Subitizing

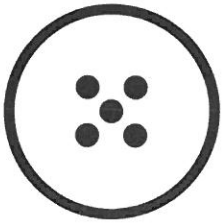
Subitizing is the ability to recognize dot arrangements in different patterns.

Since children begin to learn these patterns by repetitive counting they are closely connected to their understanding of the particular number concept. Quantities up to 10 can be known and named without the routine of counting. This can help children in counting on (from a known patterned set) or learning combinations of numbers (seeing a pattern of two known smaller patterns).

Young children should begin by learning the patterns of dots up to 6. Students should also associate the dot patterns to numbers, numerals, finger patterns, bead strings, etc. You can then extend this to patterns up to 10 when they are ready.

Subitizing is a fundamental skill in the development of number sense, supporting the development of conservation, compensation, unitizing, counting on, composing and decomposing of numbers.

For example:



We want children to learn that

- there are 5 dots in this pattern or arrangement;
- five is more than four;
- a set of 5 objects can be separated into a set of two objects and a set of three objects, etc.;
- five counters, no matter how arranged, still retains the same numerical quantity;
- the associated oral name for a set of five things is "five"

There are two types of subitizing: perceptual and conceptual.

Perceptual Subitizing:

- recognition of number pattern

Conceptual Subitizing:

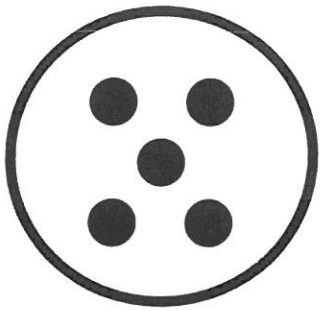
- recognition of number pattern as composite of parts and whole
- spatial (dot arrangements), temporal (attaching number to sounds), kinesthetic (finger patterns), rhythmic (hand-clapping)
- spatial arrangements of sets influences how difficult they are to subitize (rectangular easiest → linear → circular → scrambled most difficult)
- different arrangements lead to different decompositions of that number

Oral Numbers: Generally, students are ready to use oral numbers if they know that a set does not alter the number of objects in the set.

Numerals: Generally, the use of numerals with dot patterns should occur after children have made solid connections between the oral names for numbers and sets.

For more information, please refer to *John A. Van De Walle, Elementary and Middle School Mathematics: Teaching Developmentally.*

Dot Card Activities



Activities:

1. **Counter Match** (Materials: dot plates or dot cards, paper plates, counters)
   Students place one counter on top of each dot (dot plate or card). They compare the number of counters to the number of dots. Students dump counters onto an empty plate and compare the number of counters to the number of dots on the dot plate.

2. **Double Counter Match** (Materials: dot plates, paper plates, variety of counters)
   Place two empty plates, one on either side of a dot plate or card. Students make equivalent sets in each plate using a different type of counter. Students describe how all three plates compare.

3. **Make the Pattern** (Materials: dot cards, numeral cards, paper plates, counters)
   Hold up a dot card and have your students make the same pattern they see on their own plate using counters. Ask them how many dots they see and how they see them. To extend, place two empty plates down. Place a dot card in the center. Students build a set that is one less on one plate and one more on the other. Do the same activity by holding up numeral cards.

4. **Dot Card Flash** (Materials: dot cards, hole-punched cards, bingo chips, overhead)
   Flash a dot card then hide, or briefly display on an overhead a hole-punched card, an overhead dot card or bingo chips. Students state the number, hold up a dot card or numeral, or construct the arrangement.

5. **Dot Card Match** (Materials: dot cards)
   Students sort different arrangements of the same number. Discuss the number of dots in each group; which group has the most, least, etc.

6. **Number/Numeral Match** (Materials: dot cards)
   Teacher states a number or holds up a numeral card and students find the corresponding dot card.

7. **Which One is Out?** (Materials: dot cards)
   Students determine which card does not belong in a set where all but one represent the same number.

8. **Dot Card Trains** (Materials: dot cards)
   Students arrange a random set of dot cards in order (from 1-6 and back down). Extend to trains from 1-10.

8. **Concentration** (Materials: 2 sets of dot cards or plates)
   Place dot cards face down in a 5x4 array. Students take turns turning over two cards trying to find a match.

10. **Dot Card Challenge** (Materials: 2 sets of dot cards in 2 colours)
    Each student gets 1 set of cards. Each student turns over the top card of their pile and identifies the amount. The student with the larger number takes both cards.

11. **Addarama** (Materials: 2 sets of dot cards in 2 colours)
    Each student gets 1 set of cards. Each student turns over their top card. Both students add the two dot cards together. The first student to say the total amount out loud gets both cards. To extend, have each student turn over two cards and find the total of their cards. The student with the greatest amount takes all the cards.

12. **Finger Dot Match** (Materials: dot cards, numeral cards, finger cards)
    Teacher holds up fingers (i.e. 2) and asks students how many fingers. Students imitate and state number. Students then find a dot card with that many dots. Teacher then holds up 2 fingers and one more. Students imitate and state number. Students find a plate with 3 dots. Continue with other finger patterns to 10.

13. **Clothespin Match** (Materials: dot plates or cards, clothespins)
    Students choose a dot plate and attach the corresponding number of clothespins on the edge of the card.

14. **Popsicle Stick Match** (Materials: popsicle sticks, dot cards)
    Students match popsicle sticks with different dot arrangements on dot cards.

15. **Dice/Card Match** (Materials: dice, dot cards)
    Roll the die or dice and have students find a dot card with the same amount.

16. **Combination Target Match** (Materials: dot cards)
    Teacher holds up a dot card. Students find two plates that have as many dots as the target plate. Similarly, teacher holds up a numeral card or states a number or students choose a numeral card and find two plates that together have the total number of dots named by the numeral card. Challenge students to find more than one combination.

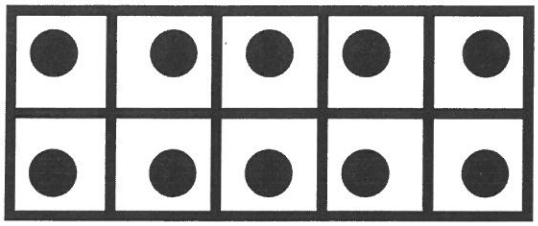
17. **Dot Card/Ten Frame Match** (Materials: dot cards, ten frames)
    Students match a dot card to a ten frame with the same amount.

18. **Snap** (Materials: 2 sets of dot cards in 2 colours)
    Students play in pairs. Each student gets 1 set of cards. Each student flips over their top card. If they are the same amount, they say "SNAP". The student who says "SNAP" first gets both cards.

19. **I Wish I had...** (Materials: dot cards)
    Teacher holds up a dot card (i.e. 5) and says, "I wish I had 7". The student states how many more dots are required and finds the dot card (missing addend) with that amount.

20. **Make Ten** (Materials: bingo-dabbed plates that have been marked with the regular 0 to 10 dot patterns with an extra 5 (12 plates in all))
    Place dot plates face up in an array. Students take turns removing 2 dot plates that add up to the target number "10". Challenge students by placing dot plates face down.

Five-Frame/Ten-Frame Activities



Introduction

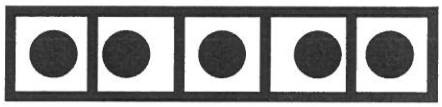
Five frames and ten frames are one of the most important models to help students anchor to 5 and 10.

Five frames are a 1x5 array and ten frames are a 2x5 array in which counters or dots can be placed to illustrate numbers.

The five frame helps students learn the combinations that make 5. The ten-frame helps students learn the combinations that make 10. Ten-frames immediately model all of the facts from 5+1 to 5+5 and the respective turnarounds. Even 5+6, 5+7 and 5+8 are quickly seen as two fives and some more when depicted with these powerful models.

For students in kindergarten or early first grade who have not yet explored a ten frame, a good idea is to anchor to five by beginning with a five frame.

Starting with Five-Frames:



Activities:

1. **Building Sets** (Materials: blank five frame mat, counters)
   Call out a number to the students, such as 4, and have them show that amount on their mat. They may place the counters in any manner. Ask if they can place the 4 counters down in a different way. Try other numbers from 0-5. Have your students make observations about their placement of counters.
   - *It has a space in the middle.*
   -It's two and two.

   Numbers greater than 5 are shown with a full five-frame and additional counters on the mat but not on the frame.

2. **Roll and Build** (Materials: five frame cards, dice)
   Students roll one die or two dice and build that amount on their five frame mat.

3. **Memory** (Materials: two sets of five frame cards)
   Place the five frame cards face down in an array. Students take turns turning over two cards. They identify the amount on each card. If they are the same they take both cards. Play goes to the next players.

4. **Challenge** (Materials: two sets of five frame cards in 2 colours)
   Each student gets 1 set of cards. Each student turns over the top card of their pile and identifies the amount. The student with the greater amount takes both cards.

5. **Five Frame Flash** (Materials: large five frame cards)
   Flash a five frame card to your students and ask them to identify how many dots they saw. To challenge students ask them to identify one more or one less than the amount of dots. To extend, have them tell you how many empty spaces there are or how many more are needed to make 5.

6. **Five Frame Trains** (Materials: at least two sets of five frame cards)
   Students sequence a random set of five frame cards in order from 1 to 5 and then back to 1, etc. Students practice counting forwards and backwards out loud. Extend by turning over one card in the train and have students identify which number was turned over.

7. **Make 5** (Materials: two sets of five frame cards)
   Place the cards face up in an array. Students try to find two cards that together total 5. To challenge students turn the cards face down.

8. **Dice Match** (Materials: die, five frame cards)
   Roll the die and have students find the five frame card that has the same amount. If they roll a 6, they roll again.

Starting with Ten Frames:

Activities:

1. **Building Sets** (Materials: blank ten frame mats, double ten frame mats, counters)
   Call out a number from 1-10 and have students build that amount on their ten frame. Students fill the first row first. Call out a different number and have students build the new number. Observe to see which students can simply add or remove counters and those that must begin from 1. Continue with different amounts. Extend to a double ten frame building numbers to 20.

2. **Roll and Build** (Materials: ten frame cards, dice)
   Students roll two dice and build that amount on their ten frame mat.

3. **Memory** (Materials: two sets of ten frame cards)
   Place the ten frame cards face down in an array. Students take turns turning over two cards. They identify the amount on each card. If they are the same they take both cards.

4. **Challenge** (Materials: two sets of ten frame cards in 2 colours)
   Each student gets 1 set of cards. Each student turns over the top card of their pile and identifies the amount. The student with the greater amount takes both cards.

5. **Ten Frame Flash** (Materials: large ten frame cards)
   Flash a ten frame card to your students and ask them to identify how many dots they saw. To challenge students ask them to identify one more or one less than the amount of dots. To extend, have them tell you how many empty spaces there are or how many more are needed to make 10.

6. **Ten Frame Trains** (Materials: at least two sets of ten frame cards)
   Students sequence a random set of ten frame cards in order from 1 to 10 and then back to 1, etc. Students practice counting forwards and backwards out loud. Extend by turning over one card in the train and having students identify which number was turned over.

7. **Make 10** (Materials: two sets of ten frame cards)
   Place the cards face up in an array. Students try to find two cards that together total 10. To challenge students turn the cards face down.

8. **Dice Match** (Materials: dice and ten frame cards)
   Roll the dice and have students find the ten frame card that has the same amount. If they roll 11 or 12, they roll again.

9. **What's the Difference?** (Materials: at least three sets of ten frames, 50 counters)
   5 cards are spread out face down and the rest are placed in a pile face down. The students take turns turning over the top card in the pile as well as one of the spread cards. They then determine the difference between the two cards and take that amount of counter. The card that was turned over from the spread pile is flipped over again. Play continues until all of the cards from the pile have been used. The player with the most counters wins. Observe to see what strategies students are using to find the difference and to get the most counters.

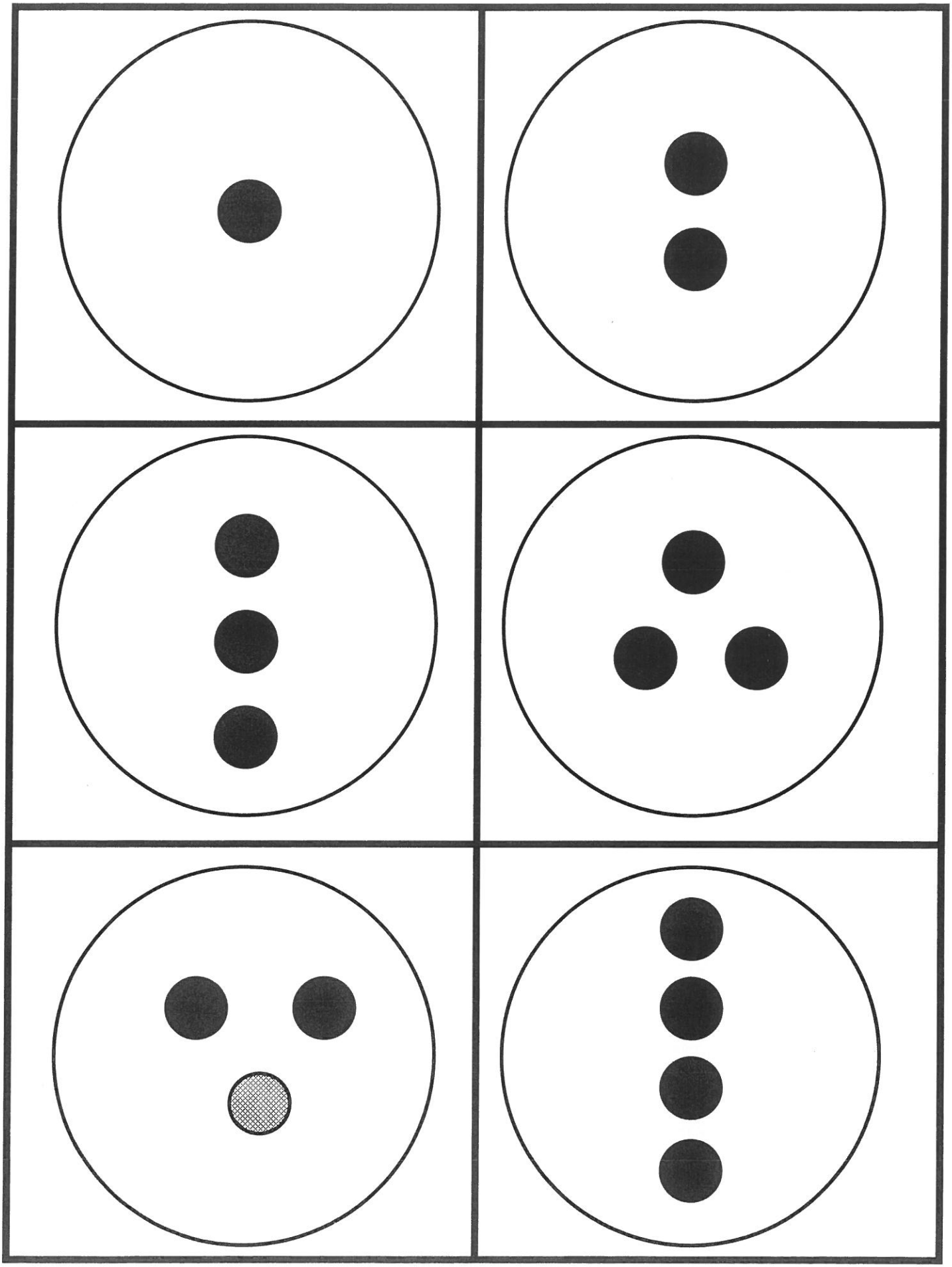
10. **Ten Frame Difference Challenge** (Materials: two sets of ten frame cards in 2 colours, 50 counters)
    Students play the game like the traditional "War" game. Each student turns over the top card from their pile. Each identifies their amount. The student with the largest takes as many counters from the pile as the difference between the two cards. Play continues until all the counters are gone. The winner is the player with the most counters.

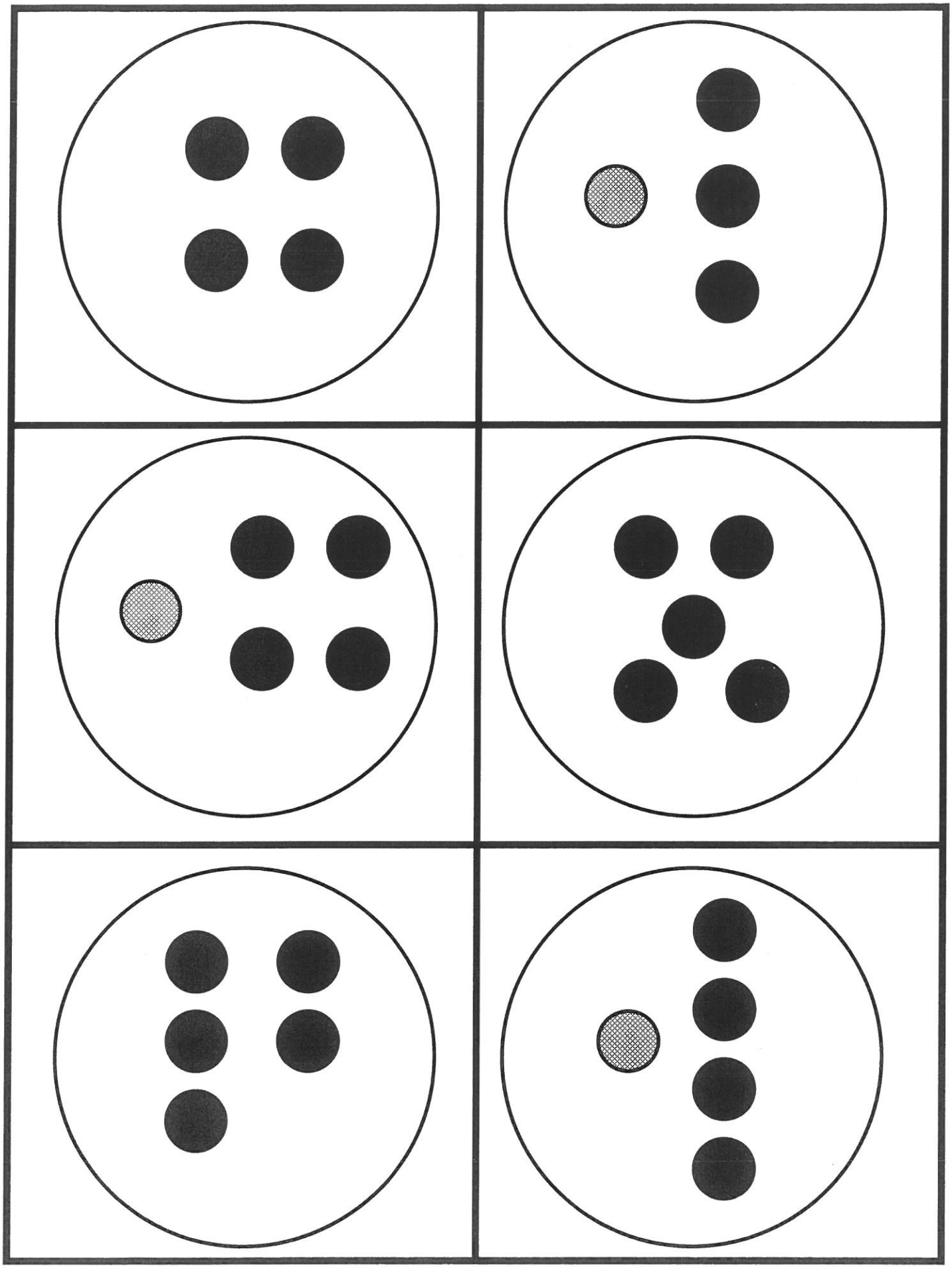
11. **Fish** (Materials: at least two sets of ten frames)
    Students play in groups of 2 to 4. Deal each player 4 cards. Spread the rest in the center like a fish pond. Students take turns asking another if they have a card with an amount that is the same as one of their cards. If they have the card they give it to the player. If they do not they draw a card from the pile. Play continues until one player gets rid of all their cards, or all the cards are matched.

