



Cross-Number

DISCOVERY PUZZLES & GAMES

LEVEL PRE/K

An educational resource that integrates the concepts children need most in their learning of mathematics



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CROSS-NUMBER DISCOVERY PUZZLES

PRE-KINDERGARTEN

Cross-Number Discovery Puzzles Pre/Kindergarten is the first resource in the series *Cross Number Discovery Puzzles & Games*. The resource is divided into two parts, each with a set of puzzle cards. The first set of thirty cards is for pre-kindergarten and the second set is for kindergarten. Also included in this resource are magnetic number tiles for use with the first set of thirty puzzle cards.

In the first set of thirty puzzles, the cards have nine numbers across the top. Children place the magnetic number tiles on the appropriate numbers before matching them to nine images within the puzzle. The puzzles are cumulative in nature, with each group of five puzzles having the same learning outcomes. This means that the questions in puzzles 1-5 involve the same outcomes, the questions in puzzles 6-10 involve the same outcomes, and so on. Each group of five puzzles introduces new number concepts, while repeating those from previous puzzles.

The puzzles involve early number concepts and are based on the instructional framework set out in *Teaching Number: Advancing Children's Skills and Strategies*, 2nd edition, by Robert J. Wright, James R. Martland, Ann K. Stafford, and Garry Stanger. This instructional framework helps teachers determine where their children are at and what the next learning outcomes should be.

The puzzles can be used with an entire class, small groups, or individual children. The puzzles can also be used with Smart Board. Software for Smart Board is provided on the enclosed CD. Although these puzzles are intended for children in pre-kindergarten, they are an excellent resource for those who are ready for them, whether they are in pre-kindergarten, kindergarten, or in a grade.

NUMBERS IN THE PUZZLES

In *Cross-Number Discovery Puzzles Pre-Kindergarten* children are required to count up to 9. As children work their way through the puzzles, check that they are able to say the numbers in order from 1 to 9 as well as recognize and name these numerals. Also check that they do not confuse numerals such as 2 and 5, 6 and 8, or 6 and 9.

It is important that children can count forwards, starting at a number other than the number 1. In *Cross-Number Discovery Puzzles Pre-Kindergarten*, children are required to count forwards from a number that is not the number 1, beginning in Puzzle 21. It is also important that children can count backwards as well as forwards. Although counting backwards is considerably more difficult for children than counting forwards, it is a necessary skill for children to develop. When first learning to count backwards, often children will count forwards subvocally. In *Cross-Number Discovery Puzzles Pre-Kindergarten*, children are required to count backwards beginning in Puzzle 26.

PUZZLES 1-5

In puzzles 1-5, the numerals and the images involve the numbers 1, 2, and 3. As there are 9 numerals and 9 images, each of the numbers 1 to 3 appears three times.

As children work through these five puzzles, check that they can co-ordinate their pointing action with the saying of each number and understand that the last number they say when they complete their count is the number shown by the image.

Encourage children to not only count forwards from 1 to 3, but also to count backwards from 3 to 1.

The finger patterns in these five puzzles are for 1 to 3 fingers. Encourage children to make these finger patterns.

The dot cards in these five puzzles have up to 3 dots. Check whether children are able to recognize the number of dots on the dot cards without having to count them one by one.

PUZZLES 6-10

In puzzles 6-10, the numerals and the images involve the numbers 1, 2, 3 and 4.

Encourage children to not only count forwards from 1 to 4, but also to count backwards from 4 to 1.

The finger patterns in these five puzzles are for 1 to 4 fingers. Encourage children to make these finger patterns.

The dot cards in these five puzzles have up to 4 dots. Check whether children are able to recognize the number of dots on the dot cards without having to count them one by one.

PUZZLES 11-15

In puzzles 11-15, the numerals and the images involve the numbers 1, 2, 3, 4 and 5.

Check that children do not confuse the numeral 2 and the numeral 5.

Encourage children to not only count forwards from 1 to 5, but also to count backwards from 5 to 1.

The finger patterns in these five puzzles are for 1 to 5 fingers. Encourage children to make these finger patterns.

