Sixth Grade Math Packet

Take Home Practice and Study Materials

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6th Grade Math Review & Practice
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6.1 Ratios Note Page

SOL 6.1
The student will represent relationships between quantities using ratios, and will use appropriate notations, such as $\frac{a}{b}$, a to b, and a:b.

A ratio is a comparison of any two quantities and conveys an idea that cannot be expressed as a single number. A ratio is used to represent a variety of relationships within a set and between two sets.

A ratio can be written using a fraction ($\frac{2}{3}$), a colon (2:3), or the word *to* (2 to 3).

A ratio can compare part of a set to the entire set (part-whole comparison).

Example: Joseph has 10 coins in his pocket. He has 4 dimes, 2 quarters, 2 nickels, and 2 pennies. What is the ratio of dimes to the total number of coins?

ANSWER: Joseph has 4 dimes and 10 total coins. This can be written in three different ways:

4:10 4 to 10 $\frac{4}{10}$

Sometimes, simplified answers are required. Simplify by finding the greatest common factor (GCF) and then divide the numerator AND the denominator by the GCF.

Example: $\frac{4}{10} \div \frac{2}{2} = \frac{2}{5}$

Using the example above, the answer would be: 2:5 2 to 5 $\frac{2}{5}$

A ratio can compare part of a set to another part of the same set (part-part comparison).

Example: Joseph has 10 coins in his pocket. He has 4 dimes, 2 quarters, 2 nickels, and 2 pennies. What is the ratio of quarters to dimes?

ANSWER: Joseph has 2 quarters and 4 dimes. This can be written in three different ways:

2:4 2 to 4 $\frac{2}{4}$

If simplified, the answer would be: 1:2 1 to 2 $\frac{1}{2}$

A ratio can compare part of a set to a corresponding part of another set (part-part comparison).

Example: The table shows the number of coins two boys have in their pockets.

	Dimes	Quarters	Nickels
Joseph	4	2	2
Kendrick	3	1	6

What is the ratio of the number of quarters Joseph has compared to the number of quarters Kendrick has?

ANSWER: Joseph has 2 quarters and Kendrick has 1 quarter. This can be written in three different ways: 2:1, 2 to 1, $\frac{2}{1}$

A ratio can compare all of a set to all of another set (whole-whole comparison).

Example: The table shows the number of coins two boys have in their pockets.

	Dimes	Quarters	Nickels
Joseph	4	2	2
Kendrick	3	1	6

What is the ratio of the number of coins Joseph has compared to the number of coins Kendrick has?

ANSWER: Joseph has 8 coins and Kendrick has 10 coins. This can be written in three different ways:

8:10 8 to 10 $\frac{8}{10}$

If simplified, the answer would be: 4:5 4 to 5 $\frac{4}{5}$

A ratio is a multiplicative comparison of two numbers, measures, or quantities.
All fractions are ratios.

6.2 Fraction Decimal Percent Note Page

SOL 6.2
The student will
- **a) represent and determine equivalencies among fractions, mixed numbers, decimals, and percents;* and**
- **b) Compare and order positive rational numbers.***

- A **ratio** can compare part of a set to the entire set (part-whole comparison)

A **fraction** can be defined as a number written with the bottom part (the denominator) telling you how many parts the whole is divided into, and the top part (the numerator) telling how many you have. In other words, a fraction is a **ratio** comparing a part to a whole.

A decimal is a fraction where the denominator (the bottom number) is a power of ten (such as 10, 100, 1000, etc).

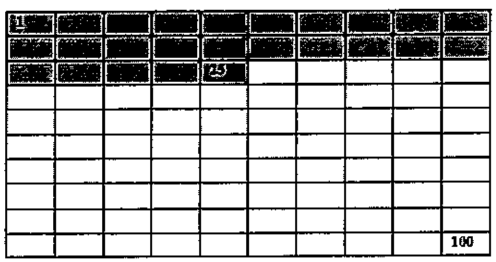
A decimal is a **ratio** comparing a part to a whole.

$\frac{43}{100} = 0.43$ 43 parts to 100

$\frac{51}{1000} = 0.051$ 51 parts to 1000

- Percent means parts per 100. A percent is a **ratio** comparing the number of parts to 100.

Example: 25% means a ratio of shaded parts to total parts



Fractions, decimals, and **percents** are three different representations of the same number.

Percent means "per 100" or how many "out of 100"; *percent* is another name for *hundredths*.

A number followed by a percent symbol (%) is equivalent to that number with a denominator of 100.

Example: $30\% = \frac{30}{100} = \frac{3}{10} = 0.3$

Percents can be expressed as fractions with a denominator of 100.

Example: $75\% = \frac{75}{100} = \frac{3}{4}$

Percents can be expressed as decimals.

Example: $38\% = \frac{38}{100} = 0.38$

A fraction can be rewritten as an equivalent fraction with a denominator of 100, and, thus, as a decimal or percent.

Example: $\frac{3}{5} = \frac{60}{100} = 0.60 = 60\%$

Decimals, fractions, and percents can be represented using concrete materials (e.g., base-10 blocks, decimal squares, or grid paper).

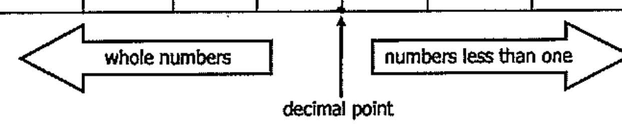
Percents should be represented by drawing a shaded region on a 10-by-10 grid to represent a given percent.

The **decimal point** is a symbol that indicates the location of the ones place and all other subsequent place values in the decimal system.

The decimal point separates a whole number amount from a number that is less than one.

Place Value Chart (decimals to thousandths)

Thousands	Hundreds	Tens	Ones	Tenths	Hundredths	Thousandths



To order fractions, decimals and percents convert to the same form.

Examples:

Which list is in order from greatest to least?

A) $\frac{1}{5}$, 0.166 , 16%

B) 0.166 , $\frac{1}{5}$, 16%

C) $\frac{1}{5}$, 16% , 0.166

D) 16% , 0.166 , $\frac{1}{5}$

→

$\frac{1}{5}$	$.2\underline{00}$	20%
.166	.166	16.6%
16%	$.16\underline{0}$	16%

The answer is A.

Which list is in order from least to greatest?

A) $\frac{3}{7}$, $\frac{4}{5}$, $\frac{5}{11}$

B) $\frac{4}{5}$, $\frac{5}{11}$, $\frac{3}{7}$

C) $\frac{5}{11}$, $\frac{3}{7}$, $\frac{4}{5}$

D) $\frac{3}{7}$, $\frac{5}{11}$, $\frac{4}{5}$

→

$\frac{3}{7}$	.43	43%
$\frac{4}{5}$	.80	80%
$\frac{5}{11}$	$.\overline{45}$	45%

The answer is D.

6.3 Integers/Absolute Value Note Page

SOL 6.3 The student will:

a) identify and represent integers;
b) compare and order integers; and
c) identify and describe absolute value of integers.

a) **What is an Integer?**

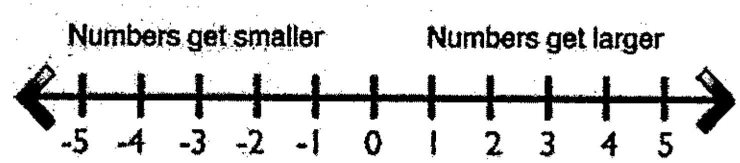
a whole number, anywhere from zero to positive or negative infinity

the set of integers:

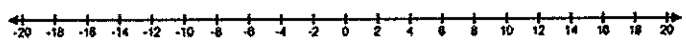
{..., −3, −2, −1, 0, 1, 2, 3, ...}

the set of integers on a number line:

b) How do we compare and order integers?



Step 1: Start by creating a number line from -20 to 20.



Step 2: Plot the numbers on the number line:
{20, -5, 0, -2, 12, -18, 3, -11}

Step 3: Order the integers from least to greatest by writing the numbers in order from left to right.

The numbers farthest to the left of 0 are the least and they increase in value as you move to the right on the number line.

-18, -11, -5, -2, 0, 3, 12, 20

This is your final answer. This set of numbers is now in order from least to greatest.

c) Absolute Value

Absolute Value means how far a number is from zero:

"6" is 6 away from zero,
and "–6" is also 6 away from zero.

So the absolute value of 6 is 6,
and the absolute value of –6 is also 6

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6.4 Exponents and Perfect Squares

6.4 (Calculator may be used)
The student will investigate and describe concepts of positive exponents and perfect squares.

- In exponential notation, the base is the number that is multiplied, and the exponent represents the number of times the base is used as a factor. In 7^4, 7 is the base and 4 is the exponent.

  $7^4 = 7 \times 7 \times 7 \times 7$

- A power of a number represents repeated multiplication of the number by itself.

  $8^3 = 8 \times 8 \times 8$ and is read " 8 to the third power"

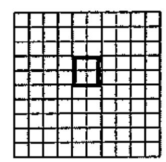
- Any real number other than zero raised to the zero power is 1.
  - Example $15^0 = 1$
  - Example $4^0 = 1$
  - Example $1{,}379^0 = 1$

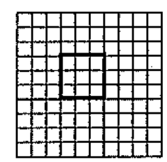
- A perfect squares are the numbers that result from multiplying any whole number by itself.
  - 1 x 1 = 1
  - 2 x 2 = 4
  - 3 x 3 = 9
  - 4 x 4 = 16
  - 5 x 5 = 25

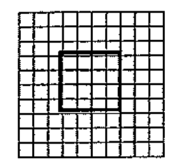
- The first 20 perfect squares are:

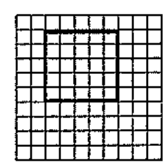
1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225, 256, 289, 324, 361, 400

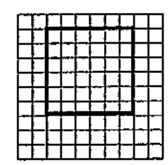
- Perfect squares can be represented using grid paper.


2x2


3x3


4x4


5x5


6x6

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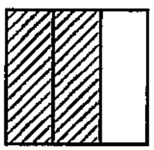
6.5 Fractions Note Page

SOL 6.5
The student will

- **a) multiply and divide fractions and mixed numbers; (No calculator)**
- **b) solve single-step and multistep practical problems involving addition, subtraction, multiplication, and division of fractions and mixed numbers;**
- **c) solve multistep practical problems involving addition, subtraction, multiplication, and division of decimals**

- When multiplying a fraction by a fraction such as $\frac{2}{3} \bullet \frac{3}{4}$, we are asking for part of a part.
  - Below is an example of how this can be represented using models.



