Brick Math Lesson of the Month
March 2024

from Pre-Algebra Using LEGO® Bricks Teacher Edition

9

BRICKS NEEDED

Size	Number
1x1	10 green 10 red
1x2	10 green 10 red
1x10	1 purple 1 green
1x12	1 yellow

Note: Using a baseplate helps keep the bricks in place. One baseplate is suggested for these activities.

TWO-STEP EQUATIONS AND INEQUALITIES

Students will learn/discover:

- How to solve two-step equations and inequalities with positive coefficients using models

Why is this important?

Math is not always about equality within and across groups. Inequalities tell us about the relative size of values. Sometimes we only know that something is greater or less than something else. Inequalities do not represent an exact amount. Roads have speed limits, certain movies have age restrictions, walking time to the park will vary every day. All of these are examples of inequalities.

Vocabulary:

- **Equation:** Mathematical expression that uses an equal sign (=) to show that both sides of the equation are equivalent to one another
- **Inequality:** Mathematical expression that includes a special sign to indicate which side is larger or smaller, or to show that the two sides are not equal

- **Symbols used in inequalities:**

Equal to	=
Not equal to	≠
Less than	<
Less than or equal to	≤
Greater than	>
Greater than or equal to	≥

The lessons in this chapter help students understand these rules of inequalities:

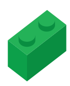
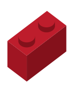
- Adding or subtracting the same quantity from both sides of an inequality leaves the inequality unchanged.
- Multiplying and dividing the same *positive* quantity from both sides of an inequality leaves the inequality unchanged.

How to use the companion student book,
Pre-Algebra Using LEGO® Bricks–Student Edition

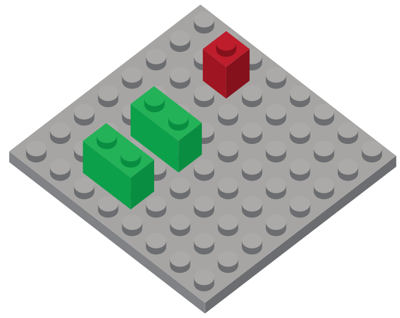
- After students build their models, have them draw the models and explain their thinking in the Student Edition. Recording the models on paper after building them with bricks helps reinforce the concepts being taught.
- Discuss the vocabulary for each lesson with students as they work through the Student Edition.
- Use the chapter assessments in the Student Edition to gauge student understanding of the content.

Part 1: Show Them How

Show students the following bricks and discuss the value that each one represents. These were introduced in chapters 6 and 7.

	Brick	Represents:
	Green 1x1	Positive 1
	Red 1x1	Negative 1
	Green 1x2	Positive x variable
	Red 1x2	Negative x variable

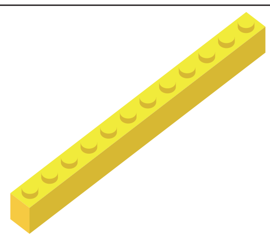
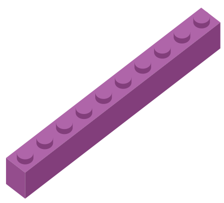
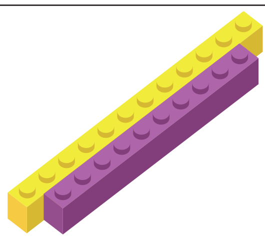
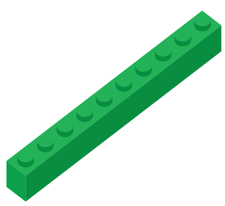
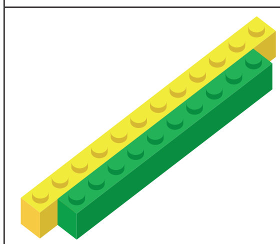
Note: Have the chart available for students to see throughout the lessons in this chapter.



Show students this model and ask them to identify the expression.

(*Answer:* 2x - 1)

Show students this chart and explain what each brick represents:

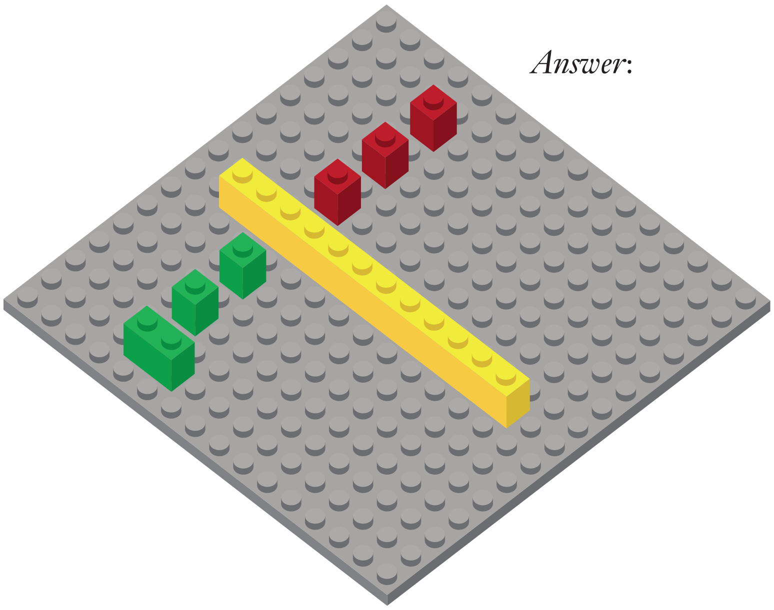
	Brick	**Represents**	**Symbol**
	Yellow 1x12	equal to	=
	Purple 1x10	less than	<
	Yellow 1x12 next to purple 1x10	less than or equal to	≤
	Green 1x10	greater than	>
	Yellow 1x12 next to green 1x10	greater than or equal to	≥

Note: Have the chart available for students to see throughout the lessons in this chapter.

