

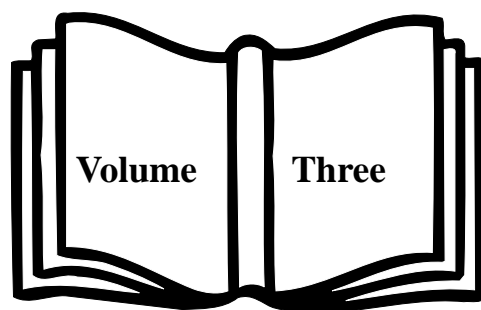
GRADE SIX INDICATORS

FOR THE

MATHEMATICS

STANDARD COURSE OF

STUDY



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The Indicators for Grade Six Mathematics

What are Indicators?

Indicators are measures to determine mastery of a concept, procedure, or application within a specific objective or group of objectives. The Indicators illustrate and elaborate each objective with sample problems and tasks, vocabulary, and related concepts and skills. They are written to provide a fuller explanation of the objectives in the Grade Six Mathematics Standard Course of Study. Whenever possible they are couched in a context to further illustrate the scope of the objectives. Indicators are summative in nature, that is, they are intended to show the kind of mathematical problem solving that is appropriate to indicate a student's mastery of the curriculum after an extended period of instruction and practice.

The items contained in this document are not intended to represent sample end-of-grade test questions. Students are encouraged to explain or defend their responses and not merely give an answer. Communication is an important part of mathematics and mathematics education. Writing in mathematics helps students solidify their thinking and gives teachers an insight into the thought process of their students.

It is hoped that teachers will find this material useful in understanding both the intent of the 2003 revised Mathematics Standard Course of Study and the thinking of their students.

Questions and comments should be directed to Linda Patch at the Department of Public Instruction (lpitch@dpi.state.nc.us or 919.807.3841).

Grade 6

Number and Operations

1.01 Develop number sense for negative rational numbers.

- a) Connect the model, number word, and number using a variety representations including the number line.
- b) Compare and order.
- c) Make estimates in appropriate situations.

1.02 Develop meaning for percents.

- a) Connect model, number word, and number using a variety of representations.
- b) Make estimates in appropriate situations.

1.03 Compare and order rational numbers.

1.04 Develop fluency in addition, subtraction, multiplication and division of non-negative rational numbers.

- a) Analyze computational strategies.
- b) Describe the effect of operations on size.
- c) Estimate the results of computations.
- d) Judge the reasonableness of solutions.

1.05 Develop fluency in the use of factors, multiples, exponential notation, and prime factorization.

1.06 Use exponential, scientific, and calculator notation to write very large and very small numbers.

1.07 Develop flexibility in solving problems by selecting strategies and using mental computation, estimation, calculators or computers, and paper and pencil.

Measurement

2.01 Estimate and measure length, perimeter, area, angles, weight, and mass of two- and three-dimensional figures, using appropriate tools.

2.02 Solve problems involving perimeter/circumference and area of plane figures.

Geometry

3.01 Identify and describe the intersection of figures in a plane.

3.02 Identify the radius, diameter, chord, center, and circumference of a circle; determine the relationships among them.

3.03 Transform figures in the coordinate plane and describe the transformation.

3.04 Solve problems involving geometric figures in the coordinate plane.

Data Analysis and Probability

4.01 Develop fluency with counting strategies to determine the sample space for an event. Include lists, tree diagrams, frequency distribution tables, permutations, combinations, and the Fundamental Counting Principle.

4.02 Use a sample space to determine the probability of an event.

4.03 Conduct experiments involving simple and compound events.

4.04 Determine and compare experimental and theoretical probabilities for simple and compound events.

4.05 Determine and compare experimental and theoretical probabilities for independent and dependent events.

4.06 Design and conduct experiments or surveys to solve problems; report and analyze results.

Algebra

5.01 Simplify algebraic expressions and verify the results using the basic properties of rational numbers.

a) Identity.

b) Commutative.

c) Associative.

d) Distributive.

e) Order of operations.

5.02 Use and evaluate algebraic expressions.

5.03 Solve simple (one- and two-step) equations or inequalities.

5.04 Use graphs, tables, and symbols to model and solve problems involving rates of change and ratios.

1.01 Develop number sense for negative rational numbers.

a) Connect the model, number word, and number using a variety of representations including the number line.

b) Compare and order.

c) Make estimates in appropriate situations.

To achieve this objective, students should be able to:

- *Use integers to represent real-life situations.*
- *Represent integers on the number line.*
- *Compare integers using the symbols $=$, \neq , $>$, $<$, \geq , \leq .*
- *Understand that an integer and its additive inverse are called opposites.*

A. When keeping scores in golf, reference is made to “par”, a designated number of strokes. A score of 2 under par can be written as -2 and a score of 3 over par can be written as 3. For a given round of golf, a group of six golfers had the following scores: Charlie -4, Tom 1, Frank 5, George -2, Andy 3, and Mike -1. Graph each score on a number line.

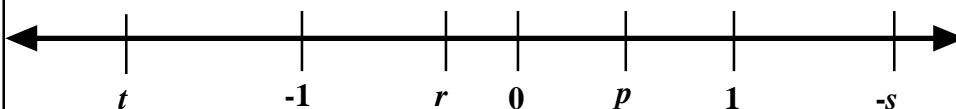
Vocabulary
and
Resources

additive inverse
opposites
negation
integers
number line
equal
less than or equal to
 \leq
greater than or equal to
 \geq
compound inequality
(ex. $a < b < c$)

ascending order
descending order

rounding
place value
benchmark values

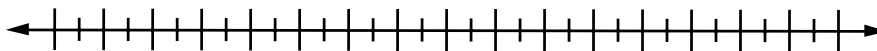
B.



Using the number line above, insert the symbol $<$, $>$, or $=$ in each of the following to make a true statement.

- | | | |
|-------------------|----------------------|----------------------|
| a. p _____ $-p$ | f. $-p$ _____ 0 | k. $-s$ _____ r |
| b. t _____ $-t$ | g. t _____ r | l. $-(-s)$ _____ r |
| c. p _____ r | h. $-r$ _____ $-t$ | m. 0 _____ $-s$ |
| d. $-s$ _____ p | i. $-p$ _____ t | n. -1 _____ $-p$ |
| e. $-r$ _____ 1 | j. $-(-s)$ _____ s | o. $-r$ _____ $-s$ |

C. The lowest daily temperatures for the first eight days of the month were -10°F , -5°F , 5°F , -13°F , 2°F , 22°F , 7°F , and -4°F . Set up an appropriate scale on the number line below and graph these integers.



1.02 Develop meaning for percents.

Vocabulary
and
Resources

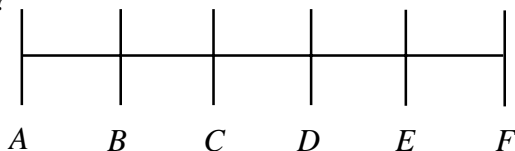
a) Connect the model, number word, and number using a variety of representations.

b) Make estimates in appropriate situations.

To achieve this objective, students should be able to:

- *Use the “out of 100” interpretation to develop an understanding of the concept of percent.*
- *Write percents, decimals, and fractions for shaded parts of figures.*
- *Build an understanding of the relationship among the concepts of fractions, decimals, and percents and their representations.*
- *Develop ways to model situations involving fractions, decimals, and percents.*
- *Move flexibly between and among fraction, decimal, and percent representations.*
- *Use number lines to represent equivalent fractions, decimals, and percents.*
- *Use percent, decimal, and fraction benchmarks to make estimates in appropriate situations.*

A. The line segment AF is marked off into five equal parts. If you start at point A and go 77% of the way to point F , between which two points will you be?



(Adapted from SREB publication *Getting Students Ready for Algebra I: What Middle Grades Students Need to Know and Be Able to Do*)

*Vocabulary
and
Resources*

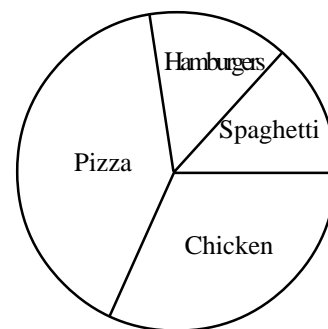
part/whole
ratio
proportion
cross product

hundred grid
circle graph

B. At a school health fair, the technician recorded the weights of 265 sixth grade students. According to national health statistics, 40% of the students would be classified as overweight. What fractional part of the students are overweight? How many students are overweight? Shade the portion of the rectangle to represent the overweight students in the sixth grade.

