

Objective #10: Use strategies to add within 20.



As mentioned before, solving facts within 20 will require a different set of skills that relies on the basic facts to 10. Students will learn strategies while solving these addition facts that will increase flexibility and metacognition. Students should be encouraged to try different methods and see which method makes the most sense for them. Keep in mind that these facts will likely be a little slower than facts to ten as students rely on a strategy. However, it should always be more efficient than counting.

The games included in this objective will go in order of the strategies students will likely use to add within 20. Each strategy will be listed and described briefly. These strategies will need to be presented to students to give it a name. However, students with strong number sense will likely already be doing some of these things. Instead of teaching them as a new procedure, these will help students to see fun ways to play with numbers and to think critically.

Consider introducing these strategies as a mini lesson or small group lesson with the lesson plan support provided at the beginning of this manual. Videos and in-depth examples of each strategy are included in the Developing Number Sense for Math Fact Fluency course.

Students should be able to:

- Use basic facts within 10 to add within 20.
- Decide which strategy is the most efficient for a given fact.
- Explain how each fact was solved using a strategy through modeling and a written or verbal explanation.

The following activities and resources will help students to reach the goals listed above. They are organized by the strategy and will mention which strategy should be used to practice. The final resources will help students to use a variety of skills and focus on helping students determine when to use which strategy.

- Teacher Resource 10.1: Mental Math Strategies
- Teacher Resource 10.2: Strategy Number Strings
- Teacher Resource 10.3: Count On to 20
- Teacher Resource 10.4: Make a 10 to Add
- Teacher Resource 10.5: Jump Along the Number Line
- Teacher Resource 10.6: Doubles Plus/Minus 1 Puzzles
- Teacher Resource 10.7: Double Down Dice
- Teacher Resource 10.8: Race to 20
- Teacher Resource 10.9: Using Strategies to Add
- Teacher Resource 10.10: Assessment Toolbox #10

Mental Math Strategies for Addition

This is not a full list of strategies that students use to solve addition facts within 20 but includes the most common ones. Remember that students will need to be introduced to these strategies as a way to consider solving problems differently- not taught procedurally. Please refer to the videos, sample lessons and anchor charts in the Developing Number Sense for Math Fact Fluency course to see this in action.

Counting On

This strategy is typically used when adding 0, 1, 2 and 3. Students who are familiar with the counting sequence to 20 will quickly be able to consider what number comes next.

Making a Ten

Students who have a strong sense of 10 will do this naturally. They will see when adding numbers that are close to ten, they can consider what can be added to make a ten. Then they can easily add ten and some more. For example, $9 + 5$ could be considered as $9 + 1 + 4$.

Using Ten as a Benchmark

If students consider teen numbers as ten and some more, they know that getting to ten will help speed up the process. In this strategy, students consider how many more to ten and then add on. For example, $7 + 5$ could be considered as $7 + 3 + 2$.

Doubles Plus or Minus One

Students can use this strategy if they already know their doubles facts. They can consider a fact that is close to that double and add or subtract one to get to the answer. For example, $7 + 6$ could be considered as $7 + 7 - 1$ or $6 + 6 + 1$.

Key Considerations:

- **Students need to understand our number system:** Activities were listed at the beginning of this manual to encourage strong number sense. Students will also need to know the commutative property of addition and how it works to use these strategies.
- **The focus is critical thinking, not procedures:** Students cannot learn these as another procedure or it will quickly be forgotten. Instead students need to see these as opportunities to play with numbers and think critically.

Teacher Resource 10.2: Strategy Number Strings

One of the main differences in this milestone is that there are a variety of methods for students to solve addition facts within 20. There is no one way to solve each set of facts and students will need to determine which strategy makes the most sense.

Based on the definition of fluency, that method should be efficient and accurate. One way to assist students in using efficient methods is to encourage the use of strategies when solving facts. Instead of teaching this as a rote procedure, number strings that lend themselves to this strategy can help students make sense of choosing a strategy.

For more information on performing a strategy number string mini lesson, see the example in the Developing Number Sense for Math Fact Fluency course. For additional resources and a plethora of examples, consider Sherry Parrish's book, *Number Talks: Whole Number Computation*.

Number Strings for Making a Ten

$$\begin{array}{c} 7 + 3 \\ 7 + 3 + 4 \\ 7 + 5 + 3 \\ 7 + 6 \end{array}$$

$$\begin{array}{c} 2 + 8 \\ 2 + 3 + 8 \\ 2 + 8 + 2 \\ 8 + 4 \end{array}$$

$$\begin{array}{c} 6 + 4 \\ 6 + 3 + 4 \\ 6 + 2 + 4 \\ 6 + 5 \end{array}$$

Number Strings for Using Ten as a Benchmark

$$\begin{array}{c} 9 + 1 \\ 9 + 2 \\ 9 + 1 + 2 \\ 9 + 4 \end{array}$$

$$\begin{array}{c} 8 + 2 \\ 8 + 2 + 3 \\ 8 + 5 \end{array}$$

$$\begin{array}{c} 5 + 5 \\ 5 + 1 + 5 \\ 5 + 6 \\ 5 + 7 \end{array}$$

Number Strings for Doubles Plus or Minus 1

$$\begin{array}{c} 5 + 5 \\ 5 + 6 \\ 5 + 4 \end{array}$$

$$\begin{array}{c} 8 + 8 \\ 8 + 7 \\ 8 + 6 \end{array}$$

$$\begin{array}{c} 6 + 6 \\ 6 + 5 \\ 6 + 7 \end{array}$$

Teacher Resource 10.3: Count On to 20 Student Directions

Materials:

- paper clip
- 2 counters
- Count On to 20 Board
- pencil

This game is designed for pairs and focuses on the counting on strategy.

1. Invite each student to choose a counter and place it before the 1 on the Count On to 20 Board.
2. Encourage STUDENT 1 to use the pencil and paper clip to spin the spinner. Invite STUDENT 1 to decide what space he or she will land on before moving his or her counter. Ask STUDENT 1 to say it as an addition sentence. For example, if STUDENT 1 chose a 3, STUDENT 1 would say, " $0 + 3 = 3$."
3. Once the student says the sentence, STUDENT 1 should move the counter along the board.
4. Invite STUDENT 2 to repeat the same process to move along the board.
5. Encourage each student to take turns spinning the spinner to move along the board. Students should say the addition sentence each time. For example, if STUDENT 2 is on 11 and spins a 3, STUDENT 2 should say, " $11 + 3 = 14$ ".
6. The first player to reach 20 wins!

Differentiation Options:

- Encourage students to write their addition sentences on a whiteboard with a dry erase marker to help check them faster.
- When students finish this activity, ask them to write a journal entry using the following prompt: Why was counting on an easier strategy for this game? Was there any number that was challenging to count on? Why or why not?