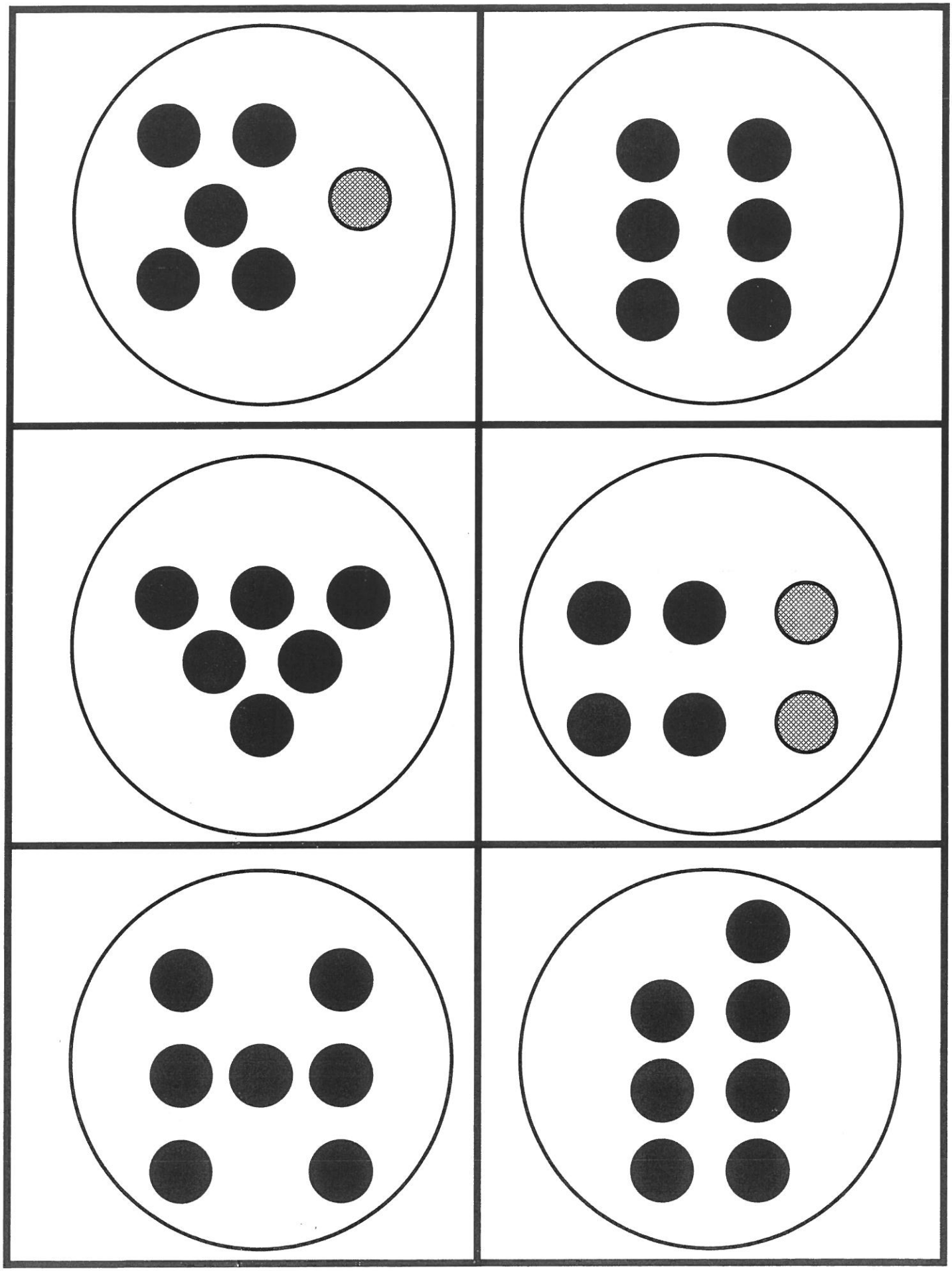
12. **10 Fish** (Materials: ten frame cards)
    Play the game like "Fish" only the object of the game is to ask the other students for a card that will add to yours to make a sum of ten.

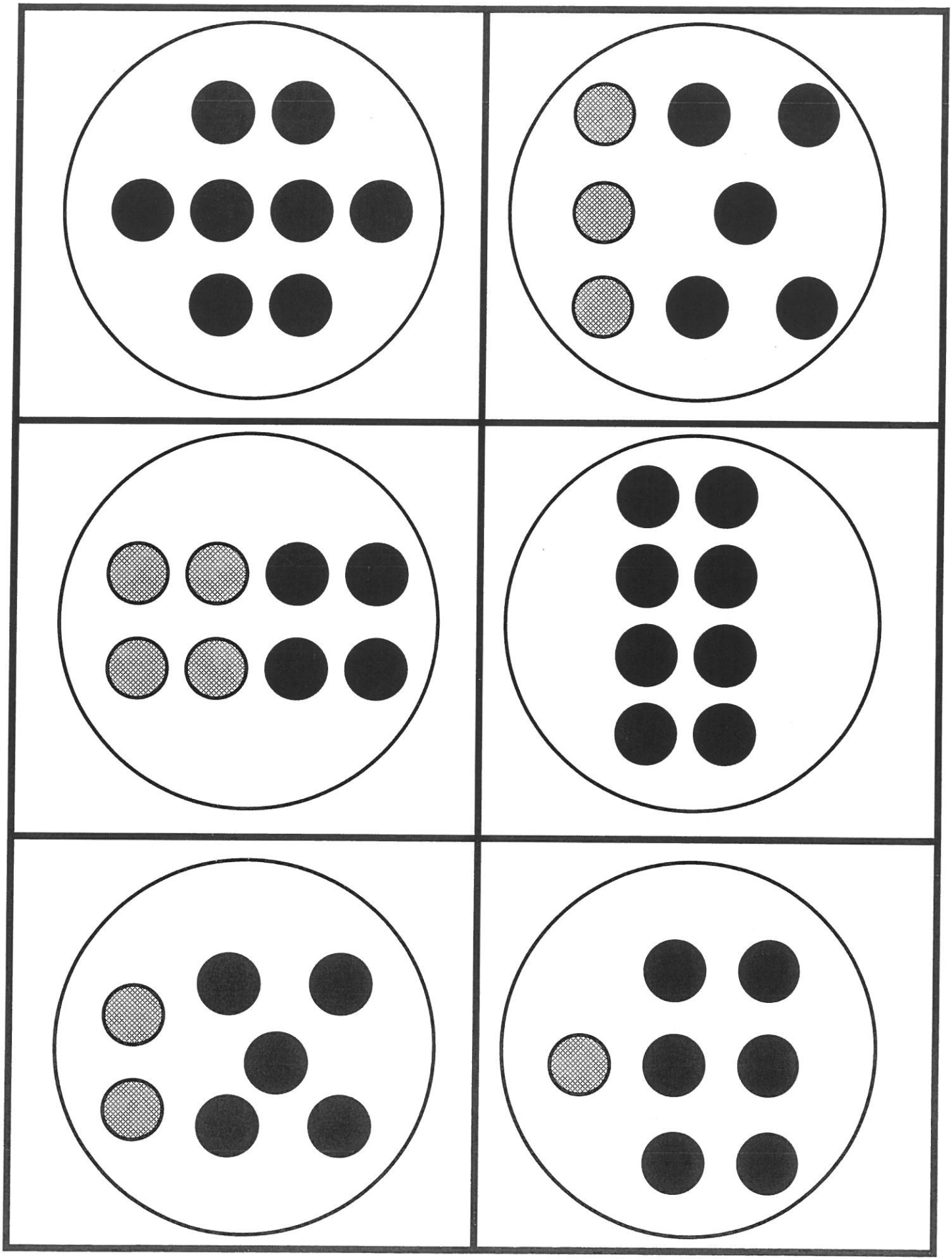
13. **Ten Plus/Nine Plus** (Materials: 2 sets of ten frames in 2 colours)
    Place one 10 ten frame card face up in the center. Place the other cards in a pile face down. Students take turns turning over the top card and adding it to "10". Play the game "Nine Plus" like ten plus only use the nine card as the card to add the other numbers to.

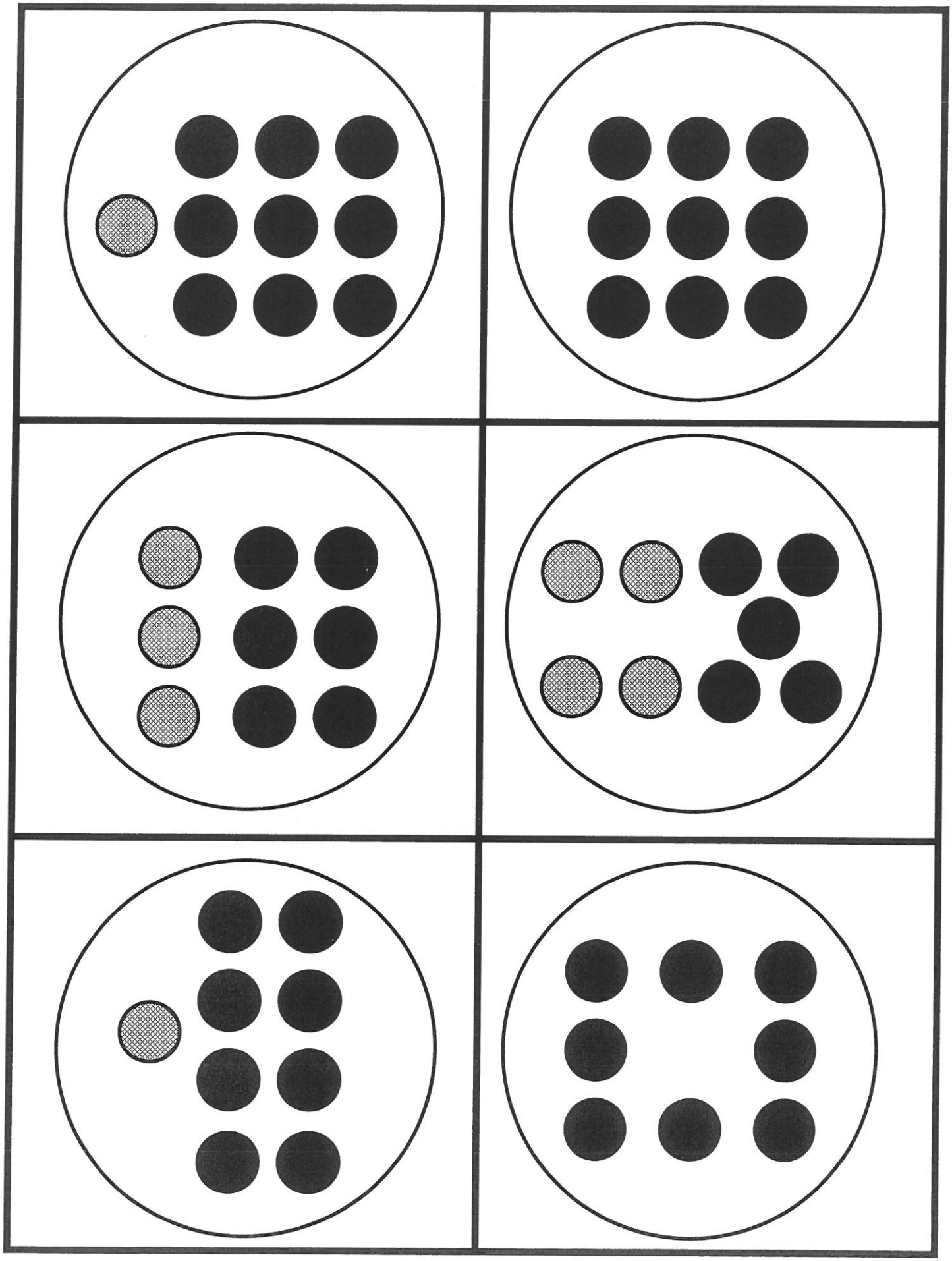
14. **0-20 Numeral/Ten Frame Match** (Materials: two sets of ten frame cards, 0-20 numeral cards)
    Spread the 0-20 numeral cards face up in order. Students take turns turning over two ten frame cards and finding the total. If the numeral card match is there, they take the card. The winner is the player with the most numeral cards.

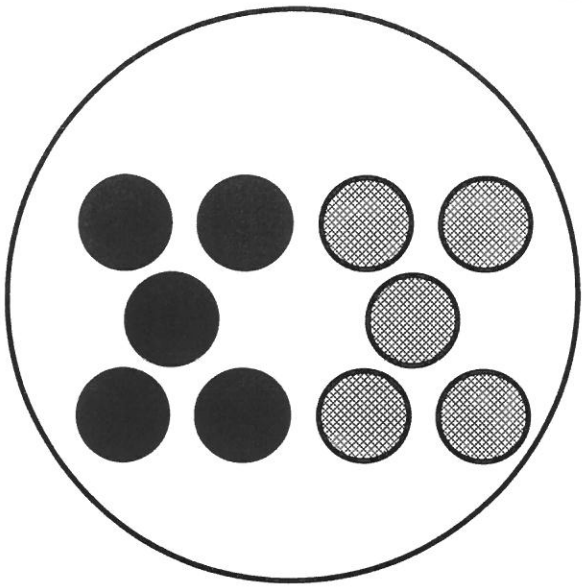


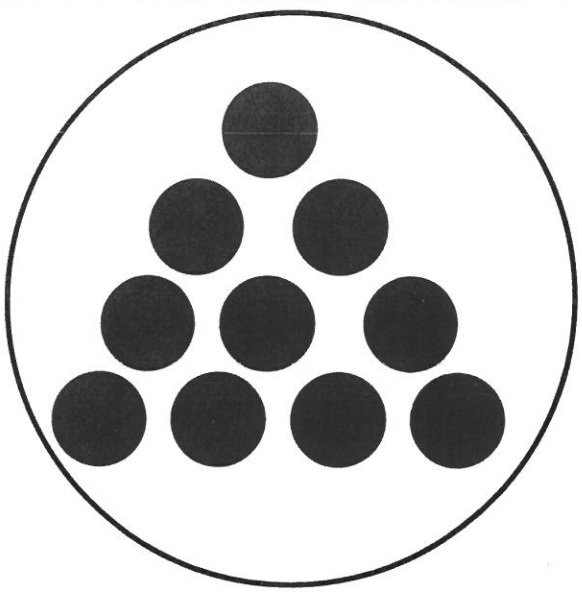












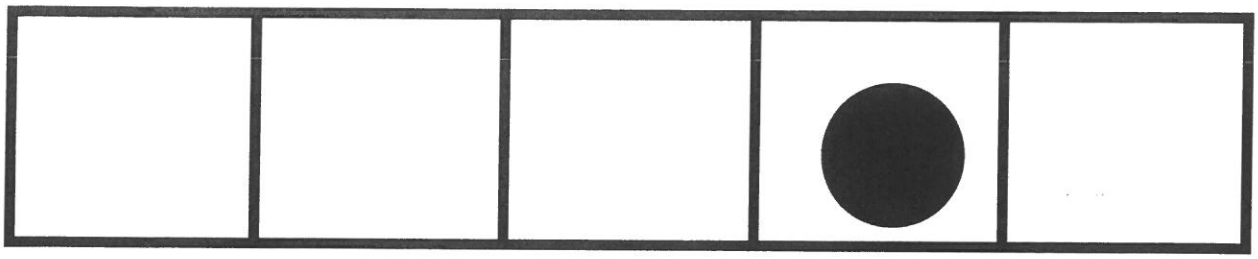
Dot cards can be used to enhance number sense.

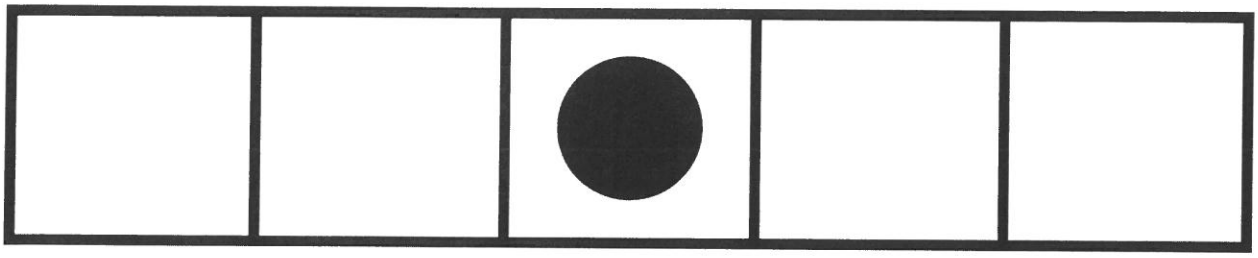
Help students with their ability to subitize (recognition of domino and dice patterns).

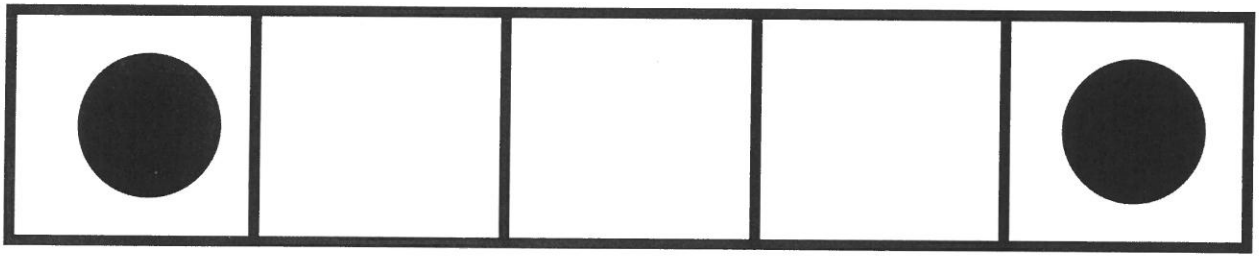
Simply copy onto card stock, laminate, cut out.....and enjoy!

