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.

<table>
<thead>
<tr>
<th>Phrases</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>plus, increased by, sum, total</td>
<td>Addition</td>
</tr>
<tr>
<td>minus, decreased by, difference</td>
<td>Subtraction</td>
</tr>
<tr>
<td>times, of, product</td>
<td>Multiplication</td>
</tr>
<tr>
<td>divided by, divided evenly, divided among, quotient</td>
<td>Division</td>
</tr>
</tbody>
</table>

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 $10n$ 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.

<table>
<thead>
<tr>
<th>1.)</th>
<th>a number, $n$, increased by 0.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.)</td>
<td>a number, $n$, minus $\frac{1}{3}$</td>
</tr>
<tr>
<td>3.)</td>
<td>the sum of a number, $n$, and 51</td>
</tr>
<tr>
<td>4.)</td>
<td>the difference of a number, $n$, and nine tenths</td>
</tr>
<tr>
<td>5.)</td>
<td>$\frac{1}{4}$ of the students, $s$</td>
</tr>
<tr>
<td>6.)</td>
<td>18 prizes divided among friends, $f$</td>
</tr>
<tr>
<td>7.)</td>
<td>the quotient of a number, $n$, and 5</td>
</tr>
<tr>
<td>8.)</td>
<td>3 times the rate, $r$</td>
</tr>
</tbody>
</table>
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 $r = 4.3$
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.
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:

<table>
<thead>
<tr>
<th>Expression</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>$4^2 \cdot 3 + 3 \cdot 2^3 - 25 \div 5$</td>
<td>original expression</td>
</tr>
<tr>
<td>$16 \cdot 3 + 3 \cdot 8 - 25 \div 5$</td>
<td>calculate $4^2$ and $2^3$</td>
</tr>
<tr>
<td>$48 + 24 - 25 \div 5$</td>
<td>calculate $16 \cdot 3$ and $3 \cdot 8$</td>
</tr>
<tr>
<td>$48 + 24 - 5$</td>
<td>divide 25 by 5</td>
</tr>
<tr>
<td>$72 - 5$</td>
<td>add 48 and 24</td>
</tr>
<tr>
<td>$67$</td>
<td>subtract 3 from 72</td>
</tr>
</tbody>
</table>

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.) $8^2 - 5 \cdot 1 + 3^2$
## 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.

<table>
<thead>
<tr>
<th>Expression</th>
<th>Value 1</th>
<th>Value 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.) $6s^2$ if $s = 3$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.) $\frac{x^5}{4}$ if $x = 2$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.) $35 - 2n$ if $n = 8$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.) $\frac{n^2}{3}$ if $n = 6$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.) $\frac{7.5k}{6}$ if $k = 4$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.) $\frac{1}{2}x + 1$ if $x = 12$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 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:

<table>
<thead>
<tr>
<th>Original Equation</th>
<th>Add/Subtract</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>$m + 3 = 10$</td>
<td>$-3$</td>
<td>$m = 7$</td>
</tr>
<tr>
<td>$m + 0 = 7$</td>
<td>$-0$</td>
<td>$m = 7$</td>
</tr>
</tbody>
</table>

#### Example 2:

<table>
<thead>
<tr>
<th>Original Equation</th>
<th>Add/Subtract</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>$m - 7 = 5$</td>
<td>$+7$</td>
<td>$m = 12$</td>
</tr>
<tr>
<td>$m + 0 = 12$</td>
<td>$-0$</td>
<td>$m = 12$</td>
</tr>
</tbody>
</table>

#### Practice Problems:

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.) $n - 2.75 = 28.75$
## 7th Grade – Summer Math Packet

**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 $m = \text{miles that Luke ran.}$

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

\[
m + 18 = 27
\]

**Step 2: Solve the equation.**
\[
\begin{align*}
m + 18 &= 27 \\
-18 &-18 \\
m &\quad = 9
\end{align*}
\]

Solution: $m = 9$

### Exercises

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.
**7th Grade – Summer Math Packet**

**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:**  
\[
\begin{align*}
5m &= 15 & \text{original equation} \\
5m &= 15 & \\
\frac{5}{5} &= \frac{15}{5} & \text{divide both sides by 3} \\
1m &= 3 & \text{solution} \\
m &= 3 & \text{simplify}
\end{align*}
\]

- **Example 2:**  
\[
\begin{align*}
m &= 7 & \text{original equation} \\
\frac{m}{4} &= \frac{7}{4} & \text{multiply both sides by 4} \\
1m &= 28 & \text{solution} \\
m &= 28 & \text{simplify}
\end{align*}
\]

