.

What percentage of the cookies were eaten?



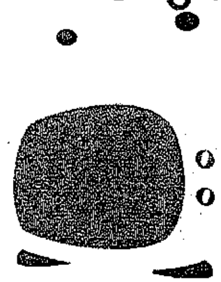
Percentage Task Cards #17

Matthew polled 28 of his classmates to find out which ice cream flavors they liked best. About 16% liked strawberry the best. About how many kids did NOT choose strawberry?



Percentage Task Cards #18

Dad bought a new television online. The TV was $1,567. Shipping charges were 20% of the cost of the item bought. How much was the television AND shipping combined?

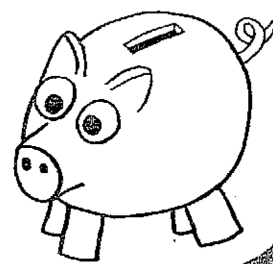


Percentage Task Cards #19

Mom and dad were going on a special trip for their anniversary. The airlines were running a special deal. If you paid full price for the first ticket, you got 20% off the price of the second ticket. Mom and dad paid $345 for the first ticket. How much will they spend on both tickets total?

Percentage Task Cards #20

Patrick put $250 in a savings account. Every month, he got 3% of the amount in his savings account deposited in interest. How much money did he earn in interest after the first month?

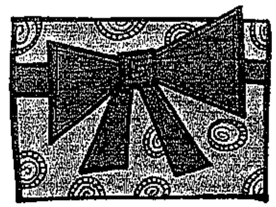


Percentage Task Cards #21

There are 27 children in Ms. Kloot's class. When the flu was going around, about 26% of the students in the class were absent. How many students were sick?

Percentage Task Cards #22

During the holiday Toy Drive, 287 toys were donated. 65% of those toys were wrapped, but the rest weren't. About how many of the toys were wrapped?



Percentage Task Cards #23

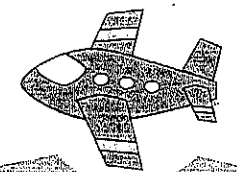
Out of the thirty questions on the science quiz, Charlotte got 23 of them correct. What percentage of questions did Charlotte answer correctly?

Percentage Task Cards #24

When Max moved to a new school in 6th grade, there were only 3 other kids he knew at the entire school. There were 367 kids in the school. What percentage of kids did Max know?

Percentage Task Cards #25

David was at the airport for 2 hours. He spent 45 minutes of that time waiting in the security line. What percentage of time did he spend in the security line?



Percentage Task Cards #26

The jacket at the department store originally cost $199. It was selling so well that the store decided to increase the price by 25 percent. What was the new cost of the jacket?

Percentage Task Cards #27

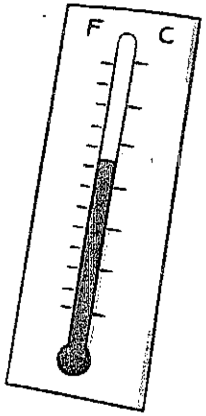
When dad pulled out the lights to hang on the tree, he tested them. Out of the 284 lights on the string, 6 of them were out. What percentage of the lights were out?

Percentage Task Cards #28

Jennifer bought a new game at Target for $17. When she went to the store next door, the game was 25% less expensive. How much was the game next door?

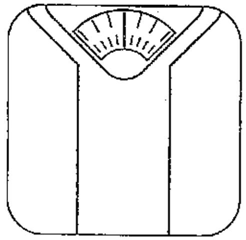
Percentage Task Cards #29

On Monday the temperature was 75 degrees. That night, a fierce cold front blew through. On Tuesday, it was 33% cooler. What was the temperature on Tuesday?

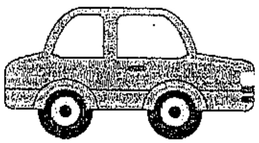


Percentage Task Cards #30

Donald weighed 154 pounds. His body fat percentage was 24%. How much of his weight was body fat?



Percentage Task Cards #31



During his road trip, Glen stayed at hotels two nights in a row. The first night, the hotel cost $199. The next night, it was 36% less. How much was the room the second night?

Percentage Task Cards #32

Jack bought an old collectible at an antique store. He paid $34 for it. He sold it on eBay for 76% more than he paid. How much money did he make from selling the collectible?

Task Card Recording Sheet

Name: ____________________

Topic: ____________________

1.	2.	3.	4.
5.	6.	7.	8.
9.	10.	11.	12.
13.	14.	15.	16.
17.	18.	19.	20.
21.	22.	23.	24.
25.	26.	27.	28.
29.	30.	31.	32.

Percent Task Card Answer Key

Answers are rounded to the nearest whole number, except for dollar amounts.

1. $11.25	2. 3 pounds	3. $47.60	4. 71%
5. 52 minutes	6. 47 times	7. 112 trains	8. $86
9. $111.30	10. 25 oz	11. Wal Mart	12. 42%
13. 5%	14. 50%	15. $33.12	16. $6.75
17. 23 kids	18. $1,880.40	19. $621	20. $7.50
21. 7 kids	22. 186	23. 77%	24. 1%
25. 37.5%	26. $248.75	27. 2%	28. $12.75
29. 50 degrees	30. 37 pounds	31. $127.36	32. $25.84

Name: ______________________ Period: __________ Date: __________

Fractions, Decimals, and Percents

FRACTION	# CUBES	DECIMAL	PERCENT
$\frac{1}{100}$			
$\frac{10}{100}$			
$\frac{100}{100}$			

$\frac{1}{4}$			
$\frac{2}{4}=\frac{1}{2}$			
$\frac{3}{4}$			

$\frac{1}{8}$			
$\frac{2}{8}=\frac{1}{4}$			
$\frac{3}{8}$			
$\frac{4}{8}=\frac{2}{4}=\frac{1}{2}$			
$\frac{5}{8}$			
$\frac{6}{8}=\frac{3}{4}$			
$\frac{7}{8}$			
$\frac{8}{8}=1$			

FRACTION	# CUBES	DECIMAL	PERCENT
$\frac{1}{16}$			
$\frac{2}{16}=\frac{1}{8}$			
$\frac{3}{16}$			
$\frac{4}{16}=\frac{2}{8}=\frac{1}{4}$			
$\frac{5}{16}$			
$\frac{6}{16}=\frac{3}{8}$			
$\frac{7}{16}$			
$\frac{8}{16}=\frac{4}{8}=\frac{2}{4}=\frac{1}{2}$			
$\frac{9}{16}$			
$\frac{10}{16}=\frac{5}{8}$			
$\frac{11}{16}$			
$\frac{12}{16}=\frac{6}{8}=\frac{3}{4}$			
$\frac{13}{16}$			
$\frac{14}{16}=\frac{7}{8}$			
$\frac{15}{16}$			
$\frac{16}{16}=\frac{8}{8}=\frac{4}{4}=\frac{2}{2}=1$			

FRACTION	# CUBES	DECIMAL	PERCENT
$\frac{1}{3}$			
$\frac{2}{3}$			
$\frac{3}{3}$			

$\frac{1}{6}$			
$\frac{2}{6}=\frac{1}{3}$			
$\frac{3}{6}=\frac{1}{2}$			
$\frac{4}{6}=\frac{2}{3}$			
$\frac{5}{6}$			
$\frac{6}{6}=1$			

If 30% of some number = 288, FIND:

a) 75% ________

b) 15% ________

c) 40% ________

d) 10% ________

e) 5% ________

f) 120% ________

If 60% of some number = 612, FIND:

a) 40% ________

b) 15% ________

c) 90% ________

d) 80% ________

e) 5% ________

f) 145% ________

Name:______________________________

Equation Abstract Art

Equation #1: ____________________

x	y

Equation #2: ____________________

x	y

Equation #3: ____________________

x	y

Equation #4: ____________________

x	y

Equation #5: ____________________

x	y

Equation #6: ____________________

x	y

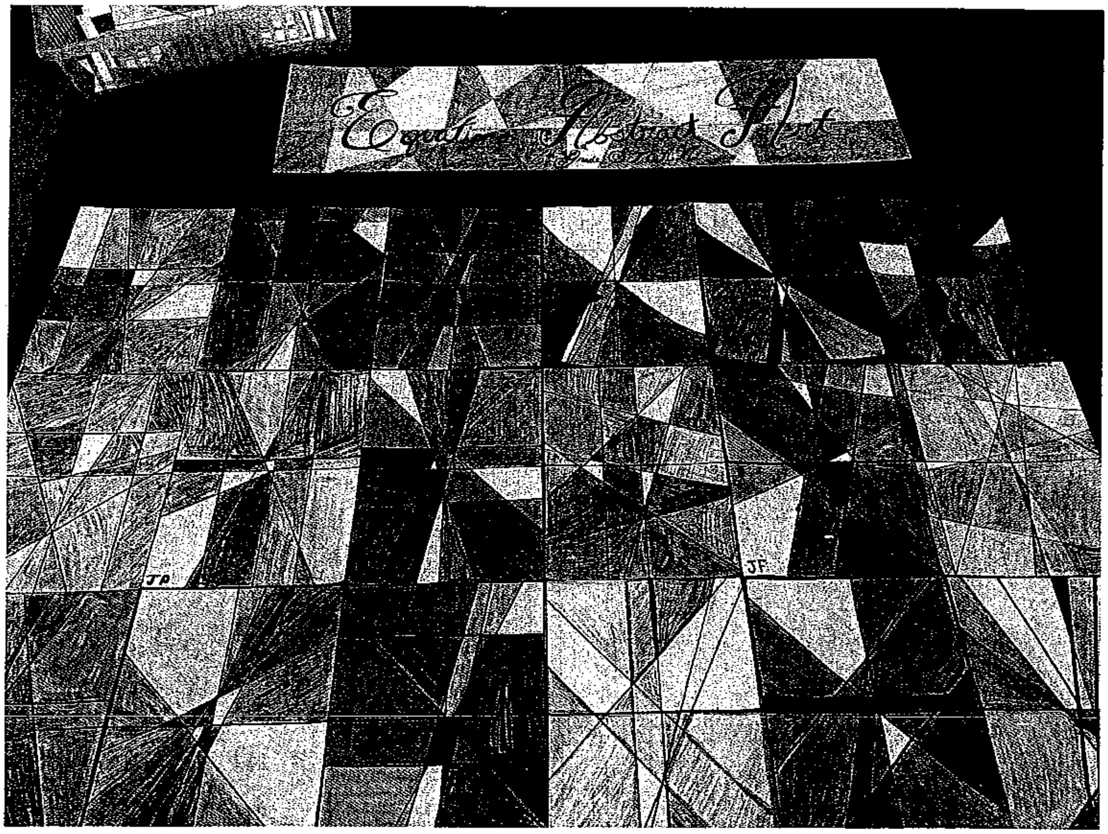
Lesson: **Math Bulletin Board- Linear Equation Abstract Art**

Students were given a coordinate graph and were asked to create 6 linear equations (in the form of y=mx+b), make a table with different x and y values, and graph each point to create a line. I gave students hints as to what each part of the equation means (the m value is the slope, the b value is the y-intercept). My higher level math students were able to use this to create specific lines they had in mind and my average to

Name:______________________________

low math students created their own lines with teacher help/guidance. When they finished graphing, they were able to color in each section of the coordinate graph to then quilt with the other student and make math abstract art! This lesson was fun, engaging, and enriching to students of all levels.

Sample below:



Algebra

3x-12

Name____________________________

Write the Algebraic Expressions

Example: *four times a number decreased by twelve* = $4n-12$

Look at the phrases below and re-write them into an algebraic expression:

1.) A number minus 18

2.) A number decreased by 16

3.) x plus twelve is twenty one

4.) x times twelve is forty-six

5.) six increased by twelve

6.) two times eight

7.) six more than twice a number

8.) eight divided by twice a number

9.) The sum of seven and x

10.) x times eleven is equal to thirty-three

11.) The difference between x and eight is equal to fifteen.

12.) A number plus ten

13.) The quotient of x and four is thirteen

14.) x increased by five is equal to thirty-eight.

15.) The product of a number and thirteen.

Algebra

3x-12

Name________________________________

Write the Algebraic Expressions

Example: *four times a number decreased by twelve* = *4n-12*

Answers:

1.) A number minus 18	$n - 18$
2.) A number decreased by 16	$n - 16$
3.) x plus twelve is twenty one	$x + 12 = 21$
4.) x times twelve is forty-six	$x \cdot 12 = 46$
5.) six increased by twelve	$6 + 12$
6.) two times eight	$2 \cdot 8$
7.) six more than twice a number	$2n + 6$
8.) eight divided by twice a number	$2n \div 8$ or $\frac{8}{2n}$
9.) The sum of seven and x	$7 + x$
10.) x times eleven is equal to thirty-three	$x \cdot 11 = 33$
11.) The difference between x and eight is equal to fifteen.	$x - 8 = 15$
12.) A number plus ten	$n + 10$
13.) The quotient of x and four is thirteen	$\frac{x}{4} = 13$
14.) x increased by five is equal to thirty-eight.	$x + 5 = 38$
15.) The product of a number and thirteen.	$13n$

Name________________________________

Write the Algebraic Expressions

Example: *four times a number decreased by twelve = 4n-12*

Look at the phrases below and re-write them into an algebraic expression:

1.) The product of x and seven equals twenty-eight.

2.) The difference of a number and 13 equals forty-eight.

3.) The number increased by 7 is equal to six.

4.) Twelve more than a number is eleven.

5.) The second power of eight.

6.) The difference of a number and fifteen is thirty-eight.

7.) Fifteen less than a number.

8.) The product of the number and nine equals five.

9.) The difference of a number and four is eighteen.

10.) Thirteen less than a number.

11.) The fifth power of eight.

12.) Add five to a number, then divide it by 3.

13.) Multiply a number by four and add 3.

Algebra

3x-12

Write the Algebraic Expressions

Example: *four times a number decreased by twelve* = $4n-12$

Answers:

1.) The product of x and seven equals twenty-eight. $x \cdot 7 = 28$

2.) The difference of a number and 13 equals forty-eight. $n - 13 = 48$

3.) The number increased by 7 is equal to six. $n + 7 = 6$

4.) Twelve more than a number is eleven. $n + 12 = 11$

5.) The second power of eight. 8^2

6.) The difference of a number and fifteen is thirty-eight. $n - 15 = 38$

7.) Fifteen less than a number. $n - 15$

8.) The product of the number and nine equals five. $n \cdot 9 = 5$

9.) The difference of a number and four is eighteen. $n - 4 = 18$

10.) Thirteen less than a number. $n - 13$

11.) The fifth power of eight. 8^5

12.) Add five to a number, then divide it by 3. $\frac{n+5}{3}$

13.) Multiply a number by four and add 3. $4n + 3$

2.5a Translate to an Algebraic Expression

Addition

______ 1. The **sum** of a and 8

______ 2. 4 **plus** c

______ 3. 16 **added to** m

______ 4. 20 **more than** f

______ 5. T **increased by** r

Subtraction

______ 1. The **difference of** 23 and p

______ 2. 550 **minus** h

*______ 3. W **less than** 25

______ 4. 7 **decreased by** j

______ 5. M **reduced by** x

*______ 6. 12 **subtracted from** l

Multiplication

______ 1. The **product of** 4 and x

______ 2. 20 **times** b

______ 3. **Twice** x

______ 4. $\frac{3}{4}$ **of** m

______ 5. 7 **multiplied by** x

Division

______ 1. The **quotient of** r and 19

______ 2. x **divided by** d

______ 3. The **ratio of** c to d

______ 4. The price p **per** gallon g

Mixed Practice

______ 1. Eight more than one – fourth of d

______ 2. Five less than twice a number

______ 3. Seven increased by the product of two numbers

______ 4. one half of some number

______ 5. A number m plus six times n

______ 6. The sum of m and n

______ 7. Thirty-four divided by x

______ 8. The quotient of two numbers subtracted from 20

______ 9. The product of six and three less than the number

______ 10. Twice the sum of a number and eight

Words indicating equality, = : is the same as, equal, **is**, are

Let n represent the **number** and translate each phrase or sentence.

1. Four more than a number.
2. Four times a number
3. Four less than a number
4. A number increased by four
5. A number decreased by four
6. The product of four and a number
7. Six more than five times a number
8. Six less than five times a number
9. Nine less than twice a number
10. A number divided by 7
11. The product of a number and seven more than the number
12. The product of a number and seven less than the number
13. Eight less than twice a number is fourteen.
14. One less than three times a number is seven.
15. Four more than five times a number is two less than the number.
16. Ten less than a number is three more than six times the number.
17. Twice the sum of a number and 3 is 20.

Name: ______________________ Date: __________

Variable Expressions Worksheet

Write an expression.

1 a. *t* to the 10th power	**1 b.** 2 multiplied by *c*
2 a. *p* to the 7th power	**2 b.** *k* squared
3 a. *v* to the 7th power	**3 b.** quotient of *x* and 68
4 a. difference of 8 and *n*	**4 b.** 32 subtracted from *k*
5 a. quotient of *w* and 2	**5 b.** *a* squared
6 a. quotient of *s* and 6	**6 b.** *k* to the 6th power

Name: ______________________ Date: __________

Answer Key

1 a. t^{10}	1 b. $2c$
2 a. p^7	2 b. k^2
3 a. v^7	3 b. $\frac{x}{68}$
4 a. $8 - n$	4 b. $k - 32$
5 a. $\frac{w}{2}$	5 b. a^2
6 a. $\frac{s}{6}$	6 b. k^6

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Write the phrase as a variable expression. Use x to represent "a number."

1) the difference of Five and a number — 1) ______

A) $5x$ B) $5 - x$ C) $x - 5$ D) $\frac{5}{x}$

2) The quotient of 38 times a number and -4 — 2) ______

A) $38x + 4$ B) $38x - 4$ C) $\frac{38x}{-4}$ D) $\frac{1}{-152x}$

3) A number divided by -11 — 3) ______

A) $\frac{-11}{x}$ B) $-11x$ C) $\frac{x}{-11}$ D) $x - (-11)$

4) Negative thirteen decreased by 3 times a number — 4) ______

A) $13 - 3x$ B) $-13 - 3x$ C) $-13 + 3x$ D) $13 + 3x$

5) The sum of -9 and a number — 5) ______

A) $-9 - x$ B) $-9 + x$ C) $9 + x$ D) $-9x$

6) Eleven subtracted from a number — 6) ______

A) $11 - x$ B) $11x - 11$ C) $\frac{x}{11}$ D) $x - 11$

7) The quotient of 40 and the product of a number and -8 — 7) ______

A) $\frac{40}{x} - 8$ B) $-320x$ C) $\frac{40}{-8x}$ D) $\frac{-8x}{40}$

8) Twice a number, decreased by 58 — 8) ______

A) $2(x - 58)$ B) $2x - 58$ C) $2x + 58$ D) $2(x + 58)$

9) A number subtracted from -20 — 9) ______

A) $-20x$ B) $-20 + x$ C) $x - (-20)$ D) $-20 - x$

10) Five times the sum of a number and -23 — 10) ______

A) $5 + x + (-23)$ B) $5x - (-23)$ C) $5x + (-23)$ D) $5[x + (-23)]$

1) B
2) C
3) C
4) B
5) B
6) D
7) C
8) B
9) D
10) D

Name: ________________________________

Equivalent Expressions

Equivalent expressions are two expressions that give the same results for every value of the variable.

Example: **3x** and **(4x - x)** are equivalent because for every value of x, you get the same result.

3x

x	1	3	5
result	3	9	15

(4x - x)

x	1	3	5
result	3	9	15

Use tables to determine if the two given expressions are equivalent.

1. **4x - 16** and **2(2x – 8)**

4x - 16

x			
result			

2(2x – 8)

x			
result			

2. **6x – x + 3** and **4 + 5x – 1**

6x – x + 3

x			
result			

4 + 5x – 1

x			
result			

Name: ______________________________

3. **x + x - 8** and **8 – x + x**

x + x - 8

x			
result			

8 – x + x

x			
result			

4. A group of students worked on the ladder problem from Problem 4.1. Four of them came up with equations relating the number of steel pieces P to the number of squares n.

Which of the expressions for the number of steel pieces in a ladder of n squares are equivalent? Show your work and **explain why.**

Name: ______________________________

Equivalent Expressions II

Equivalent expressions are two expressions that give the same results for every value of the variable. One way to find equivalent expressions is to **simplify by combining like terms.** "Like terms" are terms that are the same.

In the expression **$4x + x + 2 + 1$,** $4x$ and x are like terms because they both have the same variable. We can combine these using the operation given. $4x + x$ would give me $5x$. 2 and 1 are also like terms. Using the operation between them, we can combine $2 + 1$ to be 3. Therefore, an equivalent expression to **$4x + x + 2 + 1$** is **$5x + 3$.**

Example: Combine like terms to find an expression equivalent.

$$x + 6 + x + 7x - 2$$

Simplify the expression by combining like terms.

1. $7n + 7n + 9n + 10$

2. $12 - 4 + s + 5 + s$

3. $12j + 7 - 10j - 4$

4. $5 - 3 + 7f - 1 - 3f + 4f + 10$

Name: ______________________________

Determine if the two expressions are equivalent. Show your work.

m + m + 3m and **3m + 2**

p + p and **p + 7**

5r + 5 – r – 1 and **4r – 4**

Use what you know about combining like terms to write **two** equivalent expressions to the one given.

5n + 2

6r + 4

20 + 9k

Name: ______________________________

Equivalent Expressions III

Equivalent expressions are two expressions that give the same results for every value of the variable. The Distributive Property helps to show that two expressions are equivalent. It states that for any numbers *a, b,* and *c* the following is true.

$$a(b + c) = ab + ac$$

The expression a(b + c) is in *factored form.*

The expression ab + ac is in *expanded form.*

Example: Use the Distributive Property to write an equivalent expression to 4(x +2).

$$4(x + 2) \quad =$$

Example: Use the Distributive Property to write an equivalent expression to 6x + 3.

$$6x + 3 =$$

Use the Distributive Property to write an equivalent expression to the one given.

1. 6(x + 3)

2. 2(2x - 1)

3. x(3 + 4)

4. 3x(2 – 4)

Name: ______________________________

5. $12 + 6x$

6. $10n - 4$

7. $9 + 6f$

Use the Distributive Property to determine if the two expressions are equivalent.