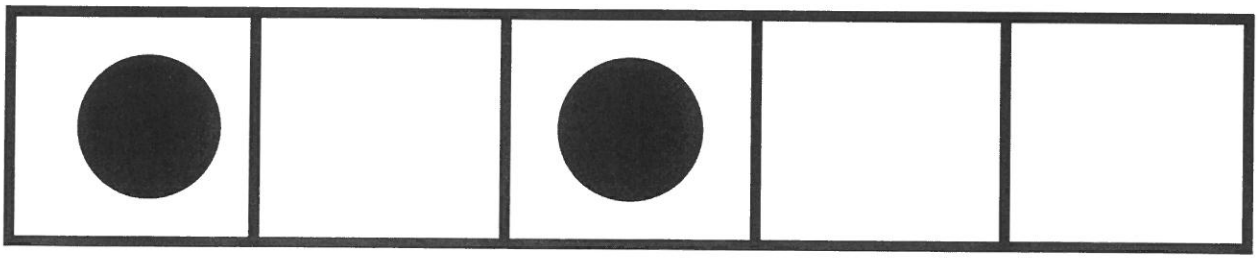
Source: John Van De Walle

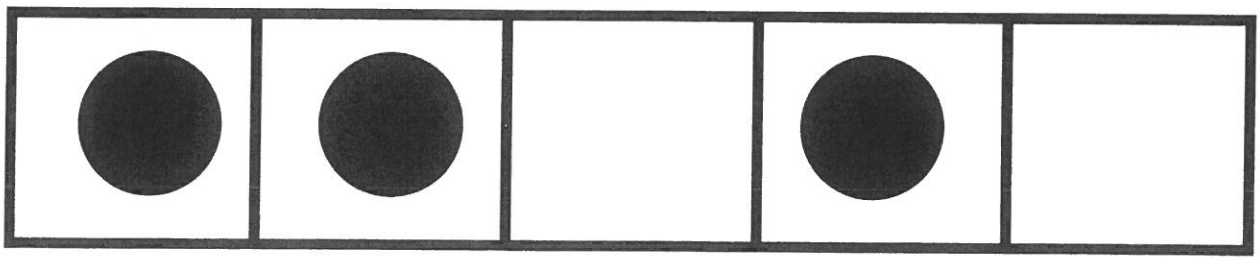
Large Quinary Five Frame Cards











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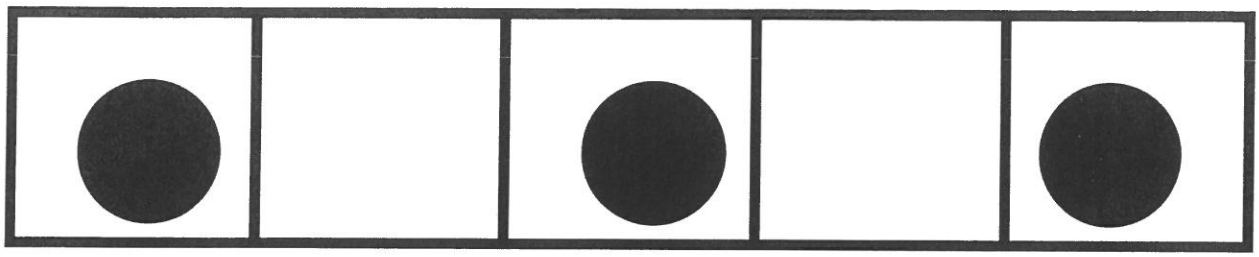

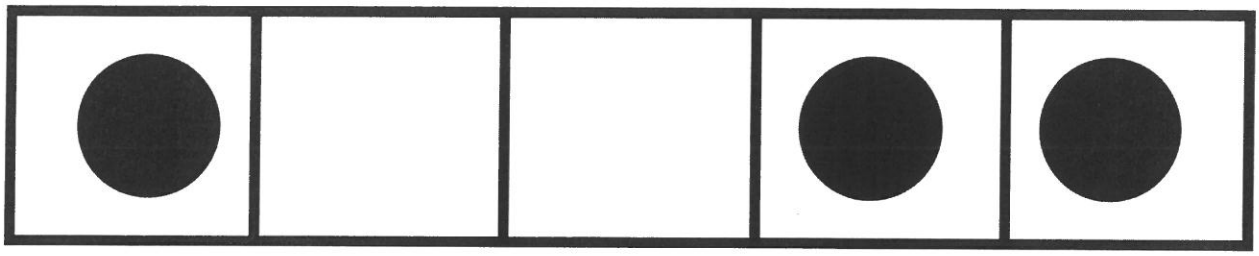

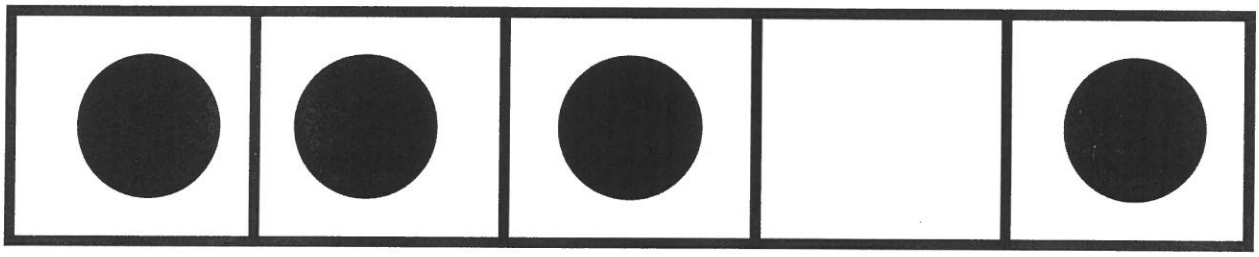

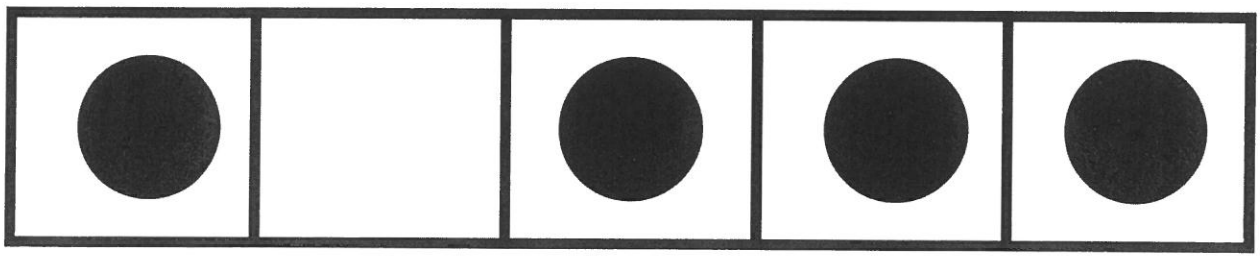

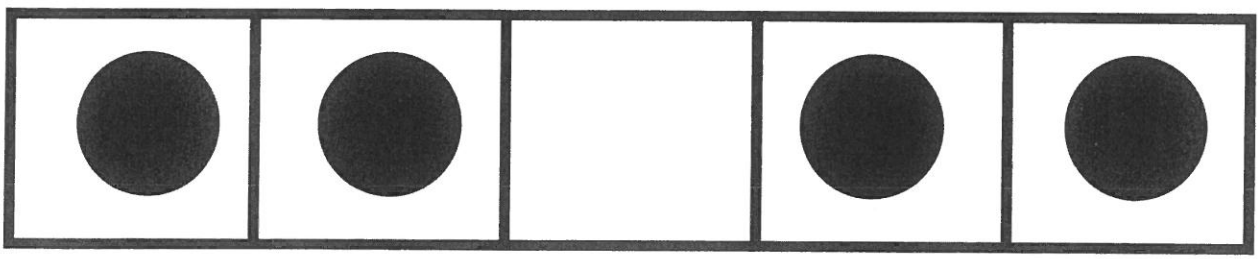

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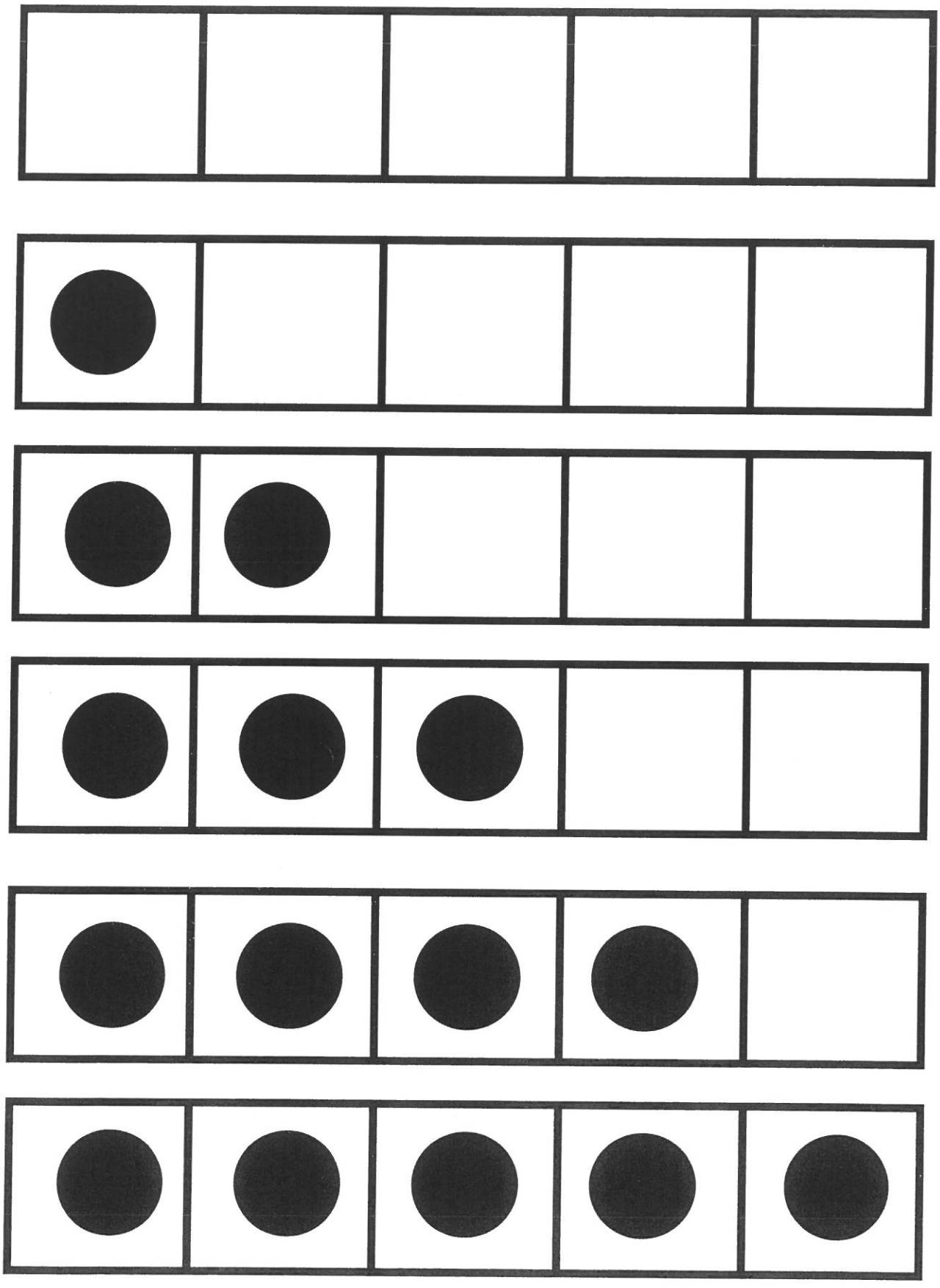
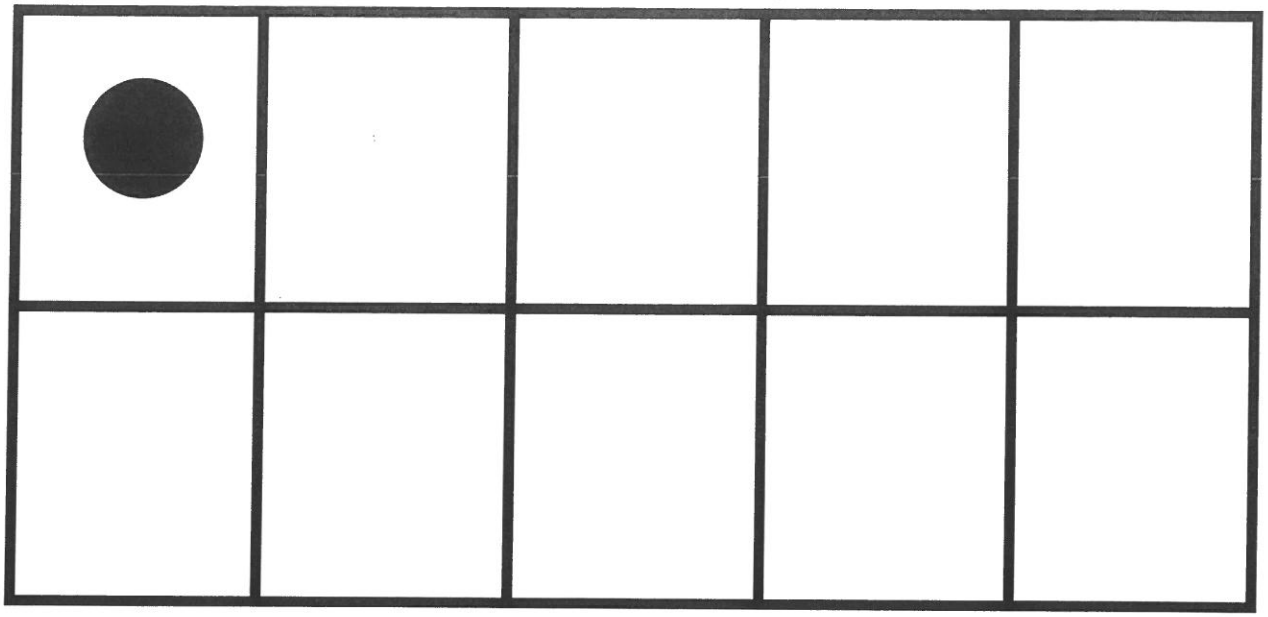
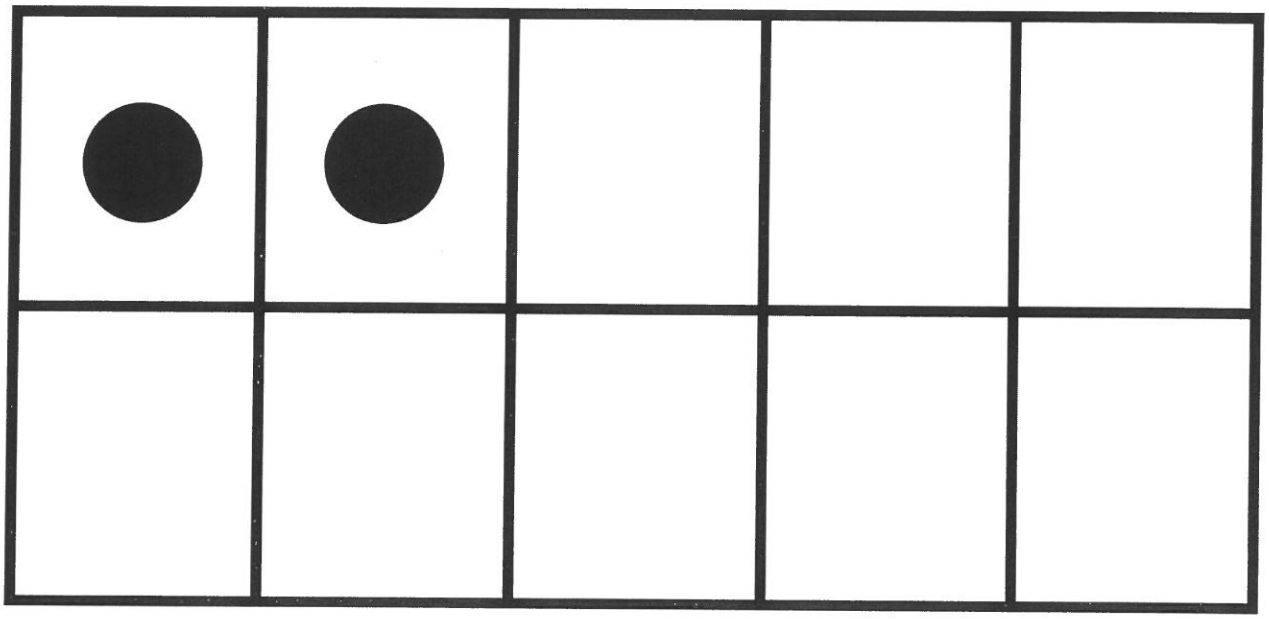
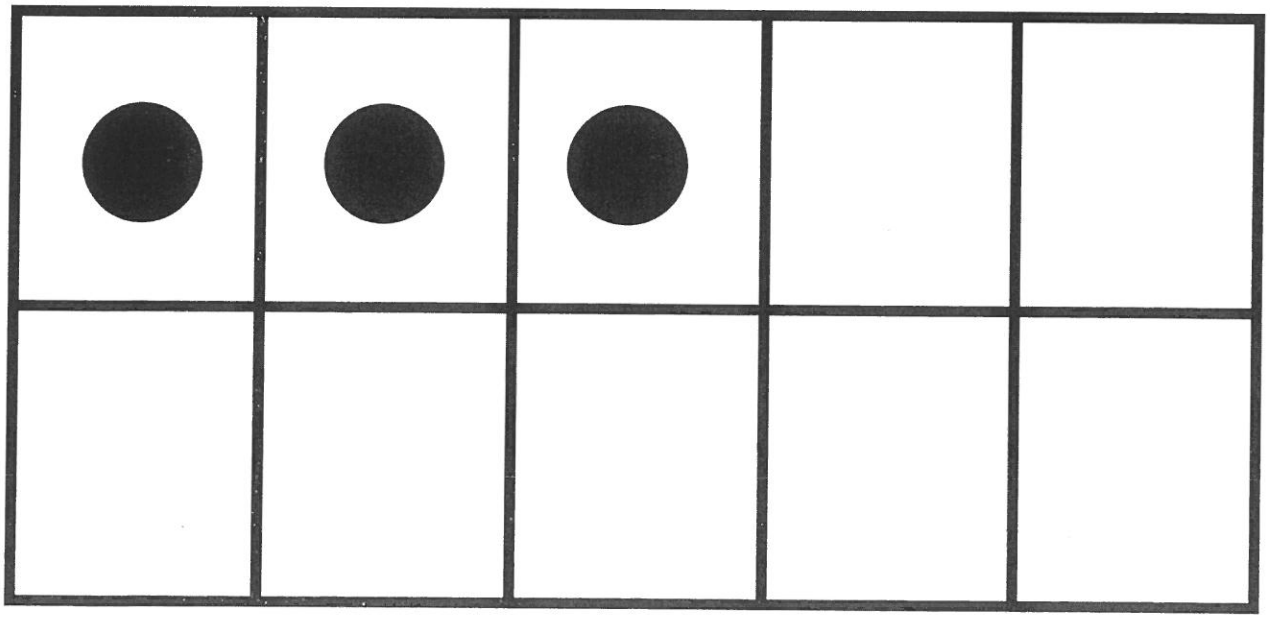
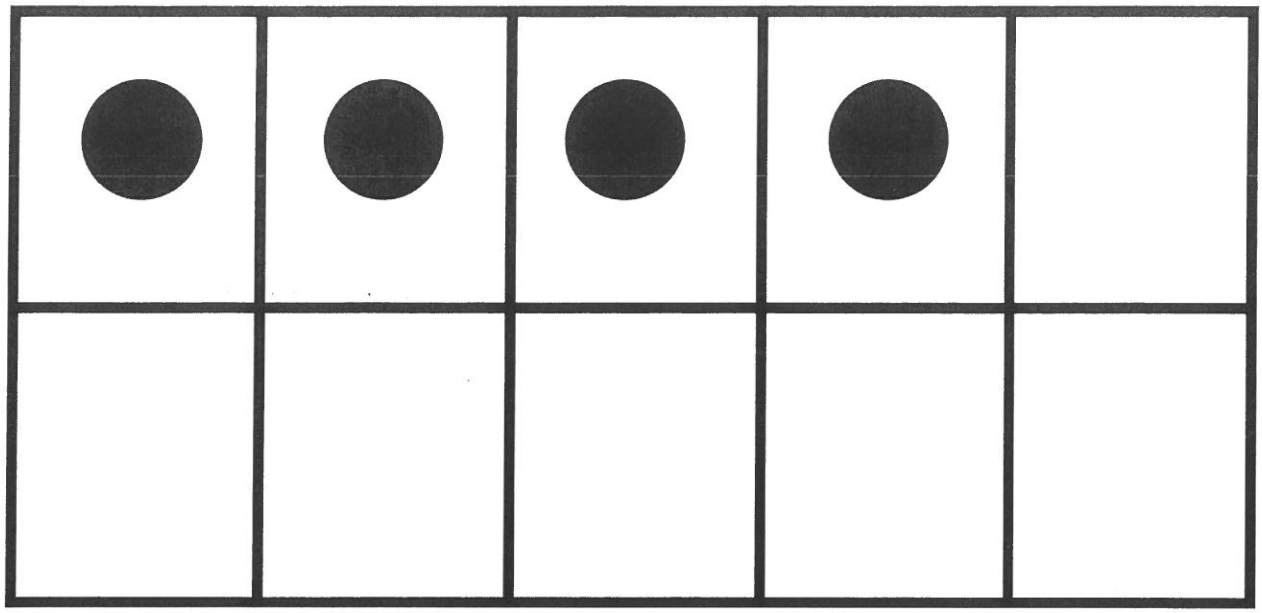
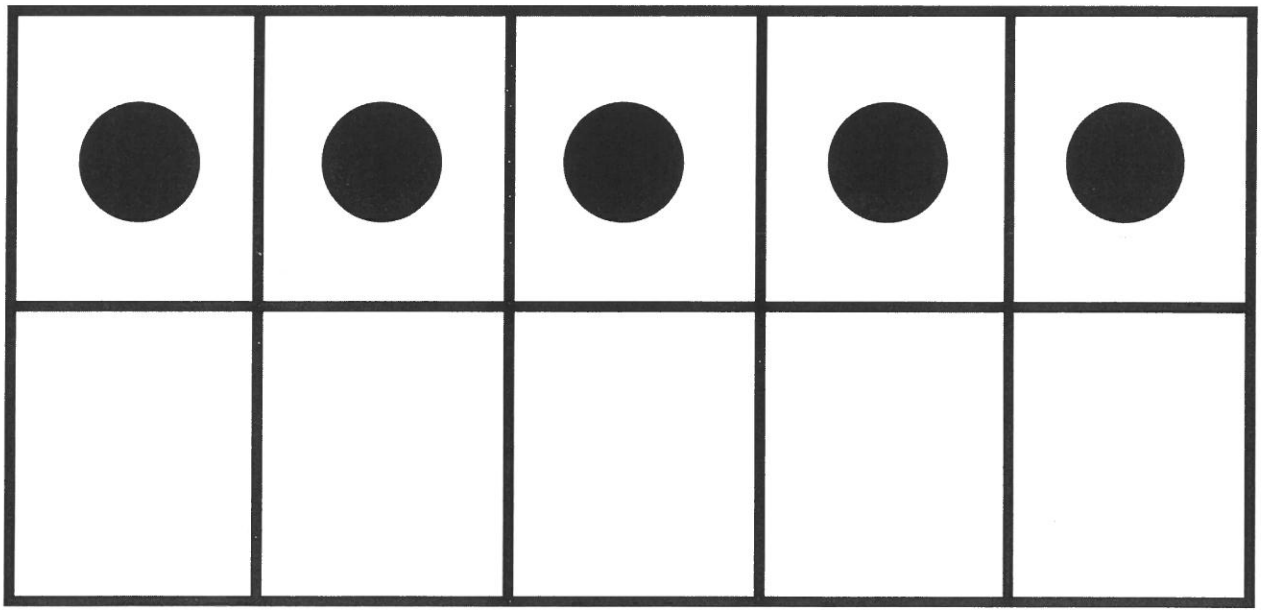


