

# Fundamentals

Games to develop and reinforce mental computation strategies

Sample Game Green



Brian Tickle  
James Burnett

ORIGO  
EDUCATION



# This or That?

2 or more players

Using multiple operations

## Purpose

This game requires the students to use their knowledge of operations and place value to reach a given target. The students could use a variety of mental strategies for each operation.

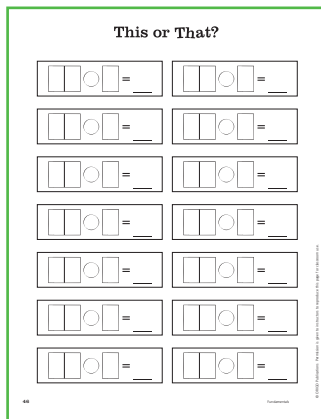
## Materials

Each group of players will need

- Three (3) standard number cubes showing numerals 1-6.

Each player will need

- A 'This or That?' game board (page 46) as shown below.



## How to Play

The aim is to score 50.

- The first player rolls the three number cubes.
- The player decides which operation to use with any combination of the three digits so the answer is equal or close to 50 (under or over).
- The player then records the number sentence on his or her game board. Each digit must be used only once.

*Example: Colby rolls 1, 3, and 5. He could record  $15 \times 3 = 45$ . However, the sample below shows one result closer to 50 is achieved using subtraction.*

$$\boxed{5} \boxed{3} \ominus \boxed{1} = \underline{\underline{52}}$$

- The other player(s) has a turn.
- The first player to score 50 is the winner.

## Reading the Research

Group games offer a rich context for children's social and mathematical development. Helping children to modify existing games or to invent their own games can extend their learning in both domains (Hildebrandt, 1998).

## Before the Game

Use the overhead projector to explain the rules of the game. Call upon a volunteer to roll the three number cubes. Write the numerals on the board. Invite students to suggest different combinations that give a result close to 50. Encourage them to consider all four operations. They should soon realize that division cannot give a result that is close to 50 when using standard number cubes. Repeat this for several sets of three digits.

## During the Game

Encourage the students to share their strategies for figuring out the answers to the number sentences.

'Bend' the rules as you watch the students play. Tell the students to roll two number cubes and think about where they would like to position them in the number sentence, then ask them what they would like to roll as their last digit to give a winning score.

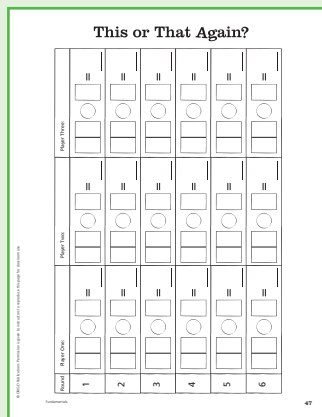
## After the Game

Challenge the students to work in pairs to invent their own game based on the rules of 'This or That?'. Start the activity by discussing ways that the game can be varied or extended. For example many students may simply suggest changing the target number. Others may suggest keeping three digits but using more than one operation. This is a great way to discuss the order of operations.

Write three digits on the board with a blank number sentence as shown (right). Have the students figure out all the multiplication sentences that can be made using each digit only once. They should create the six combinations shown.

The students can then calculate the products to determine which combinations produce the smallest and greatest products. Repeat this activity several times.