Questions to Encourage Student Discussion:

- How did you know which space to land on?
- How do the teen numbers follow a similar pattern to numbers 1-10?
- How did you decide what to write/say as your addition sentence?

Teacher Resource 10.3: Count On to 20

Start here

You did it!

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

1 2 3 2 1 2 3

Teacher Resource 10.4: Make a 10 to Add Student Directions

Materials:

- 20 connecting cubes (2 colors)
- 2 decks Digit Cards 5-9 (TR 1.2)
- Make a Ten Number Bond
- dry erase marker

This game is designed for pairs and focuses on the making a ten strategy.

1. Place the Make a Ten Number Bond in a page protector or laminate it so that it may be written on with a dry erase marker.
2. Shuffle 2 decks of the Digit Cards 5-9 and lay them face down on the table in a stack.
3. Invite STUDENT 1 to choose two digit cards and represent the numbers on the Double Ten Frame. One color of connecting cubes should be used to represent one number in the top ten frame. The other color should be used to represent the second number in the bottom ten frame.
4. STUDENT 2 should consider how this equation can be solved by making a ten. STUDENT 2 should be encouraged to move some cubes to fill in a ten on the Double Ten Frame.
5. STUDENT 1 should check the answer and then represent the problem by breaking one of the numbers apart using a number bond. It should match the same picture represented with the connecting cubes on the Double Ten Frame.
6. Encourage both students to check the problem and make sure they match.
7. Switch roles and continue playing.

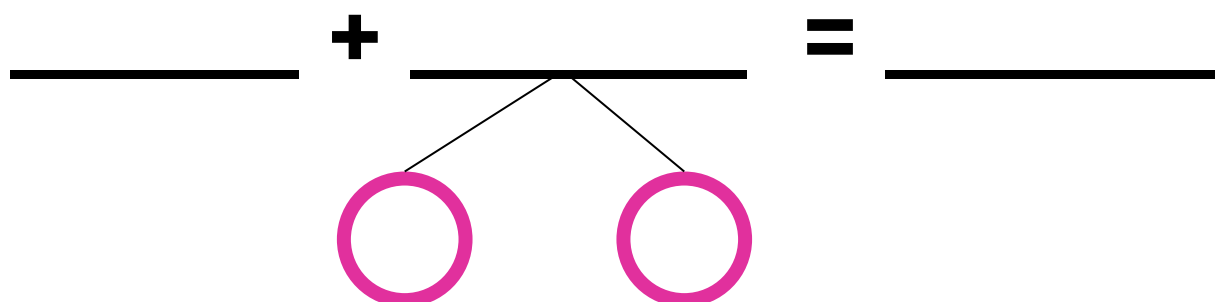
Differentiation Options:

- Challenge students to solve the same problem in two different ways. Record this with a number bond and ask students to consider which way is faster.

Questions to Encourage Student Discussion:

- How did you decide which number to break apart?
- How did you represent the number you broke apart with a number bond?
- Is there another way to solve the problem?

Teacher Resource 10.4: Make a 10 to Add



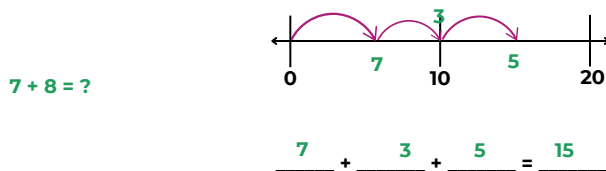
Teacher Resource 10.5: Jump Along the Number Line Student Directions

Materials:

- Number Line to 20
- 2 decks Digit Cards 6-9 (TR 1.2)
- 20 counters (10 in each color)
- dry erase marker
- Double Ten Frame (TR 8.3)

This game is designed for pairs or for individual students to practice. Students will be encouraged to use ten as a benchmark to add.

1. Provide students with the Number Line to 20 laminated or in a page protector and a dry erase marker.
2. Shuffle two decks of Digit Cards with the numbers 6-9 and place them in a pile face down on the table.
3. Invite STUDENT 1 to choose two Digit Cards. STUDENT 1 should use the number line and a dry erase marker to show one number, jump to 10 and then a jump with the remaining part. STUDENT 1 should also write the matching addition sentence.



4. STUDENT 2 should check the answer by showing the same problem with two colors of counters on the Double Ten Frame.
5. Clear both the Number Line to 20 and the double ten frame. Invite STUDENT 2 to choose two Digit Cards and repeat the same process.
6. If students run out of cards, they should shuffle them and play again.

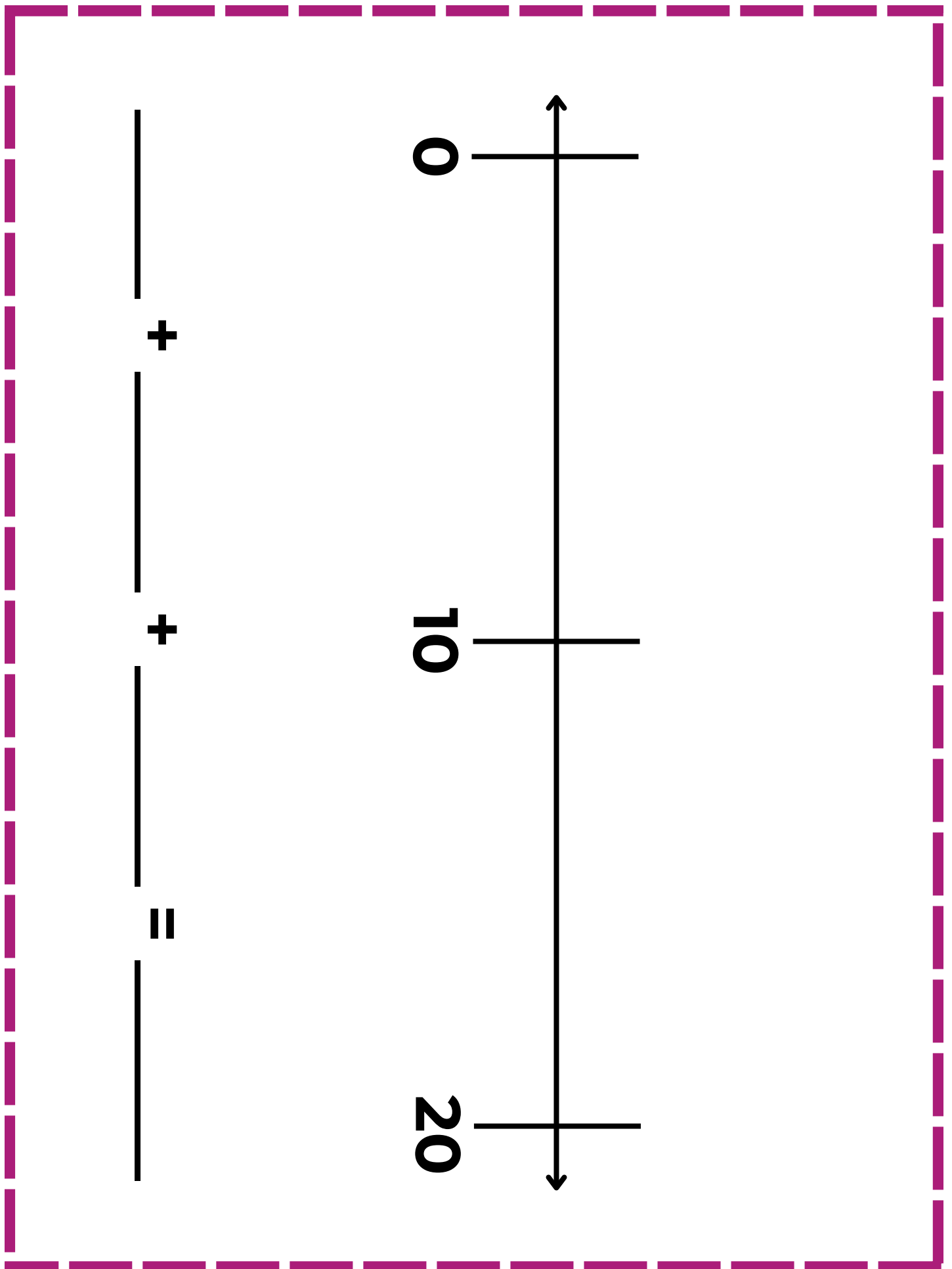
Differentiation Options:

- Invite students to sketch their number lines on a sheet of paper to record their answers. This can be used as data to see how students are developing fluency.

Questions to Encourage Student Discussion:

- How did you represent each number on the number line?
- Is there a different way to solve the problem? How would you do it?

Teacher Resource 10.5: Jump Along the Number Line



Teacher Resource 10.6: Doubles Plus/Minus 1 Puzzles Student Directions

Materials:

- Puzzle Cards
- 20 counters
- Double Ten Frame (TR 8.3)

This game is designed for pairs or for individual students to practice. Students will be encouraged to use the doubles plus or minus one to solve each puzzle.

1. Cut apart the Puzzle Cards. They will last longer if laminated. Please note that these doubles focus on teen number answers.
2. Mix up the cards and lay them face down on the table where each card's back is showing up.
3. Invite STUDENT 1 to choose two cards to see if they match. STUDENT 1 will need to decide if the double fact can be used to find the number. STUDENT 1 should represent the problem on a double ten frame and consider if adding or subtracting one would give the total. If it does, STUDENT 1 gets to keep the match. If it does not, STUDENT 1 should place the cards back in their locations face down.
4. STUDENT 2 should take a turn to choose two cards and represent the problem on a double ten frame to see if it is a match.
5. Students should continue playing until all the matches are made.

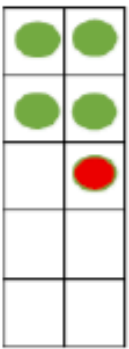
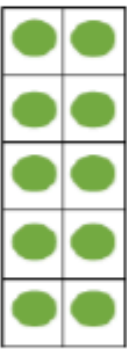


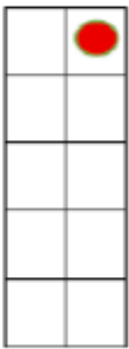
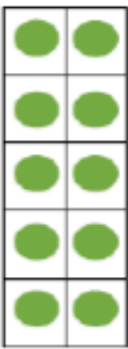
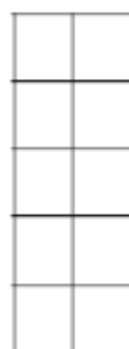

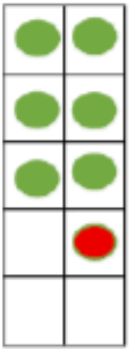
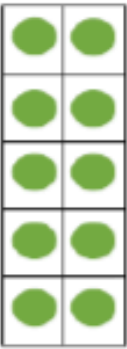


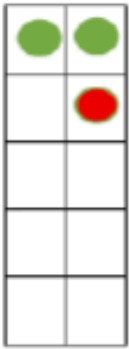
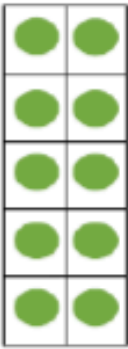
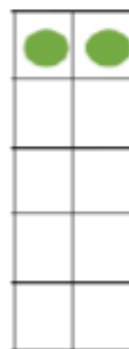

Differentiation Options:

- While students can rely on their mental math skills, encourage the building of muscle memory by having students represent each problem on a double ten frame. It will help students visualize the double and consider what 1 more or 1 less would be.
- Encourage students to write out their thinking with an addition or subtraction number sentence using number bonds as they explain their thinking.

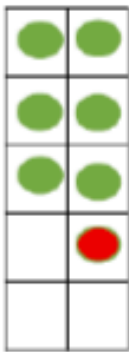
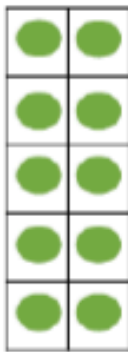


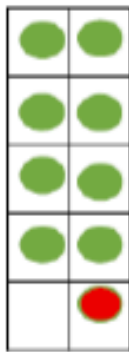



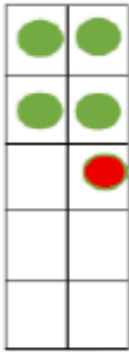



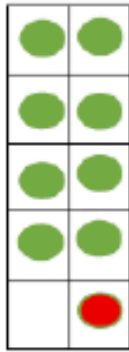



Questions to Encourage Student Discussion:

- How did you determine if the cards were a match?
- Do you prefer to add or subtract 1? Why or why not?
- Which doubles are easy for you to remember? Which ones are harder to remember?

