LESSON PLANNING GUIDE

Lesson Plan: Understanding Domain and Its Relationship to Function Graphs

Date: (Day lesson will be taught)

Estimated Time of Lesson Plan: 50 minutes

Grade/Subject: 9th Grade; Algebra I

Standards, Learning Objectives, and Assessment:
Learning objectives are observable, measureable, thoughtfully written, and matched to the state academic standards for the appropriate subject and grade level. Each "I Can" statement should rephrase the objective in student-friendly language. Each objective must have an assessment.
[Use TSW (The student will…) or TSWBAT (The student will be able to…) for each objective]

<table>
<tr>
<td rowspan="6">Standard:
A1.F.IF.B.4
Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.</td>
<td>Objective 1:
TSW identify the domain of a function from its graph and explain how the domain relates to the visual representation.</td>
<td rowspan="2">Assessment:
□ Formative □Summative
Students will analyze 4 different function graphs (linear, quadratic, exponential, and piecewise) and identify the domain for each, writing their answers in interval notation and set notation. Teacher will circulate and check for understanding using observation checklist.</td>
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<tr>
<td>"I Can…."
I can look at a graph and identify which x-values are included in the domain.</td>
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<td>Objective 2:
TSW determine the appropriate domain for a function that models a real-world relationship between two quantities.</td>
<td rowspan="2">Assessment:
□ Formative □Summative
Students will complete 3 real-world context problems (penny thrown from window, account balance over time, and rental car scenario) and determine the reasonable domain based on the context. Students will justify their domain choices in writing. Exit ticket will assess this objective.</td>
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<tr>
<td>"I Can…"
I can figure out what x-values make sense in a real-world problem and explain why.</td>
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<td>Objective 3:
TSWsketch a graph showing appropriate domain features given a verbal description of a quantitative relationship.</td>
<td rowspan="2">Assessment:
□ Formative □Summative
Students will be given 2 verbal descriptions of real-world scenarios and will sketch graphs that accurately represent the domain restrictions. Peer feedback protocol will be used where partners check each other's graphs for correct domain representation. Teacher will collect and review sketches.</td>
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<tr>
<td>"I Can…"
I can draw a graph that shows the correct domain when someone describes a situation to me.</td>
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Academic Vocabulary. *Identify and define the important academic vocabulary that students need to understand in the lesson.*	
Language Function: Students will **analyze**, **interpret**, and **justify** the domain of functions by examining graphs and real-world contexts, using mathematical terminology to explain the relationship between domain restrictions and quantitative relationships.	*Planned Supports: how will you help students to understand the language function?* Sentence frames for justifying domain choices: "The domain is ___ because in this context, x represents ___ and it makes sense that ___." • Think-aloud modeling during "I Do" phase • Color-coding on graphs to highlight domain (x-axis in one color, range in another)
Vocabulary: Domain Function Input Output Range Interval notation Set notation Continuous Discrete Restriction Quantitative Relationship	*Planned Supports: how will you teach general and discipline-specific vocabulary and support students to use it in writing and/or speaking?* Students create vocabulary cards with examples and non-examples • Use of color-coding: domain in blue, range in red throughout lesson • Reference vocabulary during each phase of instruction • Students use at least 3 vocabulary terms in their exit ticket explanation

Prior Knowledge & Prerequisite Skills

What students already know:

- How to plot points on a coordinate plane
- Understanding of x-axis (horizontal) and y-axis (vertical)
- Basic function notation f(x)
- How to read and interpret graphs
- Understanding that functions assign one output to each input
- Experience with linear, quadratic, and exponential functions
- How to identify independent and dependent variables

Skills required for success:

- Ability to identify x-values on a graph
- Understanding of inequality symbols (<, >, ≤, ≥)
- Basic understanding of interval notation (will be reviewed)
- Ability to distinguish between mathematical domain and contextual domain
- Reading comprehension for word problems
- Ability to sketch basic function graphs

Guiding Questions:

1. **What is domain, and why does it matter when we're working with functions?**
   - Establishes purpose and relevance
2. **How can we identify the domain by looking at a graph?**
   - Focuses on visual analysis skills
3. **What's the difference between the mathematical domain and the domain that makes sense in a real-world context?**
   - Develops critical thinking about contextual restrictions

4. **How do we know which x-values are included in the domain and which are not?**
    - Addresses precision in mathematical communication
5. **Why might a function have domain restrictions even if the graph could continue forever?**
    - Deepens understanding of context-based limitations

Set:
Activity: "The Impossible Scenario" (4 minutes)
Display on board: "A ball is thrown upward from ground level. The function $h(t) = -16t^2 + 32t$ represents the height of the ball in feet after t seconds."
Ask students:

- "According to this function, what would be the height of the ball at t = -5 seconds?" [Calculate together: h(-5) = -16(25) + 32(-5) = -400 - 160 = -560 feet]
- "Does this answer make sense? Can a ball be at -560 feet before we throw it?"
- "What about t = 100 seconds? Would the ball still be in the air?" [Calculate: h(100) = -16(10,000) + 32(100) = -156,800 feet—clearly impossible]

Reveal the problem: "Even though we CAN plug any number into this function mathematically, not all numbers make sense in the real world! Today we're learning about DOMAIN—which x-values are actually possible or reasonable for a function."
Purpose statement: "By the end of today's lesson, you'll be able to look at any function—whether it's a graph, equation, or word problem—and determine which x-values make sense to use. This is a critical skill for modeling real-world situations with mathematics."

Instruction:
Step-by-step presentation of the lesson, in which instruction uses the gradual release of responsibility to include modeling (**"I do"**), guided practice in assisting students with what they have just learned (**"We do"**), and/or independent practice (**"You do"**). Uses a variety of instructional strategies and formative assessments to scaffold and monitor student understanding. Create authentic learning experiences that mirror what professionals do in this discipline.

Closure:
To review, reinforce, summarize, and restate the objectives of the lesson
How will you ask your students to think about how they practiced the discipline in which you are teaching that day? (Example-How did you think like a mathematician in this lesson?)

Ask yourself:
What can the students do to show what knowledge and skills they have gained from the lesson?
How can I assess the effectiveness of my lesson?
What will trigger students to linger on the learning after the lesson?

Assignment:
Independent reinforcement of lesson objectives beyond class time

Ask yourself:
If an assignment is given, how will it ensure that students have mastered the skill without teacher guidance and/or to extend the student's thinking?
How have I considered differentiation of practice, enrichment, and/or thinking beyond the lesson?

Cross-curriculum Connections & Disciplinary Literacy:
Intentional connection(s) within the lesson with shared grade level outcomes & integration of literacy of the discipline

Ask yourself:
How does this lesson connect with other content area standards?
How does this lesson make demands on reading, writing, speaking, listening, critical thinking, and problem solving?
How I am supporting students?

How can/could I collaborate with other grade level teachers for shared accountability of student outcomes?

Differentiated Instruction & Targeted Supports (ELL/SPED)
Planning strategies & supports to insure that all students receive instruction appropriate for their needs

Ask yourself:
What differentiation will I provide for differences in readiness, interest, or learning profile?
How can I extend and enrich learning for students who demonstrate proficiency?
How can I assure learning for students who lack readiness for the skills or concepts being taught?
How will I provide access to the academic content and/or make modifications for specific students whose primary language is one other than English?
How will I provide access to the academic content and/or make modifications for specific students who have an IEP or other learning differences, including giftedness?

Materials, Resources, and Technology
List of student and teacher needs

Ask yourself:
What books, supplies, handouts, supplementary items, technology/media resources, equipment, or other materials are used to interactively engage student learning?