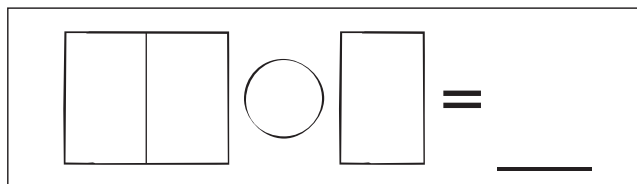
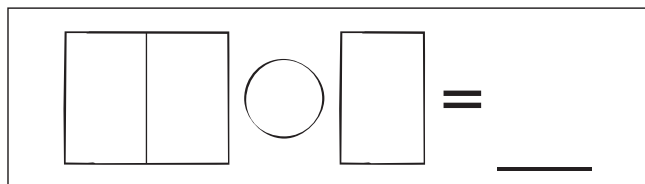
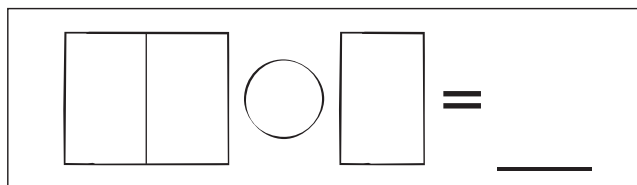
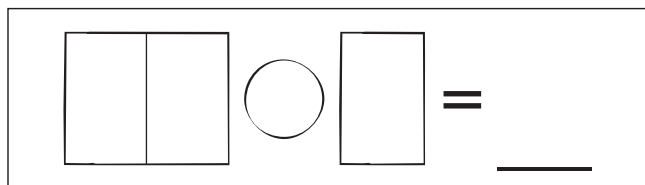
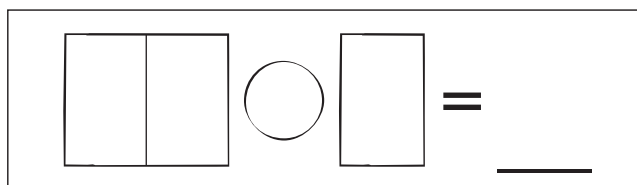
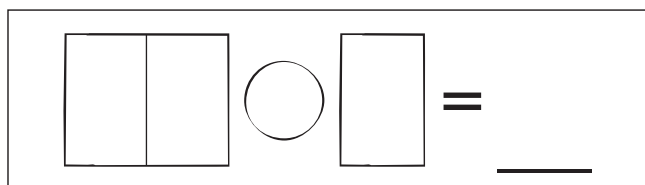
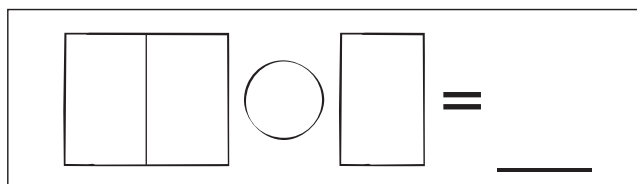
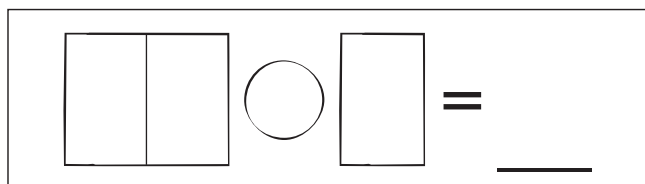
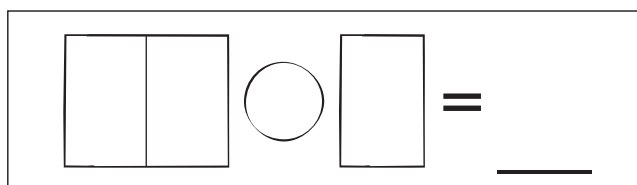
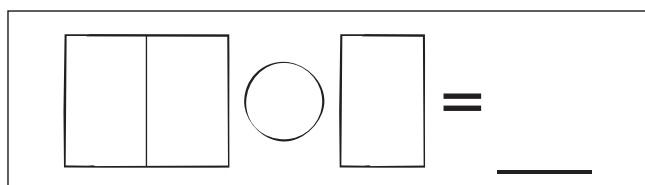
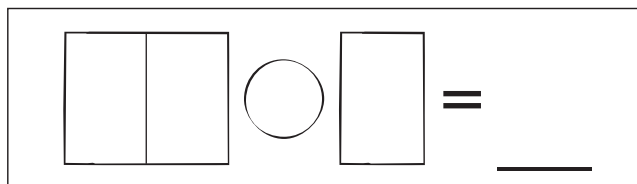
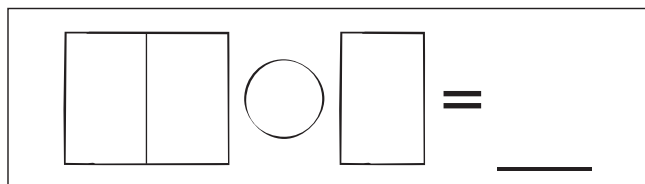
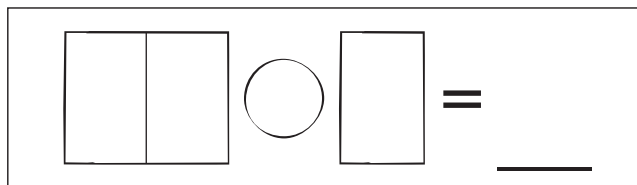
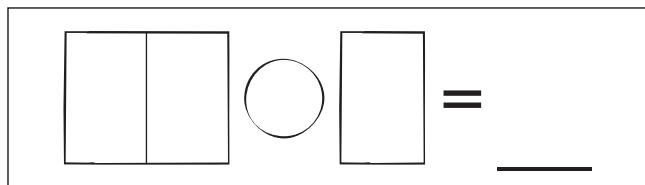
$$\begin{array}{r}
 2 \quad 3 \quad 4 \\
 \square \square \times \square = \underline{\quad} \\
 23 \times 4 \quad 32 \times 4 \\
 24 \times 3 \quad 42 \times 3 \\
 34 \times 2 \quad 43 \times 2
 \end{array}$$



## Beyond the Game

- Change the way in which the players win. Give three students a copy of the game board on page 47 (illustrated). After each round, the player who has a total closest to 50 can be the winner.
- The students can play 'This or That?' or the above variation using one standard number cube showing numerals 1-6 and two cubes made from blank wooden cubes. One of these cubes should show numerals 4-9. The other cube should show 1, 2, 3, 7, 8, and 9. The remaining rules stay the same.

