GRADE SEVEN INDICATORS

FOR THE

MATHEMATICS

STANDARD COURSE OF
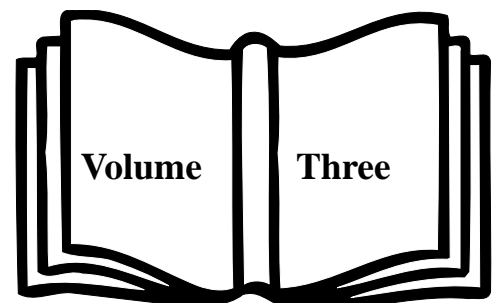
STUDY

Volume Three

NC DEPARTMENT OF PUBLIC INSTRUCTION
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The Indicators for Grade Seven 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 Seven 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 (lpatch@dpi.state.nc.us or 919.807.3841).

Grade 7

Number and Operations

1.01 Develop and use ratios, proportions, and percents to solve problems.

1.02 Develop fluency in addition, subtraction, multiplication, and division of 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.

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

Measurement

2.01 Draw objects to scale and use scale drawings to solve problems.

2.02 Solve problems involving volume and surface area of cylinders, prisms, and composite shapes.

Geometry

3.01 Using three-dimensional figures:
a) Identify. describe, and draw from various views (top, side, front, corner).
b) Build from various views.
c) Describe cross-sectional views.

3.02 Identify, define, and describe similar and congruent polygons with respect to angle measures, length of sides, and proportionality of sides.

3.03 Use scaling and proportional reasoning to solve problems related to similar and congruent polygons.

Data Analysis and Probability

4.01 Collect, organize, analyze, and display data (including box plots and histograms) to solve problems.

4.02 Calculate, use, and interpret the mean, median, mode, range, frequency distribution, and interquartile range for a set of data.

4.03 Describe how the mean, median, mode, range, frequency distribution, and inter-quartile range of a set of data affect its graph.

4.04 Identify outliers and determine their effect on the mean, median, mode, and range.

4.05 Solve problems involving two or more sets of data using appropriate statistical measures.

Algebra

5.01 Identify, analyze, and create linear relations, sequences, and functions using symbols, graphs, tables, diagrams, and written descriptions.

5.02 Translate among different representations of algebraic expressions, equations and inequalities.

5.03 Use and evaluate algebraic expressions, linear equations or inequalities to solve problems.

5.04 Develop fluency in the use of formulas to solve problems.

1.01 Develop and use ratios, proportions, and percents to solve problems.

To achieve this objective, students should be able to:

• *Understand and use standard ratio notation for expressing ratios (e.g., 3:5, 3 to 5, $\frac{3}{5}$, 60 out of 100 or 60%)*

• *Understand that a ratio can represent a part-to-part relationship (three boys to five girls) or a part-to-whole relationship (three boys to eight students).*

• *Recognize problem situations in which ratios are appropriate and in which they are not appropriate.*

• *Use a variety of strategies to solve problems, including build-up strategies, tables, unit rates, percents, equivalent ratios, and simple equations.*

A. Jenni is mixing punch for 18 people. Her recipe, which calls for $2\frac{1}{2}$ cups of sugar, serves 12. How much sugar will she use if she adjusts the recipe to serve 18?

B. One out of every three M&Ms™ is red. If a bag contains approximately 65 M&Ms™, how many would you expect to be red?

C. Zeb, Stacy, and Devon are best friends. Unfortunately they were placed on each of the three seventh grade teams at their school. Each of their math teachers gave the same test last week but their grading methods were different. Stacy said she received a score of $\frac{25}{30}$. Devon reported a score of 75%. Zeb explained that his teacher records scores as a ratio of the number of problems correct to the number of problems incorrect and that he received a score of 24:6. Give the friends' performance on the test in ascending order. Justify your results.

D.   Braxton has cows and pigs in his barnyard. The ratio of cows to pigs is 2 to 3. If there are 100 animals in the barnyard, how many of each are there?

E.   At La Cantina Italian Grill 12 girls shared five large pizzas equally and eight boys shared three large pizzas equally. Who ate more pizza, a boy or a girl?

F.   Luis mixed 6 ounces of cherry syrup with 53 ounces of water to make a cherry-flavored drink. Martin mixed 5 ounces of the same cherry syrup with 42 ounces of water. Who made the drink with the stronger cherry flavor? Give mathematical evidence to justify your answer.
(From SREB publication *Getting Students Ready for Algebra I: What Middle Grades Students Need to Know and Be Able to Do*)

G.   A certain machine produces 300 nails per minute. At this rate, how long will it take the machine to produce enough nails to fill 5 boxes of nails if each box will contain 250 nails?
(From SREB publication *Getting Students Ready for Algebra I: What Middle Grades Students Need to Know and Be Able to Do*)

H.   A calculator sells for $9.99 in a certain state. The purchase price including tax is $10.69. To the nearest whole percent, what is the sales tax in the state?
(Adapted from SREB publication *Getting Students Ready for Algebra I: What Middle Grades Students Need to Know and Be Able to Do*)

I.   Jon and Amie each purchased a pair of shoes during the annual sale at the Shoe Factory. All shoes were priced at 40% off the original price. If Jon paid $35 for his shoes, what was the original price? If Amie bought a pair of shoes originally priced at $79, what was the sale price?

J.   Laura is a realtor for a local real estate company and receives a commission of 4.5% on the selling price of the homes she sells. The selling prices of three homes she sold during the month of June were $98,500; $155,900; and $225,000. What was the commission she received for the month of June?

K. In the phrase "*number sense*", what is the ratio of vowels to consonants?

L. Is the percent of decrease from 80 to 50 the same as the percent of increase from 50 to 80? Why or why not?

M. A new home was built in 1990. In 1995, the home was appraised and its value had increased 15%. In 2000, the home was again appraised and its value had increased 10% over the 1995 amount. If a 5% increase in value occurs in the next 5 years, what is the net increase in value based on the value of the home in 1990? If the home sold for $125,000 in 1990, what will be the value of the home in 2005?

N. A sporting goods store purchases snowboards, skis, and sleds for the wholesale prices listed in the chart. These are the prices paid by the sporting goods store to the various distributors. Based on the indicated markup given in the chart, find the retail price for each item.

Item	Wholesale Price	Markup
Snowboards	$78	125%
Sleds	$54	110%
Skis	$189	105%

O.   You have a 15% discount coupon for the most popular shoe store in the mall. You would like to use your coupon to purchase the newest athletic shoes available. The store advertises the price of these shoes at $179. Determine what you will pay for the shoes including 7% tax.

P.   Mr. Drye and Ms. Little gave the same test to the 7th grade history classes. In Mr. Drye's class, 20 out of 25 students passed the test, and in Ms. Little's class, 24 out of 30 students passed the test. One of Ms. Little's students heard the results of the test and claimed that the classes did equally well. Is the student right? Explain.

Q.   Mr. Johnson's chorus has 36 members. If the ratio of girls to boys is 4:5, how many girls are in the choir? What percent of the choir is boys?