The dot cards in these five puzzles have up to 5 dots. Check whether children are able to recognize the number of dots on the dot cards without having to count them one by one.

In puzzles 11-15, dominoes are introduced and children are required to find the total number of dots on the two sides of a domino. Check that they are able to do so.

PUZZLES 16-20

In puzzles 16-20, the numerals and the images involve the numbers 1 to 6.

Encourage children to not only count forwards from 1 to 6, but also to count backwards from 6 to 1.

In puzzles 16-20, double finger patterns are introduced. Encourage children to make these finger patterns.

The dot cards in these five puzzles have up to 6 dots. Check whether children are able to recognize the number of dots on the dot cards without having to count them one by one.

In puzzles 16-20, the bead strings show up to 6 beads. Although the first 5 beads are black and the next ones are white, it is still expected that the children will be counting the beads one by one.

PUZZLES 21-25

In puzzles 21-25, the numerals and the images involve the numbers 1 to 8. Check that children do not confuse the numeral 6 and the numeral 8.

Encourage children to not only count forwards from 1 to 8, but also to count backwards from 8 to 1.

In puzzles 21-25, children are required to count forwards, starting with a number that is not the number 1. This is often challenging for children. Check that they are able to do so.

In puzzles 21-25, two rows of stars are introduced and children are required to find the total number of stars in the two rows. Check that they are able to do so.

PUZZLES 26-30

In puzzles 26-30, the numerals and the images involve the numbers 1 to 9. Check that children do not confuse the numeral 6 and the numeral 9.

Encourage children to not only count forwards from 1 to 9, but also to count backwards from 9 to 1.

In puzzles 26-30, children are required to find the next number in a backwards number sequence. Counting backwards is an important skill for children to develop. Often children will count forwards in order to determine the next number word in a backwards number sequence. Allow the children sufficient time to think about and determine the next number in a backwards number sequence.

IMAGES IN THE PUZZLES

The following images are used in the puzzles to facilitate and support learning:

Bears

Each puzzle has an image of one bear that is to be matched with the number 1. The bears in each group of five puzzles have a similar theme. For example, the bears in puzzles 1-5 wear different T-shirts, while the bears in puzzles 16-20 wear different glasses.

Dot Cards

Each puzzle has one or more images of regular dot patterns having 1 to 6 dots. Recognizing the number of dots in a pattern without having to count the dots from 1 is an important skill for children to develop.

Finger Patterns

Each puzzle has one or more images of a finger pattern. When children are first developing number concepts, the use of finger patterns is encouraged. Initially, when children are learning to show a number from 1 to 5 with their fingers, have them look at their fingers and lift each finger one after the other. Once they have developed this skill, encourage them to show the numbers from 1 to 5 without looking at their fingers. This skill is referred to as finger patterns unseen. Children can do this by placing their hands near their ears or behind their backs.

Next have children show simultaneous finger patterns for the numbers 1 to 5. In simultaneous finger patterns, children are able to look at their fingers but must lift the required number of fingers all at the same time. Once children have developed this skill, ask them to show these simultaneous finger patterns with finger patterns unseen.

When children are successful at finger patterns for the numbers from 1 to 5, have them learn the double finger patterns for 1 to 5. These double finger patterns consist of lifting the same number of fingers on each hand. Double finger patterns are shown beginning in puzzle 16.

Dominoes

Dominoes are shown beginning in puzzle 11. Children count and find the total number of dots on both sides of the dominoes.

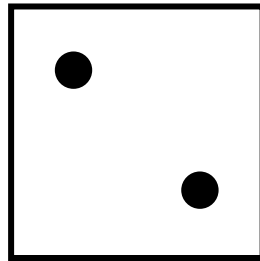
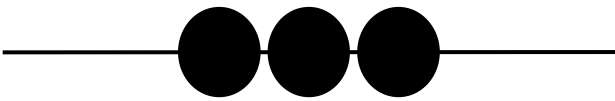
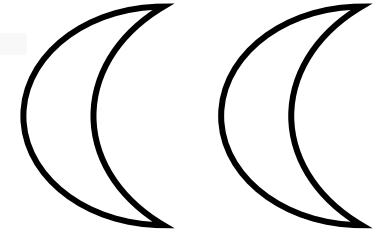
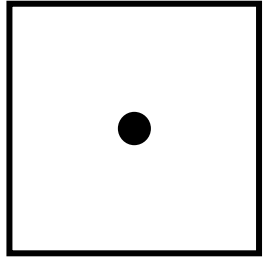
Bead Strings

In the puzzles, children are required to count up to 9 beads. The first five beads on the bead strings are always black, while the next beads are white.

