OAK HALL SCHOOL

2024-2025

Suggested Review Exercises
for students entering

Middle School Algebra 1

A message from the Math Department

Mathematics is a subject that is cumulative in nature as it constructs new knowledge from foundational prior knowledge. Therefore, as it is imperative to our students' success, we require them to have mastered certain skills and concepts before entering a new math course.

Each course in the math department has provided suggested exercises for incoming students as a resource for them to review the required prerequisites that are critical to their success in the course. While we will not be requiring students to complete these exercises as a formal assignment to be turned in, we have the highest expectations of our students as self-aware, proactive learners. Each student is responsible for gauging which prerequisites they need to reinforce and how much studying they need to do for them to start the new school year feeling confident, prepared, and accomplished.

We recommend that our students begin this process mid to late summer in order for everything to be fresh in their minds but also to give them time to recover from the school year they just completed. Rest is not an indulgence; it is a human necessity. We hope everyone has a safe, fun, and restful summer and we look forward to having another great school year when we come back in August!

Section A: Evaluating Numerical and Algebraic Expressions

1. $-8\div 2^2+6$	2. $4\bullet 12\div 2\bullet 3$	3. $4+6(12-5\bullet 2)^2$
4. $(2-4)^2-3(-2)(-3)$	5. $\lvert 23+(-25)\rvert$	6. -7^2
7. $(-7)^2$	8. $\dfrac{-4}{7}\bullet\dfrac{9}{16}$	9. $\left(\dfrac{-2}{3}\right)^2$
10. $8\left(\dfrac{-1}{3}\right)\left(\dfrac{1}{2}\right)$	11. $-3\dfrac{3}{4}-2\dfrac{3}{5}$	12. $2\dfrac{3}{8}\div\dfrac{-1}{4}$
13. $-2\dfrac{3}{8}\div 3\dfrac{1}{4}$	14. $-2\frac{3}{8}\cdot 3\frac{1}{4}$	15. $-\frac{9}{5}\div 2$

16. $7 - 2 \cdot 4 + 11$	17. $(9 + 18 - 3) \div 8$	18. $9(3 + 3) \div (-\frac{1}{6})$
19. $9 - 7 - 6 \div 6$	20. $(10 \cdot 2) \div (1 + 1)$	21. $\left(-\frac{4}{3}\right) - \left(-\frac{3}{2}\right)$
22. $1\frac{2}{5} - \left(-3\frac{3}{4}\right)$	23. Evaluate when x=4 $2x + 1$	24. Evaluate when $y = -3$ $5y^2 + 4(y - 3)$
25. Round 26.7349 to nearest hundredth.	26. Round 3271.7349 to nearest hundred.	27. Evaluate when x = -3 $-2x^2 - x$

Section B: Simplifying Algebraic Expressions

The Distributive Property states for any number *a, b,* and *c*:

1. $a(b+c) = ab + ac$ or $(b+c)a = ba + ca$
2. $a(b-c) = ab - ac$ or $(b-c)a = ba - ca$

Combining Like-Terms

Terms in algebra are numbers, variables or the product of numbers and variables. In algebraic expressions terms are separated by addition (+) or subtraction (-) symbols. Terms can be combined using addition and subtraction if they are **like-terms**.

Like-terms have the same variables to the same power.

Example of like-terms: $5x^2$ and $-6x^2$

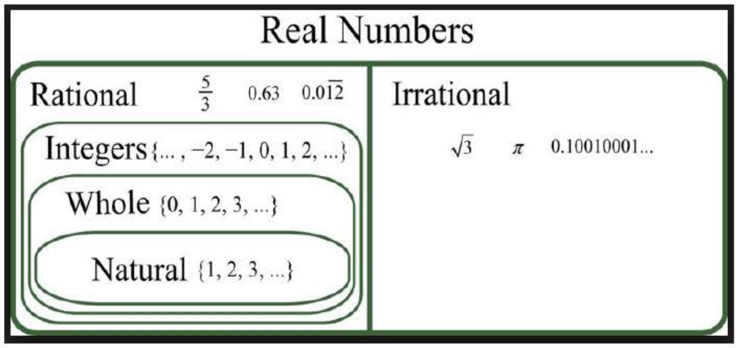
Example of terms that are **NOT** like-terms: $9x^2$ and $15x$

Although both terms have the variable ***x****, they are not being raised to the same power*

Practice: Simplify each expression

1. $5x - 9x + 2$
2. $3q^2 + q - q^2$
3. $c^2 + 4d^2 - 7d^2$
4. $5x^2 + 6x - 12x^2 - 9x + 2$
5. $2(3x - 4y) + 5(x + 3y)$
6. $10xy - 4(xy + 2x^2y)$