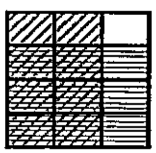
$\frac{2}{3}$

This represents two thirds (the shaded portion).

$\frac{3}{4}$

This represents three fourths (the shaded portion).

In order to represent the multiplication of fractions visually, we use the 2 shaded grids above, which represent the two fractions we are multiplying. Place the representations on top of each other (as shown below). The shaded area where the 2 grids overlap represents the product of the two fractions.

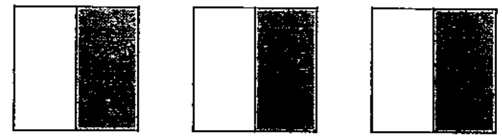


The two grids overlap in 6 out of the 12 blocks.

$\frac{2}{3} \times \frac{3}{4} = \frac{6}{12} = \frac{1}{2}$ (Always remember to simplify your answer.)

- When multiplying a fraction by a whole number such as $\frac{1}{2} \bullet 3$, we are trying to find a part of the whole.

Below is an example of how this can be represented using models.



This represents one half (the shaded portion).

This represents one half (the shaded portion).

This represents one half (the shaded portion).

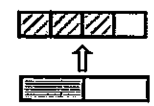
The images above show one half of each box shaded and there are three boxes. $\frac{1}{2}$ added three times is $1\frac{1}{2}$.

$$\frac{1}{2} + \frac{1}{2} + \frac{1}{2} = 1\frac{1}{2}$$

What does it mean to divide with fractions? For measurement division, the divisor is the number of groups and the quotient will be the number of groups in the dividend. **Division of fractions can be explained as how many of a given divisor is needed to equal the given dividend.** In other words, for $\frac{3}{4} \div \frac{1}{2}$ the question is, "How many $\frac{1}{2}$ make $\frac{3}{4}$?"

For partition division the divisor is the size of the group, so the quotient answers the question, "How much is the whole?" or "How much for one?" divisors will fit into a dividend. Note the models below.

dividend divisor



This reads ¾ divided by ½. In other words, how many one halves will fit into ¾?

You can visually see that **one** ½ and **half** another ½ will fit into ¾. This is 1½ .

You can visually see that **one** ½ and **half** another ½ will fit into ¾. This is 1½.

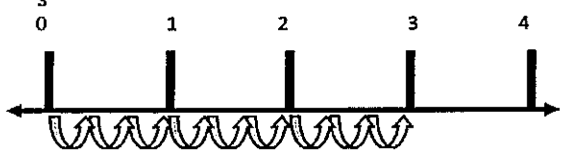
You can check with actual math!

Same Change Flip

¾ ÷ ½ $\frac{3}{4}$ **x** $\frac{2}{1}$ $= \frac{6}{4}$ **which is 1 ½**

Another way to divide with graphics is on a number line.

$3 \div \frac{1}{3}$ is asking how many one thirds are there in three whole. The answer is 9.



Simplifying fractions to their simplest form assists with uniformity of answers and concepts.

*Simplifying fractions: Find the greatest common factor (GCF) of the numerator and the denominator and then divide the numerator and the denominator by the GCF.

Example: Simplify $\frac{8}{20}$

The factors of 8 are 1, 2, 4, 8
The factors of 20 are 1, 2, 4, 5, 10, 20

The greatest common factor of 8 and 20 is 4, so divide the numerator and the denominator by 4.

$\frac{8}{20} \div \frac{4}{4} = \frac{2}{5}$ so... $\frac{8}{20} = \frac{2}{5}$

Rewriting an improper fraction as a mixed number assists with uniformity of answers and concepts.

Example 1: $\frac{17}{5}$ is an improper fraction that needs to be rewritten as a mixed number.

Divide the numerator by the denominator. $17 \div 5 = 3\frac{2}{5}$

5 goes into 17 three times. 3 becomes the whole number. There is a remainder of 2. The 2 becomes the new numerator and the 5 stays as the denominator.

Example 2: $\frac{14}{3}$ is an improper fraction that needs to be rewritten as a mixed number. Divide the numerator by the denominator. $14 \div 3 = 4\frac{2}{3}$

3 goes into 14 four times. 4 becomes the whole number. There is a remainder of 2. The 2 becomes the new numerator and the 3 stays as the denominator.

There is implied addition of the whole number part and the fractional part in mixed numbers.

Equivalent forms are needed to perform the operations of addition and subtraction with fractions.

Adding fractions with unlike denominators:

Step 1: Find the least common denominator by identifying the multiples of each denominator.

Example: $\frac{2}{3}$ The multiples of 3 are 3, 6, 9, **12**, 15, 18, etc.

$+ \frac{3}{4}$ The multiples of 4 are 4, 8, **12**, 16, 20, 24, etc.

The least common multiple of 3 and 4 is 12. This is also called the least common denominator (LCD).

Step 2: Rename the fractions using the LCD and then add the numerators.

Example: $\frac{2^{\times 4}}{3_{\times 4}} = \frac{8}{12}$ Now add. $8 + 9 = 17$

*Remember, whatever you do to the numerator, you must also do the same to the denominator!

$+ \frac{3^{\times 3}}{4_{\times 3}} = \frac{9}{12}$ The denominator stays the same after you add or subtract.

Step 3: $\frac{17}{12}$ Now simplify. The correct answer is $1\frac{5}{12}$.

Multiplication and division are inverse operations.

Inverse operations are operations which undo each other.

Example 1: $6 \times 4 = 24$ therefore $24 \div 6 = 4$
(multiplication and division are inverse operations)

Example 2: $10 + 5 = 15$ therefore $15 - 10 = 5$
(addition and subtraction are inverse operations)

- It is helpful to <u>simplify before multiplying</u> fractions, using the commutative property of multiplication to change fractions to simplest form before multiplying.

Example: Look diagonally to identify a common factor.

The greatest common factor of 14 and 4 is 2 so divide by 2.

The greatest common factor of 3 and 18 is 3 so divide by 3.

$$\frac{14}{18} \cdot \frac{3}{4}$$

$$\frac{14^{\div 2}}{18_{\div 3}} \cdot \frac{3^{\div 3}}{4_{\div 2}} = \frac{7}{6} \cdot \frac{1}{2} = \frac{7}{12}$$

This is your answer already in simplest form!

*This ***only*** works when multiplying fractions. Fractions ***cannot*** be simplified before adding, subtracting, or dividing.

- To divide by a fraction, multiply by its reciprocal.

Any two numbers whose product is 1 are called reciprocals. For example, $\frac{1}{2}$ and 2 are reciprocals because $\frac{1}{2} \cdot 2 = 1$. You use reciprocals when you divide by fractions.

Example: $\frac{4}{5} \div \frac{1}{3}$

$\frac{4}{5} \div \frac{1}{3} = \frac{4}{5} \times \frac{3}{1}$ *Multiply by the reciprocal of $\frac{1}{3}$.*

$= \frac{12}{5}$ or $= 2\frac{2}{5}$ *Multiply the numerators and denominators and rewrite as a mixed number.*

6.6 Computation of Integers and Order of Operations Note Page

SOL 6.6 The student will:

a) add, subtract, multiply, and divide integers;*
b) solve practical problems involving operations with integers; and
c) simplify numerical expressions involving integers.*

*On the state assessment, items measuring this objective are assessed without the use of a calculator.

- The set of integers is the set of whole numbers and their opposites. (e.g., … −3, −2, −1, 0, 1, 2, 3, …).
- Integers are used in practical situations, such as temperature changes (above/below zero), balance in a checking account (deposits/withdrawals), and changes in altitude (above/below sea level).

Example: The temperature in Alaska dropped 15 degrees overnight. If the previous night's temperature was -10 degrees, what is the new temperature?

To find the answer, set up an equation and solve.
(-10) - 15 = ?

ANSWER: (-10) + (-15) = -25

The answer is -25 degrees.

Order of Operations

- The order of operations are rules that determine the correct order for solving a sequence of math operations.
- One mnemonic that can be used to help students remember the order of operations is:
  - Please **E**xcuse **My** **D**ear **A**unt **S**ally
    - Parenthesis
    - Exponents
    - Multiplication/Division – whichever comes first going left to right
    - Addition/Subtraction – whichever comes first going left to right
- Go down the list and complete the first operation you see. If you do not see that operation, move to the next operation on the list.

Example 1:

	$2 + (7 \times 2) - 3 + 6^2 \div 4 \times 2$
P	$2 + 14 - 3 + 6^2 \div 4 \times 2$
E	$2 + 14 - 3 + 36 \div 4 \times 2$
MD	$2 + 14 - 3 + 9 \times 2$
MD	$2 + 14 - 3 + 18$
AS	$16 - 3 + 18$
AS	$13 + 18$
	31

Example 2:

$(44 + 20) \div 2^3 - 7 + 4 \cdot 5$
$64 \div 2^3 - 7 + 4 \cdot 5$
$64 \div 8 - 7 + 4 \cdot 5$
$8 - 7 + 4 \cdot 5$
$8 - 7 + 20$
$1 + 20$
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6.8 Coordinate Plane Note Page

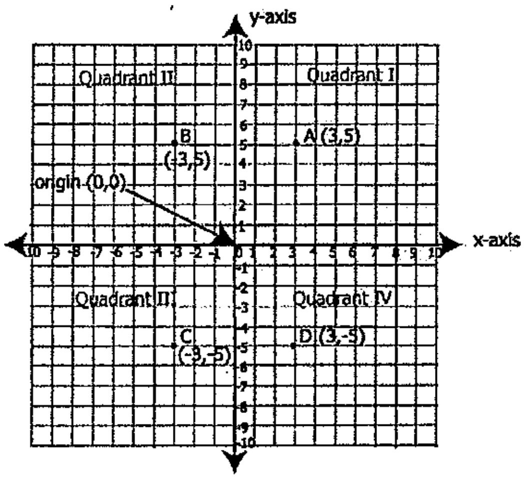
SOL 6.8
The student will
- (a) **identify the components of the coordinate plane;**
- (b) **identify the coordinates of a point and graph ordered pairs in a coordinate plane.**

(a) Identifying the coordinates of a point in a coordinate plane

- A **Coordinate plane** is formed by the intersection of a horizontal number line and a vertical number line. The number lines intersect at the **origin** and separate the coordinate plane into four regents called **quadrants.**
- The coordinates of a point are represented by **the ordered pair** (x,y), where x is the first coordinate and y is the second coordinate. The order of the coordinates matter.