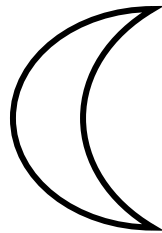
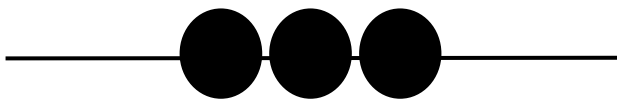
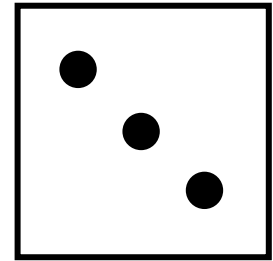
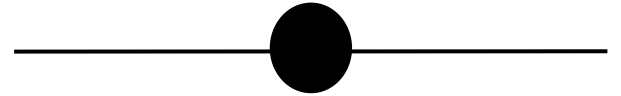
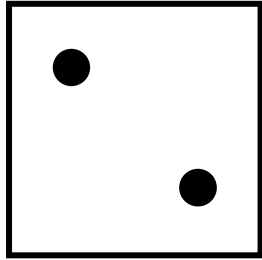
Stars, Sticks and Moons

The images in the puzzles also include stars, sticks and moons.

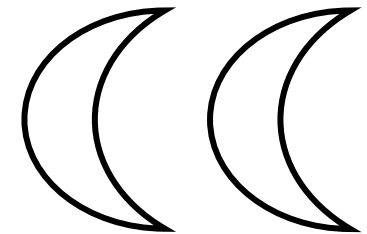
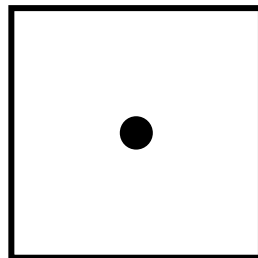
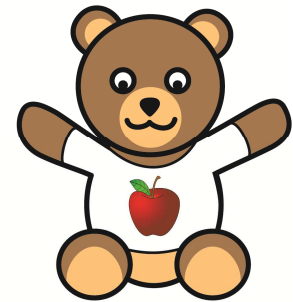
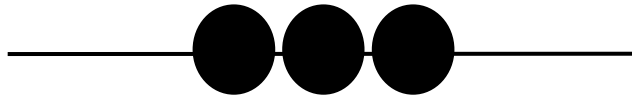
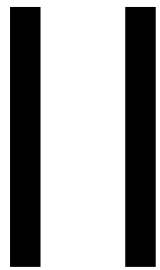
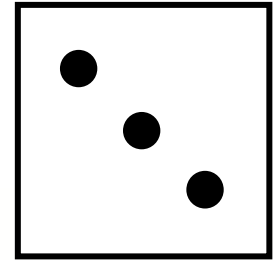
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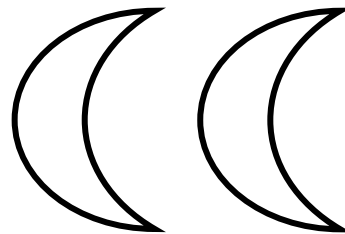
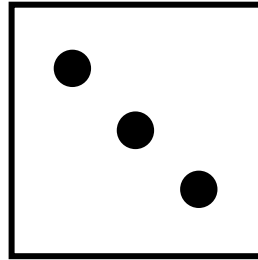
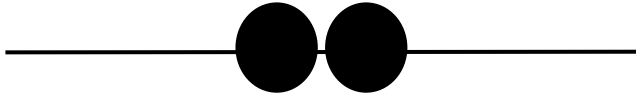
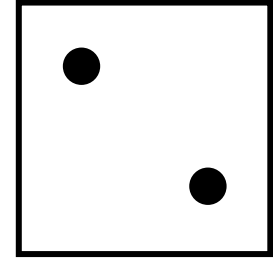
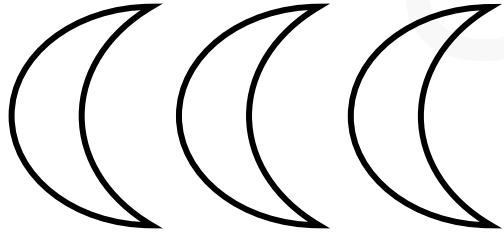
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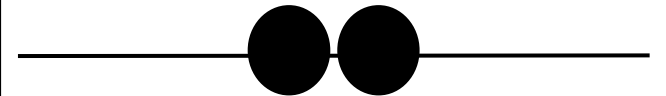
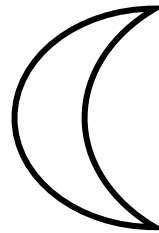
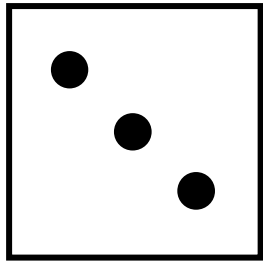
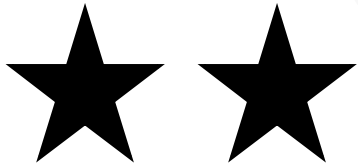
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CROSS-NUMBER DISCOVERY PUZZLES