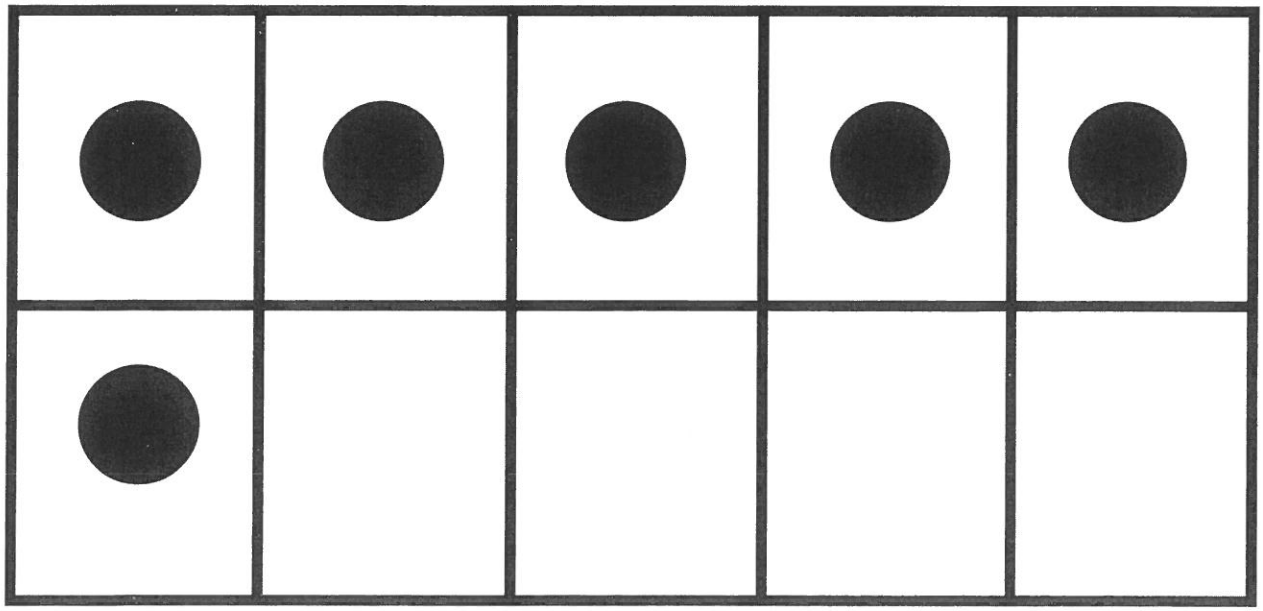


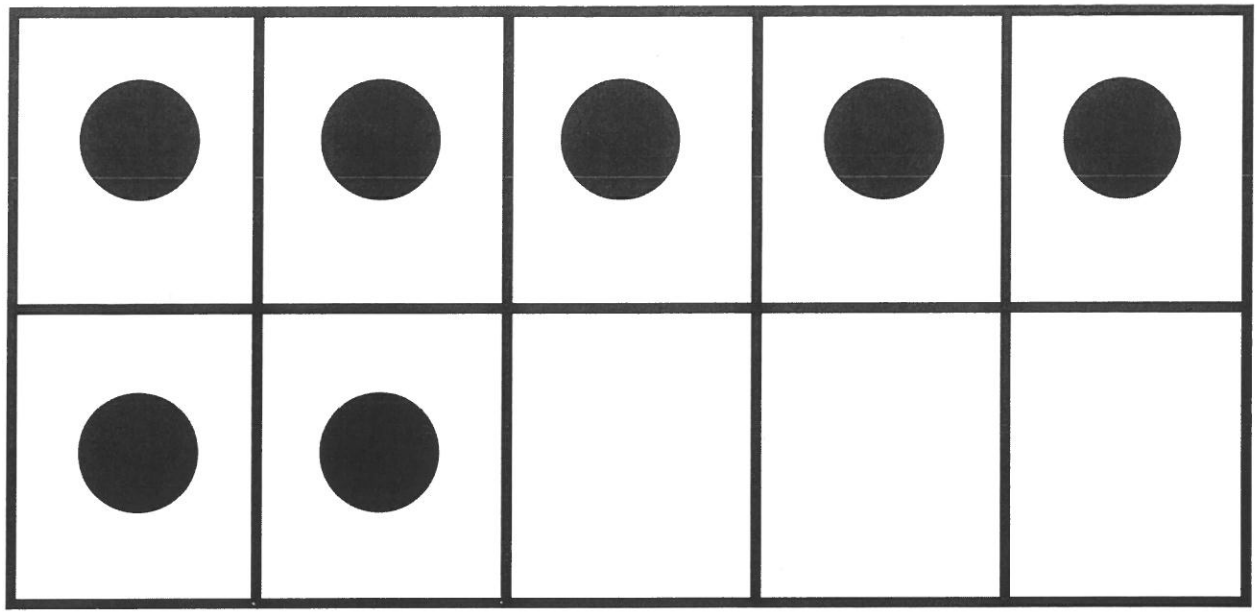


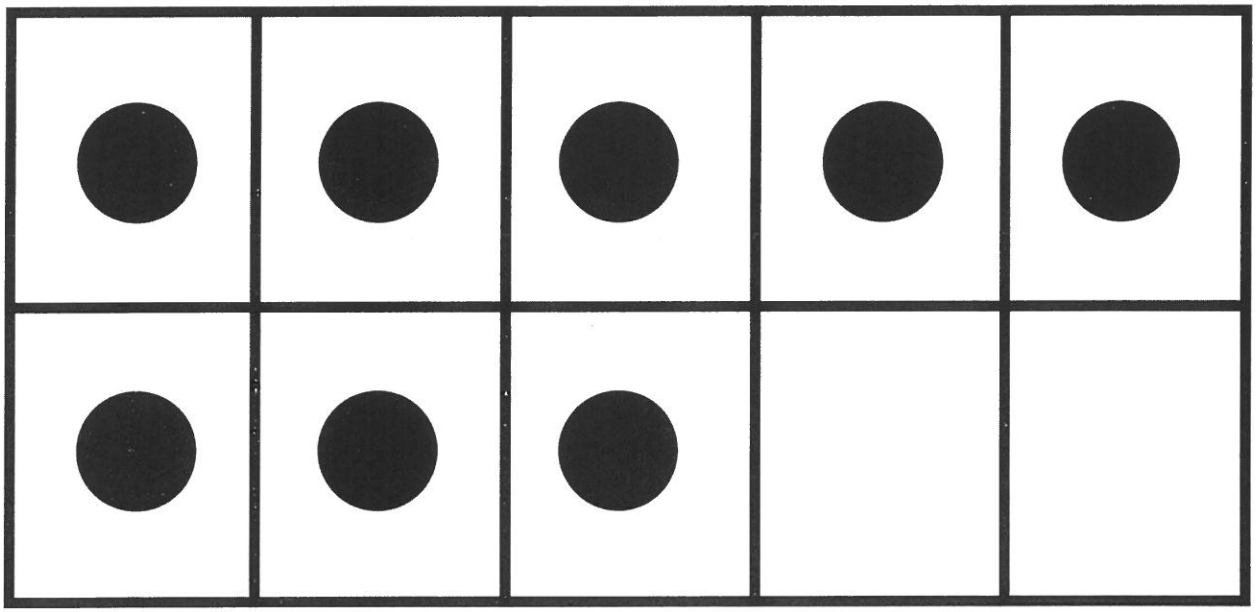


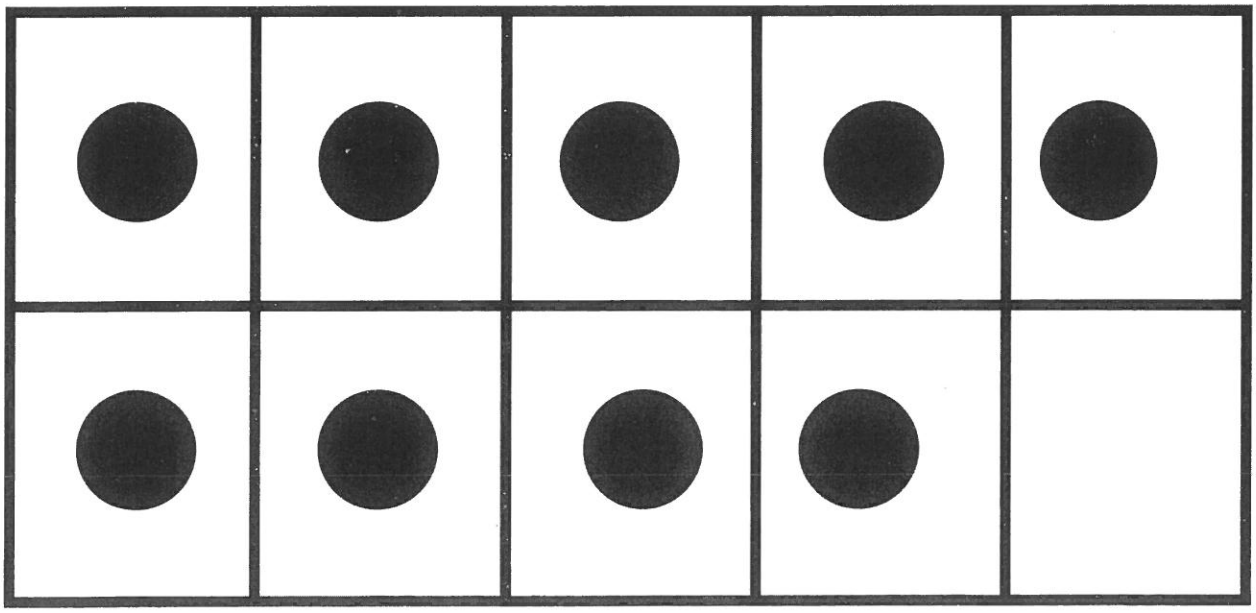


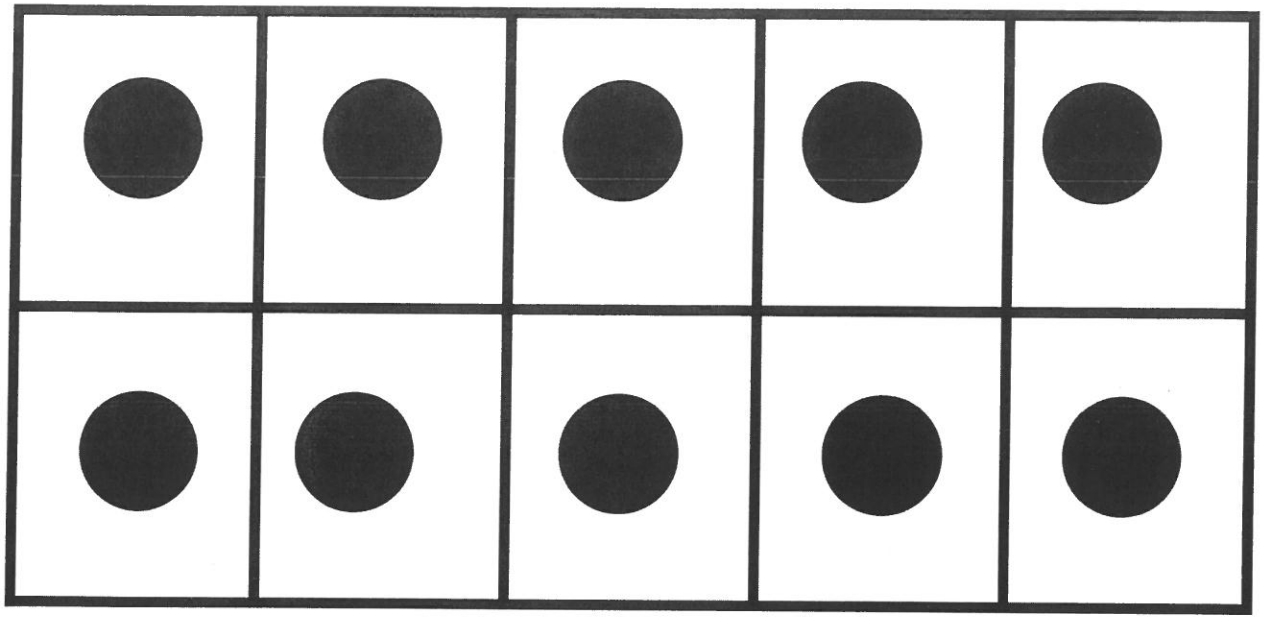


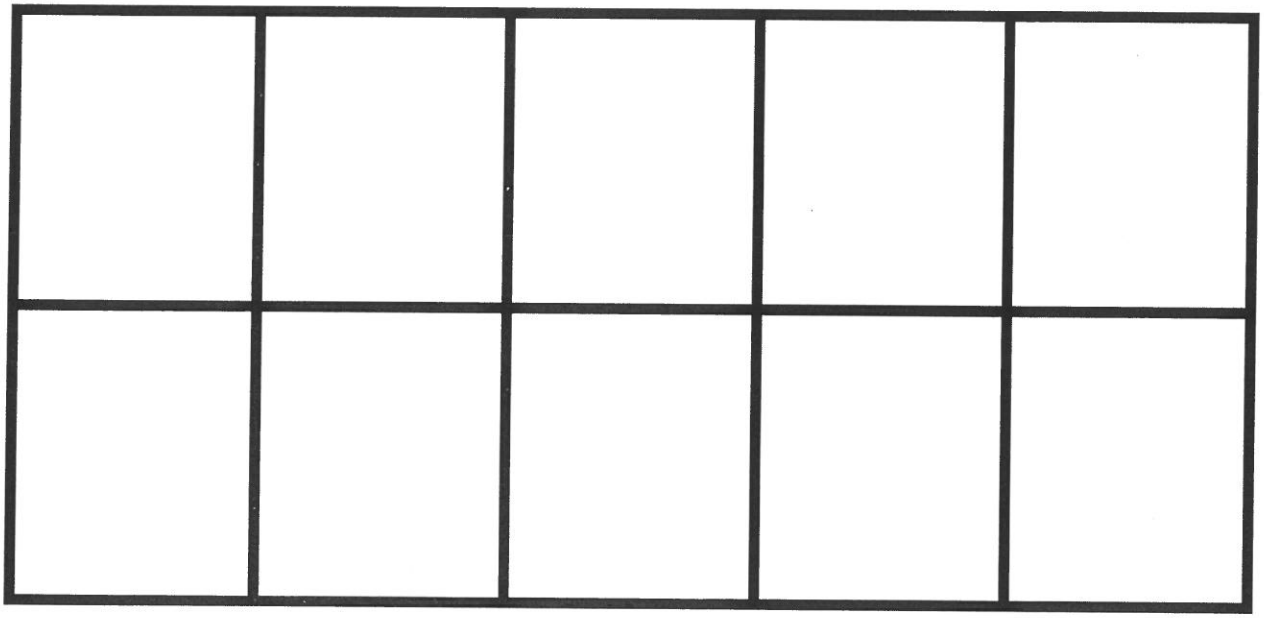


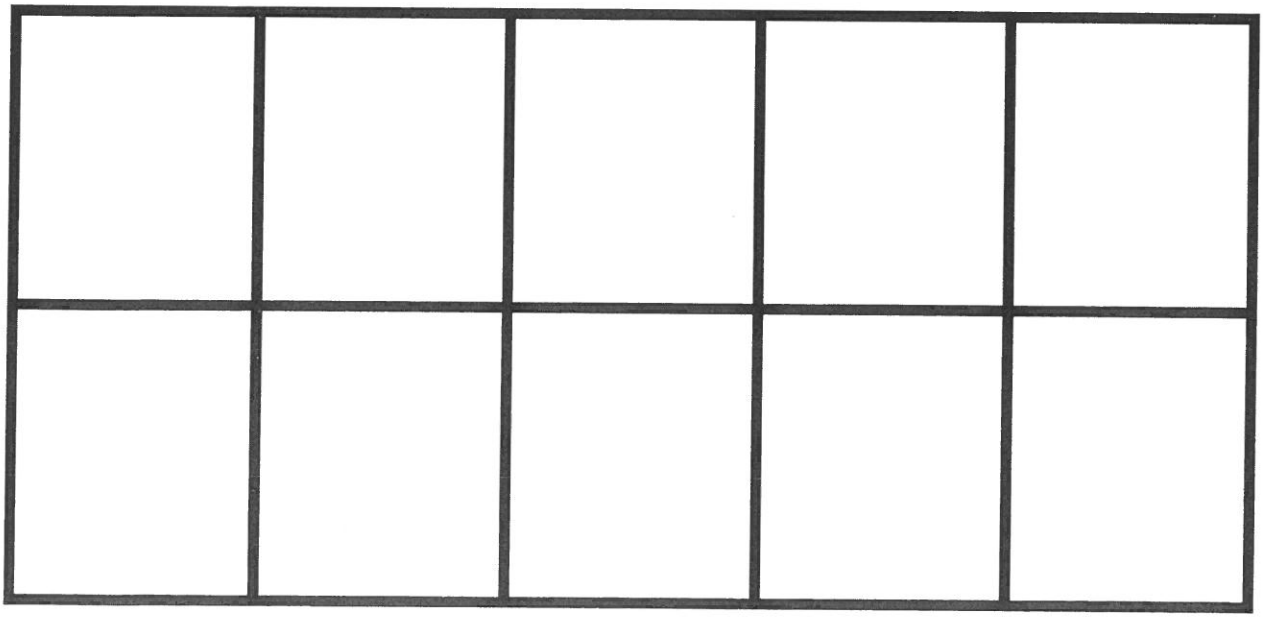




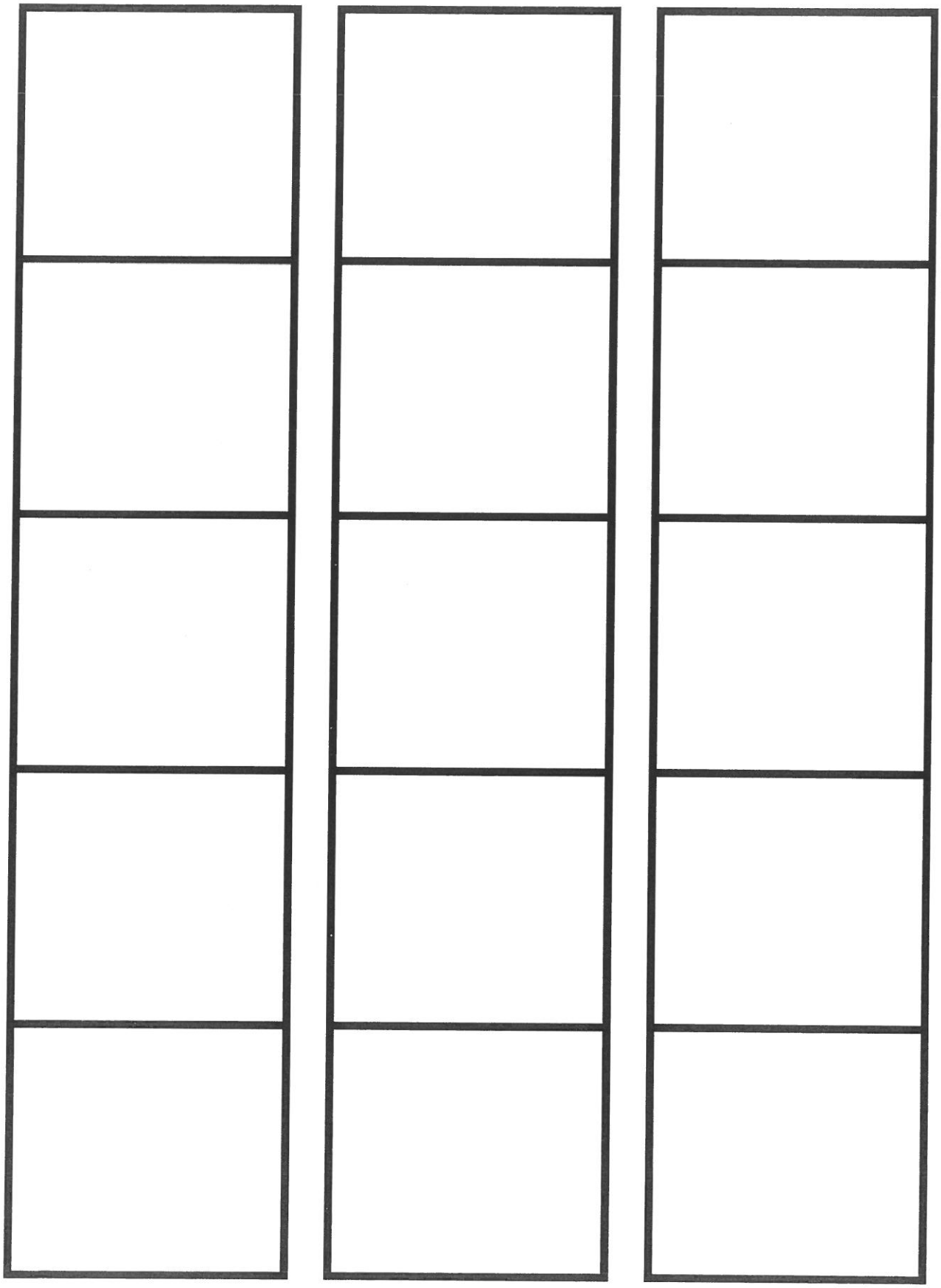




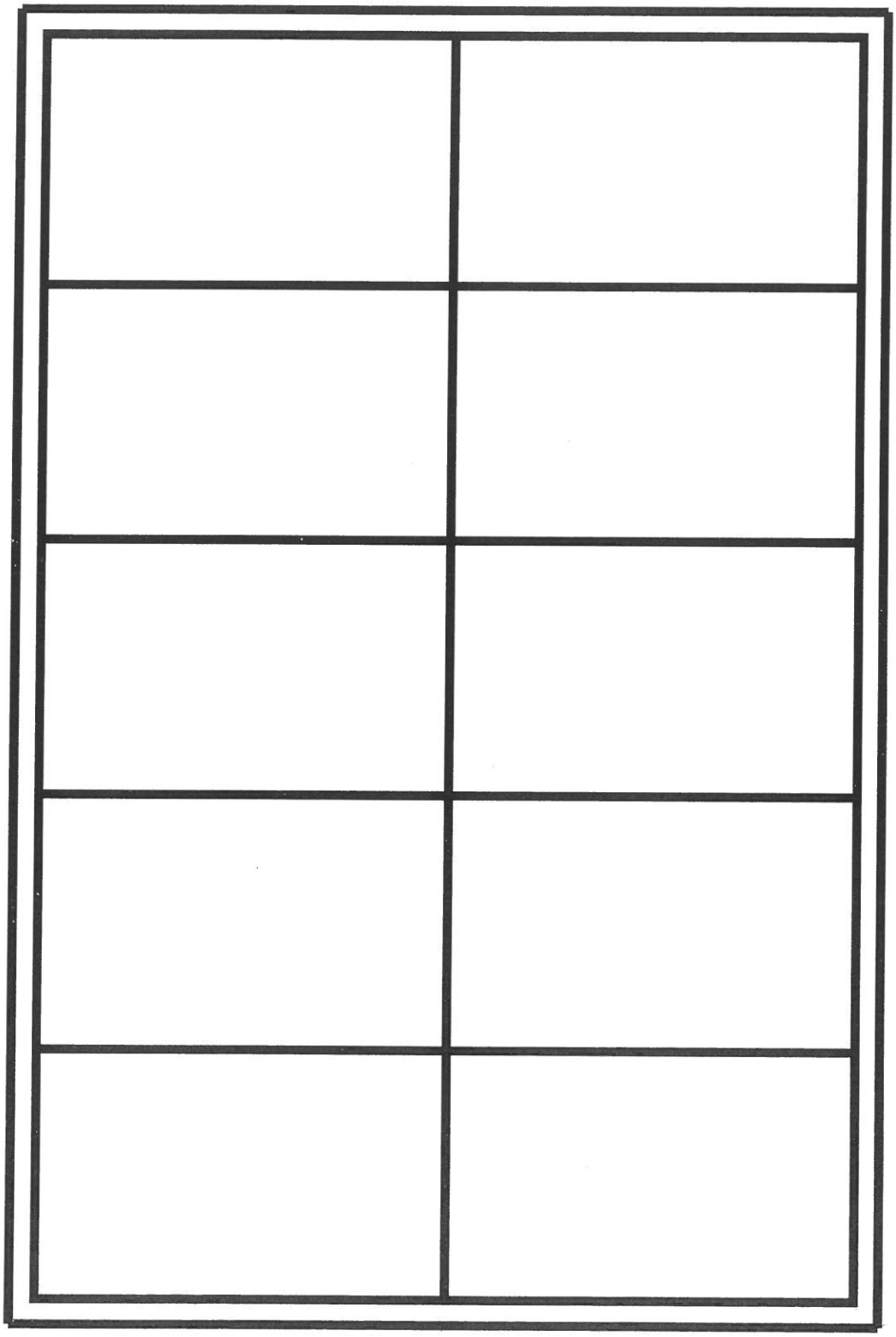


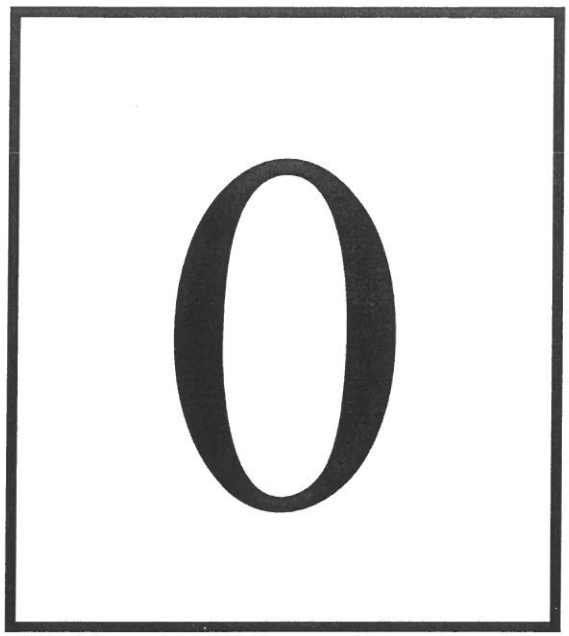


Five Frame Game Boards



Ten Frame Board

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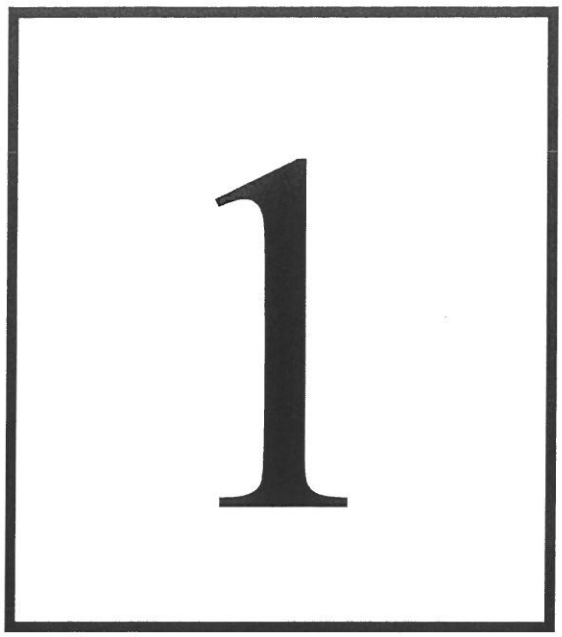
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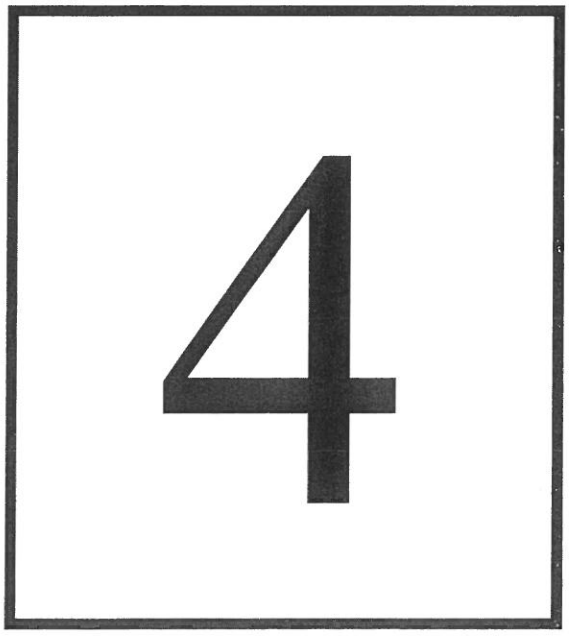