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.)</td>
<td>( 7x = 63 )</td>
<td></td>
</tr>
<tr>
<td>2.)</td>
<td>( \frac{x}{8} = 7 )</td>
<td></td>
</tr>
<tr>
<td>3.)</td>
<td>( 5m = 1.25 )</td>
<td></td>
</tr>
<tr>
<td>4.)</td>
<td>( \frac{n}{6} = 4.25 )</td>
<td></td>
</tr>
<tr>
<td>5.)</td>
<td>( 12n = 84.72 )</td>
<td></td>
</tr>
<tr>
<td>6.)</td>
<td>( \frac{p}{15} = 2.67 )</td>
<td></td>
</tr>
</tbody>
</table>
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

$$\frac{\text{Total Bill}}{\text{Total Number of People}} = \text{Amount Paid by Each Person}$$

Reason the problem with the correct operation.
Replace items with variables & values.

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

**Step 2: Solve the equation.**

$$\frac{b}{3} = 6.75$$
$$3 \times \frac{b}{3} = 6.75 \times 3$$
$$1 \times b = 20.25$$
$$b = 20.25$$

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?
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.

$n > -3$
### 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.

<table>
<thead>
<tr>
<th>Words</th>
<th>Symbols</th>
</tr>
</thead>
<tbody>
<tr>
<td>(m) is less than 9.</td>
<td>(m &lt; 9)</td>
</tr>
<tr>
<td>(r) is than or equal to (-5)</td>
<td>(r \leq -5)</td>
</tr>
<tr>
<td>(y) is greater than (-7)</td>
<td>(y &gt; -7)</td>
</tr>
<tr>
<td>(z) is greater than or equal to 1</td>
<td>(z \geq 1)</td>
</tr>
</tbody>
</table>

**Examples:**
1. The amount, \(a\), is **less than** \$250. \(a < 250\)
2. The temperature, \(t\), will be **at least** 70°. \(t \geq 70°\)
3. The price, \(p\), is **no more than** \$35. \(p \leq 35\)
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°
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. \[ 3(x + 5) = 3 \cdot x + 3 \cdot 5 \]  
   \[ = 3x + 15 \] Distribute 3 through the parentheses; Multiply 3 by \( x \) and multiply 3 by 5.  
   Simplify  
2. \[ 4(m - 9) = 4 \cdot m - 4 \cdot 9 \]  
   \[ = 4m - 36 \] Distribute 4 through the parentheses; Multiply 4 by \( m \) and multiply 4 by 9.  

<table>
<thead>
<tr>
<th>1. Use the distributive property to write an equivalent expression.</th>
<th>2. Use the distributive property to write an equivalent expression.</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ 2(n + 7) ]</td>
<td>[ 8(p - 1) ]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3. Use the distributive property to write an equivalent expression.</th>
<th>4. Use the distributive property to write an equivalent expression.</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ 7(m + 5) ]</td>
<td>[ 12(x - 4) ]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5. Use the distributive property to write an equivalent expression.</th>
<th>6. Use the distributive property to write an equivalent expression.</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ 11(k + 4) ]</td>
<td>[ 6(z - 9) ]</td>
</tr>
</tbody>
</table>
Domain: EXPRESSIONS & EQUATIONS
CCRS Standards:
14 – Apply properties of operations to generate equivalent expressions.
Objective: Combine like terms.

<table>
<thead>
<tr>
<th>Definition</th>
<th>Illustration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terms are separated by addition or subtraction.</td>
<td>$2x + 5x + 3y$</td>
</tr>
<tr>
<td>A <em>coefficient</em> is the number multiplied by a variable in a term.</td>
<td>$2x + 5x + 3y$</td>
</tr>
<tr>
<td>Like terms have exactly the same variable.</td>
<td>$2x + 5x + 3y$</td>
</tr>
</tbody>
</table>

**Like terms can be combined by adding or subtracting their coefficients.**

**Examples:**

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

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

<table>
<thead>
<tr>
<th>1.) Combine like terms: $p + p + p + p + p$</th>
<th>2.) Combine like terms: $5x + 2x$</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.) Combine like terms: $7y - y$</td>
<td>4.) Combine like terms: $3r + 4r + 5s$</td>
</tr>
<tr>
<td>5.) Combine like terms: $5m - 2m + 4n$</td>
<td>6.) Combine like terms: $6a - 4a + 7b$</td>
</tr>
</tbody>
</table>