Section C: The Real Number System



The **Real** number system is made up of two main sub-groups **Rational numbers** and **Irrational numbers.**

The set of rational numbers includes several subsets: **natural numbers, whole numbers, and integers.**

- **Real Numbers**- any number that can be represented on a number-line.
  - **Rational Numbers-** a number that can be written as the ratio of two integers (this includes decimals that have a definite end or repeating pattern)

    Examples: $2, -5, \frac{-3}{2}, \frac{1}{3}, 0.253, 0.\overline{3}$
    - **Integers**- positive and negative whole numbers and 0

      Examples: $-5, -3, 0, 8$ ...
    - **Whole Numbers** – the counting numbers from 0 to infinity

      Examples: { 0, 1, 2, 3, 4, ...}
    - **Natural Numbers**- the counting numbers from 1 to infinity

      Examples: $\{ 1, 2, 3, 4 \ldots \}$
  - **Irrational Numbers**- Non-terminating, non-repeating decimals (including π, and the square root of any number that is not a perfect square.)

    Examples: 2π, $\sqrt{3}$, $\sqrt{23}$, 3.21211211121111....

Practice: Name all the sets to which each number belongs.

1. -4.2 ______________________________
2. $3\sqrt{5}$ ______________________________
3. $\frac{5}{3}$ ______________________________
4. 9 ______________________________
5. $\sqrt{16}$ ______________________________
6. $-\frac{8}{2}$ ______________________________

Section D: Properties Real Numbers

Following are properties of Real Numbers that are useful in evaluating and solving algebraic expressions.

Additive Identity	For any number a, $a + 0 = a$.
Multiplicative Identity	For any number a, $a \cdot 1 = a$.
Multiplicative Property of 0	For any number a, $a \cdot 0 = 0$.
Multiplicative Inverse Property	For every number $\frac{a}{b}$, $a, b \neq 0$, there is exactly one number $\frac{b}{a}$ such that $\frac{a}{b} \cdot \frac{b}{a} = 1$.
Reflexive Property	For any number a, $a = a$.
Symmetric Property	For any numbers a and b, if $a = b$, then $b = a$.
Transitive Property	For any numbers a, b, and c, if $a = b$ and $b = c$, then $a = c$.
Substitution Property	If $a = b$, then a may be replaced by b in any expression.
Commutative Properties	For any numbers a and b, $a + b = b + a$ and $a \cdot b = b \cdot a$.
Associative Properties	For any numbers a, b, and c, $(a + b) + c = a + (b + c)$ and $(ab)c = a(bc)$.

Practice: Name the property illustrated in each equation.

1. $3 \bullet x = x \bullet 3$ ________________________________
2. $3a + 0 = 3a$ ________________________________
3. $2r + (3r + 4r) = (2r + 3r) + 4r$ ____________________
4. $5y \bullet \frac{1}{5y} = 1$ ________________________________
5. $9a + (-9a) = 0$ ____________________________
6. $(10b + 12b) + 7b = (12b + 10b) + 7b$ ____________________
7. $5x + 2 = 5x + 2$ ________________________
8. If $9 + 4 = 13$ and $13 = 2 + 11$ then $9 + 4 = 2 + 11$ ____________________
9. If $x = 7$ then $7 = x$__________________
10. $3 \bullet 1 = 3$ ______________________

Section E: Solving Equations

VIII. Solving Equations with Variables on One-Side

To solve an equation means to ***find the value*** of the variable. We solve equations by isolating the variable using opposite operations.

Opposite Operations:
Addition (+) & Subtraction (–)
Multiplication (x) & Division (÷)

Example:

Solve.

$3x - 2 = 10$	
$+2 \quad +2$	Isolate 3x by adding 2 to each side.
$\frac{3x}{3} = \frac{12}{3}$	Simplify Isolate x by dividing each side by 3.
$x = 4$	Simplify

Please remember…
to do the same step on each side of the equation.

Always check your work by substitution!

Check your answer.

$3(4) - 2 = 10$	Substitute the value in for the variable.
$12 - 2 = 10$	Simplify
$10 = 10$	Is the equation true? If yes, you solved it correctly!

Practice: Solve each equation.

1. $98 = b + 34$

2. $-14 + y = -2$

3. $8k = -64$

4. $\frac{2}{5}x = 6$

5. $14n - 8 = 34$

6. $8 + \frac{n}{12} = 13$

7. $\frac{3k - 7}{5} = 16$

8. $-\frac{d}{6} + 12 = -7$

Section F: Ratios and Proportions

Solve Proportions If a proportion involves a variable, you can use cross products to solve the proportion. In the proportion $\frac{x}{5} = \frac{10}{13}$, x and 13 are called **extremes.** They are the first and last terms of the proportion. 5 and 10 are called **means.** They are the middle terms of the proportion. In a proportion, the product of the extremes is equal to the product of the means.