Example: Think of an airplane. An airplane runs horizontal (x axis) first and then flies vertical (y axis). Coordinates are plotted X axis first, Y axis second.

- The coordinates of the **origin are (0,0)**
- Quadrants are named in a counterclockwise order. The signs for the quadrants are as follows:
  Quadrant I (+,+) Quadrant II (-,+) Quadrant III (-, -) Quadrant IV (+,-)
- Coordinates are written (x,y)



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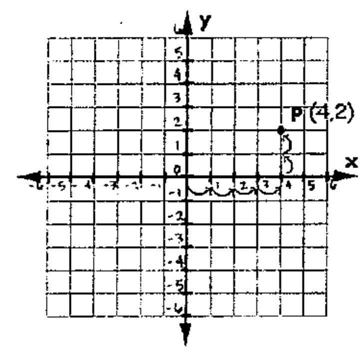
Graphing ordered pairs in a coordinate plane.



To graph the ordered pair (4, 2), start at the origin. Move four units to the right and 2 units up. Then plot the point.

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6.10 Graphs Note Page

SOL 6.10
The student, given a problem situation, will
a) represent data in a circle graph;
b) make observations and inferences about data represented in a circle graph; and
c) compare circle graphs with the same data represented in bar graphs, pictographs, and line plots.

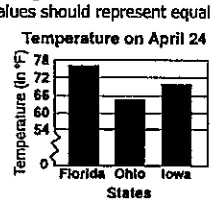
General information about data collection and graphic representations of data:

- To collect data for any problem situation, an experiment can be designed, a survey can be conducted, or other data-gathering strategies can be used. The data can be organized, displayed, analyzed, and interpreted to answer the problem.

- Data can be discrete or continuous.
- Different types of graphs are used to display different types of data.
  - Bar graphs use categorical (discrete) data (e.g., months or eye color).
  - Line graphs use continuous data (e.g., temperature and time).
  - Circle graphs show a relationship of the parts to a whole.
- All graphs include a title and data categories should have labels.
- A scale should be chosen that is appropriate for the data.
- A key is essential to explain how to read the graph.
- A title is essential to explain what the graph represents.

Bar Graphs

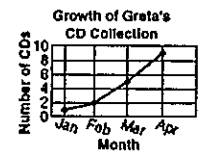
- Data are analyzed by describing the various features and elements of a graph.
- Inferences and convincing arguments are based on data analysis.
- Bar graphs are used to compare counts of different categories (categorical or discrete data).
  - A bar graph uses either horizontal or vertical parallel bars to represent counts for several categories. One bar is used for each category, with the length of the bar representing the count for that category.
  - There is space before, between, and after the bars.
  - The axis displaying the scale representing the count for the categories should extend one increment above the greatest recorded piece of data. The values should represent equal increments.
  - Each axis should be labeled, and the graph should have a title.
  - Statements representing an analysis and interpretation of the characteristics of the data in the graph (e.g., similarities and differences, mode, least and greatest) should be included.



Here is an example of a vertical bar graph.

Line Graphs

- Line graphs should be utilized to show how one variable changes over time. By looking at a single-line graph, it can be determined whether the variable is increasing, decreasing, or staying the same with the passage of time.
- The values along the horizontal axis represent continuous data on a given variable, usually some measure of time (e.g., time in years, months, or days). The data presented on a line graph is referred to as continuous data because it represents data collected over a continuous period of time.
- The values along the vertical axis represent the frequency with which those values occur in the data set. The values should represent equal increments of multiples of whole numbers, fractions, or decimals, depending upon the data being collected. The scale should extend one increment above the greatest recorded piece of data.
- Each axis should be labeled, and the graph should have a title.
- Statements representing an analysis and interpretation of the characteristics of the data in the graph (e.g., trends of increase and/or decrease, least and greatest) should be included.



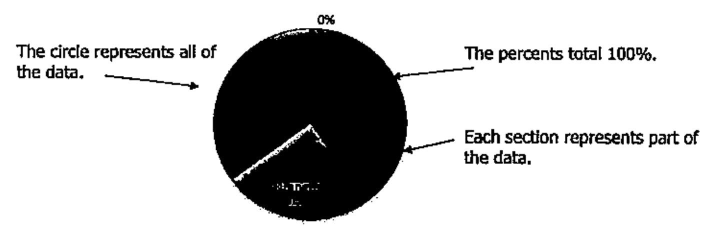
Here is an example of a line graph.

Circle Graphs

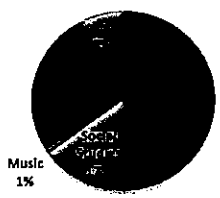
- Circle graphs show relationships of the parts to a whole. The pie-shaped sections show groups.
- Circle graphs show percent (out of 100). The percents add up to 100%.
- The sum of the angle measures in a circle graph are 360°.

Example:

Favorite Fruit



Sam's Homework



Example:

1. The circle graph shows the subjects Sam studies during homework time. Which subject does Sam spend most of his time studying?

The largest section of the graph is the section representing math. So, he spends most of his time studying math.

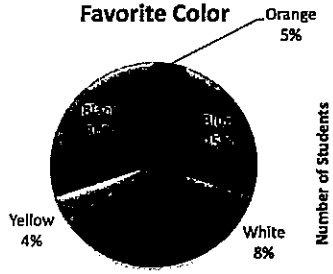
2. How does the time spent studying social studies compare to the time spent studying science?

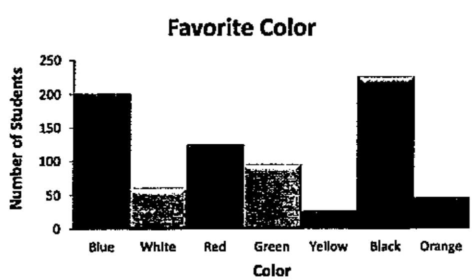
The section representing social studies is about twice the size of the section representing science. So, twice as much time is spent on social studies as on science.

Example:

A school survey asked students to choose their favorite color. The results are shown in the two data displays below. You want to compare the portion of students who chose red to all the students' responses. Which data display should you use?

Favorite Color





To use the bar graph, you have to estimate the number of students surveyed and the number of students that chose red. The circle graph shows exact percents, so it is the better choice.

6.12 Unit Rates/Proportional Relationships

SOL 6.12
The student will

(a) **represent a proportional relationship between two quantities including those arising from practical situations;**
(b) **determine the unit rate of a proportional relationship and use it to find a missing value in a ratio table;**
(c) **determine whether a proportional relationship exists between two quantities; and**
(d) **make connections between and among representations of a proportional relationship between two quantities using verbal descriptions, ratio tables, and graphs.**

PROPORTIONAL RELATIONSHIPS

A PROPORTIONAL RELATIONSHIP is a relationship between two quantities in which the ration of one quantity to the other is CONSTANT.

Number of Hours Worked	Money Earned
1	12
2	24
3	36
4	48
5	60

(+1 between successive hours; +12 between successive amounts)

In this example the change is always $12 earned for every 1 hour worked.

We can set up a fraction:

$$\frac{output\ change}{input\ change} \text{ or } \frac{y}{x}$$

In this example it would be:

$$\frac{12}{1} \text{ or } 12$$

http://slideplayer.com/slide/5815248

- A ratio table is a table of values representing a proportional relationship that includes pairs of values that represent equivalent rates or ratios. A constant exists that can be multiplied by the measure of one quantity to get the measure of the other quantity for every ratio pair. The same proportional relationship exists between each pair of quantities in a ratio table.
  - Example: Given that the ratio of y to x in a proportional relationship is 8:4, create a ratio table that includes three additional equivalent ratios.

x	y
1	2
2	4
3	6
4	8
5	10

·2 ← Ratio that is given (4, 8)

- A rate is a ratio that involves two different units and how they relate to each other. Relationships between two units of measure are also rates (e.g., inches per foot).
- A unit rate describes how many units of the first quantity of a ratio correspond to one unit of the second quantity.
  - Example: If it costs $10 for 5 items at a store (a ratio of 10:5 comparing cost to the number of items), then the unit rate would be $2.00/per item (a ratio of 2:1 comparing cost to number of items).

Unit Rate (1, $2.00); Given ratio (5, $10.00)

# of items (x)	1	2	5	10
Cost in $ (y)	$2.00	$4.00	$10.00	$20.00

- Any ratio can be converted into a unit rate by writing the ratio as a fraction and then dividing the numerator and denominator each by the value of the denominator. Example: It costs $8 for 16 gourmet cookies at a bake sale. What is the price per cookie (unit rate) represented by this situation?

$$\frac{8}{16} = \frac{8 \div 16}{16 \div 16} = \frac{0.5}{1}$$

So, it would cost $0.50 per cookie, which would be the unit rate.

- Example: $\frac{8}{16}$ and 40 to 10 are ratios, but are not unit rates. However, $\frac{0.5}{1}$ and 4 to 1 are unit rates.

- Example of a proportional relationship:

Ms. Cochran is planning a year-end pizza party for her students. Ace Pizza offers free delivery and charges $8 for each medium pizza. This ratio table represents the cost (y) per number of pizzas ordered (x).

x number of pizzas	1	2	3	4
y total cost	8	16	24	32

×8

In this relationship, the ratio of y (cost in $) to x (number of pizzas) in each ordered pair is the same:

$$\frac{8}{1} = \frac{16}{2} = \frac{24}{3} = \frac{32}{4}$$

- Example of a non-proportional relationship:

Uptown Pizza sells medium pizzas for $7 each but charges a $3 delivery fee per order. This table represents the cost per number of pizzas ordered.

x number of pizzas	1	2	3	4
y total cost	10	17	24	31

The ratios represented in the table above are not equivalent.

