Expand Algebraic Expressions with Negative Factors.

When expanding algebraic expressions with negative factors, such as $-3(x + 2)$ and $-2(5x - 1)$, you use the distributive property and apply the rules for multiplying integers.

$-3(x + 2) = -3(x) + (-3)(2)$

$= -3x + (-6)$

$= -3x - 6$

$-5(y - 2) = -5[y + (-2)]$

$= -5(y) + (-5)(-2)$

$= -5y + 10$

Use the distributive property.
Multiply.
Rewrite the expression.
Rewrite subtraction as a sum.
Use the distributive property.
Multiply.

Math Note
You have learned that:
$-1 \cdot 2 = -(1 \cdot 2) = -2$
$1 \cdot (-2) = -(1 \cdot 2) = -2$
$-1 \cdot (-2) = 1 \cdot 2 = 2$
\[-2(5x - 1)\]
\[-2(5x) - 2(1)\]
\[-10x - 2\]
\[-10x + 2\]

\[-2(5x - 1)\]
\[-2(5x + (-1))\]
\[-10x + (+2)\]
\[-10x + 2\]

\[-10x - (-2)\]
\[-10x + 2\]
\[-3(x + 2)\]
\[-3x - 6\]

\[-3x + 6\]
\[-3x - 6\]
Expand each expression.

a) \(-3 \left( \frac{-2}{3} a + \frac{1}{5} \right)\)

\[ -3 \cdot \frac{-2}{3} a + (\frac{-3}{5}) \]

\[ 2a - \frac{3}{5} \]
b) \(-(-0.4k - 2.5)\)

\[0.4k + 2.5\]
c) \[ -\frac{1}{3}(p + 2q) \]

\[ -\frac{1}{3}p - \frac{2}{3}q \]

\[ 1 \times \Rightarrow x \]

\[ -\frac{1}{3}p - \frac{p}{3} \]

Same
Guided Practice
Expand each expression.

8. $-4(3d - 2) = -12d + 8$

9. $-7(5k + e) = -35k - 7e$

10. $-4(0.6x - 4) = -2.4x + 16$

11. $-\frac{1}{4}(-3y + \frac{1}{2}) = \frac{3}{4}y - \frac{1}{8}$
Expand and Simplify Algebraic Expressions.

When you simplify an algebraic expression, you may need to expand it first before you add or subtract the like terms.

To simplify an expression like $4(2x + 1) + 3x$, you first need to expand $4(2x + 1)$.

$$
4(2x + 1) + 3x = 4(2x) + 4(1) + 3x \\
= 8x + 4 + 3x \\
= 8x + 3x + 4 \\
= 11x + 4
$$


To simplify an expression like $7 - 2(x + 2)$, you first need to rewrite the expression.

$$
7 - 2(x + 2) = 7 + (-2)(x + 2) \\
= 7 + (-2)x + (-2)(2) \\
= 7 + (-2)x + (-4) \\
= 7 + (-4) + (-2)x \\
= 7 - 4 - 2x \\
= 3 - 2x
$$

Example 13: 

Expand and simplify each expression.

a) \(4(p + 5q) - 3q\)

\[
\begin{align*}
4p + 20q - 3q = 4p + 17q
\end{align*}
\]
b) \(-2(0.5y - 3) + y\)

\[-1.0y + 6 + y\]

\[-y + 6 + y\]

\[6\]
c) $4(2n + 5) - (m - 1)$

- $8n + 20$
- $-m + 1$
- $21$
- $-m + 8n + 21$
- $8n - m + 21$
Guided Practice

Copy and complete to expand and simplify the expression.

12 $2(2a + 3b) + 5b$

$4a + 6b + 5b$

$4a + 11b$
13 \[ -3 \left( \frac{1}{2}k - 4 \right) - 2k \]

\[ -\frac{3}{2}k + 12 - 2k \]

\[ -1.5k \]

\[ -3.5k + 12 \]

\[ -\frac{7}{2}k + 12 \]
\[
14 \quad \frac{5(2h - 3)}{(2k - 1)} = \frac{10h - 15}{-2k + 1} = 10h - 2k - 14
\]