8. $3(2t + 2)$ and $5t + 2$

9. $10 - 8n$ and $2(5 - 4n)$

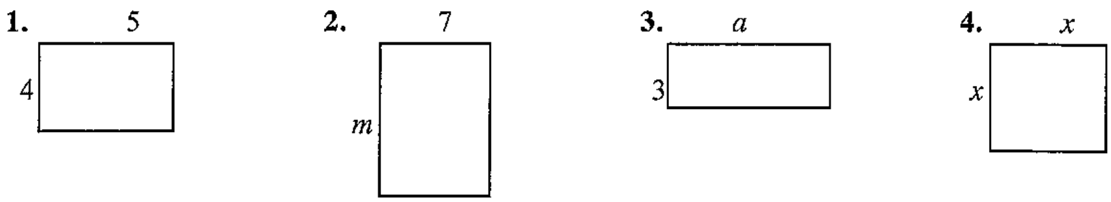
10. $6(2 + t)$ and $3(4 + 2t)$

V&P 4.3 (R)

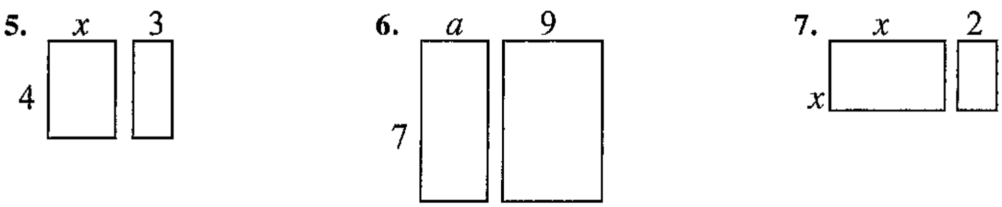
Distributive Property Using Area

NAME ____________________

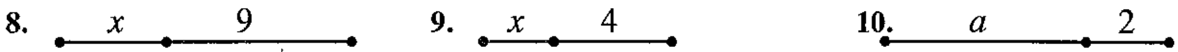
Write the expression that represents the area of each rectangle.



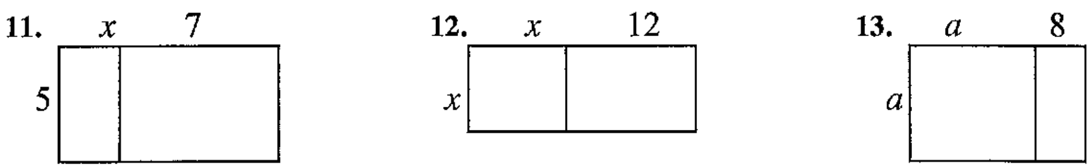
Find the area of each box in the pair.



Write the expression that represents the total length of each segment.



Write the area of each rectangle as the product of *length* × *width* and also as a sum of the areas of each box.



AREA AS PRODUCT	AREA AS SUM
5(X+7)	5X+35

AREA AS PRODUCT	AREA AS SUM

AREA AS PRODUCT	AREA AS SUM

This process of writing these products as a sum uses the **distributive property**.

Use the distributive property to re-write each expression as a sum. You may want to draw a rectangle on a separate page to follow the technique above.

14. $4(x+7)=$ __________

15. $7(x-3)=$ __________

16. $-2(x+4)=$ __________

17. $x(x+9)=$ __________

18. $a(a-1)=$ __________

19. $3m(m+2)=$ __________

20. $-4(a-4)=$ __________

21. $a(a-12)=$ __________

V&P 4.3 (R)

Factoring a Common Factor Using Area

NAME ______________________

Fill in the missing information for each: dimensions, area as product, and area as sum

1. x | 6; 2; [ ] [ ]

2(x+6)

2x+12

2. [ ] [ ]; 5; 5x | 20

______

______

3. [ ] 8; [ ]; $6x$ | 48

______

______

4. x [ ]; [ ]; $10x$ | 30

______

______

Fill in the missing dimensions from the expression given.

5. $5x+35=5($______$)$

6. $2x+12=2($______$)$

7. $3x-21=$__$($______$)$

8. $7x-21=$__$($______$)$

9. $-3x-15=-3($______$)$

10. $-5x+45=$__________

This process of writing a sum or difference as the product of factors is called **factoring.**

Factor these:

11. $4x-16=$______________

12. $-7x-35=$______________

13. $9x-81=$______________

14. $4x+18=$______________

V & P 4.3 (E)

More Factor Using Area

NAME ______________________

Fill in the missing information for each: dimensions, area as product, and area as sum

1.

	x	-7
3		

3(x-7)

3x-21

2.

-5	$-5x$	20

______

______

3.

		10
	x^2	$10x$

______

______

4.

	a	
	a^2	$-3a$

______

______

Fill in the missing dimensions from the expression given.

5. $x^2+3x=x(\_\_\_\_\_)$

6. $x^2+5x=x(\_\_\_\_\_)$

7. $6x+21=3(\_\_\_\_\_)$

8. $4x-10=$ ______

9. $a^2-5a=$ ______

10. $m^2+m=$ ______

When factoring expression, you have to consider that the common factor may be a variable instead of (or addition to) a number.

Factor these:

11. $t^2-6t=$ ______________

12. $10x-35=$ ______________

13. $6x+21=$ ______________

14. $9a^2-15a=$ ______________

V & P 4.3
(E)

Greatest Common Factor

NAME ____________________________

Complete the factorization for each:

1.

a. $3x^2 + 15x = 3(\_\_\_\_\_\_)$ b. $3x^2 + 15x = x(\_\_\_\_\_\_)$ c. $3x^2 + 15x = 3x(\_\_\_\_\_\_)$

2. Which of the above factorizations for $3x^2 + 15x$ do you think is the 'best'? Why?

____

3.

a. $4a^2 - 12a = 4(\_\_\_\_\_\_)$ b. $4a^2 - 12a = a(\_\_\_\_\_\_)$ c. $4a^2 - 12a = 4a(\_\_\_\_\_\_)$

4. Which of the above factorizations for $4a^2 - 12a$ do you think is the best? Why?

____

In each case the third factorization is the *best* because you've factored out the **greatest common factor (GCF)**.

Factor each expression below. Be sure to find and use the *greatest* common factor.

5. $5x^2 + 15x =$ __________

6. $3x^2 + 12x =$ __________

7. $6x - 4 =$ __________

8. $7x^2 - 9x =$ __________

9. $5x^2 + 5x =$ __________

10. $9a^2 - 12a =$ __________

Writing Simple Inequalities

Write an inequality for each sentence below.

a. *y* is less than 8.

b. *f* is not equal to -5.

c. *j* is greater than or equal to 4.

d. The speed limit, *s,* cannot exceed 55 mph.

e. 10 is less than or equal to *x*.

f. A number, *x* is at least 15.

g. A number, *h* is not greater than 4.

h. *x* is not more than 20.

i. A number, *z,* is negative.

j. To have a passing grade, *g*, must exceed a 70.

k. *k* is not equal to -3.

l. The total, *t,* is fewer than 8 items.

m. -2 is not equal to a number, *n*.

n. The time, *t,* on your quiz cannot exceed 20 minutes.

Solutions to Simple Inequalities

Use the solution set to determine the solutions to each inequality.

o. $x < 17$ {15, 16, 17, 18}

p. $m > 9$ {8, 9, 10, 11}

q. $r \neq 9$ {7, 8, 9, 10}

r. $b \geq 23$ {21, 22, 23, 24}

s. $m \leq 27$ {26, 27, 28, 29}

t. $3r > 18$ {4, 5, 6, 7}

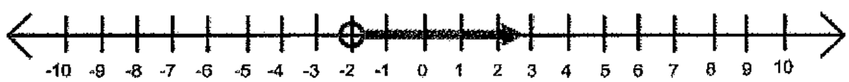
u. $8y \leq 24$ {2, 3, 4, 5}

v. $9x < 45$ {4, 5, 6, 7}

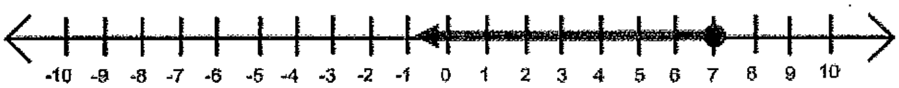
Graphing Solution Sets to Simple Inequalities

Classwork

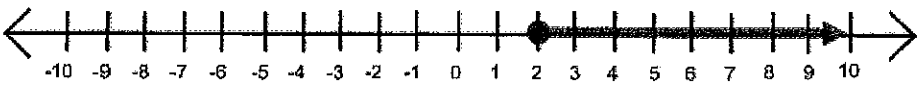
9. Write an inequality for the graph below.



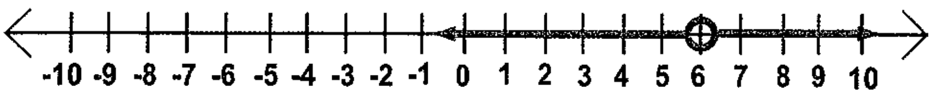
10. Write an inequality for the graph below.



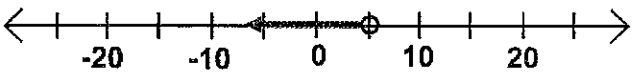
11. Write an inequality for the graph below.



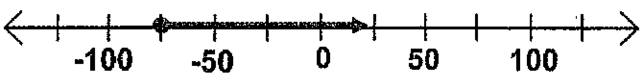
12. Write an inequality for the graph below.



13. Write an inequality for the graph below.



14. Write an inequality for the graph below.



15. Graph the solution for each inequality.

a. $w > 7$

b. $p \leq -1$

c. $m < 5$

d. $11 \geq k$

e. $t < 4$

f. $4 < n$

16. Write an inequality for each sentence below, and then graph the solutions of each inequality on a number line.

a. x is less than fifteen.

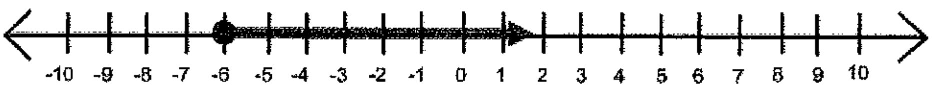
b. y cannot exceed twenty.

c. Twenty is less than or equal to m.

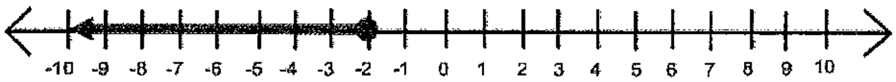
d. The cost, c, is more than $50.

Homework

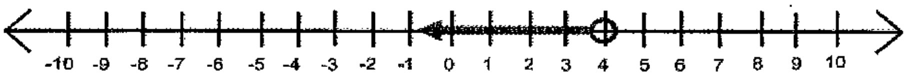
17. Write an inequality for the graph below.



18. Write an inequality for the graph below.

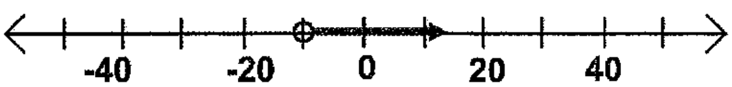


19. Write an inequality for the graph below.

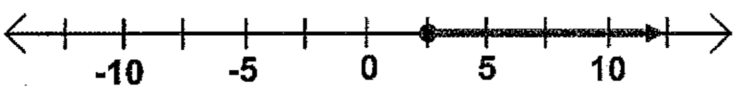


20. Write an inequality for the graph below.

21. Write an inequality for the graph below.



22. Write an inequality for the graph below.



23. Graph the solution for each inequality

a. $s \leq 25$

b. $x \geq 12$

c. $w \leq 50$

d. $g \geq 8$

e. $h \geq -5$

f. $t \neq 30$

g. $25 \geq s$

24. Write an inequality for each sentence below, and then graph the solutions of each inequality on a number line.

a. y is greater than nine.

b. x is less than or equal to sixteen.

c. Nineteen is greater than m.

d. Your height, *h*, must exceed 42 inches.

e. The weight limit, *w*, is 225 pounds.

f. A number, n, is not equal to seventeen.

supplemental for inequalities (practice)

Writing Simple Inequalities
Classwork

18. Write an inequality for each sentence below.
    a. *y* is less than 8.
    b. *f* is greater than -5.
    c. *j* is greater than or equal to 4.
    d. The speed limit, *s*, cannot exceed 55 mph.
    e. 10 is less than or equal to *x*.
    f. A number, *x* is at least 15.
    g. A number, *h* is not greater than 4.
    h. *x* is not more than 20.
    i. A number, *z*, is negative.
    j. To have a passing grade, *g*, must exceed a 70.
    k. *k* is less than or equal to -3.
    l. The total, *t*, is fewer than 8 items.
    m. -2 is less than a number, *n*.
    n. The time, *t*, on your quiz cannot exceed 20 minutes.
    o. At most, 4 students, *s*, will fail the test.

Homework

19. Write an inequality for each sentence below.
    a. *w* is greater than 7.
    b. *p* is less than or equal to -1.
    c. *m* is less than 5.
    d. 11 is greater than or equal to *k*.
    e. A number, *f* is positive.
    f. The total, *t* is fewer than 4 items.
    g. 4 is less than a number, *n*.
    h. The speed limit, *s*, cannot exceed 25 mph.
    i. A number *c* is at least 12.
    j. *w* is not more than 50.
    k. *g* is more than or equal to 8.
    l. *h* is not less than -5.
    m. The time, *t* for lunch cannot exceed 30 minutes.
    n. At most, 25 students, *s*, will be in the class.
    o. To have an A in class, *g*, must exceed a 92.

Solutions to Simple Inequalities
Classwork

20. Use the solution set to determine the solutions to each inequality.
    a. $x < 17$ {15, 16, 17, 18}
    b. $m > 9$ {8, 9, 10, 11}
    c. $r < 9$ {7, 8, 9, 10}
    d. $b \geq 23$ {21, 22, 23, 24}
    e. $m \leq 27$ {26, 27, 28, 29}
    f. $3r > 18$ {4, 5, 6, 7}
    g. $8y \leq 24$ {2, 3, 4, 5}
    h. $9x < 45$ {4, 5, 6, 7}

Homework

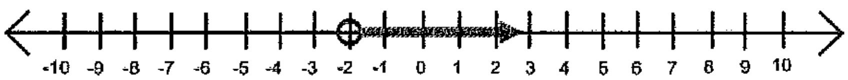
21. Use the solution set to determine the solutions to each inequality.

a.	$y \geq 14$	{13, 14, 15, 16}
b.	$x < 16$	{14, 15, 16, 17}
c.	$m \leq 9$	{8, 9, 10, 11}
d.	$g \geq 13$	{12, 13, 14, 15}
e.	$x < 32$	{31, 32, 33, 34}
f.	$4y \geq 32$	{6, 7, 8, 9}
g.	$3g > 26$	{12, 13, 14, 15}
h.	$7m \leq 56$	{6, 7, 8, 9}

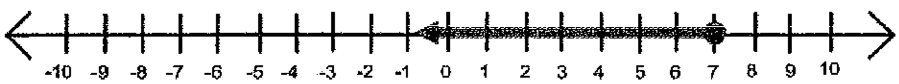
Graphing Solution Sets to Simple Inequalities

Classwork

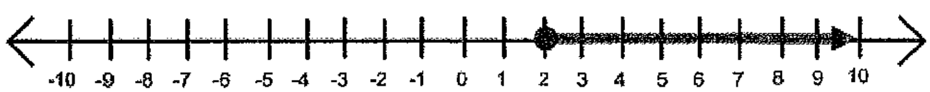
22. Write an inequality for the graph below.



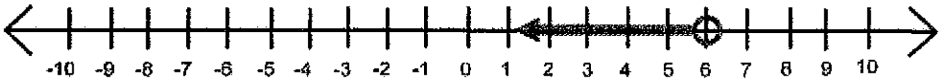
23. Write an inequality for the graph below.



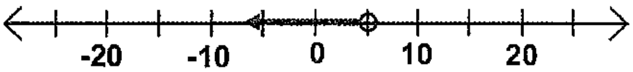
24. Write an inequality for the graph below.



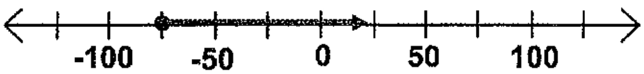
25. Write an inequality for the graph below.



26. Write an inequality for the graph below.



27. Write an inequality for the graph below.

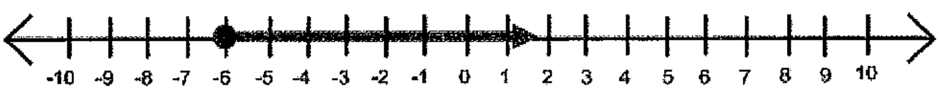


28. Graph the solution for each inequality.
   a. $w > 7$
   b. $p \le -1$
   c. $m < 5$
   d. $11 \ge k$
   e. $f > 0$
   f. $t < 4$
   g. $4 < n$

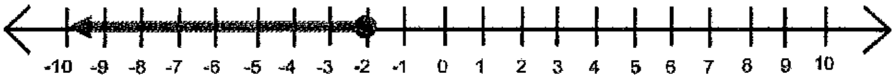
29. Write an inequality for each sentence below, and then graph the solutions of each inequality on a number line.
   a. x is less than fifteen.
   b. y cannot exceed twenty.
   c. Twenty is less than or equal to m.
   d. The cost, c, is more than $50.
   e. Twelve is greater than or equal to b.

Homework

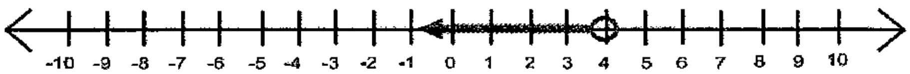
30. Write an inequality for the graph below.



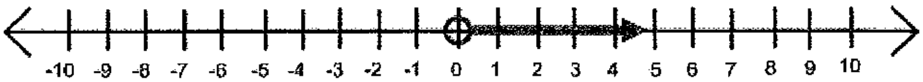
31. Write an inequality for the graph below.



32. Write an inequality for the graph below.

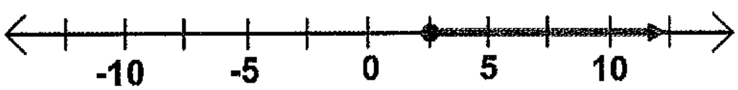


33. Write an inequality for the graph below.



34. Write an inequality for the graph below.

35. Write an inequality for the graph below.



36. Graph the solution for each inequality

a. $s \leq 25$

b. $x \geq 12$

c. $w \leq 50$
d. $g \geq 8$
e. $h \geq -5$
f. $t \leq 30$
g. $25 \geq s$

37. Write an inequality for each sentence below, and then graph the solutions of each inequality on a number line.
    a. y is greater than nine.
    b. x is less than or equal to sixteen.
    c. Nineteen is greater than m.
    d. Your height, *h*, must exceed 42 inches.
    e. The weight limit, *w*, is 225 pounds.

Expressions Chapter Problems

Mathematical Expressions

1. Circle the constant and underline the coefficient for each expression below

   a. $5x - 3$

   b. $2x + 7$

   c. $2 - 4x$

   d. $x + 3$

2. Create an algebraic expression with a coefficient of 7 and a constant of 4.
3. Create an algebraic expression with a coefficient of -1 and a constant of -12.
4. Create an equation that contains a coefficient of 6.
5. Create an equation that contains a coefficient of -13.

Order of Operations

6. $9 + 3 \times 3 + 10 - 1 =$

7. $11 + 9 \times 3 + 5 - 1 =$

8. $7 + 6^3 \div 3 =$

9. $(7 - 4)^2 \times 3 =$

10. $1 + 8 \times 2 \times 2^2 =$

11. $7^2 - 8^2 \div 2^3 + 3 \times 5 =$

12. $(1 + 4) \div 5 =$

13. $(8 + 8) \times 3 =$

14. $(7 - 4) \times 2 \div (5 - 3) =$

15.

a. Simplify the expression: $5 \times 6 - 6 =$

b. Add parentheses to the expression so that it simplifies to a different answer.

16.

c. Simplify the expression: $9 \div 1 + 9 =$

d. Add parentheses to the expression so that it simplifies to a different answer.

17. Your brother buys 3 shirts for $9 each. He also buys a pair of jeans for $25.00 that gets a $4.00 discount. How much does he spend?

18. The repairman charged $36 for parts and $12 per hour for labor to repair a bicycle. If he spent 3 hours repairing the bike, what will the total repair bill be?

Translating between Words & Expressions

Translate the words into an algebraic expression.

3. 4 times x
4. The sum of x and 6
5. The product of 9 and y
6. w less than 8
7. 5 more than x
8. The difference of 6 and x
9. 9 times the product of x and 4
10. The product of 5 and y, divided by 3
11. The quotient of 300 and the quantity of x times 2
12. x less than 32
13. The quotient of 35 and the quantity of x minus 7
14. The product of 7 and x, minus the quantity of 4 less than y
15. The quantity of 9 more than x divided by the quantity of 12 less than y
16. Adult ticket prices are $3 more than child ticket prices. Determine the adult ticket price, given the child ticket price.

Child Ticket Price	Adult Ticket Price
$5	
$7	
$10	
$12	

17. Write an expression that represents the adult price, if the child price is "x"

18. For NJASK testing, 25 students are placed in each classroom. Determine the number of classrooms needed, given the number of students testing.

Number of Students Testing	Number of Classroom Needed
250	
325	
400	
520	

Write an expression for each of the following situations.

