Step by step guide: Classifying Whole Numbers as Prime and Composite

Grade 10 Mathematics | 40-Minute Lesson

Before Class Begins

Preparation Checklist:

- Arrange learners into groups of 4-5
- Prepare number charts (1-100) for each group
- Have exit tickets ready for distribution
- Set timer for phase transitions
- For struggling learners: Pre-circle prime numbers on their charts
- Prepare factor tree examples for visual demonstration

PHASE 1: Problem-Solving and Discovery (15 Minutes)

Opening (2 minutes)

[SAY]:

"Good morning/afternoon, class! Today we're going to discover something fascinating about numbers—we'll learn how to identify the building blocks of all numbers. By the end of this lesson, you'll be able to classify any whole number as prime, composite, or neither."

[SAY]:

"Here's our key question for today: How do we use real numbers in day-to-day activities? Keep this question in mind as we explore."

Anchor Activity Introduction (2 minutes)

[SAY]:

"I'm going to give each group a chart with numbers from 1 to 100. Your task is to work together to discover which numbers are special. But first..."

[ASK]:

"Can someone tell me—what is a factor of a number?"

[WAIT for responses, then clarify]:

"A factor is a number that divides another number exactly with no remainder. For example, the factors of 6 are 1, 2, 3, and 6."

Group Work Instructions (1 minute)

[SAY - Read slowly and clearly]:

"In your groups, I want you to:
Step 1: Write numbers from 1 to 100.
Step 2: First, sort them into odd and even.
Step 3: Now, identify which numbers have ONLY two factors—1 and themselves. These are special!
Step 4: Identify which numbers have MORE than two factors.
Step 5: Find any prime numbers that are also even.
Step 6: Think of real-life examples where these classifications matter.

You have 10 minutes. Begin!"

Circulation and Probing (8 minutes)

[DO]: Walk around the room, observing each group's progress.

[ASK probing questions as you circulate]:

- "How many factors does this number have?"
- "What makes 7 different from 6?"
- "Is there an even number that has only two factors?"
- "Why do you think 1 is tricky to classify?"
- "Can you find a pattern in where the prime numbers appear?"

[OBSERVE]: Note which groups correctly identify that 2 is the only even prime. Watch for the misconception that 1 is prime.

[TIME CHECK]: At 8 minutes, announce: "Two more minutes to finalize your classifications!"

Group Sharing (2 minutes)

[SAY]:

"Time's up! Let's hear from some groups. [Group name], which numbers did you find that have only two factors?"

[LISTEN to response, then ask]:

"[Group name], did you find any even numbers with only two factors? What did you discover about the number 2?"

[TRANSITION]:

"Excellent discoveries! Now let's give names to what you've found and learn the formal definitions."

PHASE 2: Structured Instruction (10 Minutes)

Defining Prime Numbers (3 minutes)

[SAY]:

"Many of you found numbers that could only be divided by 1 and themselves. These numbers have a special name—they're called PRIME NUMBERS."

[WRITE on board]:

Prime Number: A number that has exactly TWO factors: 1 and itself.

[SAY]:

"Examples of prime numbers: 2, 3, 5, 7, 11, 13, 17, 19, 23... Think of prime numbers as the BUILDING BLOCKS of all other numbers."

[ASK]:

"What's special about the number 2?"

[Expected answer]: "It's the only even prime number."

[SAY]:

"Exactly! 2 is unique—it's the ONLY even prime number. Why? Because every other even number can be divided by 2, so they have more than two factors."

Defining Composite Numbers (3 minutes)

[SAY]:

"Now, what about numbers that have MORE than two factors? These are called COMPOSITE NUMBERS."

[WRITE on board]:

Composite Number: A natural number greater than 1 that has more than two factors.

[SAY with examples]:

"Let me show you:
• 4 is composite: 4 = 1 × 4 and 2 × 2. Factors: 1, 2, 4
• 6 is composite: 6 = 1 × 6 and 2 × 3. Factors: 1, 2, 3, 6
• 9 is composite: 9 = 1 × 9 and 3 × 3. Factors: 1, 3, 9"

Addressing the "0 and 1" Misconception (2 minutes)

[SAY]:

"Now, I noticed some groups were unsure about 0 and 1. Let me clarify this important point."

[WRITE on board]:

0 and 1 are NEITHER prime NOR composite.

[SAY]:

"Why? A prime number needs EXACTLY two distinct factors. The number 1 has only ONE factor—itself. And 0 can be divided by any number, so it doesn't fit either definition."

Key Properties Summary (2 minutes)

[SAY while writing on board]:

"Let's summarize the key properties:
• The only even prime number is 2
• All other even numbers greater than 2 are composite
• The smallest composite number is 4
• Every composite number can be broken down into prime factors
• Think of primes as building blocks, composites are made by combining those blocks"

[TRANSITION]:

"Now let's practice classifying some numbers!"

PHASE 3: Practice and Application (15 Minutes)

Direct Classification (5 minutes)

[SAY]:

"Let's classify some larger numbers together. I'll show you a number, and you tell me—prime or composite? And explain your reasoning."

[DISPLAY each number, call on learners]:

[ASK]: "1021—prime or composite?"

[Expected answer]: "Prime—it's only divisible by 1 and itself"

[ASK]: "1111—prime or composite?"

[Expected answer]: "Composite—it equals 11 × 101"

[ASK]: "1999—prime or composite?"

[Expected answer]: "Prime—it's only divisible by 1 and itself"

[ASK]: "2000—prime or composite?"

[Expected answer]: "Composite—it's even, so divisible by 2"

[ASK]: "3011—prime or composite?"

[Expected answer]: "Prime—it's only divisible by 1 and itself"

[ASK]: "3500—prime or composite?"

[Expected answer]: "Composite—it's even, so divisible by 2"

[TIP]:

"Quick check: If a number is even and greater than 2, it's automatically composite! Why? Because it's divisible by 2."

Word Problem Application (7 minutes)

[SAY]:

"Now let's apply this to a problem. Listen carefully."

[READ the problem slowly]:

"During a mathematics lesson, Grade 10 learners were asked to classify the number 45038. Which of the following statements are true?
(1) It is odd
(2) It is prime
(3) It is composite
(4) It is even

Work with your partner to determine which statements are true."

[GIVE learners 3 minutes to discuss]

[ASK]: "Who can walk us through the solution?"

[Guide the solution]:

"Step 1: Check if it's even or odd. Look at the last digit—it's 8. So the number is EVEN. That eliminates statement (1).

Step 2: Is it prime or composite? Since it's even and greater than 2, it must be divisible by 2. That means it has more than two factors. So it's COMPOSITE.

The correct answers are (3) It is composite and (4) It is even."

Partner Practice (3 minutes)

[SAY]:

"With your partner, quickly classify these: Is 641 prime or composite? What about 449?"

[WAIT 2 minutes, then reveal]:

"641 is PRIME—it has no divisors other than 1 and itself. 449 is also PRIME. Great work if you got those!"

[TRANSITION]:

"Now I want to see what each of you has learned individually."

PHASE 4: Assessment / Checkpoint (8 Minutes)

Independent Work (5 minutes)

[DISPLAY or read the questions]:

"Classify each number as Prime, Composite, or Neither:
1. 1
2. 524
3. 641
4. 449
5. 0
6. 302
7. 557
8. 504"

[SAY]:

"You have 5 minutes. Begin."

[DO]: Walk around quietly, ensuring learners are working independently.

Collection and Closure (2 minutes)

[SAY]:

"Time's up. Please pass your exit tickets forward."

[COLLECT all tickets]

[SAY]:

"Today you learned to classify whole numbers as prime, composite, or neither. You discovered that prime numbers are the building blocks of all other numbers, and composite numbers are made by combining those blocks."

[ASK]:

"Let's return to our key question: How do we use real numbers in day-to-day activities? Can someone give me an example where knowing about prime numbers might be useful?"

[ACCEPT 2-3 responses - examples: computer security/encryption, dividing items equally]

[SAY]:

"Excellent work today! For homework, find three large numbers and classify each as prime or composite. Be ready to explain your reasoning tomorrow."

Differentiation Notes

For Struggling Learners:

- Provide a 1-100 chart with prime numbers pre-circled
- Offer a list of prime numbers up to 100 for reference
- Use factor trees as visual aids
- Pair with supportive peers during group work
- Work directly with this group during the anchor activity

For Advanced Learners:

[GIVE this extension problem]:

"Can every composite number be written as a product of prime numbers? Try to express 60, 84, and 100 as products of only prime numbers. What pattern do you notice?"

[Expected work]:

- $60 = 2 \times 2 \times 3 \times 5 = 2^2 \times 3 \times 5$
- $84 = 2 \times 2 \times 3 \times 7 = 2^2 \times 3 \times 7$
- $100 = 2 \times 2 \times 5 \times 5 = 2^2 \times 5^2$

This introduces the Fundamental Theorem of Arithmetic.

Answer Key

Exit Ticket Answers:

1: Neither (only has one factor)

524: Composite (even number, divisible by 2)

641: Prime (only divisible by 1 and 641)

449: Prime (only divisible by 1 and 449)

0: Neither (zero is neither prime nor composite)

302: Composite (even number, divisible by 2)

557: Prime (only divisible by 1 and 557)

504: Composite (even number, divisible by 2)

Post-Lesson Reflection Prompts

After teaching this lesson, consider:

1. What went well? Which activities generated the most engagement?

2. What would I change? Were the time allocations appropriate?

3. Student Understanding: What did the exit tickets reveal? What percentage correctly identified 0 and 1 as neither?

4. Next Steps: Which learners need additional support? Should we explore prime factorization next?