LESSON OVERVIEW

Lesson 4
Understand Even and Odd Numbers

Lesson Objectives

Content Objectives

- Identify odd and even numbers.
- Relate doubles and doubles +1 facts to odd and even numbers.
- Use skip counting by 2s to identify even numbers.

Language Objectives

- Tell whether a number is odd or even.
- Draw a picture to show whether a number is odd or even.
- Skip count by 2s to name even numbers.

Standards for Mathematical Practice (SMP)

2 Reason abstractly and quantitatively.

3 Construct viable arguments and critique the reasoning of others.

4 Model with mathematics.

7 Look for and make use of structure.

Prerequisite Skills

- Know doubles facts to 20.
- Skip count by 2s.
- Understand the meaning of equal groups.

Lesson Vocabulary

- **even number** an even number of objects can be put into pairs or into two equal groups without any leftovers. An even number always has 0, 2, 4, 6, or 8 in the ones place.
- **odd number** an odd number of objects cannot be put into pairs or into two equal groups without a leftover. An odd number always has 1, 3, 5, 7, or 9 in the ones place.

Learning Progression

In Grade 1 students learn to skip count by 2s and learn doubles and doubles +1 facts. They also examine the concept of equality and equal shares.

In Grade 2 students continue to develop skip-counting abilities and deepen understanding of equality.

In this lesson students connect skip counting by 2s to the concept of odd and even numbers. They learn that even numbers can be seen as equal groups of 2 or as 2 equal groups of any number. Students relate the concept of 2 equal groups to doubles, examine doubles +1 facts, and relate both to the structure of even and odd numbers. They examine odd and even numbers in a 1–20 chart and study patterns.

In Grade 3 students continue the exploration of patterns in number charts. They examine patterns in addition and observe the structure found in multiplication tables.

Lesson Pacing Guide

Whole Class Instruction

Day 1
45–60 minutes

Toolbox: Interactive Tutorial*
Odd and Even Numbers

Introduction
- Opening Activity *20 min*
- Think It Through Question *5 min*
- Think *10 min*
- Think *10 min*
- Reflect *5 min*

Practice and Problem Solving
Assign pages 29–30.

Day 2
45–60 minutes

Guided Instruction

Think About Identifying Even and Odd Numbers
- Let's Explore the Idea *15 min*
- Let's Talk About It *20 min*
- Try It Another Way *10 min*

Practice and Problem Solving
Assign pages 31–32.

Day 3
45–60 minutes

Guided Practice

Connect Ideas About Even and Odd Numbers
- Evaluate *15 min*
- Analyze *15 min*
- Explain *15 min*

Practice and Problem Solving
Assign pages 33–34.

Day 4
45–60 minutes

Independent Practice

Apply Ideas About Even and Odd Numbers
- Put It Together *30 min*
- Pair/Share *15 min*

Day 5
45–60 minutes

- On-Level, Intervention, or Challenge Activity *20 min*

Toolbox: Lesson Quiz
Lesson 4 Quiz

*We continually update the Interactive Tutorials. Check the Teacher Toolbox for the most up-to-date offerings for this lesson.

Small Group Differentiation

Teacher-Toolbox.com

Reteach
Ready Prerequisite Lessons *45–90 min*

Grade 1
- Lesson 6: Doubles and Doubles Plus 1

Student-led Activities
Math Center Activities *30–40 min*

Grade 2 *(Lesson 4)*
- 2.7 Even or Odd?
- 2.8 Facts for Even and Odd Numbers

Personalized Learning

i-Ready.com

Independent
i-Ready Lessons* *10–20 min*

Grade 1 *(Lesson 6)*
- Addition Facts: Doubles

Opening Activity

Equal and Unequal Groups

Objective Examine equal and unequal groups of objects to explore the concept of odd and even numbers.

Time *20–30 minutes*

Materials for each student

- a set of 20 connecting cubes
- pencil and paper or whiteboards

Overview

Students explore the concept of odd and even numbers by breaking cube trains into equal groups. Students will develop the understanding that not all numbers can be divided into two equal groups.

Step By Step

1 Prepare students for the activity.

- Give each student or student group a set of connecting cubes.
- Ask students to follow along as you give instructions and model the activity.