Have students model with bricks, then draw and label these equations and inequalities along with you:

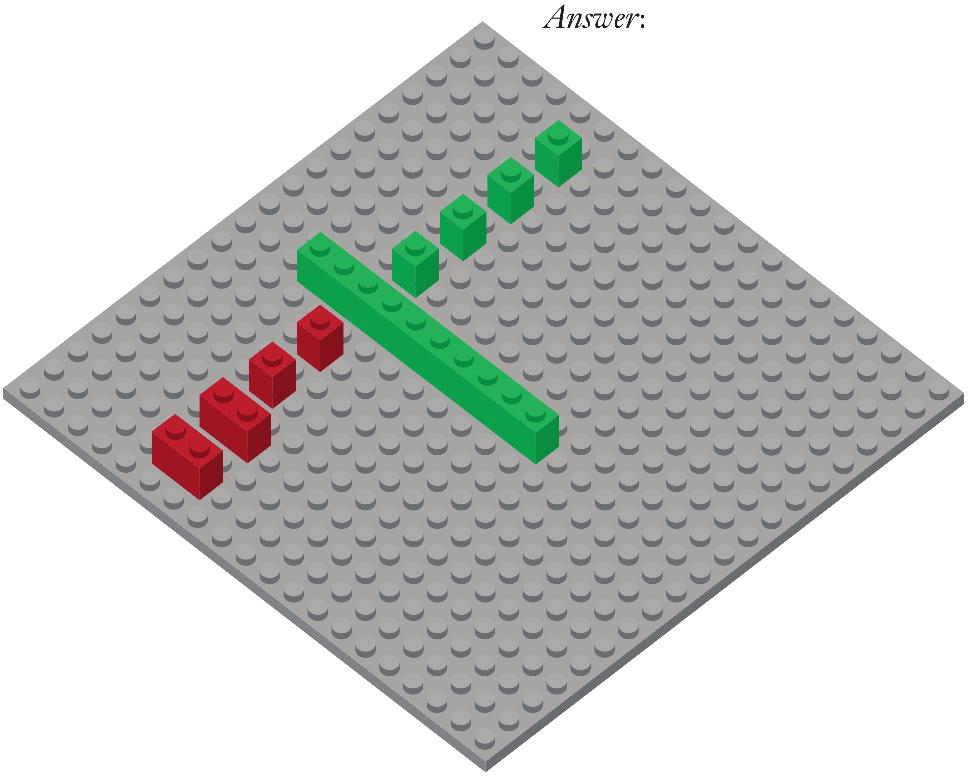
Problem #1: x + 2 = -3

Answer:



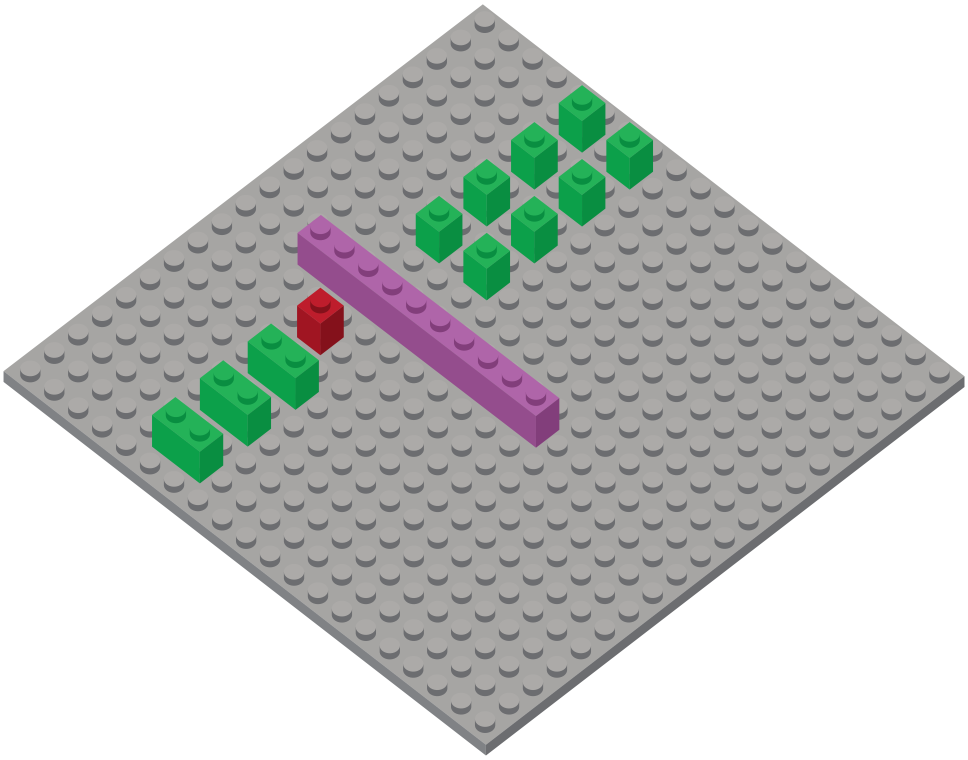
Problem #2: -2x - 2 > 4

Answer:



Problem #3: $3x - 1 < 8$

Answer:

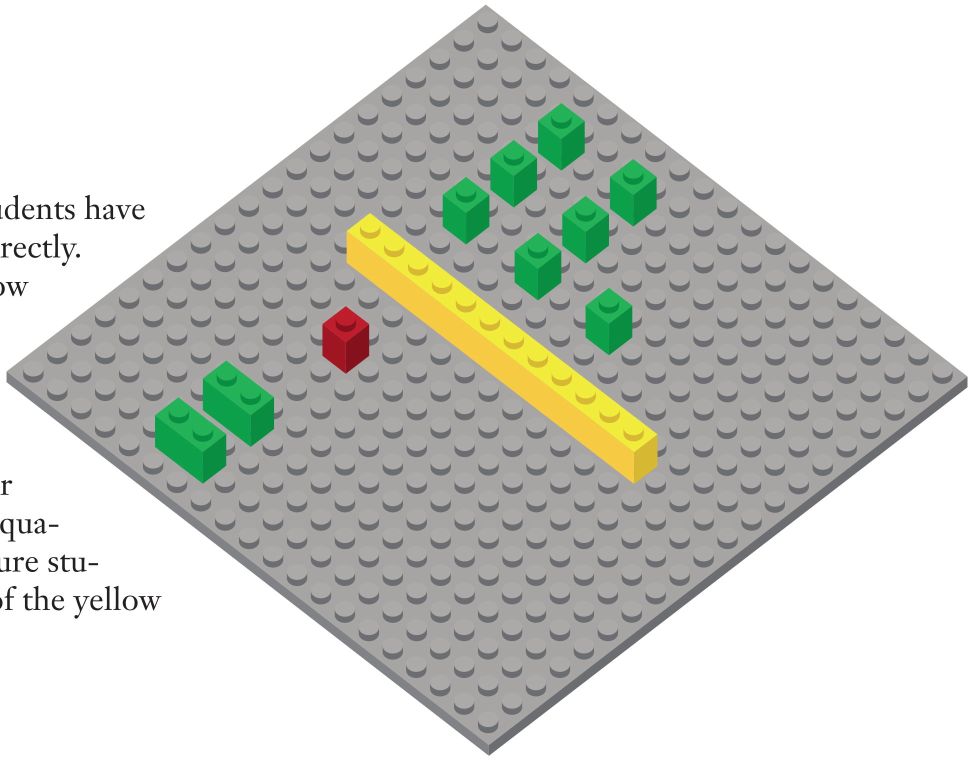


Problem #4: $2x - 1 = 7$

Answer:

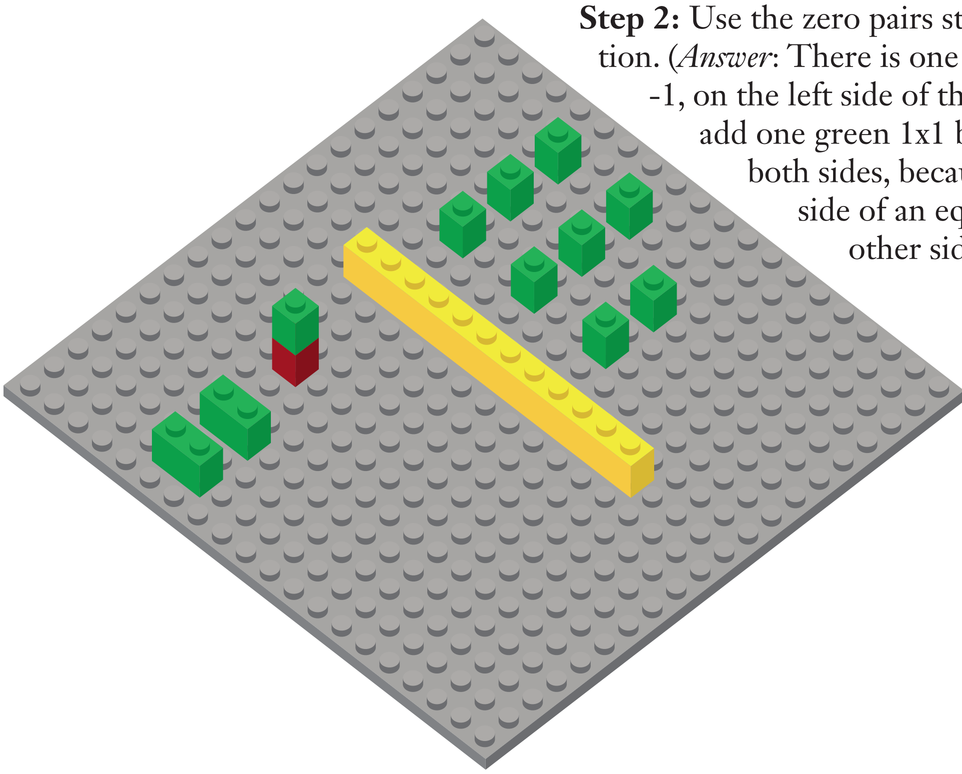
Check to make sure all students have modeled this equation correctly. Use it to show students how to model finding the value of x.

To find the value of x, use the opposite operations for both sides to narrow the equation down to x = ? Make sure students know the meaning of the yellow 1x12 brick.
(*Answer*: Equal to)



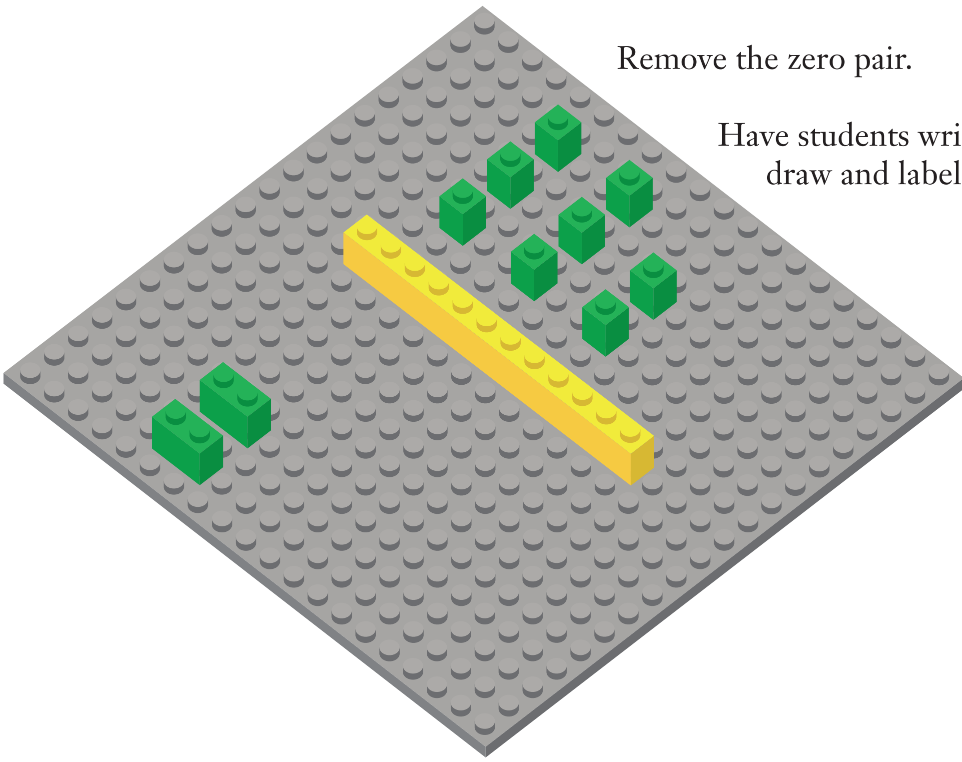
Step 1: Look for bricks on each side of the equals bar that make a zero pair. If so, you can match and remove those. (*Answer*: In this example, there are no bricks that are the same on both sides of the yellow equals bar, so none can be removed)

Step 2: Use the zero pairs strategy to narrow the equation. (*Answer*: There is one red 1x1 brick, representing -1, on the left side of the equals bar. To match it, add one green 1x1 brick, representing +1, to both sides, because what is done to one side of an equation must be done to the other side.)