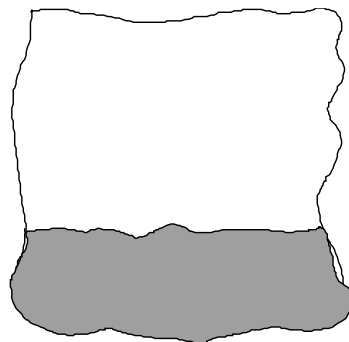


C. Favorite Cafeteria Choices



- Which two choices would represent about 25% of the total graph?
- What percent would represent the remaining choices?
- Estimate what percent of students like spaghetti or chicken nuggets?

D. Estimate the percent of the figure that is shaded. What percent of the figure is not shaded?



E. Lunch for two friends cost \$25.35 and the 6% tax was \$1.52. Use what you know about the 6% tax to estimate an 18% tip to leave the server.

F. Mary is looking for the lowest price to pay for a hair dryer. Which store would have the lowest price?

Store A	\$8 off \$20.95
Store B	25% off \$20
Store C	$\frac{1}{3}$ off \$18
Store D	10% off \$25

*Vocabulary
and
Resources*

1.03 Compare and order rational numbers.

To achieve this objective, students should be able to:

- Graph, compare, and order positive and negative numbers.
- Use $0, \frac{1}{2}, 1, 1\frac{1}{2}, 2$ and so on as benchmarks to estimate the values of other fractions.

fractions
decimals
percents

number line
equal to
greater than
less than
less than or equal to
 \leq
greater than or equal to
 \geq

compound inequality
 $a < b < c$

ascending order
descending order

common denominator
least common denominator
multiple
least common multiple
(LCM)
factor

numerator
denominator
improper fraction
mixed number
simplify fraction

A. Circle the equivalent numbers in each set.

a) $\frac{2}{3}$ $\frac{18}{27}$ 66.7%

b) 0.070 70% 0.70

c) 48% $\frac{48}{100}$ $\frac{12}{25}$

d) 0.33 $\frac{1}{3}$ 33.3%

e) \$0.35 .35¢ \$ $\frac{7}{20}$

B. Latroy was bragging to his friend Antonio that he ate six out of eight pieces of his pizza at Marios. Antonio told him that wasn't a big deal because he had eaten 75% of his pizza at The Italian Kitchen. Kaneisha overheard the conversation and told the boys they had both eaten the same amount. Was Kaneisha correct? Explain.

C. Annette and Robin were eating lunch together. When they finished eating, Annette stated that she had eaten half of her sandwich. Robin said, "I ate 50% of my sandwich but I ate more than you." Explain how this is possible.

D. Sophia has $\frac{1}{10}$ of a dollar, Juan has \$0.45, Dwayne has 5% of a dollar, and Alex has one 50 cent piece. Who has the most money?

E. Place a rational number in each blank so that the three numbers are arranged in order from smallest to largest.

- a) $-\frac{3}{4}$, _____, $-\frac{1}{2}$
- b) $\frac{1}{4}$, _____, $\frac{3}{8}$
- c) $33\frac{1}{3}\%$, _____, 0.75
- d) -5.67 , _____, $-5\frac{1}{10}$
- e) $-3\frac{5}{6}$, _____, $-3\frac{3}{4}$

1.04 Develop fluency in addition, subtraction, multiplication and division of non-negative rational numbers.

a) Analyze computational strategies.

b) Describe the effect of operations on size.

c) Estimate the results of computations.

d) Judge the reasonableness of solutions.

To achieve this objective, students should be able to:

- *Explore the relationship between two numbers and their product to generalize the conditions under which the product is greater than both factors, between the factors, or less than both factors.*
- *Use $0, \frac{1}{2}, 1, 1\frac{1}{2}, 2$ and so on as benchmarks to make sense of the size of a sum difference, product or quotient.*
- *Develop strategies to estimate the results of fraction and decimal operations.*
- *Make sense of whether a situation requires an overestimate or an underestimate.*
- *Examine the patterns of quotients (products) when numbers are divided (multiplied) by powers of 10.*

Vocabulary and Resources

- *Develop ways of modeling addition and subtraction of fractions and decimals.*
- *Develop ways of modeling multiplication of fractions and decimals, including use of the area model.*
- *Develop ways of modeling division of fractions and decimals.*
- *Use fact teams to develop an understanding of the relationship between addition and subtraction or multiplication and division of fractions and decimals.*
- *Develop algorithms for fraction and decimal operations.*
- *Apply knowledge of decimal and fraction operations to solve problems.*

A. At Deli Extravaganza, salads are \$0.21 per ounce and an empty plate weighs three ounces. What is the cost of the salad if the scale reads 1.25 pounds?

B. Ground beef is on sale for \$1.89 per pound. Kelly has found a package that weights 1.25 pounds. If Kelly has \$2.00, does she have enough money to purchase this package of ground beef?

C. Roberto works for two hours. Lee works $2\frac{3}{4}$ times as long as Roberto. Jack works $1\frac{1}{4}$ hours less than Jedd. Jedd works $2\frac{1}{2}$ times as long as Lee. How long does each person work?

decimals
fractions
numerator
denominator
improper fractions
simplify fractions
factors
products
least common multiple
(LCM)
greatest common factor
(GCF)
like/unlike
denominators
common denominator
least common
denominator
mixed number

sum
difference
product
quotient

inverse operation
multiplicative inverse

rounding
benchmark numbers

D. The following table gives the number of hours Dylan worked and the amount of money he earned each day.

Day	Hours (H)	Earnings (E)
Monday	2	\$13.30
Tuesday	$3\frac{2}{3}$	\$24.38
Wednesday	$1\frac{1}{5}$	
Thursday	3	\$19.95
Friday		\$43.23

- a) What is Dylan's hourly wage?
- b) Write an equation that can be used to determine his earnings.
- c) How much did Dylan earn on Wednesday?
- d) How many hours did Dylan work on Friday?
- e) What are Dylan's total earnings for the week?

E. I have three brothers who really love pizza and have eaten some of the pizza I ordered for a friend and myself. One ate one-fifth of the pizza, one ate one-fourth of the pizza, and the other ate one-eighth of the pizza. How much pizza remains? Is there at least half of the pizza left?

F. At the deli counter, Mr. Jones asks for $1\frac{3}{4}$ pounds of sliced ham.

The clerk says, “Twenty ounces, OK?” What should you reply? Explain

G. Jake has five pieces of wood that are each 12 feet long. He plans to make two bookcases and each bookcase will have six shelves of length 57 inches. Jake claims he has enough wood for the shelves. Do you agree or disagree? Explain.

*Vocabulary
and
Resources*

1.05 Develop fluency in the use of factors, multiples, exponential notation, and prime factorization.

To achieve this objective, students should be able to:

- *Classify numbers as prime or composite.*
- *Recognize that factors come in pairs and that once one factor is found, another can also be found.*
- *Understand the connection between division and finding factors of a number.*
- *Recognize that a number may have several different factorizations, but, except for order, each number greater than 1 has exactly one prime factorization.*
- *Use primes, factors, and multiples to solve problems.*
- *Develop strategies for finding factors and multiples of whole numbers.*
- *Use and interpret exponential notation to represent numbers.*
- *Apply knowledge of factors, multiples, exponential notation, and prime factorization to solve problems. The formal use of the laws of exponents is not expected until Algebra I (1.01a): Apply the laws of exponents.*

A. Simplify each of the following:

a. $(2.3)^2 + (0.5)^4$

b. $(6)^2 \cdot (5)^0 + \left(\frac{1}{2}\right)^3$

c. $3 + (11)^2 \cdot (0.3)^4$

d. $5^6 \div 5^2$

e. $2^2 \cdot 3^2 \cdot 2 \cdot 2^3 \cdot 3$

f. $\frac{4^6}{4^6}$

g. $\frac{2^3 \cdot 7^5}{2 \cdot 7^3}$

h. $(3 \cdot 5^2)^3$

B. Write the prime factorization for 72 in two different ways (include exponential notation).

C. Shanika and Jarvis are making bead bracelets to sell in a booth at the fair. They have 15 yellow beads, 30 blue beads, and 40 red beads. How many blue beads should be on each bracelet if they want to make the bracelets so they are all the same and they use all the beads. How many bracelets will they make?

D. Jason is filling grab bags for the school festival. Two hundred bags are lined up on a long table. He has already placed crackers and other food items in each bag and now has a limited amount of prizes to add to some of the bags. If he places prize A in every 8th bag, prize B in every 12th bag, and prize C in every 15th bag, which bag will have all three prizes?

E. A clockmaker must wind his clocks on a regular schedule. He winds some of his clocks every two days, some of his clocks every three days, and the remainder of his clocks every five days. How often does he wind all of his clocks on the same day?