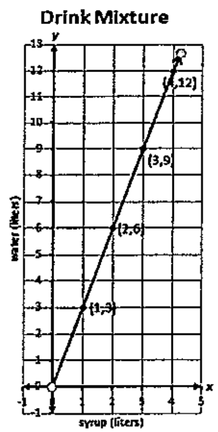
In this relationship, the ratio of y to x in each ordered pair is not the same:

$$\frac{10}{1} \neq \frac{17}{2} \neq \frac{24}{3} \neq \frac{31}{4}$$

- Proportional relationships can be expressed using verbal descriptions, tables, and graphs.
  - Example: (verbal description) To make a drink, mix 1 liter of syrup with 3 liters of water. If x represents how many liters of syrup are in the mixture and y represents how many liters of water are in the mixture, this proportional relationship can be represented using a ratio table:

Syrup (liters) x	1	2	3	4
Water (liters) y	3	6	9	12

- The ratio of the amount of water (y) to the amount of syrup (x) is 3:1. Additionally, the proportional relationship may be graphed using the ordered pairs in the table.



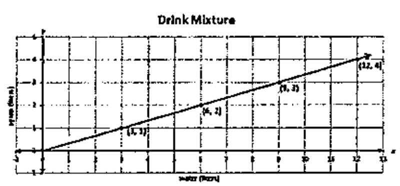
- The representation of the ratio between two quantities may depend upon the order in which the quantities are being compared.

  - Example: In the mixture example above, we could also compare the ratio of the liters of syrup per liters of water, as shown:

Water (liters) x	3	6	9	12
Syrup (liters) y	1	2	3	4

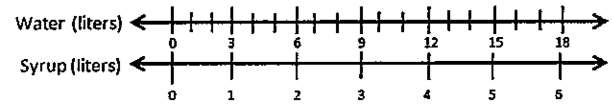
In this comparison, the ratio of the amount of syrup (y) to the amount of water (x) would be 1:3.

The graph of this relationship could be represented by:



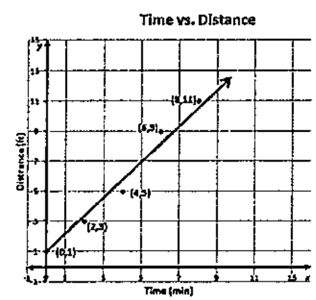
The order in which quantities are compared affects the way in which the relationship is represented as a table of equivalent ratios or as a graph.

- Double number line diagrams can also be used to represent proportional relationships and create collections of pairs of equivalent ratios.
  - Example:



In this proportional relationship, there are three liters of water for each liter of syrup represented on the number lines.

- A graph representing a proportional relationship includes ordered pairs that lie in a straight line that, if extended, would pass through (0, 0), creating a pattern of horizontal and vertical increases. The context of the problem and the type of data being represented by the graph must be considered when determining whether the points are to be connected by a straight line on the graph.
  - Example of the graph of a non-proportional relationship:



The relationship of distance (y) to time (x) is non-proportional. The ratio of y to x for each ordered pair is not equivalent. That is,

$$\frac{11}{8} \neq \frac{9}{6} \neq \frac{5}{4} \neq \frac{3}{2} \neq \frac{1}{0}$$

The points of the graph do not lie in a straight line. Additionally, the line does not pass through the point (0, 0), thus the relationship of y to x cannot be considered proportional.

- A unit rate could be used to find missing values in a ratio table.
  - Example: A store advertises a price of $25 for 5 DVDs. What would be the cost to purchase 2 DVDs? 3 DVDs? 4 DVDs?

# DVDs	1	2	3	4	5
Cost	$5	?	?	?	$25

The ratio of $25 per 5 DVDs is also equivalent to a ratio of $5 per 1 DVD, which would be the unit rate for this relationship. This unit rate could be used to find the missing value of the ratio table above. If we multiply the number of DVDs by a constant multiplier of 5 (the unit rate) we obtain the total cost. Thus, 2 DVDs would cost $10, 3 DVDs would cost $15, and 4 DVDs would cost $20.

6.13 Linear Equations

SOL 6.13 The student will solve one-step linear equations in one variable, including practical problems that require the solution of a one-step linear equation in one variable.

- A one-step linear equation is an equation that require one operation to solve.
- An equation is a mathematical sentence stating that two expressions are equal. Equations have an equal sign.

Below is an example of an equation:

$$4 + x = 10$$

- A variable is a symbol (placeholder) used to represent an unspecified member of a set.

x is the variable in the above equation.

- A term is a number, variable, product, or quotient in an expression of sums and/or differences. In $7x^2 + 5x - 3$, there are three terms, $7x^2$, $5x$, and 3.

- A coefficient is the numerical factor in a term. For example, in the term $3xy^2$, 3 is the coefficient.

- An expression is a mathematical phase that can contain ordinary numbers, variables and operators (addition, subtraction, multiplication, or division). Expressions do not have equal signs.

Look at the expression below.

$$4x + 7y - 9$$

What is the coefficient of x? **Answer: 4**
What is the coefficient of y? **Answer: 7**
How many terms are in the expression? **Answer: 3**
What are the variables in the expression? **Answer: x and y**

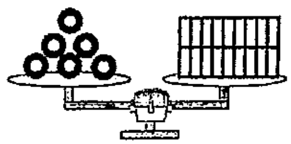
Models are often used to teach beginning concepts in algebra. Students are taught to write an equation based on a model.

Example:

 **represents** w

 **represents 1**

Use the representations above to answer the following question.



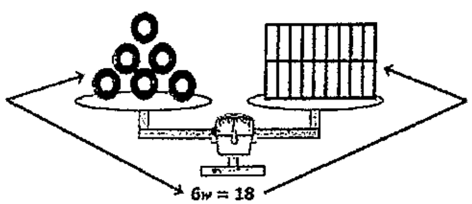
The scale is balanced. Write a number sentence that best represents it.

<u>Step 1:</u> A balance scale represents an equation because both sides of the scale <u>**and**</u> both sides of an equation <u>**must**</u> be equivalent.

<u>Step 2:</u> The key at the top of the question indicates that one **"donut"** represents **one** w in the equation. Looking at the left side of the scale, notice that there are 6 "donuts" or $6w$ on the left side of the scale. So, write the left side of the equation.

$6w = ?$

<u>Step 3:</u> The key at the top of the question also indicates that one **"bar"** represents **one** in the equation. Looking at the right side, notice that there are 18 "bars" or 18 on the right side of the scale. Include that number on the right side of the equation.



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Students are also given an equation and asked to model it using manipulatives.

Example:

 **represents** x

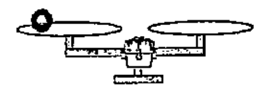
 **represents 1**

Using the representations above, draw a model that best represents the following:

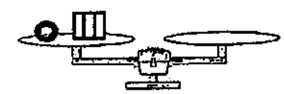
$x + 3 = 8$

<u>Step 1:</u> A balance scale represents an equation because both sides of the scale <u>**and**</u> both sides of an equation <u>**must**</u> be equivalent.

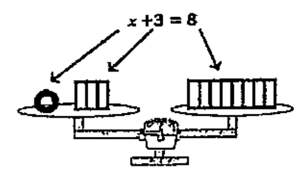
<u>Step 2:</u> The key at the top of the question indicates that one **"donut"** represents **one** x in the equation. Looking at the left side of the equation, the first term is x. Draw a "donut" on the left side of the balance scale to represent x. Remember that there is *only* one x so draw *only* one "donut".



<u>Step 3:</u> Notice that on the left side of the equation, 3 is added to x. The x was modeled in the previous step so now add 3 to the left side of the balance scale. The key at the top of the question indicates that one **"bar"** represents **one** in the equation. So, place 3 "bars" next to the "donut".



<u>Step 4:</u> Now, look back at the equation. The value of the right side of the equation is 8. To represent this, draw 8 "bars" on the right side of the balance scale. The equation and the balance scale model are equivalent.



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- To solve an equation you find the value that makes the number sentence true. To maintain equality, an operation performed on one side of an equation must be performed on the other side.

Example 1:

$x + 7 = 20$

$-7 = -7$

$x = 13$

Your objective is to get the variable x by itself. In order to accomplish this you perform the inverse operation, you subtract 7 from both sides of the equation. Now add down, you are left with the solution $x = 13$

Example 2:

$z - 5 = 12$

$+5 = +5$

$z = 18$

Your objective is to get the variable z by itself. In order to accomplish this you perform the inverse operation, you add 5 to both sides of the equation. Now add down, you are left with the solution $z = 18$

Example 3:

$\frac{3s}{3} = \frac{21}{3}$

$s = 7$

Your objective is to get the variable s by itself. In order to accomplish this you perform the inverse operation, you divide both sides of the equation by 3. Now divide, you are left with the solution $s = 7$

Example 4:

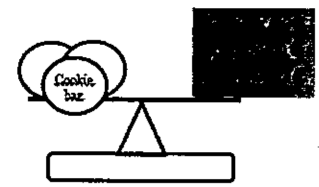
$3 \times \frac{d}{3} = 6 \times 3$

$d = 18$

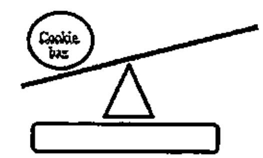
Your objective is to get the variable d by itself. In order to accomplish this you perform the inverse operation, you multiply both sides of the equation by 3. To maintain equality, an operation performed on one side of an equation must be performed on the other side. Now multiply, you are left with the solution $d = 18$

SOL Practice Items provided by the VDOE,
http://www.doe.virginia.gov/testing/sol/standards_docs/mathematics/index.shtml

1. The scale below is balanced.



Using the above representation, which could be placed on the right side of the following scale to make it balanced?

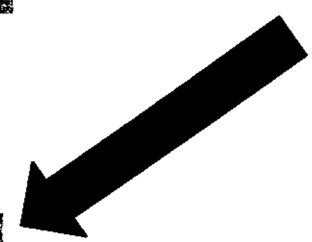


a) 

b) 

c) 

d) 



6.1

1. Write equivalent ratios across each row. All fractions must be simplified.

Using a colon	Using the word "to"	Fraction Notation
5:9		
	3 to 12	
		$\frac{2}{7}$

2. Identify all of the ratios that could be used to represent the number of lawns to the number of hours in the following word problem.

John can mow 3 lawns in 6 hours

6:12	6 to 3	3 to 6	6:3	1:2

3. Ms. Larson bought 4 red roses and 16 purple tulips for the front yard. What is the ratio of roses to the total number of flowers?

A. 1:4
B. 4:1
C. 1:5
D. 4:5

4. A pet store has 40 animals for sale and 15 of them are puppies! What is the ratio of animals that are *not* puppies to the total number of animals for sale at the pet store?