1.02   Develop fluency in addition, subtraction, multiplication, and division of 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:

- *Model addition and subtraction of positive and negative numbers using a variety of models.*
- *Use the relationship between addition and subtraction found in fact teams (families) to understand addition and subtraction of positive and negative numbers.*
- *Use the number line model to develop the relationship between repeated addition and multiplication of positive and negative numbers.*
- *Use the relationship between multiplication and division found in fact teams (families) to understand multiplication and division of positive and negative numbers.*
- *Use a variety of strategies to estimate the results of positive and negative rational number operations.*

A.   A bottle has a mass of 1.5 kg when it is one-third full of syrup and a mass of 2.5 kg when it is two-thirds full of syrup. What is the mass of the empty bottle?

B.   Marianne spent two-fifths of her salary on a scarf and a hat. The hat costs three times as much as the scarf. If she has $36.00 left, how much did the scarf cost.

C.   Sammy started a new exercise program that requires him to run 10 miles a week. On Monday he ran $2^1/_2$ miles and on Tuesday he ran $1^3/_4$ miles. If he chooses not to run on Wednesday or Thursday, can he reach his goal if runs 2 miles on each of the remaining days of the week?

integers
rational numbers
proper fraction
improper fraction
mixed number
terminating decimal
repeating decimal

inverses/opposites
reciprocal
inverse operations

factors
multiples
least common multiple
greatest common factor
prime number
composite number
prime factorization

D.   At the Wholesale Club a family bought a package of 14 individual pan pizzas for $29.96. Dean, the oldest child, ate three pizzas. Mom, Dad, Julie, Brian, and Jennifer each ate two pizzas and Chris ate one pizza. How much does it cost to feed Dean and Chris?

E.   John received a letter from a pen pal who mentioned that the weather had turned quite cold and the average low temperature reading for the week was -20º Celsius. Using the formula $F = \frac{9}{5} C + 32$, find the equivalent Fahrenheit reading.

F.   Reba has invested money in some stock and keeps track of the loss or gain per share on a daily basis. On Friday of last week, the value of a share of the stock was $36.71 when the stock exchange closed for the day. If the net change for Wednesday was -0.15, for Thursday +1.23, and for Friday -0.03, what was the value of a share of the stock when the stock exchange closed last Tuesday?

G.   Mr. Jacobs gets a monthly statement on his investments from his financial adviser. The change in the value of his investments for the last six months was: +$327.50, +$98.85, -$63.77, -$38.23, +$22.97. Estimate the net change over the last six months.

H.   Katie was helping her sister Julie with her homework. Julie wanted to rename the number $- 2 \frac{3}{8}$ as an improper fraction and said that it would be equivalent to $- \frac{13}{8}$. What mistake did Julie make? Explain how Julie could correctly rename the number as an improper fraction.

I. Caitlyn's family drove 329.44 miles. Caitlyn determined that the car averaged 28.4 miles per gallon of gasoline. About how many gallons of gasoline did the car use?

J. Shauna plans to place a border around the quilt she and her grandmother made together. The dimensions of the quilt are 8 ft by $4\frac{1}{2}$ ft. If she purchases 8 yards of material for the border, will she have enough to cover all four sides? Justify your answer.

K. Mr. Patch baked cookies for the fair. He sold three-fifths of them to the soccer team and one-fourth of the rest to the cheerleaders. If he had 36 cookies left, how many did he bake?

L. The numbers 0, 1, -1, *A*, *B*, *C* and *D* are located on the number line below:

$$D \qquad -1 \qquad C \quad 0 \qquad A \qquad 1 \qquad B$$
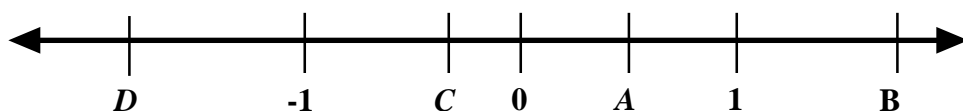
For each of the following, insert the symbol <, >, or = to make a true statement.

a. A _____ B

b. $C - D$ _____ 1

c. $B + C$ _____ 0

d. $C \bullet B$ _____ 0

e. $D + C$ _____ 0

f. $B + C$ _____ 0

g. $A + (-A)$ _____ 0

h. $C \bullet A$ _____ -1

i. $D + A$ _____ 0

j. $B - D$ _____ 0

k. $C \bullet C$ _____ 0

l. $C \bullet \frac{1}{C}$ _____ 1

m. $A \bullet B$ _____ 0

n. $C - B$ _____ 0

M. The recipe for a cake calls for two-thirds of a cup of oil, three and a half cups of flour and one cup of milk. The bowl Hal wants to use to mix the cake holds three quarts. Is it sufficient for the task? How do you know?

N. Examine each situation. Explain your reasoning.

a) What number(s) greater than 0 can you multiply 3.2 by to make the product less than 3.2, greater than 3.2, or equal to 3.2? Justify your answers.

b) What number(s) less than 0 can you multiply $\frac{1}{2}$ by to make the product less than $\frac{1}{2}$, greater than $\frac{1}{2}$, or equal to $\frac{1}{2}$? Justify your answers.

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

percent
percent of change
percent of increase
percent of decrease

mark-up
selling price
sales tax
commission
discount
regular price
sale price
interest

circle graphs

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

A.   The Allowance Mystery

Year	Total Year Allowance	Total Family Income
1992	$250	$25,000
1993	$260	$26,000

The table above shows Ben's total yearly allowance and his family's total income for the year. Between 1992 and 1993 the cost of living increased by 8%. Ben's family was discussing the change in his allowance between 1992 and 1993.

•Ben's older sister insisted that Ben's allowance had increased.
•Ben complained that the allowance had gone down.
•Ben's mother maintained that there had been no change in the allowance system.

Explain how each person's opinion could be valid.

B.   Sally bought a pair of $59.00 jeans at 10% off. Susan found the same pair of $59.00 jeans on sale for $54.00. Joanie bought two pair of the same $59.00 jeans for $105.00. How much did Sally spend on her pair of jeans? What is the percent of decrease on the pair of jeans that Susan bought? Calculate the percent of decrease for one pair of Joanie's jeans using $59.00 as the original price. What is the average percent of decrease?

C.   You have been asked to organize an event to raise money for your school. You decide you want to sponsor a teacher dunking booth at a school-wide celebration. You randomly survey 60 students as to the maximum amount they would be willing to pay for one ticket. Here are your survey results:

SURVEY RESULTS

Ticket Price	# of Positive Responses
$0.50	3
$1.00	22
$1.50	18
$2.00	7
Would not purchase ticket	10

*Due to student interest in dunking teachers, only one ticket per student may be purchased.

Determine the ticket price that would generate the most income. Explain why you chose that price. Use this information to predict the total amount of income if 500 students attend the celebration.

E.   Estimate how long it would take you to walk five miles. Explain the procedure you used and provide all your calculations.

F.   A principal wants to send representatives of all the school's performing arts clubs and the journalism club to a Broadway musical on tour in a nearby city. Because she wants to be fair, she wants to make sure that the numbers of students from each group who attend are exactly proportional to the numbers of students in each group. Based on the number of students in each group listed below, and assuming that a student can belong to only one group, is this possible? Why or why not?

