

Decatur City Schools

Decatur, Alabama

Mathematics Department

Summer Course Work

In preparation for

9th Grade Algebra 1

Completion of this summer work
is required on the first class day
of the 2019-2020 school year.

Student Name: _____

Decatur City Schools
Mathematics Department

Summer Workbook
Algebra 1
Topics

1. Order of Operations
2. Fractions
3. Real Numbers
4. Variables and Verbal Expressions
5. Algebraic Expressions
6. Solving Equations
7. Measures of Central Tendencies
8. Plotting Points on the Coordinate Plane

All pages **MUST** show the work in order for the work to be accepted. If more paper is needed, the work may go on the back of each page or neatly on a separate page.

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

*****If you do not remember something, look it up. Use resources such as, Khan Academy, Google, YouTube, etc.**

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Dear Parents and Guardians:

Attached are the summer curriculum review materials for *Algebra 1*. This booklet was prepared by the Decatur City Schools Math Department and contains topics that reflect content learned in prerequisite courses. These materials must be completed and brought to class on the first class day of school.

Your child is required to complete this booklet over the summer. A test based on the material in the packet will be given to your child during the second week of school. It will count as the first test of the year and the grade will be determined as follows:

Completion of the packet on time will count 20% of the grade
Performance on the test will count 80% of the grade.

Thank you for your cooperation.

Sincerely,

Decatur City School Mathematics Department

Section 1 – Order of Operations

The order of operations in mathematics is a set of rules to follow to determine which operation to do first when there are different operations within a single problem. The order to perform combined operations is called the **PEMDAS** rule. A common mnemonic for **PEMDAS** is **Please Excuse My Dear Aunt Sally**.

- Always work on the calculations within *parenthesis* first (if any)
- Next, calculate the *exponents*
- Then, carry out *multiplication* or *division*, working from *left to right*
- Lastly, do *addition* and *subtraction*, working from *left to right*

Example 1

Evaluate $16 - 8 \div 2^2 + 14$.

$$\begin{aligned} 16 - 8 \div 2^2 + 14 &= 16 - 8 \div 4 + 14 && \text{Evaluate powers.} \\ &= 16 - 2 + 14 && \text{Divide 8 by 4.} \\ &= 14 + 14 && \text{Subtract 2 from 16.} \\ &= 28 && \text{Add 14 and 14.} \end{aligned}$$

Example 2

Evaluate each expression.

a. $4 \div 2 + 5(10 - 6)$

$$\begin{aligned} 4 \div 2 + 5(10 - 6) &= 4 \div 2 + 5(4) && \text{Evaluate inside parentheses.} \\ &= 2 + 5(4) && \text{Divide 4 by 2.} \\ &= 2 + 20 && \text{Multiply 5 by 4.} \\ &= 22 && \text{Add 2 to 20.} \end{aligned}$$

b. $6[32 - (2 + 3)^2]$

$$\begin{aligned} 6[32 - (2 + 3)^2] &= 6[32 - (5)^2] && \text{Evaluate innermost expression first.} \\ &= 6[32 - 25] && \text{Evaluate power.} \\ &= 6[7] && \text{Subtract 25 from 32.} \\ &= 42 && \text{Multiply.} \end{aligned}$$

Section 1 – Exercises

Evaluate and simplify each expression.

1. $10 + 8^3 \div 16$

2. $(12 - 6) \cdot 5^2$

3. $3[10 - (27 \div 9)]$

4. $4[(6^3 - 9) \div 23]$

5. $3[4 - 8 + 4^2(2 + 5)]$

6. $25 + \left[(16 - 3 \cdot 5) + \frac{12 + 3}{5} \right]$

Section 2 – Fractions

We use fractions or ratios every day. A fraction is part of an entire object. It consists of two numbers, a number on the top called a numerator and a number on the bottom called a denominator. To add or subtract a fraction, you must have a common denominator.

- Find the Least Common Denominator (LCD) of the fractions
- Rename the fractions to have the LCD
- Add (or subtract) the numerators
- Keep the LCD
- Simplify the fraction

Example 1

Find each sum or difference. Write in simplest form.

a. $\frac{1}{2} + \frac{2}{3}$

$$\begin{aligned}\frac{1}{2} + \frac{2}{3} &= \frac{3}{6} + \frac{4}{6} \\ &= \frac{3+4}{6} \\ &= \frac{7}{6} \text{ or } 1\frac{1}{6}\end{aligned}$$

The LCD for 2 and 3 is 6. Rename $\frac{1}{2}$ as $\frac{3}{6}$ and $\frac{2}{3}$ as $\frac{4}{6}$.