A. $\frac{5}{8}$
B. $\frac{3}{8}$
C. $\frac{5}{3}$
D. $\frac{8}{5}$

5. At Centerville Middle School, there are 120 students in sixth grade, and 80 of those students are girls. What is the ratio of girls to boys in Centerville's sixth grade?

A. 2 to 3
B. 3 to 2
C. 2 to 1
D. 1 to 2

6. Benjamin has 10 green marbles, 15 red marbles, and 5 yellow marbles in a box. What is the ratio of green marbles to all of the marbles in the box?

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

7. A restaurant sells 40 bowls of soup and 8 bowls of chili each day. What is the ratio of bowls of chili to bowls of soup?

A. 1:5

B. 1:4

C. 1:3

D. 2:5

8. The table shows the number of video games sold at Max's Electronics.

Video Games Sold at Max's Electronics on Saturday

Games	Number Sold
Baseball	12
Car Race	20
Soccer	15
War Zone	8

What is the ratio of War Zone games sold to Baseball games sold?

A. 1 to 2
B. 2 to 3
C. 2 to 5
D. 3 to 4

6.1
1. What ratio describes the ratio of the value of a dime to the value of a quarter?

A 1:4
B 1:10
C 2:5
D 1:25

6.1
2. What is the ratio of red roses to white roses?

Red Roses	White Roses
4	2
12	6
16	8
20	10

A 1:4
B 2:1
C 8:16
D 4:2

6.1
3. Jack has 15 green triangles and 22 blue triangles. What ratio compares the number of green triangles to the total number of triangles?

A 15 to 22
B 22 to 15
C 15 to 37
D 22 to 37

6.1

4. **The ratio $\frac{5}{3}$ represents the relationship between two sets. Which description represents this relationship?**

A For every 5 points that Jack earns, Michael earns 8 points.

B For every 10 points that Jack earns, Michael earns 5 points.

C For every 3 points that Jack earns, Michael earns 5 points.

D For every 15 points that Jack earns, Michael earns 9 points.

6.2a

5. **Which of the following statements is false?**

A $0.39 = \frac{39}{100} = 39\%$

B $0.534 = \frac{534}{1000} = 53.4\%$

C $0.9 = \frac{90}{100} = 90\%$

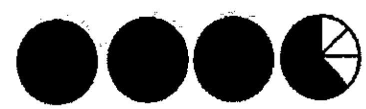
D $6.07 = \frac{607}{1000} = 60.7\%$

6.2a

1. Complete the table with equivalent fractions, decimals, and percentages. The red sections represent the numerator. All decimals should be rounded to the nearest thousandth and all fractions must be written in simplest form.

Picture	Fraction	Decimal	Percent
			
			
			

2. Which two answer choices represent the illustration below?



$3\frac{5}{8}$	458%
3.58	$\frac{37}{8}$
362.5%	0.625

3. Write the equivalent decimal and percent for $\frac{4}{7}$. Round the decimal to the nearest thousandth.

Decimal | Percent

4. Circle all of the numbers that are equivalent to $\frac{2}{9}$.

$0.2\overline{2}$ | 29% | $22.\overline{2}\%$ | 0.29 | $22\frac{2}{9}\%$ | $0.29\overline{9}$

5. Which decimal and fraction are equivalent to 23%?

A. 2.3 and $\frac{23}{1}$

B. 2.3 and $\frac{23}{10}$

C. 0.23 and $\frac{23}{100}$

D. 0.23 $\frac{23}{1000}$

6. Jordan made a new playlist for his upcoming road trip and 25% of the songs are hip hop. Which fraction represents the number of songs on Jordan's playlist that are *not* hip hop?

A. $\frac{1}{4}$

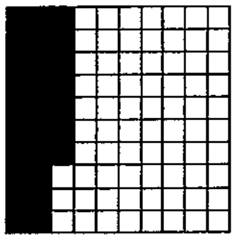
B. $\frac{2}{5}$

C. $\frac{1}{2}$

D. $\frac{3}{4}$

6.2b

1. Circle the inequality symbol that makes each pair of pictorial representations true.



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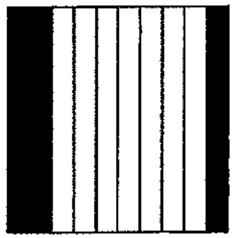

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2. Put the following numbers in ascending order.

$1\frac{3}{5}$	1.35	$\frac{9}{5}$	13.5%

3. Put the following numbers in order from greatest to least.

Greatest

Least

$\frac{1}{3}$	0.13
13.3%	3

4. Circle two numbers that make the inequality statement true.

$0.25 < \_\_\_\_ < \frac{3}{4}$

75% $\frac{2}{3}$ 0.225 $\frac{1}{5}$ 2.5% $0.\overline{6}$

5. At soccer practice, Keith ran $\frac{5}{8}$ of a mile, Jake ran $\frac{4}{9}$ of a mile, and Julian ran $\frac{1}{2}$ of a mile. Put these distances in descending order.

A. $\frac{4}{9}, \frac{1}{2}, \frac{5}{8}$

B. $\frac{1}{2}, \frac{4}{9}, \frac{5}{8}$

C. $\frac{1}{2}, \frac{5}{8}, \frac{4}{9}$

D. $\frac{5}{8}, \frac{1}{2}, \frac{4}{9}$

6. Which number goes in the blank space to make the inequality statement true?

$$\frac{5}{6} > \frac{}{12}$$

A. 9
B. 10
C. 11
D. 12

7. The table shows changes in gasoline prices per gallon over one year.

Gasoline Prices	
Month	Change in cost per gallon
January	2.075
April	$\frac{103}{50}$
August	208.3%
December	$2\frac{3}{8}$

Which statement about these prices is true?

A. January > August

B. April > January

C. December < January

D. January < December

6.2a
6. **A seventh-grade class conducted a survey to find out what kinds of pets their classmates owned. They discovered that 60% of the pets owned by the students were dogs. What fractional part of the pets were not dogs?**

A $\frac{2}{5}$

B $\frac{2}{3}$

C $\frac{3}{10}$

D $\frac{3}{5}$

6.2b
7. **Which of the following statements is true?**

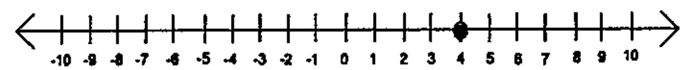
A 90.03 = 90.3
B 90.03 < 90.03
C 90.03 < 90.30
D 90.03 > 90.3

6.2b
8. **Compare:** $\frac{2}{6}$ _?_ $\frac{2}{3}$

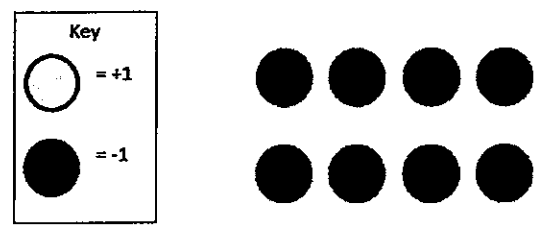
A <
B >
C =

6.3a

1. If you move the blue point ten units to the left, what number will it land on? _____



2. Use the key to answer the question below.



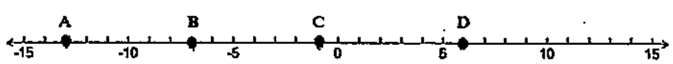
What integer is represented in the illustration above? _____

3. Illustrate where six degrees below zero is located on the thermometer below.

4. Shade all of the boxes that contain an integer.

$\|-8\|$	$\sqrt{25}$	$-\frac{3}{4}$
1.7	0	2^3

5. Identify each integer represented on the number line below.



A = _____ B = _____ C = _____ D = _____

6. Write the integer represented by each situation below.

A loss of 5 yards on the football field _____

A withdrawal of sixty dollars from the ATM _____

A golfer ends up with a score 9 strokes over par _____

Water rises 35 feet above sea level _____

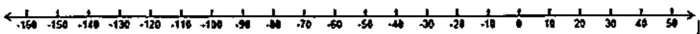
A mom loses 12 pounds after childbirth _____

A deposit of $100 at the bank _____

A temperature eleven degrees below zero _____

6.3b

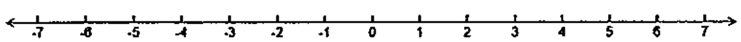
1. Use the number line to put the following integers in ascending order.



-40	20	0	-156	-13	6

2. Circle all of the integers on the number line that satisfy the inequality below.

$$-3 \le x \le 5$$



3. Identify all of the following statements that are true.

$10 \ge 9$	$1 < -9$	$6 \le 6$	$-4 \ge -3$
$-11 < -7$	$-2 \ge -2$	$0 > -1$	$-5 \ge -7$

4. Which statement is true when comparing -9 and -4?

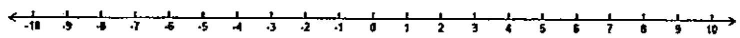
A. $-9 < -4$, because -9 lies to the right of -4 on the number line
B. $-9 > -4$, because -9 lies to the right of -4 on the number line
C. $-9 < -4$, because -9 lies to the left of -4 on the number line
D. $-9 > -4$, because -9 lies to the left of -4 on the number line

5. Which set of integers is listed is descending order.

A. $-10, -7, 2, 5, 13$
B. $13, 5, 2, -7, -10$
C. $2, 5, -7, -10, 13$
D. $13, -10, -7, 5, 2$

6.3c

1. Represent $|4|$ and $|-4|$ on the number line below.



2. What is the absolute value of zero? ____

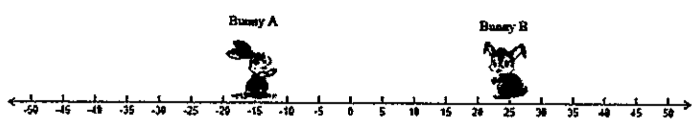
   Why? ____

   ____

3. Identify the two true statements below.

$\lvert 6\rvert = -6$	$\lvert -8\rvert = 8$	$-4 = \lvert 4\rvert$
$\lvert -10\rvert = -10$	$\lvert 9\rvert = -9$	$\lvert 52\rvert = 52$

4. Bunny A and Bunny B are hopping on the number line below. What point should Bunny B hop to in order to have the same absolute value as Bunny A?

