Grade 7 Curriculum Overview

Ratio and proportional relationships

- **Expand understanding of ratio and use ratios to solve problems**
- **Expand understanding of rate and use rates to solve problems**
- **Understand proportions and use proportions to solve problems**
- **Decide if two ratios are proportional**
- **Compute unit rates**
- **Compute simple interest**
- **Write and calculate percents**
- **Solve problems using percents**
- **Calculate a slope**
- **Understand that the slope of a line is the ratio of rise to run and is a constant rate of change**

The number system

- **Expand understanding of the order of operations**
- **Expand understanding of operations with fractions**
- **Represent numbers on a number line**
- **Perform the operations on rational numbers**
- **Recognize patterns in an arithmetic sequence**
- **Graph an equation on the coordinate system**
- **Evaluate absolute values**
- **Find common factors and multiples**
- **Expand understanding of the commutative, associative, and distributive properties**
- **Distinguish between a rational and an irrational number**
- **Perform transformations in the coordinate system**
- **Create a table of values and use it to solve problems**

Expressions and equations

- **Understand that a number can be substituted for a variable to evaluate an expression**
- **Apply the operations to simplify polynomial expressions**
- **Solve real life problems using algebraic equations**
- **Translate a word sentence into an algebraic equation**
- **Solve word problems using inequalities**
- **Solve an equation using the property of reciprocals**
- **Solve an equation using the property of opposites**
- **Compare numbers and expressions using <, >, and =**

Geometry

- **Accurately draw or construct geometric figures**
- **Determine when certain conditions lead to unique (congruent) figures**
- **Know the formulas for the area and circumference of a circle and use them to solve problems**
- **Know the formulas for perimeter and area for triangles, rectangles, parallelograms, trapezoids and squares and use them to solve problems**
- **Solve problems involving angle measures**
- **Find the volume and surface area of three-dimensional figures**
- **Create a net as a means for calculating the surface area of a regular three-dimensional figure**
- **Solve problems using the Pythagorean theorem**

Statistics and probability

- **Expand understanding of the measures of central tendency**
- **Find the upper extreme, the lower extreme, the upper quartile, and the lower quartile of a data set.**
- **Find the interquartile range of a data set and explain what it means**
- **Understand that a random sample allows for making conclusions about a larger population**
- **Determine whether or not a sample set is biased**
- **Calculate the probability of an event**
- **Make conclusions from a stem-and-leaf plot**
- **Use a graph to answer questions**
- **Answer problems using theoretical probability**

Instructions for Parents

- This book is designed to be used 3-4 days per week for 10 weeks.
- This book supports the Common Core Curriculum and the Standards of all 50 states. Some materials may not have been presented to your child. Please allow your child to skip concepts not yet learned. Introduce new concepts only if your child shows readiness.
- Check answers immediately for optimal feedback. Solution pages are provided at the back of the book. (Solution pages represent only ONE method of solving each problem.) A Lesson Tracker has been added for your convenience.
- "Help Pages" have been added at the front of the book to clarify certain concepts.
- Allow your child to use a calculator.
- Pages entitled "Brain Aerobics" are located at the back of the book. Have your child complete one page per week for extra practice. The answers to these questions are on the back of each page.
- A "Glossary of Terms" and a "Table of Measurements" are at the back of the book.
- Please complete the lessons in order.
- If your child experiences difficulty with concepts that have been already taught, address the problem with his or her teacher in the fall.

Dividing a Whole Number by a Fraction

Example: $2 \div \frac{1}{3}$

1st Step: $2 = \frac{2}{1}$ — Put the *whole number* in fraction form.

2nd Step: $\frac{2}{1} \div \frac{1}{3}$ ← divisor — Locate the divisor and invert.

$\frac{1}{3}$ becomes $\frac{3}{1}$

3rd Step: $\frac{2}{1} \times \frac{3}{1} = \frac{6}{1}$ — Invert the divisor and multiply.

4th Step: $\frac{6}{1} = 6$

Dividing a Fraction by a Whole Number

Example: $\frac{1}{3} \div 2$

1st Step: $2 = \frac{2}{1}$ — Put the whole number in fraction form.

2nd Step: $\frac{1}{3} \div \frac{2}{1}$ ← divisor — Locate the divisor and invert.

$\frac{2}{1}$ becomes $\frac{1}{2}$

3rd Step: $\frac{1}{3} \times \frac{1}{2} = \frac{1}{6}$ — Multiply the numerators and denominators.

4th Step: $\frac{1}{6}$ is in lowest terms — Simplify (reduce) if necessary.

1. The *mean*, *median*, and *mode* are measures of *central tendency*. Find the following for the number set below.

2 2 5 0 2 9 8 6 25

a. Mean _____ b. Median _____ c. Mode _____

d. Which do you think is the best measure of middle? Justify your answer.

2. Evaluate the following to the nearest hundredth.

a. $.5\overline{)83.015}$ b. $.004\overline{)258}$ c. $3.6\overline{)295.2}$

3. Write the prime factors of the following:

a. 6 b. 10 c. 20

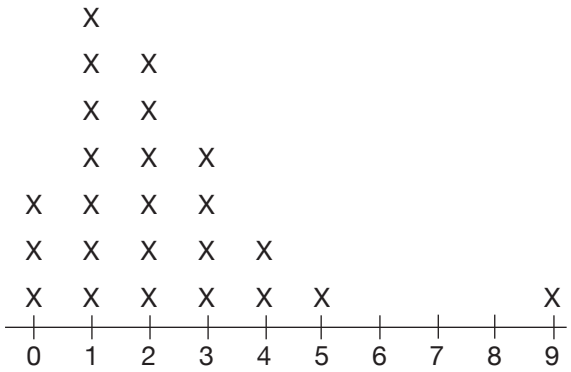
d. What is the least common multiple of 6, 10, and 20? _____

4. A six-sided fair die is tossed. The numbers 1, 2, 3, 4, 5, and 6 are equally likely to occur. Find the probability of each of the following.

a. $P(3)$ _____ b. $P(<3)$ _____ c. $P(\geq 3)$ _____

d. Of the above, which is most likely to occur? _____

5. Mrs. Whitney surveyed her class as to the number of pets per family. She used the *frequency graph* below to record the results.



a. How many families did not own a pet? _____

b. What is the median number of pets per family? _____

c. What is the mean number of pets? _____

d. Circle which is a better representative of the middle, the mean or the median?

6. Given the sequence 4, 8, 16, 32…

a. Find the next two terms _____, _____

b. This sequence is *geometric*. To find the next term you multiply by the *common ratio.* To find this:

$$common\ ratio = \frac{next}{previous}$$ **. Find the common ratio. _____**

c. If the 7th term is 256, what is the 8th term? _____

7. Complete the chart.

a. Exponent form: 10^0 10^1 10^2 10^3 10^4 10^5

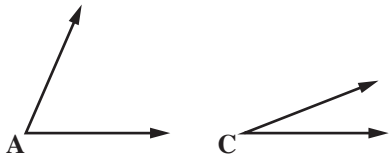
Standard form: 1 10 _____ _____ _____ _____

b. Conclude: 10^n is 1 followed by _____ zeros.

1. Estimate by rounding to the nearest whole number.

a. $7.09 \times 8.99 \approx$ **b.** $4.9 - 2.1 + 8.3 \approx$ **c.** $45.3 \div 14.98 \approx$

2. $\angle A$ **and** $\angle C$ **are complementary.** $m\angle A = 4m\angle C$ **.**



a. Write a number sentence to describe the situation.

b. Find the measure of each angle.

3. Mental math: Find each product or quotient.

a. $200 \times 30 =$ _____ **b.** $500 \times 1000 =$ _____

c. $3600 \div 90 =$ _____ **d.** $2400000 \div 800 =$ _____

4. a. 468 inches = _____ feet = _____ yards

b. 59000 mm = _____ cm = _____ m

5. Choose from the associative property, commutative property or distributive property to justify each of the following.

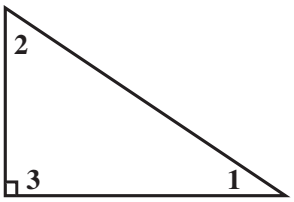
a. $6 + 42 - 6 + 8 = 6 - 6 + 42 + 8 = 50$ _____

b. $6x - 12y = 6(x - 2y)$ _____

c. $(50 \times 9) \times (8 \times 2) = (50 \times 2)(9 \times 8) = 100 \times 72 = 7200$ _____

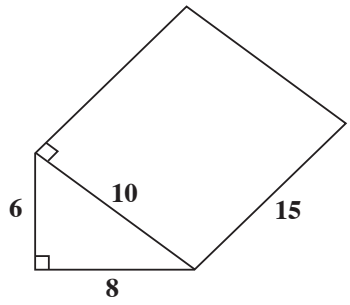
6. Show that 5, 7, and 9 cannot be sides of a right triangle.

7. The $m\angle 1 = 46°$. Find the measure of each of the other angles.



8. Should students be allowed to chew gum during class?
The audience at a choir concert was surveyed, and the majority of those in attendance said, "No." Explain why this sample might be biased.

9. a. Draw a net for the prism pictured at the right.



b. Find the surface area.

10. An electrician charges $25 plus $50 for each hour or portion of an hour.
a. Write a number sentence to represent this situation.

b. If the job takes 1.5 hours, how much should he charge?

c. He made $275 on a particular job. How many hours or partial hours did he work?

11. Find the area of a trapezoid with $h = 8$ inches, $b_1 = 4$ inches and $b_2 = 6$ inches.

1. Simplify the following:

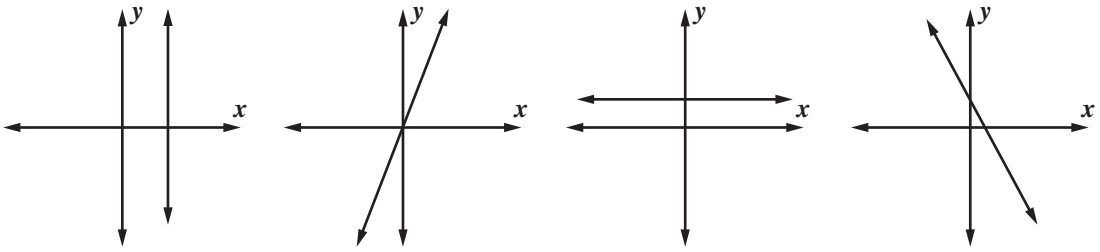
a. $(2-4)^2 / 1+1 =$ **b.** $8-8/2\times 2 =$ **c.** $\dfrac{7-1^2}{4-2} =$

2. Let $a=3 \quad b=\dfrac{1}{3} \quad c=-3 \quad d=-\dfrac{1}{3}$**. Find the following:**

a. ab _____ **b.** $a+c$ _____ **c.** c^2 _____

d. $\dfrac{b}{a}$ _____ **e.** $-a-c$ _____ **f.** $abcd$ _____

3. Identify each graph as having a positive, negative, infinite or no slope.



_____ _____ _____ _____

4. Solve each inequality for x **and graph on the number line.**

a. $2x+1 \le 3$

b. $\dfrac{1}{3}x-5>-2$

c. $-x-1>3$

5. You are trying to convince your parents to let you have a fourth pet.

You surveyed your homeroom asking the following question.

"How many pets does your family have?"

Results: 0,0,1,1,1,1,1,1,2,2,2,2,2,3,3,3,3,3,4,6,20,22

a. Which measure of central tendency (mean, median, mode) will be the most convincing and why?

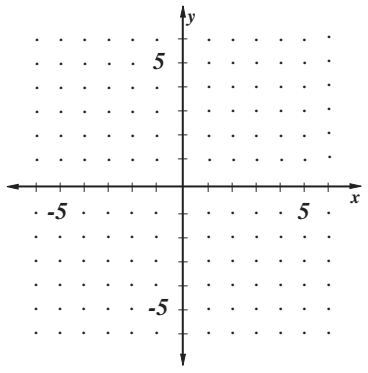
b. An *outlier* is an extremely large or small number that affects the mean. Which numbers are outliers? _____ , _____

6. Use the distributive property to evaluate the following.

$7 \times 39 = 7(\_\_\_\_\_ - \_\_\_\_\_) = 7(\_\_\_\_\_) - 7(\_\_\_\_\_) = \_\_\_\_\_$

7. a. Graph $y = -x + 3$ and $y = 2x$ on the coordinates to the right.

b. What point do they share?



8. In 2019 the Coronavirus was first identified. Its size varies but is approximately 4.724×10^{-7} nm (nanometer). Write this number in standard notation. _____

BRAIN AEROBICS - WEEK 1

1. What is the sum of all the prime numbers between 10 and 20?

2. Judith is 5 years younger than Trina and 5 years older than Gretchen. The average of their ages is 23. How old is each woman?

3. Pamela can swim under water for 51 seconds without a breath. Lucy can swim $\frac{3}{5}$ minute and Kady .8 minute. Who can stay underwater the longest?

4. Mr. Jackson spends $500 per month for rent. His new apartment will cost him 10% more than he is paying now. How much is the rent for his new apartment?

5. Find the set of counting numbers which would make this equation true.
$20 - x \rangle 14$

The Metric Units

Temperature - Celsius
0°C: the freezing point of water
37°C: the normal body temperature
100°C: the boiling point of water

Mass
1000 milligrams (mg) = 1 gram
1000 grams = 1 kilogram (kg)
1000 kilograms = 1 metric ton (t)

Capacity
1000 milliliters (mL) = 1 liter (L)
1000 liters = 1 kiloliter (kL)

Length
10 millimeters (mm) = 1 centimeter
10 centimeters (cm) = 1 decimeter
1000 millimeters (mm) = 1 meter (m)
100 centimeters = 1 meter (m)
10 decimeters (dm) = 1 meter
1000 meters (m) = 1 kilometer (km)

The Customary Units

Temperature - Fahrenheit
32°F: the freezing point of water
98.6°F: the normal body temperature
212°F: the boiling point of water

Weight
1 pound (lb) = 16 ounces (oz)
1 ton = 2,000 pounds

Time
1 minute (min) = 60 seconds (s)
1 hour = 60 minutes
1 day = 24 hours
1 week = 7 days
1 month (mo) = approx. 4 weeks
1 year (yr) = 365 days
52 weeks
12 months
1 decade = 10 years
1 century = 100 years

Capacity

1 cup (c) =	8 fluid ounces (fl oz)
1 pint (pt) =	16 fluid ounces 2 cups
1 quart (qt) =	32 fluid ounces 4 cups 2 pints
1 gallon (gal)=	128 fluid ounces 16 cups 8 pints 4 quarts

Length

1 foot (ft) =	12 inches (in)
1 yard (yd) =	36 inches 3 feet
1 mile (mi) =	5,280 feet 1,760 yards

GLOSSARY OF TERMS AND FORMULAS

a.m.: a way of expressing time between 12:00 midnight and 12:00 noon.

absolute value: the positive distance from zero.

acute angle: an angle measuring less than 90 degrees.

addends: numbers to be added together in an addition problem.

algebraic expression: a combination of numbers and variables joined by the operations of arithmetic.

angle: the union of two rays (the sides) at a point (the vertex).

area: the number of square units or parts of square units required to cover a two-dimensional figure.

Formula examples: **parallelogram:** $A = hb$ **trapezoid:** $A = \frac{1}{2} h(b_1 + b_2)$

triangle: $A = \frac{1}{2} hb$ **rectangle:** $A = lw$

circle: $A = \pi r^2$ **square:** $A = s^2$

arithmetic sequence: a number pattern where the difference between consecutive numbers (terms) is constant.

average: a number obtained by adding a group of numbers together and dividing by the number of addends.

biased sample: one in which members of a sample are underrepresented or totally ignored.

center: the point from which all points on a circle are equally distant.

circle: the set of all points equally distanct (the radius) from a point (the center).

circumference: the distance around a circle.

Formula: $c = 2\pi r$ **where** r **= radius** $\pi \approx 3.14$

common denominator: a multiple of all denominators in a problem.

common factor: a number that is a factor of two other numbers is a common factor.

Example: 3 is a common factor of 9 and 12.

common multiple: a number that is a multiple of two other numbers.

Example: 24 is a common multiple of 6 and 4.

complementary angles: two angles with a sum of 90 degrees.

congruent: refers to figures that have the same shape and size.

congruent figure: the image of another figure under a translation, reflection or rotation.

coordinates: number pairs used in graphing. The horizontal axis is listed first and the vertical axis is listed second.

Example: 8, 10

Lesson 21 page 41

① a. $3\frac{1}{8}x - \frac{3}{4} = \frac{1}{8}$ → $+\frac{6}{8}\ +\frac{6}{8}$ → $\frac{8}{25}\cdot\frac{25}{8}x = \frac{7}{8}\cdot\frac{8}{25}$ → $x = \frac{7}{25}$

b. $1\frac{1}{2}x + \frac{1}{4} = \frac{1}{3} = \frac{4}{12}$ → $-\frac{3}{12}\ -\frac{3}{12}$ → $\frac{3}{2}\cdot\frac{2}{3}x = \frac{1}{12}\cdot\frac{2}{3}$ → $x = \frac{1}{18}$

c. $.02x - 2 = 6.4$ → $+2\ +2$ → $\frac{.02x}{.02} = \frac{8.4}{.02}$ → $x = 420$

② a. ≈ 5 b. ≈ 10 c. ≈ 100 d. ≈ 410

③ a. $100\% - 20\% = 80\%$ $.8p = 28.80$ b. $\frac{.8p}{.8} = \frac{28.80}{.8}$ → $p = \$36$

④ Let $a = 2$, $b = \frac{1}{2}$, $c = -\frac{1}{2}$, $d = -2$

a. $2^{-1} \_\_ \left(\frac{1}{2}\right)^{-1}$ → $\frac{1}{2} < 2$

b. $\left(\frac{1}{2}\right)^2 \_\_ (-2)^2$ → $\frac{1}{4} < 4$

c. $2^0 \_\_ \left(-\frac{1}{2}\right)^0$ → $1 = 1$

d. $\frac{1}{2} \_\_ \left(\frac{1}{2}\right)^2$ → $\frac{1}{2} > \frac{1}{4}$

e. $-(2)^2 \_\_ (-2)^2$ → $-4 < 4$

f. $a + c \_\_ b + d$ → $2 + -\frac{1}{2} \_\_ \frac{1}{2} + -2$ → $1\frac{1}{2} > -1\frac{1}{2}$

⑤ a. $\frac{x}{6} = \frac{3}{8}$ → $\frac{1}{8}\cdot 8x = 18\cdot\frac{1}{8}$ → $x = \frac{18}{8} = 2\frac{1}{4}$

b. $\frac{x}{15} = \frac{5}{75}$ → $75x = 75$ → $x = 1$

c. $\frac{x}{1000} = \frac{1}{10}$ → $10x = 1000$ → $x = 100$

Lesson 21 continued page 42

⑥ a. $U = 1^3 = 1$
b. $U = 2^3 = 8$
c. 8 times

⑦ a. $-3 \times -7 = 21$ b. $\left(-\frac{2}{3}\right)\left(-\frac{9}{10}\right) = \frac{3}{5}$ c. $-100 \times -40 = 4000$
d. positive

⑧ a. 64, 125, 216
b. neither. These are $1^3\ 2^3\ 3^3\ 4^3\ 5^3\ 6^3$

⑨ $300{,}000 \times .1 = 30{,}000$

⑩ a. $|4| \_\_ |-4|$ → $4 = 4$

b. $4^2 \_\_ (-4)^2$ → $16 = 16$

c. $2^4 \_\_ 4^2$ → $16 = 16$

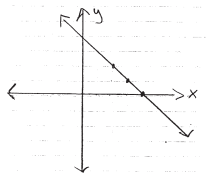
d. $4^1 \_\_ 4 \times 10^0$ → $4 = 4$

⑪ $\frac{S}{180} = \frac{(n-2)180}{180}$ → $\frac{S}{180} = n - 2$ → $+2\ +2$ → $\frac{S}{180} + 2 = n$

Lesson 22 page 43

① a. (4,0) (3,1) (2,2)

b.



c. $m = \frac{0-1}{4-3} = \frac{-1}{+1} = -1$

② c. $4(x+2) = 4x+8$
a. $\left(\frac{1}{3}\times\frac{1}{2}\right)(3) = \left(\frac{1}{3}\times 3\right)\left(\frac{1}{2}\right)$
b. $.99 + .48 + .01 = .99 + .01 + .48$

③ $60 \times 2{,}000{,}000 = 120{,}000{,}000$

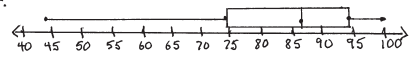
④ a.

x	0	1	2	3	4	5
y	-1	2	5	8	11	14

b. $3x - 1 = y$
c. $3(10) - 1 = 29$

Lesson 22 continued page 44

⑤ a. 100
b. 44
c. 87
d. 94
e. 74.5
f.



⑥ Let $x = m\angle A = m\angle B$
$2x + 30 = 180$
$2x = 150$
$x = 75°$

⑦ a. $m\angle 1 = 130°$ b. $m\angle 2 = 50°$
c. $m\angle 3 = 55°$ d. $m\angle 4 = 75°$

Lesson 23 page 45

① a. ≈ 63 b. ≈ 11 c. ≈ 3

② a. Let $x = m\angle C$
$4x = m\angle A$
$x + 4x = 90$

b. $\frac{1}{5}\cdot 5x = 90\cdot\frac{1}{5}$ → $x = 18°$ → $4x = 72°$

③ a. 6000 b. 500,000
c. 40 d. 3000

④ a. 468 inches = 39 feet = 13 yards
b. 59000 MM = 5900 CM = 59 M

⑤ a. commutative
b. distributive
c. associative

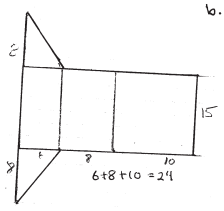
⑥ $5^2 + 7^2 = 9^2$
$25 + 49 \neq 81$

Lesson 23 continued page 46

⑦ $m\angle 2 = 44°$ $m\angle 3 = 90°$

⑧ Since it is the choir, they are not likely to be allowed to chew gum during practice or performance.

⑨ a.



b. $p(\text{base}) = 6+8+10 = 24$
$SA = ph + 2(\frac{1}{2}bh)$
$= 24\cdot 15 + 2(\frac{1}{2}\cdot 6\cdot 8)$
$= 360 + 48$
$= 408 \text{ units}^2$

⑩ a. $C = 25 + 50h$
b. $C = 25 + 50(2) = \$125$
c. $275 = 25 + 50h$
$250 = 50h$
$5 = h$ → 5 hours

⑪ $A = \frac{1}{2}h(b_1 + b_2)$
$A = \frac{1}{2}\cdot 8(10) = 40 \text{ inches}^2$

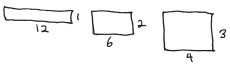
Lesson 24 page 47

① $\frac{1}{3} = \frac{4}{12}$ $\frac{1}{2} = \frac{6}{12}$ $\frac{5}{12}$

② 6 and 7

③ b. meters
d. kilometers
a. millimeters
c. centimeters

④ a.



b. $p = 2(12+1) = 26$ $p = 2(6+2) = 16$ $p = 2(4+3) = 14$
c. The 3ft x 4ft

⑤ a. 600 b. 300
c. 10,000 d. .0001

Lesson 24 continued page 48

⑥ 1000 grams 1 liter = 1000 milliliters

⑦ a. $|-5| = 5$ b. $(-5)^2 = 25$ c. $(-(-5))^2 = 25$

⑧ $3 \times 6 \times 2 = 36$

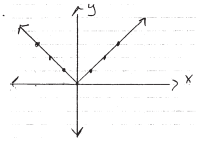
⑨ $.055 \times 1{,}800{,}000 = \$99{,}000$

⑩ $22 - (-7) = 29°$

⑪ a.

x	-3	-2	-1	0	1	2	3
y	3	2	1	0	1	2	3

b.



c. The absolute value of a number is positive.