Remove the zero pair.

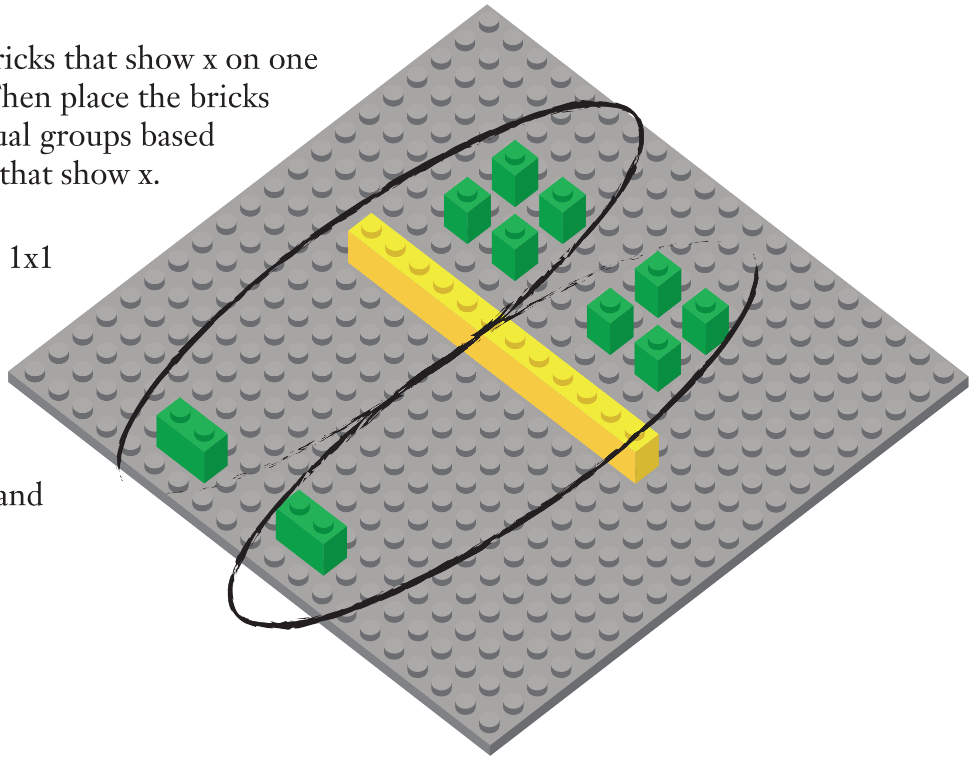
Have students write this new equation and draw and label this model. (*Answer*: 2x = 8)



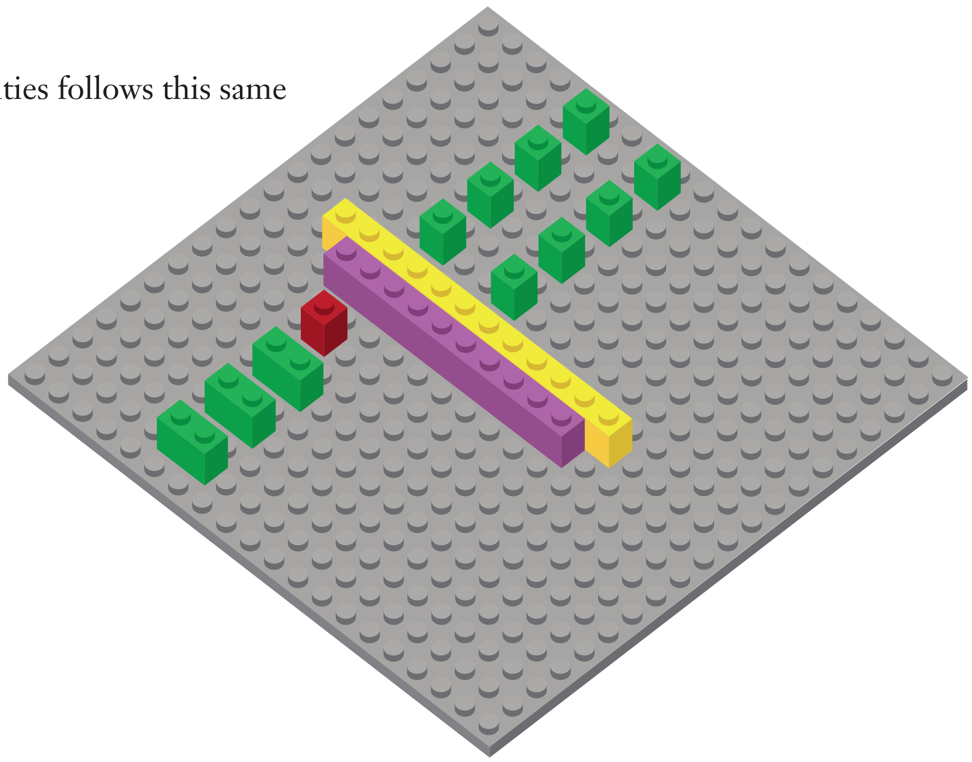
Step 3: Rearrange the bricks that show x on one side into equal groups. Then place the bricks on the right side into equal groups based on the number of bricks that show x.

Each set of x has 4 green 1x1 bricks associated with it. This model shows that $x = 4$.