19. Bob weighs 7 more pounds than Jack. Jack weighs x pounds. Bob's weight:

20. Tiffany has 6 dollars less than Jessica. Jessica has x dollars. Tiffany's money:

21. Samantha has 12 more stickers than Mike. Mike has x stickers. Samantha's sticker amount:

22. The recipe calls for twice the amount of sugar than flour. There is f amount of flour in the recipe. Amount of sugar:

23. Mark's quiz grade is one more than twice Ted's quiz grade. Ted's quiz grade is x. Mark's quiz grade:

24. Laura paid x dollars for her prom dress. Beth paid four dollars less than Laura. Beth's prom gown price:

25. David ran the 5k in x minutes. Harry ran the same race in five minutes less than double David's time. Harry's time:

26. The beans grew k inches. The tomatoes grew 3 inches more than triple the height of the beans. Tomato height:

Create a scenario for the following expressions:

27. $x + 5$

28. $2(x - 3)$

Evaluating Expressions

1. Evaluate the expression for the given value

i. $(2n + 1)^2$ for $n = 3$

ii. $2(n + 1)^2$ for $n = 4$

iii. $2n + 2^2$ for $n = 3$

iv. $4x + 3x$ for $x = 5$

v. $3(x - 3)$ for $x = 7$

vi. $8(x + 5)(x - 2)$ for $x = 4$

vii. $3x^2$ for $x = 2$

viii. $5x + 45$ for $x = 6$

ix. $\underline{4x}$ for $x = 10$

x. $4y + x$ for $x = 2$ and $y = 3$

ff. $\underline{x\ } + 17$ for $x = 12$ and $y = 2$

$6x + 8y$ for $x = 9$ and $y = \frac{1}{4}$

gg. $x + (2x - 8)$ for $x = 10$

hh. $5(3x) + 8y$ for $x = 2$ and $y = 10$

Solving Equations Chapter Problems

Determining Solutions to Equations

Use the solution set to determine the solution to each equation.

a. $x + 12 = 20$ $\{5, 6, 7, 8\}$
b. $x - 13 = 32$ $\{43, 44, 45, 46\}$
c. $2x + 4 = 26$ $\{9, 10, 11, 12\}$
d. $5y - 3 = 57$ $\{9, 10, 11, 12\}$
e. $4x + 3 = 15$ $\{3, 4, 5, 6\}$
f. $5p - 4 = 16$ $\{3, 4, 5, 6\}$
g. $5g + 15 = 25$ $\{1, 2, 3, 4\}$
h. $7h - 14 = 42$ $\{8, 9, 10, 11\}$

Solving an Equation for a Variable

Name the inverse operation needed to solve for the variable.

i. $x + 9 = 17$
j. $y - 8 = 5$
k. $m + 5 = 21$
l. $\frac{w}{6} = 12$
m. $9v = 108$

When solving an equation, why do you apply the inverse of the given operation to both sides?

Solving One Step Equations with Addition and Subtraction
Solve.

n. $n + 7 = 20$
o. $x + 9 = 28$
p. $50 + w = 92$
q. $4 + m = 18$
r. $x - 6 = 15$
s. $y - 19 = 27$
t. $m - 56 = 32$
u. $x - 9 = 72$

Solving One Step Equations with Multiplication and Division
Classwork

Solve.

a. $7x = 84$
b. $30 = 12m$
c. $5m = 25$
d. $10c = 80$
e. $13m = 143$
f. $9y = 126$
g. $\frac{x}{5} = 13$
h. $\frac{y}{4} = 12$
i. $\frac{z}{8} = 10$
j. $\frac{x}{7} = 25$
k. $\frac{x}{9} = 45$
l. $\frac{y}{5} = 62$

Writing Equations

Write the equation and solve for the unknown.

1. Larry has 14 toy cars. His grandparents give him some more toy cars. Now he has 22 toy cars. Write an equation that can be used to determine how many toy cars Larry's grandparent's give him.

2. Kenya did 16 pull-ups at the end of the month. This was 4 times as many pull-ups as she was able to do at the beginning of the month. Write an equation that can be used to find the number of pull-ups Kenya could do at the beginning of the month.

3. Tracy worked 28 hours this week. That was 3 hours less than Frank worked. Write an equation to figure out how many hours Frank worked.

4. During the school Walk-a-Thon, each class completed an average of 64 laps around the track. The school completed 832 laps all together. Write an equation to represent the number of classes that participated in the Walk-a-Thon.

5. Jennifer bought 3 bags of trail mix to make snack packs. She made 18 snacks packs with the trail mix. Write an equation to represent the number of snack packs each bag of trail mix made.

6. Samantha, who is 3 years older than Francis, is 12. Write an equation to represent Francis' age.

7. Frederick is half as tall as his older sister. His older sister is 62 inches tall. Write an equation to represent Frederick's height.

8. Franco bought a bag of 25 jolly ranchers. After sharing with his friends, he had 13 left. Write an equation to represent the number of jolly ranchers he shared with his friends.

Moving **Mayhem**!!

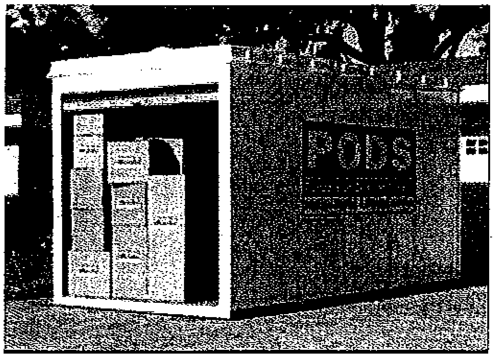
Problem: *You found out that you are moving to a new house but you have to pack up everything tonight! You have a POD and you need to find out the MAXIMUM number of boxes that you can fit in the POD. Boxes cost* ***$2.97*** *each and the POD costs* ***$485.65.*** *How much will this move cost you?*

Group Members: ____________

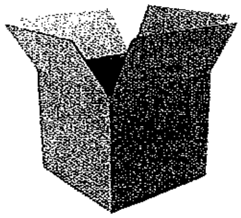
____________, ____________,

____

Date: ____________ **Pd.** ________



POD Dimensions
9 feet wide
12 feet long
10 feet tall



BOX Dimensions
2.25 feet wide
2.25 feet long
2.25 feet tall

Moving **Mayhem**!!

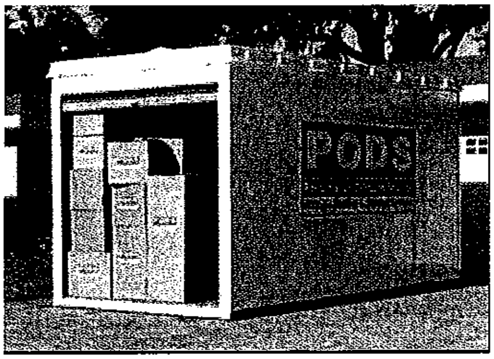
Problem: *You found out that you are moving to a new house but you have to pack up everything tonight! You have a POD and you need to find out the MAXIMUM number of boxes that you can fit in the POD. Boxes cost* ***$2.97*** *each and the POD costs* ***$485.65.*** *How much will this move cost you?*

Group Members: ____________

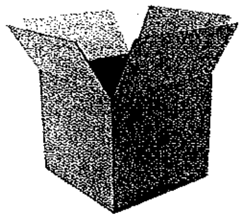
______**ANSWER KEY**___, ______________,

____

Date: ______________ **Pd.** ________



POD Dimensions
9 feet wide
12 feet long
10 feet tall



BOX Dimensions
2.25 feet wide
2.25 feet long
2.25 feet tall

You can fit a maximum of 4 boxes wide, 5 boxes long and 4 boxes high for a total (volume) of 80 boxes. 4 x 5 x 4 = 80

2.25 x 4 = 9ft wide
2.25 x 5 = 11.25 feet long
2.25 x 4 = 9 feet high

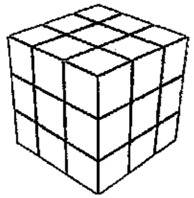
6.G.2 Volume With Fractional Cubic Units

Score

Name: ____________________

Date: ____________________

1. Each ▢ has a length of $\frac{1}{2}$ inch.

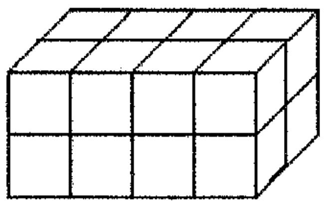


What is the volume of one ▢ ? ____________

Which could be used to determine the volume of the entire figure?

A. $3 \times 3 \times 3 \times \frac{1}{8}$
B. $4 \times 4 \times 4 \times \frac{1}{2}$
C. $3 \times 3 \times 3 \times \frac{1}{2}$
D. $2 \times 2 \times \frac{1}{8}$

2. Samuel made the figure below. Each cube has a volume of $\frac{1}{3}$ square units. What is the volume of the figure below if each cube is worth $\frac{1}{3}$ square units?



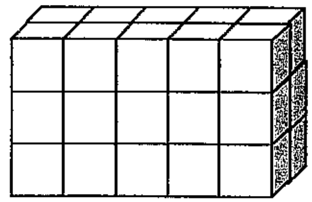
Show your work!

A. 16 un^3
B. 8 un^3
C. $\frac{16}{27}un^3$
D. $\frac{16}{3}un^3$

3. Each ▢ has a length of $\frac{1}{4}$ inch.

Show your work!

What is the volume of the figure below?

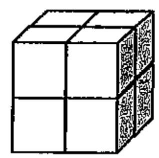


A. $\frac{30}{4}$ in^3
B. $\frac{30}{12}$ in^3
C. $\frac{30}{64}$ in^3
D. $\frac{30}{30}$ in^3

4. Each ▢ has a length of $\frac{1}{6}$ cm.

Show your work!

What is the volume of the figure below?

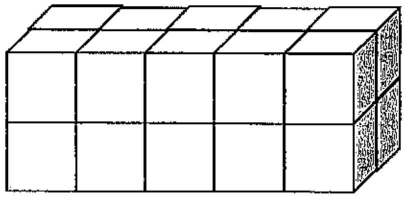


A. $\frac{8}{18}$ cm^3
B. $\frac{8}{216}$ cm^3
C. $\frac{30}{18}$ cm^3
D. $\frac{8}{36}$ cm^3

5. Each ☐ has a length of $\frac{1}{5}$ inch.

What is the volume of the **base** of the figure below?

Show your work!

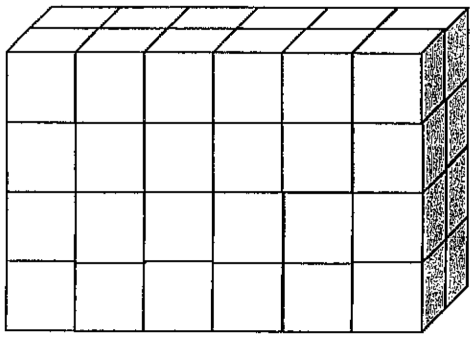


_______ in^3

6. Each ☐ has a length of $\frac{1}{4}$ yd.

Show your work!

What is the volume of the figure below?

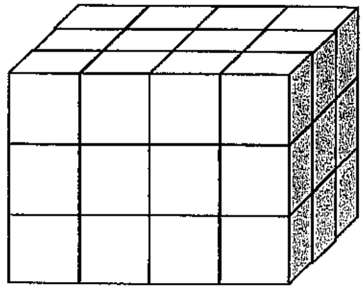


_______ yd^3

7. Each ☐ has a length of $\frac{1}{2}$ inch.

What is the volume of the figure below?

Show your work!

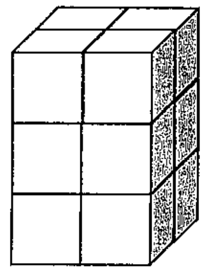


_______ in^3

8. Each ☐ has a length of $\frac{1}{2}$ mm.

Show your work!

What is the volume of the figure below?



_______ mm^3

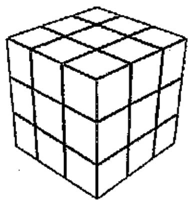
6.G.2 Volume With Fractional Cubic Units

Score

Name: ____________________

Date: ____________________

1. Each [cube] has a length of $\frac{1}{2}$ inch.

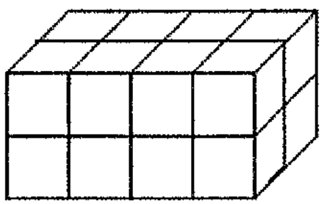


What is the volume of one [cube] ? $\frac{1}{8}$ in^3

Which could be used to determine the volume of the entire figure?

(A.) $3 \times 3 \times 3 \times \frac{1}{8}$
B. $4 \times 4 \times 4 \times \frac{1}{2}$
C. $3 \times 3 \times 3 \times \frac{1}{2}$
D. $2 \times 2 \times \frac{1}{8}$

2. Samuel made the figure below. Each cube has a volume of $\frac{1}{3}$ square units. What is the volume of the figure below if each cube is worth $\frac{1}{3}$ square units?



Show your work!

$4 \times 2 \times 2 \times \frac{1}{3} = \frac{16}{3}$

A. 16 un^3
B. 8 un^3
C. $\frac{16}{27}$ un^3
(D.) $\frac{16}{3}$ un^3

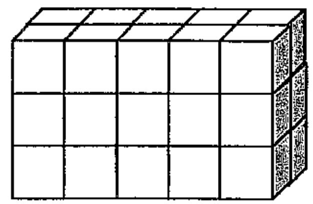
3. Each [cube] has a length of $\frac{1}{4}$ inch.

What is the volume of the figure below?

Show your work!

$\frac{1}{4} \times \frac{1}{4} \times \frac{1}{4} = \frac{1}{64}$

$5 \times 2 \times 3 \times \frac{1}{64} = \frac{30}{64}$



A. $\frac{30}{4}$ in^3
B. $\frac{30}{12}$ in^3
(C.) $\frac{30}{64}$ in^3
D. $\frac{30}{30}$ in^3

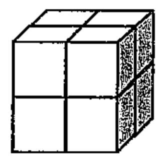
4. Each [cube] has a length of $\frac{1}{6}$ cm.

What is the volume of the figure below?

Show your work!

$\frac{1}{6} \times \frac{1}{6} \times \frac{1}{6} = \frac{1}{216}$

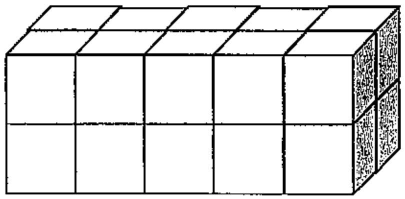
$2 \times 2 \times 2 \times \frac{1}{216} = \frac{8}{216}$



A. $\frac{8}{18}$ cm^3
(B.) $\frac{8}{216}$ cm^3
C. $\frac{30}{18}$ cm^3
D. $\frac{8}{36}$ cm^3

5. Each ▢ has a length of $\frac{1}{5}$ inch.

What is the volume of the **base** of the figure below?



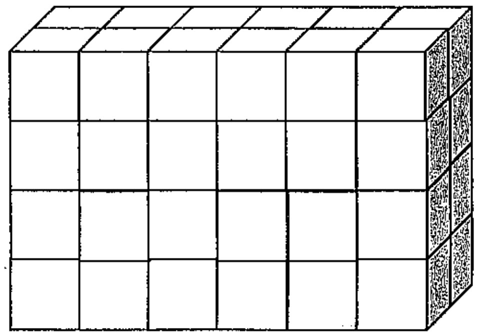
Show your work!

$5 \times 2 \times \frac{1}{125} =$

$\frac{10}{125}$ in³

6. Each ▢ has a length of $\frac{1}{4}$ yd.

What is the volume of the figure below?



Show your work!

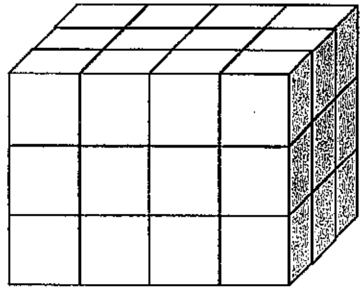
$\frac{1}{4} \times \frac{1}{4} \times \frac{1}{4} = \frac{1}{64}$

$6 \times 2 \times 4 \times \frac{1}{64} = \frac{48}{64}$

$\frac{48}{64}$ yd³

7. Each ▢ has a length of $\frac{1}{2}$ inch.

What is the volume of the figure below?



Show your work!

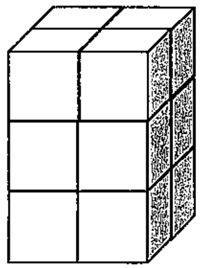
$\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{8}$

$4 \times 3 \times 3 \times \frac{1}{8} = \frac{36}{8}$

$\frac{36}{8}$ in³

8. Each ▢ has a length of $\frac{1}{2}$ mm.

What is the volume of the figure below?



Show your work!

$\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{8}$

$2 \times 2 \times 3 \times \frac{1}{8} = \frac{12}{8}$

$\frac{12}{8}$ mm³

Surface Area Using Nets Scavenger Hunt 6.G.4

Created By: Nerdy Numbers

Graphics By: Lovin Lit

Directions:

•Cut each page in half vertically on the dotted line so there is an answer on top and a problem on bottom. Hang all the problems **randomly** around the room. (be sure to mix up the cards). I have included both an orange set & a black and white set if you don't have color ink.

•Students can work alone or in pairs.

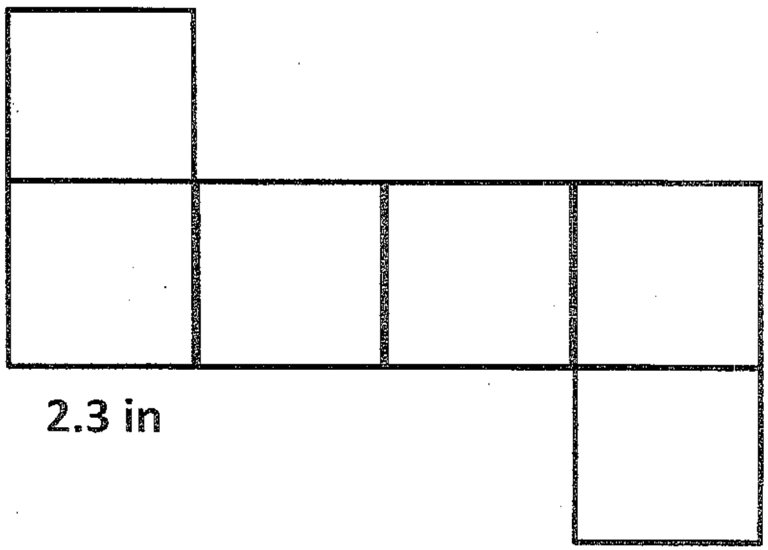
•Students can start at any station. They first must work out the problem on the bottom of the card on their recording sheet. After they work their first problem out, they need to find that answer somewhere in the room. (If they can't find their answer they know they made a mistake)

•Students will continue solving problems and finding their corresponding answers.

•Students final answer should be back at the station they started on.

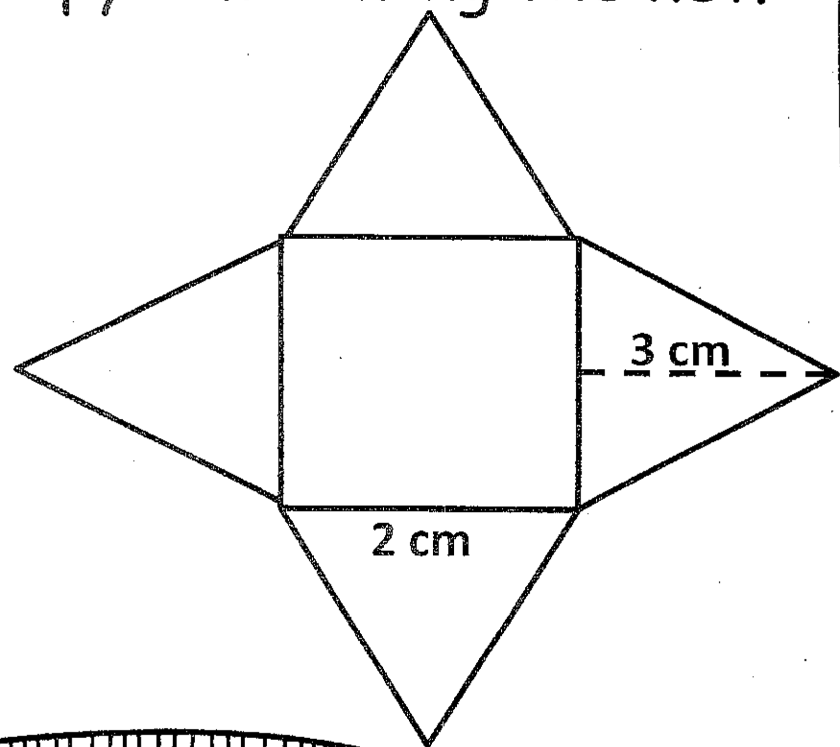
$108\frac{1}{4}$ ft^2

Find the surface area of the cube using the net.



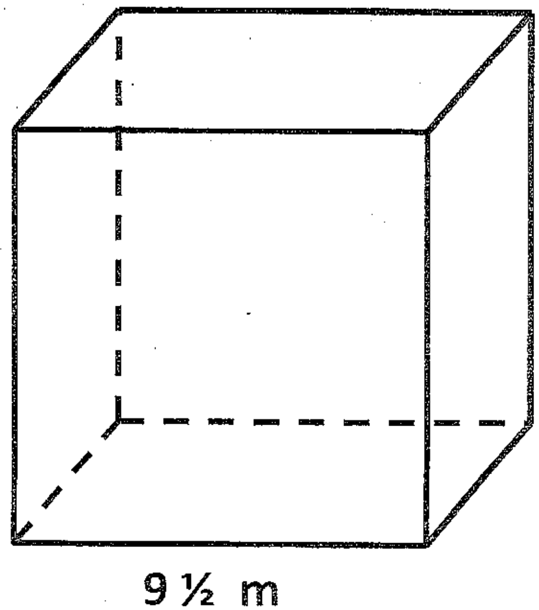
31.74 in^2

Find the surface area of the square based pyramid using the net.



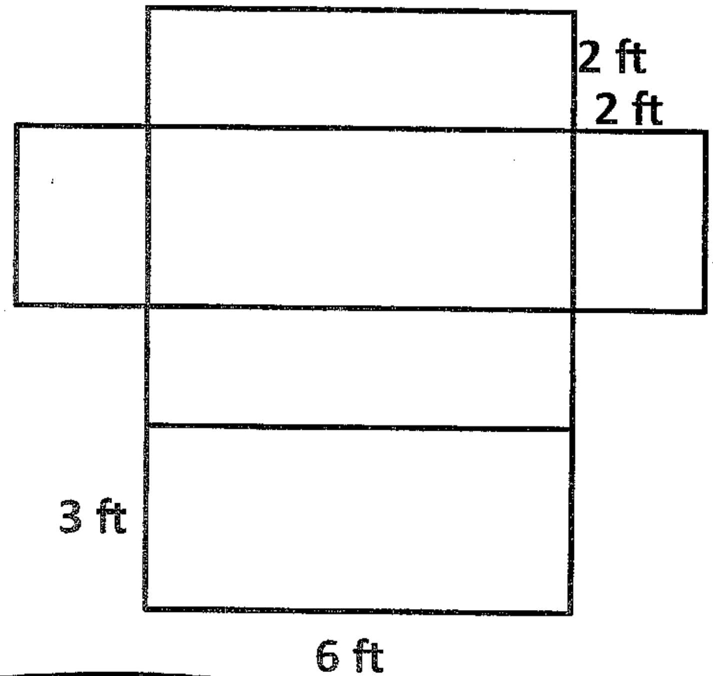
$16\ cm^2$

Find the surface area of the cube below.