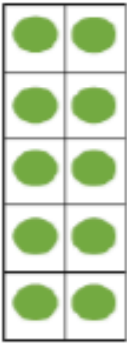
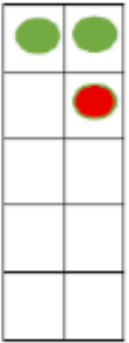
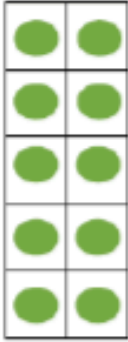
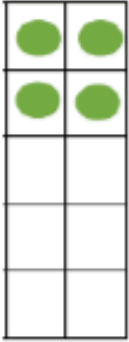
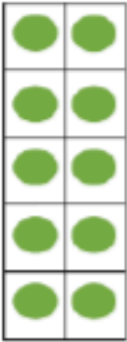

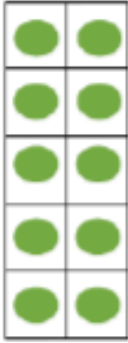

Teacher Resource 10.6: Doubles Plus/Minus 1 Puzzles

 15 	 7 + 7 
 11 	 5 + 5 
 17 	 8 + 8 
 13 	 6 + 6 

Teacher Resource 10.6: Doubles Plus/Minus 1 Puzzles

 17 	 9 + 9 
 19 	 9 + 9 
 15 	 8 + 8 
 19 	 10 + 10 

Teacher Resource 10.6: Doubles Plus/Minus 1 Puzzles

	<p>13</p>   <p>7 + 7</p>  
	<p>11</p>   <p>6 + 6</p>  

Teacher Resource 10.7: Double Down Dice Student Directions

Materials:

- Double Down Dice Recording Sheet
- 20 counters (2 colors)
- Double Ten Frame (TR 8.3)
- Double Down Dice

This game is designed for pairs or for individual students to practice. Students will be encouraged to use the doubles plus or minus one strategy to solve.

1. Put together the dice pattern for 2 dice numbered 6-10 or use dice that you already have.
2. Provide each student with the Double Down Dice recording sheet where they will record their work.
3. Invite STUDENT 1 to roll the two dice. If STUDENT 1 rolls a doubles fact, STUDENT 1 should record the fact and the answer on the Double Down Dice recording sheet. Each double scores 1 point. If STUDENT 1 rolls a fact that can be solved using a doubles plus or minus one fact, STUDENT 1 should record the fact and the answer on the Double Down Dice recording sheet. Each doubles plus or minus one fact scores 2 points.
4. If STUDENT 1 does not roll either one, STUDENT 1 passes the dice to STUDENT 2.
5. If STUDENT 1 thinks he or she has a double or doubles plus/minus 1, STUDENT 2 should check the answer using the double ten frame and two colors of counters.
6. STUDENT 2 should take the dice and switch roles.
7. The player with the most points wins.

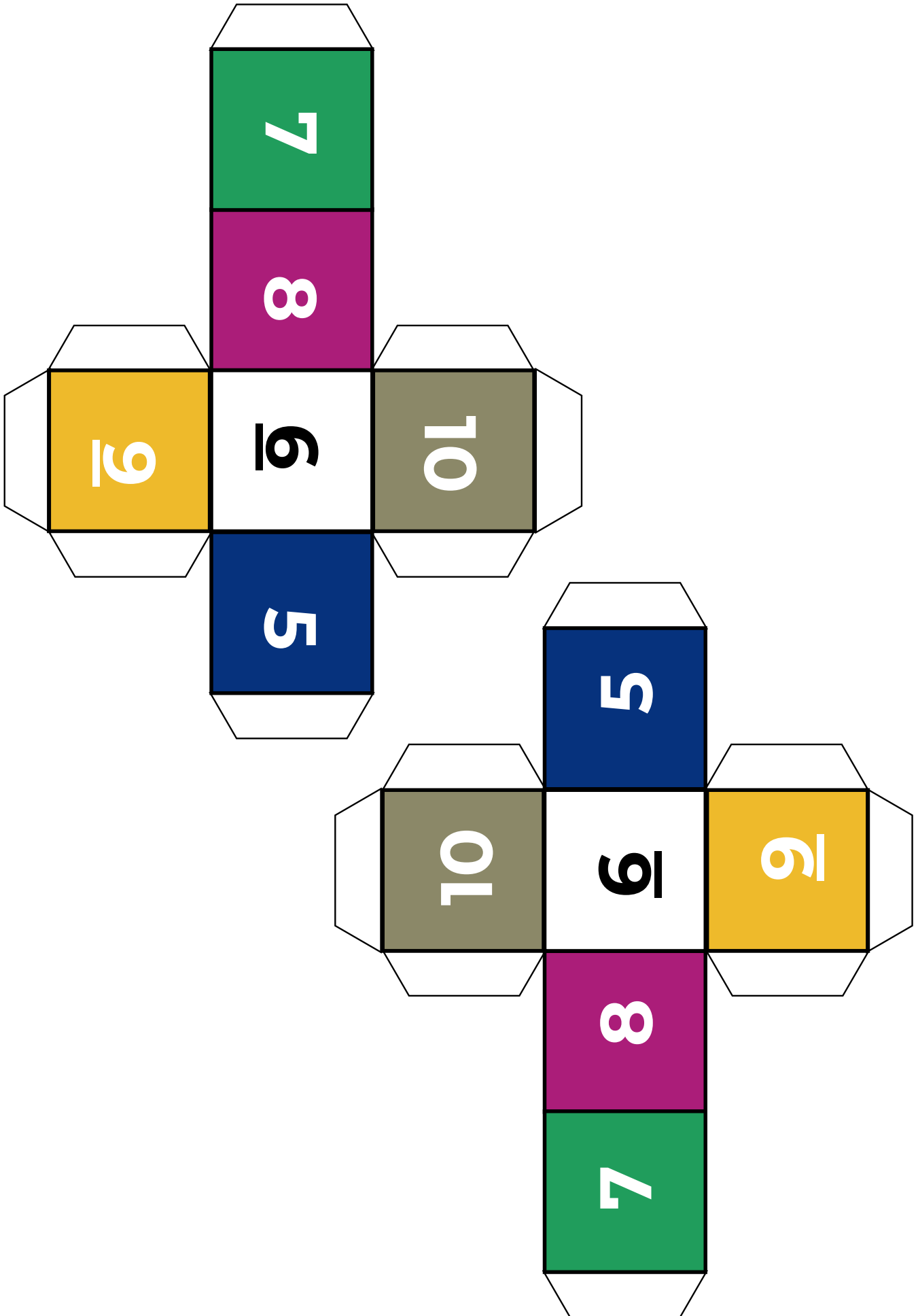
Differentiation Options:

- While students can rely on their mental math skills, encourage the building of muscle memory by having students represent each problem on a double ten frame. It will help students visualize the double and consider what 1 more or 1 less would be.

Questions to Encourage Student Discussion:

- How did you determine if you have a doubles fact or a doubles plus/minus one?
- What strategy did you use to solve?

Teacher Resource 10.7: Double Down Dice



Teacher Resource 10.8: Race to 20 Student Directions

Materials:

- 1 die numbered 1-6
- Race to 20

This game is designed for pairs or small groups. Students will be encouraged to use any strategy and explain why it was chosen.

