Clifton High School Mathematics Summer Workbook

Algebra 1

Completion of this summer work is required on the first day of the school year.

Date Received: _____ Date Completed: _____

Student Signature: _____

Parent Signature: _____

Please read the note to parents following this page.

Dear Parents and Guardians,

Attached is the mathematics workbook that your child is required to work on over the summer. Our goal is that your child will continue to work on appropriate math skills and concepts to maintain the progress made during the previous grade. This work will also help prepare your child for the next level. We have included a list of vocabulary words to define and several review sheets and problems that require written explanations, as well as web sites that can be helpful with the review problems. Please note that directions and sample problems are offered in each section for reference and review.

Summer workbooks can be accessed online through the Clifton web site:

- http://www.clifton.k12.nj.us/cliftonhs/index.html
- click on: mathematics summer workbooks

Please sign to indicate the date the packet was received and the date it was completed. Encourage your child to work through the booklet a section at a time during July and August.

Your child's math teacher will collect the workbook during the first week of school. Giving time and thought to this work will help to maximize your child's grade on the test given in September. The test will be based on the work and will count as the first test of the school year. The grade will be determined as follows:

- Completion of the workbook on time will count as 20% of the grade.
- Performance on the test will count as 80% of the grade.

Thank you for your cooperation.

Sincerely,

Michael Doktor
Principal

Mary Campbell
Supervisor of Mathematics 9-12

CLIFTON HIGH SCHOOL
MATHEMATICS DEPARTMENT

ALGEBRA I SUMMER WORKBOOK
TOPICS COVERED

	Basic Vocabulary
1-1	Variables and Expressions (includes Order of Operations)
1-2	Solving Equations by Adding and Subtracting
1-3	Solving Equations by Multiplying and Dividing
1-4	Solving Multi-Step Equations
1-5	Solving Equations with Variables on Both Sides
1-6	Solving for a Variable
1-7	Solving Absolute Value Equations

The Algebra 1 textbook can be accessed for reference over the summer. There are instructional videos to explain each lesson.

http://my.hrw.com
Username: cwwms1
Password: clifton

Study Island can also be accessed during the summer. Students should be familiar with the 8th grade common core topics.

All pages **MUST** show the work in order for the answers to be accepted. All work should be written neatly on a separate page. This booklet must be kept neat and in order and is to **remain in your notebook** as a reference guide.

3-Ring binders are required for 9th grade Algebra.

Completion of this booklet is required on the first day of the school year.

VOCABULARY:

Match the given words to the correct definition. Write the answers on this page.

absolute value	equation	GCF	prime number	sum
base	exponent	integers	product	variable
composite numbers	expression	LCM	quotient	<
difference	factors	ordered pair	rational number	>

1) _____ a mathematical sentence that contains an equal sign

2) _____ made up of quantities and the operations performed on them

does not contain $=, \neq, <, \leq, >, \geq$

3) _____ a symbol that is used to represent a number

4) _____ used to locate points (x, y) in the coordinate plane

5) _____ the solution to an addition problem

6) _____ the solution to a subtraction problem

7) _____ the solution to a multiplication problem

8) _____ the solution to a division problem

9) _____ whole numbers and their opposites {…-3,-2,-1,0,1,2,3,…} (symbol is **Z**)

10) _____ a number that can be expressed in the form a/b, in which a and b are integers and $b \neq 0$ (symbol is **Q**)

11) _____ a number's distance from zero on the number line

12) _____ the quantities that are multiplied in a multiplication expression

13) _____ a whole number greater than one, with exactly 2 factors, 1 and itself

14) _____ a whole number greater than 1 that has more than 2 factors

15) _____ the greatest number that is a factor of two or more integers

16) _____ the least positive integer that is divisible by each of 2 or more integers

17) _____ the "x" in an expression of the form x^n

18) _____ the "n" in an expression of the form x^n

19) _____ the symbol for "less than" (2 __ 3)

20) _____ the symbol for "greater than" (3 __ 2)

Name _____ Date _____ Class _____

LESSON 1-1

Review for Mastery

Variables and Expressions

To translate words into algebraic expressions, find words like these that tell you the operation.