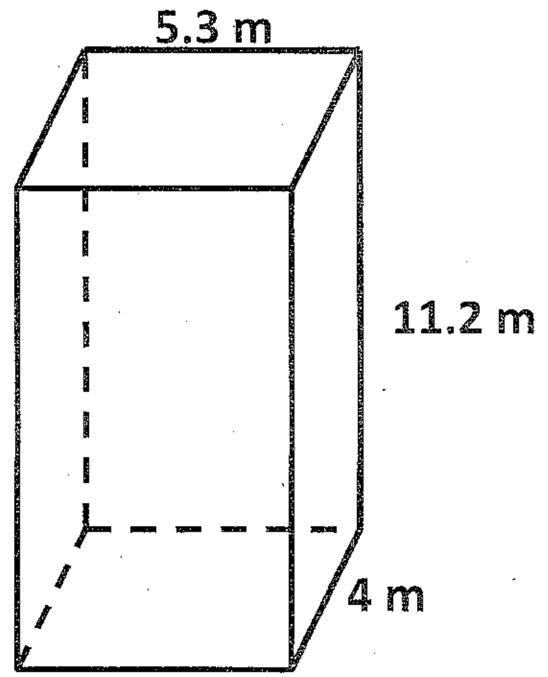
$541\frac{1}{2}\ m^2$

Find the surface area of the rectangular prism using the net.



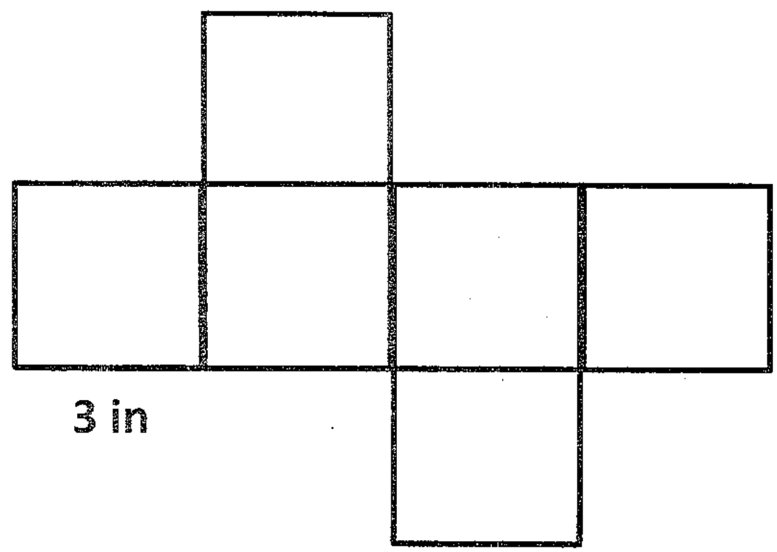
$72\ ft^2$

Find the surface area of the rectangular prism below.



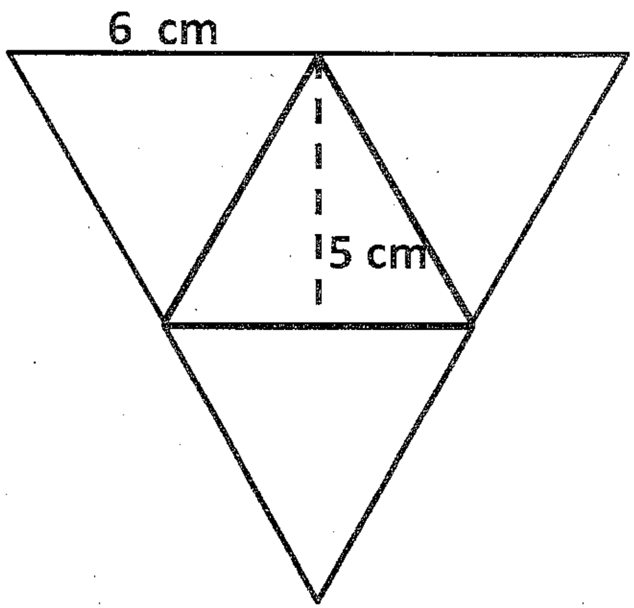
$250.72\ m^2$

Find the surface area of the cube using the net.



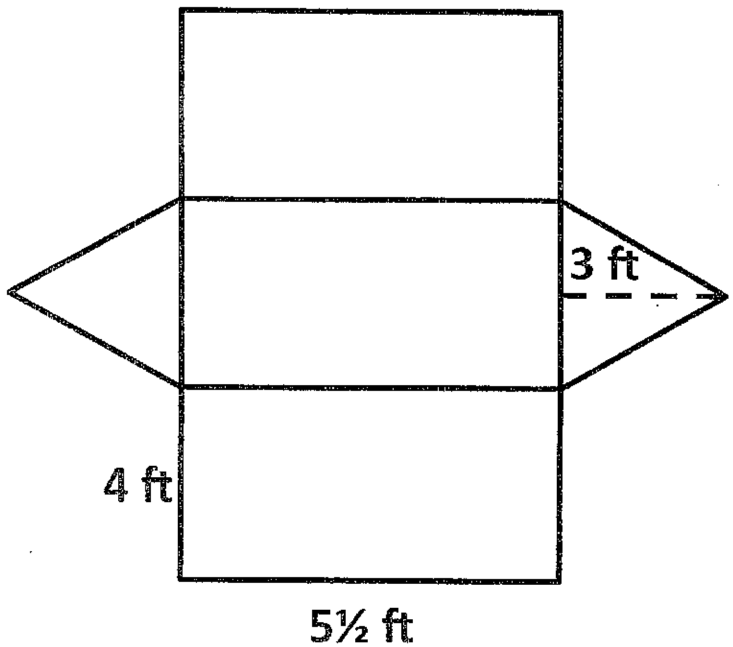
$54\ in^2$

Find the surface area of the triangular pyramid using the net.



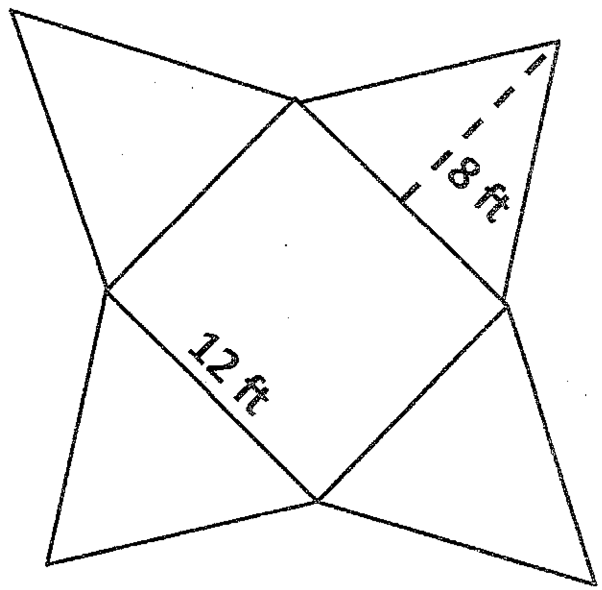
$60\ cm^2$

Find the surface area of the triangular prism using the net.



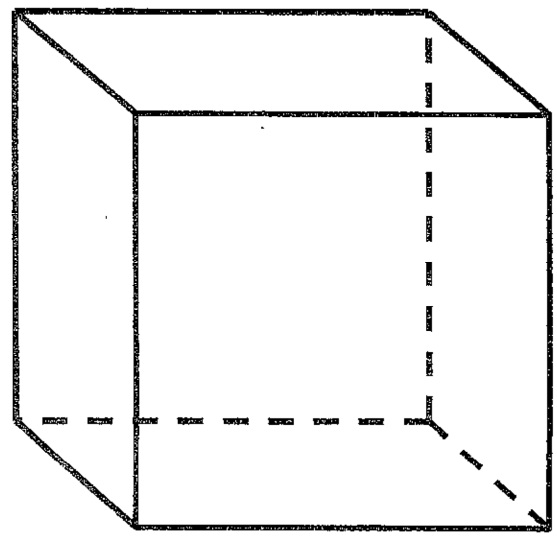
$78\ ft^2$

Find the surface area of the square based pyramid using the net.



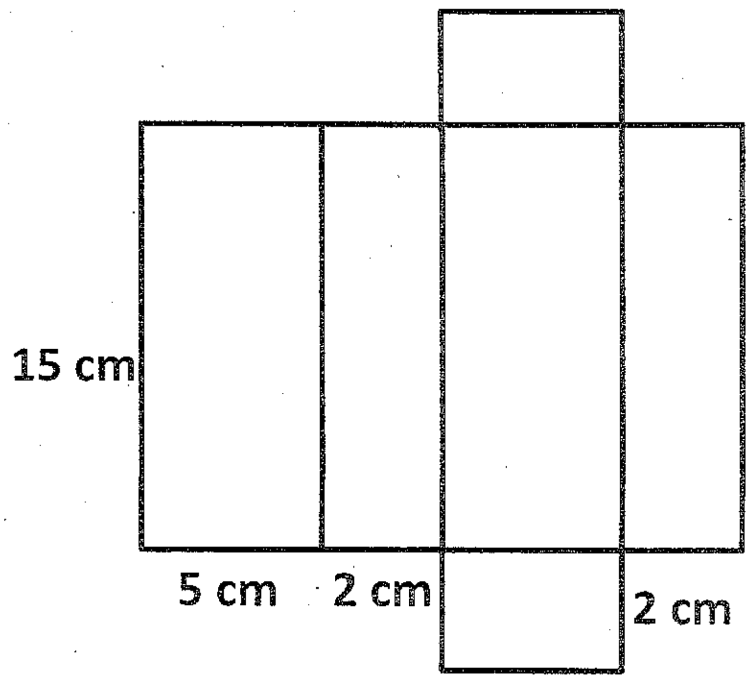
$336\ ft^2$

Find the surface area of the cube below.



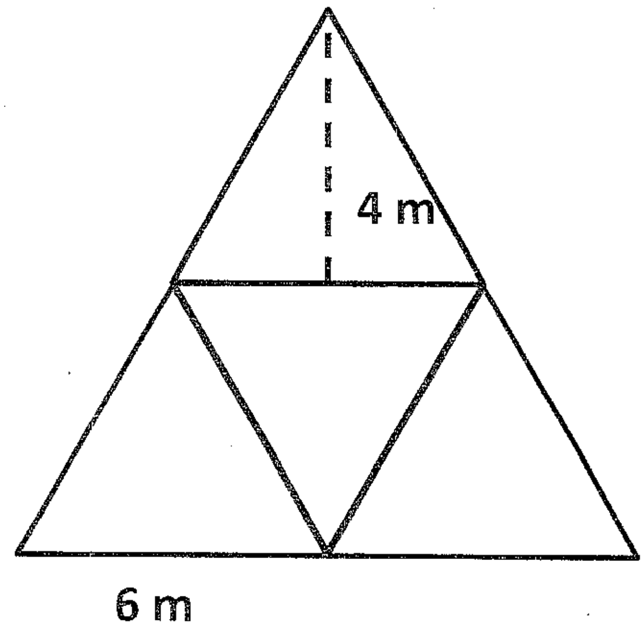
$530.16\ in^2$

Find the surface area of the rectangular prism using the net.



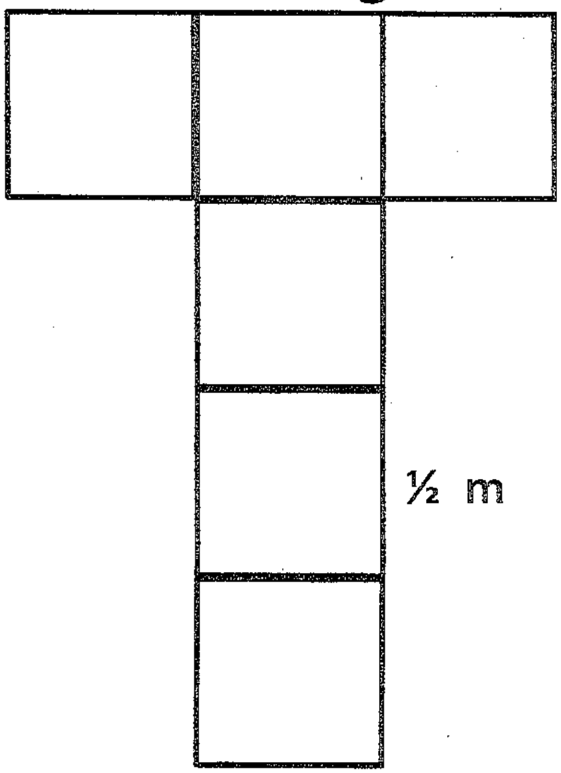
$230\ cm^2$

Find the surface area of the triangular pyramid using the net.



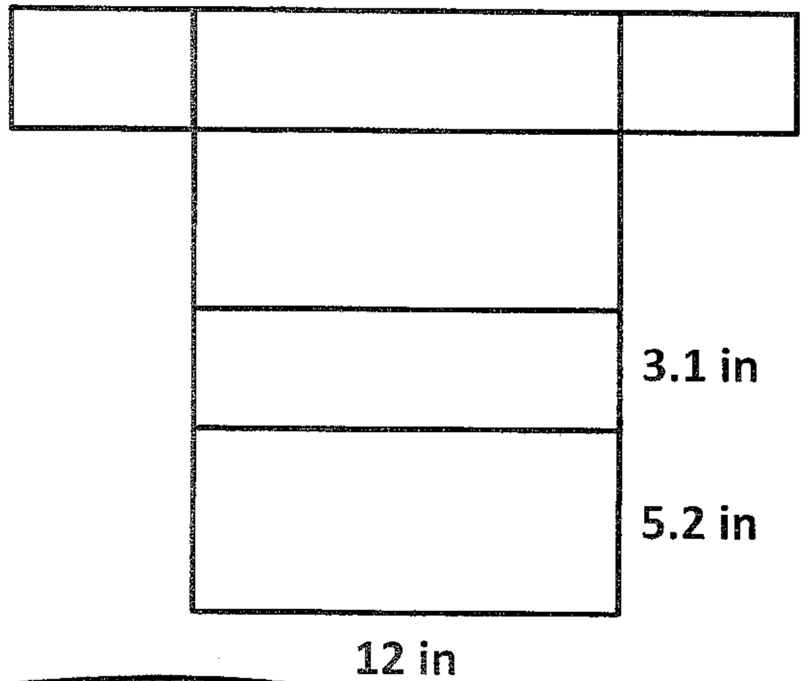
$48\ m^2$

Find the surface area of the cube using the net.



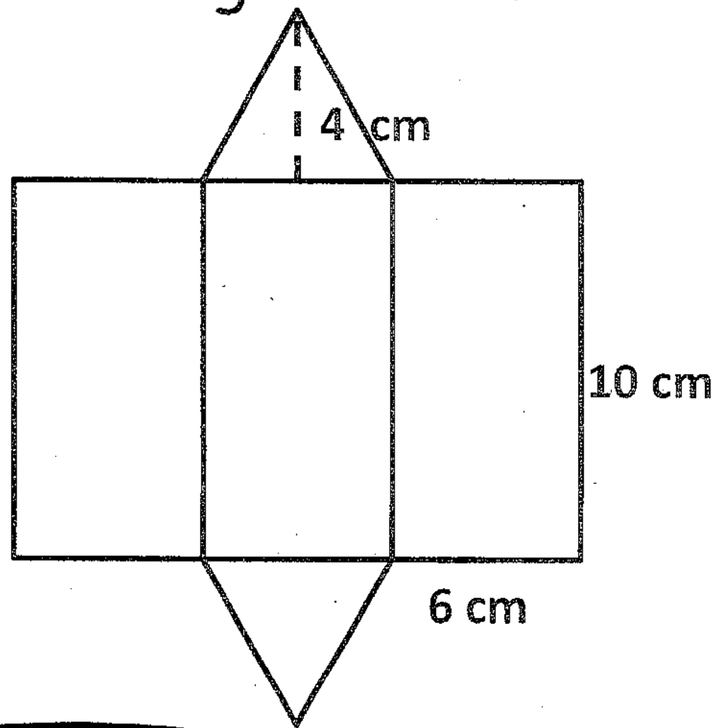
$1\frac{1}{2}\ m^2$

Find the surface area of the rectangular prism using the net.



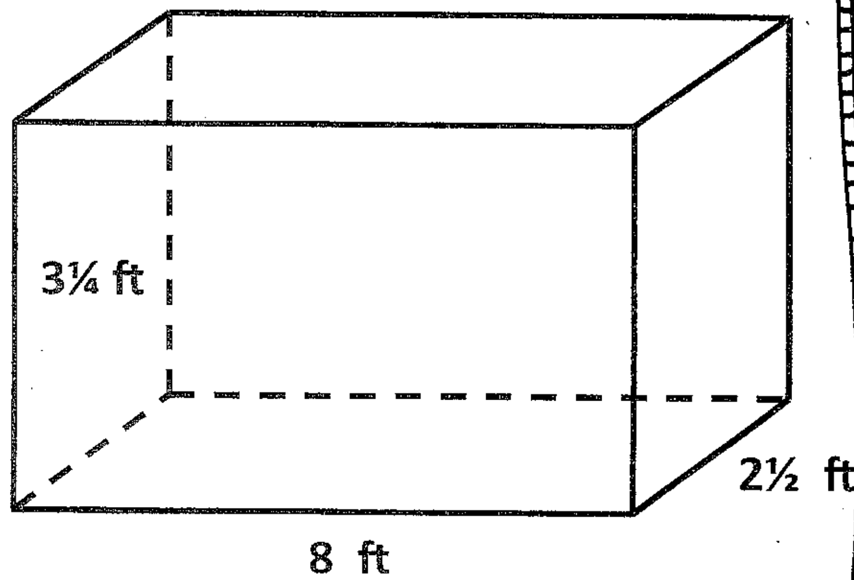
231.44 in^2

Find the surface area of the triangular prism using the net.



204 cm^2

Find the surface area of the rectangular prism below.



Name: ________________________________ Date: __________ Hour: _____

Surface Area Using Nets Scavenger Hunt

Work	Answer

Surface Area Using Nets Scavenger Hunt

Work	Answer

Name: ______________________ Date: ________ Hour: _____

Surface Area Using Nets Scavenger Hunt

Work	Answer
5.29 + 5.29 + 5.29 + 5.29 + 5.29 + 5.29 =	31.74 in^2
4 + 3 + 3 + 3 + 3 =	16 cm^2
$90\frac{1}{4} + 90\frac{1}{4} + 90\frac{1}{4} + 90\frac{1}{4} + 90\frac{1}{4} + 90\frac{1}{4}$ =	$541\frac{1}{2}$ m^2
18 + 18 + 12 + 12 + 6 + 6 =	72 ft^2
21.2 + 21.2 + 44.8 + 44.8 + 59.36 + 59.36 =	250.72 m^2
9 + 9 + 9 + 9 + 9 + 9 =	54 in^2
15 + 15 + 15 + 15 =	60 cm^2
22 + 22 + 22 + 6 + 6 =	78 ft^2

Note: Student answers should be in the same order, but not necessarily starting on the same problem.

Surface Area Using Nets Scavenger Hunt

Work	Answer
144 + 48 + 48 + 48 + 48 =	336 ft^2
88.36 + 88.36 + 88.36 + 88.36 + 88.36 + 88.36 =	530.16 in^2
75 + 75 + 30 + 30 + 10 + 10 =	230 cm^2
12 + 12 + 12 + 12 =	48 m^2
$\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} =$	$1\frac{1}{2}$ m^2
62.4 + 62.4 + 37.2 + 37.2 + 16.12 + 16.12 =	231.44 in^2
60 + 60 + 60 + 12 + 12 =	204 cm^2
20 + 20 + 26 + 26 + 8 1/8 + 8 1/8 =	$108\frac{1}{4}$ ft^2

Using Nets to Find Surface Area and Volume of 3-D Prisms

NAME_______________________________

1) Find the area of each face on each net. Write the area on each face.
2) Cut out the net. Fold on the heavy lines. Tape the prism together so that the grid is on the outside of the prism.
3) Tape/paste each prism to the corresponding location on this worksheet.
4) Name the prism with the most specific name possible. Find the surface area. Be sure to include the appropriate units.