Add the numerators.

Simplify.

b. $\frac{3}{8} - \frac{1}{3}$

$$\begin{aligned}\frac{3}{8} - \frac{1}{3} &= \frac{9}{24} - \frac{8}{24} \\ &= \frac{9-8}{24} \\ &= \frac{1}{24}\end{aligned}$$

The LCD for 8 and 3 is 24. Rename $\frac{3}{8}$ as $\frac{9}{24}$ and $\frac{1}{3}$ as $\frac{8}{24}$.

Subtract the numerators.

Simplify.

c. $\frac{2}{5} - \frac{3}{4}$

$$\begin{aligned}\frac{2}{5} - \frac{3}{4} &= \frac{8}{20} - \frac{15}{20} \\ &= \frac{8-15}{20} \\ &= -\frac{7}{20}\end{aligned}$$

The LCD for 5 and 4 is 20. Rename $\frac{2}{5}$ as $\frac{8}{20}$ and $\frac{3}{4}$ as $\frac{15}{20}$.

Subtract the numerators.

Simplify.

Section 2 – Exercises

Find each sum or difference. Write your answer in simplest form. (Leave as an improper fraction.)

7. $\frac{2}{3} + \frac{7}{8}$

8. $\frac{13}{20} - \frac{2}{5}$

9. $\frac{5}{6} - \frac{8}{9}$

To multiply fractions, multiply the numerators and multiply the denominators. If the numerators and denominators have common factors, you can simplify before you multiply by cross canceling.

Example 2

Find each product.

a. $\frac{2}{5} \cdot \frac{1}{3}$

$$\frac{2}{5} \cdot \frac{1}{3} = \frac{2 \cdot 1}{5 \cdot 3}$$
$$= \frac{2}{15}$$

Multiply the numerators.
Multiply the denominators.
Simplify.

b. $\frac{3}{5} \cdot 1\frac{1}{2}$

$$\frac{3}{5} \cdot 1\frac{1}{2} = \frac{3}{5} \cdot \frac{3}{2}$$
$$= \frac{3 \cdot 3}{5 \cdot 2}$$
$$= \frac{9}{10}$$

Write $1\frac{1}{2}$ as an improper fraction.
Multiply the numerators.
Multiply the denominators.
Simplify.

c. $\frac{1}{4} \cdot \frac{2}{9}$

$$\frac{1}{4} \cdot \frac{2}{9} = \frac{1}{\cancel{4}^2} \cdot \frac{\cancel{2}^1}{9}$$
$$= \frac{1 \cdot 1}{2 \cdot 9} \text{ or } \frac{1}{18}$$

Divide by the GCF, 2.
Multiply the numerators.
Multiply the denominators and simplify.

Section 2 – Exercises

Find each product. Write your answer in simplest form. (Leave as an improper fraction.)

10. $\frac{3}{5} \cdot \frac{5}{6}$

11. $\frac{11}{3} \cdot \frac{9}{44}$

12. $-\frac{2}{7} \cdot 4\frac{2}{3}$

To divide one fraction by another, you multiply the first fraction by the reciprocal of the second fraction.

Example 3

Find each quotient.

a. $\frac{1}{3} \div \frac{1}{2}$

$$\frac{1}{3} \div \frac{1}{2} = \frac{1}{3} \cdot \frac{2}{1}$$
$$= \frac{2}{3}$$

Multiply $\frac{1}{3}$ by $\frac{2}{1}$, the reciprocal of $\frac{1}{2}$.

Simplify.

b. $\frac{3}{8} \div \frac{2}{3}$

$$\frac{3}{8} \div \frac{2}{3} = \frac{3}{8} \cdot \frac{3}{2}$$
$$= \frac{9}{16}$$

Multiply $\frac{3}{8}$ by $\frac{3}{2}$, the reciprocal of $\frac{2}{3}$.

Simplify.

c. $\frac{3}{4} \div 2\frac{1}{2}$

$$\frac{3}{4} \div 2\frac{1}{2} = \frac{3}{4} \div \frac{5}{2}$$
$$= \frac{3}{4} \cdot \frac{2}{5}$$
$$= \frac{6}{20} \text{ or } \frac{3}{10}$$

Write $2\frac{1}{2}$ as an improper fraction

Multiply $\frac{3}{4}$ by $\frac{2}{5}$, the reciprocal of $2\frac{1}{2}$.

