Unit 4 Family Support Materials

Expressions and More Equations

Section A: Writing Equivalent Expressions

This week your student will be working with equivalent expressions (expressions that are always equal, for any value of the variable). For example, $2x + 7 + 4x$ and $6x + 10 - 3$ are equivalent expressions. We can see that these expressions are equal when we try different values for x.

	$2x + 7 + 4x$	$6x + 10 - 3$
when x is 5	$2 \cdot 5 + 7 + 4 \cdot 5$ $10 + 7 + 20$ 37	$6 \cdot 5 + 10 - 3$ $30 + 10 - 3$ 37
when x is -1	$2 \cdot \text{-}1 + 7 + 4 \cdot \text{-}1$ $\text{-}2 + 7 + \text{-}4$ 1	$6 \cdot \text{-}1 + 10 - 3$ $\text{-}6 + 10 - 3$ 1

We can also use properties of operations to see why these expressions have to be equivalent—they are each equivalent to the expression $6x + 7$.

Here is a task to try with your student:

Match each expression with an equivalent expression from the list below. One expression in the list will be left over.

1. $5x + 8 - 2x + 1$
2. $6(4x - 3)$
3. $(5x + 8) - (2x + 1)$
4. $\text{-}12x + 9$

List:

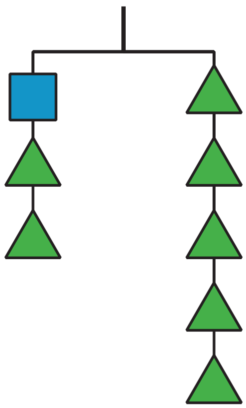
- $3x + 7$
- $3x + 9$
- $\text{-}3(4x - 3)$
- $24x + 3$
- $24x - 18$

Solution:

1. $3x + 9$ is equivalent to $5x + 8 - 2x + 1$, because $5x + \text{-}2x = 3x$ and $8 + 1 = 9$.
2. $24x - 18$ is equivalent to $6(4x - 3)$, because $6 \cdot 4x = 24x$ and $6 \cdot \text{-}3 = \text{-}18$.
3. $3x + 7$ is equivalent to $(5x + 8) - (2x + 1)$, because $5x - 2x = 3x$ and $8 - 1 = 7$.
4. $\text{-}3(4x - 3)$ is equivalent to $\text{-}12x + 9$, because $\text{-}3 \cdot 4x = \text{-}12x$ and $\text{-}3 \cdot \text{-}3 = 9$.

Section B: Equivalent Equations

This week your student will work on solving linear equations. We can think of a balanced hanger as a metaphor for an equation. An equation says that the expressions on either side have equal value, just like a balanced hanger has equal weights on either side.



If we have a balanced hanger and add or remove the same amount of weight from each side, the result will still be in balance. For example, we could remove 2 triangles from each side of this hanger and it would still balance. We could also add a square to each side and it would still balance.

We can do this with equations as well: Adding or subtracting the same amount from both sides of an equation keeps the sides equal to each other. For example, if $4x + 20$ and $-6x + 10$ have equal value, we can write an equation $4x + 20 = -6x + 10$. We could add -10 to both sides of the equation or divide both sides of the equation by 2 and keep the sides equal to each other. Using these moves in systematic ways, we can find that $x = -1$ is a solution to this equation.

Here is a task to try with your student:

Elena and Noah work on the equation $\frac{1}{2}(x+4) = -10 + 2x$ together. Elena's solution is $x = 24$ and Noah's solution is $x = -8$. Here is their work:

Elena:

$$\begin{aligned} \frac{1}{2}(x+4) &= -10 + 2x \\ x + 4 &= -20 + 2x \\ x + 24 &= 2x \\ 24 &= x \\ x &= 24 \end{aligned}$$

Noah:

$$\begin{aligned} \frac{1}{2}(x+4) &= -10 + 2x \\ x + 4 &= -20 + 4x \\ -3x + 4 &= -20 \\ -3x &= -24 \\ x &= -8 \end{aligned}$$

Do you agree with their solutions? Explain or show your reasoning.

Solution:

No, they both have errors in their solutions.

Elena multiplied both sides of the equation by 2 in her first step, but forgot to multiply the $2x$ by the 2. We can also check Elena's answer by replacing x with 24 in the original equation and seeing if the equation is true.

$$\frac{1}{2}(x + 4) = -10 + 2x$$
$$\frac{1}{2}(24 + 4) = -10 + 2(24)$$
$$\frac{1}{2}(28) = -10 + 48$$
$$14 = 38$$

Because 14 is not equal to 38, Elena’s answer is not correct.

Noah divided both sides by -3 in his last step, but wrote -8 instead of 8 for $-24 \div -3$. We can also check Noah’s answer by replacing x with -8 in the original equation and seeing if the equation is true. Noah’s answer is not correct.