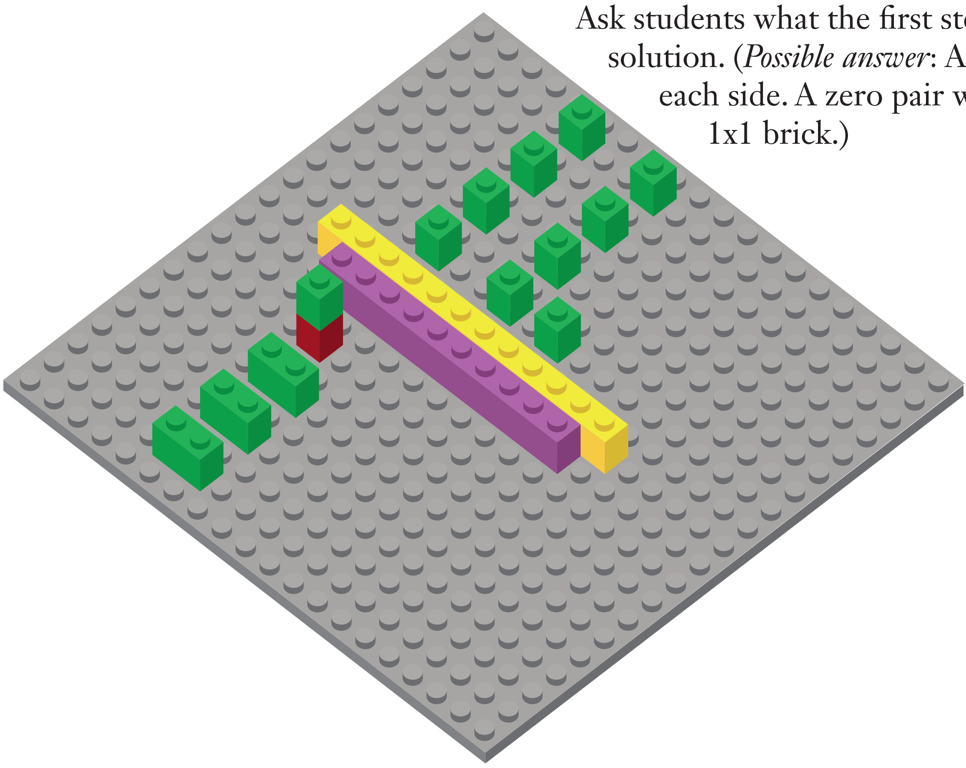
Have students write this new equation, and draw and label the solution model.



Problem #5: $3x - 1 \leq 8$
Explain that solving inequalities follows this same procedure.

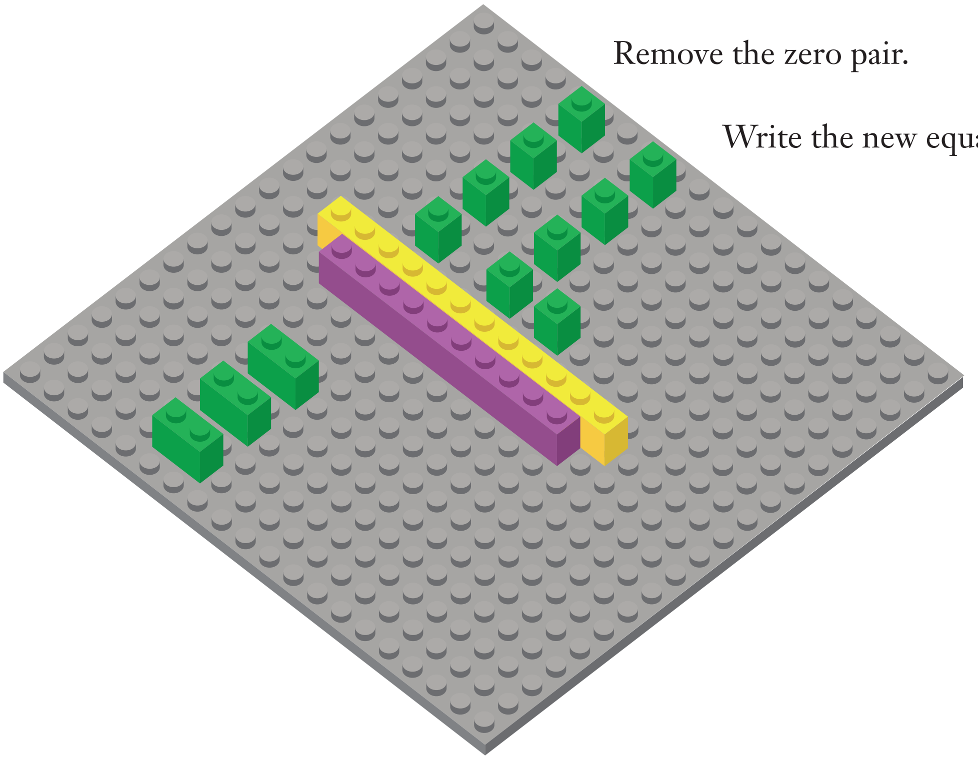


Ask students what the first step might be to model the solution. (*Possible answer*: Add one green 1x1 brick to each side. A zero pair will be created with the red 1x1 brick.)