2 Work with an even number of cubes.

- Instruct students to connect 6 cubes to make a train. Model this with your set of cubes.
- Tell students to break the train into 2 equal groups. Ask them how they know the groups are equal. Listen for ideas such as counting the cubes in each group or matching them up to see that they are the same.
- Repeat with a train of 10 cubes.

3 Work with an odd number of cubes.

- Tell students to make a train of 13 cubes. Have them try to break the train into 2 equal groups. Tell students to get the groups as even as possible. Ask what they notice about the groups. [They are not equal.]
- Repeat with a train of 7 cubes.

4 Work independently with different numbers of cubes.

- Give students about 5 minutes to make trains with different numbers of cubes and try to break them into 2 equal groups. Have them record the numbers of cubes that can and cannot divide equally into 2 groups.

5 Discuss the results.

- Have students take turns giving you a number and telling if it did or did not divide equally. Write the numbers on the board in a vertical column in order from least to greatest. Write *yes* or *no* next to each number. For incorrect responses, ask students to justify with the cubes and correct the error.
- Discuss any observations students make about the numbers. Listen for reference to counting by 2s or other patterns.
- Ask: *What did you notice about the leftovers every time there were not 2 equal groups?* [There was 1 extra cube.] *What do you think it means when we say a number is even?* [The numbers can be divided *evenly* into 2 groups.]

Teacher Notes

At A Glance

Students explore the concept of odd and even numbers by breaking apart numbers of items into groups of 2. Then students explore ways of thinking about odd and even numbers.

Step By Step

- Introduce the question at the top of the page. Remind students of what they discovered in the opening activity.
- Draw attention to the socks that are circled. Guide students to see that there are 4 groups of 2 socks each with no leftovers.
- Read the **Think** section together. Instruct students to circle groups of 2 shoes and answer the question.
- Use the Mathematical Discourse questions to reinforce the relationship between even and odd numbers.

▶ Mathematical Discourse 1–3

▶ Hands-On Activity

Think It Through

What are even and odd numbers?

You can break apart some numbers into groups of 2. Look at these 8 socks.

Think **Sometimes when you make groups of 2, there is a leftover.**

Look at these 7 shoes.

Circle groups of 2.

How many shoes are NOT in a group of 2? 1

▶ Mathematical Discourse

1 *How are the leftover shoes you found on this page like the leftover blocks in the opening activity?*

Students should notice that in both cases there is 1 leftover.

2 *What would happen if you added 1 more shoe to the group of 7? Why?*

If you added 1 more shoe, you could make another group of 2.

3 *What would happen if you took away 1 shoe from the group of 7? Explain.*

If you took away 1 shoe, you could make 3 groups of 2 and have no leftovers.

▶ Hands-On Activity

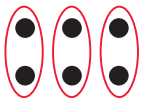
Use models to understand odd and even numbers.

Materials: connecting cubes

- Ask each student to take a handful of cubes. Make sure there is variation in how many they end up with. Have students organize the cubes into groups of 2.
- Invite students to tell whether their cubes divided evenly or if there was a leftover. Help them recognize that students started with different numbers of cubes but there are only two possible outcomes: equal groups of 2 or 1 leftover.
- Ask students if they think this would happen if they combined cubes with a partner or if they grouped all the cubes in the classroom. Help them generalize that no matter how many cubes are used, they can either be grouped evenly into groups of 2 or there will be 1 leftover.

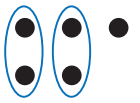
Think **Make groups of 2 to tell if a number is even or odd.**

A number is **even** if you make groups of 2 and have no leftovers.



There are no leftovers, so 6 is even.

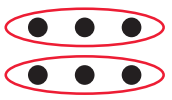
A number is **odd** if you make groups of 2 and have 1 leftover.



There is 1 leftover, so 5 is odd.

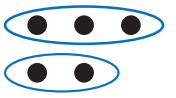
Think **Try making 2 equal groups to tell if a number is even or odd.**

A number is **even** if you can make 2 equal groups.



Each group has the same number, so 6 is even.

A number is **odd** if you cannot make 2 equal groups.



Each group has a different number, so 5 is odd.

Reflect **Work with a partner.**

1 Is 9 an even or odd number? Why?

Possible answer: 9 is an odd number because when I make groups of 2, there is 1 leftover.