Means-Extremes Property of Proportions	For any numbers a, b, c, and d, if $\frac{a}{b} = \frac{c}{d}$, then $ad = bc$.

Example 1:

$$\frac{x}{5} = \frac{10}{13}$$

$$x \cdot 13 = 5 \cdot 10$$

$$13x = 50$$

$$\frac{13x}{13} = \frac{50}{13}$$

$$x = \frac{50}{13}$$

Example 2:

$$\frac{x+1}{4} = \frac{3}{4}$$

$$4(x+1) = 3 \cdot 4$$

$$4x + 4 = 12$$

$$-4 \quad -4$$

$$4x = 8$$

$$\frac{4x}{4} = \frac{8}{4}$$

$$x = 2$$

Practice: Solve each proportion.

1. $\frac{x}{21} = \frac{3}{63}$

4. $\frac{9}{y+1} = \frac{18}{54}$

2. $\frac{-3}{x} = \frac{2}{8}$

5. $\frac{a-8}{12} = \frac{15}{3}$

3. $\frac{0.1}{2} = \frac{0.5}{x}$

6. $\frac{3+y}{4} = \frac{-y}{8}$

Section G: Percent

Percent Proportion	$\dfrac{\text{PART (IS)}}{\text{WHOLE (OF)}} = \dfrac{\text{PERCENT}}{100}$

Complete each problem below using the percent proportion. Round your answers to the nearest hundredth, if necessary. Show all work!

1. What percent of 140 is 30?

2. 25% of what number is 85?

3. 32% of 118 is what number?

4. 56 is what percent of 65?

5. What is 170% of 40?

6. 45% of what number is 30?

Section H: Rate of Change and Slope

Slope of a Line	$m = \frac{\text{rise}}{\text{run}}$ or $m = \frac{y_2 - y_1}{x_2 - x_1}$, where (x_1, y_1) and (x_2, y_2) are the coordinates of any two points on a nonvertical line

Example 1 **Find the slope of the line that passes through $(-3, 5)$ and $(4, -2)$.**

Let $(-3, 5) = (x_1, y_1)$ and $(4, -2) = (x_2, y_2)$.

$m = \frac{y_2 - y_1}{x_2 - x_1}$ Slope formula

$= \frac{-2 - 5}{4 - (-3)}$ $y_2 = -2, y_1 = 5, x_2 = 4, x_1 = -3$

$= \frac{-7}{7}$ Simplify.

$= -1$

Example 2 **Find the value of r so that the line through $(10, r)$ and $(3, 4)$ has a slope of $-\frac{2}{7}$.**

$m = \frac{y_2 - y_1}{x_2 - x_1}$ Slope formula

$-\frac{2}{7} = \frac{4 - r}{3 - 10}$ $m = -\frac{2}{7}, y_2 = 4, y_1 = r, x_2 = 3, x_1 = 10$

$-\frac{2}{7} = \frac{4 - r}{-7}$ Simplify.

$-2(-7) = 7(4 - r)$ Cross multiply.

$14 = 28 - 7r$ Distributive Property

$-14 = -7r$ Subtract 28 from each side.

$2 = r$ Divide each side by -7.

Practice:

Find the slope of the line that passes through each pair of points.

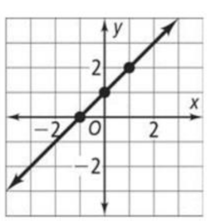
1. $(4,9), (1 - ,6)$

3. $(4, 3.5), (-4, 3.5)$

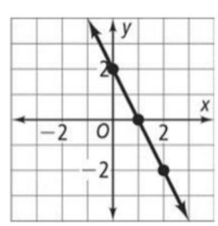
2. $(2,5), (6,2)$

4. $(1, -2), (-2, -5)$

5.

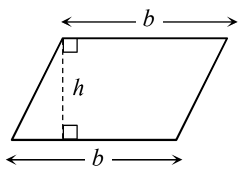


6.