Group	Number of students
Chorus	42
Dance Club	15
Drama Club	21
Journalism Club	12
Orchestra	47
Wind Ensemble	51

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

G.   An advertising agent for a shoe company placed ads in several different newspapers throughout the state. Each newspaper charges $18 per column inch. The ads were $4\frac{1}{2}$ column inches, $3\frac{3}{4}$ column inches, $3\frac{1}{2}$ column inches, $2\frac{1}{4}$ column inches, and 4 column inches. What is the total cost of these ads?

H.   A cabinet 30 inches high must have a 4-inch thick base and $1\frac{1}{2}$ - inch thick top. Four equal sized drawers must fit in the remaining space with $\frac{3}{4}$ inch between each drawer. What is the height of each drawer?

I.   Gregory wants to fence in his rectangular yard that measures $10\frac{1}{2}$ yards by $20\frac{3}{4}$ yards. If fence material cost $2.25 per yard, how much will Gregory spend to fence in his entire yard?

J.   From a bolt of cloth measuring $2\frac{2}{3}$ yards, Tomasena cut a $6\frac{3}{4}$ yard piece and a 11.5 yard piece. How much material is left on the bolt?

K.   Help! I only have $6.21 left after shopping. I think I should have more. I purchased 3 pairs of earrings for $4.95 each, two necklaces for $7.95 each, and a new purse for $5.50. Sales tax would be 7% on these purchases. I began shopping with $50. Do I have the correct change?

2.01　Draw objects to scale and use scale drawings to solve problems.

A.　Using a North Carolina State Transportation Map, determine each of the following:
- •the greatest East-West distance across the state
- •the greatest North-South distance across the state
- •an estimate of the area of the county that you live in
- •the time it would take a military aircraft flying at 600 km/hr to fly from Havelock to Fayetteville

B.　Carlos and Jennie are building scale models of different vehicles for a class project. They just completed a 4 inch long model of a car that is 15 feet in length. If they use the same scale, what will be the length of a scale model of a truck that is 31.5 feet long?

C.　When Jermaine designed his dream house, he used a scale of $\frac{1}{4}$ inch = 2 feet. He plans to purchase carpet for the actual living room with dimensions $1\frac{1}{4}$ inches by $1\frac{1}{2}$ inches in his model. The carpet sells for $5.95 per square foot. How much will it cost Jermaine to carpet his living room?

D.　Your Social Studies teacher has asked you to draw a map of North Carolina. You decide that the scale you will use is 1 inch = 30 miles. The actual disance from Charlotte to Raleigh is 144 miles. How far apart should the cities be on your map?

2.02   Solve problems involving volume and surface area of cylinders, prisms, and composite shapes.

To achieve this objective, students should be able to:

- *Understand that volume is the measure of the interior of a space expressed in cubic units.*

- *Understand that surface area is the total area of the surfaces of an object.*

- *Use nets to visualize and calculate surface area of prisms and cylinders.*

- *Develop formulas for the volume of prisms and cylinders.*

A.   Huong covered a box with sticky-backed decorating paper. The paper costs 3¢ per square inch. How much money will Huong need to spend on paper?

A. $1.89
B. $2.22
C. $3.78
D. $6.66

$h = 9$ inches

$w = 3$ inches
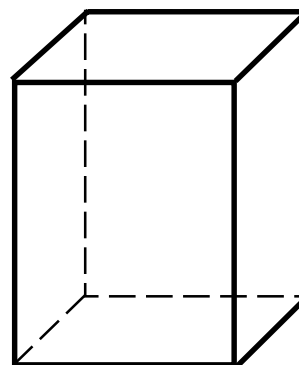
$l = 7$ inches

B.   A film of water about 0.05 cm thick clings to the skin when people get out of a bath. Estimate the amount of water that clings to the skin of an average seventh grader. (An estimate of the surface area of the body is required; this can be done by considering a collection of cylinders and prisms that approximates the body.)

C.   A can of cola drink has a diameter of 65 mm and a height of 15 cm. Compute the volume and surface area of the container?

D.   The Yummy Tastin' company is exploring packaging options for their oatmeal. One option is a cylindrical package with a diameter of 5 inches and a height of 10 inches. The other option is a rectangular box with a length of 7 inches, a width of 2 inches and a height of 14 inches. If the packaging material costs $^1/_4$ ¢ per square inch, what option would be the least expensive?

E.   The dimensions of an aquarium in a local restaurant are 3.5 feet by 2.5 feet by 2 feet. How many cubic inches of water does the aquarium hold?

F.   A woodworker has a solid block of wood in the shape of a rectangular prism that measures 22.5 inches by 8 inches by 5.5 inches. What is the surface area of the block of wood? He is going to cut a cylindrical shaped piece of wood from the block so that he can put a piece of rope through the block. If the cylinder he cuts has a diameter of 3 inches and a height of 5.5 inches, what will the surface area of the block now be?

G.   Jennie purchased a box of crackers from the deli. The box is in the shape of a triangular prism (see diagram below). If the volume of the box is 3,240 cubic centimeters, what is the height of the triangular face of the box? How much packaging material was used to construct the cracker box?

15 cm

15 cm

30 cm

18 cm
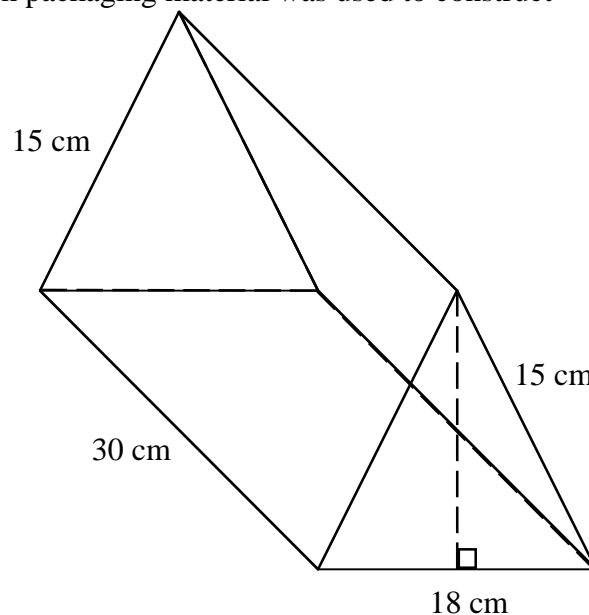
H.   Chef Mario baked a 2-layer cake for a birthday party. The bottom layer of the cake is in the shape of a cube that measures 10 inches on each edge. The top layer of the cake is in the shape of a cylinder with a 6-inch diameter and height of 5 inches. What is the volume of the cake? Chef Mario is going to frost all the exposed area of the cake. What is the total area that will be frosted?
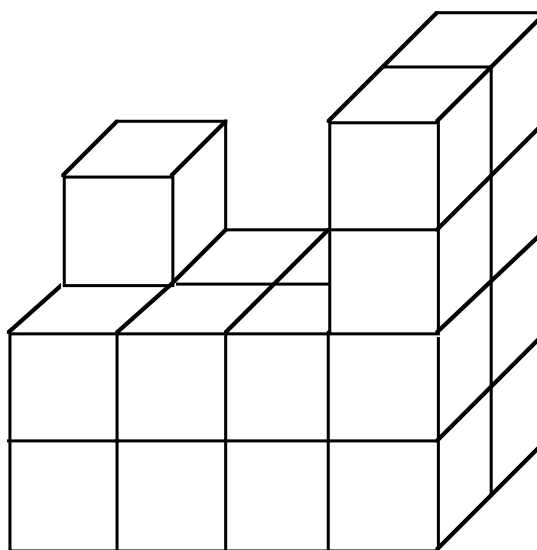
3.01 Using three-dimensional figures:

a) Identify, describe, and draw from various views (top, side, front, corner).

b) Build from various views.

c) Describe cross-sectional views.