Step By Step

- Read the first **Think** section together. Ask students how this relates to what they discovered on the previous page.
- Read the second **Think** section together. Make sure that students understand the difference between groups of 2 and 2 equal groups.
- Have students discuss the **Reflect** question with a partner and write their reply in the space provided.

Real-World Connection

SMP TIP **Model with Mathematics**
Have students consider the scenarios described in the Real-World Connection and ask whether it is possible for there to be more than one person left over. Have students use a model to explain their thinking. *(SMP 4)*

Concept Extension

Ready Mathematics PRACTICE AND PROBLEM SOLVING

Assign *Practice and Problem Solving* **pages 29–30** after students have completed this section.

Concept Extension

Examine unequal groups of cubes.

Materials For each pair: connecting cubes

- Put students in pairs. Have partners make a train of 12 cubes, then break it into a group of 7 and a group of 5. Ask partners to discuss why this would or would not be a good way to show if 12 is odd or even.
- Call on volunteers to share their ideas with the class. Help students recognize that by moving 1 cube from the group of 7 to the group of 5, you can make 2 groups of 6.
- Repeat the activity using 11 cubes in 4 groups of 2 and 1 group of 3. Ask students to rearrange the cubes to show whether 11 is odd or even.

Real-World Connection

Relate the concept of odd and even numbers to a familiar situation. Ask students what happens when they are picking two teams for an outdoor game or a game in gym class and there is an even number of students. What happens when there is an odd number of students?

Encourage students to think of other real-world situations that involve odd and even numbers. They may think of pairing up for math activities or pairing up with a "buddy" on a field trip. Discuss what happens when there is an even or odd number of students.

Guided Instruction

At A Glance

Students model the concept of even and odd numbers by dividing groups of items into groups of 2 or into 2 equal groups. Then students use doubles and doubles + 1 facts to identify odd and even numbers. They skip count by 2s to identify even numbers.

Step By Step

Let's Explore the Idea

- Tell students that they will have time to work individually on the problems on the page and then share their responses in groups.

▶ Mathematical Discourse 1

- Remind students that in Problems 2 and 3, they are circling groups of 2. In Problems 4 and 5, they are circling 2 equal groups, if possible. Since each picture has 2 rows, suggest that students circle each row to try to find 2 equal groups.

▶ Mathematical Discourse 2

▶ Visual Model

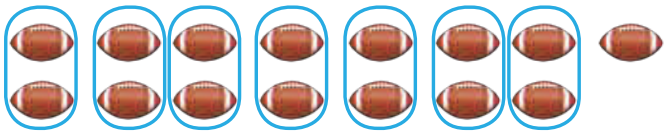
▶ English Language Learners

Think About **Identifying Even and Odd Numbers**

Let's Explore the Idea Tell if a number is *even* or *odd*.

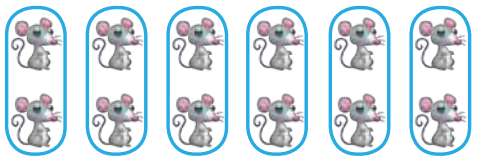
Circle groups of 2. Then tell if the number is *even* or *odd*.

2



15 is odd .

3



12 is even .

Show whether you can make 2 equal groups. Then tell if the number is *even* or *odd*.

4

14 is even .

5

11 is odd .

▶ Mathematical Discourse

1 *How can you tell if a number is even or odd?*

If there are no leftovers after making groups of 2, the number is even. If there is a leftover, the number is odd.

2 *In Problem 5, how did you know the number of lions to circle?*

Students might recognize that 5 lions match up in each row, but the top row has 1 more lion.

▶ English Language Learners

Help ELL students connect an everyday meaning of *even* and *odd* to the mathematical use of the word. *Odd* can mean *different*. The leftover means that the groups are not the same (they are different). The word *even* relates to equality, for example, *evenly* dividing some cookies.

▶ Visual Model 1

Analyze even/odd structure in dominoes.

