

# Summer Math Packet

Entering 9th Grade



Student Name: \_\_\_\_\_

Students & Parents,

Enclosed you will find the summer math practice packet. The purpose of the summer math practice packet is to provide students with the opportunity to stay engaged in mathematics over the summer and reinforce the necessary skills for the upcoming school year. If you have any questions or concerns, please feel free to contact me at [adavid@colemancarroll.org](mailto:adavid@colemancarroll.org)

## **Central Tendencies**

(Mean, Median, Mode, and Range)

**Mean** is the sum of the values in a set of data divided by the number of values.

**Median** is the middle value of a set of data written in ascending order. If there are two middle values, the median is the mean of those values.

**Mode** is the most frequent value in a set of data.

**Range** is the difference between the greatest and least value in a set of data.

Exercises:

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

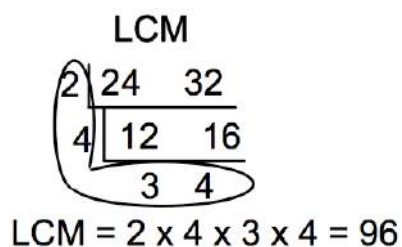
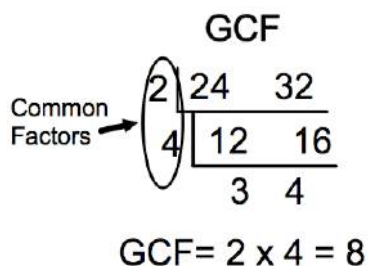
1. 108, 93, 426, 766, 518, 210

2. 21.5, 35.5, 49.5, 16.3, 35.5

## GCF & LCM

Example:

Find the Greatest Common Factor (GCF) and Least Common Multiple (LCM) of 24 and 32.



Exercises:

**Find the GCF.**

1. 42, 60

2.  $24xy^2$ ,  $42xy$

3.  $27x^2y^2$ ,  $45x^2$

4. 11, 21

**Find the LCM**

5. 27, 18

6.  $15x$ ,  $18xy$

7.  $9x^2y$ ,  $15xy^2$

8. 64, 48

**Fractions**  
(Addition, Subtraction, Multiplication, and Division)

Miscellaneous

**Write the fractions in lowest terms.**

1.  $\frac{8}{24}$

2.  $\frac{18}{24}$

3.  $\frac{15x^2y}{20xy}$

4.  $\frac{36abc^4}{45a^3bc^2}$

**Solve for  $x$ .**

5.  $\frac{16}{48} = \frac{x}{12}$

6.  $\frac{12}{42} = \frac{4}{x}$

7.  $\frac{20}{32} = \frac{x}{16}$

8.  $\frac{6}{9} = \frac{12}{x}$

**Write as improper fractions.**

9.  $2\frac{1}{3}$

10.  $-4\frac{6}{7}$

**Write as mixed numbers.**

11.  $-\frac{9}{4}$

12.  $\frac{38}{3}$

Addition and Subtraction

**Find each sum or difference. Write your answer in simplest form.**

**13.**  $-\frac{2}{3} + \frac{1}{4}$

**14.**  $3\frac{5}{9} + 2\frac{1}{6}$

**15.**  $\frac{3}{10} - \frac{4}{5}$

**16.**  $6\frac{7}{10} + \left(-1\frac{1}{5}\right)$

**17.**  $5\frac{4}{11} - 2\frac{2}{3}$

**18.**  $2\frac{7}{12} - 9\frac{2}{3}$

Multiplication and Division

**Find each product or quotient. Write your answer in simplest form.**

**19.**  $-\frac{5}{6} \cdot \frac{6}{15}$

**20.**  $-\frac{3}{4} \div \left(-\frac{9}{16}\right)$

**21.**  $2\frac{2}{5} \cdot \left(-3\frac{3}{4}\right)$

**22.**  $-3\frac{3}{4} \div 4\frac{2}{3}$

**23.**  $\frac{2}{9} \cdot \frac{3}{16} \cdot \frac{3}{6}$

**24.**  $6\frac{3}{4} \div 4$

## Order of Operations

When several operations are indicated in a numerical expression, proceed in the following order: work within the parentheses, expand each power, multiply and divide (whichever comes first), and finally, add or subtract (whichever comes first).

**PEMDAS** (“**P**lease **E**xcuse **M**y **D**ear **A**unt **S**ally”) is an acronym that provides a good way to remember your order of operation.

**P:** Parentheses

**E:** Exponents

**MD:** Multiply or Divide, whichever comes first

**AS:** Add or Subtract, whichever comes first

Simplify.