F. A class of 28 students stood in a circle and counted off by ones. Those students identified with a multiple of four sat down. The remaining students who were standing counted by ones again and this time those identified with a multiple of three sat down. Once again the remaining students counted off and this time the multiples of two sat down. When the third count off was completed, how many students were still standing?

G. The Peterson family is planning a picnic for 16 people. They will be serving hotdogs. If hotdogs come in packages of eight and hotdog buns come in packages of six, what is the minimum amount of each that they should purchase so they have an equal number of hotdogs and hotdog buns and each person can have the same number of hotdogs?

H. The national debt of a country is approximately 10^9 dollars. If the debt could be reduced by 10^6 dollars per year, about how many years would it take to eliminate the entire debt?

Vocabulary and Resources

exponent
base
power
square
square root
(of perfect square)
cube
cube root
(of perfect cube)

operations with
exponents
(\times and \div)

order of operations

factor tree
divisibility rules
greatest common factor
least common multiple

prime number
composite number

1.06 Use exponential, scientific, and calculator notation to write very large and very small numbers.

To achieve this objective, students should be able to:

- *Relate negative powers of 10 as used in scientific notation to repeated multiplication of the fraction $\frac{1}{10}$ (e.g. $10^{-3} = \frac{1}{10} \times \frac{1}{10} \times \frac{1}{10} = \frac{1}{1000}$)*
- *Relate positive powers of 10 as used in scientific notation to repeated multiplication of ten (e.g. $10^3 = 10 \times 10 \times 10 = 1000$)*
- *Convert numbers written in scientific notation to standard notation and numbers written in standard notation to scientific notation*
- *Use calculators to explore contexts in which numbers are expressed in scientific notation*

place value
standard form
powers of ten

exponent
base

A. The population of a certain country has reached 4.29×10^8 . Which of the following is another way to represent the population?

- A 429 million
- B 4.29 million
- C 4.29 billion
- D 429 billion

B. The Diplococus dinosaur is believed to have become extinct approximately 1.38×10^8 years ago, The Oviraptor is believed to have become extinct approximately 7×10^7 years ago. About how many years were there between the extinctions of these two dinosaur types?

C. The figure below shows the display on a scientific calculator. The value of the displayed number is between which of the following pairs of numbers?



- a) 0.04 and 0.05
- b) 0.4 and 0.5
- c) 4.0 and 5.0
- d) 40.0 and 50.0
- e) 400.0 and 500.0

(From SREB publication *Getting Students Ready for Algebra I: What Middle Grades Students Need to Know and Be Able to Do*)

D. Write the following numbers in scientific notation:

- | | |
|------------------|--------------------|
| a) 2,379,000 | d) 0.0000786 |
| b) 0.0000000005 | e) 489,500,000,000 |
| c) 8,000,000,000 | f) 0.00000206 |

1.07 Develop flexibility in solving problems by selecting strategies and using mental computation, estimation, calculators or computers, and paper and pencil.

To achieve this objective, students should be able to:

- *Use strategies such as making a table or diagram, using guess-and-check, looking for patterns, simplifying the problem, and working backwards to solve problems.*
- *Use strategies such as decomposing numbers, estimation, and compensation to solve problems using mental computation.*
- *Use calculators or computer and paper and pencil as appropriate to aid in problem solving.*

guess and test
make a table/chart/graph
make a diagram/picture
make an organized list
work backwards
solve a simpler problem
find a pattern
extraneous information

A. The gasoline gauge of John's car was on empty when he filled the gasoline tank of his car. The price of the gasoline was about \$1.53 per gallon. If he paid \$32.65 for the gasoline, about how many gallons must his tank hold?

B. Two runners start running at the same time from the start/finish line of a 400-meter oval track. One runner runs laps of 1 minute 15 seconds and the other runs laps of 1 minute 45 seconds. How long will it be before the runners cross the start/finish line at the same time? How many laps will each have run? Explain your answer.

(From SREB publication *Getting Students Ready for Algebra I: What Middle Grades Students Need to Know and Be Able to Do*)

C. Of the 90 people in a room, two-thirds are men and three-fifths of the people have brown hair. What is the least number of men in the room who could have brown hair?

(Adapted from SREB publication *Getting Students Ready for Algebra I: What Middle Grades Students Need to Know and Be Able to Do*)

D. Tate has two dogs, Tucker and Britney. Britney consumes 0.75 of a can of dog food each day and Tucker consumes 1.5 cans of dog food each day. The price for dog food this week is 3 cans for \$2.00. How much will it cost Tate for a 20-day supply of dog food for his two dogs?

E. Kim has a recipe for 36 cupcakes that requires 5 cups of flour, 3 eggs, and 2 cups of sugar. If she wants to make 24 cupcakes, how much of each of these ingredients will she need? How much of each ingredient will she need for 54 cupcakes?

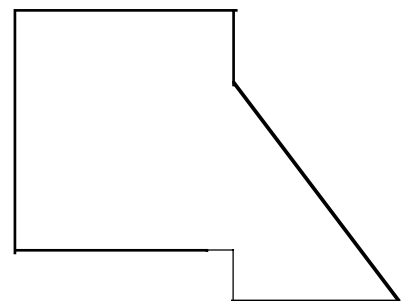
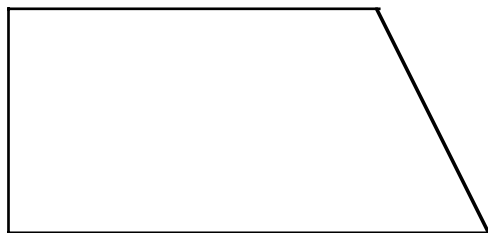
F. Place a row of 100 pennies all heads up. Now turn every second penny heads down. Next, change the position of every third penny (if it is heads up, make it heads down; if it is heads down, make it heads up). Now change the position of every penny that is a multiple of four. Next change the position of every penny that is a multiple of five. If you continue this pattern with multiples of 6, 7, 8, ..., which pennies would be heads up?

2.01 Estimate and measure length, perimeter, area, angles, weight, and mass of two- and three-dimensional figures using appropriate tools.

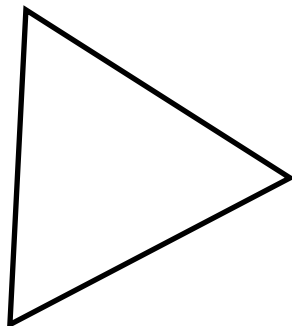
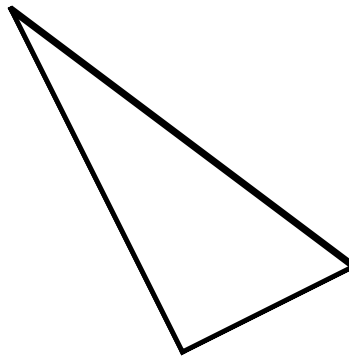
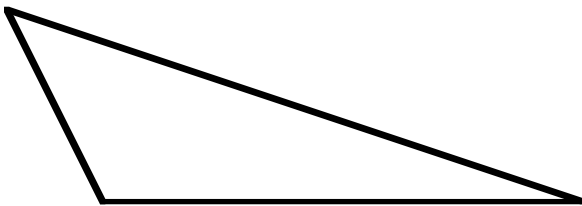
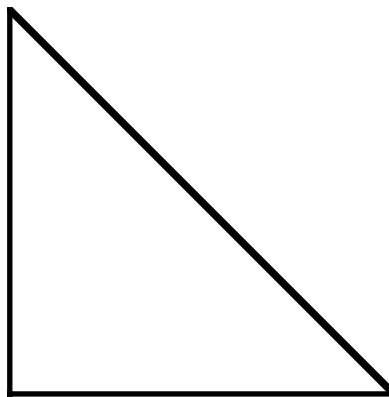
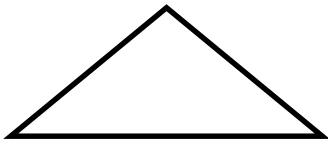
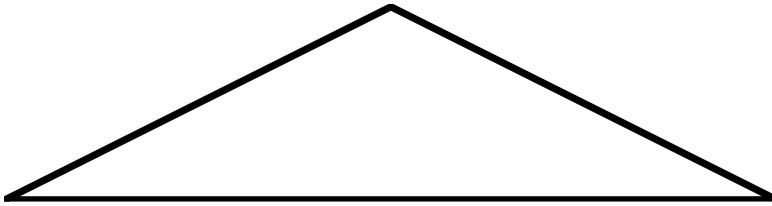
To achieve this objective, students should be able to:

- *Estimate angle measures using benchmarks and find precise angle measures of two-dimensional figures using appropriate tools.*
- *Estimate length measures using benchmarks and find precise length measures of two-dimensional figures using appropriate tools.*
- *Estimate weight/mass measures using benchmarks and find precise weight/mass measures of three-dimensional objects using appropriate tools.*
- *Understand and find perimeter and area of simple and composite two-dimensional figures.*

A. Use your centimeter ruler to determine the perimeter and area of each figure below.



- B.** For the triangles below give the measures of the angles and the sides. Determine if the triangle is
- right, obtuse, or acute
 - equilateral, isosceles, or scalene



Vocabulary and Resources

protractor
degree
vertex
acute angle
obtuse angle
right angle
complementary angles
supplementary angles

balance scale

metric system
meters
centimeters
kilometers
grams
kilograms

customary system
feet
inches
yards
miles
ounces
pounds

square units

parallelogram
triangle
trapezoid
height
altitude

C. Using a protractor, measure each angle in each figure below. State whether each angle is acute, obtuse or right.

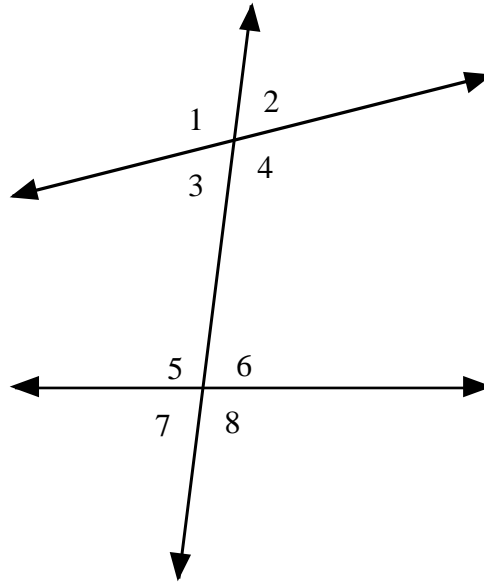


Figure 1

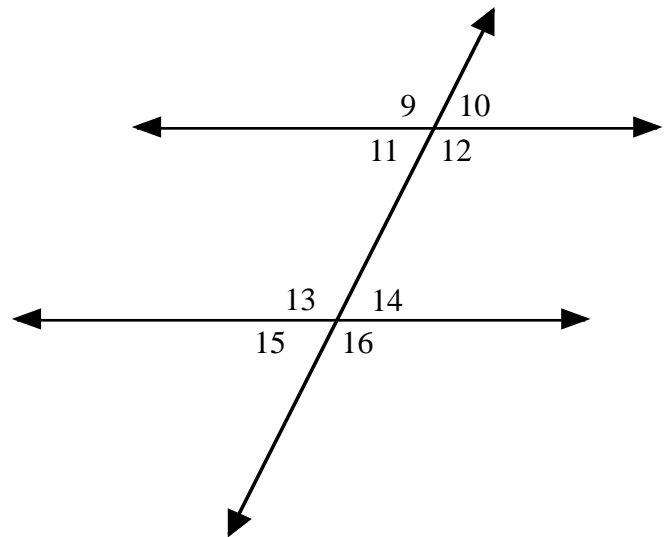


Figure 2

- D.** Find containers that are represented by the shapes below.
- Measure the dimensions of each container.
 - Measure the mass of each empty container .
 - Estimate what mass of rice would be needed to fill each container.
 - Plan a strategy to find the actual mass of the rice .
 - Compute the actual mass of the rice needed to fill the container.



Figure A

Length _____
Width _____
Height _____
Mass _____

Estimated mass of rice _____

Actual mass of rice _____

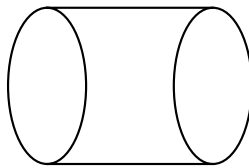


Figure B

Radius _____
Diameter _____
Height _____
Circumference _____
Mass _____

Estimated mass of rice _____

Actual mass of rice _____

2.02 Solve problems involving perimeter/circumference and area of plane figures.

To achieve this objective, students should be able to:

- *Understand that the area of an object is the number of unit squares needed to cover it and the perimeter of an object is the number of units of length needed to surround it.*
- *Understand that the circumference of a circle is the number of units of length needed to surround it.*
- *Develop techniques for estimating the area of a circle.*
- *Discover that it takes slightly more than three (π) times the square of the radius to equal the number of square units in the area of a circle.*
- *Understand that two figures with the same area may have different perimeters and that two figures with the same perimeter may have different areas.*
- *Understand how the area of a rectangle is related to the area of a triangle and of a parallelogram.*
- *Develop formulas – stated in words or symbols – for finding areas and perimeters of rectangles, parallelograms, triangles, and circles and then use these formulas to solve problems.*

A. Carlos paid \$8.99 for a large pizza (16-inch diameter). Tameka bought two rectangular pan pizzas, each of which measured 11 inches by 13 inches. She paid a total of \$10.99 for the two pizzas. Which pizza is the better buy based on the number of square inches per pizza?

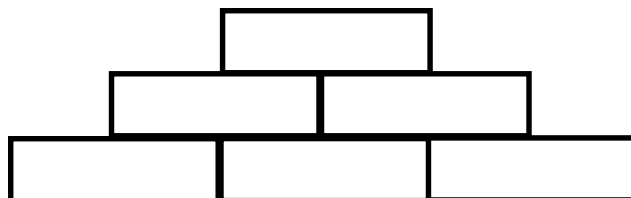
B. Plastic edging for flower beds comes in 50-foot rolls and costs \$6.85 per roll. What is the cost to completely edge two rectangular flower beds 40 feet by 15 feet and one circular flower bed 16 feet in diameter?

(From SREB publication *Getting Students Ready for Algebra I: What Middle Grades Students Need to Know and Be Able to Do*)

C. The area of a square is 196 square meters. If one-half of the perimeter of the square is the same as the perimeter of a regular pentagon, what is the length of one side of the pentagon?

D. Which has the smallest area, a circle with a diameter of 3 yards, a triangle with a base of 20 feet and a height of 11 feet, or a square with a side of 10.5 feet?

E. In the given diagram each rectangle is centered on the two rectangles directly below any given rectangle. If each rectangle has a length of 13 centimeters and a width of 4 centimeters, determine the perimeter and area of the given figure. If two more rows of rectangles are added, determine the perimeter and area of the new figure.



F. Mr. Evans is going to replace the carpet in his family room. The dimensions of the room are 22.5 feet by 26.5 feet. If the cost of the carpet, pad, and installation is \$28.75 per square yard, what will be the total cost excluding tax?

G. One pipe has a 1.25 centimeter diameter. A second pipe has a two and one-half centimeter diameter. What is the difference in the area of the openings of the two pipes?

H. An eight inch diameter pizza costs \$6.95. Kate asserts that a 16-inch diameter pizza (same toppings, same crust) should cost \$13.90. Explain her reasoning and determine if this is a fair price. If not, what would be a fair price?

Vocabulary and Resources

pi
radius
diameter
circle

polygon
triangle
quadrilateral
pentagon
hexagon
octagon
nonagon
decagon

square units

height
altitude

- Understand and know that the intersection of figures and/or lines in a plane create interior and exterior regions and/or angles.
- Understand and know that two different lines in a plane either intersect or are parallel and that perpendicular lines intersect at a 90° angle.
- Understand and know that two lines intersect if they have a common point.

parallel
perpendicular

C. Three different lines, l_1 , l_2 , and l_3 are located in a given plane. Sketch different possibilities for the intersection of these lines.

D. Two parallel lines are located 6" apart. A circle with a diameter of 2" is drawn. Give a diagram to illustrate each of the following:

- a) Two points of intersection
- b) One point of intersection
- c) No point of intersection

E. Two parallel lines are located 5" apart. A circle with a diameter of 8" is drawn. Give a diagram to illustrate each of the possibilities for the intersection of the two parallel lines with the circle.

F. Two pairs of parallel lines, l_1 and l_2 located 2 cm apart, and l_3 and l_4 located 5 cm apart, intersect in a plane. What are the possible figures determined by their intersection?

G. Graph triangle ABC with coordinates (7, -2), (-2, 2), (-1, -3) and rectangle $RSTU$ with coordinates (6, -1), (6, 1), (-4, 1), and (-4, -1).

- a) Give the coordinates of points that satisfy each of the following conditions:
 - in the interior of both the triangle and the rectangle
 - in the interior of the rectangle only
 - in the interior of the triangle but in the exterior of the rectangle
 - in the interior of the rectangle but in the exterior of the triangle
- b) Shade the region in the first quadrant that is formed by the intersection of the two figures.

3.02 Identify the radius, diameter, chord, center, and circumference of a circle; determine the relationships among them.