+	−	•	÷
add	subtract	multiply	divide
sum	difference	product	quotient
more	less	times	split
increased	decreased	per	ratio

Kenny owns *v* video games. Stan owns 7 more video games than Kenny. Write an expression for the number of video games Stan owns.

v represents the number of video games Kenny owns.

$v + 7$ *Think: The word "more" indicates addition.*

Order does not matter for addition. The expression $7 + v$ is also correct.

Jenny is 12 years younger than Candy. Write an expression for Jenny's age if Candy is *c* years old.

c represents Candy's age.

The word "younger" means "less," which indicates subtraction.

$c - 12$ *Think: Candy is older, so subtract 12 from her age.*

Order does matter for subtraction. The expression $12 - c$ is incorrect.

1. Jared can type 35 words per minute. Write an expression for the number of words he can type in *m* minutes. _____

2. Mr. O'Brien's commute to work is 0.5 hour less than Miss Santos's commute. Write an expression for the length of Mr. O'Brien's commute if Miss Santos's commute is *h* hours. _____

3. Mrs. Knighten bought a box of *c* cookies and split them evenly between the 25 students in her classroom. Write an expression for the number of cookies each student received. _____

4. Enrique collected 152 recyclable bottles, and Latasha collected *b* recyclable bottles. Write an expression for the number of bottles they collected altogether. _____

5. Tammy's current rent is *r* dollars. Next month it will be reduced by $50. Write an expression for next month's rent in dollars. _____

Name _____ Date _____ Class _____

LESSON 1-1

Review for Mastery

Variables and Expressions continued

The value of $\square - 9$ depends on what number is placed in the box.

Evaluate $\square - 9$ when 20 is placed in the box.

$\square - 9$

$20 - 9$

11

In algebra, variables are used instead of boxes.

Evaluate $x \div 7$ for $x = 28$.

$x \div 7$

$28 \div 7$

4

Sometimes, the expression has more than one variable.

Evaluate $x + y$ for $x = 6$ and $y = 2$.

$x + y$

$6 + 2$

8

Evaluate $5 + \square$ when each number is placed in the box.

6. 3 _____

7. 5 _____

8. 24 _____

Evaluate each expression for $x = 4$, $y = 6$, and $z = 3$.

9. $x + 15$ _____

10. $3y$ _____

11. $15 - z$ _____

Evaluate each expression for $x = 2$, $y = 18$, and $z = 9$.

12. $x \cdot z$ _____

13. $y - x$ _____

14. $y \div z$ _____

15. $\frac{y}{x}$ _____

16. xy _____

17. $z - x$ _____

Name _____ Date _____ Class _____

LESSON 1-2

Review for Mastery

Solving Equations by Adding or Subtracting

Use counters to model solving equations.

Solve $x + 2 = 5$.

Using counters	Using numbers
$x +$ ○○ $=$ ○○○	$x + 2 = 5$
$x +$ ⊘⊘ $=$ ○○○	$x + 2 = 5$ $\underline{\ -2\ \ -2}$
$x + 0 \quad =$ ○○	$x + 0 = 3$
$x =$ ○○	$x = 3$
Check: ○○ + ○○ = ○○○○	***Check:*** $x + 2 = 5$ $3 + 2 \stackrel{?}{=} 5$ $5 \stackrel{?}{=} 5$ ✓

Solve the following by drawing counters. Check your answers.

1. $x + 1 = 5$

2. $7 = x + 2$

Solve each equation. Check your answers.

3. $x + 4 = 12$

4. $21 = x + 2$

5. $x + 3 = 8$

Name _____ Date _____ Class _____

LESSON 1-2

Review for Mastery

Solving Equations by Adding or Subtracting *continued*

Any addition equation can be solved by adding the opposite. If the equation involves subtraction, it helps to first rewrite the subtraction as addition.

Solve $x + 4 = 10$.

Find the opposite of this number.

$x + 4 = 10$	*The opposite of 4 is –4.*
$\underline{-4 \quad -4}$	*Add –4 to each side.*
$x = 6$	

Check: $x + 4 = 10$

$6 + 4 \stackrel{?}{=} 10$

$10 \stackrel{?}{=} 10$✓

Solve $-5 = x - 8$.

Find the opposite of this number.

