7th Grade – Summer Math Packet

Domain: EXPRESSIONS & EQUATIONS
CCRS Standards:
13 –Write, read, and evaluate expressions in which letters stand for numbers.
13a – Write expressions that record operations with numbers and with letters standing for numbers.
Objective: Write an algebraic expression to represent unknown quantities.

- A variable is a symbol, usually a letter, used to represent a number.
- Algebraic expressions are combinations of variables, numbers, and at least one operation.

Phrases	Operation
plus, increased by, sum, total	Addition
minus, decreased by, difference	Subtraction
times, of, product	Multiplication
divided by, divided evenly, divided among, quotient	Division

Examples:

1. The sum of 3 and a number is written as **3 + *n*** because the operation that is associated with the word sum is addition.
2. The difference of a number and seven tenths is written as ***n* – 0.7** because the operation that is associated with the word difference is subtraction.
3. The product of 10 and a number is written **10*n*** because the operation associated with the word product is multiplication.
4. Twelve dollars divided evenly among a number of friends is written $\frac{12}{f}$ because the phrase divided by is associated with division.

1.) a number, *n*, increased by 0.2	2.) a number, *n*, minus $\frac{1}{3}$
3.) the sum of a number, *n*, and 51	4.) the difference of a number, *n*, and nine tenths
5.) $\frac{1}{4}$ of the students, *s*	6.) 18 prizes divided among friends, *f*
7.) the quotient of a number, *n*, and 5	8.) 3 times the rate, *r*

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Domain: EXPRESSIONS & EQUATIONS
CCRS Standards:
13 –Write, read, and evaluate expressions in which letters stand for numbers.
13c – Evaluate expressions at specific values of their variables.
Objective: Evaluate an algebraic expression.

- A variable is a symbol, usually a letter, used to represent a number.
- Algebraic expressions are combinations of variables, numbers, and at least one operation.
- Multiplication in algebra can be shown as $8n$ or $8 \times n$
- The variables in an algebraic expression can be replaced with any number.
- Once the variables have been replaced, you can evaluate, or find the value of, the algebraic expression.

Example 1: Evaluate $25 + n$ if $n = 7$

$25 + n = 25 + 7$ Replace n with 7.
$= 32$ Add 25 and 7.

Example 2: Evaluate $12x$ if $x = 6$

$12x = 12(6)$ Replace x with 6.
$= 72$ Multiply 12 and 6.

Example 3: Evaluate $5x - 20$ if $x = 10$

$5x - 20 = 5(10) - 20$ Replace x with 10.
$= 50 - 20$ Use order of operations.
$= 30$ Subtract 20 from 50.

1.) Evaluate $120 + g$ if $g = 35$

2.) Evaluate $16k$ if $k = 3$

3.) Evaluate $14n + 19$ if $n = \frac{1}{2}$

4.) Evaluate $30p$ if $p = 1.5$

5.) Evaluate $3x + 10$ if $x = 4$

6.) Evaluate $18 - 2r$ if $r = 4.3$

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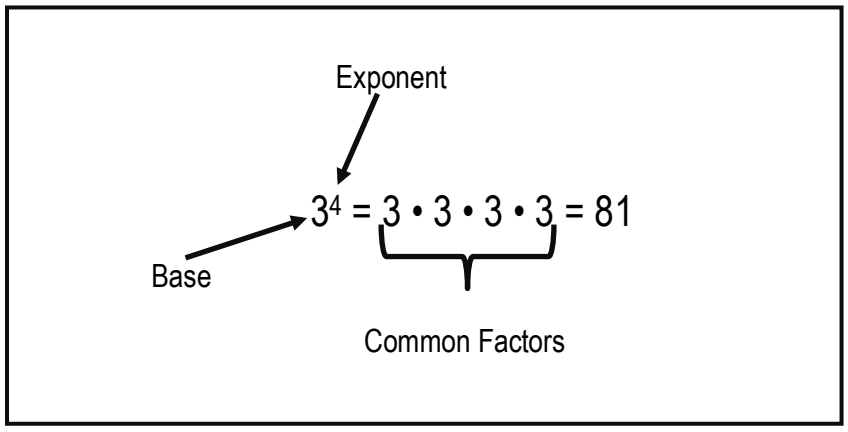
Domain: EXPRESSIONS & EQUATIONS
CCRS Standards:
12 – Write and evaluate numerical expressions involving whole-number exponents.
Objective: Read, write, and represent whole numbers using exponential notation.