Simplify.

d. $-\frac{1}{5} \div \left(-\frac{3}{10}\right)$

$$-\frac{1}{5} \div \left(-\frac{3}{10}\right) = -\frac{1}{5} \cdot \left(-\frac{10}{3}\right)$$
$$= \frac{10}{15} \text{ or } \frac{2}{3}$$

Multiply $-\frac{1}{5}$ by $-\frac{10}{3}$, the reciprocal of $-\frac{3}{10}$.

Same sign \rightarrow positive quotient; simplify.

Section 2 – Exercises

Find each quotient. Write your answer in simplest form. (Leave as an improper fraction.)

13. $\frac{3}{25} \div \frac{2}{15}$

14. $2\frac{1}{4} \div \frac{1}{2}$

15. $-\frac{9}{10} \div 3$

Section 3 – Real Number Comparison

An inequality is a mathematical sentence that compares the value of two expressions using an inequality symbol.

Inequality Symbol	Pronounced	Example
$<$	Less than	$4 < 9$
\leq	Less than or equal to	$-3 \leq 2$
$>$	Greater than	$-4 > -7$
\geq	Greater than or equal to	$5 \geq 5$
\neq	Not equal to	$7 \neq 11$

Example 1

Which one is greater, $\frac{4}{9}$ or $\frac{5}{12}$?

Rewrite each fraction using the LCD.

$$\frac{4}{9} = \frac{16}{36} \quad \text{and} \quad \frac{5}{12} = \frac{15}{36}$$

$$\frac{16}{36} > \frac{15}{36} \quad \text{So} \quad \frac{4}{9} > \frac{5}{12}$$

Section 3 – Exercises

Use $<$, $=$, or $>$ to compare the numbers.

16. -12 _____ -15	17. 0.63 _____ 0.6	18. 0.88 _____ $\frac{8}{9}$
19. $\frac{2}{3}$ _____ $\frac{1}{6}$	20. $\frac{3}{4}$ _____ $\frac{12}{16}$	21. $-2\frac{5}{8}$ _____ $-2\frac{1}{2}$

Section 4 – Variables & Verbal Expressions

Translating in mathematics usually involves changing a verbal phrase into a mathematical phrase. The following are common phrases used in mathematics.

Phrase	Sign
sum, increased, added to, more than, plus, totals, combined, perimeter	+
difference, minus, less than, used, remain, subtracted from, decreased by	–
product, of, times, area, doubles, multiplied by	•
quotient, division, average, half, divided by, per	÷
is, is the same as, equal, was, were, has, costs, becomes	=

Section 4 – Exercises

Write an algebraic expression for each phrase.

22. 12 less than p
23. the product of 2 and t
24. 9 plus the quotient of y and 15
25. the sum of 7 and h

Section 5 – Evaluating Algebraic Expressions

A *variable* is a letter that represents an unspecified number. To evaluate an algebraic expression, replace the variables with their values. Then find the value of the numerical expression using the order of operations.

Example 1

Evaluate $3x^2 + (2y + z^3)$ if $x = 4$, $y = 5$, $z = 3$.

$$\begin{aligned} 3x^2 + (2y + z^3) &= 3(4)^2 + (2 \cdot 5 + 3^3) && \text{Replace } x \text{ with } 4, y \text{ with } 5, \text{ and } z \text{ with } 3. \\ &= 3(4)^2 + (2 \cdot 5 + 27) && \text{Evaluate } 3^3. \\ &= 3(4)^2 + (10 + 27) && \text{Multiply } 2 \text{ by } 5. \\ &= 3(4)^2 + (37) && \text{Add } 10 \text{ to } 27. \\ &= 3(16) + 37 && \text{Evaluate } 4^2. \\ &= 48 + 37 && \text{Multiply } 3 \text{ by } 16. \\ &= 85 && \text{Add } 48 \text{ to } 37. \end{aligned}$$

Section 5 – Exercises

Evaluate each expression.

26. $t + u \div 6$ for $t = 12$, $u = 18$

27. $m^2 - 7$ for $m = 11$

28. $4p - 26$ for $p = 10$

29. $\frac{ab}{2} - 4c$ for $a = 6$, $b = 5$, $c = 3$

Section 6 – Solving One-Step Equations

In an equation, the variable represents the number that satisfies the equation. To solve an equation means to find the value of the variable that makes the equation true. You will only need to perform one step in order to solve a **one-step** equation.