KINDERGARTEN

Cross-Number Discovery Puzzles Kindergarten is the second part of *Cross-Number Discovery Puzzles Pre/Kindergarten*. It consists of thirty puzzle cards and a sheet of number tiles. Across the top of each of the thirty puzzles are twelve numbers that are to be matched to twelve images in each puzzle. Children can place number tiles over the twelve numbers at the top of each puzzle, and then move them to their appropriate image within the puzzle. Another option is for teachers to duplicate the puzzles, and then have the children cut out the twelve numbers at the top of each puzzle and paste them onto their appropriate image.

The puzzles are cumulative with each group of five puzzles having similar learning outcomes. This means that the outcomes in puzzles 1-5 are the same, the outcomes in puzzles 6-10 are the same, and so on. Each group of five puzzles introduces new number concepts, while repeating those introduced in previous puzzles.

The puzzles focus on the numbers 1 - 30. They are based on the instructional framework of how children learn early number concepts. More information on the instructional framework on which these puzzles are based can be found in the book, *Teaching Number: Advancing Children's Skills and Strategies*, by Robert Wright, James Martland, Ann Stafford, and Garry Stanger.

The puzzles can be used with an entire class, small groups, or individual children. The puzzles can also be used with Smart Board. Software for Smart Board is provided on the enclosed CD. Although these puzzles are intended for children in kindergarten, they are an excellent resource for those who are ready for them, whether they are in pre-kindergarten, kindergarten, or in a grade.

IMAGES USED IN THE PUZZLES

The following images are used in the puzzles to facilitate and support learning:

Bead Strings

The beads shown in the puzzles are in two colours, the colours alternating every five beads. The bead strings support counting. Each group of puzzles is more challenging than the previous group. In the first group of five puzzles, the bead strings have up to 10 beads, in the second group of five puzzles, they have up to 12 beads, in the third group they have up to 15 beads, and so on. As children work through the puzzles, have them practice counting actual items. Check that they are able to coordinate the number words with the pointing of their finger or the moving of the items. Note that children are not expected to count the beads in the bead strings in groups of five but by ones. Also note that children must recognize and identify numerals as they work through the puzzles.

Have the children count the beads in each of the puzzles not only forwards but backwards as well. Although counting backwards is more challenging for children, it is a very important skill for them to develop.

PUZZLES 1-5

Bead Strings

The bead strings have up to 10 beads.

Numeral Tracks, Forwards and Backwards

The forward sequences involve numbers from 1 to 10.

Finger Patterns

The finger patterns involve 1 to 5 fingers.

Dot Cards

The dot patterns are the domino patterns for 1 to 6.

Dominoes

The dot patterns in the dominoes have from 1 to 5 dots.