To achieve this objective, students should be able to:

- *Know that the perimeter of a circle is called its circumference.*
- *Discover that it takes slightly more than three (π) diameters to equal the circumference of a circle.*
- *Know that the circumference is greater than the diameter ($C = \pi d$), and the diameter is greater than the radius ($d = 2r$).*
- *Know that the diameter is the longest chord in a circle.*

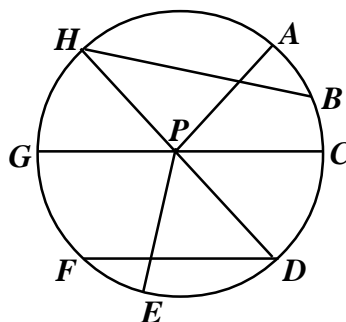
pi (π)
ratio
proportion

A. The circumference of a truck wheel is 9.5 meters. How would you find the diameter of the wheel?

B. A circle has a radius of 15 centimeters. How do you find the diameter and circumference of the circle. What is the maximum length of any chord of this circle?

C. For circle P , name the following:

- the center
- a radius
- a diameter
- a chord that is not a diameter



D. Select five circular objects and complete the table with the required information.

Object	Circumference	Diameter	$\frac{c}{d}$	r	r^2	Area

Note any relationships that you observe.

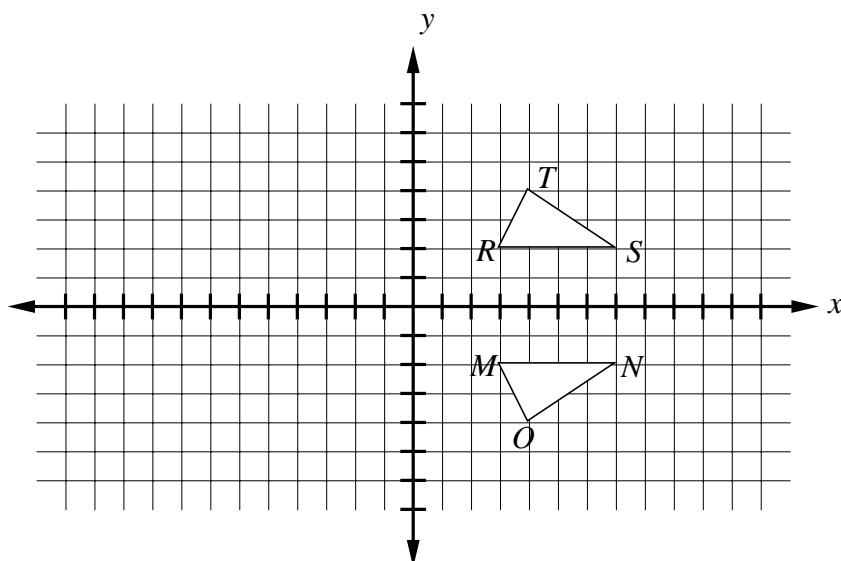
E. If a chord of a circle measures 8 centimeters, what is the minimum area the circle could have. Explain.

3.03 Transform figures in the coordinate plane and describe the transformation.

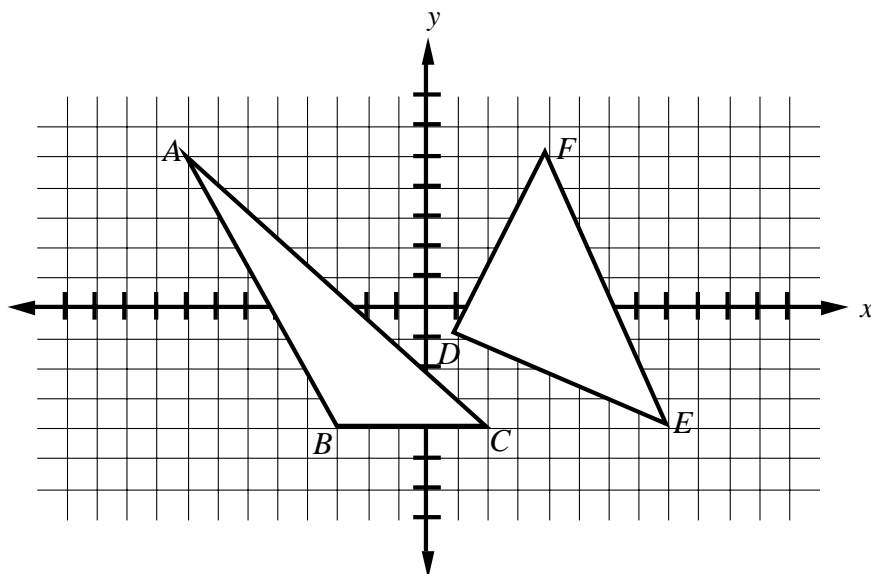
To achieve this objective, students should be able to:

- Plot points in the four quadrants of a coordinate grid.
- Understand that translations, reflections, and rotations produce a second figure (image) congruent to the original figure (pre-image).
- Use sample notation (see side bar) to describe transformations.
- Recognize that a transformation of the form $(x', y') = (x + a, y + b)$ is a translation which moves the point (x, y) a units horizontally and b units vertically.
- Reflect a figure over a given line in the plane and name the coordinates of the image.
- Translate a figure in the plane and name the coordinates of the image.
- Rotate a figure in the plane about a given point (angle of rotation a multiple of 90°) and name the coordinates of the image.

A. $\triangle RST \rightarrow \triangle MNO$ Identify the transformation that occurred. Give the coordinates of points M , N , and O . Write in words a description of this transformation.



- B.** Triangle ABC is translated 4 units to the right and two units down. Give the coordinates of triangle $A'B'C'$. Is triangle $A'B'C'$ congruent to triangle ABC ? Using the same rule, give the coordinates of triangle $D'E'F'$.



- C.** Graph a figure in the coordinate plane. Describe a reflection of this figure that will produce the same result as a translation of the figure, and graph the resulting figure.

- D.** Triangle ABC is rotated 90° clockwise about the origin. If the coordinates of B are $(-4, 4)$, what are the coordinates of B' ?
(Adapted from SREB publication *Getting Students Ready for Algebra I: What Middle Grades Students Need to Know and Be Able to Do*)

- E.** Triangle ABC : $A(4, 5)$, $B(3, 7)$, $C(5, 7)$ is reflected over the line containing $(2, 7)$ and $(6, 7)$. The image and pre-image together form which polygon?

- F.** Graph the quadrilateral: $P(5, 6)$, $Q(6, 4)$, $R(3, 2)$, $S(2, 4)$. If the polygon is transformed according to the rule $(x', y') = (x + 2, y + 1)$, where will the diagonals of the new polygon $P'Q'R'S'$ meet? Is figure $PQRS$ congruent to figure $P'Q'R'S'$?

Vocabulary and Resources

reflection (flip)
translation (slide)
rotation (turn)
line of reflection
center of rotation
angle of rotation
pre-image
image

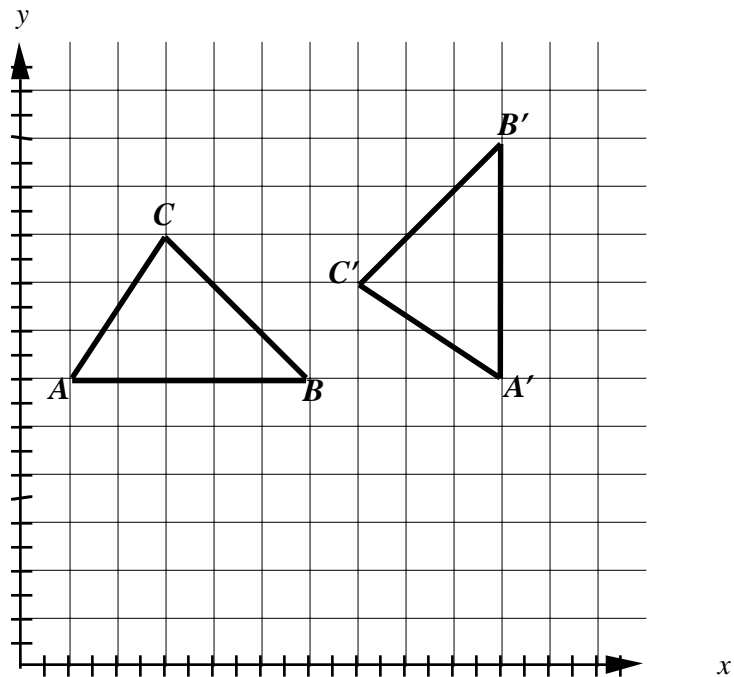
x -axis
 y -axis
quadrants
Quadrant I
1st Quadrant
Quadrant II
2nd Quadrant
Quadrant III
3rd Quadrant
Quadrant IV
4th Quadrant

clockwise
counterclockwise

notation:
 $\triangle ABC \rightarrow \triangle DEF$
 $\triangle ABC \rightarrow \triangle A'B'C'$
 $A \rightarrow A'$
 $(x, y) \rightarrow (x', y')$
 $(x', y') = (x + a, y + b)$

mirrors
patty paper

G. What transformations were performed to move triangle ABC to triangle $A'B'C'$?



H. What is the image of triangle ABC : $A(1, 4)$, $B(3, 2)$, $C(1, 2)$ if it is translated to the left five units and down six units?