1.) Write 10^4 as a product of the same factor.	2.) Write 2^6 as a product of the same factor.
3.) Evaluate 6^3.	4.) Evaluate 5^4.
5.) Write $7 \cdot 7 \cdot 7 \cdot 7 \cdot 7$ in exponential form.	6.) Write $25 \cdot 25 \cdot 25$ in exponential form.

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Domain: EXPRESSIONS & EQUATIONS
CCRS Standards:
12 – Write and evaluate numerical expressions involving whole-number exponents.
13c – Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations).
Objective: Evaluate numeric expressions using order of operations.

Examples:

$4^2 \cdot 3 + 3 \cdot 2^3 - 25 \div 5$	original expression
$16 \cdot 3 + 3 \cdot 8 - 25 \div 5$	calculate 4^2 and 2^3
$48 + 24 - 25 \div 5$	calculate $16 \cdot 3$ and $3 \cdot 8$
$48 + 24 - 5$	divide 25 by 5
$72 - 5$	add 48 and 24
67	subtract 3 from 72

1.) $12 \cdot 4 - 72 \div 9$	2.) $64 - 4 \cdot 2^3 + 7$
3.) $9 \cdot 4 - 3^2 + 5 \cdot 2$	4.) $78 - 16 \times 5 + 8 - 12$
5.) $45 \div 9 - 3 + 7 \cdot 3$	6.) $8^2 - 5 \cdot 1 + 3^2$

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Domain: EXPRESSIONS & EQUATIONS
CCRS Standards:
12 – Write and evaluate numerical expressions involving whole-number exponents.
13c – Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations).
Objective: Evaluate an algebraic expression using one unknown and no more than 2 operations.

1.) Evaluate $6s^2$ if $s = 3$	2.) Evaluate $\frac{x^5}{4}$ if $x = 2$
3.) Evaluate $35 - 2n$ if $n = 8$	4.) Evaluate $\frac{n^2}{3}$ if $n = 6$
5.) Evaluate $\frac{7.5k}{6}$ if $k = 4$	6.) Evaluate $\frac{1}{2}x + 1$ if $x = 12$

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Domain: EXPRESSIONS & EQUATIONS
CCRS Standards:
18 – Solve real world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p, q, and x are all nonnegative rational numbers.
Objective: Determine the unknown in a linear equation (addition & subtraction).

- Addition equations: Subtract the same number from each side of the equation so that the two sides remain equal.
- Subtraction equation: Add the same number to each side of the equation so that the two sides remain equal.

Example 1:

$m + 3 = 10$	original equation
$-3 \quad -3$	subtract 3 from each side
$m + 0 = 7$	solution
$m = 7$	simplify

Example 2:

$m - 7 = 5$	original equation
$+7 \quad +7$	add 7 to each side
$m + 0 = 12$	solution
$m = 12$	simplify

1.) $k + 5 = 18$

2.) $g - 9 = 14$

3.) $x + 5.5 = 10.5$

4.) $g - 3.5 = 7.5$

5.) $y + 8.25 = 24$

6.) $n - 2.75 = 28.75$

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Domain: EXPRESSIONS & EQUATIONS
CCRS Standards:
18 – Solve real world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p, q, and x are all nonnegative rational numbers.
Objective: Write and solve linear equations (addition & subtraction).

Example: Last week, Brett ran 18 more miles than Luke. If Brett ran 27 miles, how many miles did Luke run?

Step 1: Write the equation

Let m = miles that Luke ran.

Luke's miles + difference between Brett's miles and Luke's miles = Brett's miles

m + 18 = 27

Step 2: Solve the equation.

m + 18 = 27	Equation
–18 –18	Subtract 18 from both sides.
m + 0 = 9	Solution
m = 9	Simplify

1.) Write an equation and solve:

The sum of 6 and a number, n, is 15. Find the number.

2.) Write an equation and solve:

The difference between a number, x, and 4 is 9. Find the number.

3.) Write an equation and solve:

Last week, Beth ran 14 more miles than Jennifer. If Beth ran twenty miles, how many miles did Jennifer run?

4.) Write an equation and solve:

Mark paid $11.50 for a pizza. He now has $17.75. How much money did he have before buying the pizza?

5.) Write an equation and solve:

Katie is 5 years older than Jack. If Katie is 16, how old is Jack?

6.) Write an equation and solve:

A number, n, decreased by 17 is 25. Find the number.

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Domain: EXPRESSIONS & EQUATIONS
CCRS Standards:
18 – Solve real world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p, q, and x are all nonnegative rational numbers.
Objective: Determine the unknown in a linear equation (multiplication & division).

- Addition equations: Subtract the same number from each side of the equation so that the two sides remain equal.
- Subtraction equation: Add the same number to each side of the equation so that the two sides remain equal.

Example 1:

$5m = 15$	original equation
$\frac{5m}{5} = \frac{15}{5}$	divide both sides by 3
$1m = 3$	solution
$m = 3$	simplify

Example 2:

$\frac{m}{4} = 7$	original equation
$4 \times \frac{m}{4} = 7 \times 4$	multiply both sides by 4
$1m = 28$	solution
$m = 28$	simplify

1.) $7x = 63$

2.) $\frac{x}{8} = 7$

3.) $5m = 1.25$

4.) $\frac{n}{6} = 4.25$

5.) $12n = 84.72$

6.) $\frac{p}{15} = 2.67$

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Domain: EXPRESSIONS & EQUATIONS
CCRS Standards:
18 – Solve real world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p, q, and x are all nonnegative rational numbers.
Objective: Write and solve linear equations (multiplication & division).

Example: Mario and two of his friends ordered a large pizza. They decided to divide the bill evenly. If each person paid $6.75, what was the total bill?

Step 1: Write the equation

Let b = the total bill

$\frac{Total\ Bill}{Total\ Number\ of\ People} = Amount\ Paid\ by\ Each\ Person$ Reason the problem with the correct operation.

$\frac{b}{3} = 6.75$ Replace items with variables & values.

Step 2: Solve the equation.

$\frac{b}{3} = 6.75$ Equation

$3 \times \frac{b}{3} = 6.75 \times 3$ Multiply both sides by 3.

$1 \cdot b = 20.25$ Solution

$b = 20.25$ Simplify

1.) Write an equation and solve:
The product of 8 and a number, n, is 40. Find the number.

2.) Write an equation and solve:
A number, n, divided by 12 is 5. Find the number.

3.) Write an equation and solve:
One-half of a number is 16. What is the number?

4.) Write an equation and solve:
Mark's dad is 3 times older than Mark. If Mark's dad is 42, how old is Mark?

5.) Write an equation and solve:

Sarah spent $15 on three fancy pens. How much did each pen cost?

6.) Write an equation and solve:

Kathryn and 7 friends went out to eat. They decided to divide the bill evenly. Each person paid $8.72. What was the total bill?

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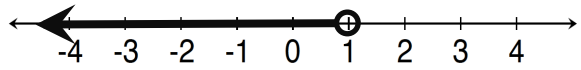
Domain: EXPRESSIONS & EQUATIONS
CCRS Standards:
19 – Write an inequality of the form $x > c$ or $x < c$ to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form $x > c$ or $x < c$ have infinitely many solutions; represent solutions of such inequalities on number line diagrams.
Objective: Identify or graph solutions of inequalities on a number line.

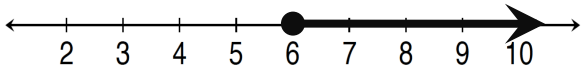
Examples: Graph each inequality on a number line.

$x < 1$



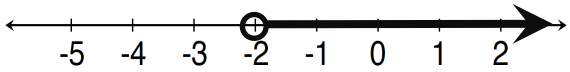
The open circle means that the number is **not** included in the solution.

$m \geq 6$



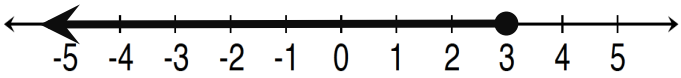
The closed circle means that the number **is** included in the solution.

$y > -2$

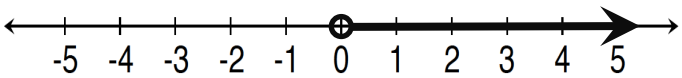


The solution is all numbers greater than negative two.
–2 is **not** included in the solution.

1.) Write an inequality for the graph.

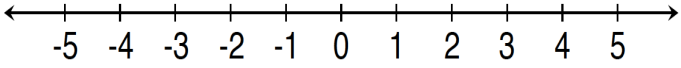


2.) Write an inequality for the graph.



