## Lesson 8: Expanding and Factoring

Let's use the distributive property to write expressions in different ways.

### 8.1: Number Talk: Parentheses

Find the value of each expression mentally.

$2+3⋅4$

$\left(2+3\right)\left(4\right)$

$2−3⋅4$

$2−\left(3+4\right)$

### 8.2: Factoring and Expanding with Negative Numbers

In each row, write the equivalent expression. If you get stuck, use a diagram to organize your work. The first row is provided as an example. Diagrams are provided for the first three rows.



| factored | expanded |
| --- | --- |
| $-3\left(5−2y\right)$ | $-15+6y$ |
| $5\left(a−6\right)$ |  |
|  | $6a−2b$ |
| $-4\left(2w−5z\right)$ |  |
| $-\left(2x−3y\right)$ |  |
|  | $20x−10y+15z$ |
| $k\left(4−17\right)$ |  |
|  | $10a−13a$ |
| $-2x\left(3y−z\right)$ |  |
|  | $ab−bc−3bd$ |
| $-x\left(3y−z+4w\right)$ |  |

#### Are you ready for more?

Expand to create an equivalent expression that uses the fewest number of terms: $\left(\left(\left(\left(x​+1\right)\frac{1}{2}\right)+1\right)\frac{1}{2}\right)+1$. If we wrote a new expression following the same pattern so that there were 20 sets of parentheses, how could it be expanded into an equivalent expression that uses the fewest number of terms?

### Lesson 8 Summary

We can use properties of operations in different ways to rewrite expressions and create equivalent expressions. We have already seen that we can use the distributive property to **expand** an expression, for example $3\left(x+5\right)=3x+15$. We can also use the distributive property in the other direction and **factor** an expression, for example $8x+12=4\left(2x+3\right)$.

We can organize the work of using distributive property to rewrite the expression $12x−8$. In this case we know the product and need to find the factors.

The terms of the product go inside:



We look at the expressions and think about a factor they have in common. $12x$ and $-8$ each have a factor of 4. We place the common factor on one side of the large rectangle:



Now we think: "4 times *what* is 12$x$?" "4 times *what* is -8?" and write the other factors on the other side of the rectangle:



So, $12x−8$ is equivalent to $4\left(3x−2\right)$.



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