PUZZLES 6-10

Bead Strings

The bead strings have up to 12 beads.

Numeral Tracks, Forwards and Backwards

The forward sequences involve numbers from 1 to 12. The backward sequences involve numbers from 6 to 1.

Finger Patterns

The finger patterns are the double patterns for 1 to 5.

Dot Cards

The dot patterns include the pairs patterns for 3 to 6.

Dominoes

The dot patterns in the dominoes have from 1 to 6 dots.

PUZZLES 11-15

Bead Strings

The bead strings have up to 15 beads.

Numeral Tracks, Forwards and Backwards

The forward sequences involve numbers from 1 to 15. The backward sequences involve numbers from 10 to 1.

Finger Patterns

The finger patterns are the double patterns for 1 to 5.

Dot Cards

The dot patterns include the pairs patterns to 8.

Dominoes

The dot patterns in the dominoes have from 1 to 8 dots. Many of the dominoes involve doubles.

PUZZLES 16-20

Bead Strings

The bead strings in these and subsequent puzzles have up to 20 beads.

Numeral Tracks, Forwards and Backwards

The forward sequences involve numbers from 1 to 20. The backward sequences involve numbers from 15 to 1.

Finger Patterns

The finger patterns are the five plus patterns for 6 to 10.

Dot Cards

The dot patterns include the pairs patterns to 10.

Dominoes

The dots on the first side of each domino are hidden, and the number of hidden dots on that side of the domino is indicated by a numeral.

PUZZLES 21-25

Numeral Tracks, Forwards and Backwards

The forward sequences involve numbers from 1 to 20. The two middle numbers are now screened. The backward sequences involve numbers from 20 to 1.

Finger Patterns

The finger patterns are the five plus patterns for 6 to 10.

Dot Cards

The dot patterns include 4-grids, 6-grids and 8-grids.

Dominoes

The dots on one side of each domino are hidden.

Equal Groups and Sharing

The stars are divided into groups of 3, 4, or 5.

PUZZLES 26-30

Numeral Tracks, Forwards and Backwards

The forward sequences involve numbers from 1 to 30. The backward sequences involve numbers from 20 to 1. Note that the two middle numbers are screened.

Finger Patterns

The finger patterns are the doubles plus one patterns.

Dot Cards

The dot patterns include 10-grids.

Dominoes

The dots on one side of each domino are hidden.

Equal Groups and Sharing

The stars are divided into groups of 2.

Numeral Tracks, Forwards and Backwards

An important outcome in early learning is saying forward number word sequences, for example, continuing the sequence 4, 5, 6,... Also important, but more challenging, is saying backward number word sequences, for example, continuing the sequence 6, 5, 4,... When first learning to say the next backward number word, children often have to count forwards subvocally. With these tasks, as with all the tasks in these puzzles, it is important to allow the children sufficient thinking time.

The first group of five puzzles involves only forward sequences from 1 to 10, while the second group of five puzzles involves forward sequences from 1 to 12, as well as backward sequences from 6 to 1. In the final groups of puzzles, the middle two numbers are screened.

Finger Patterns

Current research supports young children using their fingers when first learning about number. Encourage children to make the finger patterns shown in the puzzles. When they are making the patterns, check whether they can make them when they are not able to look at their fingers. This skill is known as finger patterns unseen. In finger patterns unseen, the children can hold their hands near their ears (bunny ears) or behind their backs. Also check whether they have to make the patterns by lifting their fingers one by one or whether they can lift their fingers all together. Making finger patterns unseen as well as lifting their fingers all together are important skills for children to develop.

Dot Patterns

Recognizing how many dots are in a pattern without having to count the dots one by one is another important outcome. This skill is called subitizing. In these puzzles, the dot patterns include domino patterns from 1 to 6, pairs patterns from 3 to 10, as well as 4-grids, 6-grids, 8-grids and 10-grids. When working with the grids, have the children note not only the number of dots in the grids, but also the number of empty squares. In the last group of puzzles, puzzles 26-30, the dots in the 10-grids are shown five-wise as they usually appear in ten-frames.