$-5 = x + -8$	*Rewrite subtraction as addition.*
	The opposite of –8 is 8.
$\underline{+8 \quad +8}$	*Add 8 to each side.*
$3 = x$	

Check: $-5 = x - 8$

$-5 \stackrel{?}{=} 3 - 8$

$-5 \stackrel{?}{=} -5$✓

Solve $x - (-6) = 2$.

Find the opposite of this number.

$x + 6 = 2$	*Rewrite subtraction as addition.*
	The opposite of 6 is –6.
$\underline{-6 \quad -6}$	*Add –6 to each side.*
$x = -4$	

Check: $x - (-6) = 2$

$4 - (-6) \stackrel{?}{=} 2$

$2 \stackrel{?}{=} 2$✓

Rewrite each equation with addition. Then state the number that should be added to each side.

6. $x - 7 = 12$

7. $x - (-1) = -5$

8. $-4 = x - 2$

Solve each equation. Check your answers.

9. $x + 10 = -6$

10. $-8 = x - 2$

11. $x - (-5) = -2$

Name _____ Date _____ Class _____

LESSON 1-3

Review for Mastery

Solving Equations by Multiplying or Dividing

Solve equations involving multiplication and division by performing the inverse operation.

Solve $\frac{x}{5} = 4$. ***Check:*** $\frac{x}{5} = 4$

$\frac{x}{5} = 4$	*x is divided by 5.*	$\frac{20}{5} \stackrel{?}{=} 4$
$5 \cdot \frac{x}{5} = 4 \cdot 5$	*Multiply both sides by 5.*	$4 \stackrel{?}{=} 4$ ✓
$\frac{5x}{5} = 20$	*Simplify.*	
$x = 20$		

Solve $-3x = 27$. ***Check:*** $-3x = 27$

$-3x = 27$	*x is multiplied by –3.*	$-3(-9) \stackrel{?}{=} 27$
$\frac{-3x}{-3} = \frac{27}{-3}$	*Divide both sides by –3.*	$27 \stackrel{?}{=} 27$ ✓
$x = -9$	*Simplify.*	

Circle the correct word in each sentence. Then solve the equation.

1. $\frac{x}{-2} = 7$

   x is multiplied/divided by –2.

   To solve, multiply/divide both sides by –2.

   $x =$ _____

2. $5m = -40$

   m is multiplied/divided by 5.

   To solve, multiply/divide both sides by 5.

   $m =$ _____

Solve each equation. Check your answers.

3. $-2x = -20$

4. $\frac{w}{5} = -7$

5. $6z = -42$

_____ _____ _____

Name _____ Date _____ Class _____

LESSON 1-3

Review for Mastery

Solving Equations by Multiplying or Dividing continued

Equations with fractions can be solved by multiplying by the reciprocal.

Solve $\frac{2}{3}x = 8$. ***Check:*** $\frac{2}{3}x = 8$

$\frac{2}{3}x = 8$	*x is multiplied by* $\frac{2}{3}$.	$\frac{2}{3}(12) \stackrel{?}{=} 8$
$\frac{3}{2} \cdot \frac{2}{3}x = 8 \cdot \frac{3}{2}$	*Multiply both sides by* $\frac{3}{2}$.	$\frac{24}{3} \stackrel{?}{=} 8$
$\frac{6}{6}x = \frac{24}{2}$	*Simplify.*	$8 \stackrel{?}{=} 8$ ✓
$x = 12$		

Solve $-\frac{3}{4}x = \frac{2}{5}$. ***Check:*** $-\frac{3}{4}x = \frac{2}{5}$

$-\frac{3}{4}x = \frac{2}{5}$	*x is multiplied by* $-\frac{3}{4}$.	$-\frac{3}{4}\left(-\frac{8}{15}\right) \stackrel{?}{=} \frac{2}{5}$
$-\frac{4}{3} \cdot -\frac{3}{4}x = \frac{2}{5} \cdot -\frac{4}{3}$	*x is multiplied by* $-\frac{4}{3}$.	$\frac{24}{60} \stackrel{?}{=} \frac{2}{5}$
$\frac{12}{12}x = -\frac{8}{15}$	*Simplify.*	$\frac{2}{5} \stackrel{?}{=} \frac{2}{5}$ ✓
$x = -\frac{8}{15}$		

Find the reciprocal.

6. $\frac{2}{5}$ _____

7. $-\frac{5}{7}$ _____

8. 7 _____

Solve each equation. Check your answers.