- Project a domino block or draw a large domino with 8 dots. Ask students if they can tell without counting whether the number of dots is an even or odd number. They should recognize that the way the dots are lined up, you can see equal groups of 2 or 2 equal groups.
- Repeat the activity, showing dominoes with a variety of even and odd numbers of dots. Ask students to determine whether the number shown is even or odd and justify their responses.
- This activity builds visual/spatial skills and reinforces the concept of the structure of even and odd numbers.

Let's Talk About It

Work with a partner.

6 Write a doubles fact for 8.

4 + 4 = 8

7 Write a doubles + 1 fact for 9.

4 + 4 + 1 = 9

8 Write these doubles or doubles + 1 facts.

5 + 5 = 10 3 + 3 + 1 = 7

6 + 6 = 12 7 + 7 + 1 = 15

9 Are sums of doubles odd or even numbers? Are sums of doubles + 1 odd or even numbers? Explain.

Possible answer: Doubles show 2 equal groups, so sums of doubles are even. Doubles + 1 show 2 equal groups and 1 leftover, so sums of doubles + 1 are odd.

Try It Another Way **Skip count by 2s to find even numbers.**

You can skip count by 2s to find even numbers.

10 Skip count by 2s to finish this list. Stop at 20.

2, 4, 6, 8, 10, 12, 14, 16, 18, 20

11 Numbers on your list in Problem 10 are even. Numbers less than 20 that are not on your list are odd.

Circle the even numbers. Underline the odd numbers.

11 (14) (16) 17

Step By Step

Let's Talk About It

- Organize students in pairs to complete this section. You may choose to work through Problem 6 with the class.
- As students work in pairs, walk around to each pair. Listen to and join in on discussions at different points.

▶ Mathematical Discourse 3 and 4

Try It Another Way

- Direct students' attention to **Try It Another Way**. Have volunteers come to the board and share their solutions on the number line used in the Visual Model.

▶ Visual Model

SMP TIP Look for Structure
Emphasize the structure of even and odd numbers on the number line, leading students to recognize the AB pattern that is formed. *(SMP 7)*

Ready Mathematics PRACTICE AND PROBLEM SOLVING

Assign *Practice and Problem Solving* **pages 31–32** after students have completed this section.

▶ Visual Model 2

See even and odd numbers on a number line.

- Draw a 0–20 number line on the board.
- Point to 0 and ask students to tell you where your first "jump" will land if you skip count by 2s. Make an arc from 0 to 2 on the number line.
- Continue to model skip counting on the number line by 2s. Lead students to notice that the numbers you landed on are even and the numbers in between are odd.
- On the same number line, make two arcs below the line, from 0 to 3 and from 3 to 6. Ask if 6 is odd or even. [even] Have students add 1 more, tell where you will land, and identify this number as odd or even. [7; odd] Repeat using other doubles and doubles + 1 facts from the student page.

▶ Mathematical Discourse

3 *How is using doubles and doubles + 1 like using the pictures in Let's Explore the Idea?*

Doubles are like finding 2 equal groups. When you add them, the sum is always even. The 1 in a doubles + 1 fact is like the leftover when you circle groups of 2.

4 *What would happen if you subtracted 1 from a doubles fact?*

It would be an odd number. If you take 1 away, one of the groups will have 1 less than the other.

Guided Practice

At A Glance

Students analyze pictures and real-world situations to determine whether numbers are even or odd. Then students demonstrate their understanding of even and odd numbers by identifying and generalizing a pattern on a 1–20 chart.

Step By Step

- Discuss each problem as a class using the discussion points outlined below.

Evaluate

- Ask: *When there are two apples left over, what does that tell you? How can you help Pat organize his apples differently?* Students should realize that Pat can put 1 leftover in each of the 2 groups to make 2 equal groups.

Analyze

- If students struggle to make sense of the scenario presented, lead them to choose an appropriate tool to help visualize the problem. Allow each student to select the representation that he or she finds most meaningful and then share it with the class.
- Some students may solve the problem by displaying 9 groups of 2 and 1 extra, while others may show 2 groups of 9 with 1 extra. Display models for both and discuss why they show the same total number.
- Show a third model by drawing a row of 9 dots below a row of 10 dots on the board. Ask volunteers to show how to find the total using all three models, and then write the corresponding equations. This investigation sets the stage for arrays that are presented in the next lesson.