SHAPE A	SHAPE B
Name _________________ Surface Area = _________	Name _________________ Surface Area = _________
SHAPE C	**SHAPE D**
Name _________________ Surface Area = _________	Name _________________ Surface Area = _________

NAME________________________

SHAPE E

Name ________________

Surface Area = ________

SHAPE F

Name ________________

Surface Area = ________

SHAPE G

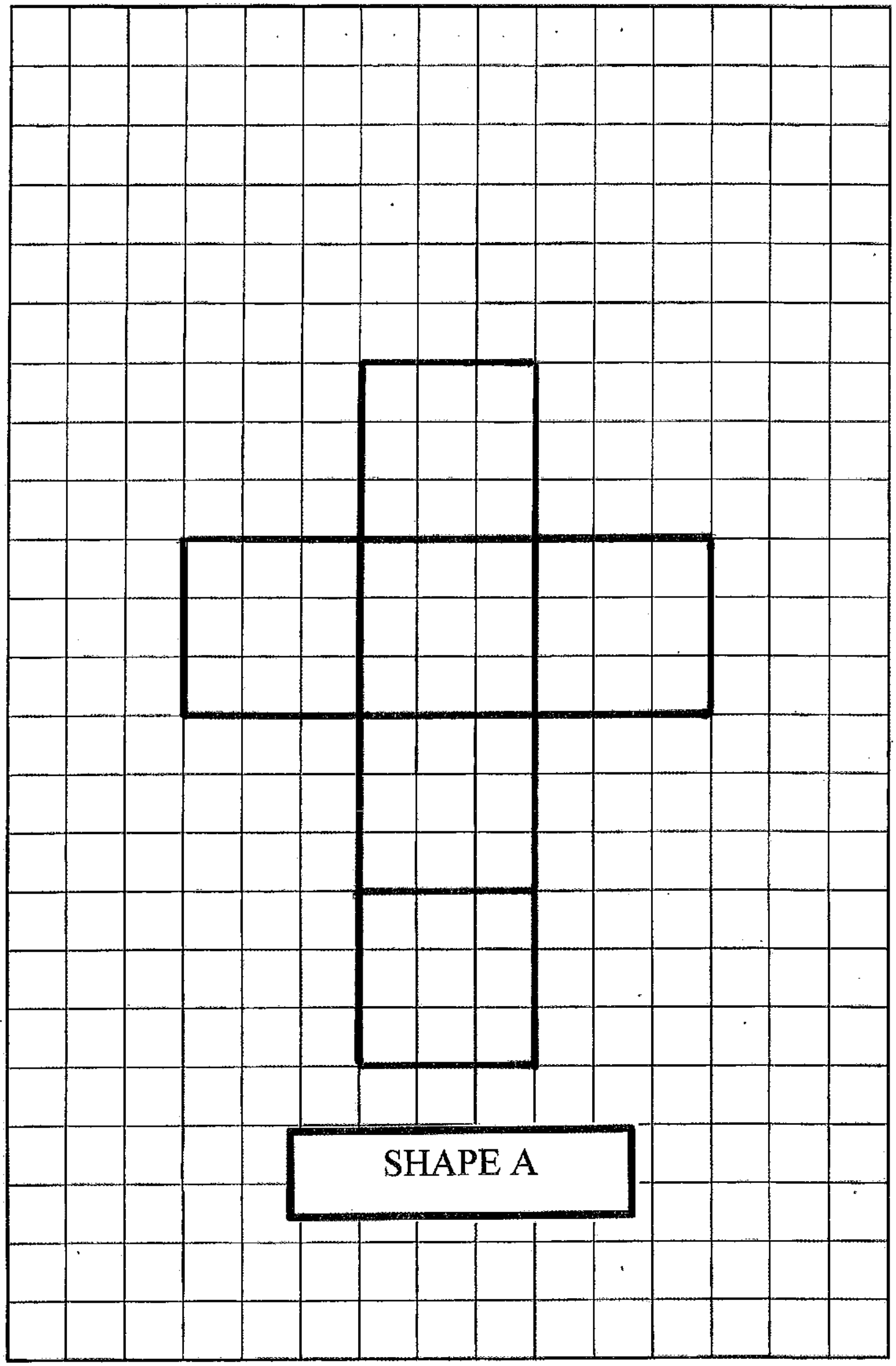
Name ________________

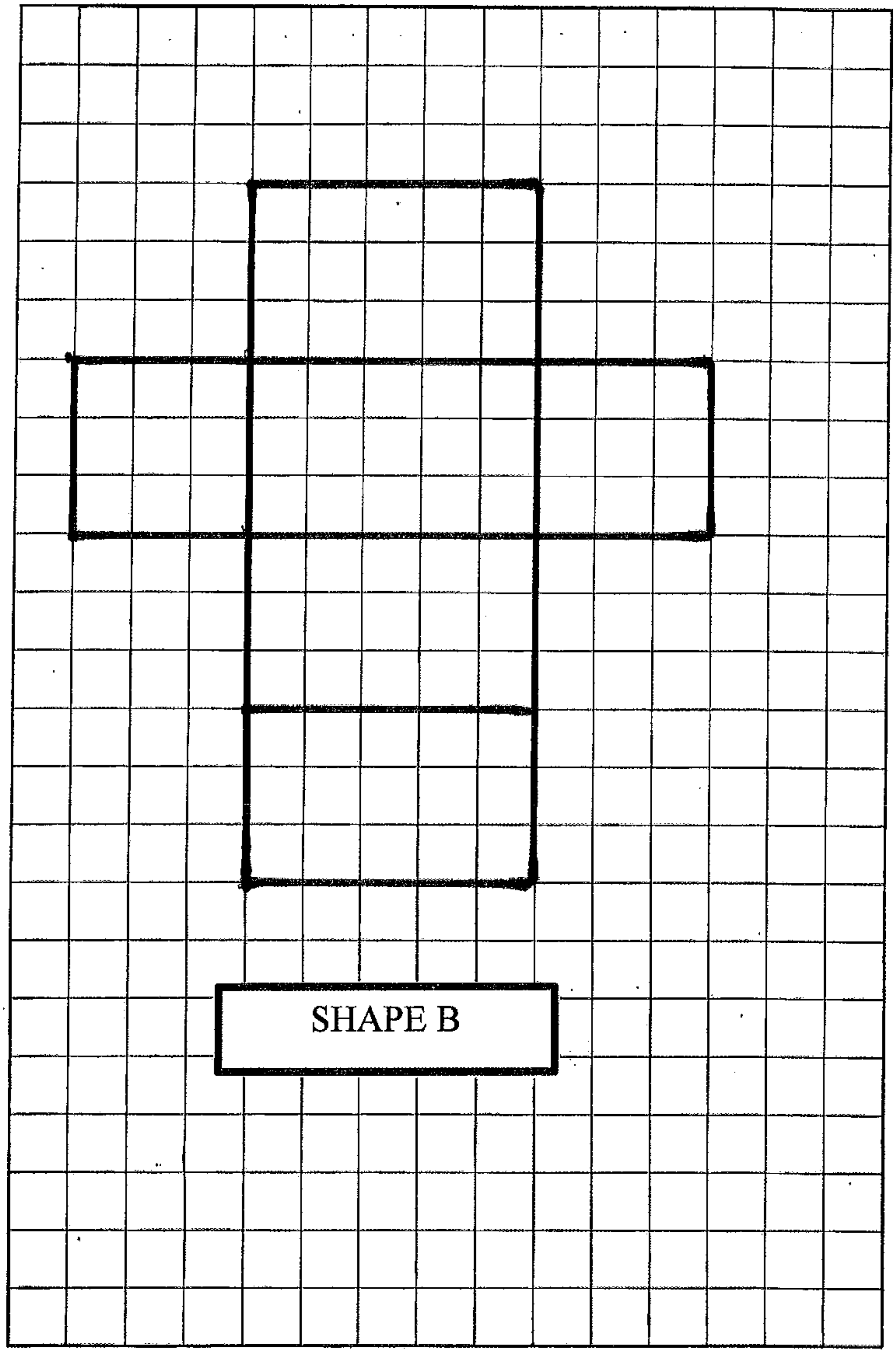
Surface Area = ________

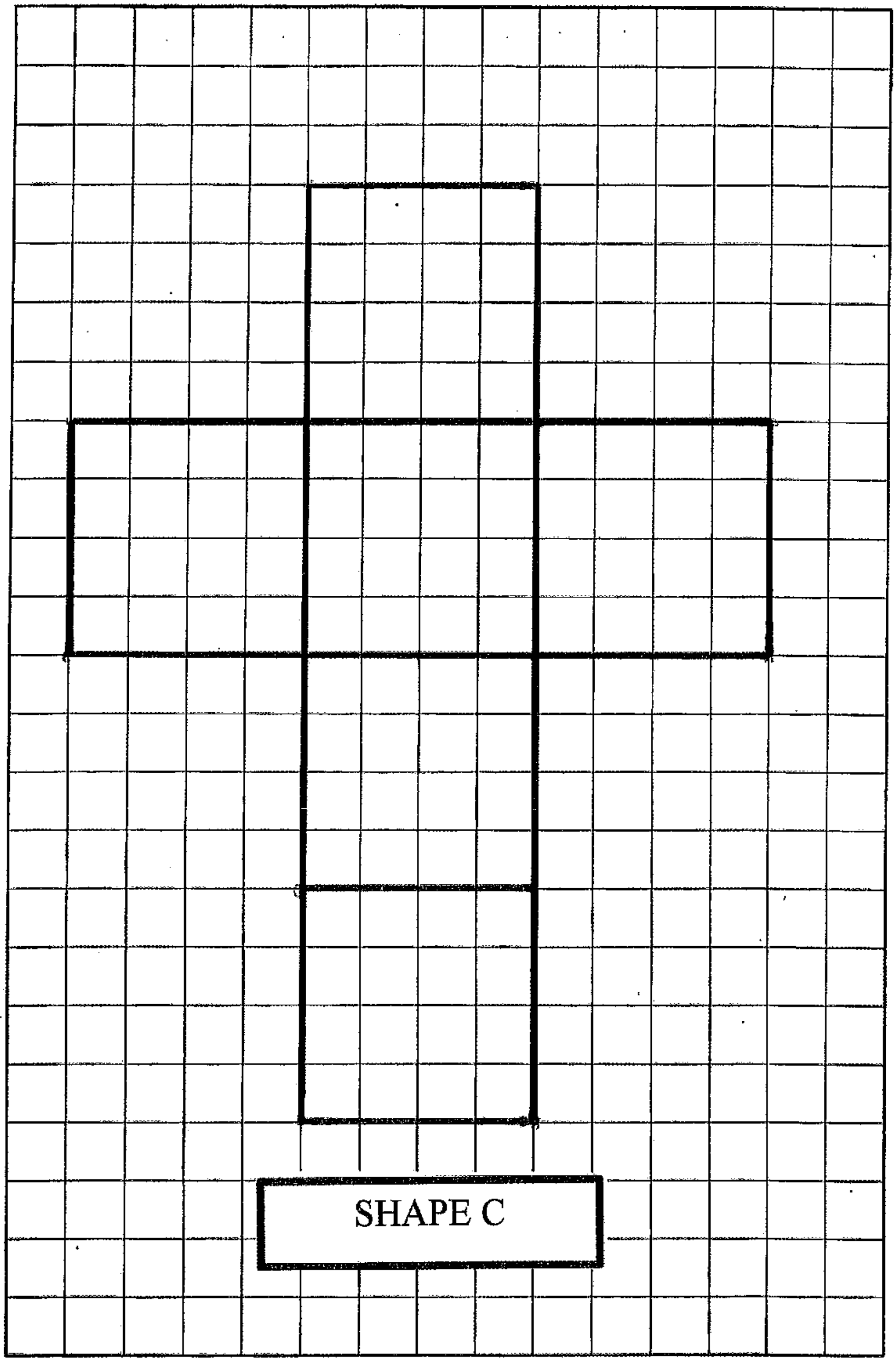
SHAPE H

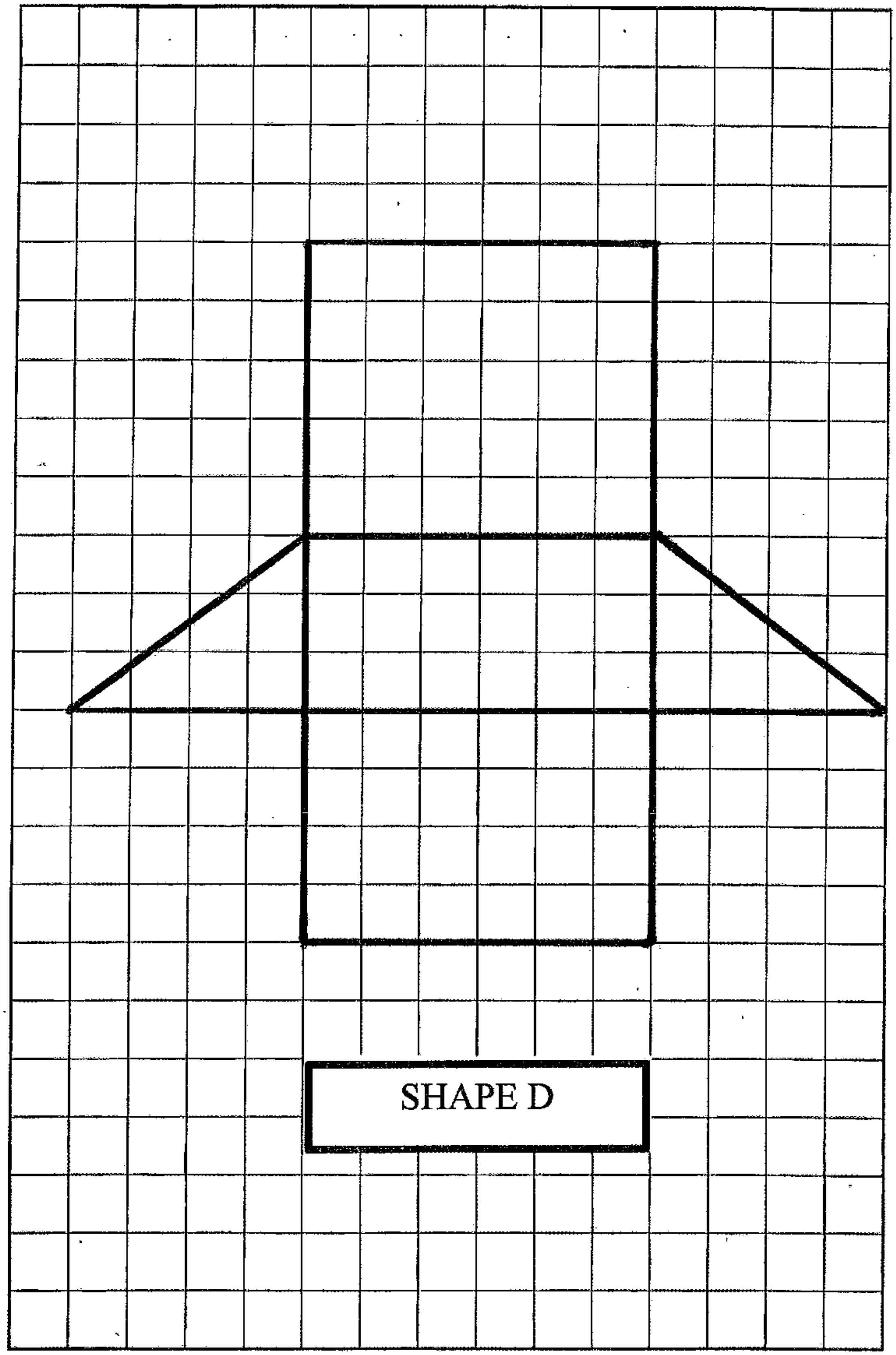
Name ________________

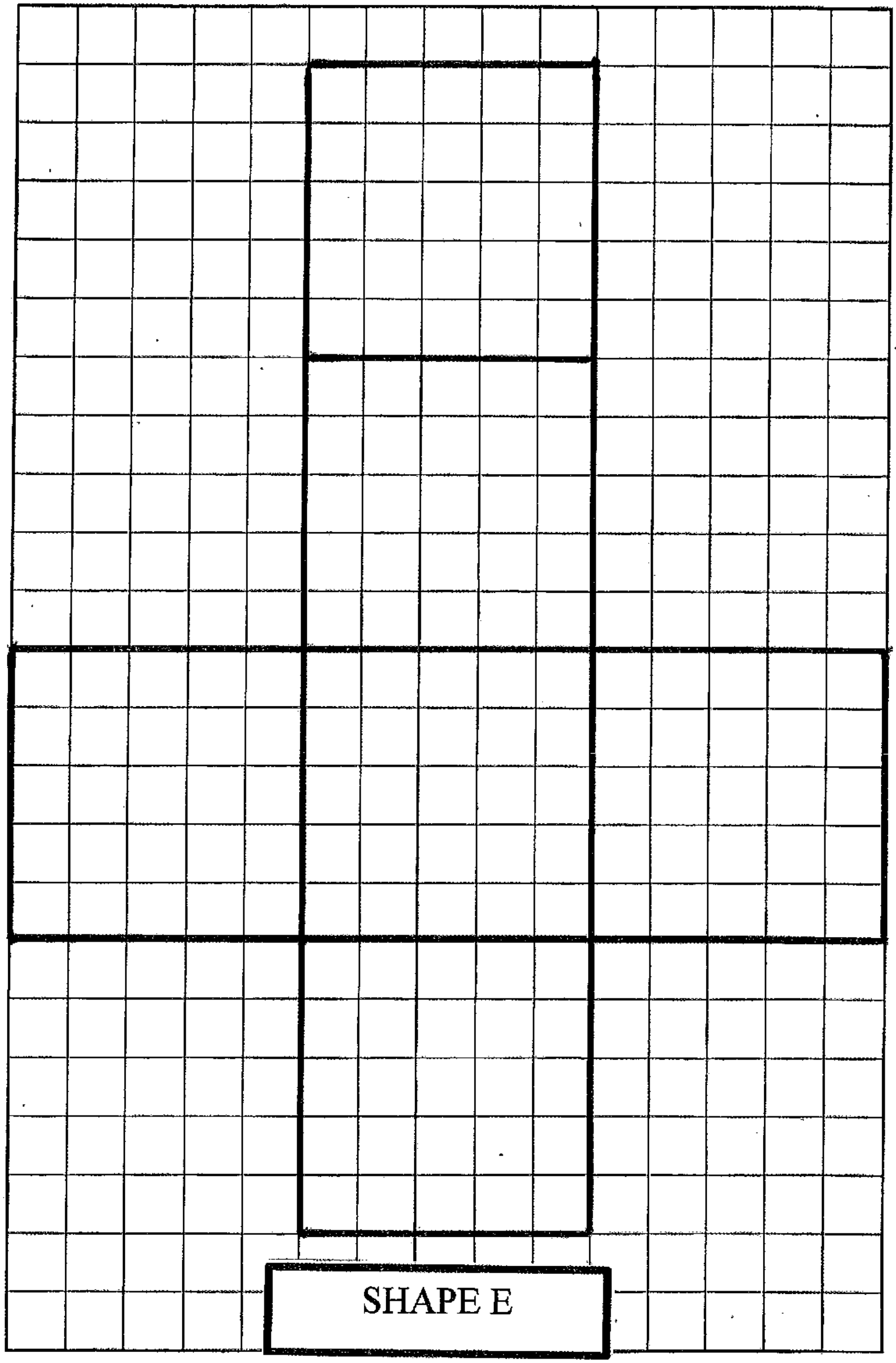
Surface Area = ________


SHAPE A

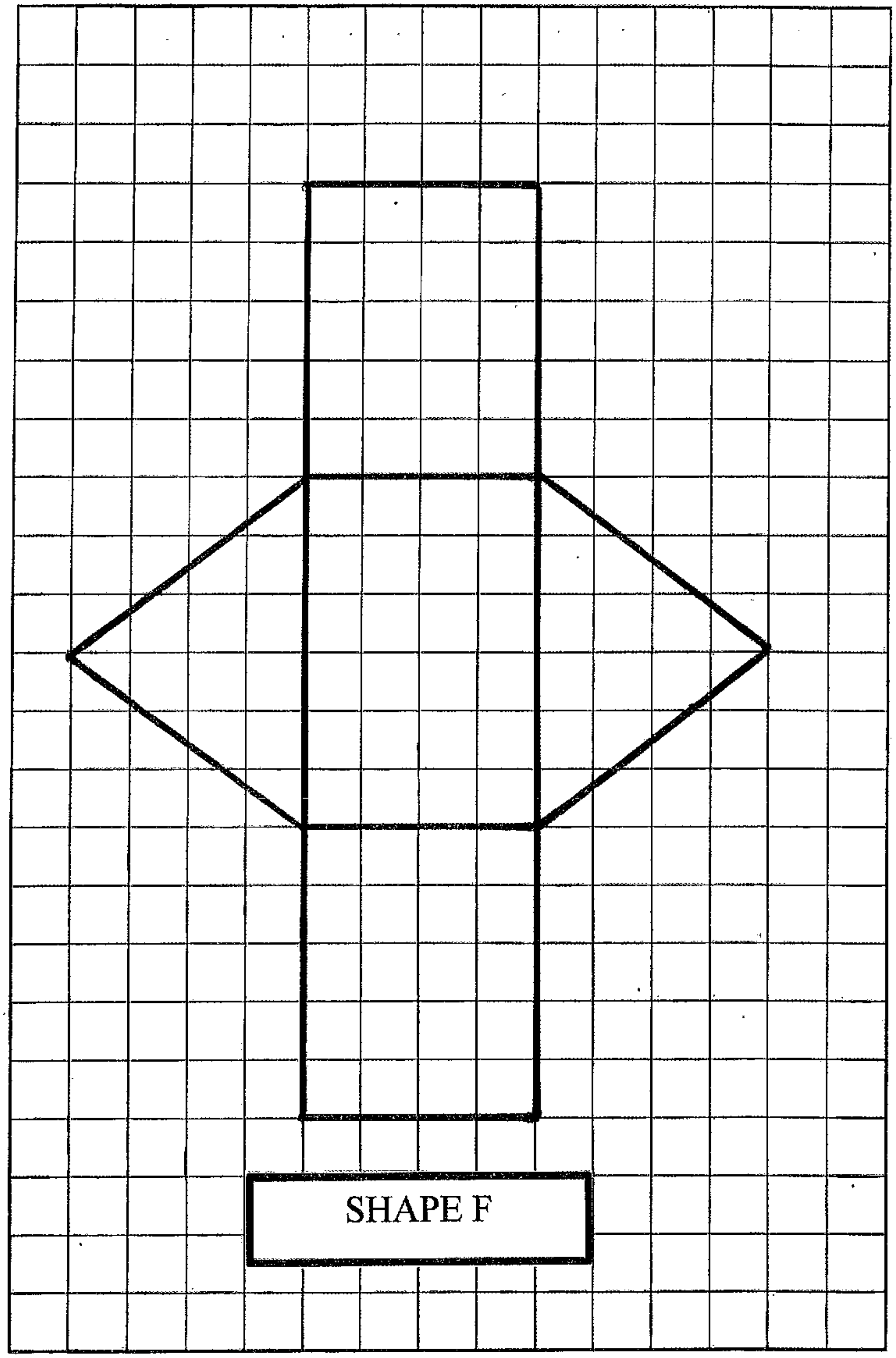

SHAPE B

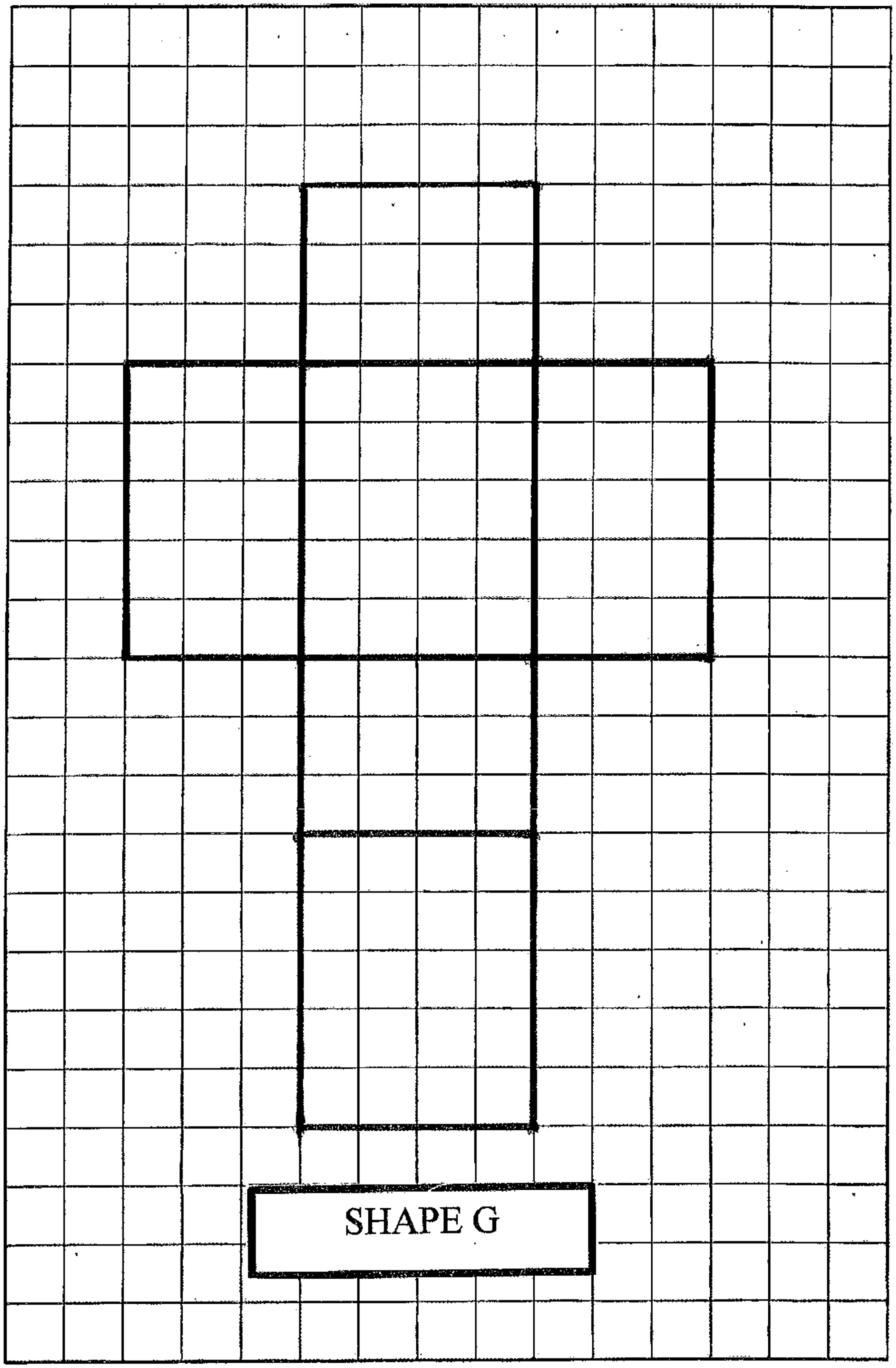

SHAPE C

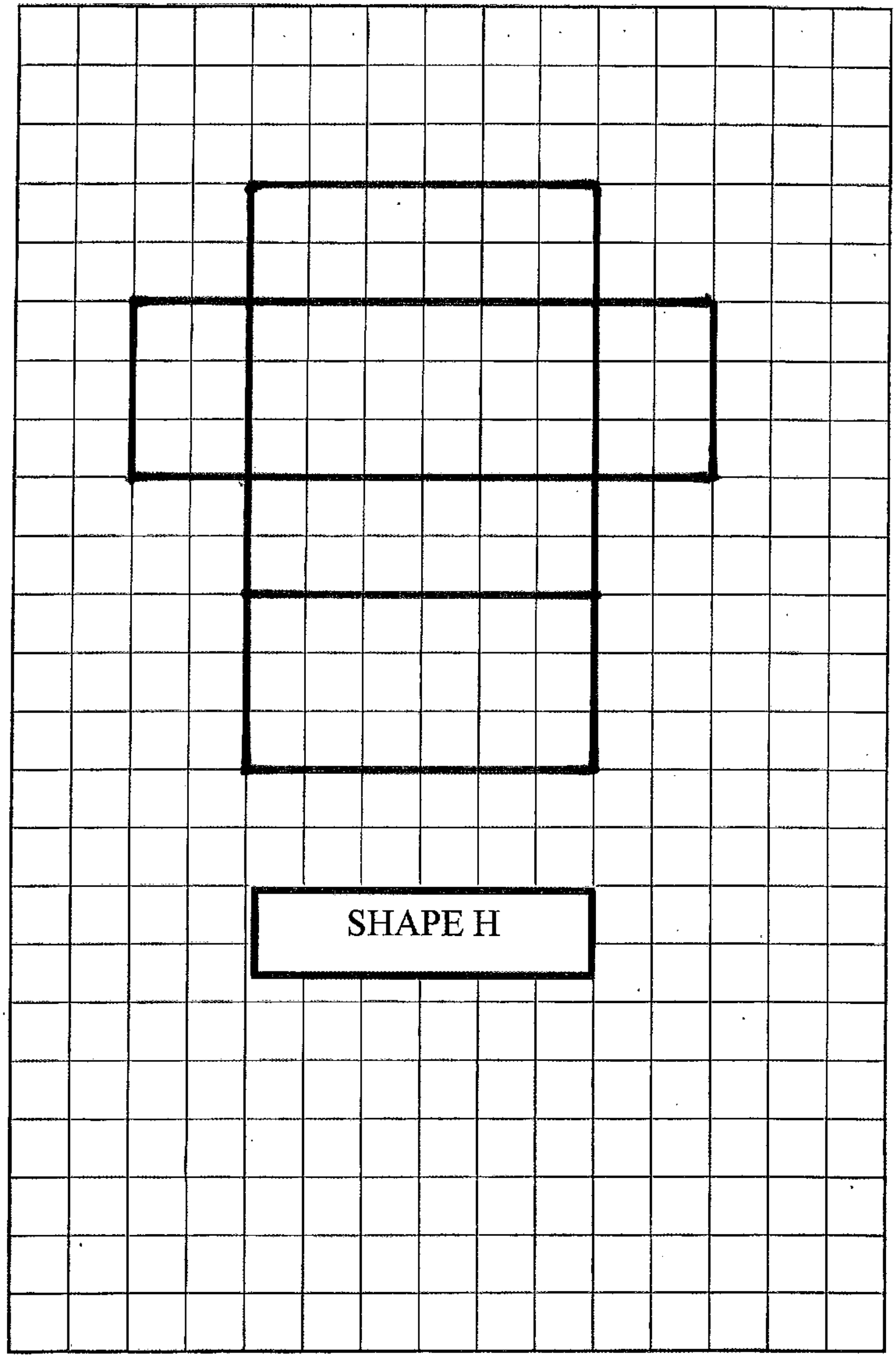

SHAPE D



SHAPE E


SHAPE F


SHAPE G



SHAPE H

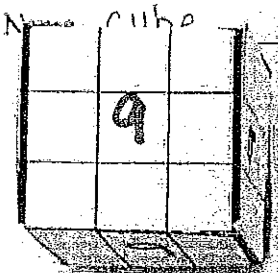
Using Nets to Find Surface Area and Volume of 3-D Prisms

NAME Key

1) Find the area of each face on each net. Write the area on each face.
2) Cut out the net. Fold on the heavy lines. Tape the prism together so that the grid is on the outside of the prism.
3) Tape/paste each prism to the corresponding location on this worksheet.
4) Name the prism with the most specific name possible. Find the surface area. Be sure to include the appropriate units.

SHAPE A

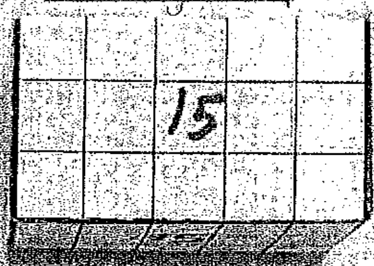
Name cube



Surface Area = 54 cm²

SHAPE B

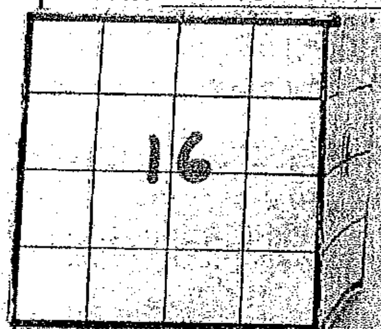
Name rectangular prism



Surface Area = 78 cm²

SHAPE C

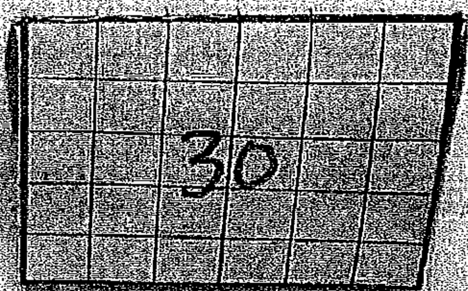
Name cube



Surface Area = 96 cm²

SHAPE D

Name triangular prism

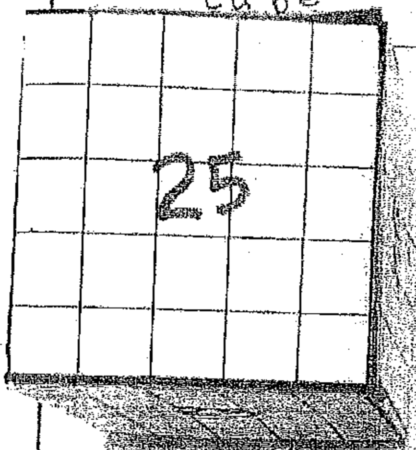


Surface Area = 84 cm²

NAME Key

SHAPE E

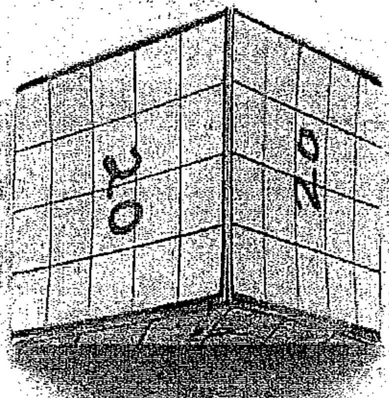
cube



Surface Area = 150 cm²

SHAPE F

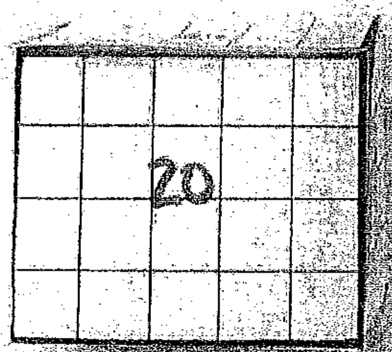
Name triangular prism



Surface Area = 88 cm²

SHAPE G

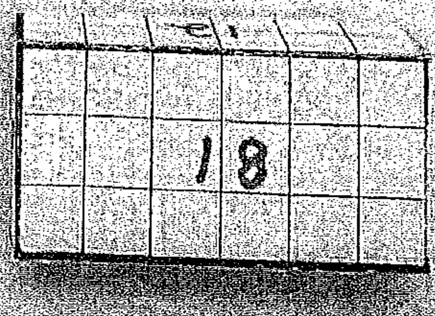
Name rectangular prism



Surface Area = 94 cm²

SHAPE H

Name rectangular prism



Surface Area = 72 cm²

Area Contractor

GRADE: 6-8
PERIODS: 2

STANDARDS:

AUTHOR:
Julie Healy
Falls Church, VA

This lesson gives students the opportunity to explore surface area in the same way that a contractor might when providing an estimate to a potential customer. Once the customer accepts the estimate, a more detailed measurement is taken and a quote prepared. In this lesson, students use estimation to determine the surface area of the walls and floor of their classroom. They check the reasonableness of their estimates, and then measure the classroom for accuracy.

This lesson has two parts. The first part involves estimation of area, and the second part involves actually measuring the area for accuracy. The parts can be completed separately, or students can be given all the information up front and allowed to work at their own pace.

To prepare for the estimated area activity, you may want to measure ahead of time various items in your classroom that you could suggest to students as measurement reference points. The Area Contractor Activity Sheet is set up to include a typical classroom with 4 walls and standard obstructions. Modifications may be necessary for rooms with a different number of walls or unique architecture.

Area Contractor Activity Sheet

Divide students into groups of three and assign roles. Each group member should be assigned a task role and a measurement role, as outlined on the activity sheet. This lesson lends itself to differentiated instruction through group role assignments (see discussion below). Groups will indicate their assigned roles on their activity sheets by circling their role titles.

Part 1: Estimation

Each group must first estimate the surface area of the classroom walls and floor using reference points found in the classroom. If students are not familiar with estimating measurements using reference points, you may want to consider the following questions as a way to access prior knowledge or help identify potential reference points in your classroom:

- What is the difference between estimation of area and actual area?

  [Estimation is based on visual inspection and reference points. For example, to estimate the area of a wall, use visual inspection to count the number of concrete blocks, 8" by 16". Actual area requires the use of a tape measure with accuracy within prescribed tolerances.]

- What reference points in the room could you use to estimate the gross square footage of the ceiling, walls, and floor of the classroom?

  [Standard door height is 80" or 6'8". Concrete (cinder) blocks are 8" by 16". Floor tiles are typically 12" square. Other reference points might include bookcases, counter tops, desks, and students' physical height.]

During the estimation phase, actual measuring instruments are not to be used. Estimations are to be checked by each member of the group for reasonableness before proceeding with actual measurements. While students work on their estimations, you might want to consider posing one or more of the following questions to group members:

- What reference points did you use to derive your estimate?

  [Reference points that students might choose could include their personal heights, bookcases, desks, bricks, doors, or windows. Some doors have height labeled, so they may choose those.]

- Why did you choose these reference points?

  [Most students will tell you that they "know those measurements" or it just makes sense to them. Be prepared for some creativity.]

- How close do you think your estimate is to the actual measurement? Why do you think this?

  [The majority of students will be over on their estimates, which is a reasonable result. When asked why, they will tell you they either guessed or rounded up. If their measurements are under, the typical explanation is that they could not reach. Estimates can also be under the actual measurements if students did not properly convert their units between inches and feet.]

It is important that students know how to properly use and read a tape measure. If students are completing both parts of this lesson at their own pace, you may want to instruct them on how to use the tape measure before they begin Part 1, the estimation activity. If all groups start Part 2 at the same time, it would be better to instruct students on how to use the tape immediately before the accurate measurement activity.

Each person in a group will use the measuring tapes provided to measure the surface area of one or more classroom walls and floor for accuracy. Measurements are to be reviewed by each member of the group for reasonableness. If there is a question of reasonableness, then the surface in question should be measured again by a different group member. If time permits, have someone else within the group verify all measurements for accuracy. As students work on collecting their actual measurements, consider asking group members one or more of the following questions:

- How close were you to your original estimate? What might have accounted for the difference?

  [Answers will vary regarding closeness. Many differences tend to be from conversion between inches and feet, recording measurements incorrectly, or not paying attention to detail.]

- If you were going to paint this wall, do you think it is important to actually measure it or would an estimate been good enough?

  [Most students will tell you that an estimate is good enough, and if they ran out of paint they would just buy more. This is true for many do-it-yourself projects, but if a contractor had to buy more paint, he/she would lose money. A contractor would have first bid on the job for a specific number of hours and amount of paint. If it takes longer or takes more paint, it costs the contractor, not the customer, more money.]

Have groups prepare a presentation to the class comparing their estimates to their actual measurements. Presentations should include the methods the group used for their estimates and a discussion of why there is a difference between the estimate and the actual measurement. Once all groups have presented their findings, consider a whole-group discussion using one or more of the *Questions for Students*.

Differentiated Instruction

This activity can be used with differentiated instruction and mixed-ability groups. Each student within a group will have an assigned role. You or the group members can make these assignments. If you assign the specific roles within a group, consider doing so based on the students' ability levels.

- Level 1 – The Novice of the group should be assigned the responsibility of measuring the wall with minimal obstructions.