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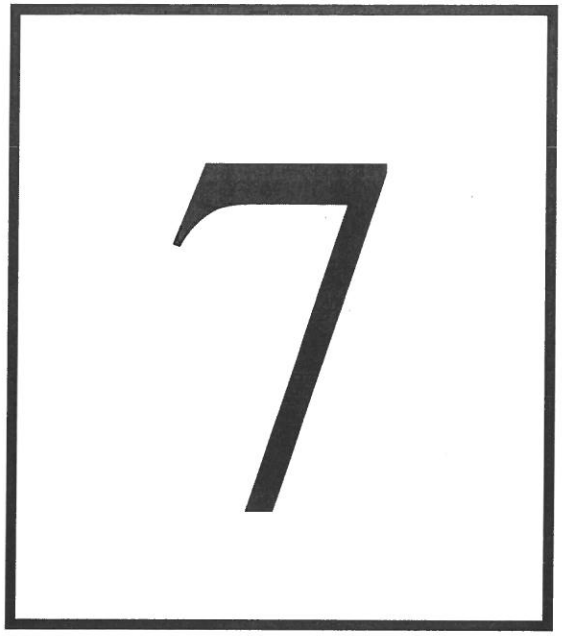
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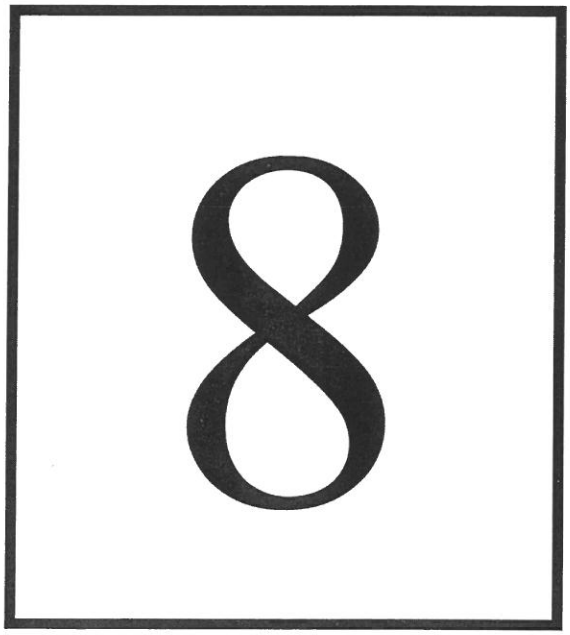
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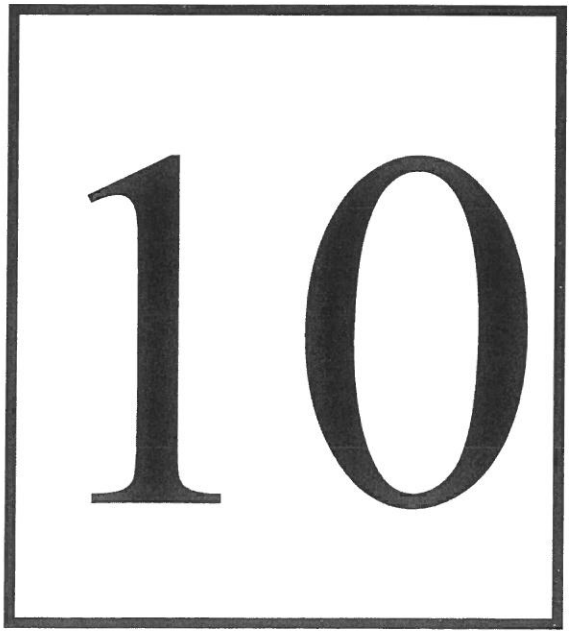
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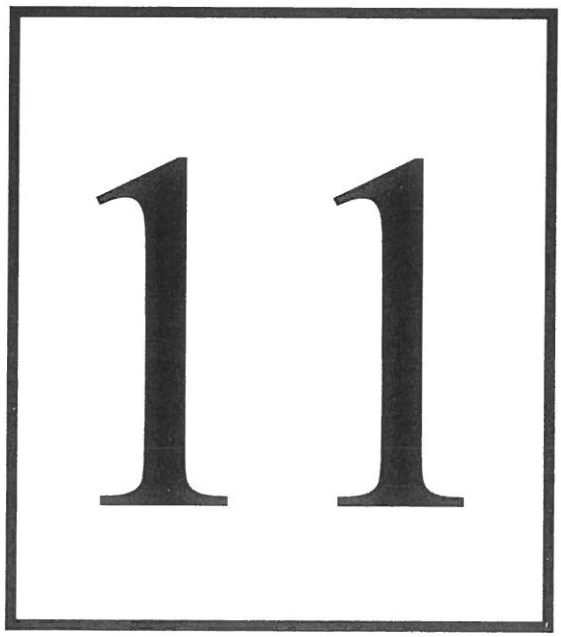
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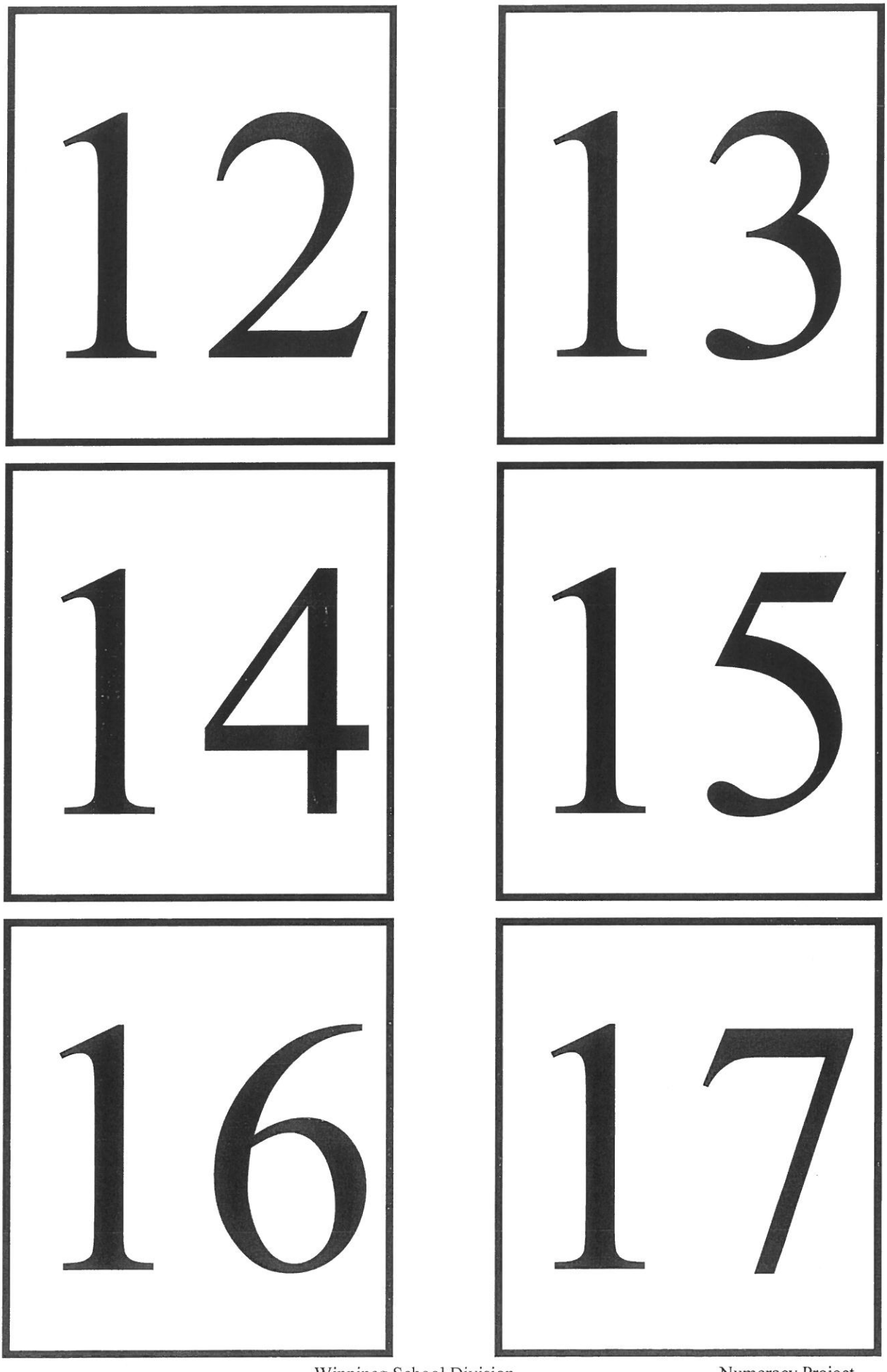
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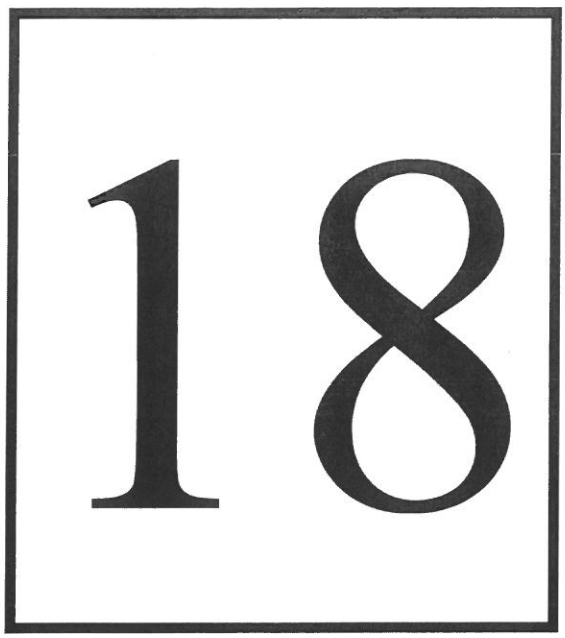
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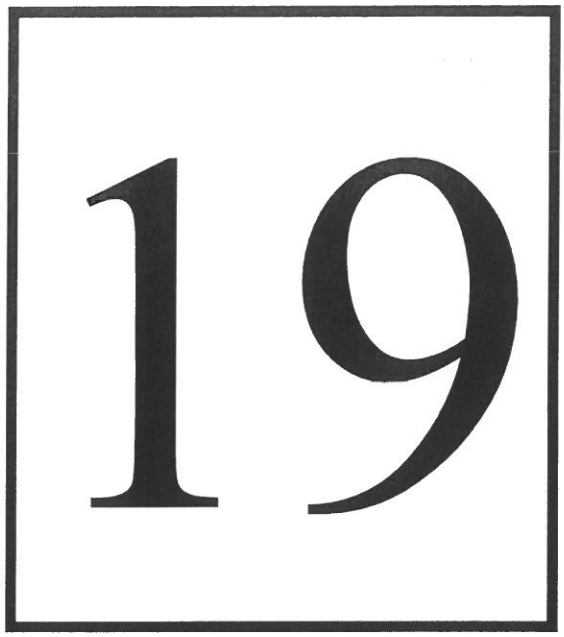