1.  $2^4 - 3(3^2 - 8)$

2.  $(4^2 + 10)4 - 10(5^2 - 20)$

3.  $4^2 - 4(5^2 - 32 \div 8 \cdot 4)$

4.  $(8 \cdot 5 \div 10 + 2)(2^5 - 8^2 \div 2)$

5.  $5^2 - 3[6 + (-2)(20 + (-15))]$

6.  $[4^3 + (-10)(30 - 8 \cdot 5)]$

7.  $[15 - 3(4^2 - 10) + 25 \div 5 \cdot 15]$

8.  $\{10 - 5[20 - 2(3^2 + 1)]\}$

9.  $|-32| + 32$

10.  $\frac{48 - 24 \div 2^3}{3 + 2 \cdot 6}$

## Working with Integers

### Adding and Subtracting:

1<sup>st</sup>: Rewrite all subtraction as addition then...

- If the integers have the same signs, add their absolute values. The sum will have the same sign of the addends.
- If the integers have different signs, subtract their absolute values. The sum has the sign of the addend with the greater absolute value.

### Multiplying and Dividing:

- The product or quotient of two integers having the same sign is positive.
- The product or quotient of two integers having different signs is negative.

*Find each sum, difference, product, or quotient.*

- |                 |                    |                      |
|-----------------|--------------------|----------------------|
| 1. $-13 + 19$   | 2. $37 + (-13)$    | 3. $-18 + (-29)$     |
| 4. $-27 - 93$   | 5. $-46 - (-32)$   | 6. $9 - 83$          |
| 7. $-45 \div 9$ | 8. $-84 \div -12$  | 9. $\frac{132}{-11}$ |
| 10. $8(-17)$    | 11. $-24 \cdot -6$ | 12. $-62(8)$         |

13. There is a  $6^\circ$  drop in temperature over the past hour. If it is  $55^\circ$  now, what was the temperature an hour ago?
14. It is  $-9^\circ$  now. The temperature will drop  $5^\circ$  in two hours. What will the temperature be in two hours?



## Evaluating Expressions and Formulas

To evaluate an expression, first replace the variable by a given value. Then simplify the resulting numerical expression.

*Evaluate the expression when  $x = -2$  and  $y = 5$ .*

1.  $x + y$

2.  $x^2 + y^3$

3.  $2x - y$

4.  $-2(y - 2x)$

5.  $\frac{3x-y}{11}$

6.  $\frac{x}{3-y}$

## Properties of Operations

### Commutative Property of Addition:

$$a + b = b + a$$

### Commutative Property of Multiplication:

$$a \times b = b \times a$$

### Associative Property of Addition:

$$(a + b) + c = a + (b + c)$$

### Associative Property of Multiplication:

$$(a \times b) \times c = a \times (b \times c)$$

### Identity Property of Addition:

$$a + 0 = a$$

### Identity Property of Multiplication:

$$a \times 1 = a$$

*Name the property illustrated by each expression.*

1.  $8 \times 12 = 12 \times 8$

2.  $3 \times (2 \times 5) = (3 \times 2) \times 5$

3.  $2 + 5 + 12 = 5 + 2 + 12$

4.  $xy + 0 = xy$

5.  $1x = x$

6.  $5 + 7 = 7 + 5$

7.  $3 + (4 + 5) = 3 + (5 + 4)$

8.  $3xy = 3xy(1)$

9.  $(4 + 8) + 5 = 4 + (8 + 5)$

10.  $5 \times 6 \times 8 = 8 \times 5 \times 6$

## Solving Multi-Step Equations

**Procedure:** To solve multi-step equations...

1. Fully simplify both sides of the equation
2. Get all variables to one side of the equation.
3. Use inverse operations to isolate the variable  
\*\*undo addition and subtraction first\*\*

Ex.

$$\begin{array}{r} 2x + 3 = 7 \\ \underline{-3 \quad -3} \\ 2x = 4 \\ \underline{\div 2 \quad \div 2} \\ \boxed{x = 2} \end{array}$$

Ex.

$$\begin{array}{r} 2(x + 5) = 3x - 5 \\ 2x + 10 = 3x - 5 \\ \underline{-2x \quad -2x} \\ 10 = x - 5 \\ \underline{+5 \quad +5} \\ \boxed{x = 15} \end{array}$$

### Exercises

**Solve and check each equation.**

1.  $-2x + 7 = 25$

2.  $3 - 8x = -141$

3.  $15 - 2(w + 5) = 11$

4.  $12 - 4r = 6r + 2$

5.  $-4(n + 5) = -32$

6.  $12 - 2x + 5 = -1$

7.  $3 - 2x = 15$

8.  $\frac{z}{2} - 7 = 12$

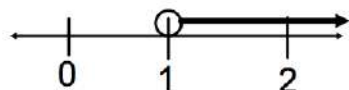
9.  $17 + 3x = 4x - 9$

10.  $-3(6f - 12) = 36 - 18f$


## Solving Multi-Step Inequalities

**Note:** Solve a multi-step inequality just like you would solve a multi-step equation. However, if you multiply or divide both sides of an inequality by a negative number, then the inequality sign reverses.

Ex.

$$\begin{array}{r}
 2x + 5 > 7 \\
 \underline{-5 \quad -5} \\
 2x > 2 \\
 \underline{\div 2 \quad \div 2} \\
 \boxed{x > 1}
 \end{array}$$


Ex.

$$\begin{array}{r}
 10 \leq -2(x - 4) \\
 10 \leq -2x + 8 \\
 \underline{-8 \quad -8} \\
 10 \leq -2x \\
 \underline{\div -2 \quad \div -2} \\
 \boxed{-5 \geq x \text{ or } x \leq -5}
 \end{array}$$


### Exercises

**Find and graph the solution set of each inequality.**

1.  $3x + 8 > 17$

2.  $-6y + 3 > 9 - 7y$

3.  $2v + 7 \geq 11$

4.  $7 > 3 + \frac{b}{3}$

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

6.  $4b + 4 < 4(5 - 3b)$

7.  $2z - 5 < -21 - 2z$

8.  $8b - 10 \geq 6(3 - a)$

9.  $3x - 5 > 6x + 13$

1.  $7(y + 5) - 10 \leq 2y$

## Linear Functions

### Exercises

**Tell whether each ordered pair is a solution of the equation.**

1.  $3x + y = -11, (-4, 1)$

2.  $2x - y = 4, (3, -2)$

**Find the intercepts of the equations graph.**

3.  $3x - 4y = -12$

4.  $y = -2x - 8$

**Find the slope through the given points.**

5.  $(4, 7), (-3, 6)$

6.  $(-5, 7), (-5, -14)$

**Identify the slope and y-intercept of the line with the given equation.**

7.  $y = 2x - 12$

8.  $2x - 3y = -6$

**Write an equation of the line that is parallel to the given line and passes through the given point.**

9.  $y = -2x - 6, (0, -4)$

10.  $-2x + 3y = 12, (3, 2)$

**Graph the equation using any method.**

11.  $y = 2x - 3$

12.  $-2x - 3y = 12$

## Polynomials

### Examples

A polynomial is in **Standard Form** if it is simplified and the terms are arranged so the degree of each term increases (or stays the same) from left to right.

#### **Find the difference:**

$$(6x^2 - 5x + 2) - (-3x^2 - 8x + 3)$$

First: Turn the expression into an addition problem by distributing the negative to the second expression.

$$(6x^2 - 5x + 2) + (3x^2 + 8x - 3)$$

Then: Combine like terms

$$(6x^2 + 3x^2) + (-5x + 8x) + (2 + -3) = 9x^2 + 3x - 1$$

#### **Find the product:**

$$3x(2x^2 - 5) = 3x(2x^2) + 3x(-5) = 6x^3 - 15x$$

#### **Find the quotient:**

$$\frac{8r^4 + 4r^2 - 6r}{2r} = \frac{8r^4}{2r} + \frac{4r^2}{2r} + \frac{-6r}{2r} = 4r^3 + 2r - 3$$

#### **Find the product using the F.O.I.L. method (F: first, O: outer, I: inner, L: last):**

$$(2x - 3)(x + 5) = 2x(x) + 2x(5) - 3(x) - 3(5) = 2x^2 + 7x - 15$$

### Exercises

#### **Write the expression in standard form.**

1.  $13 - 4x + 3x^3$

2.  $4y^3 - 2(2y - 3) + y$

#### **Find the sum or difference.**

3.  $(3x^2 - 5x + 2) + (5x^2 + 9x - 5)$

4.  $(8y^2 + 2y - 6) - (3y^2 - 5y + 2)$

#### **Find the product or quotient.**

5.  $3x(x^2 - 5)$

6.  $(4z^3 - 5z + 2)6z$

7.  $\frac{8y^3 - 4y^2 + 6y}{2y}$

8.  $\frac{18z^6 - 9z^4 - 3z^2}{-3z^2}$

9.  $(x + 2)(x + 3)$

10.  $(y - 3)(y + 10)$