- Level 2 – The Apprentice should have proven skills in estimating and measuring area. The apprentice should be assigned the responsibility of measuring the wall with simple obstructions, such as the chalkboard.
- Level 3 – The Expert should be assigned the task of determining the net surface area of walls with complex obstructions. Complex obstructions may include multiple windows, doors, or cabinets.

- Measuring tape (1 per group; tapes 25 feet or longer provide the best accuracy)
- Chart paper and markers
- Area Contractor Activity Sheet

Assessment Options

1. Collect the completed activity sheets.
2. Have students present their results to the class.
3. Have groups prepare a written report of their findings that includes a description of the mathematics used to justify their estimates.
4. Consider having students repeat this activity for a room in their home. This could also be a family-night assignment that encourages other family members to participate.

Extensions

1. Groups can compete for accuracy of estimates without being under. As well, as part of the opener for Part 2, let students know that bonus points will be awarded for the most accurate measurement. Note: In order to offer this extension, you will need accurate measurements of the classroom before starting this lesson. Your school's building engineer may have that information available.
2. Add additional elements to the estimation task, such as the ceiling and any trim.
3. Invite a guest speaker to talk about the process of providing estimates.
4. Consider asking your building engineer to come in and present the estimate request to your students.

Questions for Students

1. If you were the customer, would you want your contractor to overstate or understate the estimate? Which would be better if you were the contractor? Why?

[From both the customer's and the contractor's perspective it is better to overestimate than to underestimate. The contractor could lose money on the job if the cost comes out higher than the estimate. The customer may feel misled if the final cost is higher than the estimate. However, contractors need to take care that they do not grossly overestimate the cost because they may scare their potential customer off.]

2. What are some situations in which an estimate is usually sufficient?

[Answers will vary but may include distance, value of the contents of a shopping cart, cost of a meal when eating out, etc.]

3. Describe a situation where precision is critical.

[Answers will vary. A good example to get students talking is the fabrication of an airplane. Would they want to fly in a plane were the parts were not measured with precision? In any situation where integrity of the construction could mean the difference between life and death or injury, precision is critical.]

Teacher Reflection

- Did students have sufficient knowledge of estimation to work on this activity independently within their groups?
- Did students experience difficulties with using the measuring tapes? If so, what could be done to make it easier for them?
- If you used ability grouping or differentiation, were the results positive or negative? Why? What would you do differently next time?
- Do you feel that group dynamics were important in this activity? Why?
- If time was a constraint for this activity, what would you change?
- Were concepts presented too abstractly? too concretely? How would you change them?
- What were some of the ways in which students showed that they were actively engaged in the learning process?
- Did you find it necessary to make adjustments while teaching the lesson? If so, what adjustments? Were these adjustments effective?
- What worked with respect to classroom behavior management? What didn't work? How would you change what didn't work?

Learning Objectives

Students will:

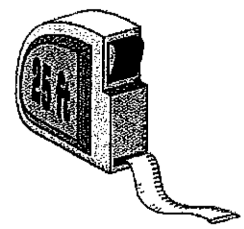
- Estimate area of walls and floor using reference items or points in a room.
- Estimate area of windows, doors, and any obstructions that cannot be moved or that the customer does not want moved.
- Estimate net surface area of walls and floor by subtracting the area of any obstructions from the appropriate wall or floor gross estimate.
- Calculate actual gross surface area of walls and floor using a tape measure, within ±1 inch tolerance (or as determined by you).
- Determine net surface area of walls and floor through actual measurement of surface area less any obstructions such as chalkboards, cabinets, windows, doors, etc., within a tolerance determined by you.

NCTM Standards and Expectations

- Use common benchmarks to select appropriate methods for estimating measurements.
- Select and apply techniques and tools to accurately find length, area, volume, and angle measures to appropriate levels of precision.

Area Contractor

NAME ____________________



Every summer the building engineers refinish the floors, paint, and repair classrooms as needed. We have been asked to help out the engineers by calculating the net area of this classroom's floors and walls. You will measure the room in groups of three, and then make a presentation to the class.

Task Assignments

Each group member will focus on one task to be completed. Circle the role you were assigned.

TEAM LEADER	Acts as project manager ensuring all work is completed and team members remain on task; provides assistance, as needed, to other team members.
RECORDER	Responsible for documenting results, coordinating the presentation, and acting as spokesperson for the group. Consider this person the operations manager.
RESOURCES	Responsible for obtaining all materials needed to complete the project and returning materials upon completion. Consider this person the supply officer.

Measurement Assignments

Each group member will measure a different part of the room. Circle the role you were assigned.

MEMBER A	Measure the floor and help measure walls as determined by your Team Leader. Assume all furniture will be removed from the room, so there is no need to deduct for furniture obstructions. You do need to deduct for permanent cabinets and fixtures.
MEMBER B	Measure the gross area of the walls and with assistance from Member A.
MEMBER C	Measure the obstructions such as doors, windows, and chalkboards. Your measurements will be subtracted from the gross measurements of the surfaces.

Part 1: Estimation

Each person must first estimate their assigned surface area using reference points found in the classroom. Measurements should be accurate within ± 1 ft and rounded to the nearest foot. Record your estimated measurements in the left-hand side of each table below.

Gross surface area does not have any deductions for obstructions.

SURFACES	ESTIMATED MEASUREMENTS			ACTUAL MEASUREMENTS		
	LENGTH	WIDTH	AREA (FT^2)	LENGTH	WIDTH	AREA (FT^2)
FLOOR						
WALL 1						
WALL 2						
WALL 3						
WALL 4						
ESTIMATED GROSS AREA				ACTUAL GROSS AREA		

Obstructions include any permanent fixtures that cannot be removed from the room. The table contains possible obstructions in the room. Enter other obstructions into the table as needed.

OBSTRUCTIONS	ESTIMATED MEASUREMENTS			ACTUAL MEASUREMENTS		
	LENGTH	WIDTH	AREA (FT^2)	LENGTH	WIDTH	AREA (FT^2)
DOORS						
WINDOWS						
CHALK/WHITEBOARDS						
CABINETS						
OTHER						

Finally, obstructions are subtracted from the gross surface area of the respective surface. Net surface area is gross area minus obstruction area.

SURFACES WITHOUT OBSTRUCTIONS	ESTIMATED MEASUREMENTS			ACTUAL MEASUREMENTS		
	LENGTH	WIDTH	AREA (FT^2)	LENGTH	WIDTH	AREA (FT^2)
FLOOR						
WALL 1						
WALL 2						
WALL 3						
WALL 4						
		ESTIMATED NET AREA			ACTUAL NET AREA	

Part 2: Accurate Measurement

Using a measuring tape, find the actual areas of the surfaces in the room. Measurements should be accurate within ± 1 in and rounded to the nearest inch. Record your actual measurements in the right-hand side of each table above.

Presentation

Please include the following in your presentation to the class:

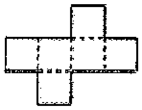
- Your square footage for each surface based on estimation rounded to the nearest foot (Note what reference points were used for estimation.)
- Your actual square footage for each surface rounded to the nearest inch
- A list of obstructions that were deducted from your measurements and why
- A comparison between your estimate and your actual measurements

Be prepared to discuss the following questions:

- What could account for the differences between the estimated and the actual measurement if the difference is significant (significant is defined as more than ± 10%)?
- Is it better to use estimation or actual measurements for this type of project? Why?