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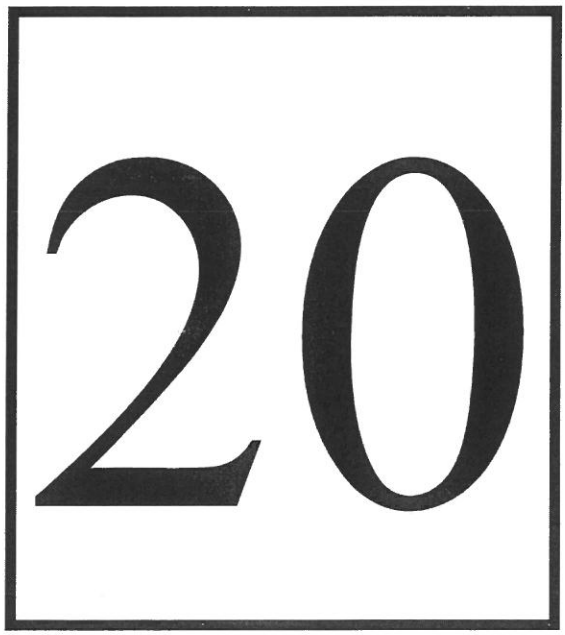
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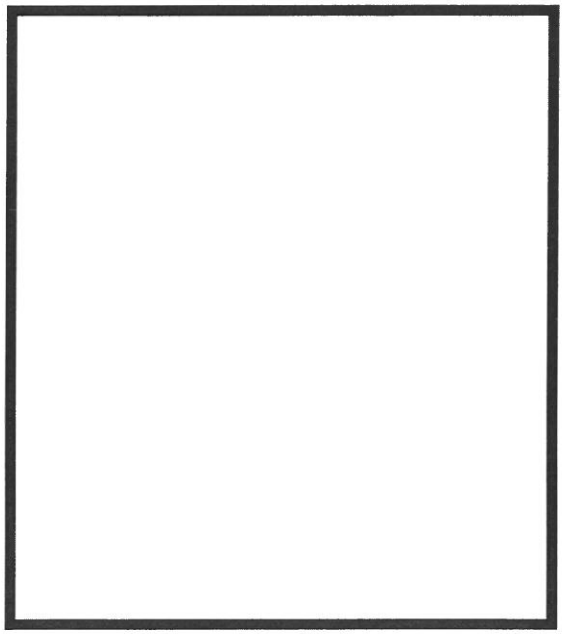
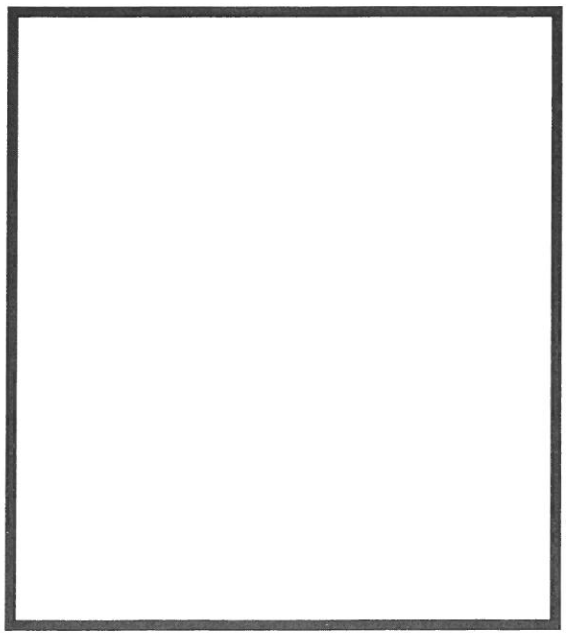
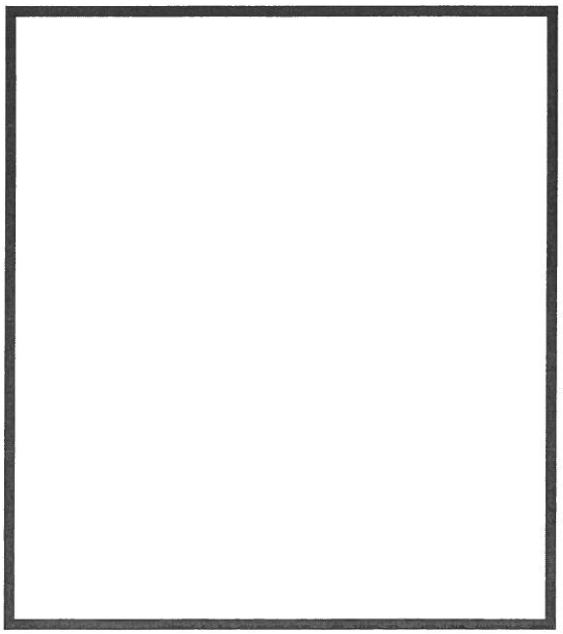
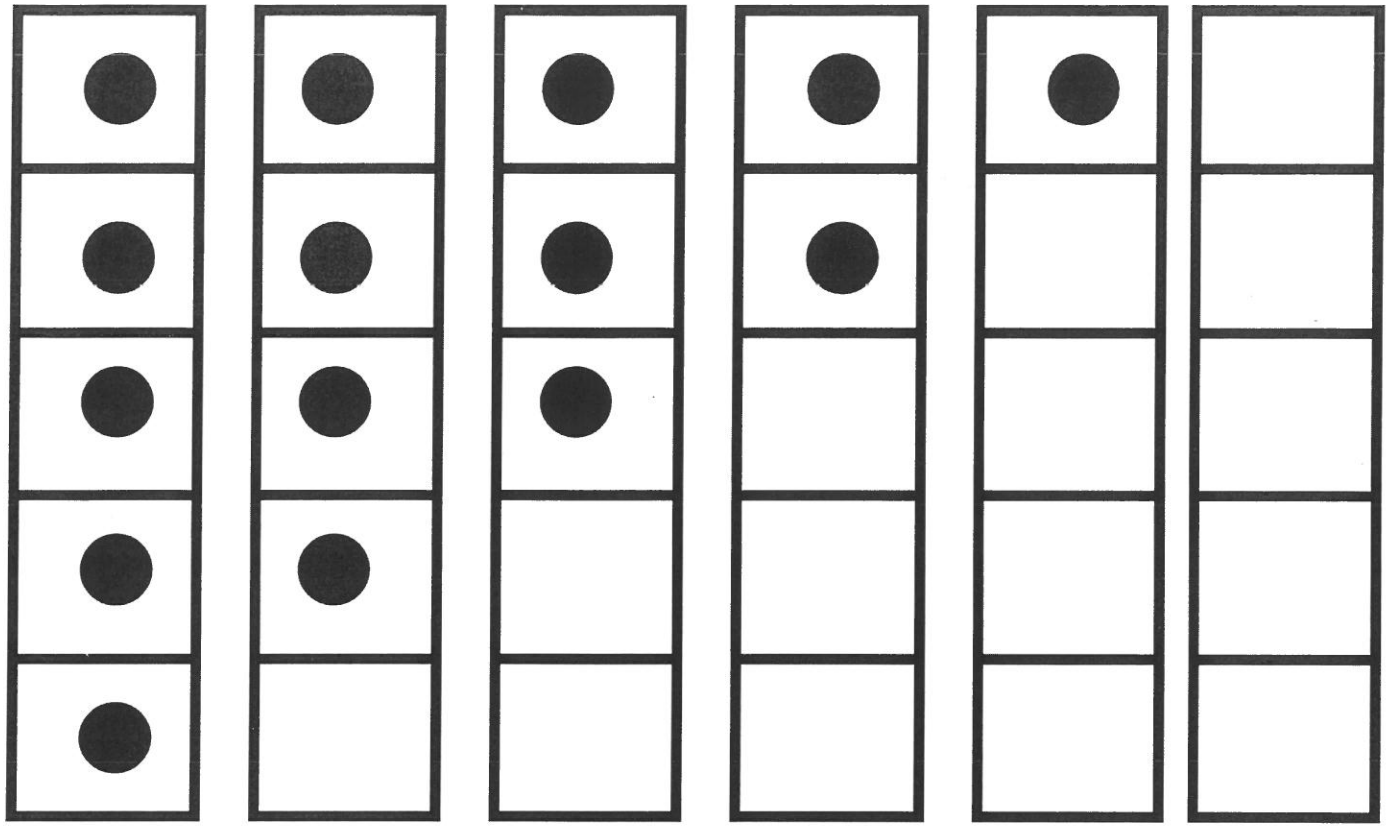
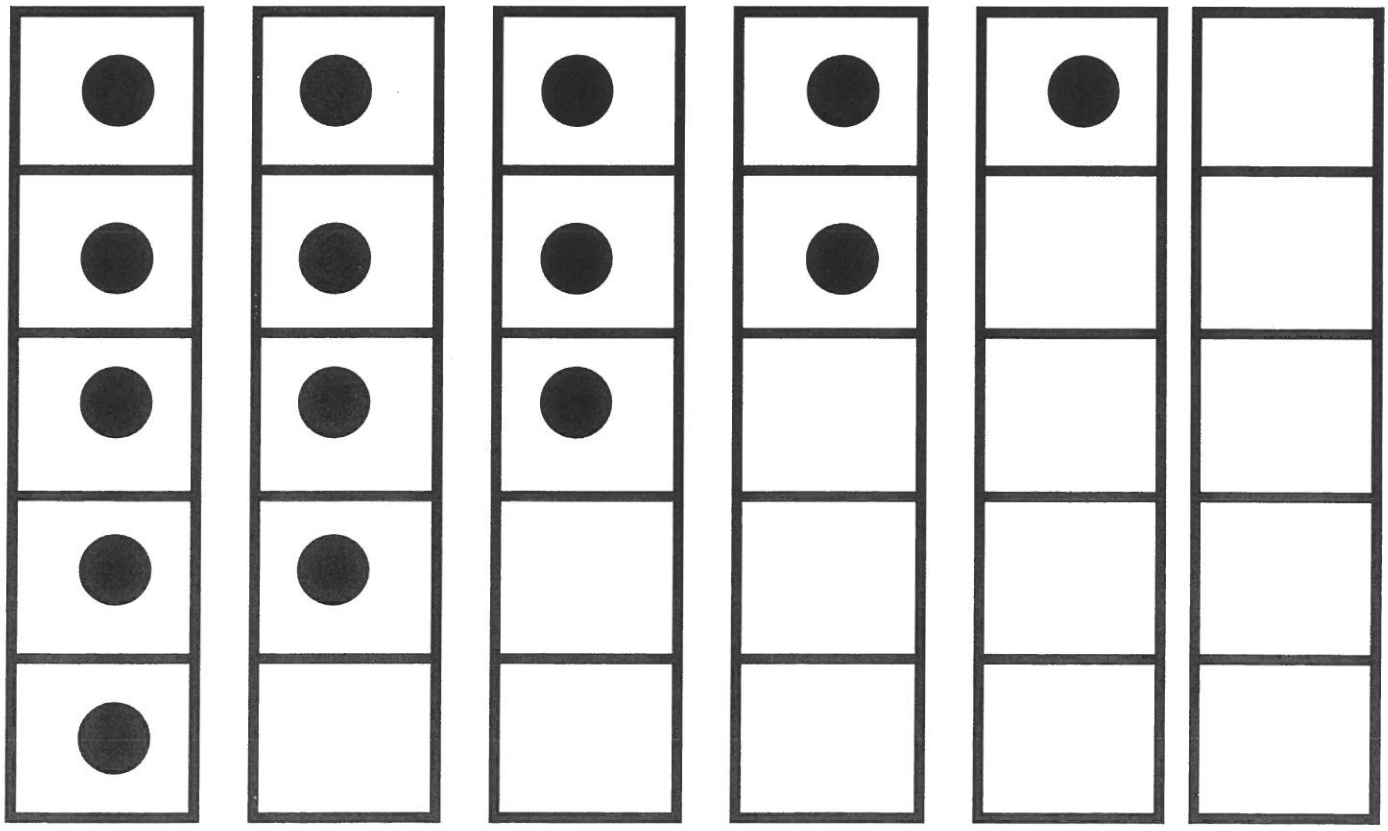






Five Frame Cards





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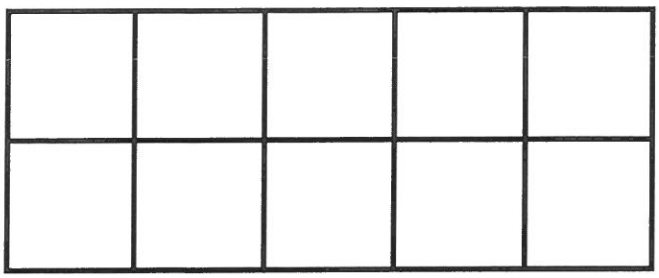
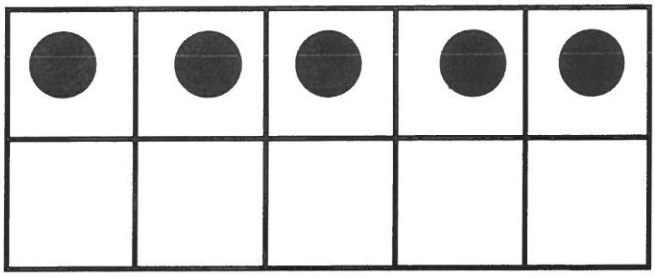
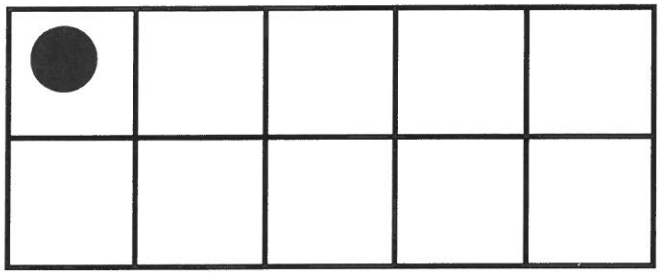
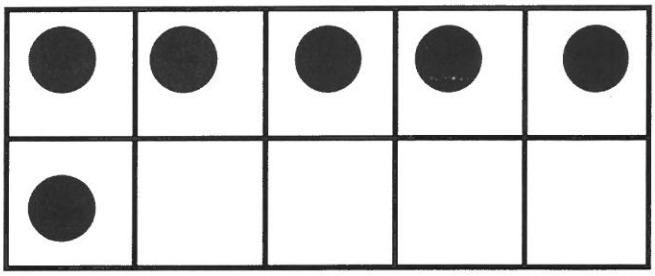
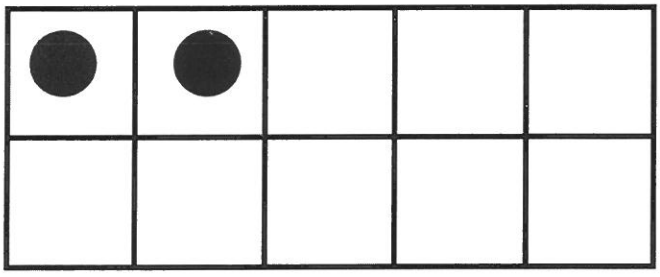
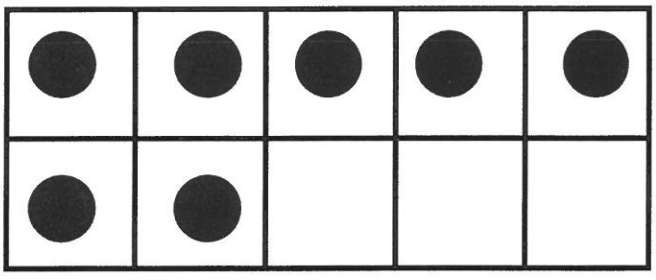


