Didax

Ages 5 and up!

Unifix® Cubes

Ten-Frame Trains

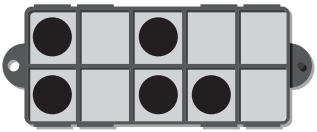
Ten-Frame Trains are intended for use with Unifix® Cubes, but can also be used with beans, base ten cubes, or other suitable counters.

Ten-frames are two-by-five rectangular frames into which counters are placed to illustrate numbers less than or equal to ten. The use of ten-frames appears in the work of researchers such as Van de Walle (1988) and Bobis (1988). Various arrangements of counters on the ten frames can be used to prompt different mental images of numbers and different mental strategies for manipulating these numbers, all in association with the numbers' relationship to ten.

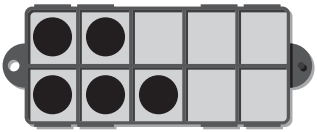
Introducing Ten Frames

Look at the three ten-frames below. What numbers are illustrated? What does the arrangement of the counters prompt you to think about the numbers? What can you say about each number's relationship to ten?

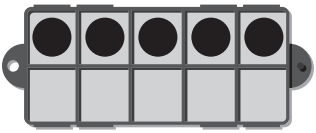
Frame A



Frame B



Frame C



Frame A:

Five counters may be seen as sub-groups of three and two, either by looking at the clusters, or by looking at the number in the top and bottom rows.

Frame B:

This may be seen as two in top row and three in the bottom, or as four and one, or two and two and one. It is also noticeable that there are five empty boxes remaining, in a similar shape to the full boxes. This prompts the awareness that "five and five make ten."

Frame C:

This arrangement illustrates the idea that "five and five make ten" and that half of ten is five. This type of thinking would not occur if the five counters were presented without the context of the ten-frame.

Plenty of activities with ten-frames will enable children to automatically think of numbers less than ten in terms of their relationship to ten, and to build a sound knowledge of the basic addition/subtraction facts for ten that are an integral part of mental calculation.

Learning About "Ten and Some More"

Kathy Richardson, (*Assessing Math Concepts: Ten Frames,* © 2003) has worked with thousands of children and finds that "…even before children are able to think of numbers as composed of tens and ones, they can add and subtract numbers to 20 and beyond using whatever strategies they have developed to that point. They can add by counting all, counting on, counting up, and by knowing one more and one less, doubles, and doubles plus and minus one… When children are given practice adding and subtracting numbers before they know the parts of numbers to 10 and more, many develop fast counting for getting answers before learning the basic relationships. This does not help them when they confront the same or similar problems again… Learning the parts of numbers to 10 takes longer than teachers assume it will."

Ten frames can be used to help children master what Kathy Richardson identifies as the following "critical learning phases":

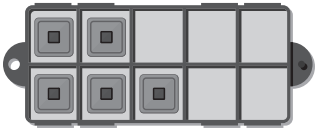
- Describes a 10 as a single entity even though it is composed of 10 single objects
- Organizes numbers into groups of 10 and left-overs
- Knows 10 plus any number from 1-10
- Tells how many needed to make 10
- Tells how many left-overs when removing 10 from numbers from 11 to 20
- Combines quantities by reorganizing into one 10 and left-overs
- Subtracts quantities by breaking numbers apart and recombining whatever is left.

Activities to 10

The first step in using the ten-frames is to let children play and discover. Put out enough Unifix® Cubes to fill up all the ten-frames. Children will naturally fill the cars with cubes and connect them to make trains. Next, provide each child with one ten frame and some Unifix® Cubes, working in small groups if possible.

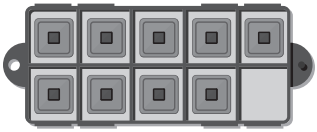
Addition

Have each child set up their car as shown:



Ask them how many cubes will be needed to fill the car. Ask them how they determined this. Repeat this activity, using different numbers as a starting point.

This is a slight variation, but with a different question:



Ask "how many cubes are in this car?" Then ask "how did you know?" The child may say that there are nine, because nine is one less than ten. Now ask them to fill the car. Repeat this activity with different numbers.

You can make this a self-directed activity by asking children to use the spinner to determine how the cars will be set up initially.