1. Provide each student with a Race to 20 recording sheet. This will be essential in seeing the strategies students used when solving the problem.
2. Invite STUDENT 1 to roll the die. STUDENT 1 should record the addition sentence beginning at zero on the Race to 20 recording sheet and explain the strategy used. STUDENT 2 should check the answer using a strategy.
3. Encourage STUDENT 2 to roll the die next and follow the same steps.
4. Students should continue taking turns adding from their last turn until one player reaches 20. The first player to 20 wins!

Differentiation Options:

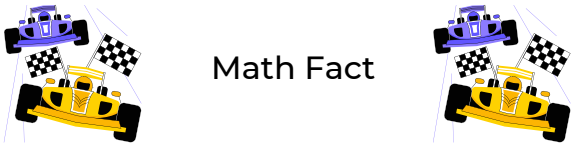
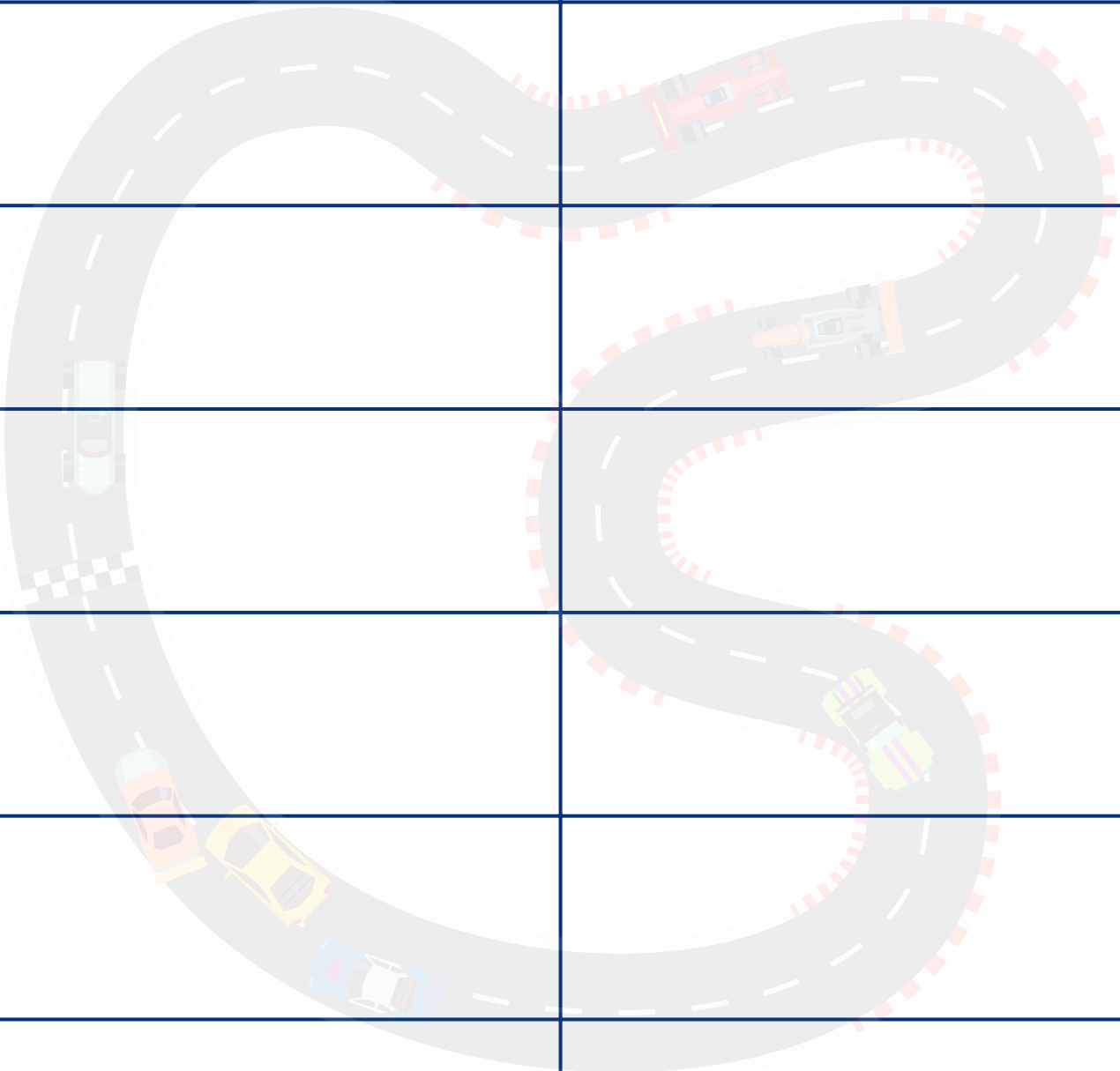
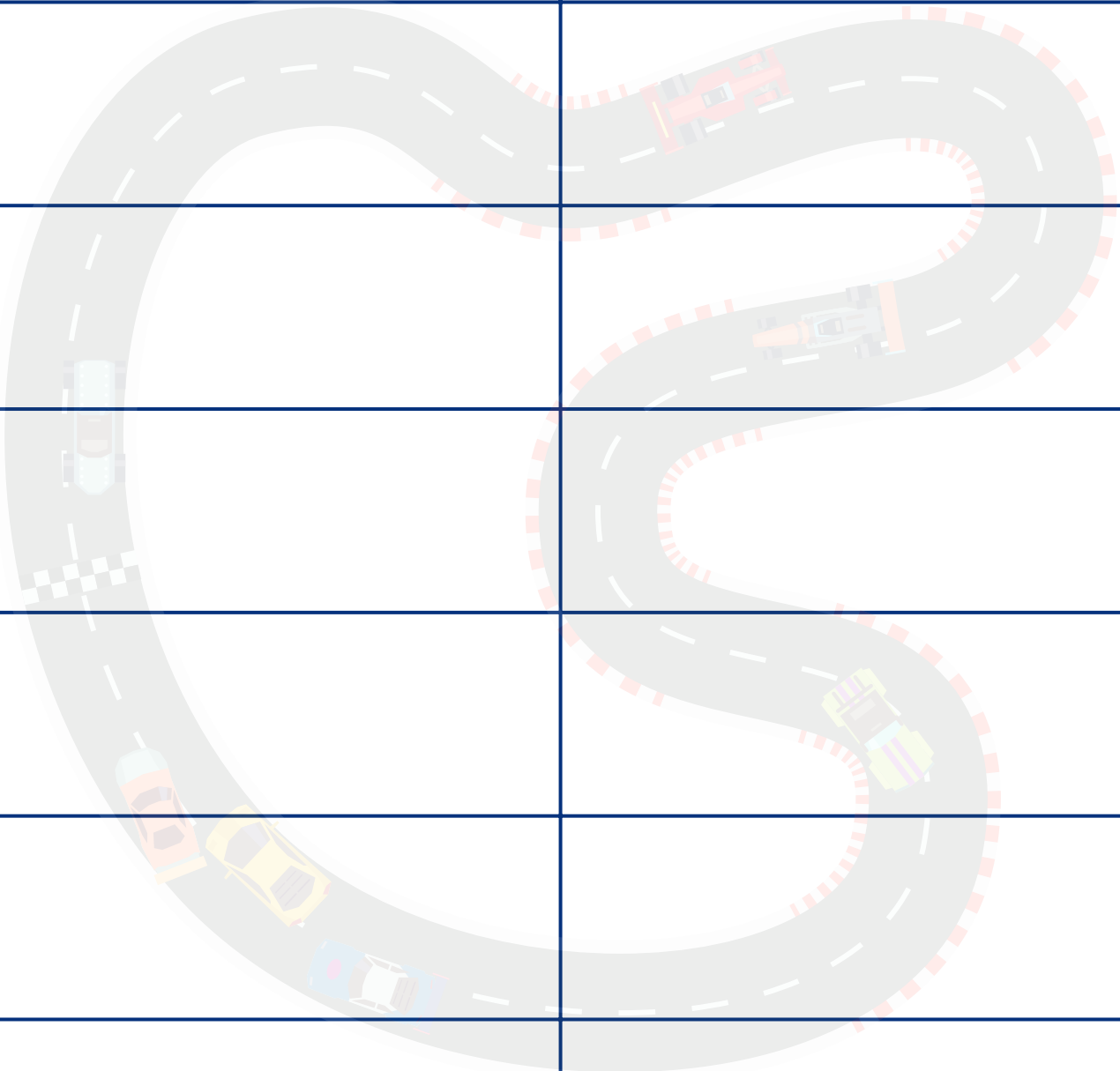
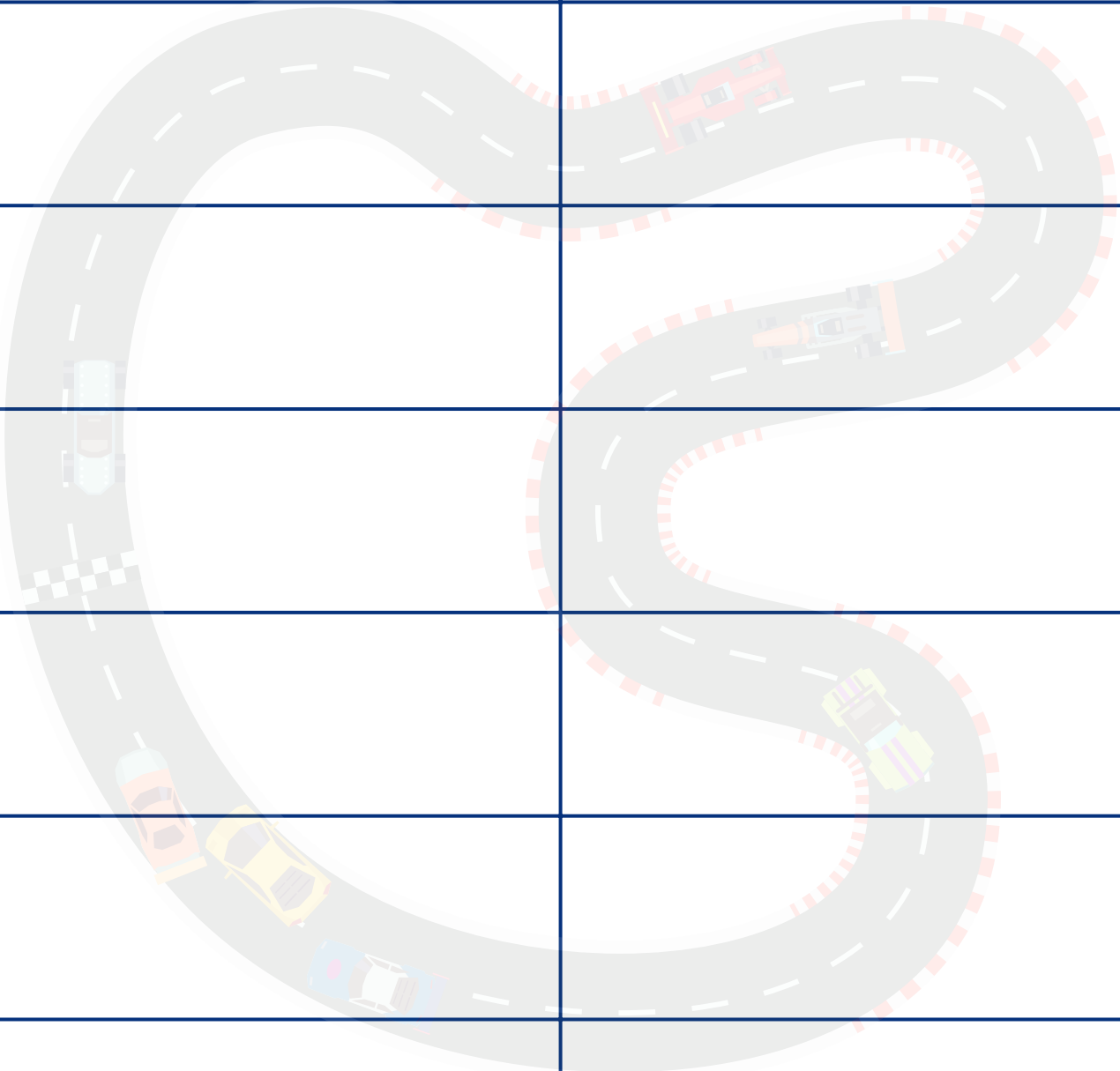
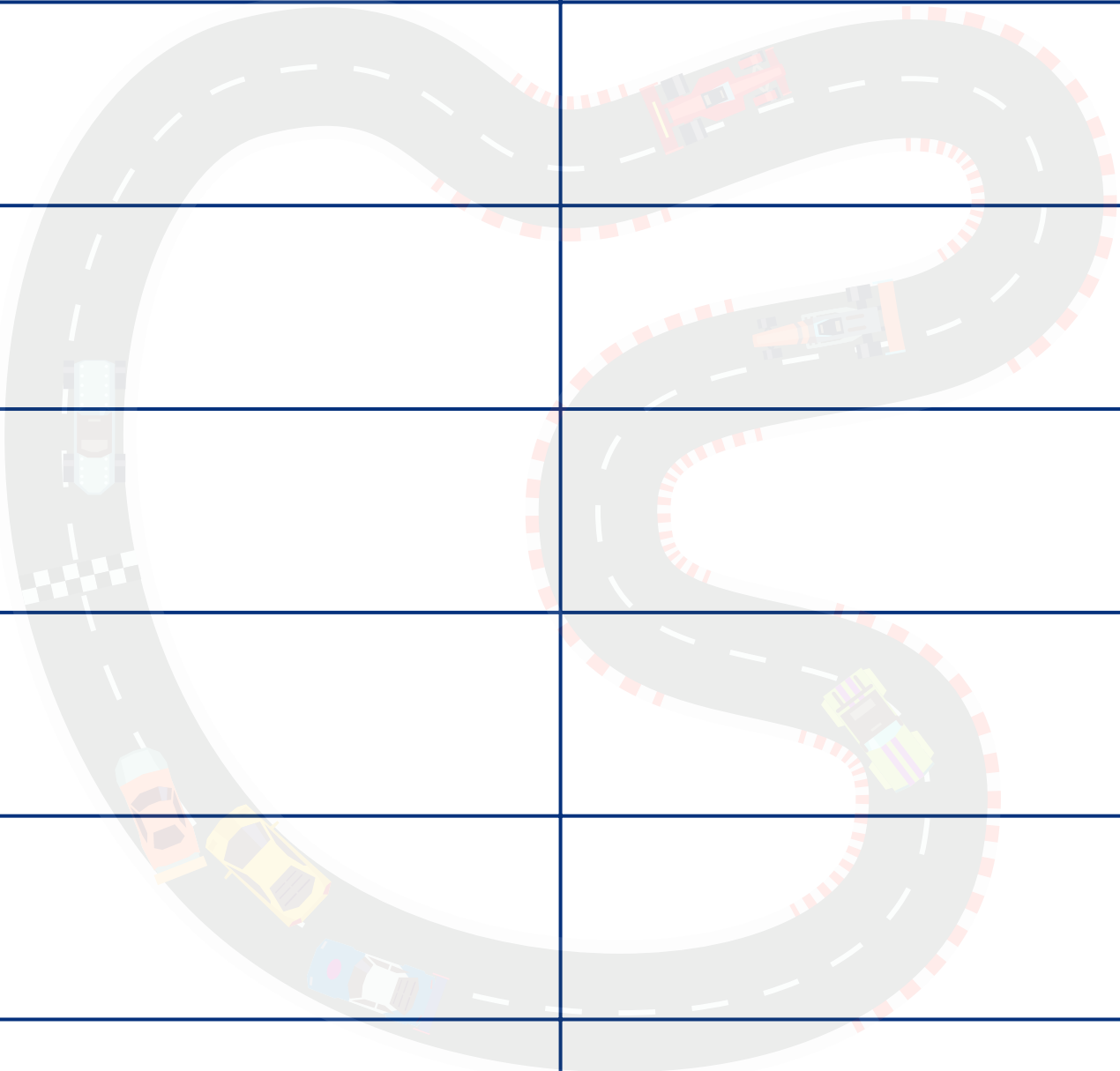
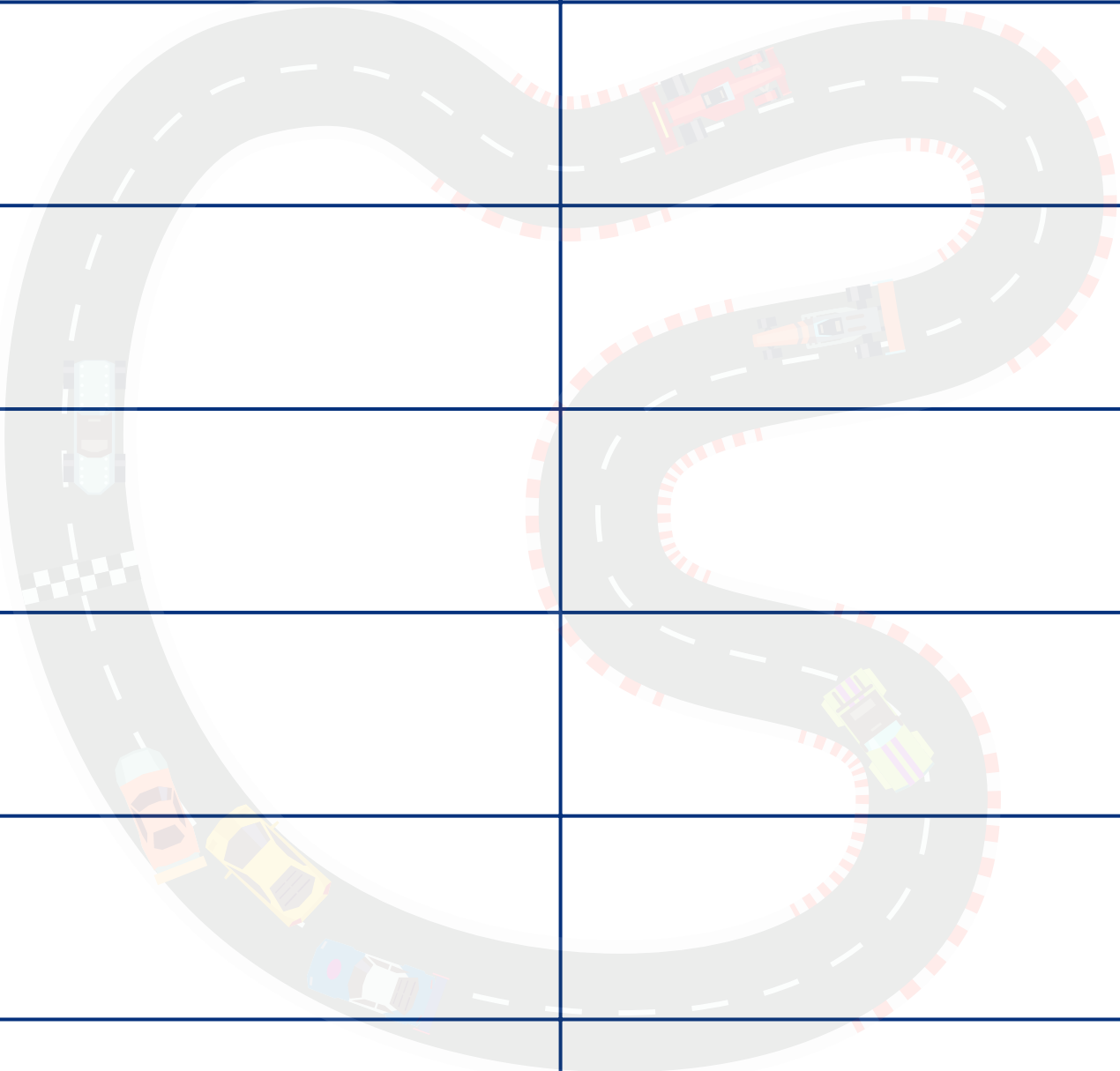
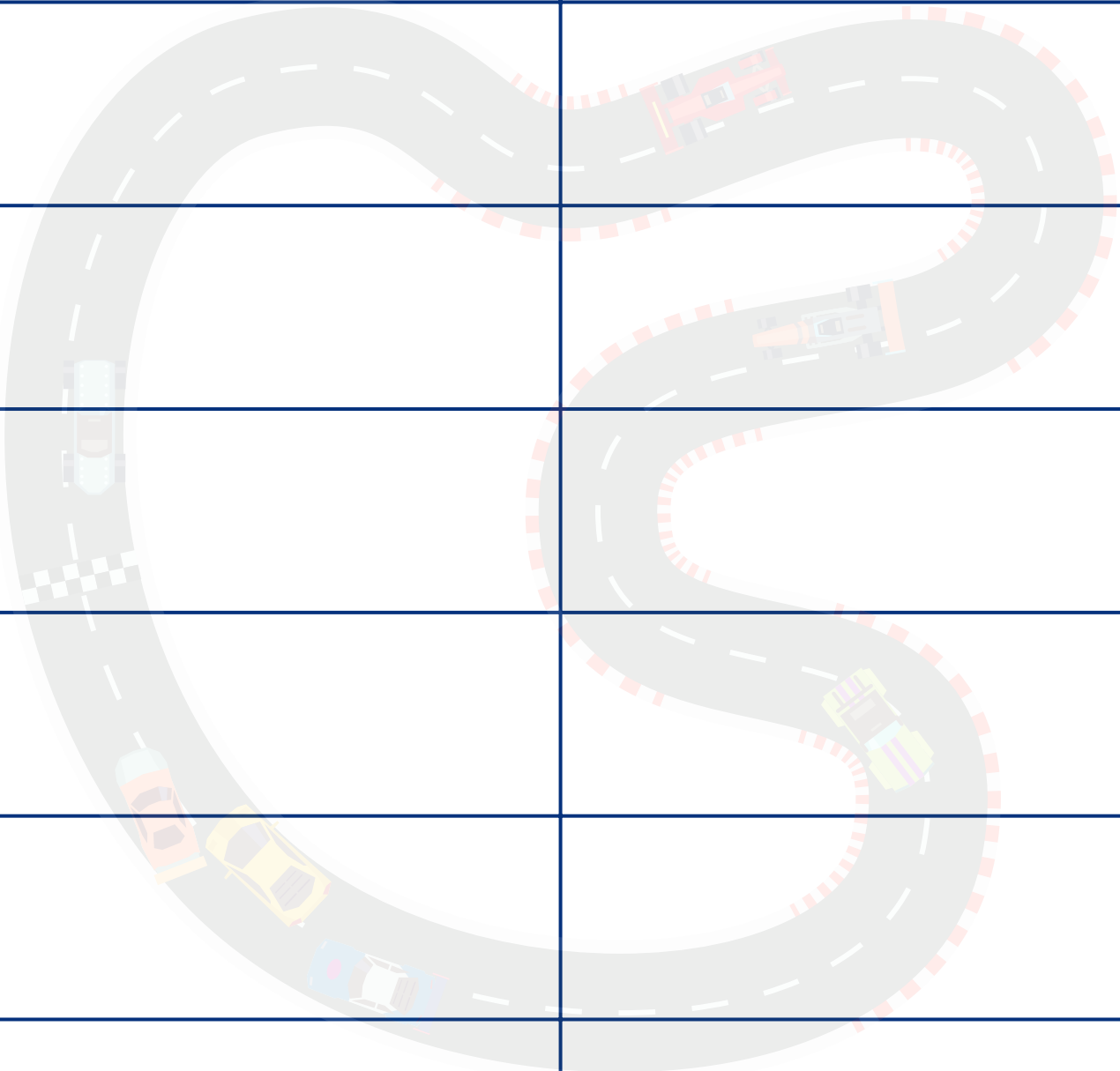
- The Race to 20 recording sheet would be a great progress monitoring activity. It can be saved to check students' progress and later partnered with an interview.
- If needed, allow students to check the answer using a double ten frame and some counters. At this point, the goal is for students to use mental math strategies first and then check with counting as necessary.
- Encourage students to play this game over and over again with different strategies. You might challenge students to not use counting on or only to work with doubles.