I. Trapezoid $DEFG$: $D(1, 7)$, $E(3, 9)$, $F(7, 9)$, $G(8, 7)$ is reflected over its longer base. Name polygon $DEFGF'E'$.

3.04 Solve problems involving geometric figures in the coordinate plane.

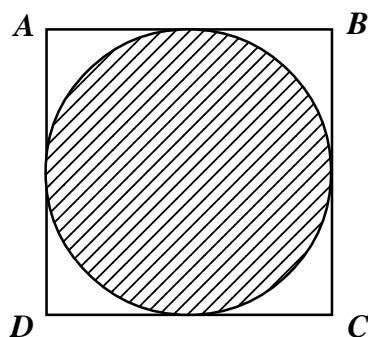
A. Given the points $A(3, 1)$, $B(3, 6)$, and $D(7, 1)$, what are the coordinates of C if figure $ABCD$ is a rectangle? Determine the perimeter and area of figure $ABCD$.

B. Graph triangle ABC : $A(4, 9)$, $B(1, 3)$, $C(8, 3)$. Determine the area of the triangle. Give the coordinates for a triangle DEF that has an area twice that of triangle ABC .

C. Graph figure $PQRS$: $P(-4, 5)$, $Q(10, 5)$, $R(10, -3)$, $S(-4, -3)$.

- Determine the area and perimeter of the figure.
- Give the coordinates of a figure that has a perimeter half that of figure $PQRS$.
- Give the coordinates of a triangle that has an area half that of figure $PQRS$.

D. Figure $ABCD$ is located in the coordinate plane with the following vertices: $A(-2, 3)$, $B(6, 3)$, $C(6, -5)$ and $D(-2, -5)$. A circle is drawn in the figure as shown below. Give the radius, diameter, and circumference of the circle. Find the area of the unshaded region.



Vocabulary and Resources

reflection (flip)
translation (slide)
rotation (turn)
line of reflection
center of rotation
angle of rotation
pre-image
image

x -axis
 y -axis
quadrants
Quadrant I
1st Quadrant
Quadrant II
2nd Quadrant
Quadrant III
3rd Quadrant
Quadrant IV
4th Quadrant

clockwise
counterclockwise

notation:
 $\triangle ABC \rightarrow \triangle DEF$
 $\triangle ABC \rightarrow \triangle A'B'C'$
 $A \rightarrow A'$
 $(x, y) \rightarrow (x', y')$

4.01 Develop fluency with counting strategies to determine the sample space for an event. Include lists, tree diagrams, frequency distribution tables, permutations, combinations, and the Fundamental Counting Principle.

To achieve this objective, students should be able to:

- *Develop a variety of strategies to find sample spaces in order to determine theoretical probabilities; strategies include using:*
 - *Organized lists of all possible outcomes*
 - *Frequency distribution tables*
 - *Tree diagrams: Find all possible outcomes involving a limited number of choices*
 - *Permutations: Find all possible arrangements involving a limited number of choices*
 - *Combinations: Find all possible combinations and arrangements involving a limited number of choices*
- *Use the Fundamental Counting Principle to determine the number of possible outcomes for combinations of independent events.*

sample space
favorable outcomes
possible outcomes

A. John, Paul, George and Roger were all listening to the same radio station when it was announced that there were free tickets being given away to the latest movie. All four placed a phone call. List all possibilities for the order in which these four calls could be received.

B. Nancy will choose one salad, one dessert, and one drink for her lunch. The salad choices are: chicken, tuna, or ham. The dessert choices are: chocolate cake, ice cream, or cookie. The drink choices are milk or juice. How many different lunch combinations are possible?

C. Count the total number of letters in the first and last names for each student in your class and record the information in a frequency distribution chart similar to the one below.

Number of Letters in Name	Tally	Frequency
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		

- How many students have 5 letters in their name? 12 letters? 16 letters?
- What is the probability that a new student added to your class will have 12 letters in his/her name? 5 letters?
- Find the median, mode and range for this set of data.

D. Clay has three pairs of shorts and five coordinating shirts. How many days can Clay wear a different combination of shirt and shorts.

E. The swim coach needs to select four swimmers from a group of six who are qualified to swim in the freestyle relay. How many different relay teams are possible?

4.02 Use a sample space to determine the probability of an event.

To achieve this objective, students should be able to:

- *Understand that probabilities are useful for predicting what will happen over the long run.*
- *Understand the concepts of equally likely and not equally likely outcomes.*
- *Understand the idea that probability, p , is always $0 \leq p \leq 1$. Probability, p , can be written as a common fraction, decimal fraction, or percent.*
- *Understand that the sum of the probabilities of all possible outcomes for a given event is always 1.*
- *Understand that an event is the outcome of a trial.*
- *Use counting strategies in contexts involving counting discrete events (e.g., tosses of coins or number cubes; drawing objects from bag), determining areas (e.g., grids), and measuring angles (e.g., using spinners) to determine the probability of an event.*

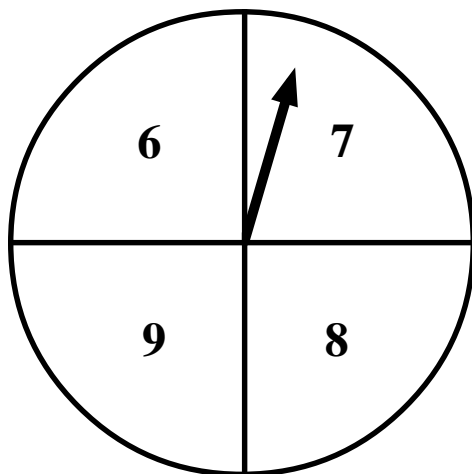
possible outcomes
favorable outcomes
geometric probability

A. T. K. Chance tossed four fair coins. List the ways he could get one head and three tails. What is the probability that he will get exactly three tails when he tosses four fair coins? Predict the number of times he would get exactly three tails when tossing four fair coins 500 times.

B. A fair coin is to be tossed three times. What is the probability that two heads and one tail in any order will result?
(Adapted from SREB publication *Getting Students Ready for Algebra I: What Middle Grades Students Need to Know and Be Able to Do*)

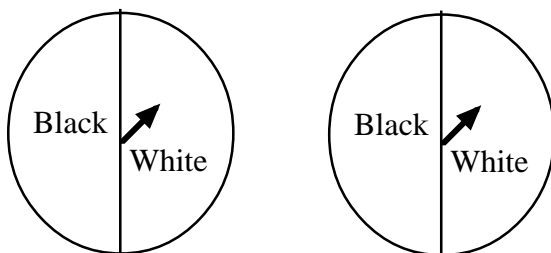
C. Blake is helping his younger brother Ben with his addition facts. Ben spins the fair spinner twice and determines the sum of the two numbers.

- a) What is the probability that the two numbers will produce the smallest possible sum? the largest possible sum?
- b) What is the probability that the sum will be greater than 13?
- c) What is the probability that the sum will be an even number?
- d) Is there one sum that is more likely to occur than any other sum? Explain.



D. Suppose you toss two fair number cubes with faces labeled zero to five and then determine the sum of the two numbers. What is the probability of obtaining a sum of seven?

E. The two fair spinners shown below are part of a carnival game. A player wins a prize only when both arrows land on black after each spinner has been spun once. James thinks he has a 50-50 chance of winning. Do you agree? Justify your answer.



(Adapted from SREB publication *Getting Students Ready for Algebra I: What Middle Grades Students Need to Know and Be Able to Do*)

F. Rebecca is throwing darts at a square dart board that measures 3 feet on a side and has a blue circular region in the center with a diameter of 2 feet. What is the probability that the dart will land on the dart board in the blue region?

4.03 Conduct experiments involving simple and compound events.

To achieve this objective, students should be able to:

- *Recognize that simultaneous trials and trials conducted one at a time give the same information.*
- *Understand that simple events are those which consist of a single outcome. Rolling a 5 when rolling a die is a simple event (only one way for this to occur: 5).*
- *Understand that compound events are those which consist of more than one outcome. Rolling an even number when rolling a die is a compound event (three ways for this to occur: 2, 4, and 6).*
- *Understand the distinction between simple events and compound events.*

experimental results
sample space
outcomes
favorable outcomes
possible outcomes

tree diagrams
organized lists
Fundamental Counting
Principle

A. Conduct an experiment using a styrofoam cup by tossing the cup and recording how it lands.

- How many trials did you conduct?
- How many times did it land right side up?
- How many times did it land upside down?
- How many times did it land on its side?
- Can you determine the probability for each of the above results?