9. $\frac{5}{6}x = 10$ _____

10. $6 = -\frac{3}{5}x$ _____

11. $\frac{2}{3}x = -\frac{3}{5}$ _____

Name _____ Date _____ Class _____

LESSON 1-4

Review for Mastery

Solving Two-Step and Multi-Step Equations

When solving multi-step equations, first combine like terms on each side if possible. Then use inverse operations.

	Operations	Solve using Inverse Operations
$4x - 3 = 15$	• x is multiplied by 4. • Then 3 is subtracted.	• Add 3 to both sides. • Then divide both sides by 4.
$\frac{x}{3} + 2 = 9$	• x is divided by 3. • Then 2 is added.	• Add –2 to both sides. • Then multiply both sides by 3.

The order of the inverse operations is the order of operations in reverse.

Solve $2x - 7 + 3x = 13$.

Check:

$2x + 3x - 7 = 13$ *Group like terms together.* $2x - 7 + 3x = 13$

$5x - 7 = 13$ *Add like terms.* $2(4) - 7 + 3(4) \stackrel{?}{=} 13$

$5x - 7 = 13$ *x is multiplied by 5. Then 7 is subtracted.*

$+7 \quad +7$ *Add 7 to both sides.* $8 - 7 + 12 \stackrel{?}{=} 13$

$5x = 20$ $13 \stackrel{?}{=} 13$ ✓

$\frac{5x}{5} = \frac{20}{5}$ *Divide both sides by 5.*

$x = 4$

Solve each equation. Check your answers.

1. $3x - 8 = 4$

2. $\frac{b}{2} - 4 = 26$

3. $5y + 4 - 2y = 9$

4. $14 = 3(x - 2) + 5$

Name _____ Date _____ Class _____

LESSON 1-4

Review for Mastery

Solving Two-Step and Multi-Step Equations continued

A two-step equation with fractions can be simplified by multiplying each side by the LCD. This will clear the fractions.

Solve $\frac{x}{4} + \frac{2}{3} = 2$. **Check:**

$\frac{x}{4} + \frac{2}{3} = 2$		$\frac{x}{4} + \frac{2}{3} = 2$
$12\left(\frac{x}{4} + \frac{2}{3}\right) = (12)2$	*Multiply both sides by the LCD 12.*	$\frac{1}{4}x + \frac{2}{3} = 2$
$12\left(\frac{x}{4}\right) + 12\left(\frac{2}{3}\right) = 12(2)$		$\frac{1}{4}\left(\frac{16}{3}\right) + \frac{2}{3} \stackrel{?}{=} 2$
$3x + 8 = 24$	*x is multiplied by 3. 8 is added.*	$\frac{16}{12} + \frac{2}{3} \stackrel{?}{=} 2$
$\underline{\quad -8 \quad -8}$	*Add −8 to both sides.*	$\frac{4}{3} + \frac{2}{3} \stackrel{?}{=} 2$
$3x = 16$		$\frac{6}{3} \stackrel{?}{=} 2$
$\frac{3x}{3} = \frac{16}{3}$	*Divide both sides by 3.*	$2 \stackrel{?}{=} 2$ ✓
$x = \frac{16}{3}$		

Solve each equation. Check your answers.

5. $\frac{x}{2} + \frac{3}{8} = 1$

6. $\frac{w}{3} + \frac{2}{5} = \frac{1}{15}$

7. $3 = \frac{a}{5} + \frac{1}{2}$

_____ _____ _____

Name _____ Date _____ Class _____

LESSON 1-5

Review for Mastery

Solving Equations with Variables on Both Sides

Variables must be collected on the same side of the equation before the equation can be solved.

Solve $10x = 2x - 16$.

		Check:
$10x = 2x - 16$		$10x = 2x - 16$
$-2x \quad -2x$	*Add $-2x$ to both sides.*	$10(-2) \stackrel{?}{=} 2(-2) - 16$
$8x = -16$		$-20 \stackrel{?}{=} -4 - 16$
$\frac{8x}{8} = \frac{-16}{8}$	*Divide both sides by 8.*	$-20 \stackrel{?}{=} -20$ ✓
$x = -2$		

Solve $3x = 5(x + 2)$.