Surface Area Project

Choose a box (rectangular solid)



Poster

You may set up your poster any way you wish as long as you show the following items.

- Measure your box (length, width, height) record these measurements on your poster including appropriate units (cm or in)
- Turn your 3-D rectangular solid into a net (flatten out the box) and tape/glue/staple it onto the poster board
- Find the area of each surface. A rectangular solid has 6 surfaces. (top, bottom, front, back, side, side). Record these 6 area measurements on your poster. Add the 6 measurements together to get the total surface area.
- Now use the formula for surface area of a rectangular solid. SA = 2lw + 2lh + 2wh (write the formula on your poster) Show your work completing the formula and your answer.
- Compare your two answers for surface area. Should the answers be the same? Why? Explain your answer on your poster.
- Find the volume of your rectangular solid. V = lwh. (write the formula on your poster) Show your work completing the formula and your answer.

*make sure you label your answers correctly

Extra Points: Do the same project with a cylinder

For the teacher:

I had my students bring in boxes from home. (cereal boxes, cracker boxes, Kleenex boxes, etc.) The students take ownership of their box and the project means more to them. I allowed students to bring in as many boxes as they wanted. This ensures that every student has a box. You may want to add 5 points to the project for bringing in boxes.

Students may work on this project individually or with a partner. By figuring out surface area using a formula and by finding the area of each of the 6 faces (surfaces) the students make a connection when they discover the 2 answers will be the same. It is an a-ha moment for the student! Instead of just plugging in numbers to a formula (plug and chug) students actually understand the meaning of surface area.

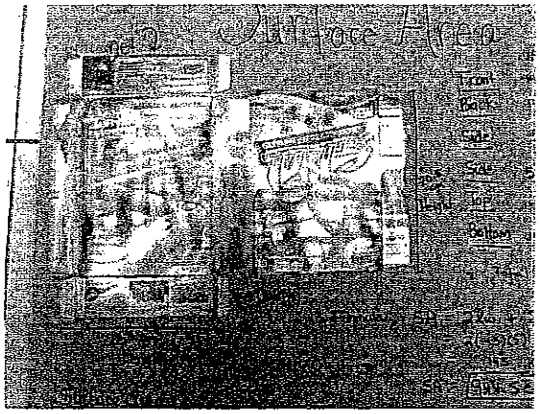
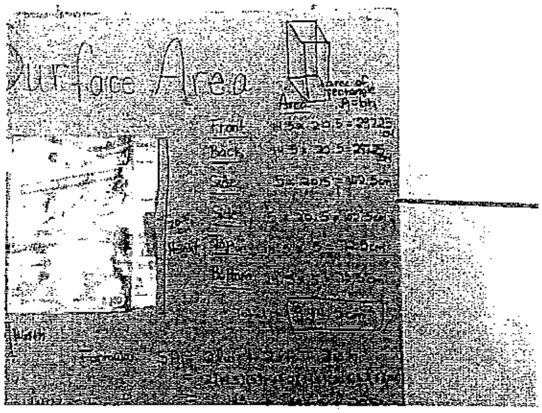
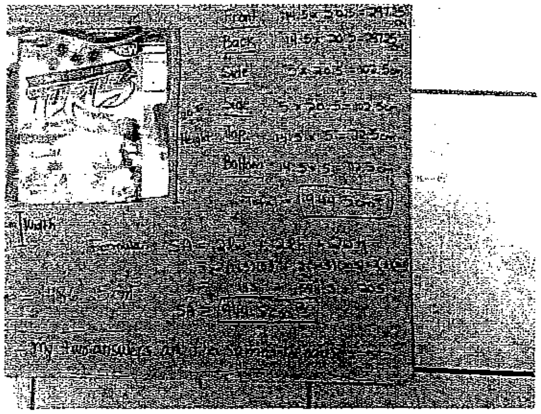
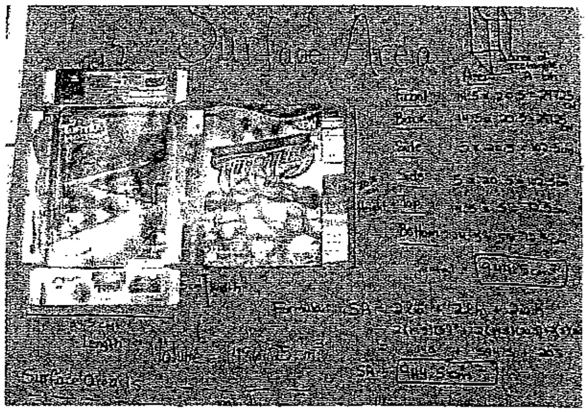
This same project can be applied to cylinders, or any other 3-D shape!

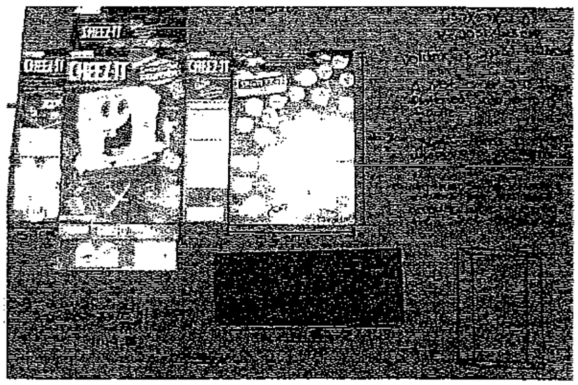
Students will be reviewing area, surface area, nets, volume and measurement. Be sure to remind the students that the units for area are squared, and the units for volume are cubed.

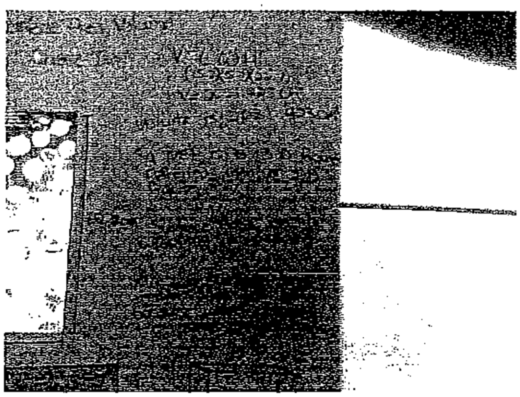
When completing this project, some students will be confused by the extra tabs on the boxes (the tabs that fold inside of the box). I had my students just cut off the extra tabs. They should have 6 faces (top, bottom, side, side, front, back).

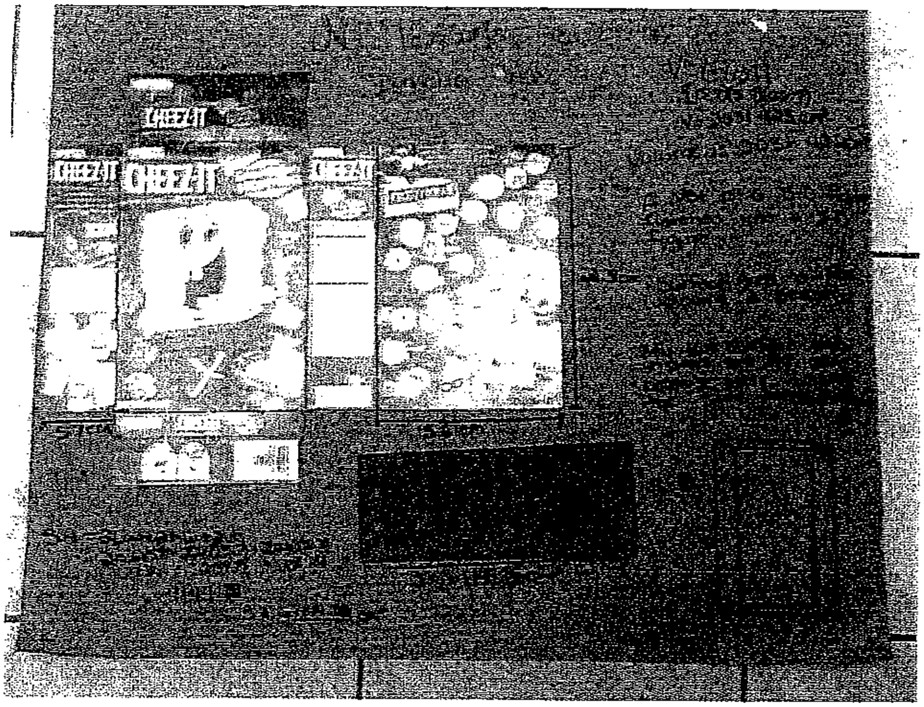
This project may be used as review, or as an assessment.

When looking at the pictures below: The blue poster (teenage mutant ninja turtles) was my example for the class. I left some things blank on purpose, but I wanted to give the students an idea of what I was looking for. The green poster (sponge bob) is an example of a student created project. I was teaching lower level students – depending on the level you teach – you may or may not want to display an example.


Surface Area

Surface Area


Surface Area


CHEEZ-IT

CHEEZ-IT



CHEEZ-IT

Surface Area and Volume Project

(This will count as a test grade – so do your best!)

Directions for the Rectangular Solid

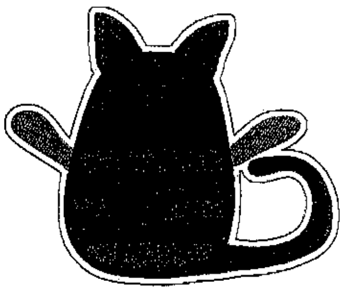
1. Choose a box. Label ½ of your poster "Rectangular Solid". (Worth 1 point)
2. Draw a 3-D Rectangular Solid on your poster. Label it 3-D. (Worth 3 points)
3. Measure the length, width, and height of the box in centimeters. (Write this information on your poster) (Worth 7 points)
4. Write the definition of volume on your poster. (Worth 7 points)
5. Find the volume of the box (make sure you write the formula, show your work, and solve the problem) (be sure to use the correct unit of measure)(Write this information on your poster) (worth 11 points)
6. Write the definition of surface area on your poster. (Worth 7 points)
7. Find the surface area of your box. (Make sure you write the formula, show your work, and solve the problem) (Be sure to use the correct unit of measure)(Write this information on your poster) (Worth 11 points)
8. Break your box down to make a net. Glue or staple your box onto the poster. Next to or on your box label length, width, and height. (Worth 3 points)

Directions for the Cylinder

1. Choose a cylinder. Label ½ of your poster "Cylinder". (Worth 1 point)
2. Draw a 3-D Cylinder on your poster. Label it 3-D. (Worth 3 points)
3. Draw the 2-D Net on your poster. Label it 2-D. (worth 3 points)
4. Measure the radius and height of the cylinder in centimeters. (Write this information on your poster) (Write the measurements next to your 3-d drawing) (Decorate your 3-D drawing to look like your cylinder because you can't staple the cylinder to your poster!) (Worth 7 points)
5. Find the volume of the cylinder. (Make sure you write the formula, show your work, and solve the problem) (Be sure to use the correct unit of measure)(Write this information on your poster) (Worth 11 points)
6. Find the surface area of your cylinder. (Make sure you write the formula show your work, and solve the problem) (Be sure to use the correct unit of measure)(Write this information on your poster) (Worth 11 points)

Answer the following questions in complete sentences and write them on your poster.

1. In real life how would you use volume? (Worth 7 points)
2. In real life how would you use surface area? (Worth 7 points)



Foldable Box 'n Whisker Slips

Data Set 4 36	54	60	68	70	71	72	75	79	82	85	89	91	92	93	96
Data Set 5 36	70	71	72	72	73	74	77	77	78	79	79	79	86	91	96
Data Set 6 36	42	45	48	52	60	67	76	78	80	83	86	88	91	95	96
Data Set 1 60	64	67	70	74	76	79	80	82	87	88	90	93	96	100	
Data Set 2 60	61	65	65	70	74	76	80	80	83	85	90	94	98	100	
Data Set 3 60	68	69	75	78	78	80	80	86	88	92	95	96	98	100	

Box and Whisker Plots:
What do they tell us about sets of numbers?

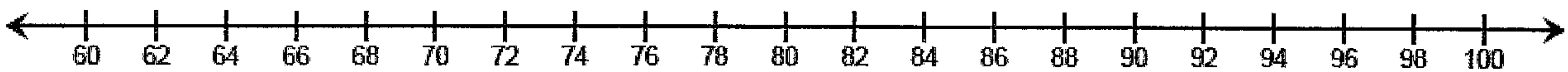
Names ____________________
Date ____________ Period ________

In your group of three, have each person fold their strip in half. Make a note of the **median** of each set of data. You'll need this soon. Now, take the strip and fold it again. The numbers in the new creases are the **lower quartile (Q1)** and the **upper quartile (Q3)**. On the number line below, construct three box and whisker plots to show your data. Then, answer the questions below the plot.

lot 1

lot 2

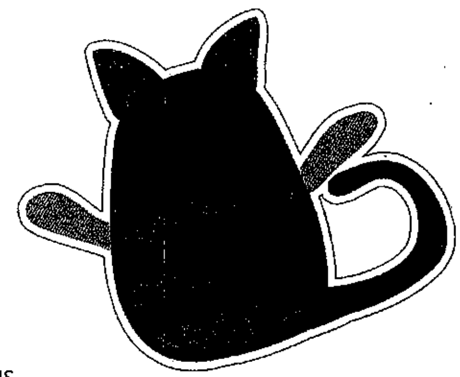
lot 3



1. Make three observations about the minimum, maximum, and median of the three sets of data. Write them below.

2. If you were to judge the three classes based on ONLY the three measures above, what would you say about how they did?

3. How does each set of data differ from the others?



4. Based on all of the information you see above, which class did the best on the test?

Box and Whisker Plots:
What do they tell us about sets of numbers?

Names ____________________

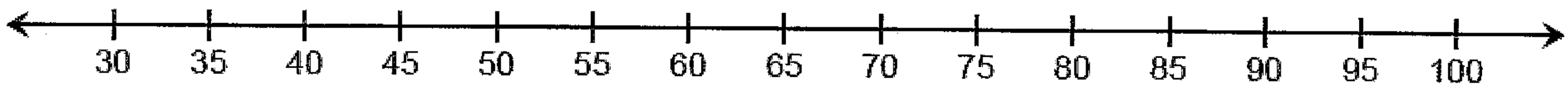
Date ____________ Period ____________

In your group of three, have each person fold their strip in half. Make a note of the **median** of each set of data. You'll need this soon. Now, take the strip and fold it again. The numbers in the new creases are the **lower quartile (Q1)** and the **upper quartile (Q3)**. On the number line below, construct three box and whisker plots to show your data. Then, answer the questions below the plot.

ot 4

ot 5

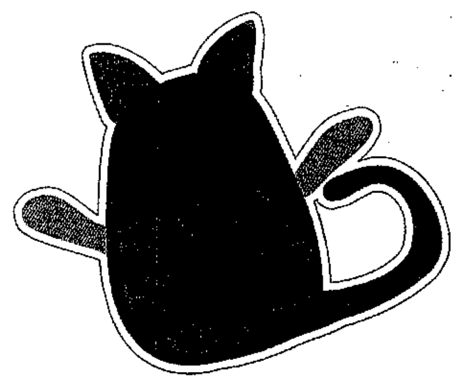
ot 6



1. Make three observations about the minimum, maximum, and median of the three sets of data. Write them below.

2. If you were to judge the three classes based on ONLY the three measures above, what would you say about how they did?

3. How does each set of data differ from the others?



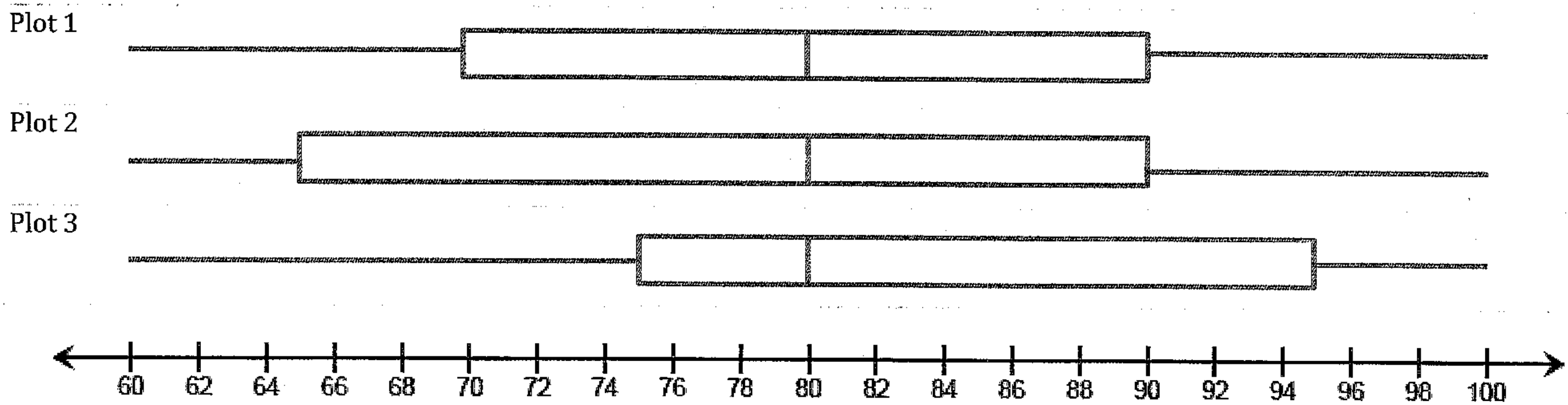
4. Based on all of the information you see above, which class did the best on the test?

Box and Whisker Plots:
What do they tell us about sets of numbers?

Names ____________ ANSWER KEY ____________

Date ____________ Period ____________

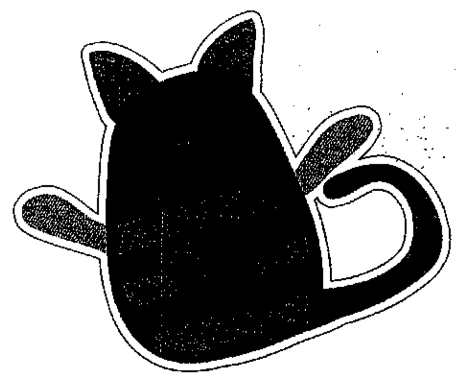
In your group of three, have each person fold their strip in half. Make a note of the **median** of each set of data. You'll need this soon. Now, take the strip and fold it again. The numbers in the new creases are the **lower quartile (Q1)** and the **upper quartile (Q3)**. On the number line below, construct three box and whisker plots to show your data. Then, answer the questions below the plot.



1. Make three observations about the minimum, maximum, and median of the three sets of data. Write them below.
Answers will vary.

2. If you were to judge the three classes based on ONLY the three measures above, what would you say about how they did?
Overall, very well, considering the median is 80.

3. How does each set of data differ from the others?
The quartiles are in different places.

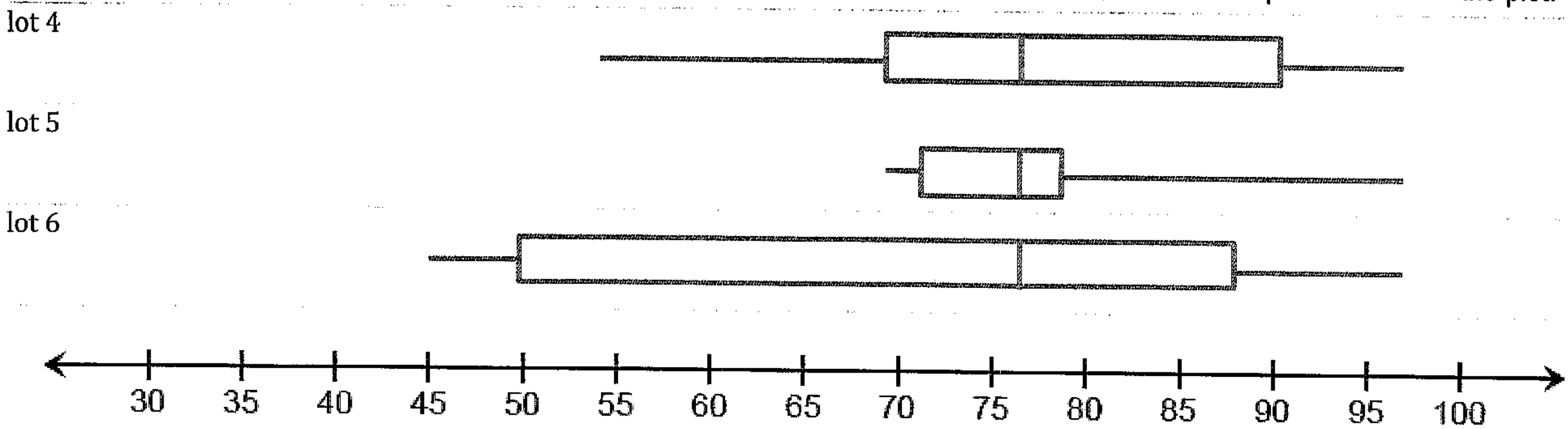


4. Based on all of the information you see above, which class did the best on the test?
140 swers will vary.

Box and Whisker Plots:
What do they tell us about sets of numbers?

Names ______ANSWER KEY______________
Date ______________ Period ______________

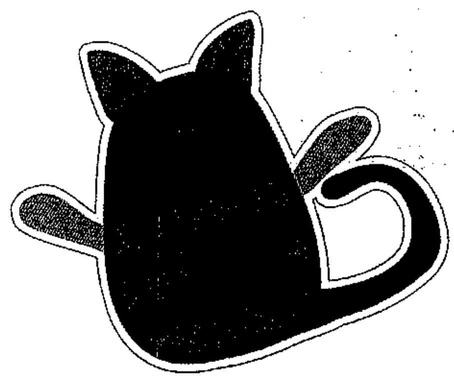
In your group of three, have each person fold their strip in half. Make a note of the **median** of each set of data. You'll need this soon. Now, take the strip and fold it again. The numbers in the new creases are the **lower quartile (Q1)** and the **upper quartile (Q3)**. On the number line below, construct three box and whisker plots to show your data. Then, answer the questions below the plot.



1. Make three observations about the minimum, maximum, and median of the three sets of data. Write them below.
Answers will vary.

2. If you were to judge the three classes based on ONLY the three measures above, what would you say about how they did?
The highest scores are better, but the lower scores are pretty low.

3. How does each set of data differ from the others?
Same medians and upper extremes, but quartiles vary.



4. Based on all of the information you see above, which class did the best on the test?
swers will vary.

Box 'n Whisker Plots from Fast Food Data

Find the five number summaries for the total fat grams in foods served by each restaurant. Construct a box-and-whisker plot for all 4 sets of data on the same number line. Write three comparisons based on the box-and-whisker plot.

