Mathematicians Say: The Sum of Two Even Numbers:

Once your students can identify even and odd numbers, they will enjoy investigating whether or not the sum of two even numbers is *always* another even number. Testing this idea provides a context in which your students can apply and practice their growing academic skills.

Before Class

Print copies of student handouts and a class list with room for notes beside each student's name.

Collect mathematical manipulatives, pencils, markers, or other supplies being used.

Decide which academic standards you want to address in this lesson (see below).

Write learning goals based on the standards being addressed.

Post learning goals in plain sight.

Refer to learning goals often during the lesson.

Sample learning goals
> Written in student friendly language
> Linked to Common Core Standards they support

I can use counting stones to decide if a number is even or odd.

I can use mental math to add pairs of even numbers under 20.

I can test this idea by adding pairs of even numbers in order to see if the answer is an even or odd number.

I can draw pictures to help me figure out if pairs of even numbers always add up to another even number.

During Class

What does it mean to test ideas in math? Invite students to share what they already know about addition, sums, even numbers, odd numbers, and collecting information to determine if an idea is true or false. Make sure they can identify small and large even numbers.

Introduce the idea that you want them to test. Bring your students' attention to the statement at the top of the handout. Remind them that reading and understanding informational text requires attention to detail because each word is used in a specific way in math. Make sure they understand the statement.

The sum of two even numbers is always an even number.

- Have your students underline the words that have special mathematical meanings.
- Have them look up the meaning of each term.
- Let them draw symbols, doodle images, or write synonyms to show the meaning of each term.
- Have them restate the sentence in their own words.
- Invite students to wonder if this statement holds true for every pair of even numbers.

Direct Teaching: Model what you want your students to do in order to test the idea. For example, demonstrate how to use manipulatives to determine if a number is even or odd. Think aloud as you add two even numbers in order to see if their sum is also an even number. Refer to the posted learning goals so that students connect what they are doing with what they are learning. You may encourage them to record your work on their handouts or not depending on your students.

For example:

- Choose a pair of even numbers such as 6 and 8.
- Walk through this example with the entire class.
- Make sure students can explain how the example supports the statement.
- Consider filling this answer space with an example before you copy the student handouts.
- Feel free to share your awestruck enthusiasm for how cool this relationship is.
- **Support** your students as needed: Let students in need of support work with a partner who is more confident. Alternatively, prepare them for this lesson by making sure they understand the concepts and vocabulary in advance.
- **Challenge** your students as needed: What would mathematicians say about the *difference* between even numbers? Or, What about the *product* of two even numbers?

Guided Learning: Repeat the process of adding two even numbers to determine if their sum is also an even number. Encourage your students to help by suggesting steps to follow and sharing their reasoning as you all work through this example together.

Share an example:

- Invite the class to help you create and test another example.
- Adjust the pace to hold student interest and yet, ensure comprehension.
- Show them how to record the process on their handouts.
- Make use of number lines, diagrams, and doodles to support understanding.

Collaborative Learning: Let students work with their peers in small, heterogeneous groups to follow your step by step examples on their own. Circulate around the room, making notes next to student's names on your printed class list to document their progress toward the posted learning goals. Make note of who uses vocabulary correctly or anyone who seems less confident about using the math vocabulary in conversation.

As each group finishes their work either invite them to continue as a group (to benefit those who need the additional confidence gained by working through another example collaboratively) or let them transition to working independently.

Share another example:

- Have students work in small groups or pairs to create and test another example.
- Make sure that each student in the group writes their initials on their peer's handouts to document which students worked together.
- Make sure that each student records the group's work on their individual handout.
- Let the students who need more support with you or with an aide.
- Carefully monitor understanding and comprehension.

Independent Learning: Transition from testing the idea as a group to testing the idea individually. Working by themselves allows each student to choose their level of difficulty. Some students will enjoy using larger and larger numbers to test this idea, while others will be satisfied using smaller numbers to continue testing. Make note of who uses manipulatives and who uses mental math.

Share another example:

- Let each student create their own unique examples that test or illustrate the statement.
- Let students use calculators and another sheet of paper to search for a pair of even numbers which do not follow this relationship.
- Encourage students to create a table showing their results:

Share a counterexample if possible:

- Feel free to offer a Million dollar prize for any counterexample found.

● Students in need of a challenge might want to search for other even/odd math rules.

Closure: Have a whole class discussion to reflect on the learning goals and the results of their testing. Make notes next to student's names on the class list relating to their progress toward specific learning goals. Allow students to complete the final section of the handout.

Mathematicians Say:

The sum of two even numbers is always another even number.

What do you say?

- Have students write this idea in their own words.
- Encourage them to share diagrams and doodles that support the statement.
- Have them explain how their examples support the statement.
- Invite them to share their thoughts and reactions to discovering this relationship.
- Invite students to share how they might use this rule to help them with their math work.
- Remember that this lesson DOES NOT provide mathematical proof that this rule holds true in all cases - so if some students remain skeptical - encourage them to explain what kind of information they would need to see in order to say that this relationship holds true in every case. These 'hold outs' are your future rocket scientists or mathematicians!