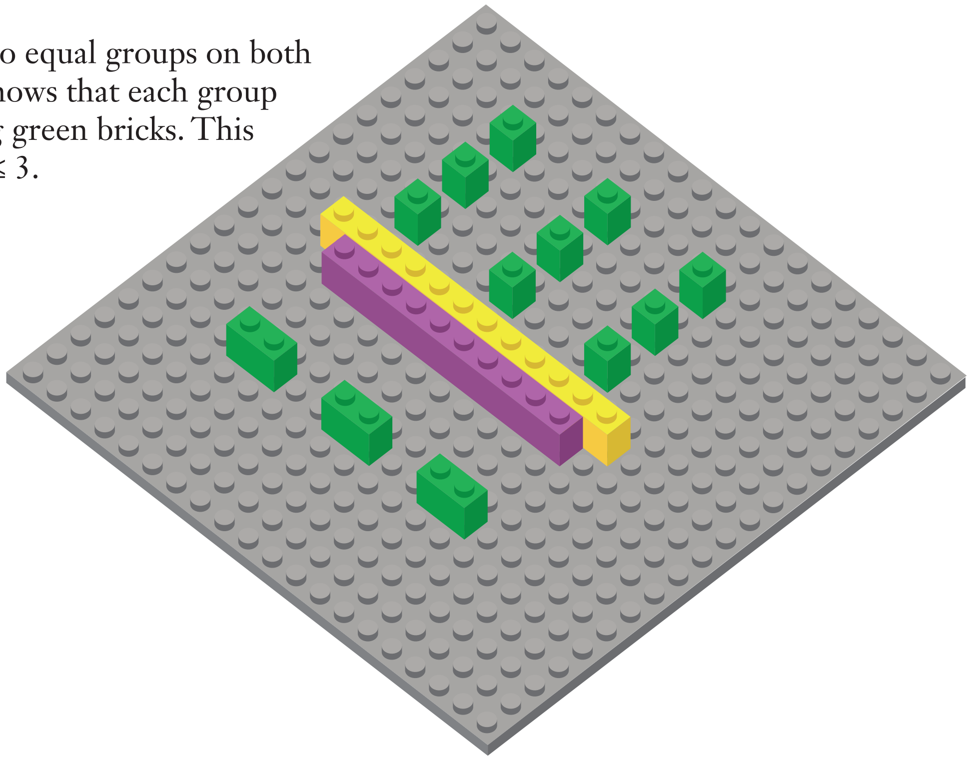


Remove the zero pair.

Write the new equation as $3x \leq 9$.



Rearrange the bricks into equal groups on both sides. The model now shows that each group of x has 3 corresponding green bricks. This shows the solution of $x \leq 3$.



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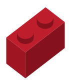
from Pre-Algebra Using LEGO® Bricks
Student Edition Workbook Pages

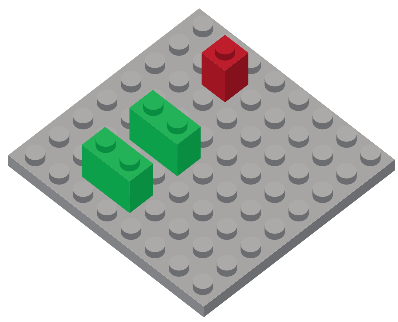
TWO-STEP EQUATIONS AND INEQUALITIES

Part 1

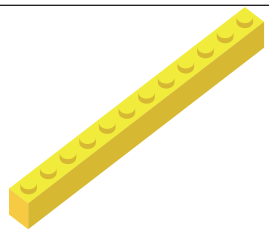
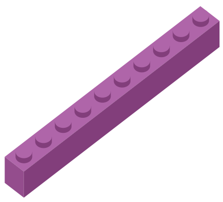
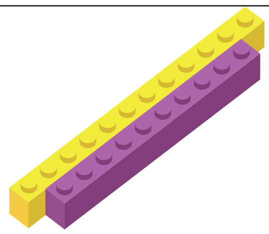
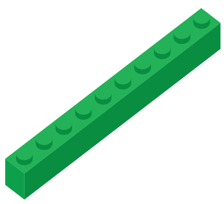
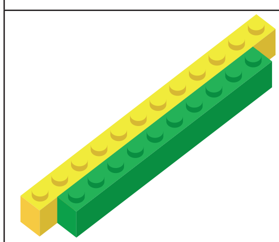
Find these bricks. Keep this chart handy as a reference for the lessons in this chapter. These values were introduced in chapters 6 and 7.

	Brick	Represents:
	Green 1x1	Positive 1
	Red 1x1	Negative 1
	Green 1x2	Positive x variable
	Red 1x2	Negative x variable

Identify the expression modeled in this illustration. ________________________________

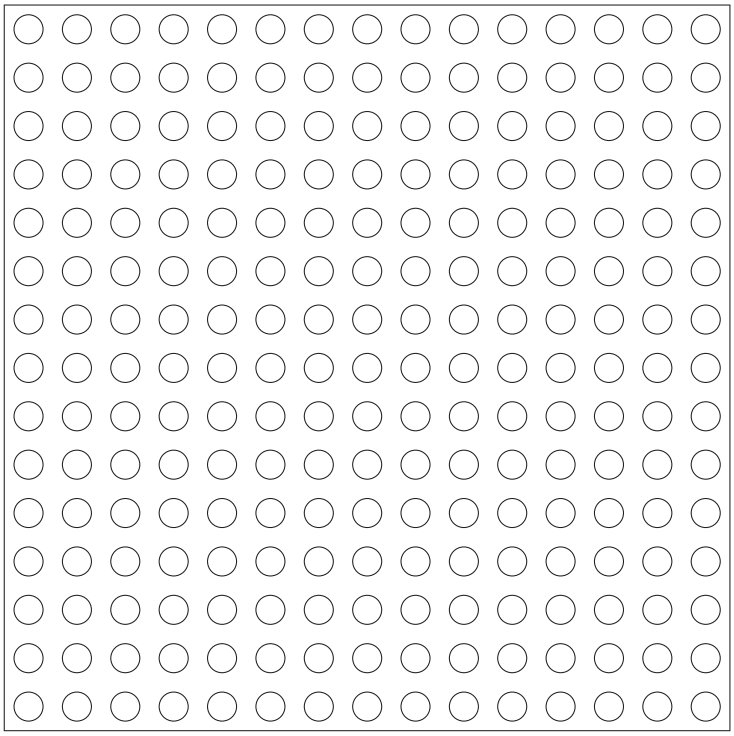


Review this chart and keep it handy as a reference for the lessons in this chapter:

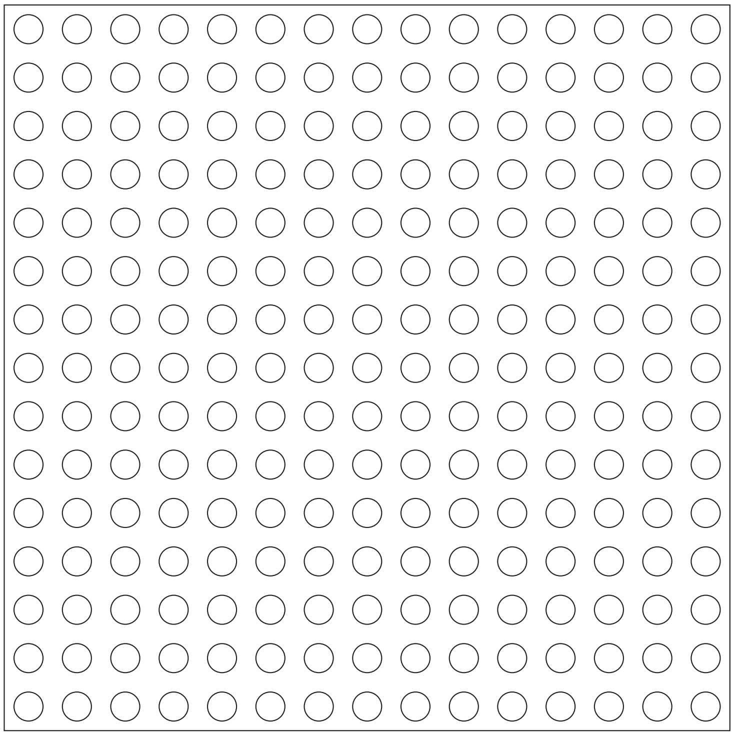
	Brick	Represents	Symbol
	Yellow 1x12	equal to	=
	Purple 1x10	less than	<
	Yellow 1x12 next to purple 1x10	less than or equal to	≤
	Green 1x10	greater than	>
	Yellow 1x12 next to green 1x10	greater than or equal to	≥

Model the following four inequalities and equations, then draw and label your models.

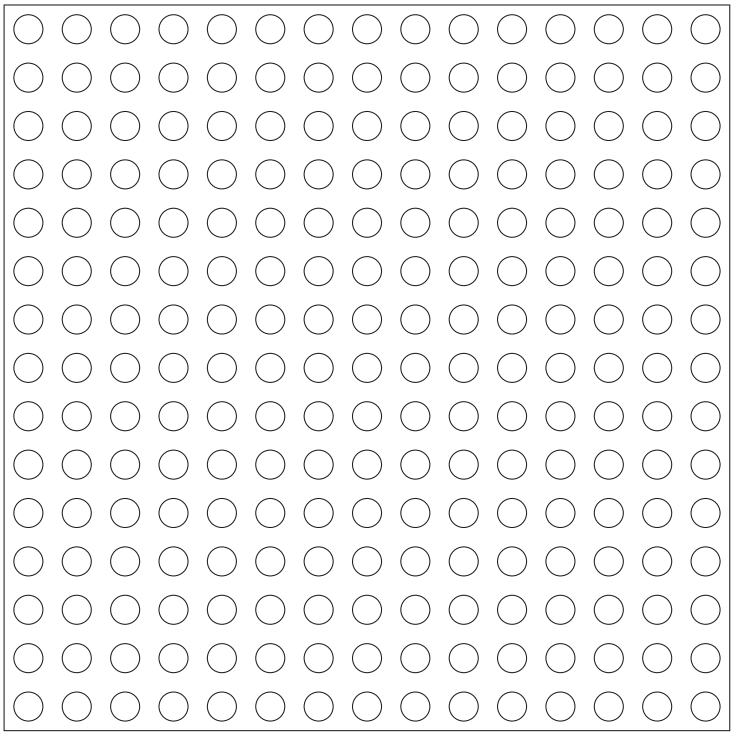
Problem #1: x + 2 = -3



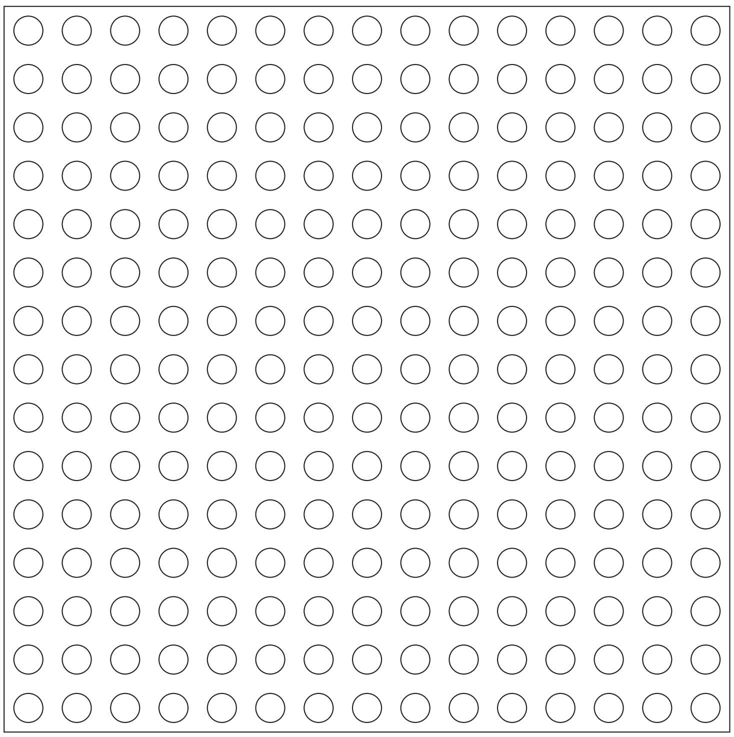
Problem #2: -2x - 2 > 4



Problem #3: $3x - 1 < 8$



Problem #4: $2x - 1 = 7$



To find the value of x in the equation $2x - 1 = 7$, use the opposite operations for both sides to narrow the equation down to $x = ?$

What does the yellow 1x12 brick represent in the model of $2x - 1 = 7$?