B. Devise an experiment using a coin to determine whether a baby is a boy or a girl. Conduct the experiment ten times to determine the gender of ten births. How could you use a die to simulate whether a baby is a girl or a boy?

C. Is the probability of getting two heads greater if you toss three coins at the same time or toss one coin three times in succession? Explain your answer.

D. You and a friend are going to play a game where you each roll a fair number cube labeled with the numbers 1 through 6. If the resulting two numbers determine a rational number in lowest terms, your friend gets a point; however, if the numbers determine a rational number that is not in lowest terms, you get the point. Repeat this 20 times and record the data in a table with the following headings.

Rational Number	Points	
	Player 1 (Lowest Terms)	Player 2 (Not in Lowest Terms)

Based on the results, decide if this is a fair game and explain why or why not. How do these experimental results compare with the theoretical probability of getting a rational number in lowest terms under these conditions?

E. Identify each of the following as a simple or compound event. Determine the probability of each.

- rolling a 4 on a fair number cube
- rolling a prime number on a fair number cube
- drawing a vowel from a bag of 26 alphabet cards
- drawing the letter p from a bag of 26 alphabet cards
- selecting a red jelly bean from a bag containing six red, two green, and four orange jelly beans

4.04 Determine and compare experimental and theoretical probabilities for simple and compound events.

To achieve this objective, students should be able to:

- *Understand that experimental probability is determined by gathering data from experiments and theoretical probability is determined by analyzing all possible outcomes.*
- *Understand that a small number of trials may produce a wide variation in results.*
- *Understand the relationship between experimental and theoretical probabilities: when an experimental probability is based on a large number of trials, it is a good estimate of the theoretical probability.*

experimental results
sample space
outcomes
favorable outcomes
possible outcomes
geometric probability

tree diagrams
organized lists
Fundamental Counting
Principle

A. What is the probability of getting two heads when you toss two fair coins, a quarter and a nickel, at the same time?

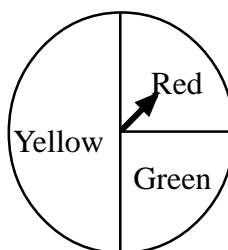
B. Your teacher has a bag of Starburst™ candies. There are six cherry, four orange, and ten lemon candies in the bag. If you close your eyes and select one piece of candy from the bag, what is the probability it will be orange? Which flavor are you most likely to select?

C. If you are tossing a fair coin and recording the results as heads or tails, which of the following is more likely:

- a) two heads if you toss the coin three times
- b) twenty heads if you toss the coin thirty times?

Explain your answer.

D. Charmaine is using this spinner to play a game. When playing the game, she spun the spinner 120 times and it landed on red ten times. Assuming that this is a fair spinner, are these results unusual?



E. Jason is tossing a fair coin. He tosses the coin ten times and it lands on heads eight times. If Jason tosses the coin an eleventh time, what is the probability that it will land on heads?

F. When tossing a pair of fair dice, what is the probability that the sum of the two numbers will be even? What is the probability that the sum of the two numbers will be 12? What sum is most likely to occur?

G. With a tied score and five seconds left in the basketball game, the coach has to decide on the best player to send to the foul line. Simpson made 150 of the last 206 free-throw shots he has attempted, Sandman made 78 of the last 95 free-throw shots he has attempted, and Vincent made 84 of the last 123 free-throw shots he has attempted. Who do you think the coach should select? Explain your reasoning.

H. A bag contains 100 marbles, some red and some purple. Suppose a student, without looking, chooses a marble out of the bag, records the color, and then places the marble back in the bag. The student has recorded 9 red marbles and 11 purple marbles. Using these results, predict the number of red marbles in the bag.

(Adapted from SREB publication *Getting Students Ready for Algebra I: What Middle Grades Students Need to Know and Be Able to Do*)

4.05 Determine and compare experimental and theoretical probabilities for independent and dependent events.

To achieve this objective, students should be able to:

- *Understand that two events are independent if they do not influence each other.*
- *Understand that if two events are not independent they are dependent.*

experimental results

sample space
favorable outcomes
possible outcomes

with replacement
without replacement

A. Charlie received a miniature gumball machine for his birthday. The machine holds ten large gumballs. Currently there are two yellow, three blue, one white and four red gumballs in the machine. Assuming the gumballs have an equal chance of being released, what is the probability that the gumball machine releases a blue gumball followed by a yellow gumball if Charlie does not put the first gumball back in the machine? Does the probability of the situation change if Charlie puts the first gumball back into the machine after seeing what color it is? Explain.

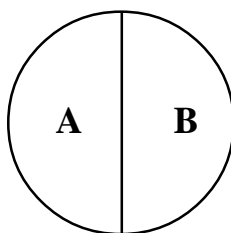
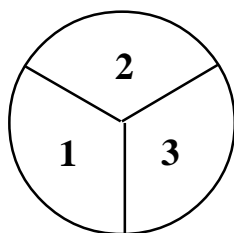
B. Janet is tossing a fair coin and rolling a fair number cube numbered 1 to 6. What is the probability that the coin will land on heads and she will roll a factor of 6?

C. There are three green, four red, five orange, and six brown M&M's™ in a bag. Without looking, you pick one M&M's™ out of the bag and eat it. You then pick another M&M's™ out of the bag. What is the probability that both M&M's™ will be red? What is the probability that one will be orange and the other will be green?

D. There are three blue chips and two red chips in a bowl.

- a) List the sample space if you draw two chips in succession, without replacement. What is the probability of drawing two blue chips?
- b) List the sample space if you draw two chips in succession, with replacement. What is the probability of drawing two blue chips?
- c) Explain why the probabilities are different.

E. Given the following two spinners:



List the sample space when you spin both spinners. What is the probability of spinning a 2B?

F. A bowl contains three pieces of paper labeled with the numbers 1, 2, and 3.

a) Suppose you draw two pieces of paper out of the bowl, without replacing the first piece before drawing the second piece, and add the numbers. List the sample space. What is the probability of a sum of five?

b) Suppose you draw two pieces of paper out of the bowl, replacing the first piece before drawing the second piece, and add the two numbers. List the sample space. What is the probability of a sum of five?

c) Explain why these two probabilities are not the same.

G. Jamal is playing “Pick-A-Fish” at the carnival. There are ten fish in the pond. Two of the fish are worth 15 points, three are worth 10 points and five are worth 8 points. The prize he would like requires two 15-point fish. What is the probability he will win the prize with only two picks if he does not put the first fish he selects back in the pond? What is the probability he will win the prize with only two picks if he does put the first fish he picks back in the pond?

H. Your teacher has a bag of M&M’s™. The bag contains 12 red M&M’s™, 10 blue M&M’s™, 15 orange M&M’s™, and 10 green M&M’s™. If you are the first person to select candy from the bag and the teacher allows you to keep the first piece you select and then select a second piece, what is the probability that you will select one red M&M™ and one orange M&M™? What is the probability that you will select one red M&M™ and then one orange M&M™? Are these answers the same? Explain.

4.06 Design and conduct experiments or surveys to solve problems; report and analyze results.

To achieve this objective, students should be able to:

- *Pose questions, collect and analyze data, and make interpretations of the results to answer questions.*
- *Understand and evaluate different methods for selecting a sample for a survey.*

sample space

representative sample

theoretical probability
experimental results

A. Design and conduct a survey. Explain the purpose of the survey, question(s) used, and procedure you followed. Display the data collected in an appropriate format and analyze the results.

B. Jenn is the head cheerleader at her school. She is thinking of running for student council and decides to survey the other cheerleaders and ask them if they would vote for her in the upcoming student council election. Will this sample give her the information she needs? Explain.

C. Taylor is playing a game that requires her to roll four fair number cubes and record the sum of the four numbers. Design an experiment to determine:

- the probability that the sum will be less than 15;
- the probability that the sum will be an even number.

How many trials do you think you would need to conduct to be fairly confident of your results?