3-d figure
prism
pyramid
cylinder
cone
sphere
polyhedron
net

isometric view
bird's eye view

isometric dot paper
linking cubes

A   *B*

A.   After viewing this figure built from blocks, ask students to draw the two-dimensional polygons that are a front, back, top, left, and bottom view of the figure. What is the corner view from point *A*? from point *B*?

B.   What is the top view of a globe (sphere) cut at the equator? cut just below the north pole?

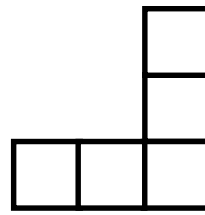**C.**   If a cone is cut parallel to its base what do the cross-sections look like?

D.   The following diagrams give the top, front, and side view of a three-dimensional figure. Use cubes to build the figure.
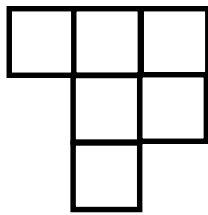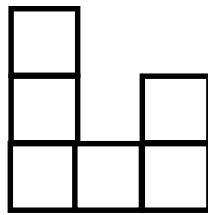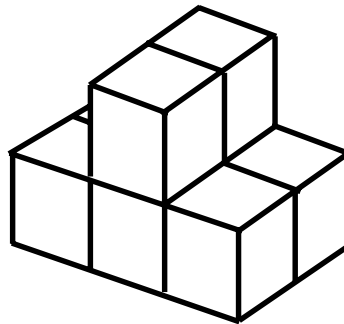

| Top | Front | Right Side |

E.   Which of the statements below is (are) true about this structure built with cubes?


1.   There are at least seven cubes in the structure.
2.   Part of the structure is two cubes high.
3.   There are two cubes on the top level.
4.   There are six cubes on the bottom level.
5.   There is a total of six cubes in the structure.

F.   Using a collection of cubes, construct a figure that has at least nine cubes, is three cubes high at one point, and has at least six cubes on the bottom layer. Draw a sketch of the figure.

12.5 cm

l
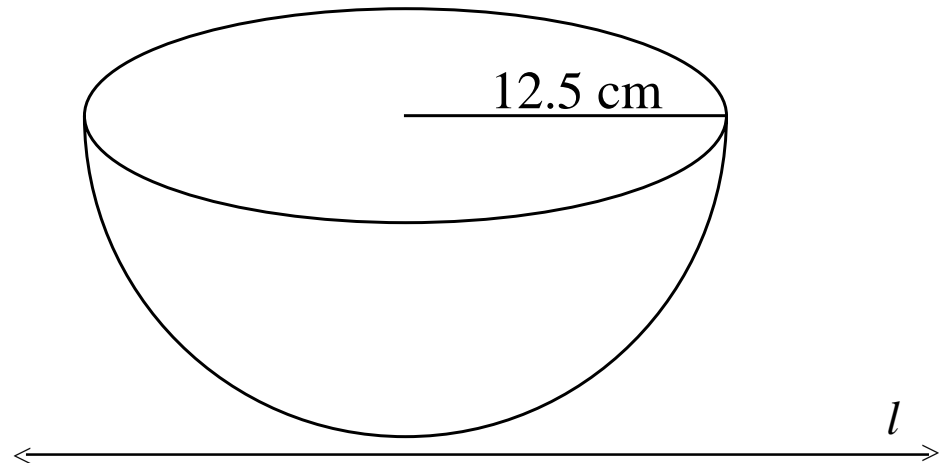
G. If this hemisphere is sliced perpendicular to line *l*, what do the cross-sections look like? If it is sliced parallel to line *l* are the cross-sections different?

H. If this cylinder is cut parallel to the base, describe the cross-sectional view. If the cylinder is cut perpendicular to the base describe the cross-sectional view. If the cut is made neither perpendicular nor parallel to the base, describe the cross-sectional view.
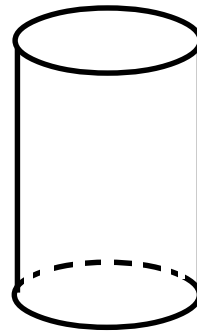
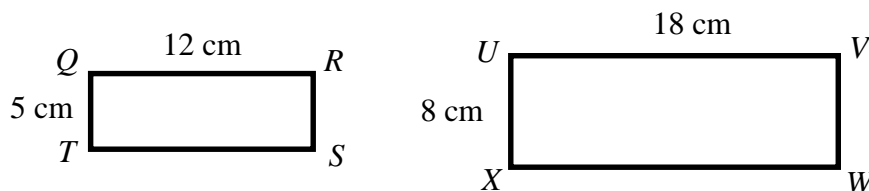**I.** If a rectangular prism is sliced diagonally from segment *AB* to segment *GH* describe the results.
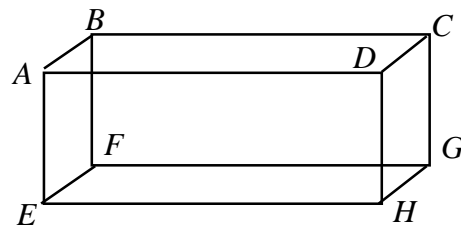
3.02 Identify, define, and describe similar and congruent polygons with respect to angle measures, length of sides, and proportionality of sides.
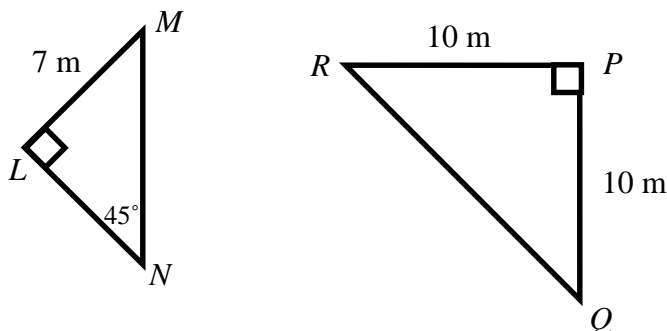
To achieve this objective, students should be able to:

- *Identify corresponding parts of similar or congruent polygons.*

- *Understand that corresponding sides of similar figures are proportional.*

- *Understand that corresponding angles of similar figures are congruent.*

corresponding parts
corresponding sides
corresponding angles

symbol for congruence
$\cong$
symbol for similarity
$\sim$

ratio
proportion
cross product

A. Is rectangle *QRST* similar to rectangle *UVWX*? Explain.

Q — 12 cm — R
5 cm
T — S

U — 18 cm — V
8 cm
X — W

B. Is triangle *LMN* similar to triangle *PQR*? Explain.

M
7 m
L
45°
N

R — 10 m — P
10 m
Q

C. Examine/measure each pair of polygons. Determine if they are congruent or similar; justify your answer.

Grade Seven: Geometry

3.03   Use scaling and proportional reasoning to solve problems related to similar and congruent polygons.
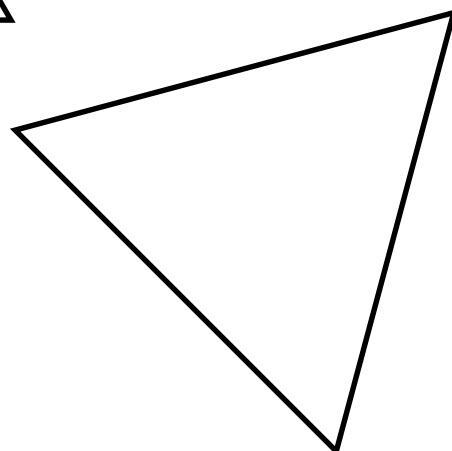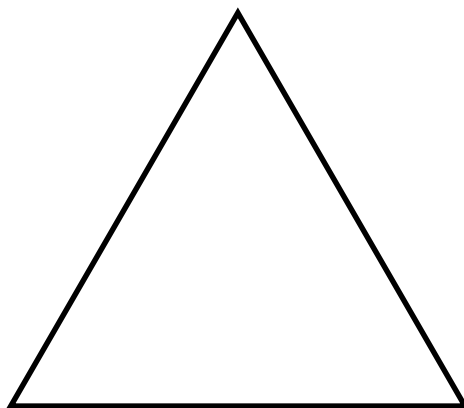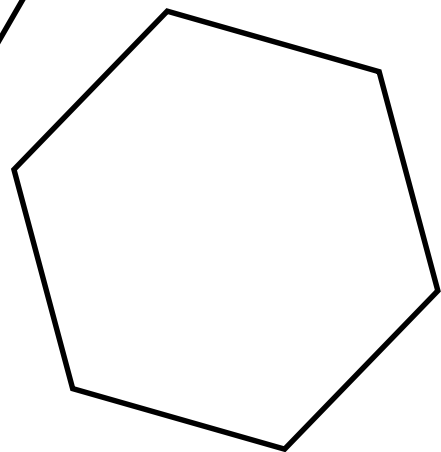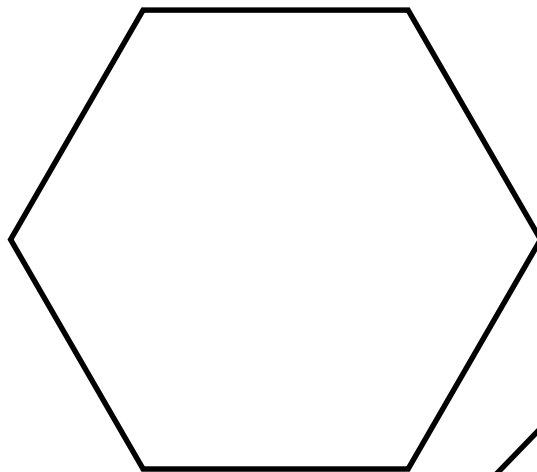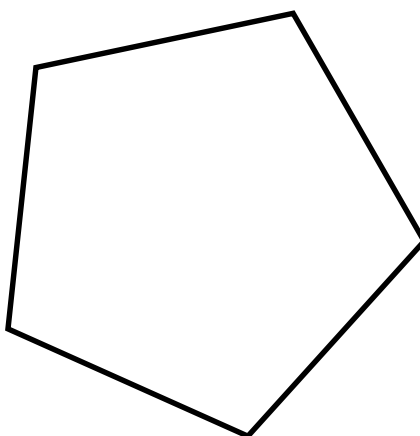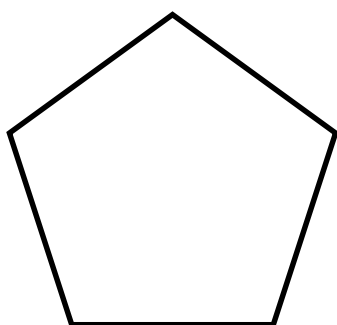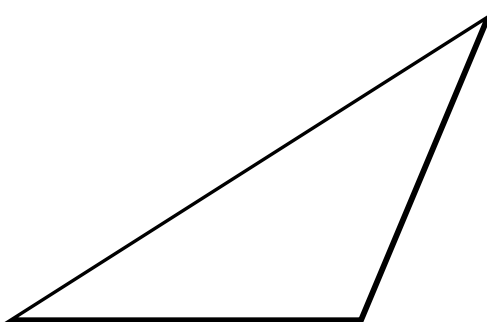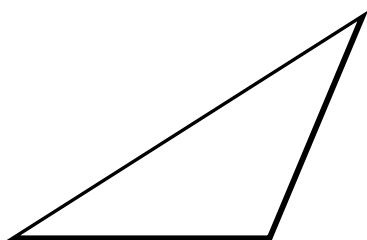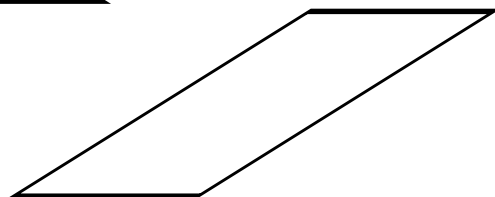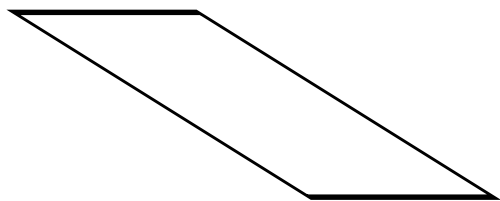
corresponding parts
ratio
proportion
cross product

indirect measurement

transformation
dilation
scale factor

A.   A tennis court is 27 feet wide and 78 feet long and the net is 3 feet high at the center of the court. A table tennis table is 5 feet wide and 9 feet long and the net is 6 inches high. Are a table tennis table and net proportional to a tennis court and net? Explain your answer.
If you wanted to make a true miniature version of a tennis court and you used the width of the table tennis table (5 feet), how long would it be? How high would the net be? If you were to make a scale model of yourself for your miniature tennis court, how tall would the model be?
(Adapted from SREB publication *Getting Students Ready for Algebra I: What Middle Grades Students Need to Know and Be Able to Do*)

B.   Susan's dad wants to build a dining room table for the family that is similar to the one in Susan's doll house. The doll house table top measures $1\frac{1}{2}$ inches by $4\frac{1}{2}$ inches. If the length of the table needs to be 6 feet, how wide should the table be?

C.   Compare the two similar triangles below.
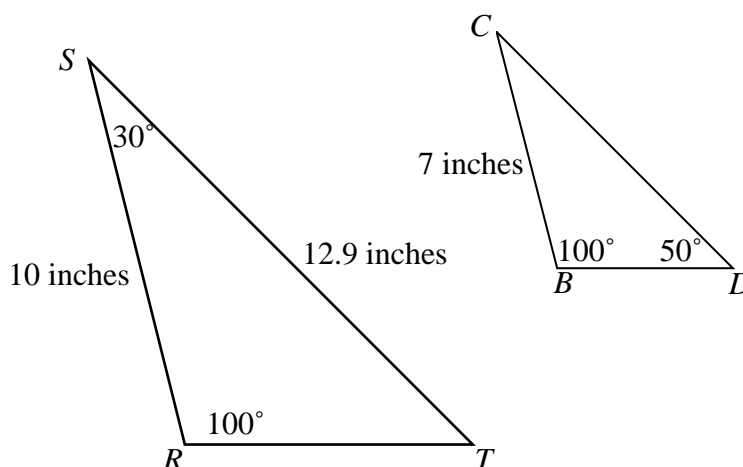
What is the measure of segment *CD*? ∠*T*? ∠*C*?