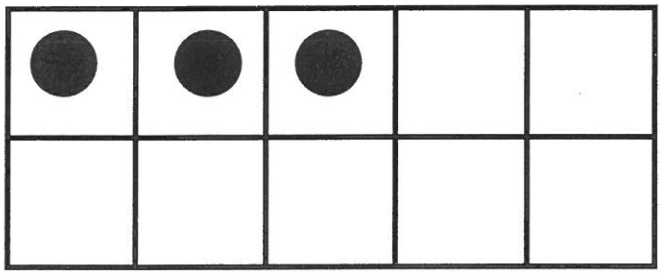


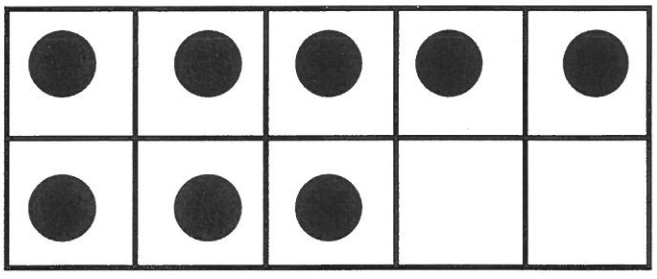


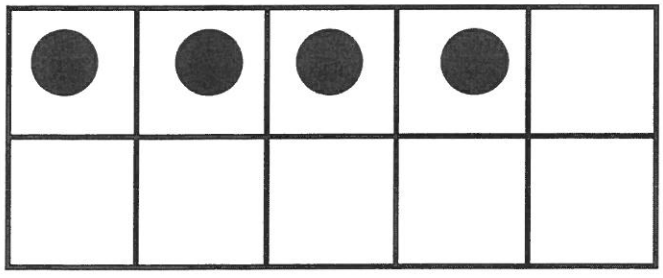


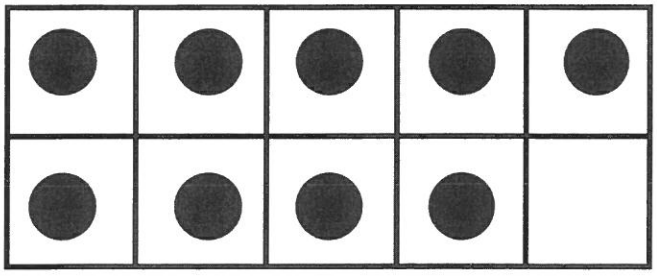




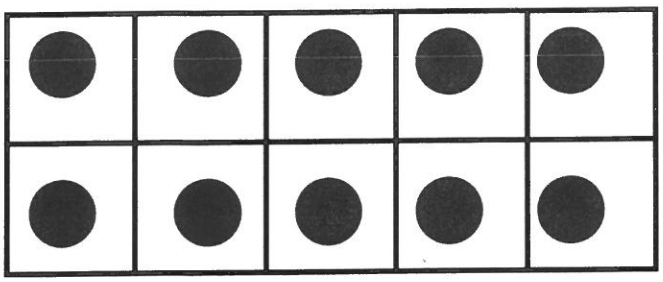
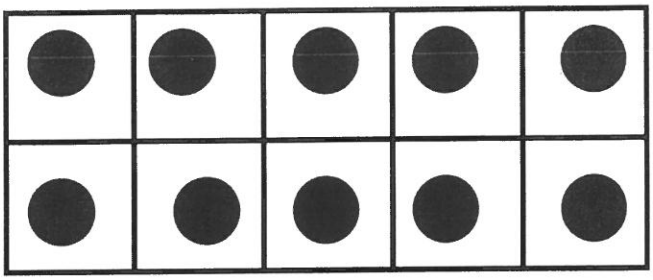
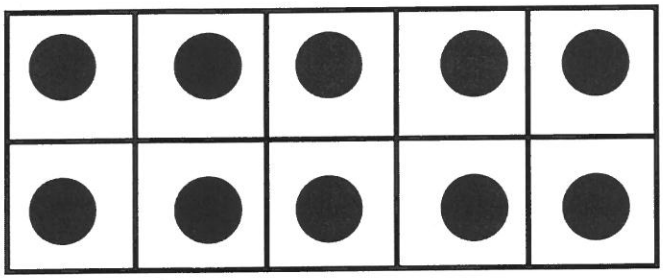
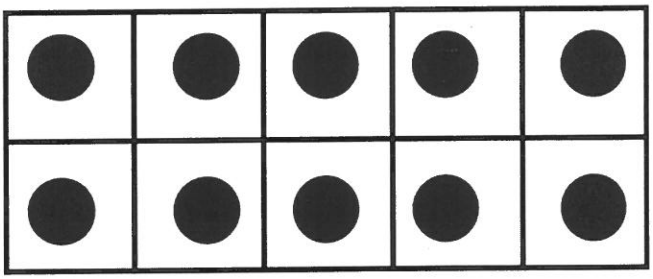
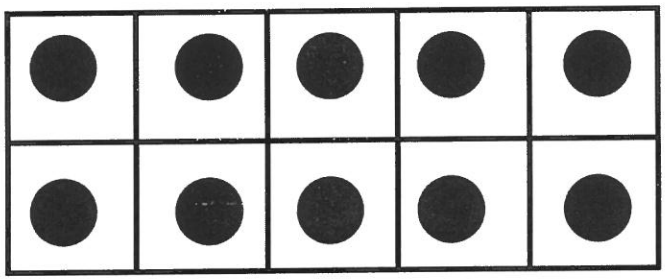
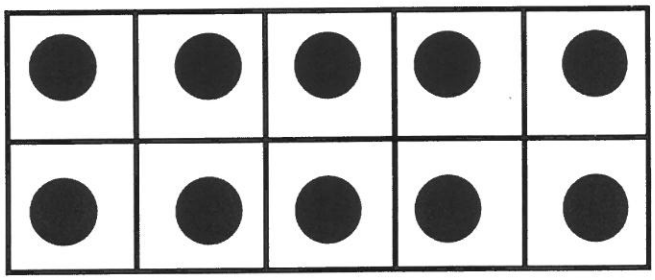
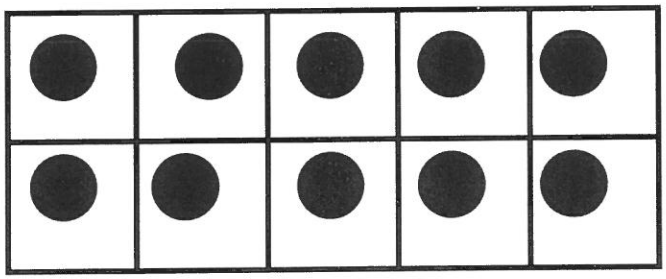
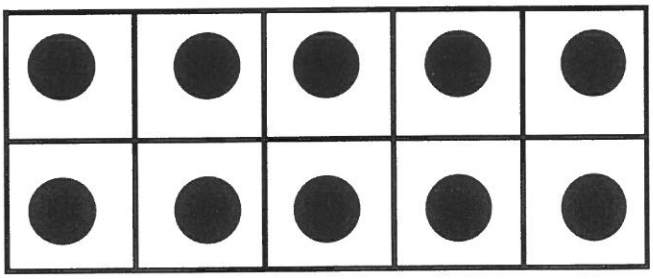
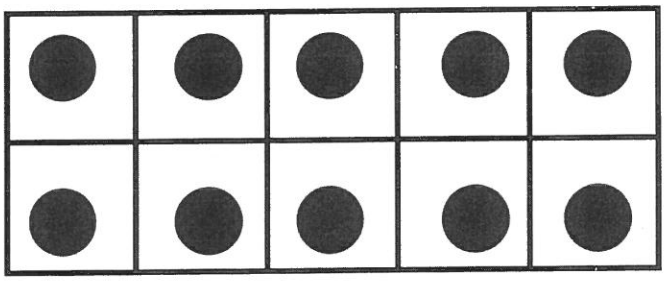
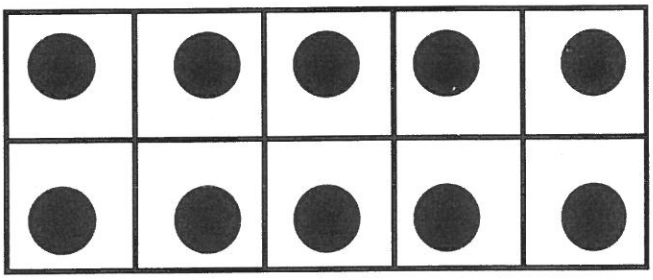








Small Ten Frame Cards

Uncover

Topic: Addition Facts

Object: Uncover the most numbers.

Groups: Pair players or 2 players

Materials for each group

- *Uncover* gameboard, p. 24
- 2 Number Cubes (1–6), p. 151
- 24 transparent markers

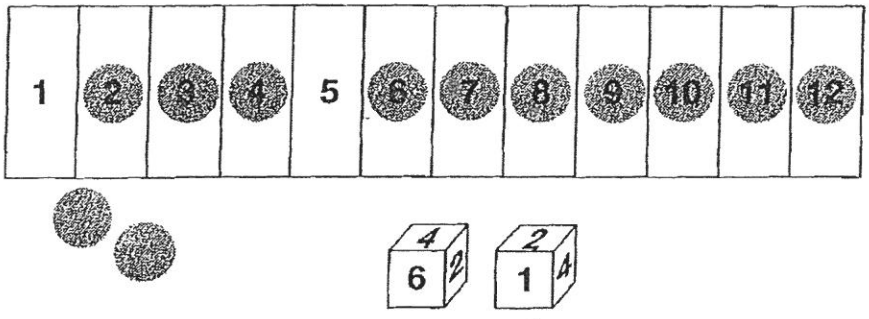
Tip *As children gain confidence, have them determine their scores by totaling the numerical values of the uncovered numbers. Winners have lower scores.*

Directions

1. Using markers, pairs cover every numbered space along their number strips on the gameboard.
2. The first pair rolls the number cubes and adds the numbers on the cubes. The pair can uncover the sum or any combination of addends that equals the rolled sum.

   Example: If 2 and 4 are rolled, the pair can uncover 6 or any combination that makes 6 (1 + 5, 1 + 2 + 3, or 2 + 4).

3. Pairs alternate turns, rolling number cubes and uncovering sums or addends on their number strips.
4. When a pair can no longer use the covered numbers to make a sum or combination, play stops for that pair. When neither pair can uncover any more numbers, the game ends.
5. The pair who uncovers the most numbers wins.



Making Connections

Promote reflection and make mathematical connections by asking:

- Which sums did you prefer to roll? Why?
- What strategies helped you uncover more markers?

Uncover

1	2	3	4	5	6	7	8	9	10	11	12

12	11	10	9	8	7	6	5	4	3	2	1

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How Many More?

Topic: Subtraction Facts

Object: Cover three in a row with your markers.

Groups: Pair players

Tip Substitute Dot Cubes or Dot Pattern Cards (1–6) if children are not ready for the number cube.

Materials for each group

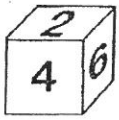
- *How Many More to Make 8?* gameboard, p. 73
- counters (different kind for each pair)
- Number Cube (1–6), p. 147
- paper for recording equations

Directions

1. The first pair rolls the Number Cube to determine how many more are needed to make 8. The pair places a counter on a dot pattern that represents the missing amount.

   Example: If 2 is rolled, 6 is needed to make 8. Thus, the pair selects and covers one of the six dot patterns on the gameboard.

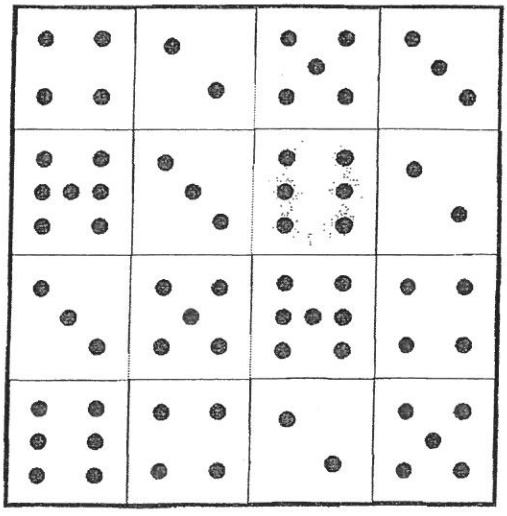
2. Pairs are required to say aloud the related subtraction fact for each turn. (If 3 is rolled, the pair states "I have 3. I need 5 more to make 8 because 8 minus 3 equals 5.")
3. Pairs alternate turns following this procedure. The first pair to place three of their counters in a row horizontally, vertically, or diagonally wins.
4. To provide practice with 10, use the *How Many More to Make 10?* gameboard, p. 74.



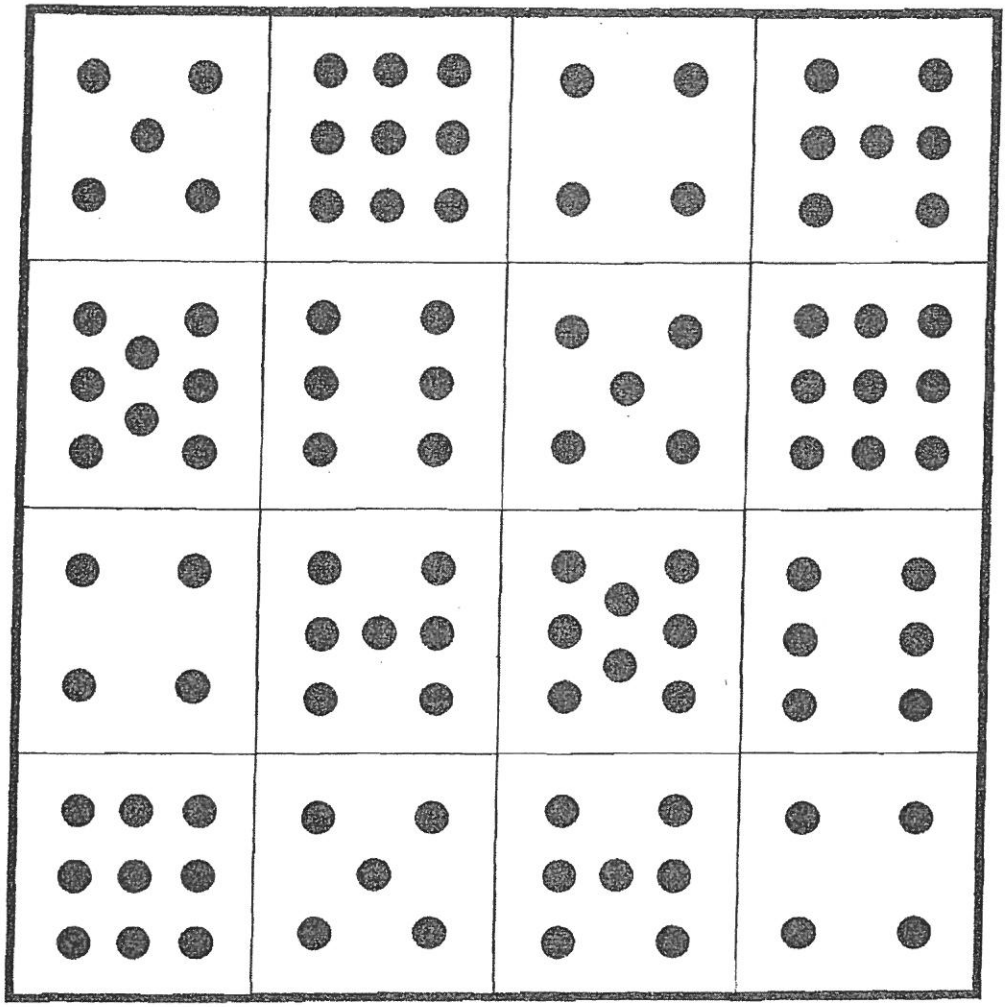
Making Connections

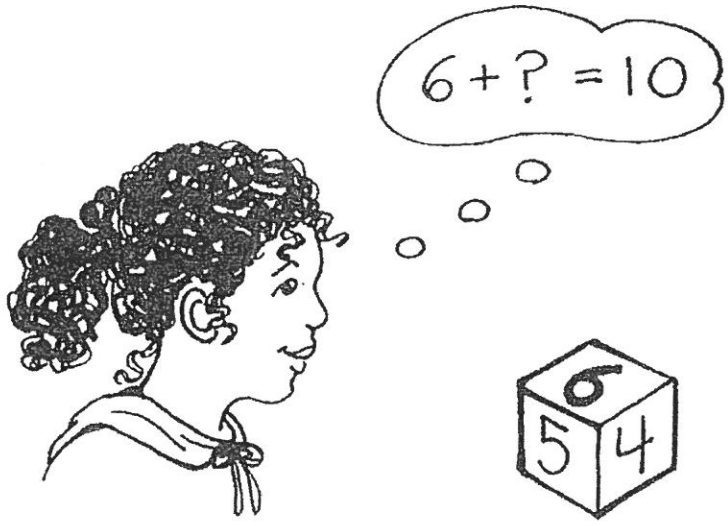
Promote reflection and make mathematical connections by asking:

- Were some numbers easier to cover than others?
- What strategies did you use in placing your counters?
- Was it difficult to block your opponent? Why or why not?



How Many More to Make 10?





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Game

Double the Die Chart

- Each player chooses a color token (tiles, cubes, chips).
- Players toss die. Highest number goes first.

How to Play

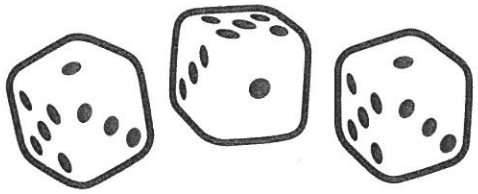
- *Toss die.*
- *Double the amount.*
- *Find the number on the chart.*
- *Place one token on the number.*
- *If number has a token on it, lose a turn.*
- *Count tokens to see who wins.*

4	6	10	12	8
2	4	12	10	2
12	2	10	6	8
6	4	6	4	2
10	12	8	12	10
8	6	2	4	6

Three-Dice Toss – Addition

How to Play

- *Toss 3 dice. Find the sum.*
- *Find the sum on the chart.*
- *Place your color token on that number.*
- *Lose a turn if you cannot place a token on the chart.*
- *Player with the most tokens wins.*



8	13	10	16	5
9	3	11	13	12
10	14	15	9	10
13	11	7	18	6
9	17	4	12	14

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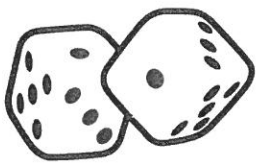
Two-Dice Subtraction Tic-Tac-Toe

- Each player chooses a color token (tiles, cubes, chips).
- Players each toss die. Highest number goes first.



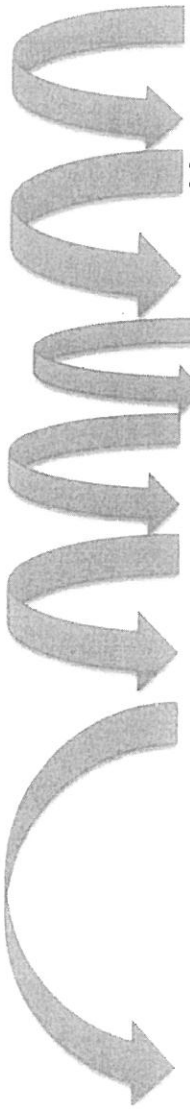
How to Play

- *Toss 2 dice.*
- *Subtract smaller number from larger number.*
- *Player finds the difference on the grid and places a token on it.*
- *If number has a token on it, lose a turn.*
- *First player to get three in a row wins that game.*
- *Play 3 games. Player winning 2 out of 3 games wins.*

0	4	3
2	3	2
1	5	1

Domino Activities

When your child has mastered one level, go on to the next.



1. Count to answer, "how many?". Have your child explain how he/she knew the amount.

2. Grab a stack of dominoes. Put them in order from least to greatest or greatest to least.

3. Pick a domino. What is 1 more? What is 1 less?

4. Pick a domino. What is 2 more? What is 2 less?

5. Pick a domino, say " I don't want (number on domino), I want (say a number greater or less than the number). What domino do I need to add or subtract?"