Dominoes

The dominoes in the puzzles involve counting items in two collections. In the first groups of puzzles, the dots on both sides of the dominoes are visible. In the latter groups of puzzles, the dots on one side of the dominoes are hidden. The number of hidden dots on that side of the domino is indicated by a numeral. Model this activity with actual items by using items of two different colours. Briefly display and then screen one of the two coloured items.

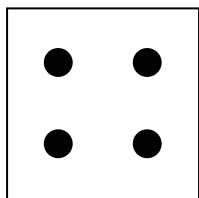
Equal Groups and Sharing

Equal groups and sharing first appear with dominoes and double finger patterns, and are more formally introduced in the latter groups of puzzles with equal groups of stars. Have the children describe the groups noting that each group has the same number of items.

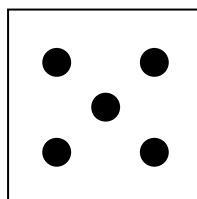
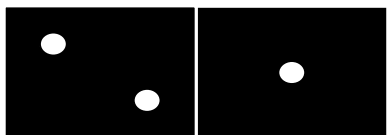
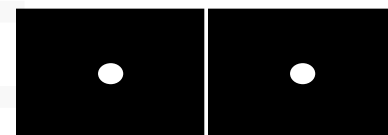
The author dedicates this first resource in the **Cross-Number Discovery Puzzles & Games** series to all her teachers. She would particularly like to express her appreciation to the mathematics educators who have helped create Mathematics Recovery. Their contribution to mathematics education is invaluable.

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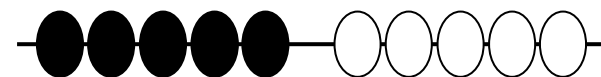
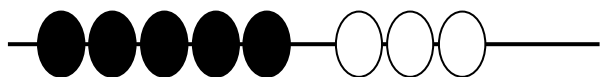
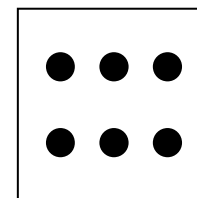


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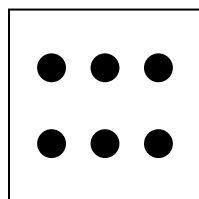
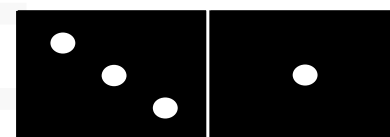
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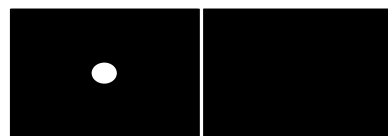
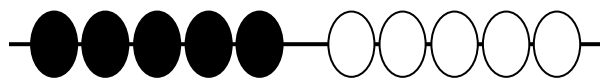