D. A model of Glaswick Park was drawn for the town council to consider.

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        A        2 feet          B
                                      2 feet

    4 feet

                                          C

              3 feet
        D
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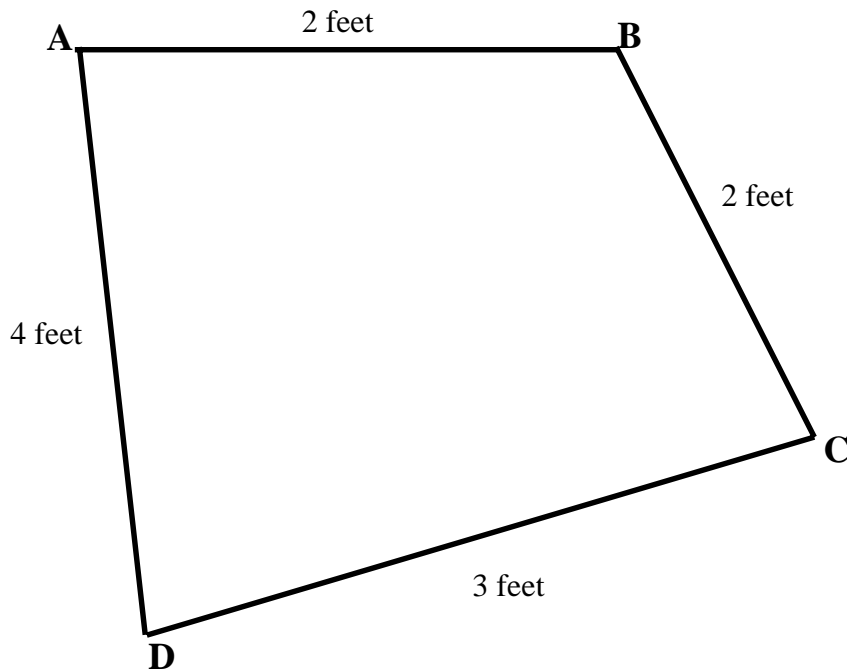
If the park's longest side is 360 yards long, and the model is a scale drawing of the actual park, what are the dimensions of the other sides?

E. Triangle *ABC* is similar to triangle *DEF*.
- side *AB* is 12 ft long
- side *BC* is 8 ft long
- m∠ *B* is 50˚
- side *DF* is 130 ft long
- side *DE* is 180 ft long
- m∠*F* = 70˚

Find the measures of ∠*A*, ∠*C*, ∠*D*, ∠*E*, sides *AC* and *EF*.

4.01   Collect, organize, analyze, and display data (including box plots and histograms) to solve problems.

A.   Use the box plots below to answer the following questions. How does the median skateboard cost compare to the median roller blade cost? What percent of skateboards cost $60 or more? What percent of roller blades cost between $50 and $100? How many of the roller blades and skateboards cost $100 or more?
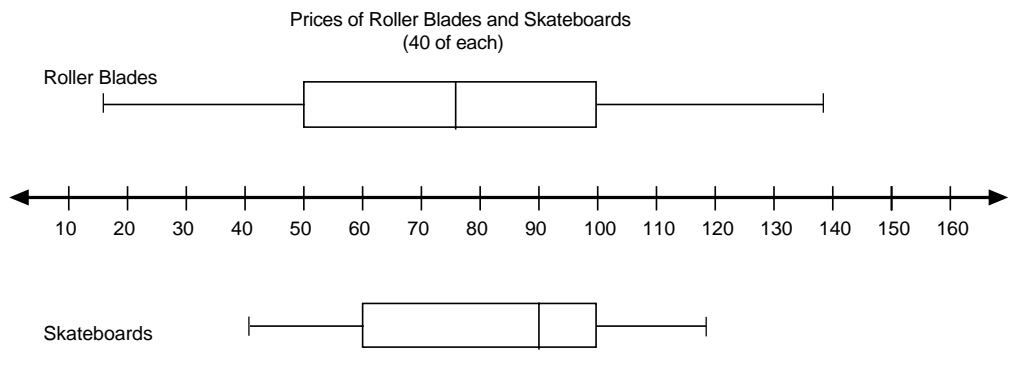
Prices of Roller Blades and Skateboards
(40 of each)

Roller Blades

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10  20  30  40  50  60  70  80  90  100  110  120  130  140  150  160
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Skateboards

B.   Maggie and Thom are members of the local year-round swim team and their weekly practice times are indicated below:

Hours of Practice Time Each Week									
	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10
Thom	10.5	8	9.5	11	10	10	8.5	12	4	6.5
Maggie	10	11.5	7	12.5	11	9	8	9.5	8.5	12

Make a box plot for each of their practice times (one above and one below the same number line).

C.   Listed below are the daily high temperatures (˚F) for the first 20 days of April. Choose appropriate intervals to group the data, make a frequency table for the data, and construct a histogram for the data.

55, 62, 68, 75, 69, 78, 82, 79, 85, 88, 65, 60, 58, 75, 80, 82, 74, 78, 78, 72

4.02   Calculate, use, and interpret the mean, median, mode, range, frequency distribution, and inter-quartile range for a set of data.

A.   John received the following grades on the first five tests of the grading period: 84, 92, 84, 75, 70. What is the minimum grade he needs to receive on the next test in order to have a C (84) average on his tests? What is the range of these six grades?

B.   Give an example of a situation involving a set of data with at least fifteen different numbers for which the mean, median and mode are all the same number. Identify the range, inter-quartile range, lower quartile and upper quartile for this set of data.

C.   The yearly salaries of the five top executives at the Bigwig Corporation are $1,000,000; $250,000; $130,000; $90,000; and $90,000. If you calculate the mean, median, and mode for these salaries and place these values in order from highest to lowest, the order would be:
a) mean, median, mode   b) mode, median, mean
c) median, mean, mode   c) mean, mode, median
(From SREB publication *Getting Students Ready for Algebra I: What Middle Grades Students Need to Know and Be Able to Do*)

D.   A group of seventh grade students took a test and these scores were recorded:

Score	Students
95	27
85	34
75	21
65	18

Find the mean, median, mode and range for this set of data.

4.03   Describe how the mean, median, mode, range, frequency distribution, and inter-quartile range of a set of data affect its graph.

A.   The box-and-whisker plot below shows the height of six plants that the students measured: 19 in., 5 in., 13 in., 16 in., 11 in., 15 in.