Explain

- Draw two rows of 4 circles. Ask: *How many are in each row?* [4] *Is this number even or odd?* [even] *What is the total? Is it even or odd?* [8; even]
- Draw one more circle in each row. Ask the same questions as above. Point out that there is an odd number of circles in each row, but the total is still an even number.

Connect Ideas About Even and Odd Numbers

Talk about these questions as a class. Then write your answers.

12 Evaluate Pat looks at this picture of 14 apples. He says that 14 is an odd number. Do you agree? Explain.

Possible answer: No. There are 2 leftovers, not 1. Each leftover can be added to a group of 6. Then there are 2 equal groups of 7. So 14 is even.

13 Analyze Ms. Lane's class is in pairs. There are 9 pairs of students. There is also 1 student paired with Ms. Lane. How many students are in the class? Is the number even or odd? Explain.

Possible answer: 9 groups of 2 students plus 1 with Ms. Lane is 9 + 9 + 1 = 19. 19 is odd. If you make groups of 2, the class has 1 leftover.

14 Explain Mimi says that when she adds doubles, the sum is always even. It doesn't matter if the doubles are odd or even numbers. Do you agree? Explain.

Possible answer: I agree. Doubles form two equal groups, which tells me a number is even. The addends of a doubles fact can be even or odd.

Scoring Rubrics

Part A

Points	Expectations
2	The student completes the color pattern accurately and describes at least one pattern, clearly articulating the even/odd structure.
1	The student completes most of the color pattern accurately and describes some kind of an even/odd pattern, although not clearly.
0	The student does not complete the color pattern accurately and does not describe an even/odd pattern.

Apply

Ideas About Even and Odd Numbers

Put It Together **Use what you have learned to complete this task.**

15 Use this table to answer the questions.

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

Odd numbers should be colored red. Even numbers should be colored blue.

Part A Color squares with odd numbers red. Color squares with even numbers blue. What patterns do you see in the numbers?

Possible answer: Every other number is odd. Every other number is even.

Part B Look at 15. Is the ones digit odd or even? Is 15 odd or even?

The ones digit, 5, is odd. 15 is odd.

Part C Look at 16. Is the ones digit odd or even? Is 16 odd or even?

The ones digit, 6, is even. 16 is even.

Part D Amy says that if a two-digit number has an even number in the ones place, the number is also even. Is she correct? Why or why not?

Possible answer: Amy is correct. When you skip count by 2, you get even numbers, and all of those numbers have an even number in the ones place.

Independent Practice

Step By Step

Put It Together

- Direct students to complete the **Put It Together** task on their own. Make sure they have red and blue crayons or pencils.
- Read the directions with students and make sure they understand each part of the task before proceeding.
- As students work on their own, walk around to assess their progress and understanding, to answer their questions, and to give additional support, if needed. Encourage students to list all the patterns they see in the chart. Some may notice that every other column contains even numbers and every other column contains odd numbers. Allow them to also explore other even/odd patterns, such as the pattern found in the diagonals.
- If time permits, ask students to share their observations and ideas about Amy's statement with the class.

Ready Mathematics PRACTICE AND PROBLEM SOLVING

Assign *Practice and Problem Solving* **pages 33–34** after students have completed Guided Practice.

Parts B and C

Points	Expectations
2	The student identifies 5 and 15 as odd and 6 and 16 as even.
1	The student identifies either 5 and 15 as odd or 6 and 16 as even, but does not answer both questions correctly.
0	The student is not able to correctly identify the digits or numbers as odd or even.

Part D

Points	Expectations
2	The student justifies the statement by using logical reasoning or a model.
1	The student agrees with the statement, but the justification is not clear or lacks logical reasoning.
0	The student's response indicates a lack of understanding of the statement.

Differentiated Instruction

▶ Intervention Activity

Model odd and even numbers with rectangles.

Materials: 20 counters; 1-inch grid paper cut into various sizes of rectangles, each containing 2 rows (Activity Sheet 3, 1-Inch Grid Paper)

- Instruct students to select a rectangle and place a counter in each box. Ask if the number of counters is an odd or an even number and why. Direct students to write an equation to show how many counters are in each row and the entire rectangle. (Example: $4 + 4 = 8$)
- Discuss why one more counter cannot be placed inside the rectangle. Then have students place 1 counter outside the rectangle and write an equation that shows the total number of counters inside and outside of the rectangle. (Example: $4 + 4 + 1 = 9$) Talk about how this shows doubles + 1, which is an odd number.
- Have students select a different rectangle and repeat the above activities.