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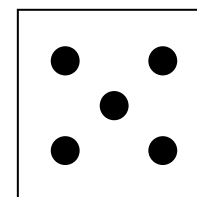
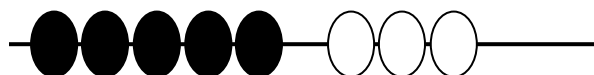
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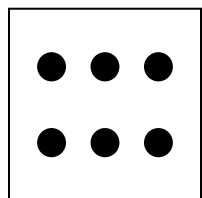
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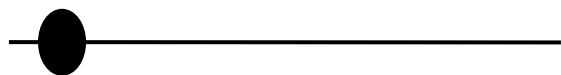
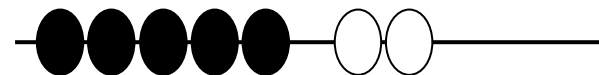
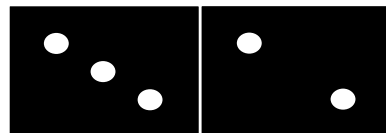
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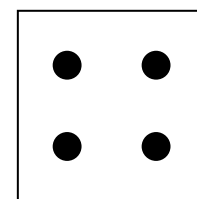
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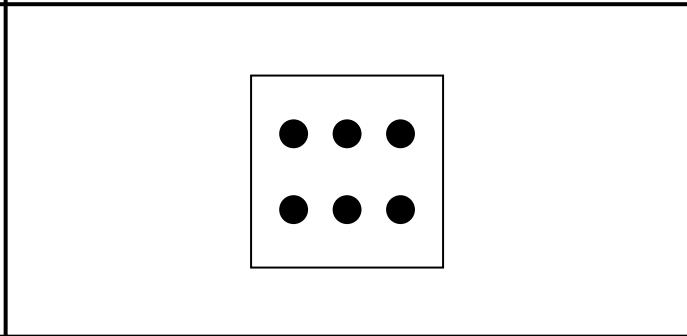
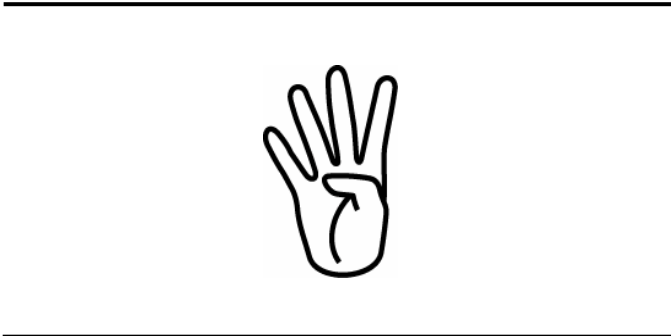
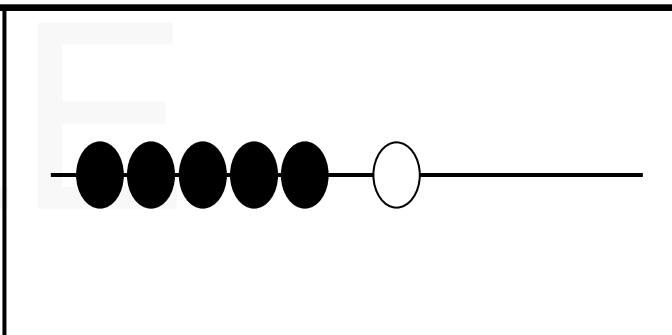
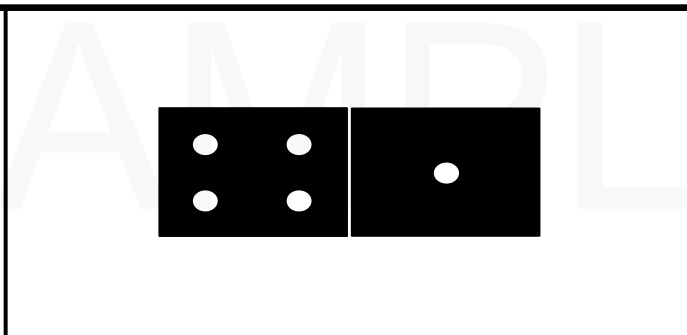


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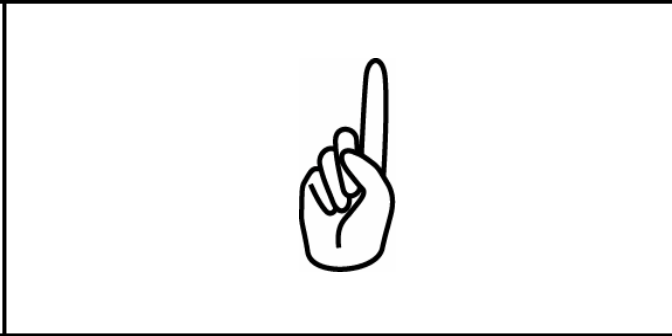
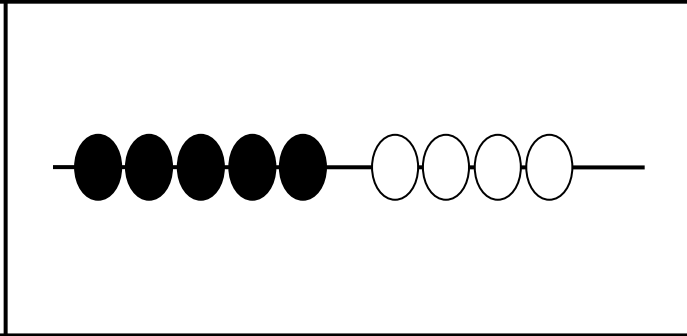
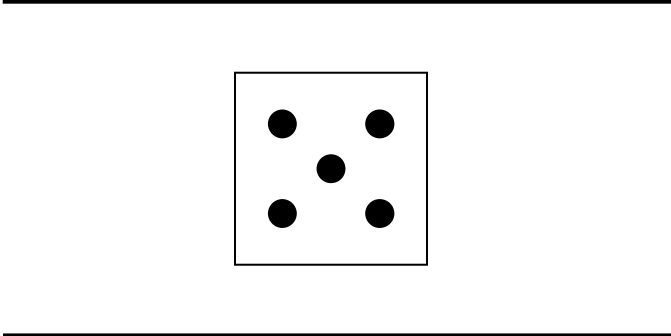