Questions to Encourage Student Discussion:

- What strategy would you use to solve this one? Why?
- What strategy would you not use to solve this one? Why not?
- Which ones were easier for you to solve? Why?

Teacher Resource 10.8: Race to 20

Name: _____

 <p>Math Fact</p>	<p>What strategy did you use?</p>
	
	
	
	
	
	

Teacher Resource 10.9: Using Strategies to Add Student Directions

Materials:

- Addition Fact Cards
- Using Strategies to Add

This game is designed for pairs or small groups. Students will be encouraged to use all strategies and explain each one.

1. Cut apart the Addition Fact Cards. They will last longer if laminated. Provide each student with a Using Strategies to Add Recording Sheet.
2. Shuffle the cards and lay them face down on the table.
3. Invite STUDENT 1 to choose a card and show it to the group.
4. Each student should look at the number and locate that box on their Using Strategies to Add Recording Sheet. Challenge each student to choose a strategy to solve the addition problem, recording it in detail in the appropriate box.
5. All the students should then compare strategies to see if they have the same answer. Challenge students to share their reasoning.
6. Encourage STUDENT 2 to choose a card and repeat the same process.

Differentiation Options:

- The Using Strategies to Add Recording Sheet would be a great progress monitoring activity. It can be saved to check students' progress and later partnered with an interview.
- As an additional activity, encourage students to sort the cards by the strategies they think would be the most efficient to solve.
- Provide students with anchor charts or notes of each strategy to help them determine which strategy to use.

Questions to Encourage Student Discussion:

- What strategy would you use to solve this one? Why?
- What strategy would you not use to solve this one? Why not?

Teacher Resource 10.9: Using Strategies to Add

1 $9 + 7 = ?$	2 $? = 8 + 9$
3 $7 + 5 = ?$	4 $? = 7 + 8$
5 $8 + 7 = ?$	6 $? = 6 + 5$
7 $? = 9 + 9$	8 $? = 9 + 4$
9 $6 + 6 = ?$	10 $? = 6 + 8$

Teacher Resource 10.9: Using Strategies to Add

11

$$12 + 5 = ?$$

12

$$? = 14 + 3$$

13

$$2 + 17 = ?$$

14

$$? = 11 + 8$$

15

$$? = 12 + 4$$

16

$$16 + 2 = ?$$

17

$$3 + 2 = ?$$

18

$$7 + 6 = ?$$

19

$$4 + 4 = ?$$

20

$$? = 5 + 5$$

Teacher Resource 10.9: Using Strategies to Add

Name: _____

1	2
3	4
5	6
7	8
9	10

Teacher Resource 10.9: Using Strategies to Add

Name: _____

11	12
13	14
15	16
17	18
19	20