

Lesson 8: Equal and Equivalent

Let's use diagrams to figure out which expressions are equivalent and which are just sometimes equal.

8.1: Algebra Talk: Solving Equations by Seeing Structure

Find a solution to each equation mentally.

$$3 + x = 8$$

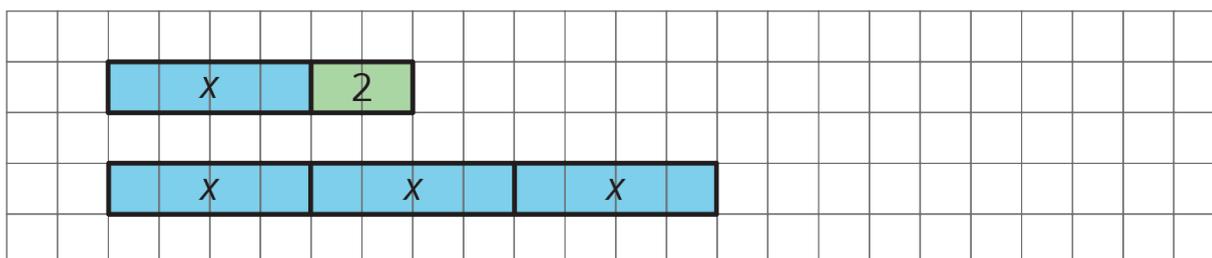
$$10 = 12 - x$$

$$x^2 = 49$$

$$\frac{1}{3}x = 6$$

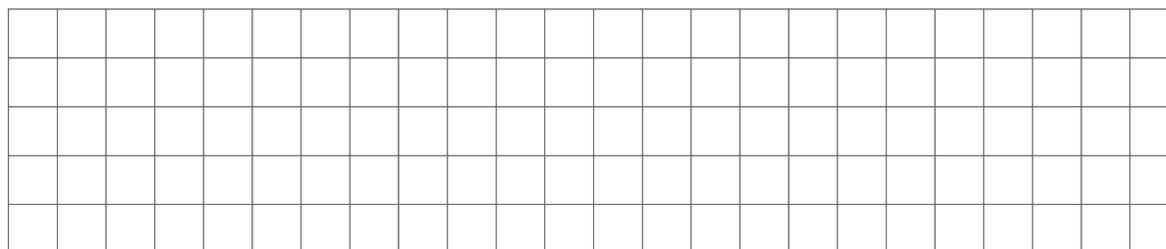
8.2: Using Diagrams to Show That Expressions are Equivalent

Here is a diagram of $x + 2$ and $3x$ when x is 4. Notice that the two diagrams are lined up on their left sides.

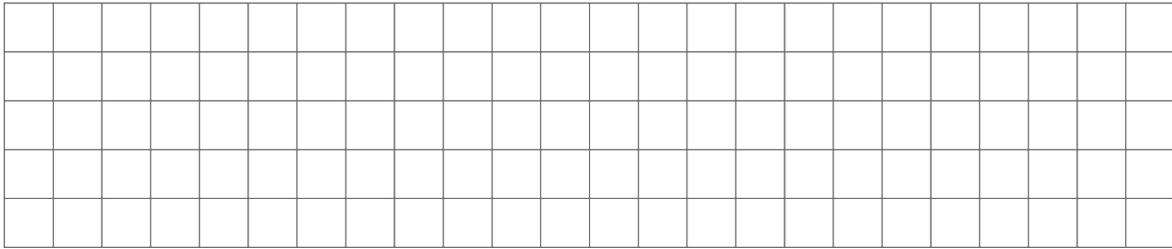


In each of your drawings below, line up the diagrams on one side.

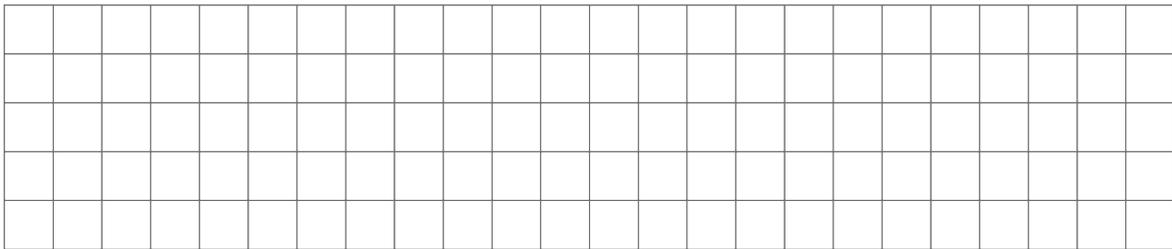
1. Draw a diagram of $x + 2$, and a separate diagram of $3x$, when x is 3.



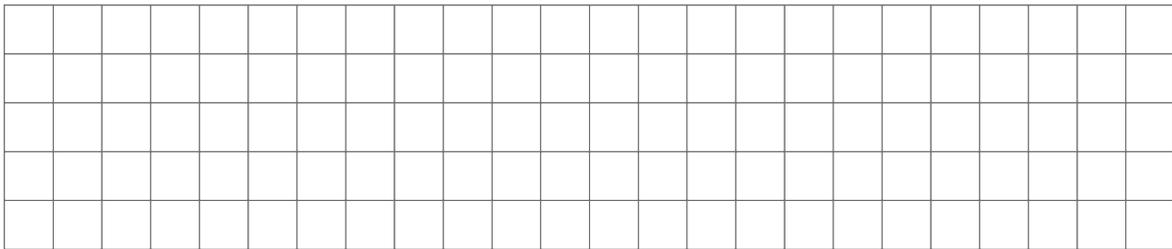
2. Draw a diagram of $x + 2$, and a separate diagram of $3x$, when x is 2.



3. Draw a diagram of $x + 2$, and a separate diagram of $3x$, when x is 1.



4. Draw a diagram of $x + 2$, and a separate diagram of $3x$, when x is 0.



5. When are $x + 2$ and $3x$ equal? When are they not equal? Use your diagrams to explain.

6. Draw a diagram of $x + 3$, and a separate diagram of $3 + x$.

7. When are $x + 3$ and $3 + x$ equal? When are they not equal? Use your diagrams to explain.

8.3: Identifying Equivalent Expressions

Here is a list of expressions. Find any pairs of expressions that are equivalent. If you get stuck, try reasoning with diagrams.

$a + 3$

$a \div \frac{1}{3}$

$\frac{1}{3}a$

$\frac{a}{3}$

a

$a + a + a$

$a \cdot 3$

$3a$

$1a$

$3 + a$

Are you ready for more?

Below are four questions about equivalent expressions. For each one:

- Decide whether you think the expressions are equivalent.
- Test your guess by choosing numbers for x (and y , if needed).

1. Are $\frac{x \cdot x \cdot x \cdot x}{x}$ and $x \cdot x \cdot x$ equivalent expressions?

2. Are $\frac{x + x + x + x}{x}$ and $x + x + x$ equivalent expressions?

3. Are $2(x + y)$ and $2x + 2y$ equivalent expressions?

4. Are $2xy$ and $2x \cdot 2y$ equivalent expressions?