5.01 Simplify algebraic expressions and verify the results using the basic properties of rational numbers.

- a) Identity.*
- b) Commutative.*
- c) Associative.*
- d) Distributive.*
- e) Order of operations.*

To achieve this objective, students should be able to:

- *Simplify first-degree algebraic expressions involving operations with non-negative numbers.*
- *Build an understanding of identity, commutative, associative, and distributive properties with first-degree algebraic expressions involving operations with non-negative numbers.*
- *Use the order of operations to simplify symbolic first-degree algebraic expressions that involve operations with non-negative numbers.*
- *Use the three forms of standard notations for multiplication. Ex. Two times three:*
 $2 \times 3 = 2 \cdot 3 = 2(3)$

A. Simplify each of the following expressions and write the property that allows you to complete each step:

- a. $w + 4(y + 8w)$
- b. $3(m + 5) + 5(2m + 6)$
- c. $7(x + y) + 3x - 5y$
- d. $2(x + 19) + 3(x - 10)$

*Vocabulary
and
Resources*

term
like terms
combining like terms
equivalent expressions
coefficient
variable
exponents
operations with
exponents (x and ÷)
multiplicative identity
additive identity
multiplicative inverse
additive inverse
grouping symbols
order of operations
parentheses
brackets
braces

Students need to be familiar
with a variety of notations
for multiplication:

2×3
 $2 \cdot 3$
 $2(3)$

B. Rewrite $8 \cdot 6z + 8 \cdot 7y$ using the distributive property.

C. Simplify each of the following:

- $80x + 2y - 15x + 3y$
- $80y \div 2 \cdot 6 + 4y$
- $6x \cdot 3 \div 9 - 1$
- $3x + 10(2x - 4) + 32x \div 2^4$
- $3x + 10 \cdot 2x - 4 + 32x \div 2^4$

D. In the blank write the property that allows you to go from one step to the next in the example below.

$$3(w + 5) + 5w + 2$$

$$3w + 15 + 5w + 2$$

$$3w + 5w + 15 + 2$$

$$(3w + 5w) + (15 + 2)$$

$$8w + 17$$

5.02 Use and evaluate algebraic expressions.

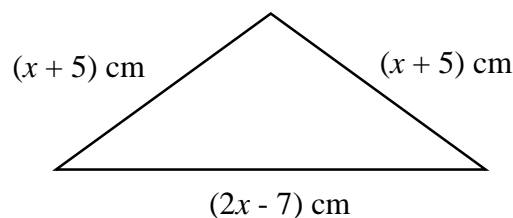
Vocabulary
and
Resources

To achieve this objective, students should be able to:

- *Evaluate algebraic expressions involving operations with non-negative numbers.*
- *Develop understanding of equivalent expressions involving operations with non-negative numbers.*
- *Translate phrases into algebraic expressions and algebraic expressions into phrases.*
- *Use algebraic expressions to describe situations in problem-solving contexts.*

A. Jeff was told that he is allowed to check a maximum of w pounds of luggage on an airplane. If one of his bags weighs 55 pounds, write an expression to represent the amount of additional weight he can check.

B. Give a simplified expression to represent the perimeter of the figure below. If x has a value of 22, what is the perimeter of the figure?



C. Evaluate each of the following expressions if $m = 5$, $x = 7$, and $y = 12$.

- | | | |
|-----------------------------|------------------------|----------------------|
| a) $6.5(m + y)$ | b) $\frac{10x + m}{y}$ | c) $18 \div y + x$ |
| d) $\frac{15m - 3y}{x + 6}$ | e) $5(y - m)$ | f) $49 \div (x + m)$ |
| g) $15xy$ | | |

combining like terms
coefficient
variable
equivalent expressions
exponents
operations with
exponents (\times and \div)
order of operations

D. Vernon wants to buy 3 CD's and 2 DVD movies. Write an expression that represents the amount of money Vernon needs if c is the cost of one CD and m is the cost of one DVD movie. If each CD costs \$18 and each DVD movie costs \$22, what will be the total cost?

5.03 Solve simple (one- and two-step) equations or inequalities.

Vocabulary and Resources

A. Solve each of the following equations or inequalities:

a. $w + 2.97 = 13.5$

e. $0.5s \leq 64.5$

b. $3m + 5 = 28$

f. $12w > w + 583$

c. $7x - 18 = 10.56$

g. $4.8z - 9.02 \geq 8.74$

d. $\frac{2}{3}(x + 2.5) = 18$

h. $\frac{3}{4}t < 16.05$

B. Zara wants to buy her mother a birthday gift that costs \$60. She has saved \$45. Write and solve an equation to determine how much more money, m , Zara needs for the gift.

C. Mr. Ames rented a car from One-Stop-Rent-A-Car. They charge a daily rate of \$42 plus \$0.35 per mile. The bill for a one-day rental was \$84.70. Write and solve an equation to determine how many miles, m , Mr. Ames drove?

D. The charter bus company we are renting from will get us buses that seat 55 students. If there are 250 students and 9 teachers, what is the minimum number of buses we need to charter for the sixth grade trip? Write an inequality that represents this situation. What is the minimum number of buses required?

E. Hector wants a new CD Player and some new CDs. The best price he has found for the CD Player is \$30 and the CDs are \$15 each. What is the maximum number of CDs he could buy with \$110? Write an inequality that represents this situation.

variable
additive inverse
multiplicative inverse
distributive property
equivalent expressions
order of operations

less than
<
greater than
>
less than or equal to
 \leq
greater than or equal to
 \geq

When working with inequalities, students should be exposed to various models including a balance.

5.04 Use graphs, tables, and symbols to model and solve problems involving rates of change and ratios.

To achieve this objective, students should be able to:

- *Analyze the relationship between variables on a graph.*
- *Make a graph that shows the relationship between two variables by identifying the two variables, choosing an axis for each, and selecting an appropriate scale for each axis.*
- *Read data given in a table and make a graph from the table.*
- *Read data given in a graph and make a table from the graph.*
- *Describe rates of change algebraically and verbally using data from tables and graphs.*
- *Recognize and write ratios to describe different situations.*

equivalent ratios
proportions

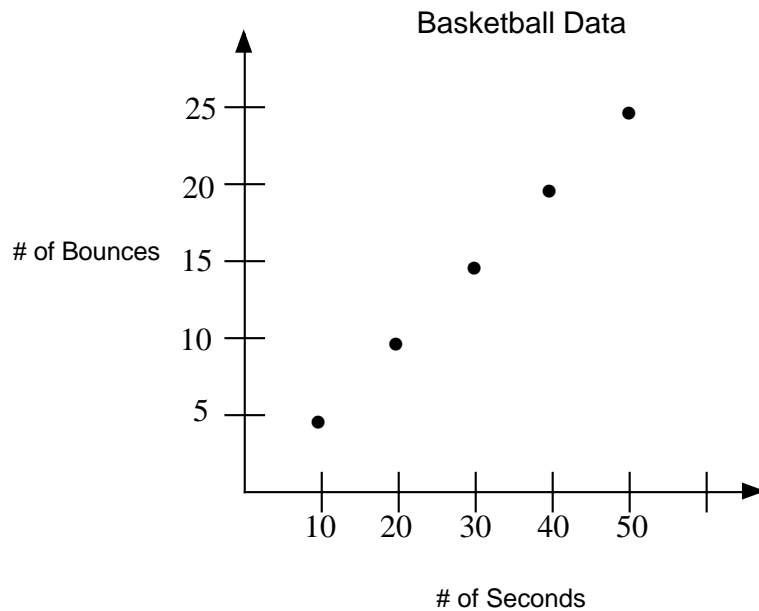
A. There are 25 students in Ms. Simple's class. If the ratio of boys to girls is 2:3, how many boys and girls are there in Ms. Simple's class?

- B.** Use the information in the table below to predict how many wins Allison would have after she plays 32 matches of tennis assuming the rate of wins stays the same.

Allison's Tennis Record

Matches Won	Matches Lost	Matches Tied
4	1	3
8	2	6
12	3	9
<div style="border: 1px solid black; display: inline-block; padding: 2px 5px;">?</div>	4	12

- C.** The graph below shows how many bounces of a basketball can occur based on the number of seconds it is bounced. Based on the data in the graph below, what is the rate of change?



D. Study the pattern below. Draw the next three figures in this pattern. Then fill out the chart below. Describe the fifteenth figure in this series. Write an expression that models this pattern. If the squares are made of toothpicks, how many toothpicks would be needed for the 50th figure?

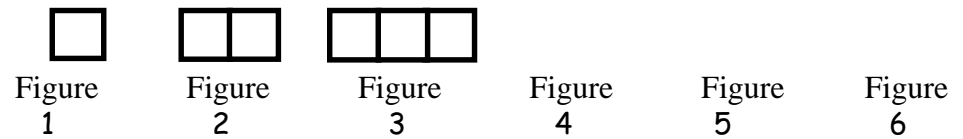


Figure Number	Number of Toothpicks
1	4
2	
3	
4	
5	
6	