HEIGHT OF PLANT (INCHES)
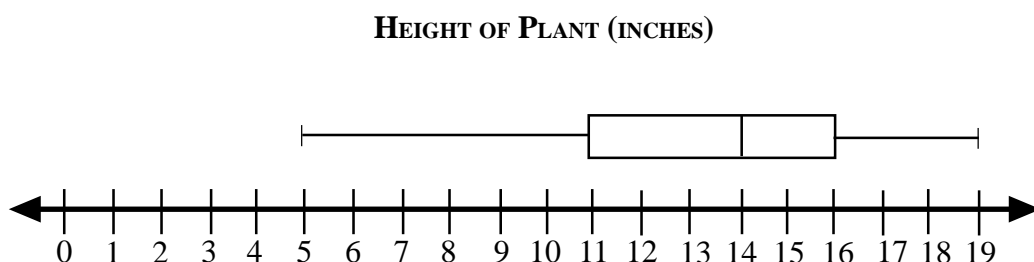
a) The students measured a seventh plant (8 inches) and added it to the data set. Which of the following will change: median, mode, range, inter-quartile range, lower quartile, upper quartile? How will the graph change?

b) If the height of an eighth plant (1 inch) is added to the data set, which of the following will change: median, mode, range, inter-quartile range, lower quartile, upper quartile? How will the graph change?

c) The last three plants the students measured each had a height of 8 inches. Which of the following will change: median, mode, range, inter-quartile range, lower quartile, upper quartile? How will the graph change?

B.   Thirty people in Max's neighborhood participated in a Walk-A-Thon fundraiser. The ages of the walkers were: 12, 8, 32, 35, 15, 47, 9, 15, 52, 55, 70, 18, 36, 29, 12, 11, 16, 45, 44, 19, 62, 60, 8, 23, 27, 10, 34, 74, 13, 59

a) Make a histogram for the set of data.

b) Determine the mean and median for this data set.

c) Explain how the median for this data relates to the graph of the data.

d) If the seven youngest participants did not walk and seven members of the Golden Oldies Club (over 70 years of age) took their place, how would this change the graph of the data? Determine the mean and median for this new data set.

C.   Use the frequency table from 4.02 D and add the following student scores:

Score	Students
95	14
85	2
75	29
65	5

How do these additional scores affect the mean, median, mode and range for the test scores?

4.04   Identify outliers and determine their effect on the mean, median, mode, and range of a set of data.

A.   Farmer Brown raises pumpkins and recorded the following weights (in pounds) for the pumpkins he harvested:

29, 15, 40, 32, 15, 250, 33, 15, 39, 25, 16, 19, 30, 28, 28, 30, 32, 33, 31, 25, 29, 30, 10, 24

Calculate the mean, median, mode, and range for the above weights. Should Farmer Brown use the mean, median, mode, or range to most accurately describe his crop. Explain. Identify the outlier for this set of data. If it is excluded, how would the mean, median, mode and range change?

B.   At a silent auction, the following bids were received on an item: $42, $22, $50, $12, $16, $105, and $37. Determine the mean, median, mode, range, and interquartile range for this set of data. Use a box plot to display the set of data. If an outlier exists, identify the outlier and explain its effect, if any, on the mean, median, mode, range, and interquartile range.

4.05   Solve problems involving two or more sets of data using appropriate statistical measures.

A.   Prices (in cents) per serving of Spiffy and Fav-O-Rite peanut butter are displayed below. Which brand has the higher mean price per serving and how much higher is it?

mean
median
mode
range

box plot
histogram
stem-and-leaf plot
line plot
circle graph
line graph
bar graph

outlier

Fav-O-Rite			**Spiffy**
9	0		
7 6 6 4 2 1	1	8 9	
1 1 0	2	1 3 6 7 7	
	3	2 2 5	

B.   A teacher was comparing results on two sets of test scores for a group of eleven students. The mean score on the second test was seven points higher than that of the first test. The median grade on both tests was the same. Determine two sets of test scores that would produce these results.
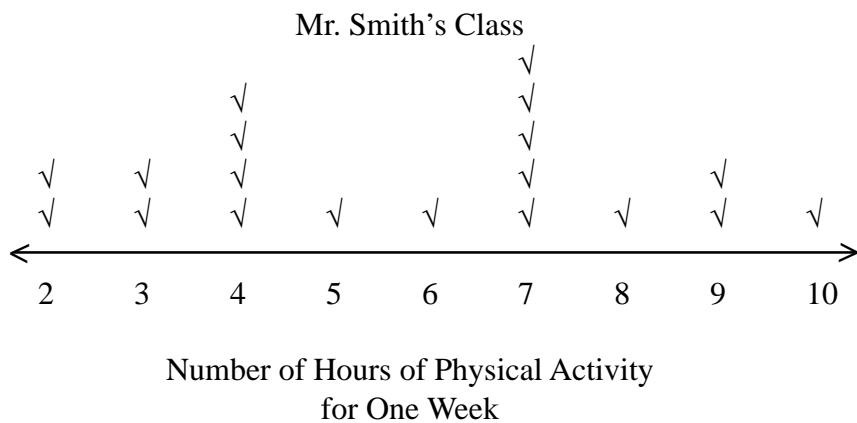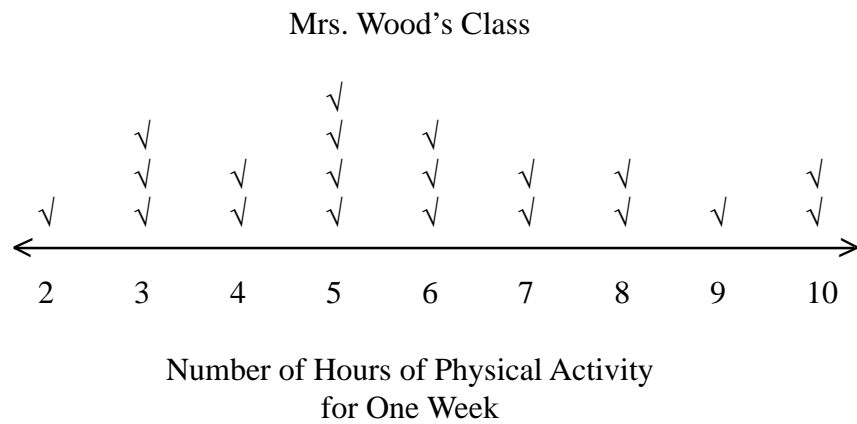
C.   Students in two seventh grade classes kept track of the amount of time they were involved in physical activity during a week long period. The information is summarized in the line plots below.

Mrs. Wood's Class

```
                        √
            √           √           √
            √     √     √     √     √     √                 √
      √     √     √     √     √     √     √     √     √
  <-----+-----+-----+-----+-----+-----+-----+-----+-----+----->
        2     3     4     5     6     7     8     9     10
```

Number of Hours of Physical Activity
for One Week

Mr. Smith's Class

```
                              √
                  √           √
                  √           √
      √     √     √           √                 √
      √     √     √     √     √     √     √     √     √
  <-----+-----+-----+-----+-----+-----+-----+-----+-----+----->
        2     3     4     5     6     7     8     9     10
```

Number of Hours of Physical Activity
for One Week

a) What percent of the students in each class was involved in at least five hours of physical activity each week?
b) Determine the mean, median, and mode for each set of data.
c) Based on the given data, would you conclude that one of the classes was more active than the other? Explain your reasoning.

5.01   Identify, analyze, and create linear relations, sequences, and functions using symbols, graphs, tables, diagrams, and written descriptions.

A.   Fill in the missing numbers for each of the following linear relations and give the equation that identifies the relation. Make a graph of the equation.

X	1	2	3	4	5	6
Y	3	6	9	12		

Equation: $Y =$

variable
independent
dependent

evaluate
order of operations
simplify
like terms

domain
range
input
output

C	1	2	3	4	5	6
D	-1	3	7	11		

Equation: $D =$

B.   The set of data represented in the table below represents a linear function. Write the equation for this function and graph it.

x	**y**
-4	-14
-1	-5
0	-2
2	4
5	13

C. Consider the "stairstep" diagrams below. Find the perimeter for each figure. Can you identify a general expression for the perimeter of the *n*th figure?
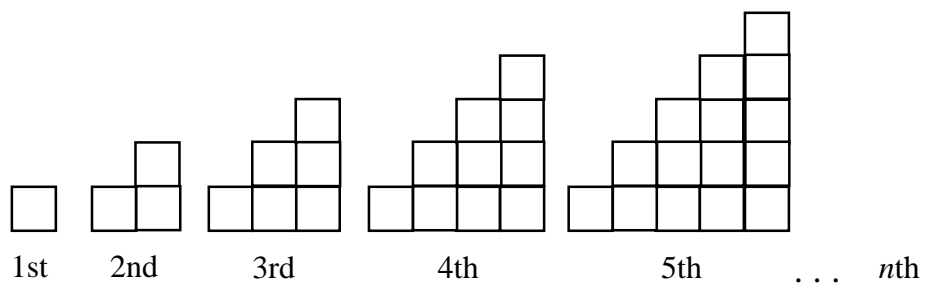
1st   2nd   3rd   4th   5th . . . *n*th

5.02 Translate among different representations of algebraic expressions, equations and inequalities.

Vocabulary and Resources

term
like terms
combining like terms
simplify
factor
equivalent expressions
coefficient
variable
exponents
rules of exponents
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:
$a \times b$
$a \cdot b$
$a(b)$

A. The Jones family is investing money in stocks to help with college expenses for their children. They plan on purchasing Mutts stock and Paws stock and want to invest a maximum of $1,200.   If they purchase x shares of Mutts stock at $20 per share and y shares of Paws stock at $40 per share, write an inequality to describe this situation, make a graph of the inequality, and give five different possibilities for their investment.

Shares of Mutts (x)	Shares of Paws (y)	Total Investment

B. The selling price of a car, $18,560, was determined by calculating an 8% markup from the dealer's cost. Write the algebraic equation that describes the situation. What did the dealer pay for the car?

C. The local bookstore is having a one-day sale on all children's books. Jane decides she will spend at least $25.00 but no more than $40.00 on books. If all sale books are priced at $3.75, write an inequality that expresses the number of books, b, that she can purchase.

D.   Simplify each of the following:
a. $8x - 12y - 15x + 3y$
b. $10y \div 2 \bullet (-6) + 4y$
c. $6xy \bullet 3 \div (-9) - 1$
d. $3ab - 10(2a - 4) + 32ab \div 2^4$
e. $-3xy + 10 \bullet 2xy - 4 - 32xy \div (-2)^4$

E.   Janine has a cell-phone and the monthly plan she has charges $39.99 for the first 400 minutes and $0.42 for each additional minute. Her bill last month was $93.33 before taxes and surcharges were added. Write an equation that can be used to calculate the number of minutes, *m*, that she used the cell-phone last month. Solve this equation showing all the steps in your solution. How many minutes did she use the cell phone last month?

5.03 Use and evaluate algebraic expressions, linear equations or inequalities to solve problems.

To achieve this objective, students should be able to:

- *Interpret situations mathematically.*

- *Write equations or inequalities to represent situations.*

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
$\geq$
compound inequality
$a < x < b$

A. In convex pentagon *ABCDE*,
$m\angle A = 6x°$,
$m\angle B = (4x + 13)°$,
$m\angle C = (x + 9)°$,
$m\angle D = (2x - 8)°$, and
$m\angle E = (4x - 1)°$.
What are the degree measures of each of the angles?

B. A quadrilateral, *LMNO*, has two congruent angles, a third angle that measures 44° and the fourth angle that measures 120°. Write and solve an equation that can be used to find the measures of the missing angles.

C. The formula for the area of a trapezoid is $A = 0.5h(b_1 + b_2)$. If $b_1 + b_2 = 25$ cm, and the area is 25 cm², find the value of h.

D. Amin, Bobbi, and Carl shared some peanuts in the ratio of 2:3:5. If Bobbi had 36 peanuts, write an equation to determine how many peanuts were shared. How many peanuts did each boy get?

E. A set of coins has a value $2.75. There are twice as many dimes as nickels, no pennies and four quarters. Write an equation to determine how many coins there are in all. How many are there?

F. The area of a rectangular garden plot is 56 square yards. If the length of the garden is seven yards, write an equation to determine how many feet of fencing will be needed to enclose the garden. How many feet of fencing are needed?

G.   Three-fifths of the books on a shelf are mystery stories. The rest of the books are science fiction. If 68 books are science fiction, write an equation to determine how many books are on the shelf.
How many books are mystery stories?

H.   If the perimeter of the triangle below is 63 centimeters, what are the lengths of the sides of the triangle?
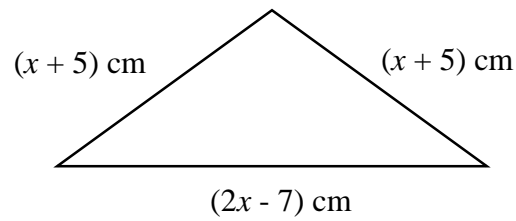
$(x + 5)$ cm $(x + 5)$ cm

$(2x - 7)$ cm

5.04 Develop fluency in the use of formulas to solve problems.

A. The Party Shoppe is advertising a special sale on balloons. They have two sizes available, 9-inch diameter and 12-inch diameter. How much larger is the circumference of the 12-inch balloon? Using the formula for the volume of a sphere, $V = \frac{4}{3}\pi r^3$, determine the amount of helium needed to fill each of the balloons. Using the formula for the surface area of a sphere, $SA = 4\pi r^2$, determine the surface area of each of the balloons.

B. Mrs. Sandler is going to invest $700 in a Certificate of Deposit (CD) at her bank for 5 years at an annual interest rate of $3\frac{1}{2}$ % compounded annually. What will be the value, A, of the CD at the end of the 5 year period? Use the formula, $A = p(1 + r)^t$ where A is the final amount (value), p is the initial amount invested, r is the annual interest rate, and t is the time in years.

C. The formula $F = \frac{n}{4} + 37$ can be used to determine the temperature in degrees Fahrenheit, F, when n is the number of cricket chirps per minute. If a cricket chirps 126 times per minute, determine the temperature. Rewrite the formula in the form $n =$, and determine the number of times a cricket chirps per minute if the temperature is 40° F.

D. The speed limit along a particular highway increased from 55 mph to 65 mph. How much time will be saved on a 100-mile trip?

E. Students can investigate the concept of density by finding objects for which both the volume and the mass can be determined. Objects might include a container of food a block of wood or a textbook. (Divide the mass by the volume to determine density.)