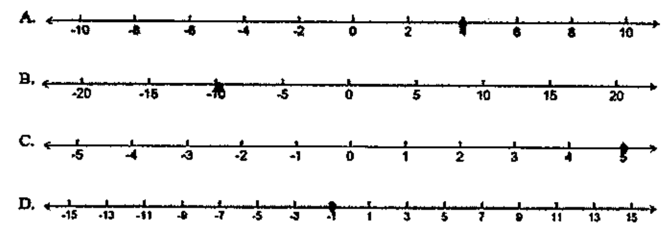


Bunny B should hop to point _______.

5. Absolute value is –

   A. the distance from zero.
   B. shown with the symbols | |.
   C. never a negative value
   D. all of the above.

6. Which point on the number lines below represents the greatest absolute value?



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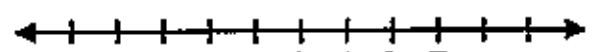
6.3a

9. Which point represents the integer of -3?



A Point P
B Point Q
C Point S
D Point T

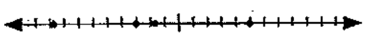
6.3b

10. Which of the following statements is correct?

A $-11 > -8 > -7 > 0 > 1$
B $-11 < -8 < -7 < 0 < 1$
C $0 < 1 < -7 < -8 < -11$
D $3 > -7 > -8 > -11 > 0$

6.3b

11. Which of the following integers does NOT lie between –30 and 30?



A –35
B –12
C –7
D 20

6.3c

12. What number has the same absolute value as 5?

A –5
B $-\frac{1}{5}$
C 0
D 5.5

6.4

1. Use your knowledge of perfect squares to complete the table below.

Square Root	1	3		11		20
Perfect Square	1	9	49		196	

2. Identify all of the answer choices that are equivalent to 6^4.

6×6×6×6	4^6	6×4	1,296	24×4
24	36×36	6×6×6×6×6	216×6	7,776

3. What is the value of 10^6?

$10^1 = 10$
$10^2 = 100$
$10^3 = 1{,}000$
$10^4 = 10{,}000$

A. 1,000
B. 100,000
C. 1,000,000
D. 10,000,000

4. Which best describes the numbers in the pattern below?

100, 121, 144, 169, ...

A. square roots
B. perfect squares
C. scientific notation
D. exponential notation

5. Max placed the numeral 10,000 in the place value chart.

Ten Thousands	Thousands	Hundreds	Tens	Ones
1	0	0	0	0

What is 10,000 written in powers of 10?

A. 10^2
B. 10^3
C. 10^4
D. 10^5

6. Based on the pattern show below, what is the value of 4^5?

$4^1 = 4$
$4^2 = 16$
$4^3 = 64$

A. 20
B. 68
C. 256
D. 1,024

7. A pattern of increasing perfect squares is shown.

9, 16, 25, 36, 49, 64, ...

What number comes next in this pattern?

A. 100
B. 81
C. 79
D. 65

8. How should 10^6 be written in a place value chart?

A.

Thousands	Hundreds	Tens	Ones
1	0	0	0

B.

Ten-thousands	Thousands	Hundreds	Tens	Ones
1	0	0	0	0

C.

Hundred-thousands	Ten-thousands	Thousands	Hundreds	Tens	Ones
1	0	0	0	0	0

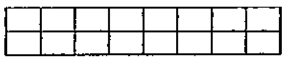
D.

Millions	Hundred-thousands	Ten-thousands	Thousands	Hundreds	Tens	Ones
1	0	0	0	0	0	0

6.4
13. Which is a model of 4^2?

A

B



C

D

6.4
14. What number belongs in this table?

10^5	?
10^4	10,000
10^3	1,000
10^2	100
10^1	10

A 50,000
B 100,000
C 110,000
D 1,000,000

6.4
15. What number belongs in the chart?

3^1	3
3^2	9
3^3	27
3^4	81
3^5	?

A 162
B 221
C 243
D 281

6.4
16. What is the base in the expression N^b?

A N
B both N and b
C b
D neither N nor b

6.5a
17. Multiply: $2\frac{5}{8} \times 3\frac{2}{5}$

A $6\frac{1}{4}$

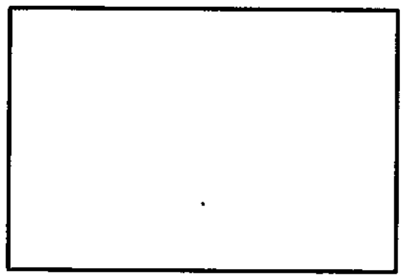
B $6\frac{37}{40}$

C $8\frac{1}{4}$

D $8\frac{37}{40}$

6.5a

1. Use the rectangle below to model $\frac{3}{5} \bullet \frac{2}{3}$?



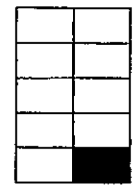
2. Write an expression that is represented by this fraction multiplication model.

3. What is the product of $3\frac{1}{2}$ and $\frac{4}{5}$?

4. Evaluate $2\frac{2}{3} \div \frac{1}{2}$.

5. In which fraction model does the shaded part represent $\frac{1}{2} \div 5$

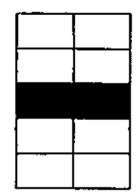
A.



B.

C.

D.



6.5b

1. **The height of a car is $46\frac{1}{4}$ inches. The toy model of that car is $2\frac{1}{2}$ inches tall. How many times greater is the height of the car than the height of its model? Express this quotient as a mixed number.**

2. **Kelsey filled 12 bags with either a red marble, yellow marble, or blue marble. One sixth of the bags included a red marble. Identify each scenario that could describe the remaining gift bags.**

$\frac{2}{3}$ of the total bags contain yellow marbles and 2 contain blue marbles.
$\frac{5}{12}$ of the total bags contain yellow marbles and $\frac{1}{3}$ contain blue marbles.
$\frac{1}{3}$ of the total bags contain yellow marbles and $\frac{1}{2}$ contain blue marbles.
$\frac{1}{2}$ of the total bags contain yellow marbles and 6 contain blue marbles.

3. **Dean bought $4\frac{1}{2}$ gallons of gasoline to use in his lawnmower. If he uses $\frac{3}{4}$ gallon each time that he mows the yard, how many times can he mow the yard before he runs out of gasoline.**
   - **A.** $3\frac{3}{4}$
   - **B.** $4\frac{3}{8}$
   - **C.** 5
   - **D.** 6

4. **Each of Mrs. Malone's 16 students ate $\frac{3}{8}$ of a pizza. How many pizzas did they eat, altogether?**
   - **A.** 6
   - **B.** 8
   - **C.** 10
   - **D.** 12

5. **On Monday Mr. Conner rode his bike for $\frac{2}{3}$ of an hour. On Tuesday he rode $\frac{5}{6}$ of an hour. On Wednesday he rode $\frac{7}{12}$ of an hour. His goal had been to ride for three hours altogether. How much time was he short of his goal?**
   - **A.** $\frac{5}{6}$ hour
   - **B.** $\frac{11}{12}$ hour
   - **C.** $\frac{25}{12}$ hour
   - **D.** $2\frac{1}{12}$ hour

6.5c

1. **Each week Terrell gets paid $20 for cutting the grass. Each week he spends $7.25 on a movie, $2.61 on candy, and $3.67 on a soda...**
   a. What are his expenses each week?
   b. How much money will he have left over, each week?
   c. If Terrell spends his money the same way each week for four weeks, and saves his leftover change, how much money will he have saved after four weeks?
2. **Each week, members of the cross country team are required to run 20 miles. The runners recorded their training distances, below. Which runners ran exactly 20 miles?**

Travis 5.4mi + 8.7mi + 5.9mi	**John** 4.8mi + 10.7mi + 5.4mi	**Antwon** 6.6mi + 6.6mi + 6.6mi
Sarah 9.2mi + 5.6mi + 4.7mi	**Maizie** 6.1mi + 9.3mi + 4.6mi	**Gabi** 5.4mi + 10.7mi + 6.6mi

3. **Three brothers go to a restaurant for dinner. They ordered one large pizza for $12.95, to share. One brother orders a soda for $1.95, and one orders hot-wings for $9.46. If they share the cost of the meal equally, how much will each brother have to pay?**
   A. $7.47
   B. $8.12
   C. $12.95
   D. $24.36

4. **At the beginning of the school year, Tyrone bought 12 notebooks for a total price of $19.56. Jaime went to the same store and bought 5 notebooks. How much did Jaime Spend**
   A. $8.15
   B. $8.05
   C. $9.21
   D. $9.42

6.5b

18. You have a 12-foot board and need to cut the board so that it is $9\frac{3}{8}$ feet long. How much do you have to cut off?

A $\frac{3}{8}$ ft.

B $2\frac{3}{8}$ ft.

C $2\frac{5}{8}$ ft.

D $3\frac{5}{8}$ ft.

6.5b

19. How many acres of land does each person have if $19\frac{1}{4}$ acres are divided among 5 people?

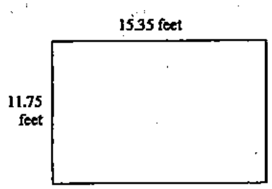
A $3\frac{5}{24}$ acres

B $3\frac{4}{5}$ acres

C $3\frac{17}{20}$ acres

D $8\frac{5}{9}$ acres

6.5c
20. Michael's garden is shown below.



If Michael buys 60 feet of fencing to go around this garden, how much will he have left over?

A 5.6 feet
B 5.7 feet
C 5.8 feet
D 5.9 feet

6.6a
21. What is the value of 300 ÷ (−25)?

A −15
B −12
C 12
D 15

6.6b
22. The record low temperature of −23° F for Texas occurred on February 8, 1933. The record high temperature of 120° F occurred on August 12, 1936. What is the difference between these two temperatures?