▶ On-Level Activity

Describe doubles and doubles + 1 strips.

Materials: 1-centimeter grid paper cut into strips of different lengths (1×6 up to 1×20; Activity Sheet 4, 1-Centimeter Grid Paper), crayons or colored pencils

- Ask each student to fold a 1×8 strip of grid paper in half. Model how to fold the strip so the grid lines are visible. Have students color each group of 4 squares with a different color. Discuss how this relates to doubles. Then ask students to refold the same strip in 4 groups of 2 squares. Emphasize that the entire strip is divided into groups of 2 with no leftovers. Ask students to describe how the model shows an odd or an even number.
- Tell students to fold a 1×11 strip so the fold is on a line, coming as close as possible to dividing the strip in half. Have them color only the squares that are part of the double, leaving one square blank. Then ask students to refold in groups of 2 squares starting at the colored end. Discuss how this relates to doubles + 1. Compare the odd and even strips they made.
- Repeat using different strips.

▶ Challenge Activity

Explore numbers that have more than two digits.

Materials: poster board or large paper

- Remind students of the statement made in Part D of Independent Practice: *If a two-digit number has an even number in the ones place, the number is also even.*
- Challenge students to determine if this generalizes to all numbers no matter how many digits the numbers have. Tell them that to prove the statement doesn't apply to numbers with more than two digits, they must find an example of a number with more than two digits that doesn't follow the statement.
- Allow students to use whatever tools they need to try to prove or disprove the statement. They should create a poster displaying their findings and be prepared to present it to the class.

Teacher Notes

LESSON QUIZ

Lesson 4
Understand Even and Odd Numbers

Teacher-Toolbox.com

Overview

Assign the Lesson 4 Quiz and have students work independently to complete it.

Use the results of the quiz to assess students' understanding of the content of the lesson and to identify areas for reteaching. See the Lesson Pacing Guide at the beginning of the lesson and the Differentiated Instruction activities that follow for suggested instructional resources.

Tested Skills

Problems on this assessment form require students to identify odd and even numbers and relate even and odd numbers to doubles and doubles + 1 facts. Students will need to know how to skip count by 2s and know their doubles facts to 20.

***Ready*® Mathematics**

Lesson 4 Quiz

Solve the problems.

1 Are the number of dots on each card odd or even?
Circle *Odd* or *Even* for each card.

a.  Odd Even

c.  Odd Even

b.  Odd Even

d.  Odd Even

2 Cheng has 2 pails of fish. Each pail has the same number of fish.
Which could be the number of fish that Cheng has in all?
Circle all the correct answers.

A 5

B 9

C 10

D 13

E 18

Lesson 4 Quiz continued

3 Write a doubles fact to show that 12 is even.
Write a doubles + 1 fact to show that 15 is odd.

12 = _____ + _____

15 = _____ + _____ + 1

4 Ethan adds 3 and 3. Sarah adds 7 and 7.
Which statement is true? Circle the correct answer.

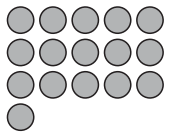
A Ethan's sum is odd and Sarah's sum is even.

B Sarah's sum is odd and Ethan's sum is even.

C Both sums are odd.

D Both sums are even.

5 Farah looks at the picture and says that 16 must be an odd number.
Is Farah correct? Explain why or why not.



Common Misconceptions and Errors

Errors may result if students:

- confuse the meaning of *even* and *odd*.
- count the number of rows, instead of the number of items, in a diagram.
- think a number is odd if the doubles fact involves odd numbers.
- do not understand that the sum of two even or two odd numbers is even.

***Ready*® Mathematics**

Lesson 4 Quiz Answer Key

1. **a.** Odd
b. Even
c. Even
d. Odd
DOK 1

2. C, E
DOK 2

3. 6, 6
7, 7
DOK 2

4. D
DOK 2

5. Farah is not correct. Possible explanation: If you place the 16 dots into 2 equal groups, there will be none left over. So 16 is even, not odd.
DOK 3