The strategy for getting the variable by itself involves using opposite operations. The most important thing to remember in solving a linear equation is that whatever you do to one side of the equation, you **MUST** do to the other side.

Example 1

$-2 = k - 14$	Solve
$-2 + 14 = k - 14 + 14$	Since 14 is subtracted from k , you must add 14 to each side of the equation
$12 = k$ or $k = 12$	Answer

Example 2

$\frac{x}{-7} = 15$	Solve
$(-7)\frac{x}{-7} = 15(-7)$	Since x is divided by -7 , you must multiply both sides by -7
$x = -105$	Answer

Example 3

$\frac{3}{4}u = -24$	Solve
$\left(\frac{4}{3}\right)\frac{3}{4}u = -24\left(\frac{4}{3}\right)$	Multiply both sides by the reciprocal of $\frac{3}{4}$ and cancel any common factors
$u = -32$	Answer

Section 6 – Exercises

Solve each equation.

30. $37 = x - 72$

31. $5p = 325$

32. $d + 1.5 = 3.7$

33. $102 + t = 36$

34. $\frac{2}{3}y = 8$

35. $\frac{h}{7} = -12$

Section 7 – Measures of Central Tendency

In working with statistical data, it is often useful to determine a single quantity that best describes a set of data. The best quantity to choose is usually one of the most popular measures of central tendency: mean, median, mode, or range.

Mean The mean is the sum of the data items in a set divided by the number of data items in the set.

Median The median is the middle value in a set of data when the numbers are arranged in numerical order. If the set has an even number of data items, the median is the mean of the two middle data values.

Mode The mode is the data item that occurs most often in a set of data.

Range The range is the difference between the greatest and least values in a set of data.

Example 1

Set of data: 34, 46, 31, 40, 33, 40, 35

In order: 31, 33, 34, 35, 40, 40, 46

Mean	$\frac{(31 + 33 + 34 + 35 + 40 + 40 + 46)}{7}$	Answer: 37
Median	35 is the middle number when written in numerical order	Answer: 35
Mode	40 is the only number that occurs more than once	Answer: 40
Range	46 – 31	Answer: 15

Section 7 – Exercises

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

<p>36. Daily sales from a store \$834, \$1099, \$775, \$900, \$970</p> <p>Mean =</p> <p>Median =</p> <p>Mode =</p> <p>Range =</p>	<p>37. Goals scored in a soccer game 3, 2, 0, 11, 7, 6, 4, 10</p> <p>Mean =</p> <p>Median =</p> <p>Mode =</p> <p>Range =</p>
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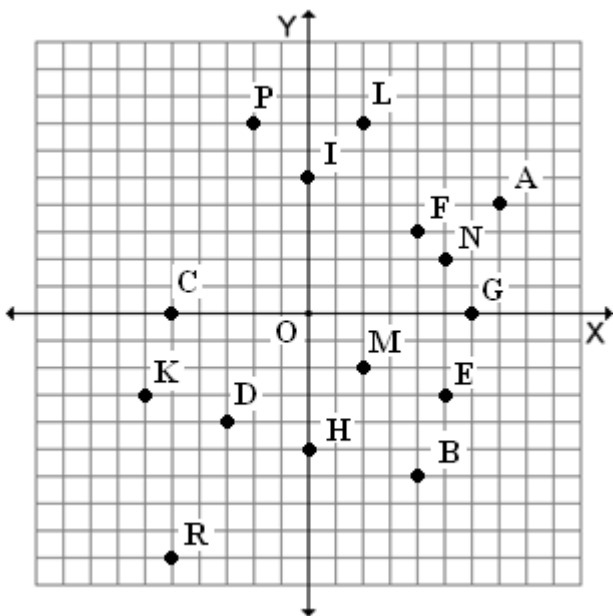
Section 8 – Plotting on the Coordinate Plane

You can graph points on a coordinate plane. Use an ordered pair (x, y) to record the coordinates. The first number in the pair is the *x-coordinate*. The second number is the *y-coordinate*. To graph a point, start at the origin $(0, 0)$. Move **horizontally** according to the value of x . Then move **vertically** according to the value of y .

Section 8 – Exercises

List the ordered pair for each letter, then identify the quadrant or axes the point lies in.

38. C	
39. A	
40. M	
41. P	
42. F	
43. I	
44. R	
45. E	



Plot & label the following ordered pairs.

46. $F = (-8, 6)$
47. $R = (6, -1)$
48. $I = (-5, -7)$
49. $D = (-4, 0)$
50. $S = (0, 7)$