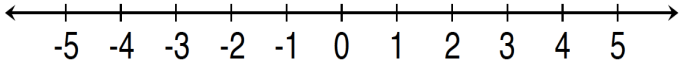
3.) Graph the inequality.

$x \leq 4$



4.) Graph the inequality.

$n > -3$



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Domain: EXPRESSIONS & EQUATIONS
CCRS Standards:
19 – Write an inequality of the form $x > c$ or $x < c$ to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form $x > c$ or $x < c$ have infinitely many solutions; represent solutions of such inequalities on number line diagrams.
Objective: Write inequality statements for real-world problems.

Words	Symbols
m is less than 9.	$m < 9$
r is than or equal to –5	$r \leq -5$
y is greater than –7	$y > -7$
z is greater than or equal to 1	$z \geq 1$

Examples:

1. The amount, *a*, is **less than** \$250. ***a* < \$250**
2. The temperature, *t*, will be **at least** 70°. ***t* ≥ 70°**
3. The price, *p*, is **no more than** \$35 ***p* ≤ \$35**
4. The distance, *d*, is **greater than** 3 miles. ***d* > 3 miles**

1.) The price of a game, *p*, is at least \$50	2.) The wind speed, *w*, is greater than 60 mph.
3.) The number, *n*, is no more than 4 days.	4.) The time allowed, *t*, is 2 hours or less.
5.) The number of entries, *n*, is less than 20.	6.) The temperature, *t*, is below 0°

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Domain: EXPRESSIONS & EQUATIONS
CCRS Standards:
14 – Apply properties of operations to generate equivalent expressions.
Objective: Use the distributive property to generate equivalent expressions.

The **distributive property** of multiplication over addition states: $a(b + c) = a \cdot b + a \cdot c$ or $a(b + c) = ab + ac$.
The same is true for subtraction: $a(b – c) = a \cdot b – a \cdot c$ or $a(b – c) = ab – ac$.

Examples:

1. $3(x + 5) = 3 \cdot x + 3 \cdot 5$ Distribute 3 through the parentheses; Multiply 3 by x and multiply 3 by 5.
   $= 3x + 15$ Simplify

2. $4(m – 9) = 4 \cdot m – 4 \cdot 9$ Distribute 4 through the parentheses; Multiply 4 by m and multiply 4 by 9.
   $= 4m – 36$

1. Use the distributive property to write an equivalent expression. $2(n + 7)$	2. Use the distributive property to write an equivalent expression. $8(p – 1)$
3. Use the distributive property to write an equivalent expression. $7(m + 5)$	4. Use the distributive property to write an equivalent expression. $12(x – 4)$
5. Use the distributive property to write an equivalent expression. $11(k + 4)$	6. Use the distributive property to write an equivalent expression. $6(z –9)$

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Domain: EXPRESSIONS & EQUATIONS
CCRS Standards:
14 – Apply properties of operations to generate equivalent expressions.
Objective: Combine like terms.

Definition	Illustration
Terms are separated by addition or subtraction.	$2x + 5x + 3y$ $2x$, $5x$, and $3y$ are *terms.*
A coefficient is the number multiplied by a variable in a term.	$2x + 5x + 3y$ 2, 5, and 3 are *coefficients.*
Like terms have exactly the same variable.	$2x + 5x + 3y$ $2x$ and $5x$ are *like terms.*
**Like terms can be combined by adding or subtracting their coefficients.	

Examples:

1. Combine like terms: $a + a + a - a$

$a + a + a - a$	=	original problem
$1a + 1a + 1a + 1a$	=	When a coefficient is not visible, it is 1.
$(1 + 1 + 1 - 1)a$	$= 3a$	Add/subtract coefficients of like terms and simplify.

2. Combine like terms: $5x + x - 7y$

$5x + x - 7y$	=	original problem
$5x + 1x - 7y$	=	When a coefficient is not visible, it is 1.
$(5 + 1)x - 7y$	$= 6x - 7y$	Add coefficients of like terms ($5x$ and $1x$); $-7y$ remains unchanged.

1.)Combine like terms: $p + p + p + p + p$	2.) Combine like terms: $5x + 2x$
3.)Combine like terms: $7y - y$	4.) Combine like terms: $3r + 4r + 5s$
5.)Combine like terms: $5m - 2m + 4n$	6.) Combine like terms: $6a - 4a + 7b$