# This or That?



# This or That Again?

Round	Player One:	Player Two:	Player Three:
1	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> <div style="font-size: 24px;">=</div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> </div> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> </div> <div style="display: flex; justify-content: center; align-items: center; margin-bottom: 5px;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> </div> <div style="display: flex; justify-content: center; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> </div>	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> <div style="font-size: 24px;">=</div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> </div> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> </div> <div style="display: flex; justify-content: center; align-items: center; margin-bottom: 5px;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> </div> <div style="display: flex; justify-content: center; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> </div>	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> <div style="font-size: 24px;">=</div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> </div> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> </div> <div style="display: flex; justify-content: center; align-items: center; margin-bottom: 5px;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> </div> <div style="display: flex; justify-content: center; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> </div>
2	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> <div style="font-size: 24px;">=</div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> </div> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> </div> <div style="display: flex; justify-content: center; align-items: center; margin-bottom: 5px;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> </div> <div style="display: flex; justify-content: center; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> </div>	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> <div style="font-size: 24px;">=</div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> </div> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> </div> <div style="display: flex; justify-content: center; align-items: center; margin-bottom: 5px;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> </div> <div style="display: flex; justify-content: center; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> </div>	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> <div style="font-size: 24px;">=</div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> </div> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> </div> <div style="display: flex; justify-content: center; align-items: center; margin-bottom: 5px;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> </div> <div style="display: flex; justify-content: center; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> </div>
3	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> <div style="font-size: 24px;">=</div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> </div> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> </div> <div style="display: flex; justify-content: center; align-items: center; margin-bottom: 5px;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> </div> <div style="display: flex; justify-content: center; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> </div>	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> <div style="font-size: 24px;">=</div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> </div> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> </div> <div style="display: flex; justify-content: center; align-items: center; margin-bottom: 5px;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> </div> <div style="display: flex; justify-content: center; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> </div>	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> <div style="font-size: 24px;">=</div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> </div> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> </div> <div style="display: flex; justify-content: center; align-items: center; margin-bottom: 5px;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> </div> <div style="display: flex; justify-content: center; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> </div>
4	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> <div style="font-size: 24px;">=</div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> </div> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> </div> <div style="display: flex; justify-content: center; align-items: center; margin-bottom: 5px;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> </div> <div style="display: flex; justify-content: center; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> </div>	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> <div style="font-size: 24px;">=</div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> </div> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> </div> <div style="display: flex; justify-content: center; align-items: center; margin-bottom: 5px;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> </div> <div style="display: flex; justify-content: center; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> </div>	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> <div style="font-size: 24px;">=</div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> </div> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> </div> <div style="display: flex; justify-content: center; align-items: center; margin-bottom: 5px;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> </div> <div style="display: flex; justify-content: center; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> </div>
5	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> <div style="font-size: 24px;">=</div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> </div> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> </div> <div style="display: flex; justify-content: center; align-items: center; margin-bottom: 5px;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> </div> <div style="display: flex; justify-content: center; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> </div>	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> <div style="font-size: 24px;">=</div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> </div> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> </div> <div style="display: flex; justify-content: center; align-items: center; margin-bottom: 5px;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> </div> <div style="display: flex; justify-content: center; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> </div>	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> <div style="font-size: 24px;">=</div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> </div> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> </div> <div style="display: flex; justify-content: center; align-items: center; margin-bottom: 5px;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> </div> <div style="display: flex; justify-content: center; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> </div>
6	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> <div style="font-size: 24px;">=</div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> </div> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> </div> <div style="display: flex; justify-content: center; align-items: center; margin-bottom: 5px;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> </div> <div style="display: flex; justify-content: center; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> </div>	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> <div style="font-size: 24px;">=</div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> </div> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> </div> <div style="display: flex; justify-content: center; align-items: center; margin-bottom: 5px;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> </div> <div style="display: flex; justify-content: center; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> </div>	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> <div style="font-size: 24px;">=</div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> </div> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-bottom: 5px;"></div> </div> <div style="display: flex; justify-content: center; align-items: center; margin-bottom: 5px;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> </div> <div style="display: flex; justify-content: center; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> </div>