		Check:
$3x = 5x + 10$	*Distribute.*	$3x = 5(x + 2)$
$-5x \quad -5x$	*Add $-5x$ to both sides.*	$3(-5) \stackrel{?}{=} 5(-5 + 2)$
$-2x = 10$		$-15 \stackrel{?}{=} 5(-3)$
$\frac{-2x}{-2} = \frac{10}{-2}$	*Divide both sides by -2.*	$-15 \stackrel{?}{=} -15$ ✓
$x = -5$		

Write the first step you would take to solve each equation.

1. $3x + 2 = 7x$ _____
2. $-4x - 6 = -10x$ _____
3. $15x + 7 = -3x$ _____

Solve each equation. Check your answers.

4. $4x + 2 = 5(x + 10)$
5. $-10 + y + 3 = 4y - 13$
6. $3(t + 7) + 2 = 6t - 2 + 2t$

Name _____ Date _____ Class _____

LESSON 1-5

Review for Mastery

Solving Equations with Variables on Both Sides continued

Some equations have infinitely many solutions. These equations are true for all values of the variable. Some equations have no solutions. There is no value of the variable that will make the equation true.

Solve $-3x + 9 = 4x + 9 - 7x$.

		Check any value of x:
$-3x + 9 = -3x + 9$	*Combine like terms.*	Try $x = 4$.
$\underline{-3x} \quad \underline{+3x}$	*Add 3x to each side.*	$-3x + 9 = 4x + 9 - 7x$
$9 = 9$ ✓	*True statement.*	$-3(4) + 9 \stackrel{?}{=} 4(4) + 9 - 7(4)$
The solution is the set of all real numbers.		$-12 + 9 \stackrel{?}{=} 16 + 9 - 28$
		$-3 \stackrel{?}{=} -3$ ✓

Solve $2x + 6 + 3x = 5x - 10$.

		Check any value of x:
$2x + 6 + 3x = 5x - 10$		Try $x = 1$.
$5x + 6 = 5x - 10$	*Combine like terms.*	$2x + 6 + 3x = 5x - 10$
$\underline{-5x} \quad \underline{-5x}$	*Add –5x to each side.*	$2(1) + 6 + 3(1) \stackrel{?}{=} 5(1) - 10$
$6 = -10$ ×	*False statement.*	$2 + 6 + 3 \stackrel{?}{=} 5 - 10$
There is no solution.		$11 \stackrel{?}{=} -5$ ×

Solve each equation.

7. $x + 2 = x + 4$

8. $-2x + 8 = 2x + 4$

9. $5 + 3g = 3g + 5$

10. $5x - 1 - 4x = x + 7$

11. $2(f + 3) + 4f = 6 + 6f$

12. $3x + 7 - 2x = 4x + 10$

Name _____ Date _____ Class _____

LESSON 1-6

Review for Mastery

Solving for a Variable

Solving for a variable in a formula can make it easier to use that formula. The process is similar to that of solving multi-step equations. Find the operations being performed on the variable you are solving for, and then use inverse operations.

	Operations	Solve using Inverse Operations
$A = lw$ Solve for w.	• w is multiplied by l.	• Divide both sides by l.
$P = 2l + 2w$ Solve for w.	• w is multiplied by 2. • Then $2l$ is added.	• Add $-2l$ to both sides. • Then divide both sides by 2.

The order of the inverse operations is the order of operations in reverse.

The formula $A = \frac{1}{2}bh$ relates the area A of a triangle to its base b and height h. Solve the formula for b.

$A = \frac{1}{2}bh$	*b is multiplied by* $\frac{1}{2}$.
$\left(\frac{2}{1}\right) \cdot A = \left(\frac{2}{1}\right)\frac{1}{2}bh$	*Multiply both sides by* $\frac{2}{1}$.
$2A = bh$	*b is multiplied by h.*
$\frac{2A}{h} = \frac{bh}{h}$	*Divide both sides by h.*
$\frac{2A}{h} = b$	*Simplify*.

Solve for the indicated variable.

1. $P = 4s$ for s _____

2. $a + b + c = 180$ for b _____

3. $P = \frac{KT}{V}$ for K _____

The formula $V = \frac{1}{3}lwh$ relates the volume of a square pyramid to its base length l, base width w, and height h.