A 43° F
B 97° F
C 120° F
D 143° F

6.6a – NO CALCULATOR

1. **Ricardo is solving a math problem. He knows the model (see below) but does not know the numbers. Find integers that would solve this problem**

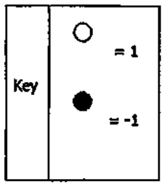
$$\frac{\square - \square}{\square \bullet \square} = -1$$

2. **Identify each true statement**

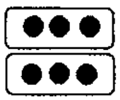
$(-9)-5=-4$	$(-12)+13=1$	$4\bullet(-7)=-28$	$4\bullet(-3)=12$
$(-27)\div(-3)=9$	$10\div(-5)=-2$	$10-(-4)=-14$	$(-5)\bullet(-6)=30$

3. **Which of the following equations is NOT true**
   A. $-2-(-6)=-4$
   B. $-6-(-7)=1$
   C. $2-(-6)=8$
   D. $6-7=-1$

4. **If *p* is a negative integer, which of these expressions represents the largest number**
   A. $5p$
   B. $5\div p$
   C. $5-p$
   D. $5+p$

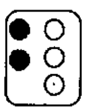


5. Which equation does this model represent?



a. 3 (-2) = -6
b. 2 (-3) = -6
c. -2 (-3) = -6
d. -2 (3) = 6

6. Which equation does this model represent?



a. -2 + 3 = 1
b. -2 + -3 = -5
c. -3 + 2 = -1
d. 3 + -5 = -2

6.6b

1. **Students in Mr. Manley's class lose three points on their grade, every time that they forget to turn in their homework.**
   a. **What integer represents the change in Erika's grade if she forgets her homework 5 times?**
   b. **What would Erika's grade end up to be if it had started at 82?**
   c. **If Subashni's grade ended up being 59, what would it have been if she had not missed seven homework assignments?**

2. **Emily enters an elevator on the 3rd floor and rides it up six floors. She then rides the elevator down three floors, and then back up two floors. When she finally exits the elevator, on what floor is she?**

3. **If the temperature during the day is 6° and the temperature drops 15° after sunset, what is the temperature at night?**
   A. -9°
   B. -6°
   C. 9°
   D. 21°

4. **Linda climbed a mountain to a height of 2,325 meters above sea level. Janice hiked down a canyon that is 37 meters below sea level. How much higher was Linda than Janice?**
   A. -2,288 meters
   B. -2,288 meters
   C. 2,288 meters
   D. 2,362 meters

5. **Francie had $250 in her savings account. For six months in a row, she withdrew $30 each time. How much money did she have in her account at the end?**
   - A. $70
   - B. $110
   - C. $180
   - D. $430

6.6c – NO CALCULATOR

1. **The work of three students in Mrs. Wray's 6th grade class is shown below:**

Abby's work	Ben's work	Charice's work
$2-12\div6\bullet2$	$2-12\div6\bullet2$	$2-12\div6\bullet2$
$2-2\bullet2$	$2-2\bullet2$	$2-12\div12$
$0\bullet2$	$2-4$	$2-1$
0	-2	1

- **Which student calculated the problem correctly?**
- **What was their solution**
- **Identify the mistakes made by the other two students**

2. **Which of the following has a value of -2**

$\frac{5+3}{4}$	$\frac{7-11}{2}$	$-4(9-3)\div12$
$\frac{2^3}{-4}$	$\lvert16-18\rvert-4$	$5(9-6)\div15$

3. **Using the order of operations, what is the second operation that should be formed in the problem below –**

$$4^2+(10-7)\bullet3$$

   - A. 4^2
   - B. (10-7)
   - C. $3\bullet3$
   - D. $16-9$

4. **Evaluate** $\frac{18}{9}+2(3+4)$

A. 12

B. 16

C. 17

D. 18

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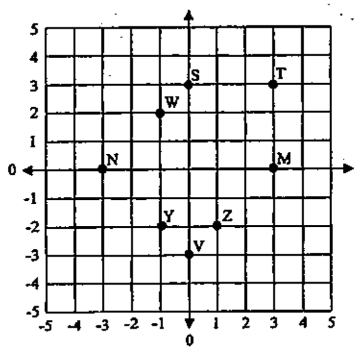
6.6c
23. What is $(2^3 - 3) + 5 \times 2$?

A 13
B 15
C 16
D 20

6.6c
24. Solve: $\frac{90-(4+2\times 3)}{10}$

A 8
B 9.2
C 88.2
D 89

Use this graph to answer the next question.

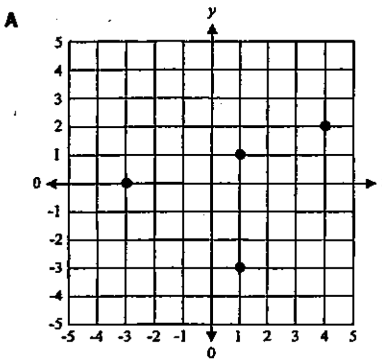


6.8a
30. Which of the following points lies on the *x*-axis?

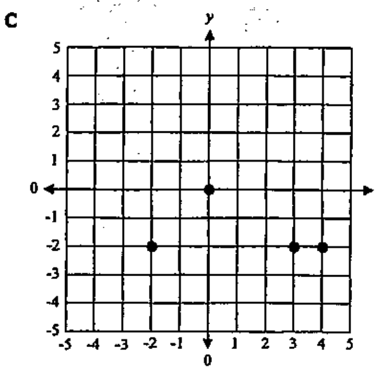
A points S and V
B points M and T
C points N and M
D points N and Y

6.8b
31. Which of the following graphs contains the ordered pairs (–2, –2); (0, 0); (3, 2); (4, –2)?

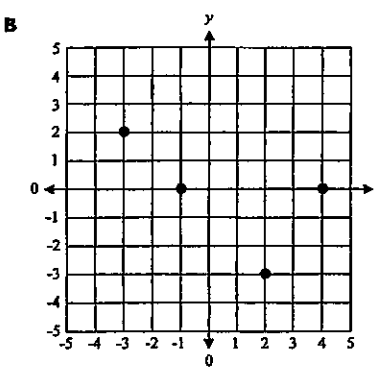
A



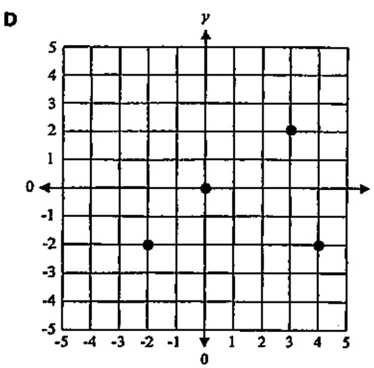
C



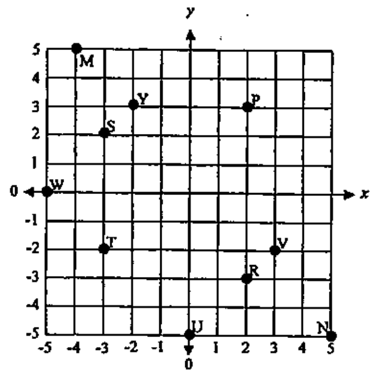
B



D



Use the coordinate plane shown below to answer the next question.



6.8b

32. Which point identifies the location of (–3, 2)?

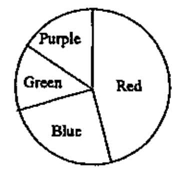
A point T
B point R
C point S
D point Y

6.10a

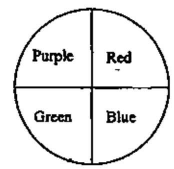
37. Ben asked 20 friends and family members to name their favorite color. This chart shows the results of the survey. Which circle graph best represents this information?

Favorite Color	Number of People
Red	4
Blue	8
Green	2
Purple	6

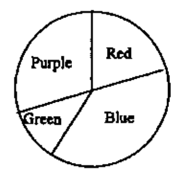
A



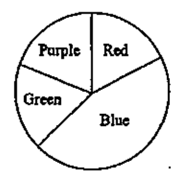
B



C



D



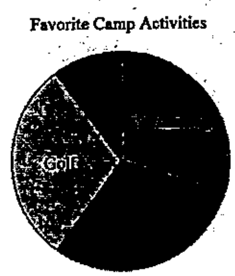
6.10a

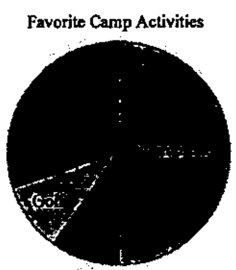
38. Two hundred summer campers were asked this question: What was your favorite activity at camp this summer? The results of this survey are shown in the table.

Favorite Camp Activities	Fractional Part of Survey Votes
Fishing	$\frac{1}{5}$
Swimming	$\frac{1}{2}$
Golf	$\frac{1}{5}$
Tennis	$\frac{1}{10}$

What circle graph best represents this information?

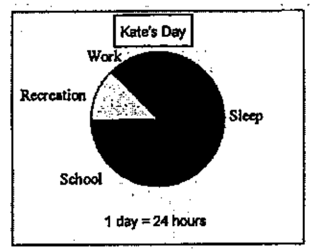
A


C


B


D


Use the circle graph below to answer the next question.



6.10b

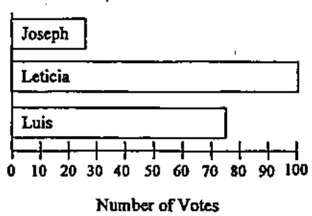
39. What did Kate spend most of her day doing?

A recreation
B working
C at school
D sleeping

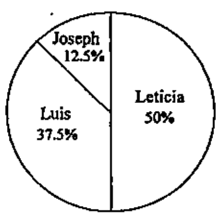
6.10c

40. Three students are running for class President. Two different data displays are used to show the results.

Sixth Grade Election Results



Sixth Grade Election Results



What statement is true about these data displays?

A Both data displays show that Luis is in third place.

B Leticia is the winner in the bar graph but not in the circle graph.

C Both graphs show that Joseph has $\frac{1}{8}$ of the total votes.

D Luis has one-half of the total votes.

6.12a

45. Jason can type 35 words in 60 seconds. Which table represents a set of values that are proportional to 35 words in 60 seconds?

A

Words	7	28	42
Seconds	12	36	48

B

Words	7	14	28
Seconds	12	36	48

C

Words	7	14	21
Seconds	12	24	36

D

Words	7	21	42
Seconds	12	48	72

6.12b

46. Jack recorded some data related to miles traveled and gallons of gas used.

Miles	87	?	203
Gallons of Gas	3	5	7

What is the missing value in this table?

A 135
B 145
C 155
D 165

6.12c
47. Which table shows a proportional relationship?