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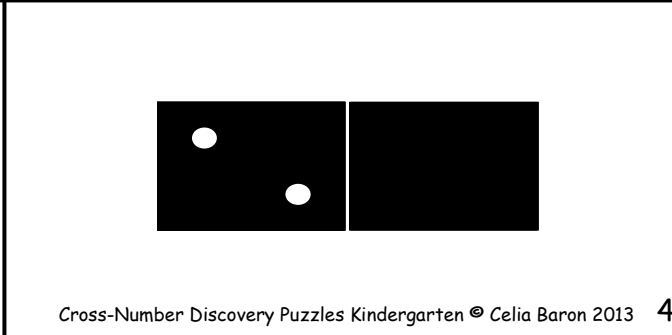
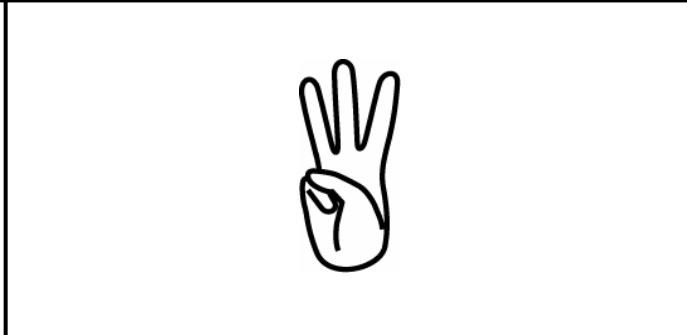
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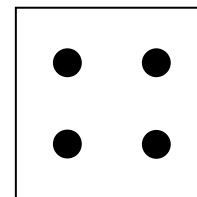
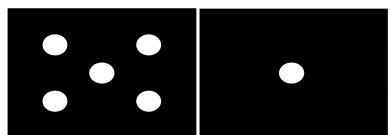
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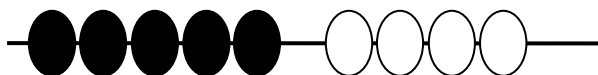
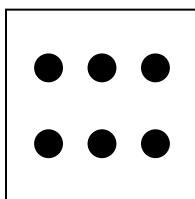
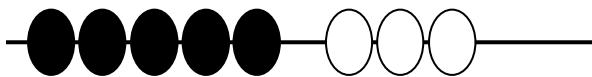
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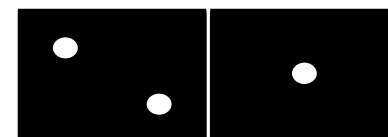
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| 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 |
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| 6 | 6 | 7 | 7 | 7 | 7 | 7 | 8 | 8 | 8 | 8 | 8 | 9 |
| 9 | 9 | 9 | 9 | 10 | 10 | 10 | 10 | 10 | 11 | 11 | 11 | 11 |
| 11 | 12 | 12 | 12 | 12 | 12 | 13 | 13 | 13 | 13 | 13 | 14 | 14 |
| 14 | 14 | 15 | 15 | 15 | 15 | 16 | 16 | 16 | 16 | 16 | 17 | 17 |
| 17 | 17 | 18 | 18 | 18 | 18 | 19 | 19 | 19 | 19 | 19 | 20 | 20 |
| 20 | 20 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |