Unit 1, Lesson 3

Números primos y números compuestos

Standards

Addressing	**4.OA.B.4, 4.OA.C.5**
Building Toward	**4.OA.B.4**

Instructional Routines

- Card Sort
- Choral Count

Goals

- Comprehend (in spoken and written language) the meaning of the terms “prime number” and “composite number.”
- Determine the factor pairs of a given whole number 1–100.
- Explain (orally and in writing) strategies for determining whether a given whole number is prime or composite.

Student Facing Learning Goals

Identifiquemos números primos y números compuestos.

Lesson Purpose

The purpose of this lesson is for students to identify factor pairs and determine whether a given whole number in the range 1–100 is prime or composite.

Narrative

In previous lessons, students were introduced to the terms “multiples” and “factor pairs.” In this lesson, they learn that whole numbers can be classified as prime or composite based on the number of factor pairs they have.

Students reason about these numbers in terms of the area and pairs of side lengths of rectangles. They learn that a **prime number** has exactly 1 factor pair—1 and the number itself. A **composite number** has more than 1 factor pair. They relate “prime” to a number that could represent the area of only one rectangle (with only one pair of side lengths) and “composite” to a number that could represent the area of multiple rectangles (with multiple pairs of side lengths).

Math Community
Tell students that, at the end of the lesson, they will be asked to identify specific actions from their “Doing Math” list they personally experienced.

Access for Students with Disabilities

- Engagement

Access for English Learners

- MLR8

Required Materials

Materials to Gather

- Math community poster: Lesson
- Grid paper: Activity 1, Activity 2

Materials to Copy

- Card Sort Area Cards (1 copy for every 2 students): Activity 1

- Inch tiles: Activity 1, Activity 2

Lesson Timeline

Warm-up	10 min
Activity 1	15 min
Activity 2	20 min
Synthesis Estimate	10 min
Actividad de cierre	5 min

Teacher Reflection Questions

Which voices went unheard in math class today? How might you leverage each student's ideas and support them being heard and seen in tomorrow's lesson?

Warm-up

10 min

Conteo grupal: Dos y cincos

Standards

Addressing	**4.OA.C.5**
Building Toward	**4.OA.B.4**

Instructional Routines

- Choral Count

The purpose of this *Choral Count* is to invite students to practice counting by 2 and 5 and notice patterns in each count. These understandings help students develop fluency and will be helpful later when students find factor pairs. In the *Activity Synthesis*, students are also invited to notice numbers that are in both counts and begin to reason why this may happen based on their emerging understanding of factors and multiples.

When students identify and predict common multiples for 2 and 5 based on the numbers recorded from the count and what they know about multiplication, they look for and express regularity in repeated reasoning (MP8).

This is the first time students experience the *Choral Count* routine in IM Grade 4. Students are familiar with this routine from a previous grade. However, they may benefit from a brief review of the steps involved.

Student Response

- Record the first count in a column with the title "count by 2." Record the second count next to the first with the title "count by 5."

Sample responses:

- Pattern in counting by 2:
  - The digits in the ones place repeat 2, 4, 6, 8, 0, 2, 4, 6, 8, 0.
  - All of the numbers are even.
  - After you count 5 numbers, the tens place increases by 1.
- Pattern in counting by 5:
  - The digits in the ones place alternate 5, 0, 5, 0.

Launch

- *"Cuenten de 2 en 2, empezando en 0"* // "Count by 2, starting at 0."
- Record as students count.
- Stop counting and recording at 30.

Activity

- *"¿Qué patrones ven?"* // "What patterns do you see?"
- 1–2 minutes: quiet think time
- Record responses.
- *"Ahora cuenten de 5 en 5, empezando en 0"* // "Now count by 5, starting at 0."
- Record as students count.

- After every even number, there's an odd number. The pattern is even, odd, even, odd, even, odd.
- After you count 2 numbers, the tens place increase by 1.

- Stop counting and recording at 75.
- *"¿Qué patrones ven?"* // "What patterns do you see?"
- 1–2 minutes: quiet think time
- Record responses.

Activity Synthesis

- Select 1–2 patterns for each count to discuss. Consider asking:
  - *"¿Alguien quiere compartir otra observación sobre por qué ocurre ese patrón aquí?"* // "Does anyone want to add an observation on why that pattern is happening here?"
  - *"¿Están de acuerdo o en desacuerdo? ¿Por qué?"* // "Do you agree or disagree? Why?"
- *"¿Cuáles números están en ambas listas? ¿Por qué creen que pasa eso?"* // "What numbers are in both lists? Why do you think that happens?" (10, 20, and 30 are in both lists. It's because they are multiples of both 2 and 5. 2 and 5 are both factors for each of those numbers.)
- *"Si los conteos siguieran, ¿qué otros números verían que son múltiplos tanto de 2 como de 5?"*// "If the counts continue, what other numbers would you see that are multiples of both 2 and 5?" (I think 40 would be the next common multiple because the multiples are going up by 10. I think 100 would be a common multiple because $2 \times 50 = 100$ and $5 \times 20 = 100$.)

Activity 1

15 min

Clasificación de tarjetas: Área

Standards

Addressing **4.OA.B.4**

Instructional Routines

- Card Sort

The purpose of this activity is for students to learn about **prime numbers** and **composite numbers**. Students are given a set of cards with rectangles on them. They sort the rectangles by area and then attempt to draw an additional rectangle for each category. They notice that some areas can be represented by more than one rectangle and some areas can only be represented by one rectangle.

During the *Activity Synthesis*, highlight that the side lengths of each rectangle represent one factor pair (each pair of side lengths should be used only once), and that the area of each rectangle represents a multiple of each side length. Students learn that a number with only one factor pair—1 and the number itself—is a prime number, and a number with more than one factor pair is a composite number.

Access for English Language Learners

MLR8 Discussion Supports. Invite students to take turns selecting a rectangle, and explaining how they should sort it to their partner. Display the following sentence frames: *"Este rectángulo va con _____ porque . . ." //* "This rectangle belongs with _____ , because . . ." Encourage students to challenge each other when they disagree.
Advances: Conversing, Representing

Access for Students with Disabilities

Engagement: Develop Effort and Persistence. Chunk this task into manageable parts to support organizational skills in problem solving. Some students may benefit from explicit guidance for how to begin. For example, before sorting, students can find the area of each rectangle.
Supports accessibility for: Conceptual Processing, Visual-Spatial Processing, Organization

Required Materials

Materials to Gather

- Grid paper: Activity 1
- Inch tiles: Activity 1

Materials to Copy

- Card Sort Area Cards (1 copy for every 2 students): Activity 1

Required Preparation

- Create a set of cards from the blackline master for each group of 2.

Student Task Statement

Tu profesor te va a dar un juego de tarjetas que muestran rectángulos.

1. Clasifica las tarjetas en categorías de una forma que tenga sentido para ti. Prepárate para explicar qué significan tus categorías.
2. Agrupa las tarjetas que tienen rectángulos con la misma área. Prepárate para explicar tu razonamiento.
3. Para cada grupo de tarjetas que tienen rectángulos con la misma área, piensa en al menos un rectángulo más. Escribe su largo y su ancho. Prepárate para explicar tu razonamiento.

Student Response

1. Students may sort by:
   - The rectangles being gridded or not gridded.

Launch

- Groups of 2
- Give each group a set of cards.

Activity

- *"Con su compañero, clasifiquen las tarjetas en categorías de una forma que tenga sentido para ustedes" //* "Work with your partner to sort the cards into categories in a way that makes sense to you."
- 2 minutes: partner work time
- Monitor for the different ways students sort the cards, including grouping the cards into rectangles with the same area.
- Invite 2–3 previously selected students to share their categories.
- *"Si no lo han hecho todavía, agrupen las tarjetas que tienen rectángulos con la misma área" //* "If you did not already, group the cards into rectangles that have the same area."
- 3–5 minutes: partner work time

- The rectangles with labels or no labels.
- The orientation of the rectangles (for example, “more tall than wide”, “more wide than tall”, “same height and width”).
- The value of the area (7, 18, 24, or 36 square units).

2. Groups:
   - Rectangles with an area of 24 square units: A, E.
   - Rectangles with an area of 36 square units: B, F, H.
   - Rectangles with an area of 18 square units: C, D.
   - Rectangles with an area of 7 square units: G.

   Sample response: A and E go together because they both have an area of 24 square units. I know A has an area of 24 square units because I know $8 \times 3 = 24$. I can also see that E has 24 square units by counting all the squares or because I know $4 \times 6 = 24$.
3. Sample responses:
   - Rectangles with an area of 24 square units: 1 by 24 or 2 by 12.
   - Rectangles with an area of 36 square units: 1 by 36, 2 by 18.
   - Rectangles with an area of 18 square units: 1 by 18.
   - Rectangles with an area of 7 square units: none.

- Ask students to check their work with another group to make sure the cards in each category match.
- *“Ahora, para cada una de las categorías en las que clasificaron sus tarjetas, hagan por lo menos un rectángulo más” //* “Now, create at least one rectangle to add to each category in your card sort.”
- 3–5 minutes: partner work time
- Observe the rectangles students add to each category. Monitor for students who notice that no new rectangles could be drawn for the area of 7 square units.

Activity Synthesis

- Invite 2–3 students to share the rectangles they added to each category.
- *“¿Por qué pudieron hacer más rectángulos para algunas áreas y no para otras?” //* “Why were you able to create more rectangles for some areas and not others?” (Some of the numbers had more factor pairs. For some numbers, there was only one possible factor pair.)
- Repeat student reasoning. *“Solo se puede hacer un rectángulo para el área de 7. Los números como este se llaman **números primos**. Un número primo solo tiene una pareja de factores: 1 y él mismo” //* “Only one rectangle can be made for the area of 7. Numbers like 7 are called **prime numbers**. Prime numbers have only one factor pair: 1 and itself.”
- *“Los números como el 15, que tienen más de una pareja de factores, se llaman **números compuestos**” //* “Numbers like 15 that have more than one factor pair are called **composite numbers**.”
- *“¿Con qué otros números compuestos trabajaron? ¿Cómo saben que son compuestos?” //* “What other composite numbers did you work with? How do you know they are composite?” (Twenty-four is a composite number because I can make 2 rows of 12 or 4 rows of 6. Eighteen is composite because it has factor pairs of 2 and 9 and 3 and 6.)

Activity 2

20 min

¿Primo o compuesto?

Standards

Addressing **4.OA.B.4**

In this activity, students use the area of rectangles to find all factor pairs of a given whole number and decide if the number is prime or composite. The *Activity Synthesis* focuses on finding all possible rectangles for a given area as a strategy to find all the factor pairs of a number. Students may notice that they do not need to find all possible rectangles to determine whether a number is prime or composite.

Required Materials

Materials to Gather

- Grid paper: Activity 2
- Inch tiles: Activity 2

Student Task Statement

La tabla muestra varias áreas. ¿Cuántos rectángulos con longitudes de lado enteras se pueden hacer para cada área?

Completa la tabla.

Los rectángulos con la misma pareja de longitudes de lado solo se deben contar una vez. Por ejemplo, si cuentas un rectángulo con 4 unidades de lado a lado y 6 unidades de arriba hacia abajo, ya no debes contar un rectángulo con 6 unidades de lado a lado y 4 unidades de arriba hacia abajo.

Launch

- Groups of 2
- Give each group access to inch tiles and grid paper.
- *"Si se les diera un número que es el área de un rectángulo, ¿cómo podrían saber cuántos rectángulos se pueden hacer que tengan esa área?"* // "If you were given a number that is the area of rectangle, how could you find out how many rectangles with that area can be made?" (Test it out with tiles. Think about factor pairs for the number.)
- 1 minute: partner discussion
- Share and record responses.

Activity

- *"Completen esta tabla con su compañero. Si quieren, pueden usar fichas de pulgada o papel cuadriculado"* // "Work with your partner to complete this table. Inch tiles and grid paper are available if you'd like them."
- 10 minutes: partner work time
- Monitor for different ways students find the number of rectangles, such as:
  - Building the rectangles from inch tiles.
  - Drawing rectangles on grid paper.

área (unidades cuadradas)	¿cuántos rectángulos?	¿primo o compuesto?
2		
10		
48		
11		
21		
23		
60		
32		
42		
31		
56		

Student Response

area (square units)	number of rectangles	prime or composite?
2	1	prime
10	2	composite
48	5	composite
11	1	prime
21	2	composite
23	1	prime
60	6	composite
32	3	composite
42	4	composite
31	1	prime
56	4	composite

- Drawing rectangles freehand.
- Listing the factor pairs of the number and knowing that one rectangle corresponds to each pair.

Activity Synthesis

- Invite 3–4 groups to share their strategy for finding the number of rectangles for a given area.
- *"¿Cómo se relaciona el número de parejas de factores con el número de rectángulos?"* // "How does the number of factor pairs relate to the number of rectangles?" (The side lengths of each rectangle is a factor pair. So, finding all the rectangles would give us all the factor pairs. Finding all the factor pairs of the number would tell us how many rectangles have that number for their area.)
- *"¿Cuáles son todos los números primos de nuestra lista? ¿Cómo sabemos que son primos?"* // "What are all of the prime numbers in our list? How do we know they are prime?" (2, 11, 23, 31. They each only have one factor pair, 1 and the number itself.)
- *"¿Qué observan sobre los números primos?"* // "What do you notice about the prime numbers?" (They are odd numbers except the number 2.)
- *"¿Cuál es el número primo más pequeño de nuestra colección? ¿Es éste el número primo más pequeño que hay?"* // "What is the smallest prime number in our set? Is it the smallest prime number?" (2. I don't know. Is 1 a prime number?)
- Display a rectangle with an area of 1 square unit.
- *"¿Cuánto miden los lados de un rectángulo que tiene un área de 1 unidad cuadrada?"* // "What are the side lengths of a rectangle with an area of 1 square unit?" (1 and 1)
- *"Como 1 solo tiene 1 factor, no tiene ninguna pareja de factores, así que no es ni primo ni compuesto"* // "Since 1 only has 1 factor, it doesn't have any factor pairs, so it is neither prime nor composite."
- *"¿Cuáles son todos los números compuestos de nuestra colección? ¿Cómo sabemos que no son primos?"* // "What are all the composite numbers in our set? How do we know they are not prime?" (10, 48, 21, 60, 32, 42, 56. They each have more than 1 factor pair.)

Lesson Synthesis

"Hoy aprendimos sobre números primos y números compuestos" // "Today we learned about prime and composite numbers."

"¿De qué sirve encontrar todos los rectángulos con cierta área para saber si el valor del área es primo o compuesto?" // "How does finding all the rectangles with a certain area tell us if the value of the area is prime or composite?" (The side lengths of each rectangle are a factor pair of the area. If we can find more than one rectangle with that area, that means the number has more than one factor pair and is composite. If we can find only one rectangle, the number is prime.)

"¿Qué preguntas tienen todavía sobre estos tipos de números?" // "What questions do you still have about these types of numbers?"

Math Community
After the *Cool-down*, ask students to individually reflect on the question *"¿Cuál acción de la columna 'Hacer matemáticas' les pareció más importante en lo que hicieron hoy? ¿Por qué?"* // "Which 'Doing Math' action did you feel was most important in your work today, and why?" Students can write their responses on the bottom of their *Cool-down* paper, on a separate sheet of paper, or in a math journal.

Collect and read their responses after class. These responses will offer insight into how students feel about their own mathematical work and help you make personal connections to the norms they will be creating during Days 4–6.

Suggested Centers

- Find the Number (4), Stage 1: Factors (Addressing)
- Five in a Row: Multiplication (3–5), Stage 1: Factors 1–5 and 10 (Supporting)

Cool-down

5 min

¿Primo o compuesto?

Standards

Addressing **4.OA.B.4**

Student Task Statement

1. a. ¿Cuáles son las parejas de factores de 40?
   b. ¿40 es un número primo o un número compuesto? Explica o muestra tu razonamiento.
2. ¿17 es un número primo o un número compuesto? Explica o muestra tu razonamiento.

Student Response

1. a. 1 and 40, 2 and 20, 4 and 10, 5 and 8.
   b. Composite, because it has more than 1 factor pair.
2. Prime, because it has only one factor pair, 1 and 17.

Responding to Student Thinking

The student confuses vocabulary from the previous lessons: prime, composite, factor pairs, multiples.

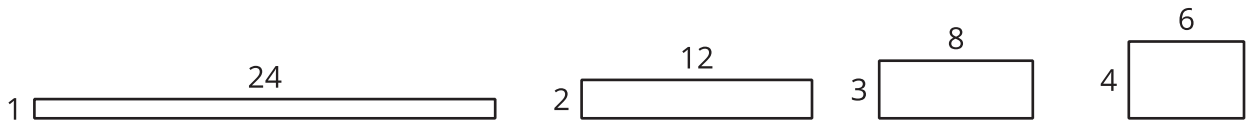
Next Day Supports
When explaining how to play Find the Number game in the next lesson, connect key vocabulary with drawings of rectangles.

Section A Summary

Usamos nuestra comprensión del área de rectángulos para aprender sobre factores, múltiplos, parejas de factores, números primos y números compuestos.

Si conocemos la longitud de uno de los lados de un rectángulo, podemos encontrar las áreas que el rectángulo podría tener. Por ejemplo, un rectángulo con un lado que mide 3 puede tener un área de 3, 6, 9, 12, 15 u otros números que sean el resultado de multiplicar un número entero por 3. Llamamos a estos números **múltiplos** de 3.

Si conocemos el área de un rectángulo, podemos encontrar las longitudes de lado que puede tener. Por ejemplo, un rectángulo que tiene un área de 24 unidades cuadradas podría tener longitudes de lado de 1 y 24, 2 y 12, 3 y 8, o 4 y 6. Llamamos **parejas de factores** de 24 a estas parejas de longitudes de lado.



También aprendimos que un número que tiene solo una pareja de factores —1 y el mismo número— se llama un **número primo**. Por ejemplo, 5 es primo porque su única pareja de factores es 1 y 5.

Un número que tiene dos o más parejas de factores es un **número compuesto**. Por ejemplo, 15 es compuesto porque sus parejas de factores son: 1 y 15, y 3 y 5.