A

x	y
1	12
2	6
3	4
4	3
6	2
12	1

B

x	y
1	3
2	6
3	9
4	12
5	15

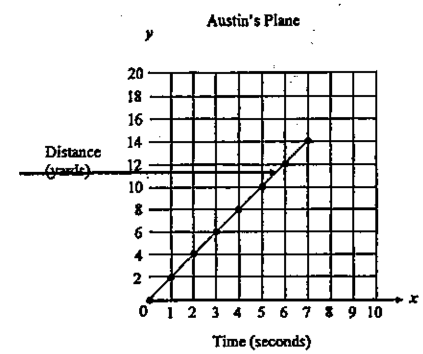
C

x	y
1	2
3	4
6	8
7	15
16	22

D

x	y
1	4
2	6
3	12
4	20
5	25

6.12d
48. Austin graphed how far his motorized airplane traveled. What is the unit rate shown on this graph?



A 2 yards per second
B 5 yards per second
C 7 yards per second
D 10 yards per second

6.13
49. What is the value of x?

x + □□□ = □□□□□□□

A □□□□
B □□□
C □□
D □

6.12a

1. Tyrique is mixing yellow and blue paint using a ratio of 2 to 3. Create a table of values to represent this proportional relationship.

Amount of yellow paint	Amount of blue paint

2. Stacy went to an arcade that requires 6 tokens to play 2 games. If a proportional relationship exists between the number of games and the number of tokens, create a table of values to represent this relationship.

Number of games	Number of tokens

3. Which of the following tables represents a proportional relationship between x and y with a ratio of 3:4?

A.

x	y
6	8
7	9
8	10

B.

x	y
6	24
7	28
8	32

C.

x	y
6	8
7.5	9.5
9	11

D.

x	y
6	8
7.5	10
9	12

4. Sophia makes $12 an hour babysitting. Which of the following tables represents the proportional relationship between the hours spent babysitting, *x*, and the money she earns, *y*?

A.

x	*y*
2	12
3	24
4	36

B.

x	*y*
2	24
3	36
4	48

C.

x	*y*
12	2
24	3
36	4

D.

x	*y*
24	2
36	3
48	4

6.12b

1. Mrs. Andrew made coffee using the ratio of 3 tablespoons of ground coffee to 6 ounces of water. Given that the ratio of number of tablespoons, x to the amount of water, y, represents a proportional relationship. Determine the missing values to complete the table.

Ground Coffee(x) (tablespoons)		9		16
Water (y) (ounces)	4		24	

2. Joey Chestnut holds the record for eating 72 hotdogs in 10 minutes. The table below represents a proportional relationship of number of minutes, x, to the number of hotdogs, y. Determine the unit rate for the number of hotdogs eaten per minute.

Minutes (x)	Hotdogs (y)
4	28.8
8	57.6
10	72

3. Micah is going to Putt- Putt with her friends. The table represents the relationship between the number of games to the cost. Determine the missing value.

Number of Games	Cost
2	16
3	24
5	
7	56

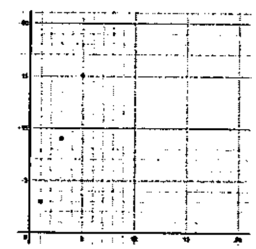
A. 32
B. 48
C. 40
D. 26

4. Jennifer earned $54 when she sold 9 cheesecakes. If this represents a proportional relationship, what is the unit rate of money earned to cheesecakes sold?

A. 1 to 6
B. 1 to 9
C. 9 to 1
D. 6 to 1

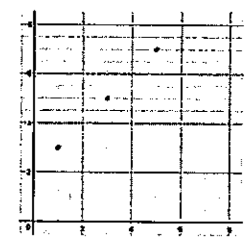
6.12c

1. Given:



Determine whether a proportional relationship exists, and explain why.

2. Given:



Determine whether a proportional relationship exists, and explain why.

3. Sarah is shopping for school supplies and sees signs that have the following descriptions:
   a. Erasers 2 for $1 or 10 for $4
   b. Pencils $0.25 each

Does the number of erasers purchased and the cost of the erasers represent a proportional relationship? Explain why or why not.

Does the number of pencils purchased and the cost of the pencils represent a proportional relationship? Explain why or why not.

4. Jose is mixing paint for an art project. He uses $\frac{1}{2}$ cup of yellow paint for every cup of blue paint. Does Jose's paint mix represent a proportional relationship? Explain.

5. Which set of ordered pairs represents a proportional relationship?

   A. (3,15), (5,17), (9,21)
   B. (3,15), (5,25), (9,45)
   C. (3,15), (5,23), (9,39)
   D. (3,15), (5,27), (9,51)

6. Which table represents a proportional relationship?

A.

x	y
1	5
2	6
3	7

B.

x	y
1	3
2	6
3	9

C.

x	y
0	3
3	6
6	9

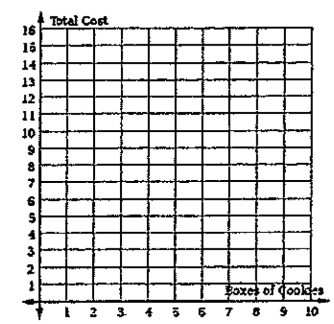
D.

x	y
0	5
3	7
6	9

6.12d

1. Create a situation that represents a proportional relationship. Create a table of values and a graph to represent this relationship.

2. Suzanne is selling 4 boxes of cookies for $10. A proportional relationship exists between the number of boxes of cookies, x, and the total cost, y. Create a graph with at least 4 points that represents the same proportional relationship.

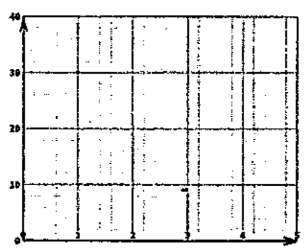


3. The table represents the relationship between the dollars earned selling T-shirts for each day that Alejandro worked.

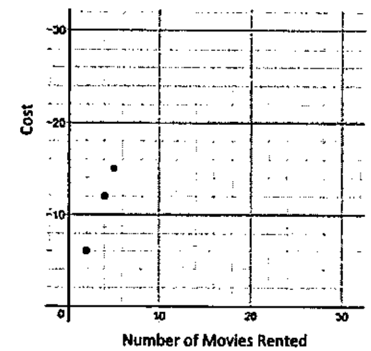
Shirts Sold	Dollars Earned
6	75
9	112.50
11	137.50

Determine and describe the unit rate for the price that he used for the cost of each shirt.

On the coordinate graph, plot points that would represent the relationship between the dollars earned and the sale of 1, 2, and 3 shirts.



4. The graph below shows the relationship between the number of movies rented to the total cost.



Which table below represents the same proportional relationship?

A.

Movies Rented	Cost
1	3
3	5
6	8

B.

Movies Rented	Cost
1	3
10	13
12	24

C.

C

Movies Rented	Cost
7	21
10	30
13	39

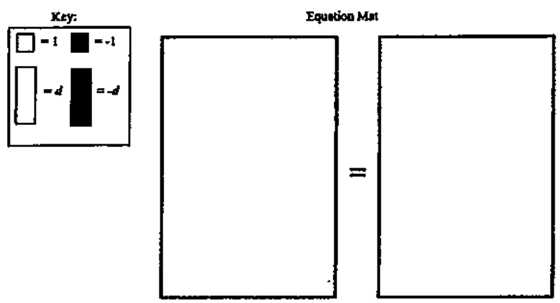
D.

Movies Rented	Cost
7	10
3	6
6	9

6.13

1. Using the given key and equation mat, represent and solve the following linear equation algebraically. Then, confirm your solution.

$$d-4=-12$$



2. Explain how to solve the algebraic equation and justify your answer.

$p+8=12$

3. Select the two methods that can be used to solve the algebraic equation.

$-2x = 12$

- Add -2 to each side.
- Multiply each side by -2
- Divide each side by -2.
- Add $-\frac{1}{2}$ to each side.
- Multiply each side by $-\frac{1}{2}$
- Divide each side by $-\frac{1}{2}$

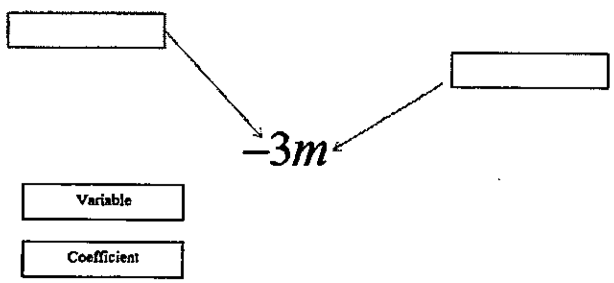
4. Represent and solve the following situation as an algebraic equation.

Richmond City Schools provides 3 buses for a school field trip. If 72 students are going on the school field trip, how many students will be on each bus? Assume the students (s) are equally divided on each bus.

Algebraic Equation: ______________________________

There will be _____ students on each bus.

5. In the following expression, drag and drop the correct algebraic name:



6. Identify three verbal statements that represent the expression below.

$4n-16$

- The product of four and a number decreased by 16
- The quotient of four and a number minus 16
- Four times a number less than 16
- Sixteen less than four times a number
- The difference between four times a number and 16
- Four more than a number decreased by 16

7. How many terms are in the following expression?

$7x^2+5x-3$

8. Which method can be used to solve the algebraic equation below?

$z-6=13$

A. Subtract 6 from both sides of the equation
B. Add 6 to both sides of the equation
C. Subtract 13 from both sides of the equation
D. Add 13 to both sides of the equation

9. How would you solve the equation below?

$\frac{1}{3}x=-6$

A. Multiply both sides of the equation by $\frac{1}{3}$
B. Multiply both sides of the equation by 3
C. Divide both sides of the equation by 3
D. Divide both sides of the equation by -6

10. Which solution will make the linear equation statement true?

$13.75=-2.5z$

A. $z=5.5$
B. $z=-16.25$
C. $z=16.25$
D. $z=-5.5$

6.13
50. What is the value of *y*?

$$\frac{y}{6} = 48$$

A 6
B 8
C 288
D 422

6.13
51. What is the coefficient of <u>3*a*</u>?

A 1
B 3
C 7
D 9

6.13
52. Which of the following is an example of an equation?

A $12 + 36 = 48$
B $15 - 2 > 10$
C $3a + 4b$
D $x - 12 + y$

6.14a
53. Juan has to stay inside until the temperature is greater than –2 degrees. Which inequality represents this situation?

A $t < -2°$
B $t > -2°$
C $t \leq -2°$
D $t \geq -2°$