Subtraction

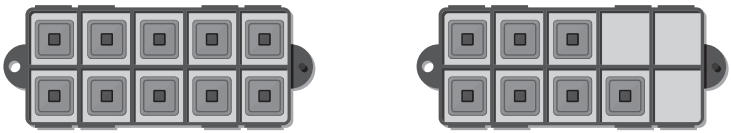
Set up train cars that are full. Ask children to remove 4 cubes and then tell you how many are left in the car. It is useful to ask them how they know.

Use the spinner to show how the full train cars should look after removing cubes. Each time, the children will say how many cubes they had to remove.

Ask children to make a stack of ten Unifix® Cubes. Then have them break off half of the cubes and load them into a car, describing what they are doing.

Activities to 20

Provide each child with at least two cars and a pile of Unifix Cubes. Fill one car completely and then say a number under ten and ask the child to put that many in the other car.



Ask how many are in each car and then ask for the total. Repeat with as many variations as you can.

The spinner can be used to set up the way the second car should look.

Games

Fill 'er Up

Players: Up to six
Materials: Two cars per student, Unifix® Cubes, spinner
Object: To fill both cars

The first player spins and takes Unifix Cubes to set up one of his or her cars as shown on the spinner. Each player does the same, in turn. Then each player spins again and takes cubes to set up the other car as shown on the spinner. Next, each player takes enough cubes to fill up one car. If either car is already full, no cubes are taken. The player with the most cubes in the two cars is the winner.

Guessing Game

Players: Two
Materials: One car per student, Unifix Cubes
Object: To deduce the layout of the other student's car

With the players opposite each other, put a large book between them, so that they can't see each other's car. One player secretly arranges some counters on a ten-frame. The other player asks questions that can be answered yes or no, trying to gain enough clues to work out the arrangement of counters. For example: Is the top row full? Are there 8 counters? Is there an empty box in the bottom row? As players become more skilled, the number of questions can be counted. The player asking fewer questions wins.

Race to 20

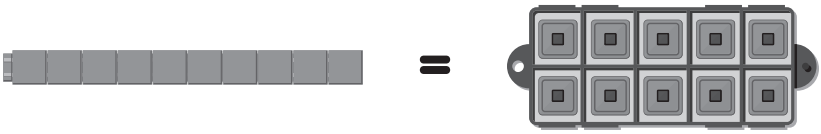
Players: Up to six
Materials: Two cars per student, Unifix Cubes, die
Object: To fill both cars first

On each turn the player will roll a die and take that many Unifix Cubes. Play progresses in order as players try and fill their cars. As soon as one car is full, the player should hook it to the other car. The first player to fill both cars wins.

Long Train

Players: Up to five
Materials: At least three cars per student, Unifix® Cubes, dice
Object: To make the longest train possible

Each player rolls the dice in turn and takes that number of Unifix Cubes, connecting them into a stick. As soon as a player has ten cubes in a stick, the player has earned a ten-frame car and can fill it with cubes, keeping the left-over cubes in a stick.



However, if a player rolls a "5," they must remove that number of cubes from their car (if they have earned one) and return them to the pile. The car can be refilled as soon as the player has 5 cubes.

Play progresses with the players building sticks of ten cubes and filling cars until all the cars are taken. The game is now over and the winner is the player with the longest train. If there is a tie, the player with the least left-over cubes is the winner.

This game is designed to provide plenty of composing and decomposing across tens. It is useful to encourage players to talk about how many ten-frame cars they have and to connect them as they become full.

Other Useful Unifix® Materials

Unifix 1-120 Number Line
Twelve sections connect with markers every ten. **#211504**

Unifix Height Chart
Measure with inches, centimeters, Unifix Cubes, and hands. **#2-702**

1,000 Unifix Cubes
#2-BKA

Unifix Graphing Base
Simple data analysis. **#211088**

Unifix Magnetic Ten-Frames
Practice ten-frames as a group with these large magnetic ten-frames. **#211037**

Unifix Ten-Frame Cards
60 full-color ten-frame cards featuring Unifix cubes. **#211499**

Unifix Attribute Pattern Kit
Combining simple attributes with patterning. **#211304**

Large Unifix Magnets
Great for demonstration. **#2-737**

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