Assess Student Progress:

Score and comment on individual student's handouts. Refer to progress notes that you wrote on the class list during the lesson. Identify students in need of review or reteaching. Make plans to support those students. Based on the quality of the student work, decide what kinds of activities would benefit the class in terms of homework, extension of ideas, or moving on to new skills and concepts.

Document student progress in terms of learning goals. You might decide to make copies of all student work before returning originals to students. Otherwise, document scores & progress toward learning goals in student files.

Reflect on Your Teaching:

Consider various elements of the lesson such as: student participation, pace, use of classroom routines, or anything that impacted the quality of student engagement. How well did the activities match the learning goals? How well did the learning goals engage your students? What went well during that lesson? How did the students do? What would you change for next time?

Possible Next Steps:

Download another math rule for your students to investigate:

Sum of Two Odd Numbers

Some of the Common Core State Standards that could be addressed are listed below. You can adapt your lesson to focus on the standards your students need to work on.

Grade 1 Common Core Standards	Activity relating to Standard
Add and subtract within 20	Students work with manipulatives to classify numbers as even or odd. Students work with manipulatives to test the idea that the sum (or difference) of a pair of even numbers is also an even number (up to 20).
Work with addition and subtraction equations.	Students write equations to show that adding/subtracting a pair of even numbers results in an even number sum/difference.
Understand place value.	Students use the digit in the unit's place to determine if a number is even or odd.
Represent and interpret data.	Students organize and display the data they have collected to show how often adding pairs of even numbers yields an even sum and how often it yields an odd sum.
Reading: Informational Text	Ask and answer questions to help determine or clarify the meaning of words and phrases in a text. Students strive to understand each word and how the words fit together in order to make sense of this mathematical statement.
Writing	After they have completed their investigations of this idea, students could write about their discoveries, explain how to sort even & odd numbers, explain how they tested the idea, and share whether or not they are convinced that it is always true.
Speaking & Listening	Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups.
Presentation of Knowledge and Ideas:	Describe properties of even numbers including relevant details, expressing ideas and feelings clearly.
Vocabulary Acquisition and Use:	With guidance and support from adults, demonstrate understanding of word relationships and nuances in word meanings.

Grade 2 Common Core Standards	Activity relating to Standard
Add and subtract within 20.	Students use manipulatives, gradually replaced with mental math, to test the idea that the sum (or difference) of a pair of even numbers is an even number.
Work with equal groups of objects to gain foundations for multiplication.	Determine whether a group of objects (up to 20) has an odd or even number of members, e.g., by pairing objects or counting them by 2s; write an equation to express an even number as a sum of two equal addends.
Reading: Informational Text	Determine the meaning of words and phrases in a text relevant to a *grade 2 topic or subject area.* Students can discuss the difference between informational text such as the statement they are testing and fictional or narrative text.
Writing	After they have completed their investigations of this idea, students could write about their discoveries, explain how to sort even & odd numbers including some examples, explain how they tested the idea adding some supporting examples of their work, and then share whether or not they are convinced that it is always true.
Comprehension and Collaboration:	Follow agreed-upon rules for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion).
Presentation of Knowledge and Ideas:	Recount their experience with investigating even numbers using appropriate facts and relevant, descriptive details, speaking audibly in coherent sentences.
Vocabulary Acquisition and Use:	Use glossaries and beginning dictionaries, both print and digital, to determine or clarify the meaning of words and phrases.

Grade 3 Common Core Standards	Activity relating to Standard
(I)dentify and explain patterns in arithmetic.	Encourage students to evaluate the underlying reasons for the idea that the sum (or difference) of a pair of even numbers is an even number. Consider the relationships between addition & multiplication, subtraction & division, then decide what mathematicians might have to say about multiplying or dividing a pair of even numbers.
Use place value understanding … to perform multi-digit arithmetic.	Students use three & four digit numbers to test the idea that the sum (or difference) of a pair of even numbers is an even number. Students use the digit in the unit's place to determine if a number is even or odd.
(R)elate area to multiplication and to addition.	Create a series of rectangles with even numbered side lengths to explore whether or not rectangles with even side lengths will also have an area that is expressed by an even number.
Reading: Informational Text	Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 3 topic or subject area. Students recognise that some words such as even & odd have specific meanings when used in a mathematical context.
Writing	After they have completed their investigations of this idea, students could write about their discoveries. They might share mathematical definitions for important vocabulary using illustrations as needed to provide clarity. They could use linking words and provide a lot of details to develop their explanations. Finally, they could share whether or not they are convinced that it is always true.
Comprehension and Collaboration:	Explain their own ideas and understanding in light of the discussion.
Presentation of Knowledge and Ideas:	Speak in complete sentences when appropriate to task and situation in order to provide requested detail or clarification.
Vocabulary Acquisition and Use:	Identify real-life connections between words and their use.

Mathematicians Say: name:

The sum of two even numbers is an even number.

For example:

Share an example:

Share another example:

Share another example:

Share a counterexample if possible:

Mathematicians Say:

The sum of two even numbers is an even number.

What do you say?

Definitions:

Even number: can be divided by two without a remainder, can be shared equally between two people, has 0, 2, 4, 6, 8 in the unit's place

Is: is equal to, is the same as, identical, fair trade for, interchangeable,

Odd number: has a remainder of one when divided by two, has 1, 3, 5, 7, 9 in the unit's place

Sum: the result of addition, total, aggregate,