6. Pick a target number. Take turns flipping dominoes over one at a time and if possible combine dominoes to make target number. The dominoes used to make that target number go in your winner pile. Dominoes that have been picked, but were unused can stay in the "fish bowl" and be used by players in future turns. The player with the most dominoes at the end wins.

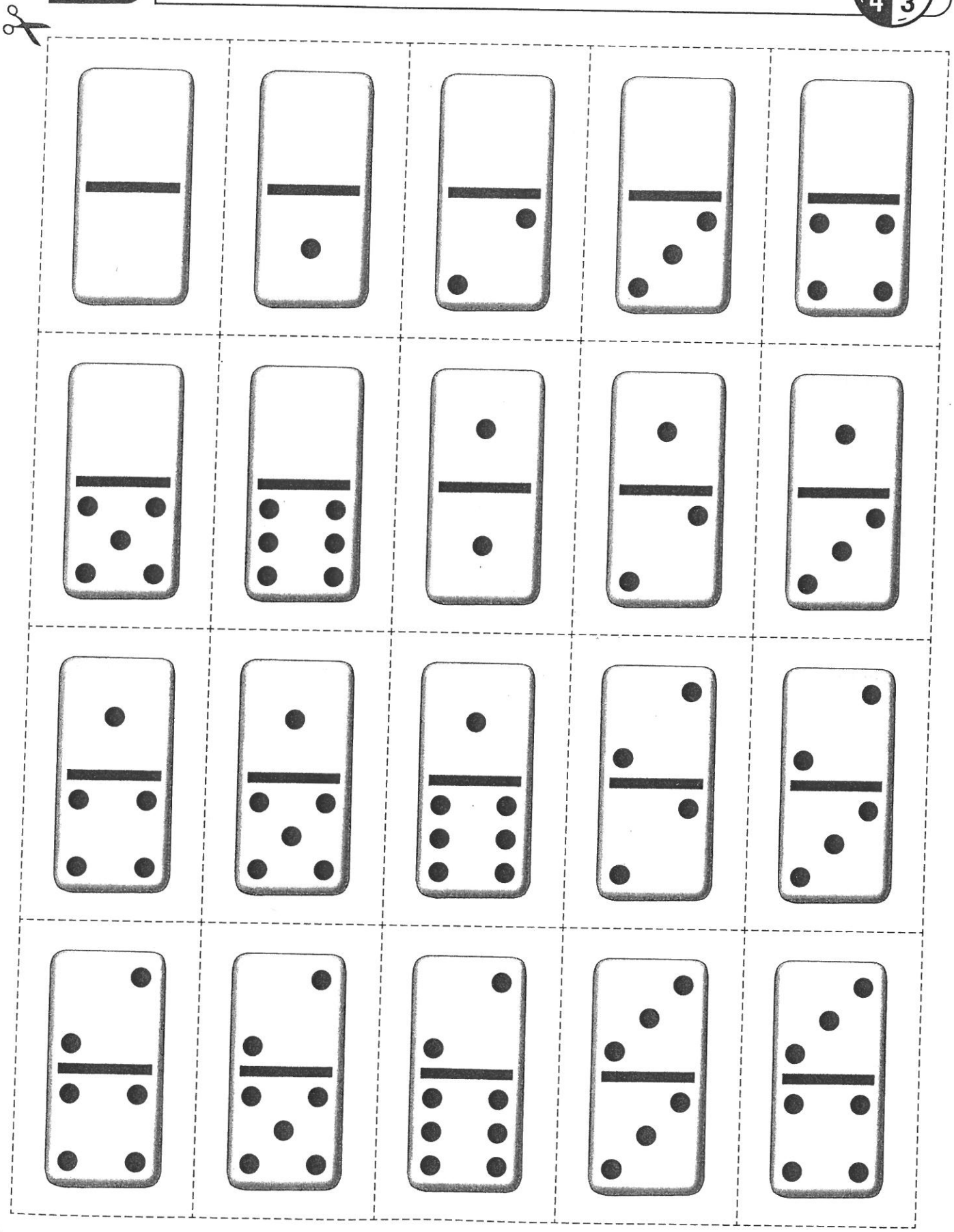
7. Play Domino Top-it. Flip over two dominoes and add them together. The player with the greater number wins. Have your child tell you the difference between then sums.

For more games with dominoes visit:
http://www.mathwire.com/numbersense/dominoes.html

Name Date Time

GAME MASTER 235

Dominoes (Double-6)



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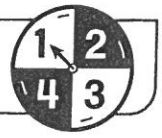
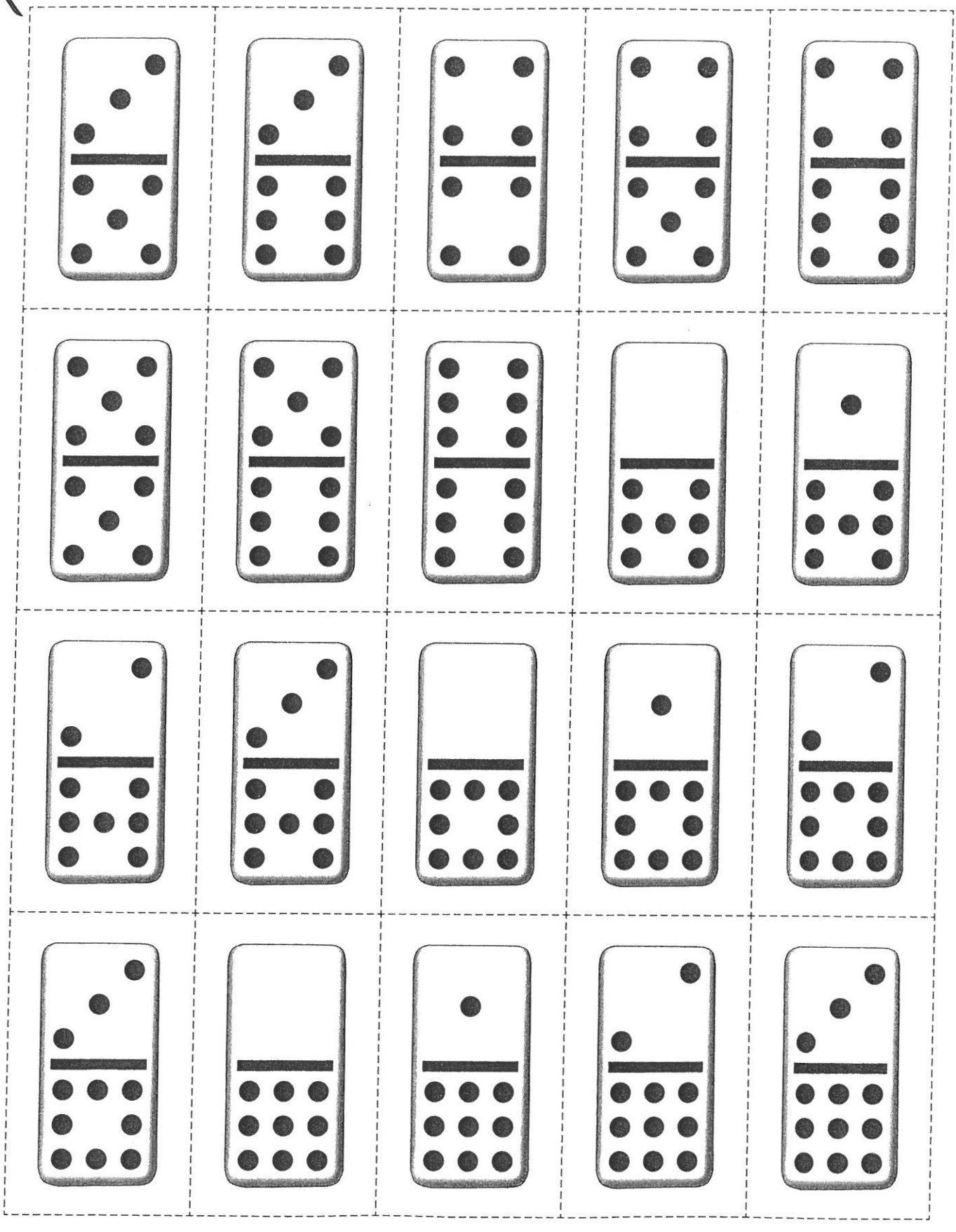
Name Date Time

GAME MASTER 236

Dominoes (Double-6 and Double-9)





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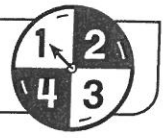
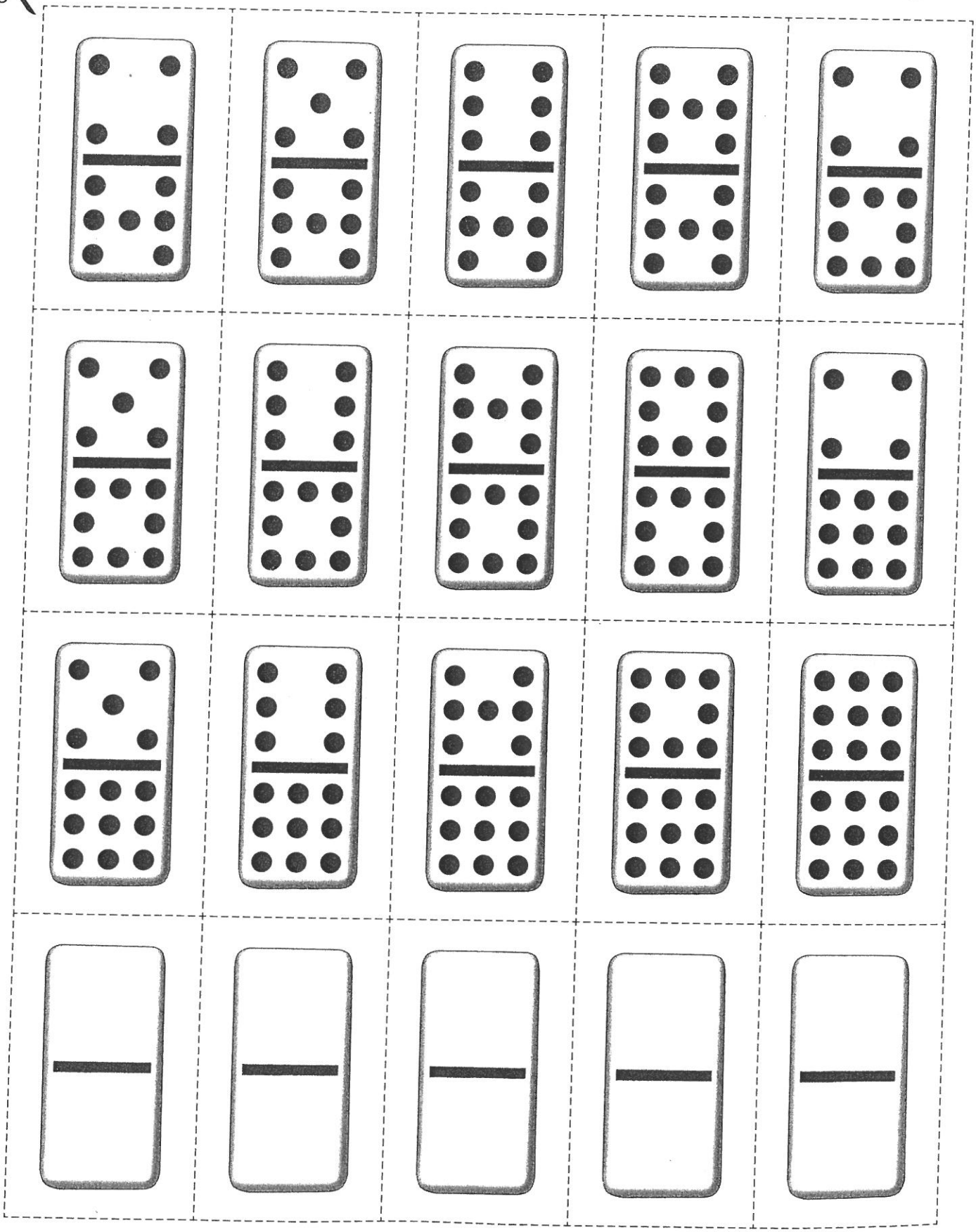
Name Date Time

GAME MASTER 237

Dominoes (Double-9)





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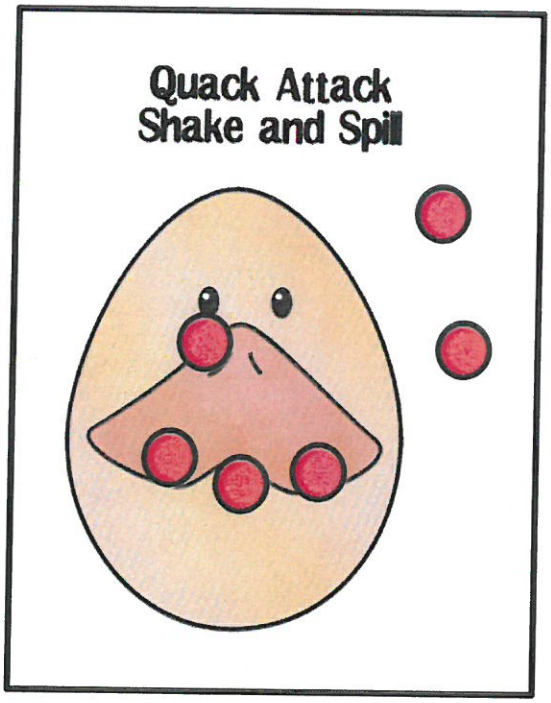
Quack Attack
Shake and Spill

Choose a target number and put that many counters in the cup.

Shake the cup and **spill** the counters on the mat.

Describe the counters on the duck and off the duck.



4 counters on the duck.

2 counters off the duck.

4 and 2 make 6.

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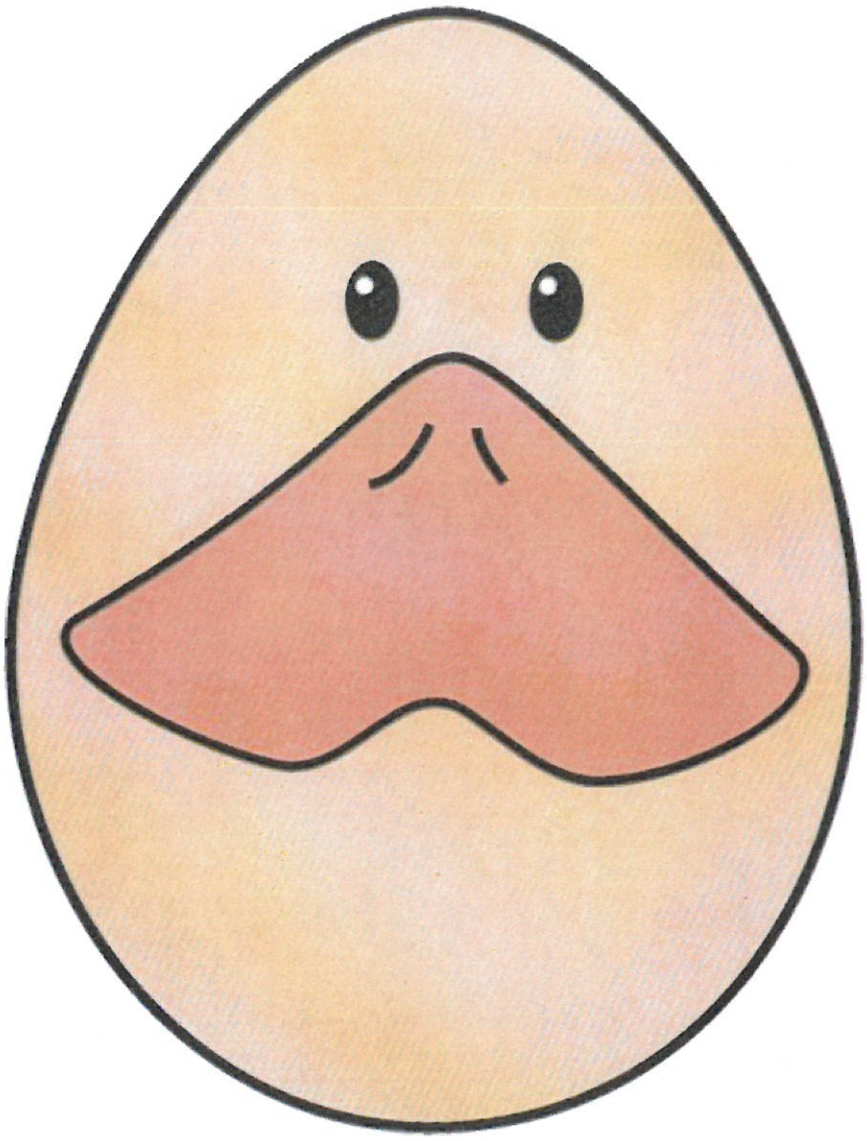
http://mathcoachscorner.blogspot.com/

Quack Attack
Shake and Spill



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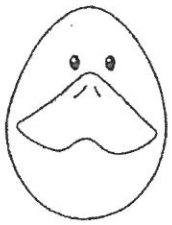
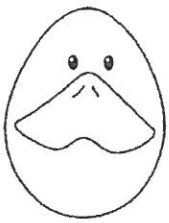
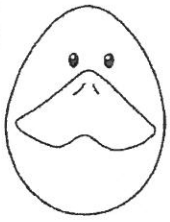
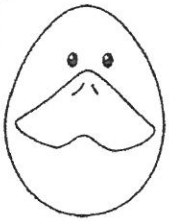
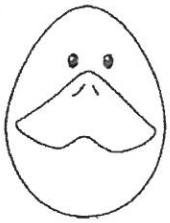
Name: _____

Draw the counters and write a number sentence

	___ = ___ + ___
	___ + ___ = ___
	___ = ___ + ___
	___ + ___ = ___
	___ = ___ + ___
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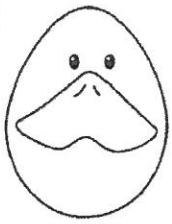
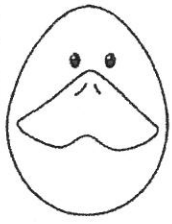
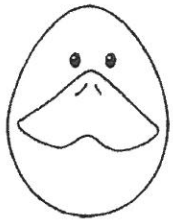
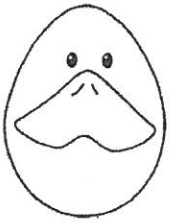
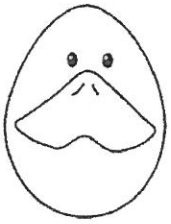
Draw the counters and write a number sentence

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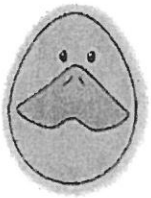

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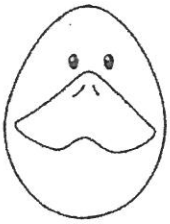
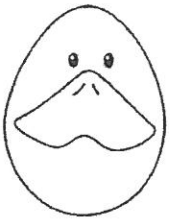
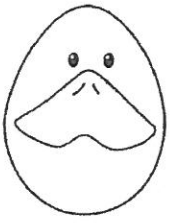
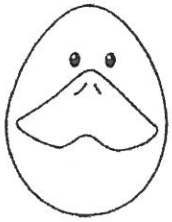
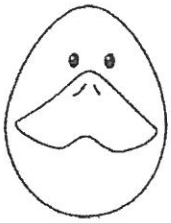
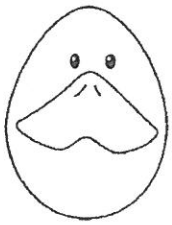
Draw the counters and write a number sentence

	___ > ___
	___ < ___
	___ > ___
	___ < ___
	___ > ___
	___ < ___

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