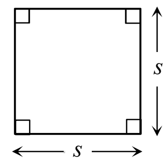


Section I: Measurement

GEOMETRY FORMULAS REFERENCE

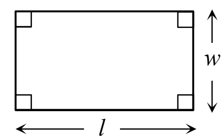


$A = bh$



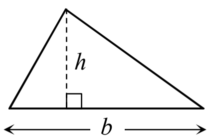
$p = 4s$

$A = s^2$

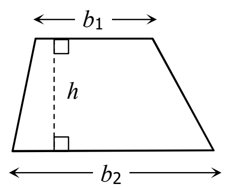


$p = 2l + 2w$

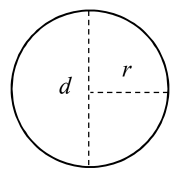
$A = lw$



$A = \frac{1}{2}bh$



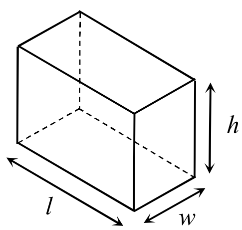
$A = \frac{1}{2}h(b_1 + b_2)$



$C = 2\pi r$

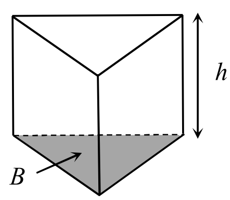
(or $C = \pi d$)

$A = \pi r^2$



$V = lwh$

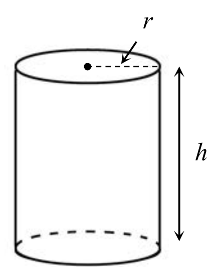
$SA = 2lw + 2lh + 2wh$



$V = Bh$

$LA = hp$

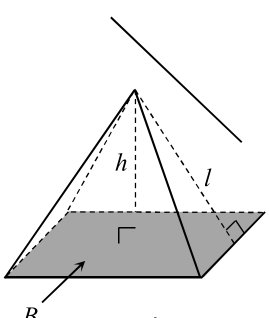
$SA = hp + 2B$



$V = \pi r^2 h$

$LA = 2\pi rh$

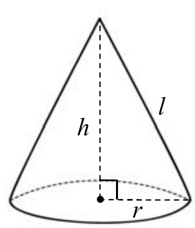
$SA = 2\pi r^2 + 2\pi rh$



$V = \frac{1}{3}Bh$

$LA = \frac{1}{2}lp$

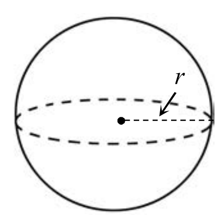
$SA = \frac{1}{2}lp + B$



$V = \frac{1}{3}\pi r^2 h$

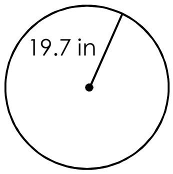
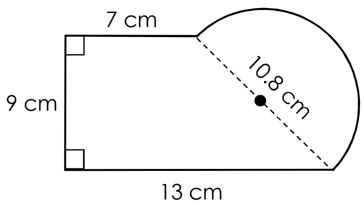
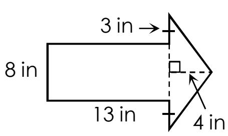
$LA = \pi rl$

$SA = \pi r^2 + \pi rl$



$V = \frac{4}{3}\pi r^3$

$SA = 4\pi r^2$

Find the perimeter and area of each composite figure. Round to the nearest tenth ***if necessary***.		
Figure	**Perimeter/Circumference**	**Area**
1. 		
2. 		
3. 		

4. Find the area of the shaded region. Round to the nearest tenth if necessary.

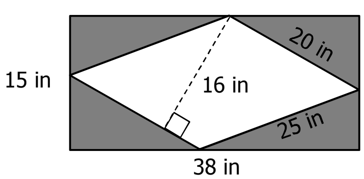
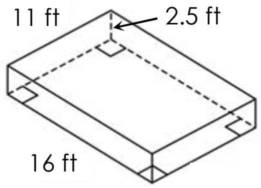
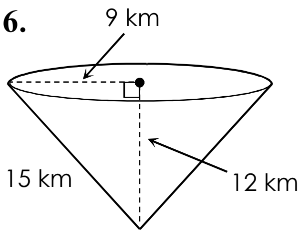
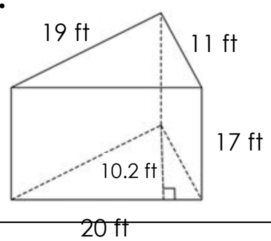
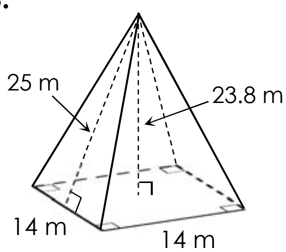
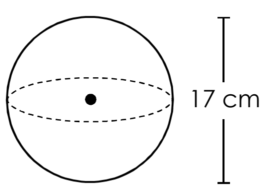


FIGURE	VOLUME	SURFACE AREA
5. 		
6. 		
7. 		
8. 		
9. 		
10.