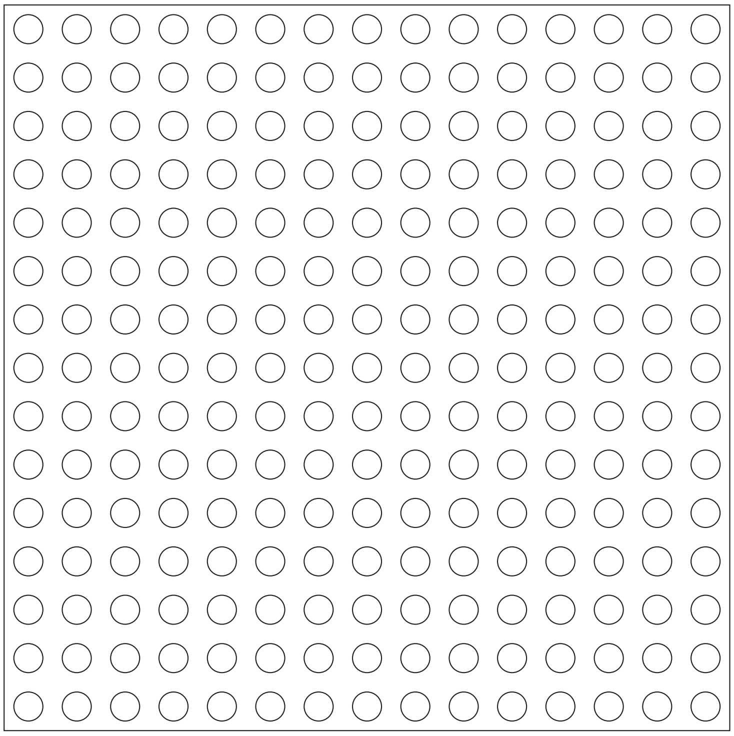
____

Model each step to solve the equation. Draw the revised model and label or explain what is happening at each step.

Step 1: Look for bricks on each side of the equals bar that make a zero pair. If so, you can match and remove those. Do you see any? ____

Step 2: Use the zero pairs strategy to narrow the equation. Remember that when you add a brick to one side, you must add the same brick to the other side. Match and remove the zero pairs. How many zero pairs did you remove? _____________________________________

Write the new equation and draw and label the model as it looks now. _________________



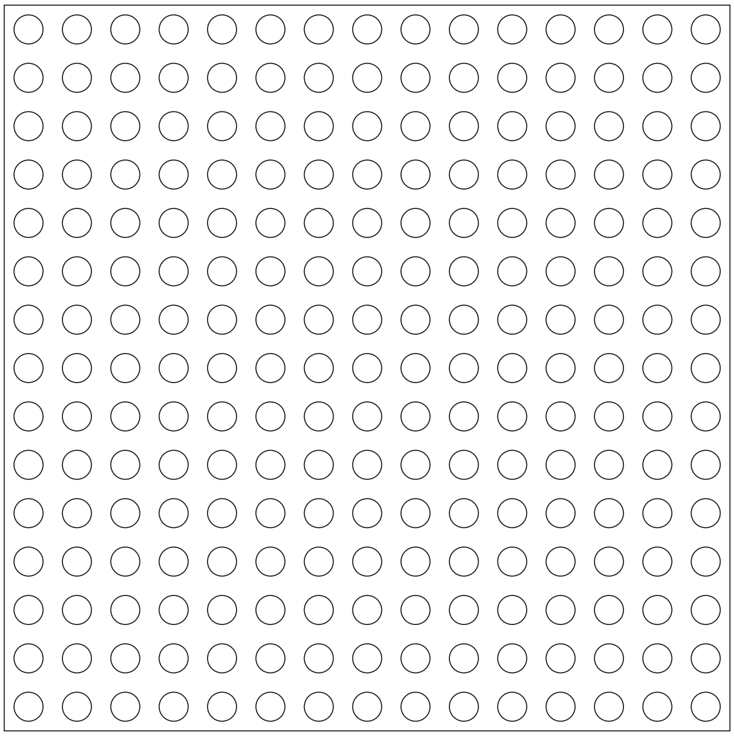
Step 3: Continue the matching process until the equation shows x.

Step 4: Rearrange the bricks that show x on one side into equal groups. Then place the bricks on the right side into equal groups based on the number of bricks that show x.

Each set of x has 4 green 1x1 bricks associated with it. This model shows that x = _________

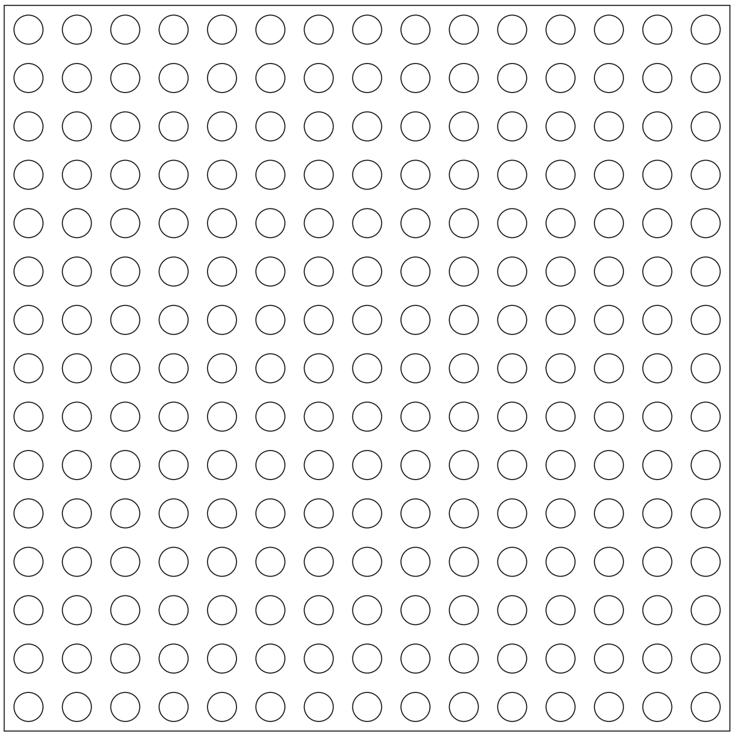
Write this new equation, and draw and label the solution model.

____



Problem #5: $3x - 1 \leq 8$

Make a model of this inequality. Draw and label the model. *Note*: Solving inequalities follows the same procedure as solving equalities.



What is the first step to model the solution? ____

____

Remove the zero pair. Write the new equation: ____________________________________

Rearrange the bricks into equal groups on both sides. The model now shows that each group of x has 3 corresponding green bricks. This shows the solution: $x \leq$ ________