4. Solve the formula for w. _____

5. A square pyramid has a volume of 560 in^3, a base length of 10 in., and a height of 14 in. What is its base width? _____

Name _____ Date _____ Class _____

LESSON 1-6

Review for Mastery

Solving for a Variable continued

Any equation with two or more variables can be solved for any given variable.

Solve $x = \frac{y - z}{10}$ for y.

$x = \frac{y - z}{10}$ — *$y - z$ is divided by 10.*

$10(x) = 10\left(\frac{y - z}{10}\right)$ — *Multiply both sides by 10.*

$10x = y - z$ — *z is subtracted from y. Add z to both sides.*

$+z \quad +z$

$10x + z = y$

Solve $a = b + \frac{c}{d}$ for c.

$a = b + \frac{c}{d}$

$-b \quad -b$ — *Add –b to each side.*

$a - b = \frac{c}{d}$

$d(a - b) = \left(\frac{c}{d}\right)d$ — *Multiply both sides by d.*

$d(a - b) = c$ — *Simplify.*

State the first inverse operation to perform when solving for the indicated variable.

6. $y = x + z$; for z _____

7. $\frac{f + g}{2} = h$; for g _____

8. $t = -3r + \frac{s}{5}$; for s _____

Solve for the indicated variable.

9. $3ab = c$; for a _____

10. $y = x + \frac{z}{3}$; for z _____

11. $\frac{m + 3}{n} = p$; for m _____

Name _____ Date _____ Class _____

LESSON 1-7

Review for Mastery

Solving Absolute-Value Equations

There are three steps in solving an absolute-value equation. First use inverse operations to isolate the absolute-value expression. Then rewrite the equation as two cases that do not involve absolute values. Finally, solve these new equations.

Solve $|x - 3| + 4 = 8$.

Step 1: Isolate the absolute-value expression.

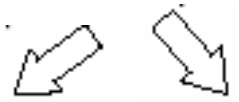
$|x - 3| + 4 = 8$

$-4 \quad -4$ *Subtract 4 from both sides.*

$|x - 3| = 4$

Step 2: Rewrite the equation as two cases.

$|x - 3| = 4$



	Case 1	**Case 2**	
Step 3:	$x - 3 = -4$	$x - 3 = 4$	
Solve.	$+3 \quad +3$	$+3 \quad +3$	*Add 3 to both sides.*
	$x = -1$	$x = 7$	

The solution are -1 and 7.

Solve each equation.

1. $|x - 2| - 3 = 5$

2. $|x + 7| + 2 = 10$

3. $4|x - 5| = 20$

4. $|2x| + 1 = 7$

Name _____ Date _____ Class _____

LESSON 1-7

Review for Mastery

Solving Absolute-Value Equations continued

Some absolute-value equations have two solutions. Others have one solution or no solution. To decide how many solutions there are, first isolate the absolute-value expression.

Original Equation	Simplified Equation	Solutions
$\lvert x\rvert + 5 = 7$	$\lvert x\rvert + 5 = 7$ $-5 \quad -5$ $\lvert x\rvert = 2$	$\lvert x\rvert = 2$ has two solutions, $x = -2$ and $x = 2$. The solutions are –2 and 2.
$\lvert x - 5\rvert + 2 = 2$	$\lvert x - 5\rvert + 2 = 2$ $-2 \quad -2$ $\lvert x - 5\rvert = 0$	$\lvert x - 5\rvert = 0$ means $x - 5 = 0$, so there is one solution $x = 5$. The solution is 5.
$\lvert x + 7\rvert + 4 = 1$	$\lvert x + 7\rvert + 4 = 1$ $-4 \quad -4$ $\lvert x + 7\rvert = -3$	$\lvert x + 7\rvert = -3$ has no solutions because an absolute-value expression is never negative. There is no solution.

Solve $\lvert 2x + 1\rvert - 3 = -7$.

$\lvert 2x + 1\rvert - 3 = -7$

$+3 \quad +3$ *Add 3 to both sides.*

$\lvert 2x + 1\rvert = -4$ *Absolute value cannot be negative.*

The equation has no solution.

Solve each equation.

5. $8 + \lvert x - 2\rvert = 8$

6. $\lvert x + 1\rvert + 5 = 2$

7. $4\lvert x - 3\rvert = -16$

8. $3\lvert x + 10\rvert = 0$