Dunkin' Donuts	Total Grams of Fat
Dunkin' Donuts Apple Fritter	10
Dunkin' Donuts Apple N' Spice Donut	14
Dunkin' Donuts Bavarian Kreme Donut	8
Dunkin' Donuts Chocolate Iced Donut	9
Dunkin' Donuts Black Raspberry Donut	15
Dunkin' Donuts Blueberry Cake Donut	8
Dunkin' Donuts Blueberry Crump Donut	16
Dunkin' Donuts Boston Kreme Donut	10
Dunkin' Donuts Bow Tie Donut	9
Dunkin' Donuts Butternut Cake Donut Ring	17
Dunkin' Donuts Caramel Apple Krunch Donut	16
Dunkin' Donuts Chocolate Coconut Cake Donut	14
Dunkin' Donuts Chocolate Frosted Cake Donut	19
Dunkin' Donuts Chocolate Frosted Coffee Roll	16
Dunkin' Donuts Chocolate Frosted Donut	15
Dunkin' Donuts Chocolate Glazed Cake Donut	9
Dunkin' Donuts Chocolate Kreme Filled Donut	16

Dunkin Donuts

Median –

Lower Quartile –

Upper Quartile –

Minimum –

Maximum -

Box 'n Whisker Plots from Fast Food Data

Find the five number summaries for the total fat grams in foods served by each restaurant. Construct a box-and-whisker plot for all 4 sets of data on the same number line. Write three comparisons based on the box-and-whisker plot.

Arby's	Total Grams of Fat
Arby's Melt w/Cheddar	15
Arby's Arby-Q	14
Arby's Beef 'N Cheddar	24
Arby's Big Montana	32
Arby's Giant Roast Beef	23
Arby's Junior Roast Beef	13
Arby's Regular Roast Beef	16
Arby's Super Roast Beef	23
Arby's Chicken Bacon 'N Swiss	33
Arby's Chicken Breast Fillet	30
Arby's Chicken Cordon Bleu	35
Arby's Grilled Chicken Deluxe	22
Arby's Roast Chicken Club	28
Arby's Hot Ham 'N Swiss	13
Arby's French Dip	18

Arby's

Median –

Lower Quartile –

Upper Quartile –

Minimum –

Maximum -

Box 'n Whisker Plots from Fast Food Data

Find the five number summaries for the total fat grams in foods served by each restaurant. Construct a box-and-whisker plot for all 4 sets of data on the same number line. Write three comparisons based on the box-and-whisker plot.

Pizza Hut	Total Grams of Fat
Pizza Hut Big New Yorker Pepperoni	16
Pizza Hut Big New Yorker Ham	13
Pizza Hut Big New Yorker Beef Topping	26
Pizza Hut Big New Yorker Pork Topping	25
Pizza Hut Big New Yorker Sausage	33
Pizza Hut Big New Yorker Supreme	23
Pizza Hut Big New Yorker Veggie Lover's Pizza	22
Pizza Hut The Edge The Works	6
Pizza Hut The Edge Veggie Lover's	3
Pizza Hut The Edge Meat Lover's	11
Pizza Hut The Edge Chicken Supreme	3.5
Pizza Hut Pan Pizza Cheese	14
Pizza Hut Pan Pizza Beef Topping	18
Pizza Hut Pan Pizza Ham	12
Pizza Hut Pan Pizza Pepperoni	14
Pizza Hut Pan Pizza Italian Sausage	20
Pizza Hut Pan Pizza Pork Topping	17
Pizza Hut Pan Pizza Meat Lover's	21
Pizza Hut Pan Pizza Veggie Lover's	12
Pizza Hut Pan Pizza Pepperoni Lover's	18

Pizza Hut

Median –

Lower Quartile –

Upper Quartile –

Minimum –

Maximum -

Box 'n Whisker Plots from Fast Food Data

Find the five number summaries for the total fat grams in foods served by each restaurant. Construct a box-and-whisker plot for all 4 sets of data on the same number line. Write three comparisons based on the box-and-whisker plot.

KFC	Total Grams of Fat
KFC Original Recipe Chicken Wing	10
KFC Original Recipe Chicken Breast	24
KFC Original Recipe Chicken Drumstick	9
KFC Original Recipe Chicken Thigh	18
KFC Extra Crispy Chicken Wing	15
KFC Extra Crispy Chicken Breast	28
KFC Extra Crispy Chicken Drumstick	12
KFC Extra Crispy Chicken Thigh	27
KFC Hot & Spicy Chicken Wing	25
KFC Hot & Spicy Chicken Breast	29
KFC Hot & Spicy Chicken Drumstick	10
KFC Hot & Spicy Chicken Thigh	26

KFC

Median –

Lower Quartile –

Upper Quartile –

Minimum –

Maximum –

Box 'n Whisker Plots from Fast Food Data

Find the five number summaries for the total fat grams in foods served by each restaurant. Construct a box-and-whisker plot for all 4 sets of data on the same number line. Write three comparisons based on the box-and-whisker plot.

Dunkin' Donuts

Arby's

Pizza Hut

KFC

Three comparisons:

1. ______________________________
2. ______________________________
3. ______________________________

Box 'n Whisker Plots from Fast Food Data

Answer the following questions.

Name: ______________________________

1. What is the smallest number on your number line?____________________
2. What is the largest number on your number line?____________________
3. What increments did you use?____________________
4. On the basis of a comparison of ONLY the medians, which fast food is the fattiest?
5. Which restaurant has the highest fat content?__________ lowest?__________
6. Which restaurant has the largest range?__________ what is it?__________
7. Which restaurant has the smallest range?__________ what is it?__________
8. What could be a good title for the box and whisker plot?____________________
9. If you had to eat one thing from each restaurant for the same meal, what would be your healthiest choice?____________________
10. If you had to eat one thing from each restaurant for the same meal, what would be your unhealthiest choice?____________________

Box 'n Whisker Plots from Fast Food Data

ANSWER KEY

Dunkin Donuts

Median – 14

Lower Quartile – 9

Upper Quartile – 16

Minimum – 8

Maximum - 19

Arby's

Median – 23

Lower Quartile – 15.5

Upper Quartile – 29

Minimum – 13

Maximum - 35

Pizza Hut

Median – 16.5

Lower Quartile – 12

Upper Quartile – 21.5

Minimum – 3

Maximum - 33

KFC

Median – 21

Lower Quartile –11

Upper Quartile – 26.5

Minimum – 9

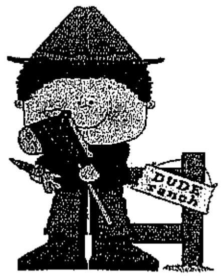
Maximum - 29

Box 'n Whisker Plots from Fast Food Data

Answer the following questions.

ANSWER KEY

1. What is the smallest number on your number line?____________________
2. What is the largest number on your number line?____________________
3. What increments did you use?____________________
4. On the basis of a comparison of ONLY the medians, which fast food is the fattiest?
5. Which restaurant has the highest fat content?__Arby's__ lowest?____DD___
6. Which restaurant has the largest range?_____Pizza Hut_____ what is it?______30____
7. Which restaurant has the smallest range?_____8____ what is it?____DD_____
8. What could be a good title for the box and whisker plot?____________________
9. If you had to eat one thing from each restaurant for the same meal, what would be your healthiest choice?_Bavarian Kreme/Blueberry Crumb donut, Hot ham/Junior RB, Veggie Lovers Pizza, Original Recipe Drumstick_
10. If you had to eat one thing from each restaurant for the same meal, what would be your unhealthiest choice?____Chocolate Frosted Cake Donut, Chicken Cordon Bleu Sandwich, New Yorker Sausage, Hot & Spicy Chicken___

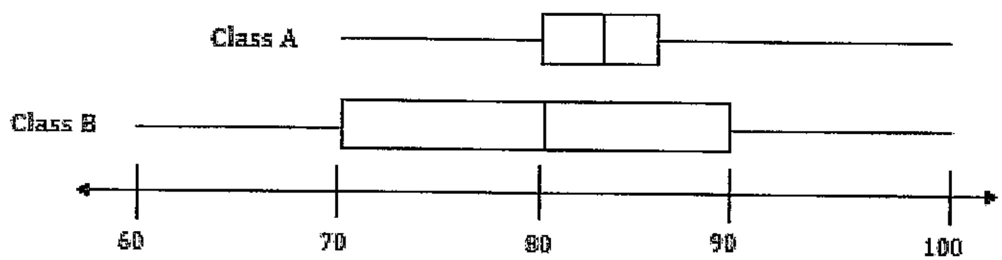


Box 'n Whisker Cowboy Ranch

Directions: Complete each problem and circle either answer one or two. The color will correspond with the problem number on the picture. For example, if the student gets the answer THIRTY for number 1, the students should color all of the number ones RED in the picture. **Name:** ____________________

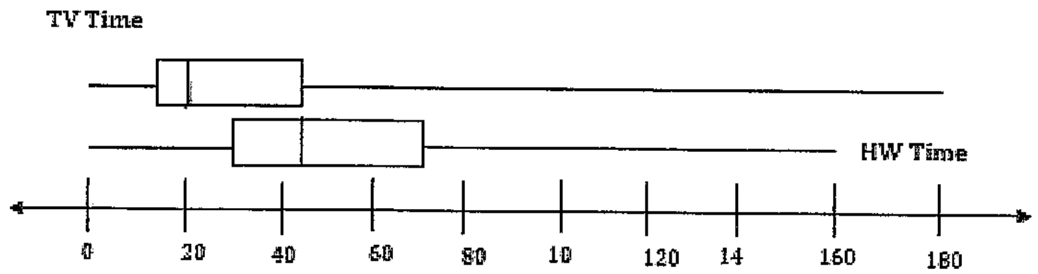
#	Problem	Answer 1	Answer 2

Ms. Grande gave a quiz last week and the results for her two classes are below. Use this Box & Whisker Plot to answer questions #1-5.



#	Problem	Answer 1	Answer 2
1	What is the difference between the upper and lower quartiles for Class A?	Thirty Red	Six Gray
2	What is the difference between the upper and lower extremes for Class B?	Twenty Green	Forty Black
3	True/False: The median for Class A is lower than the median for Class B.	False Red	True Pink
4	True/False: Class B did better on the quiz than Class A.	True Yellow	False Light Blue
5	What is an approximate difference between the upper extreme for Class A and the lower quartile for Class B?	Thirty Tan	Twenty Purple

150

#	Problem	Answer 1	Answer 2
	or questions #6-12, refer to the box & whisker graphs below that compare homework time per night with TV time per night for the same group of 8th graders. 		
6	What percent of 8th graders watch TV for more that 20 minutes per night?	75% Orange	50% Light Brown
7	True/False: 25% of the 8th graders spend between 40 & 68 minutes per night on homework.	True Yellow	False Dark Brown
8	True/False: In general, these 8th graders spend more time watching TV than doing homework.	True Light Green	False Orange
9	True/False: The median HW time and the upper quartile TV time are about the same.	True Pale Pink	False Purple
10	What percent of 8th graders do HW for more than an hour and 15 minutes?	25% Yellow	50% Green
11	What is an approximate difference between the upper extreme for TV time and the lower quartile for HW time?	100 Gray	150 Peach
12	What is the difference between the upper and lower quartiles for TV time?	40 White	25 Dark Blue

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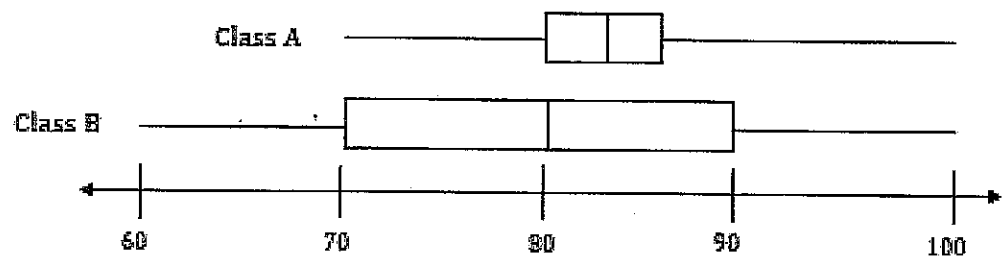
Box 'n Whisker Cowboy Ranch

Directions: Complete each problem and circle either answer one or two. The color will correspond with the problem number on the picture. For example, if the student gets the answer THIRTY for number 1, the students should color all of the number ones RED in the picture.

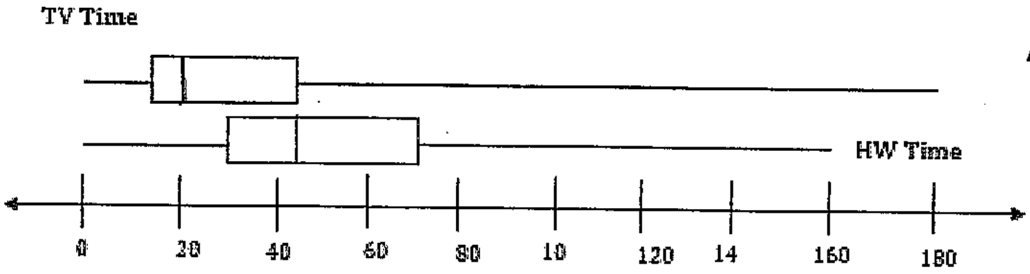
ANSWER KEY

#	Problem	Answer 1	Answer 2
	Ms. Grande gave a quiz last week and the results for her two classes are below. Use this Box & Whisker Plot to answer questions #1-5.		
1	What is the difference between the upper and lower quartiles for Class A?	Thirty Red	Six Gray
2	What is the difference between the upper and lower extremes for Class B?	Twenty Green	Forty Black
3	True/False: The median for Class A is lower than the median for Class B.	False Red	True Pink
4	True/False: Class B did better on the quiz than Class A.	True Yellow	False Light Blue
152	What is an approximate difference between the upper extreme for Class A and the lower quartile for Class B?	Thirty Tan	Twenty Purple



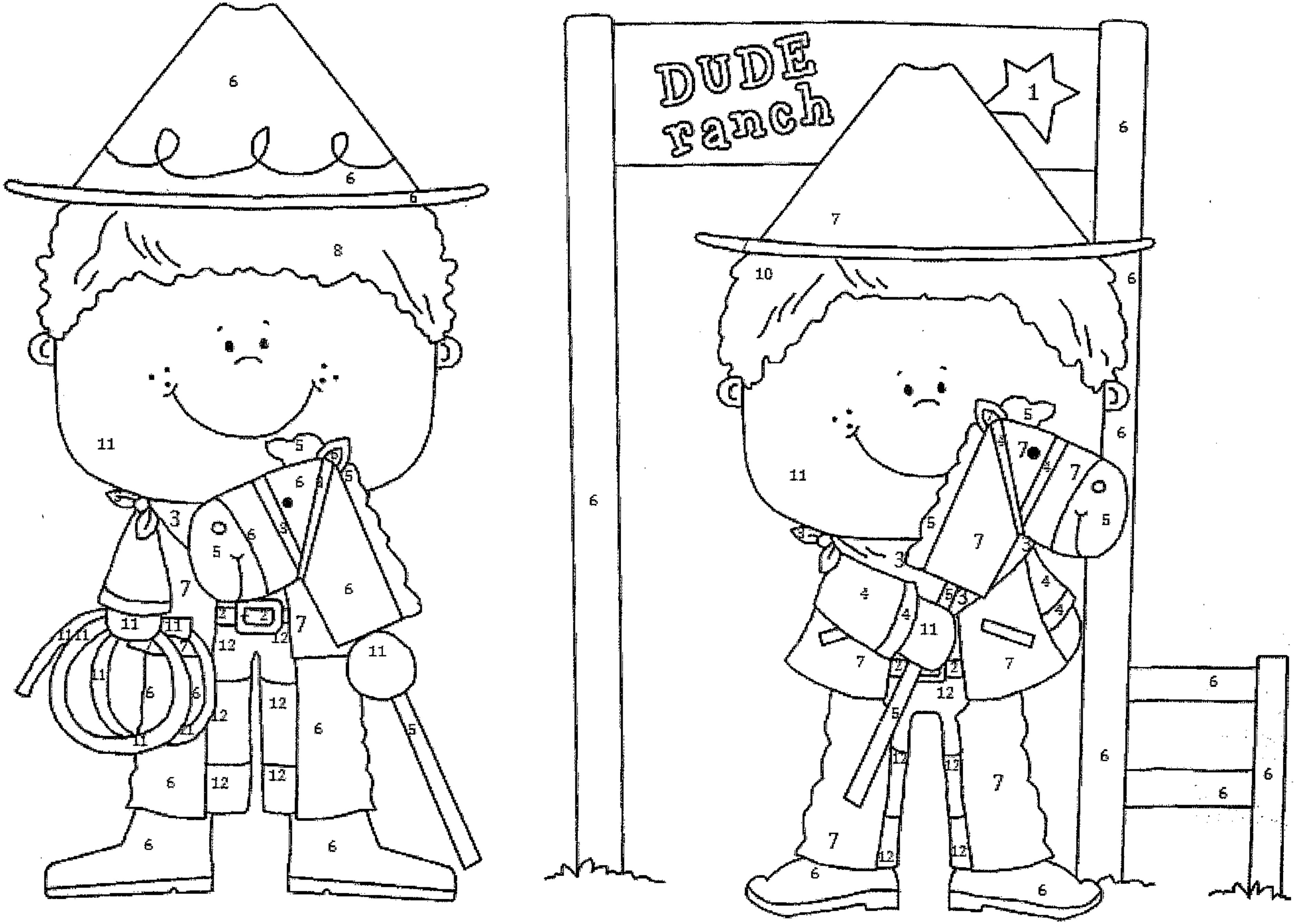
#	Problem	Answer 1	Answer 2

For questions #6-12, refer to the box & whisker graphs below that compare homework time per night with TV time per night for the same group of 8th graders.



ANSWER KEY

#	Problem	Answer 1	Answer 2
6	What percent of 8th graders watch TV for more that 20 minutes per night?	75% Orange	**50% Light Brown**
7	True/False: 25% of the 8th graders spend between 40 & 68 minutes per night on homework.	True Yellow	**False Dark Brown**
8	True/False: In general, these 8th graders spend more time watching TV than doing homework.	True Light Green	**False Orange**
9	True/False: The median HW time and the upper quartile TV time are about the same.	**True Pale Pink**	False Purple
10	What percent of 8th graders do HW for more than an hour and 15 minutes?	**25% Yellow**	50% Green
11	What is an approximate difference between the upper extreme for TV time and the lower quartile for HW time?	100 Gray	**150 Peach**
153	What is the difference between the upper and lower quartiles for TV time?	40 White	**25 Dark Blue**


DUDE
ranch

Math in Literature

Objective:

SWBAT
- Understand the mean as a number that "evens out" or "balances" a distribution
- Recognize how the mean responds to changes in the magnitude of data values

Standards:

MA.6.6.SP.A.2 - [*Standard*] - Understand that a set of data collected to answer a statistical question has a distribution, which can be described by its center, spread, and overall shape.

MA.6.6.SP.A.2 - [*Standard*] - Understand that a set of data collected to answer a statistical question has a distribution, which can be described by its center, spread, and overall shape.

MA.6.6.SP.B.5 - [*Standard*] - Summarize numerical data sets in relation to their context, such as by:

> **MA.6.6.SP.B.5c** - Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.

Procedure:

We will begin by reading "TIki TIki Tembo" as a class. We will discuss how in China, it was a custom to name the first-born son great long names. On the board, we will write out Tiki's entire name and count how many letters it has. What do you think the typical length for a first son's name is? How would we find this?

Discuss how this Chinese tradition is different from our culture. How would we find the typical name length for our culture? Students may suggest finding the mode, the median, the range, or the mean. What does finding the mean actually mean? Students are familiar with finding the mean of the data, but may not know exactly what is means and why you add up the numbers and divide.

Students will construct the physical model of their name length using the cubes in the center of their desks. Students will be ask to get out of their seats and go from student to student, exchanging the cubes in their hands until everyone in the class had the same number.

When finished, class will discuss: What did we just do with the cubes? How did we accomplish this task? Did it work out perfectly? What would have been a more affective way to accomplish this? Students may say to place all cube in the center and then divide them equally between all students. We will then ask students what they calculated.

Students will then define **mean:** The value you would get if all the data are combined and then redistributed evenly

The sum of the values divided by the number of values in the set

Within small group, have students use the cubes to calculate their groups mean of letters in the name. If the cubes do not divide evenly, how can we divide the left over cubes between the number of students in your group? This will review division of fractions, which students have learned in the beginning of the year.

What would happen if we added a name to the class? How do you think the mean would be affected if we added a new student, John Smith? How do you think the mean would be affected if we added a new student, Tiki Tiki…? Students will complete worksheet in small groups. Discuss how adding different numbers affects the mean, median, mode, and range.

Students will decide which measure of center would be best to describe the average class size if Tiki was in the class. Did it differ from what they originally chose to summarize the class?

Name: ______________________________

Introduction to Integers

Use the words in the box to complete each sentence.

negative	positive	minus	plus	left	right

1. Integers that are greater than zero are called ____________________ numbers.

2. Integers that are less than zero are called ____________________ numbers.

3. On a number line, the numbers located the furthest to the ________________ have the greatest value.

4. On a number line, the numbers located the furthest to the ________________ have the smallest value.

5. Negative numbers are always shown with a ____________________ sign.

6. Positive numbers sometimes have a ____________________ sign before them.

Now answer these questions.

7. Is it possible for a negative number to be greater than a positive number? Explain.

____

____

8. What is the smallest negative integer? Explain.

____

____

____

ANSWER KEY

Introduction to Integers

Use the words in the box to complete each sentence.

negative	positive	minus	plus	left	right

1. Integers that are greater than zero are called **positive** numbers.

2. Integers that are less than zero are called **negative** numbers.

3. On a number line, the numbers located the furthest to the **right** have the greatest value.

4. On a number line, the numbers located the furthest to the **left** have the smallest value.

5. Negative numbers are always shown with a **minus** sign.

6. Positive numbers sometimes have a **plus** sign before them.

Now answer these questions.

7. Is it possible for a negative number to be greater than a positive number. Explain.

   No, negative numbers are all less than positive numbers. All negative numbers are less than zero. All positive numbers are greater than zero.

8. What is the smallest negative integer? Explain.

   There is no "smallest negative integer." You can have an infinite number of negative numbers.